RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

1919 1944

25th
niversary

CTOBER
1944

www.americanradiohistory.com

Nerve Center of 145,000,000 Words...

A MIRACLE OF GROWTH IN 25 YEARS

Twenty-five years ago, in 1919, R.C.A. Communications sent its first radiotelegraphic message. Filling a world-wide need, revealed by World War I, over 6,000,000 words were transmitted in the first full year of service.

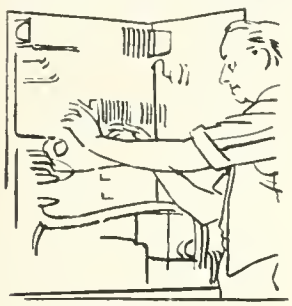
Since that first year of service RCAC's transoceanic service facilities have been continually expanded and improved. More and more, through these 25 years, radio communication has been accepted as an invaluable service to the public. Thus in this silver anniversary year, despite wartime restrictions, it is expected that a staggering total of 145,000,000 words, *nearly 25 times* the first year's volume, will have been transmitted.

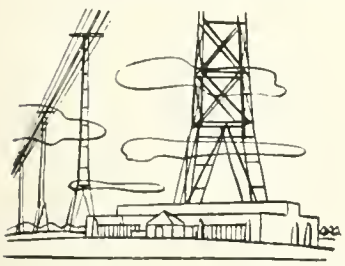
Today, the many millions of words which flow through RCAC circuits are fundamentally doing a war job. They are messages of strategic military importance or words of comforting news from home to the members of our overseas forces. Tomorrow, RCAC will continue its steady expansion—will do its part through efficient communications to bring the world closer together—thus helping to create a better understanding and to preserve a lasting peace among all nations.

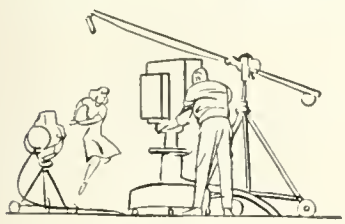
R. C. A. COMMUNICATIONS, INC.

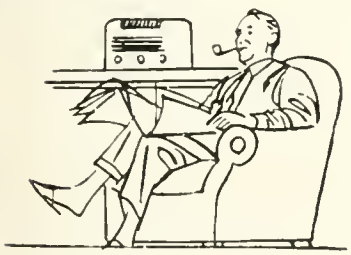
A SERVICE OF RADIO CORPORATION OF AMERICA

www.americanradiohistory.com









THIS ISSUE: Here on review is radio's great forward m a r c h — RCA's first 25 years as an all-American industry and service to the Public.

RADIO AGE

RESEARCH · MANUFACTURING · COMMUNICATIONS · BROADCASTING

VOLUME 4 NUMBER 1
OCTOBER 1944

CONTENTS

Radio Age, published quarterly by the Department of Information of the Radio Corporation of America, RCA Building, New York, N. Y., for the RCA services: RCA Laboratories, RCA Victor Division, R.C.A. Communications, Inc., Radiomarine Corporation of America, National Broadcasting Company, Inc., R.C.A. Institutes, Inc., RCA Service Company, Inc.

www.americanradiohistory.com

Twenty-Five Years of Radio

CANDLES on the 25th birthday cake of RCA typify more than the passing of the years. Like wireless towers the candles stand as sentinels of the past, their lambent flames reminiscent of the radiant sparks kindled by the wireless pioneers. As man in his electronic conquest of the ether approaches the frontiers of light, he becomes more and more aware that radio and light are akin. Now he knows that he can see by radio as well as hear.

A Symbol of Achievement

"The Story of RCA" is a story of twenty-five years of pioneering and progress. Radio has passed through almost fifty years since Marconi's first signal yet there is no radio device in its original form now in practical use that dates back to 1895. Time also has replaced the instruments of 1919. The past twenty-five years have been crowded with great activity in radio; the pace of progress has been swift.

Always there are new inventions and new opportunities. The men of RCA, alert to the challenges and opportunities of science have brought into use many of the outstanding developments in the field of radio. As a result, RCA is a symbol of achievement in the science of radio and electronics, in the art of broadcasting and in the service of worldwide communications.

RCA has carved out its destiny with the electron tube as a mighty tool. In 1919 the challenges of radio were as boundless as the ether and twenty-five years have not diminished, but make it clear that the future of radio is always greater than its past. The electron tube lights the way into the wilderness of space—into the ultra high-frequency spectrum of the ether in which new trails of communication are being blazed. The First World War revolutionized radio; so has the Second.

An Unforgettable Story

News of the Armistice in 1918 was flashed around the world by the dots and dashes carried on the long waves of wireless. The curtain went down on the first quarter century of radio. In a brief interlude between 1919 and 1920, the communication props on the world-wide stage were shifted. When the curtain went up in 1920 the radio setting was transformed as if a miracle had happened. The crystal detector was supplemented by the electron tube. So was the spark transmitter and many instruments that made the romance of wireless an unforgettable story. Alongside the wireless key there was the microphone through which man might talk and sing. Short waves had been harnessed to encircle the earth.

As a science, an art and an industry, radio was on the threshold of a new era. The silver-coated bulb of the electron tube was a new crystal ball of science in which the men of radio saw the old order of electrical things disappear and the electronic future spread before them. They saw the dreams of Marconi, Tesla, Lodge, Crookes and others coming true.

Within twenty-five years more than 21,777,000 RCA radio and phonograph instruments have been put into use throughout the world; since 1930 RCA Victor has produced 294,000,000 phonograph disks performed by the world's great artists. There are 1,000 broadcasting stations in the United States; 325 use RCA transmitters. The hemispheres are criss-crossed by invisible waves carrying millions and millions of words to the far corners of the earth; RCA operates more than 50 direct radiotelegraph circuits between the United States and foreign countries. No ship on the Seven Seas need be out of touch with land, or with its home port; approximately 80 percent of the American Merchant Marine is equipped with RCA apparatus. More than 60,000,000 broadcast receivers put the homes of America in tune with all the world. America's No. 1 Network—operated by the NBC — comprises 146 stations from coast-to-coast. Since 1930, RCA alone has sold more than 452,000,000 electron tubes, and today millions of them are in service in countless homes and on every fighting front.

The Promise of Television

Television, today, is testing its electronic eyesight just as the radiophone was testing its voice in 1919. As soon as this war is over the curtain of Time again will drop, and again all the props of communications will be shifted for a new act. The scene will be television—a camera alongside the microphone just as the microphone took its place alongside the wireless key in 1920. And the new camera will have an electronic eye as sensitive as the human optic, for it will see all that the eye can see in a room lighted by the candles on a birthday cake.

David Sarnoff

President,
Radio Corporation of America

www.americanradiohistory.com

Radio's Great Role in the War

GENERAL HARBORD TRACES ADVANCES IN RADIO SINCE THE FIRST WORLD WAR AND DISCUSSES APPLICATIONS OF RADIO-ELECTRONICS IN COMMUNICATION SO VITAL IN GLOBAL WARFARE

By Lieut. General James G. Harbord

Chairman of the Board,
Radio Corporation of America

SINCE the dawn of recorded history, when couriers from lookout posts already were being employed to dash back to their command headquarters with news of approaching enemies, communication has been a vital factor in battles and wars. For centuries in more recent times military experts have studied intently its application to their profession. Yet never in any comparably brief span of years in all the written story of mankind has there been such a striking advance in the military use of communication as has come between the First World War and the current one.

An absolutely complete and detailed account of the part being taken in the present conflict by radio communication and its related developments in radio-electronics would fill more volumes than could be piled into an Army jeep. A full report on radio in the First World War, which seemed to us spectacular at the time, would not take long to dispatch over RCA's automatic transmitters and receivers of today, which are capable of handling 600 words a minute as compared to thirty to forty words attained in World War I.

On the day after the First World War was declared, the importance of the infant art of radio was emphasized by a Presidential proclamation, directing the Navy to take over all radio stations in the United States and its possessions with the exception of those the Army already controlled. With the aid of engineering personnel and apparatus supplied by American radio companies, the Navy was prepared after this order was carried out to handle the communication requirements of its own forces, as envisaged in that period.

The Navy was far from prepared, however, to take up the overflow from the transatlantic cables when they became loaded to capacity as great numbers of our troops arrived in Europe. Yet it was apparent that if Germany should succeed in cutting our cables, radio would have to be depended on to supply our only telegraphic communication with our own Expeditionary Force and with our Allies. General Pershing strongly emphasized the need of direct radio channels. Even after improved stations capable of transmitting to Europe had been made available, the Navy still had the problem of return messages. It is an indication of radio's state of development in that era that extensive experiments were necessary before an effective transatlantic receiving station, with 150 operators, was established at Bar Harbor, Maine.

Working with the Army and the French Government, the Navy also undertook the construction of the Lafayette radio station near Bordeaux, an establishment of the 1,000-kilowatt arc type. A 500-kilowatt arc type station was built at Annapolis to supplement this. In what was then considered a most dramatic move to combat German submarines in European waters, fourteen two-kilowatt shore stations were erected in Ireland and France to cooperate with early-model aircraft scouting rather gingerly along the coasts. When it was later revealed that radio equipment was supplied and maintained by our Navy on approximately 1,500 vessels during the war, Americans who heard of it were amazed by the size of the accomplishment.

The dire danger of the submarines also forced the development of the radio direction finder into a practical instrument, after various navies had been dabbling at it experimentally since 1912. The device told the British that the German High Seas Fleet had left harbor, and led to the Battle of Jutland, because the Kaiser's fleet unsuspectingly kept using its radio transmitters. Direction finders later supplied information on sub-

TWO PRIVATES OF THE U. S. AIR FORCES CARRYING OUT THEIR VITAL COMMUNICATIONS DUTIES IN A BOMBER EQUIPPED WITH AN RCA LIAISON AIRCRAFT RECEIVER.

www.americanradiohistory.com

TWENTY-FIVE YEARS AGO, THE CUMBERSOME RIG ON THIS BIPLANE'S TOP WING WAS DEVELOPED AS A RADIO DIRECTION FINDING LOOP ANTENNA.

BELOW: IN THIS WAR, SOLDIERS MAINTAIN INSTANTANEOUS VOICE COMMUNICATION WITH FIELD COMMANDERS BY MEANS OF THE "WALKIE-TALKIE."

marines which caused United States transports to be routed from Brest to avoid attack.

One of the knottiest radio problems taken on by the Navy in the First World War was the creation of apparatus suitable for use in aircraft. Ignition interference which prevented reception of all but the clearest signals had to be overcome. Yet the weight had to be light enough to fly in the little planes of 1917 and 1918. It is understandable why the Navy was proud to be able to announce that it had fitted seventy-five planes with spark type transmitters and vacuum tube receivers before the Armistice was signed.

Our Army entered the war with field radio equipment much the same as we had had in 1914. In the meantime, France and England had profited by three years of intensive development, having realized through bitter experience that Army radio had to be changed greatly to meet the demands of trench combat in which service distances were short and light weight was a tremendous asset. So our Army adopted the radio equipment of the French Army, but created a research program of its own. A laboratory and field test section was set up by the A.E.F. in France, and a research bureau was established at Camp Vail, N. J., supplemented by the Signal Corps Laboratory and Bureau of Standards in Washington.

The basis for the amazing expansion of American radio's uses in the Second World War began to be laid very soon after the Armistice of 1918. The First World War had proved what could be accomplished by directed research and the adjustment of claims and counter-claims of rival organizations, each holding essential patents and none capable of building a complete radio communication system without the others. To end this deadlock, the Radio Corporation of America was formed, with the sympathetic cooperation of our Government. Other strong competitive companies came later. The years between the wars developed radio communication and electronics to a point which changed the daily life of the nation.

No more striking demonstration of radio's efficiency and versatility could be imagined than the uses to which it now is being put on our fighting fronts and all the embattled seven seas. Much of the story cannot yet be told, for reasons of military security.

American radio has been in the war from the first, as an eager volunteer. The production of its devices—all for the armed services—now totals $250,000,000 a month in the United States, by the latest available reports.

The demand on the radio industry for millions of electron tubes of all sizes, great numbers of transmitters, receivers, antennas and other essential equipment can be realized only when we think of the size of our 7,000,000-man Army and two-ocean Navy. They are fighting what might almost be called a "radio war," because the science of radio-electronics is playing such a conspicuous part for victory.

The part which radio, in all its various phases, is taking in the present war, will bring great advances in radio in the post-war era. The intensified research and the experience now being gained under the exacting conditions of life and death struggle will be turned to the uses of peace. We have reason to expect a forward surge in radio-electronics when this war ends that will be comparable to the great strides of radio-electronics after the First World War.

U. S. SAILOR "PIPES" ORDERS THROUGH TRANSMITTER OF RCA INTERIOR COMMUNICATIONS EQUIPMENT USED ON BATTLESHIPS AND AIRCRAFT CARRIERS.

www.americanradiohistory.com

18 YEARS IN BROADCASTING

NBC Since Formation in 1926 Has Established Many Records in Providing "the Best Programs Available for Broadcasting in the United States."

By Niles Trammell

President,
National Broadcasting Company, Inc.

NETWORK broadcasting is the joint product of many interrelated activities. Each of these activities is indispensable to the final result, yet each is dependent upon all the others. A book might be written about any one of them, and how it has contributed to the broadcasting service initiated by Radio Corporation of America and carried on since 1926 by the National Broadcasting Company.

After broadcasting over a makeshift antenna the historic Dempsey-Carpentier fight, which took place in Jersey City on July 2, 1921, RCA built Station WDY in Roselle Park, New Jersey, which went on the air with its first program on December 14th of that year. By February, 1922, RCA had transferred its broadcasting activities to Station WJZ, which it operated on a partnership basis with Westinghouse, the owner of the station. In the Spring of 1923, full ownership of WJZ was acquired by RCA.

Station WEAF, which was bought by RCA in 1926 when NBC was formed, had been established by the American Telephone and Telegraph Company in July, 1922. A month after it first went on the air, WEAF broadcast the first commercially sponsored radio program, on behalf of the Queensboro Corporation, a real estate firm.

The following January, the first network program in history was carried by two stations connected by telephone wires—WEAF, New York, and WNAC, Boston. The program was a five-minute saxophone solo, but it was the beginning of network broadcasting.

When NBC was established in 1926, WEAF was the key station of its network. That the idea of a national network was immediately successful, and necessitated the creation of a second network only a few weeks after the first was formed, testifies to the soundness of the idea without detracting from the pioneering courage of NBC's founders. WJZ occupied a key position in the second NBC network, and remained an important NBC station until the separation of the Blue Network from NBC in 1942.

NBC Affiliates Increase

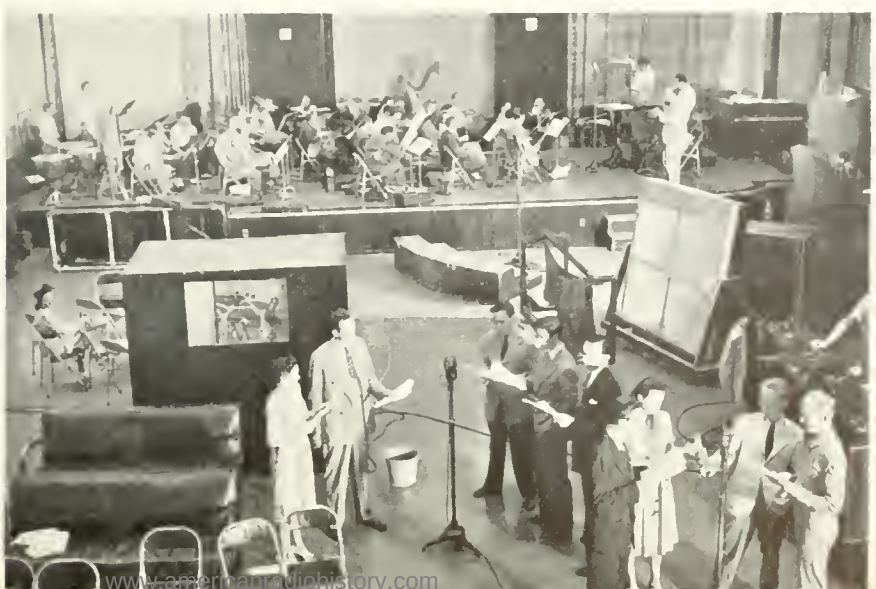
The original NBC Network comprised twenty-one stations and extended only as far west as Kansas City. By February, 1928, several stations on the Pacific Coast had become affiliated with NBC and on December 23, 1928, the network was fully established on a regular coast-to-coast basis.

The number of NBC affiliated stations has grown gradually and steadily through the years. Today, there are 150 stations in the full network—145 within the continental United States, three in Canada, one in Hawaii and one in Cuba. NBC itself owns only six stations: WEAF, New York; WRC, Washington; WTAM, Cleveland; WMAQ, Chicago; KOA, Denver; KPO, San Francisco. The remaining 144 stations are owned and operated by separate business organizations and associated with NBC in a contractual relationship.

The roster of NBC clients is a Blue Book of American industry and commerce. It is interesting to note that whereas 72 national advertisers sponsored programs over the NBC network during 1943, NBC had no less than 77 network clients during the year 1927. A comparison of NBC revenues tells a different story. The company's total revenue in 1927, its first full year of operation, was $3,760,000; in 1943 it was $49,000,000. There were 195 employees on the company's payroll when it started, compared with 2,286 on September 1, 1944. This increase is almost exactly proportional to the increase in the number of radio receiving sets in the hands of the public. In 1926, there were 5,000,000 receivers in the entire United States; in 1944, it is estimated that there are 57,000,000, of which 8,000,000 are in automobiles.

Music constituted approximately two-thirds of the network program fare in 1926. It now represents about half of NBC's total program time, although there are actually twice as many network program hours devoted to music today as there were eighteen years ago.

MUSIC AND SOUND EFFECTS ADD TO THE REALISM ACHIEVED BY ACTORS IN A DRAMATIC PRESENTATION FROM NBC'S RADIO CITY STUDIOS IN NEW YORK.



www.americanradiohistory.com

LEFT: FROM THESE LOFTY ANTENNA TOWERS ON LONG ISLAND, LISTENERS IN THE NEW YORK AREA RECEIVE PROGRAMS OF NBC'S KEY STATION WEAF. BELOW: NBC MASTER CONTROL ROOM FEEDS PROGRAMS TO AFFILIATED STATIONS ACROSS NATION.

The reason for this is that network programs are now on the air for sixteen or more hours a day, seven days a week. When NBC was established, WEAF was on the air approximately twelve hours each week-day and nine hours on Sunday; WJZ for approximately eight hours daily.

The Quiz type of program is not to be found in NBC's early schedules. It was only as recently as 1937 that this form of program became established. Dramatic programs filled only 2 per cent of NBC's total program time in 1926, compared with more than 26 per cent today. This increase of course is largely accounted for by the popular daytime serials.

News Reports Expand

The program change of greatest significance is in the field of news and special events. Except for a few sports events, there were no news programs broadcast over the network in its early days. Such programs now occupy no less than one-fifth of the network's total program hours. NBC had no news reporters or commentators in 1926; today, it has forty on its regular staff, in addition to a large news department. While the war is in large measure responsible for the present emphasis on news broadcasting, there is every likelihood that after the return of peace the reporting of national and international news will continue to play a major role in NBC programming.

In 1926, the average number of Red network stations used on a sponsored program was nine, and on the Blue network, three. Today the average number of stations per commercial program on the NBC network is 110 in the evening and 85 in the daytime.

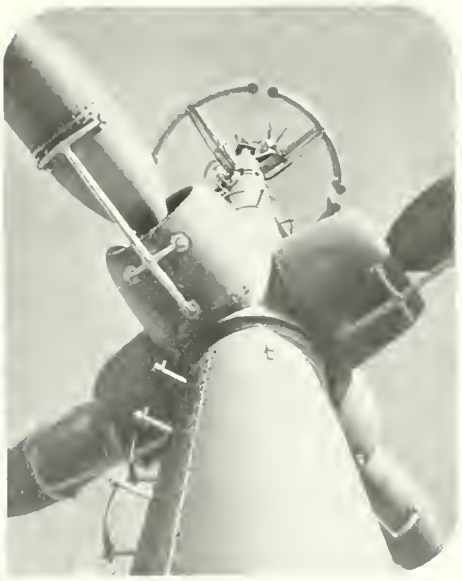
When NBC was formed, it broadcast no short-wave international programs. RCA, however, had in 1925 initiated international broadcasts to Europe over its Station W3XL at Bound Brook, New Jersey. This service was irregular until 1929, when programs provided by NBC were regularly broadcast via short-wave under the direction of RCA Communications, Inc. In 1930, this service was taken over by NBC, and has been a regular feature of the company's operations ever since. In November, 1942, the Government contracted for the full time of NBC's two 50-kilowatt international transmitters, WRCA and WNBI at Bound Brook, New Jersey. Since that time the seventy-six men and women of NBC's International Division have been engaged exclusively in the production and broadcasting of international programs in eight languages for the Government. This war service of facilities and personnel is rendered by NBC on a non-profit basis. It is certain that after the war the broadcasting of international programs will continue to be an important factor in America's foreign policy.

Pioneer With FM

Eighteen years ago Frequency Modulation (FM) was scarcely more than a technical phrase, known only to radio engineers. By 1939, however, FM had begun to show promise as a technical improvement in broadcasting, and NBC erected its own FM Station W2XWG on top of New York City's Empire State Building. This was the first FM station to be established in New York City by any network broadcaster. It has been on the air regularly with FM programs since January, 1940. NBC has also applied to the FCC for additional construction permits for FM Stations to be installed in cities where the company maintains studios. In order to stimulate the progress of FM, NBC plans to make its network programs available to the FM stations operated by the company's network affiliates. Our objective is to make NBC programs available to all radio listeners,

www.americanradiohistory.com

RIGHT: TELEVISION PROGRAMS PRODUCED BY NBC'S PIONEER NEW YORK STATION, WNBT, ARE PUT ON THE AIR FROM THIS MODERNISTIC ANTENNA ATOP THE EMPIRE STATE BUILDING. BELOW: WNBT'S TRANSMITTING CONTROL ROOM.



whether they use standard band or FM receivers.

Television is a field which has held the close attention of the company's management and engineers ever since the formation of NBC. This company is the pioneer in television broadcasting in the United States, and has a long record of "firsts," both in engineering achievements and in the creation of television programs.

Develop Program Technique

NBC engineers have helped to perfect present-day television cameras, studios and studio lighting, and transmission systems. Practically the entire technique of putting a television program on the air is an NBC product—from author's manuscript to actor's make-up.

The following dates stand out in historical importance:

October 30, 1931 — NBC commenced television broadcasting from transmitter atop Empire State Building, New York, with 120-line pictures, in experimental tests of RCA semi-electronic system, employing mechanical-scanning camera and electronic receivers. Commencing in 1933, NBC broadcast programs with 240-line pictures, in first field test from Empire State tower transmitter of RCA all-electronic system.

June 29, 1936 — Having reconstructed the Empire State tower transmitter on the basis of earlier tests, NBC began broadcasting programs in second field test of RCA all-electronic system, with 343-line pictures.

April 20, 1939 — NBC's station WNBT inaugurated America's first regular television program service to the public, televising the ceremonies opening the New York World's Fair, with 441-line pictures broadcast throughout metropolitan area from Empire State tower.

July 1, 1941 — Ten years after NBC television first went on the air, NBC inaugurated commercial television, broadcasting the programs of four advertising sponsors, with 525-line pictures. NBC had previously received the first commercial television license granted by the FCC, and had issued the first television rate card ever published.

With the exception of a brief period required in 1941 to adapt the transmitter and other equipment to new FCC standards, NBC's pioneer television station WNBT has been on the air continuously for five years, with regular weekly programs of sight-and-sound broadcasting. Within the past two years, NBC has established America's first television network, over which it furnishes a regular program service. It is for the present a modest three-station hook-up of NBC's station WNBT with WPTZ, the Philco station in Philadelphia, and WRGB, the General Electric station in Schenectady.

All members of the NBC organization share with the rest of the RCA family a tremendous and enthusiastic confidence in television as a great postwar industry and service. With the cooperation of the Government and of other members of the radio manufacturing and broadcasting industries we hope the full possibilities of television will be brought to realization early in the coming years of peace.

Guide to Future

What I have said here about the past eighteen years of NBC history is a bare outline, with numerous omissions, of a fascinating period of pioneering achievement.

NBC started with only an ideal for guidance. Today, it has both the ideal and an eighteen-year tradition of faithful service to back it up. We could not ask for more trustworthy guides into a future that is full of significance and promise.

Buy War Bonds

www.americanradiohistory.com

RADIO LINKS ALL NATIONS

RCA Has Evolved Revolutionary Changes in International Communications—Radio Circuits Encircling the Earth Handle Millions of Words.

By Lieut. Col. Thompson H. Mitchell
Vice President & General Manager, R.C.A. Communications, Inc.

A NEW ERA in the history of international telecommunications was born when the Radio Corporation of America a quarter of a century ago initiated its plans for a world-wide radio telegraph communications system centering in the United States.

A 1919 map of submarine cable routes would have shown how tenuous and insecure were the links connecting this country with the rest of the world. Across the Atlantic, a handful of slow and nearly obsolete cables landing only in Great Britain and France, with many of them foreign-owned; to South America, a tortuous system of short cable loops running from port to port down the West Coast of South America and thence across the Andes by landline to Argentina; and across the Pacific, just one slim thread of cable to serve Hawaii and all the Far East.

American telegrams to and from all other parts of the world had to pass over cable systems owned and operated by foreign interests, predominantly British. London was the communications center of the world. America's sole hope of becoming an important factor in world communications lay in radio and RCA set out to do the job.

On March 1, 1920, after months of painstaking preparation, the first RCA transoceanic direct radio circuits were opened. The most important was between New York and London. The others were between San Francisco and Honolulu, and between Honolulu and Japan. Direct circuits with Norway, Germany and France were established before the end of the year. Little by little, traffic volume increased, and stride by stride the research engineers and operating staff improved equipment and technique.

Meets First Big Test

In the summer of 1922, several of the transatlantic cables were out of commission for a week or so, and and it was then that radio really demonstrated its latent potentialities. Under the pressure of sheer necessity RCA's transatlantic circuits handled a volume of traffic far exceeding theoretical capacity. Shortly thereafter, in April, 1923, transatlantic cable rates of all companies were reduced to meet those of RCA.

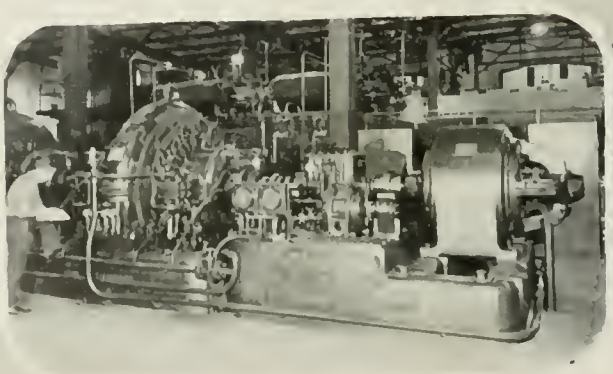
RCA was now beginning to hit its stride. Direct circuits with Italy and Poland were opened in 1923, and with short waves in the offing, new and reassuring possibilities in the way of long-distance communication began to loom up.

At the end of 1923, RCA had bridged the Atlantic and the Pacific, but had not been able to span the gap between North and South America. This was rectified in January, 1924, however, when the United States and Argentina were linked together by a direct 6,000 mile radio telegraph circuit — the longest radio telegraph circuit to be operated up to that time. Before the end of the year a new direct circuit with Sweden had also been opened. Short waves were now coming into their own.

With RCA's cable competitors now fully awake and determined to put the young radio upstart in its place, a new submarine cable connecting the United States with Italy by way of the Azores was opened in March, 1925. While RCA prepared to meet this new challenge in the Atlantic, the Commercial Pacific Cable Company deemed it an opportune time to lower its rates to Japan — thus equalizing with those of RCA and assuring more competition in the Pacific as well as in the Atlantic.

RCA had an ace of its own however, and countered by opening a

IN THE EARLY 20'S, RCA'S INTERNATIONAL RADIOTELEGRAPH SERVICE OPERATED WITH MASSIVE ANTENNA TOWERS (LEFT) AND ALEXANDERSON ALTERNATORS (CENTER), WHICH GENERATED LONG WAVES. TODAY, RELATIVELY SMALL WOODEN POLES SUPPORT ANTENNAS (RIGHT) FOR WORLD-WIDE SHORTWAVE COMMUNICATION.



www.americanradiohistory.com

direct circuit between San Francisco and the Dutch East Indies. This was the first extension of direct services in the Pacific area since 1920, although the vast communications possibilities of that region had long been recognized. The Pacific had been bridged, it is true, but pending the perfection of short wave transmission, Japan had to be reached by island-hopping, with Honolulu as the relay point.

Early in 1926, for the first time, news photographs, drawings, fashion sketches and other subject matter were flashed across the oceans. Commercial radiophoto service between San Francisco and Honolulu and between New York and London was made available to the public. During the nearly twenty years that have elapsed since radiophoto service was introduced, the speed of transmission has been tremendously increased; the quality of the received picture improved to the point where direct comparison with the original would not be unfavorable, and the cost has gone down. Also, direct radiophoto service from the United States has been extended to include Argentina, Australia, Egypt, Russia, Sweden and Switzerland, as well as Great Britain and Hawaii.

In 1926, also, RCA's now rapidly-growing network of international radio telegraph circuits was further expanded by the extension of direct service to Holland, Brazil and French Indo-China. RCA had long been working toward the goal of a world-wide network of direct circuits, and now that short waves made it possible to provide the necessary tools, little time was lost in pushing ahead.

In rapid succession during the next few years, RCA opened new direct radio circuits with almost bewildering regularity. North, South, East and West—North Atlantic, South Atlantic, the Pacific —all the etherways led to RCA at New York or San Francisco. It established its own stations in the Philippines, and from Manila proceeded to build up a network of radiotelegraph and radiotelephone circuits with neighboring countries and with other countries far and wide. It set foot in the West Indies and erected its own stations in Puerto Rico, Cuba, Haiti, and the Dominican Republic. It reached out to Belgium, Portugal, Spain, Turkey, Russia, Czechoslovakia, Switzerland, serving practically all of Europe with direct circuits. It brought Liberia, in Africa, Syria, in the Near East, and the Fiji Islands in the South Pacific, within hailing distance of the United States.

Programs Transmitted

Commerce with our Latin-American neighbors was facilitated by new direct circuits with the Netherlands West Indies, Surinam, Colombia, Venezuela, Costa Rica, Chile, Panama, Mexico and Guatemala. The far reaches of the Pacific were no longer distant in point of time, for China, Tahiti, French Indo-China and Manchuria had become new affiliates in the RCA network.

The importance of the American public's being able to listen to—and hear intelligibly — programs originating in other countries and short-waved to the United States led RCA to develop its international Program Transmission Service, by means of which is handled a large proportion of the overseas broadcasts regularly heard by millions of listeners from Maine to California.

Similarly, programs originating in the United States may be transmitted overseas via RCA for rebroadcasting abroad.

When war clouds gathered over Europe, and finally broke, the international radio communication circuits of RCA became increasingly important. Submarine cables may easily be cut by enemy action, as the British, and later the Italians, demonstrated in the Atlantic and the Mediterranean. Radio circuits, however, are much more difficult to interrupt.

Pearl Harbor did more than precipitate the United States into the war. It made the nation communications-conscious. It did even more than that. It brought a realization that only radio could do the kind of job that would have to be done.

Pearl Harbor even broke down the long-continued resistance of the British to direct circuits between the United States and Empire points. Direct radio telegraph service with Australia was opened less than a month after we entered the war. It was then and is now a vital link in our military operations in the Southwest Pacific, and both ends of the RCA circuit have been equipped with RCA multiplex and 7-unit automatic and error-proof printer apparatus, the most modern and efficient type of terminal equipment yet developed.

Circuits with New Zealand, with Chungking and Kunming in China, New Caledonia, Bermuda, French West Africa and Iran followed in quick succession, and radio kept up with the war as it developed on a global scale. In the meantime, prior to Pearl Harbor, RCA had set up direct radio communication channels with Iceland, Greenland, St. Pierre-Miquelon, Belgian Congo, Finland, Martinique, Egypt and

LEFT: PHOTOGRAPHS FROM MAJOR WAR-FRONTS ARE FLASHED OVER RCAC'S RADIOPHOTO SYSTEM TO U. S. NEWSPAPERS.

BELOW: HIGH-SPEED MULTIPLEX RADIOTELEGRAPH PRINTERS TRANSMIT MESSAGES ACROSS THE SEAS AT THE RATE OF HUNDREDS OF WORDS A MINUTE.

www.americanradiohistory.com

French Equatorial Africa, so that wherever American or Allied interests were involved, radio was on hand to solve the communications problems.

Since 1943, French West Africa, Ecuador, Gambia and India have been added to the long list of RCA direct circuits, all of them serving military as well as commercial interests.

Early in 1944 at the request of the U. S. Army authorities, RCA sent to Italy two complete transmitting and receiving stations together with all necessary engineering and operating personnel for their installation and operation behind the Italian front. One station is at Rome and the other at Naples, and through them flow vast quantities of press messages and radiograms.

600 Words a Minute

RCA as a prime factor in the international communications field has been the means not only of improving communications throughout the world, but also of bringing about very appreciable savings to American users by reducing telegraph rates wherever practicable. Since 1920, it is conservatively estimated that more than $100,000,000 has been saved to American and other users of international telegraph service as a result of rate reductions initiated by RCA. It is also computed that during the same period RCA has handled a billion and a half paid words over all of its circuits, which, including those temporarily suspended because of the war, provide a radio communication network connecting the United States directly with 58 other countries.

Geared primarily to serve the communications requirements of American business, RCA has other important customers, including the United States Government and the Press. Many of its contributions to the prosecution of the war must remain unrevealed for reasons of security, but they are important and effective. As for the Press, it is important that adequate facilities for the speedy handling of press traffic to and from all parts of the world should be provided. The direct radio channels of RCA are singularly well adapted to this purpose, and 'teens of thousands of words of press matter are sent and received over its circuits every day.

Even the present comparatively low press rates may be expected to undergo further reduction with the application of new and improved operating techniques that are now being developed, and by means of which handling costs may be whittled. Compared with transmission speeds of from 25 to 30 words a minute twenty-five years ago, speeds up to 600 words a minute are now being recorded. Instead of laboriously translating dots and dashes by ear, automatic and error-proof printers now provide printed copy requiring the minimum manual operation. By means of the time-division multiplex, RCA engineers have grafted four communication channels onto a single transmitter which formerly carried only one. The diversity receiver, also an RCA development, has been universally adopted all over the world as standard equipment.

Growth in 25 Years

In many businesses, twenty-five years is only a period of time. To RCA, from its international communications aspect, it represents the growth from birth to full maturity of an idea. Within less than a decade after the organization of the Radio Corporation of America, its international communications business had grown to such proportions that it was found advisable to organize a separate company charged with the responsibility of continuing the development and operation of radio communication services and of enhancing the prestige of RCA in the eyes of all users of international telecommunications. For these purposes, R.C.A. Communications, Inc., was formed in January, 1929. Since that date, all of the communications services and other activities mentioned have been carried on by R.C.A. Communications, Inc., a service of Radio Corporation of America. Its routing indicator—*"Via RCA"*—is known and used over all the world. It constitutes assurance of accuracy, speed and economy in international communication.

Buy War Bonds

LEFT: AT OPERATING POSITIONS SUCH AS THESE, RCA MESSAGE TRAFFIC FLOWS TO AND FROM VIRTUALLY EVERY IMPORTANT SECTION OF THE WORLD. BELOW: TECHNICAL CONTROL OVER MORE THAN FIFTY INTERNATIONAL RADIO CIRCUITS IS MAINTAINED AT THIS DESK IN RCAC'S CENTRAL OFFICE IN NEW YORK.

www.americanradiohistory.com

RCA MANUFACTURING GROWS

Diversification, Building Better Products at Lower Cost Are Keys to Steady Expansion of RCA Victor — New Services Foreseen.

By Frank Folsom

Vice President in Charge, RCA Victor Division

TO RCA's quarter-century of great achievement, the RCA Victor Division can add eighteen additional years of spectacular history, steeped in rich tradition and comprising one of the most fascinating sagas in American history.

In 1898, two men of vision labored hard in a Camden machine shop, seeking to perfect a curious mechanism, the "talking machine," which was destined to revolutionize the world's conception of home entertainment, and create a great new industry.

The story of how Emile Berliner and Eldridge Johnson met in a combination bicycle and machine shop often has been told. But no one can tell this story with greater authority than the founder himself. I'd like to quote him briefly:

"One of the very early types of talking machines was brought into the shop for alteration. The instrument was badly designed, but it caught my attention and held it fast.

"Mr. Berliner had given the world the greatest basic improvement in talking machines since the day of Mr. Edison's discovery, and I happened to be the man who was there at the right time to give this great discovery the needed improvements and refinements, and to manufacture it in such forms and designs most popular with the buying public.

"The Victor Company was a very small affair when it was first formed in 1901, but it has grown and will continue to grow as long as its products continue to grow better and better. The Victor Company is now in possession of many patents and secret processes, but our greatest secret process is this:

"We seek to improve everything we do every day.

"Improvements come hard nowadays. The field is no longer a virgin one. Great chunks of free gold are no longer lying around to be picked up by lucky hunters. The old fashioned prospector is out of the race. It is now necessary to dig according to the latest scientific methods and to keep on digging with the best equipment money can buy. What the public is eager to purchase today it cannot be sold tomorrow."

Mr. Johnson's words have as much significance to us now as they had to the Victor organization when he wrote them in 1914.

The famous Victor dog trademark became the property of the Victor Company, in 1902. The Victor Company pioneered in spending large sums of money in advertising. The Victor dog eventually came to be the best-known advertising symbol in the world.

Caruso Leads Way

The year 1906 is another important milestone in Victor history. The Company had not been very successful in persuading outstanding performers to entrust their artistry to the talking machine. Enrico Caruso was then at the height of his fame. The idea of recording his voice fascinated Caruso and he consented. With Caruso showing the way, other great operatic and concert stars hastened to enter the field.

Heretofore, records had been merchandised through bicycle shops, hardware stores, and other unrelated retail outlets. Now, the Victor Company began to merchandise records through music stores and to increase its advertising. That is when the Victor Company began its quick climb to fame.

By the early 1920's, there was scarcely a family that lacked a Victrola and a collection of Victor records. Then, Victor faced a competitive crisis. Radio with its free entertainment, and its uncanny ability to pick up faraway music and speech out of the air gripped the popular imagination. By 1925, many millions of talking machines were gathering dust in attics and cellars.

In the first five years of radio's growth, the Victor organization was unwilling to take seriously this newcomer in the public's affections. However, in 1925, the Victor Company made arrangements with David Sarnoff who was then Executive Vice President of RCA, to supply radio parts to be incorporated in a radio-phonograph combination. This was a significant move.

A year later, the Victor Company launched the biggest campaign of advertising, publicity and sales promotion in its history to herald the recording of discs by electrical methods and the introduction of the Orthophonic Victrola. The tonal quality of this instrument and the improved records were equal to the finest radios of the day. The science of electronics had breathed new life into the phonograph. It was also demonstrated that there is no fundamental competition between the phonograph and radio. Each has its own field. One provides the music of the moment—the other provides "the music you want when you want it".

Within two weeks after the first demonstration of the Orthophonic Victrola by dealers, orders totaling more than 20 million dollars at factory prices had been received in Camden. Business showed a 50 percent increase in the following two years. This was the climax in the history of the Victor Company.

In 1929, the assets of the Victor Talking Machine Company were acquired by the Radio Corporation of America and combined with the selling activities of RCA to form the RCA Victor Corporation. With the acquisition of the Victor Company, RCA obtained large manufacturing plants. By 1935, all the manufacturing, engineering, and sales activ-

www.americanradiohistory.com

ities of RCA, Victor, RCA Photophone and RCA Radiotron were consolidated into the RCA Manufacturing Company, which became the RCA Victor Division of the Radio Corporation of America at the close of 1942.

While these mergers and legal moves may seem confusing, they were all directed toward unifying our activities, and toward obtaining the rights and facilities and resources that would insure the vitality and growth of a great radio organization.

Survives Many Tests

RCA Victor was born during the world's severest economic depression. It underwent many trials, and emerged from each of these tests stronger and surer of its objectives.

Other writers, in this anniversary issue of RADIO AGE, recount the significant milestones in RCA Victor's eventful history, its production and merchandising achievements, in peace and in war. Many changes and many accomplishments have taken place in the 43 years of RCA Victor's existence.

Who can predict what the next quarter century has in store for us? What are the lessons to be learned from the past?

We have seen from the history of the Victor Talking Machine Company that no organization, or industry, however strong and flourishing, can afford to rest on its past accomplishments. We must meet changing conditions if we are to survive. We have seen how technical advances in one branch of radio and electronics can contribute to the progress of the other branches; they are, therefore, inter-dependent. We have seen that from the very beginning one of RCA's principal objectives as a manufacturing organization has been to make progressively better products at progressively lower cost.

We are a large organization with many diverse, yet inter-related, activities. A study of our Company history will demonstrate that the diversification of our activities has many advantages. It has also a number of disadvantages. There is strength in a large family only if each member of that family is also strong, self-reliant and to a large extent self-sufficient. The value of diversification has many times come to the fore, particularly during times of depression. When there is a greatly diminished demand for one product during such times of adversity, a company with diversified products can usually weather the storm, because other products can be pushed harder to make up for the deficiency of the ailing activity. However, in the final analysis, if the organization as a whole is to realize its full potentialities, every element of that organization must be able to stand on its own feet.

RCA Victor has a keen responsibility to the more than 225,000 men and women who have invested their money in our future. We have heavy responsibilities, too, to the other members of the RCA Family; to our country in its war effort, and, when the peace is won, to our commercial customers, upon whose goodwill our peacetime success will depend.

RCA's policy of continuous research and development is solid insurance for our future. Before the war, the RCA Laboratories pioneered many of radio's most important advances. After the war, we may look to these same great scientists to create marvelous new products and services, and to make continuous improvements in the radio and electronic products that are in current use. From them, we will receive additional opportunities for employment, for security, and for growth.

Building the Future

Anyone who has had any extensive experience soon learns that the success of any endeavor, or organization, is entirely dependent upon people. A company is more than a collection of factories, machinery, tools, and money. It is an instrumentality through which thousands of men and women with many talents and skills are gathered together to win for themselves certain essentials to the American way of life. These essentials include the opportunity to earn good wages and salaries, to build security, and to develop opportunities for advancement.

The only way in which a company can provide these essentials is for its men and women to work cooperatively, providing products and services which our customers want, and which they will select over similar products and services offered by competitors.

It is our ambition to make the RCA trademark continue to stand unquestionably for the finest products and services in the radio, sound and electronic fields. And to our workers, the RCA symbol must also represent an organization to which they can contribute their most conscientious efforts and their highest skills, with the knowledge that they are building for their own security and advancement, both as individuals and as a Company.

NAVY PRESENTS FOLSOM HIGH CIVILIAN AWARD

Organization and Administration Work in Office of Procurement and Material Praised by Forrestal.

THE Navy's highest civilian honor was bestowed on Frank M. Folsom, former chief of the Procurement Branch, Office of Procurement and Material, when Secretary James Forrestal presented the Distinguished Civilian Service Award to him for exceptional performance in that capacity from February, 1942, to December, 1943. Mr. Folsom is now a Director and Vice-President of the Radio Corporation of America, in charge of the RCA Victor Division.

In the citation, Secretary Forrestal said:

"By his unusual ability to organize and administer the Procurement Branch of the Office of Procurement and Material, by his adroit skill, leadership and ingenuity in adapting sound business practices to the Navy's wartime procurement problems, and by his devoted attention to duty, Mr. Folsom distinguished himself during this extremely critical period of the Navy's greatest expansion."

Buy War Bonds

---

www.americanradiohistory.com

RESEARCH OPENS THE WAY

With the Electron Tube as a Master-key Scientists Explore the Unfathomed Realm of Radio and Blaze Trails that Lead to New Products and Services.

By Otto S. Schairer

Vice President in Charge, RCA Laboratories

RADIO and electronics have achieved unparalleled progress through scientific research during the past twenty-five years. To recount some of the significant advances such as world-wide communications, broadcasting, television, radar, the electron microscope and many other applications of radio-electronics reveals what an outstanding role the men of science have played in the past quarter century.

The master key to their success is the electron tube. It is the center of their accomplishments, and its possibilities for the future are unlimited.

The modern electron tube and its circuits have long since rendered obsolete all other radio transmitting and receiving equipment. They made possible the efficient and reliable facilities by which the United States now communicates directly and instantaneously by radio with all of the principal countries of the world. But this was not accomlished without much additional research pertaining to every part of the system.

International radio communications began with long waves and high power transmitters. Large antennas on lofty towers were required. But few transmission channels were available for overseas service. Sending speeds were slow and inadequate. Research on the propagation of radio waves brought about the discovery of short waves and electron tubes were developed to harness them for practical service.

Radio Spectrum Enlarged

Success in these developments greatly expanded the amount of radio spectrum and the number of transmission channels useful for international communications and increased the efficiency of overseas radio circuits. As a result transmission now requires only one-tenth or less of the power formerly used. Research has continued to increase the intelligence-carrying capacity of the short-wave spectrum. It is now four to six times greater per channel than that of long waves. There are indications that a further six- to ten-fold increase is possible.

Research produced the RCA system of diversity reception which greatly improved the stability and reliability of short-wave communication. Directive antennas of moderate dimensions concentrate the radiated energy and beam it to the distant receiver with greatly reduced loss. Advances in terminal equipment have speeded communication services and made them more economical and dependable.

Marine transportation and navigation are today given vital direction and protection by radio services. They include telegraphy, telephone, direction finding, guides to and from ports, emergency alarm apparatus, lifeboat sets, and other devices and services, all of which have involved vast amounts of research and development.

Research has added immeasurably to the progress and safety of aviation. Electronics, ultra-high frequencies and aeronautics have a natural affinity. They are inseparable in aeronautical communication and navigation systems. Instrument landing methods, collision prevention apparatus, clearance and height measuring instruments, ground-speed indicators, and other

RCA LABORATORIES, PRINCETON, N. J., CENTER OF RADIO-ELECTRONIC RESEARCH.

www.americanradiohistory.com

instruments guided planes safely through bad weather.

The electron tube and its circuits made radio telephony practicable. They simplified and made more efficient both the radiotelephone transmitter and the receiver. Out of this came radio broadcasting, which is the greatest system of mass communication ever developed by man. Continuous and intensive research and development have greatly improved receivers and have so lowered their costs that they are within the reach of every pocketbook. Home receivers are operated from electric light circuits. Battery operated receivers are now used only where electric light service is not available, or where portability is required as in pocket and "personal" receivers. Modern receivers embody such advances as tubes operating on alternating current, circuits adapted for either alternating or direct current operation, screen-grid tubes which reduce radiation, multi-function tubes such as pentodes, hum reduction devices, push-button tuning, magic-eye tuning indicators, and many others. All of these improvements in receivers have contributed much to the phenomenal growth of the radio industry in the past quarter century. In 1941, 12,000,000 receivers were sold in this country and nearly 60,000,000 were then in use.

There are approximately 1,000 broadcasting stations in the United States. They have been connected into networks to provide both national and world-wide broadcasting. International broadcasting has also been provided by means of transoceanic radio circuits which deliver foreign programs to our domestic networks and our domestic programs to foreign networks. Direct international broadcasting is also conducted by means of short waves beamed to the recipient countries.

Radio and electronic research have revolutionized and modernized sound recording and reproducing for both the home and the theatre. Modern phonograph records are recorded electronically and are incomparably superior to those previously recorded mechanically. The reproductions from these records by modern radio-phonographs are also effected electronically with greatly improved realism and beauty.

Electronically recorded and reproduced sound added to motion pictures has made the silent film completely obsolete and has remade and revitalized the motion picture industry. All motion picture studios and theatres are equipped with sound recorders and reproducers which have been highly perfected by research and development.

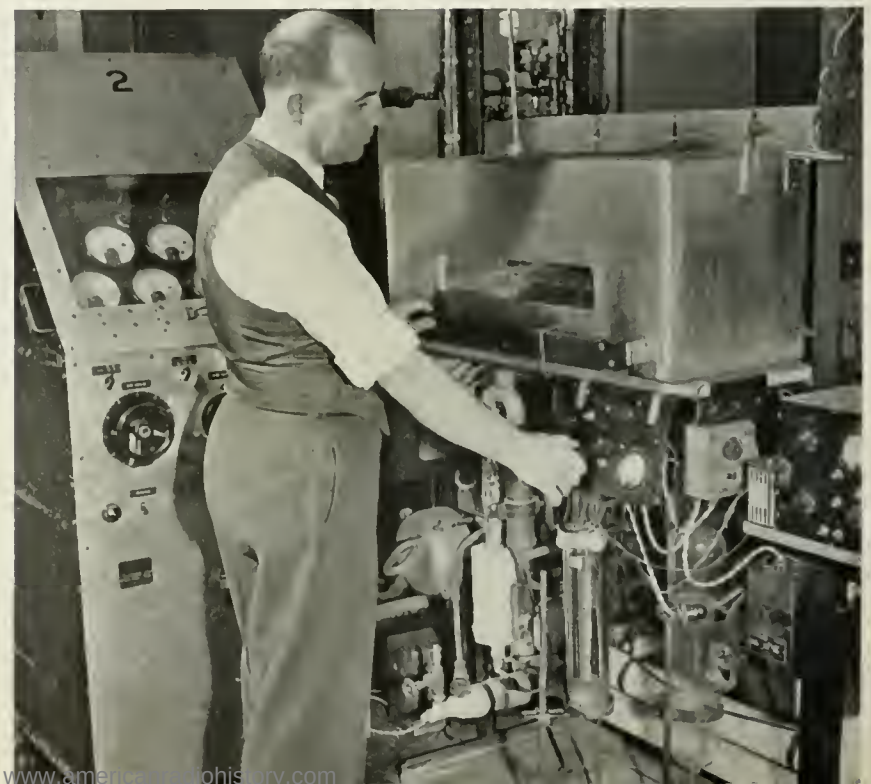
New Services Coming

Continuous research has revealed the utility of the very short radio waves — those in the very-high, ultra-high and super-high frequency ranges of the radio spectrum. It is making available for practical application vast unused portions of the radio frequency spectrum which have potentialities far greater than all radio services of the past.

In general these high frequencies have the characteristic of "short distance" or "line of sight" transmission. The range depends largely on the height of the transmitting and receiving antennas. They are also almost entirely free of atmospheric static, and they have greater inherent stability in the space circuit than other frequencies. Being especially useful for relatively short range and local uses, they make many new services possible. The use of a given band of these frequencies can be repeated many times in this country without interference between stations. They are eminently favorable for use in new services which require the transmission of very large amounts of information in very short intervals. In short, they open a new epoch in domestic and other short-range communication services.

Among them are high frequency broadcasting, or "FM", which provides substantially improved tonal quality in broadcast reception and makes many more broadcasting stations possible. FM broadcasting is destined to expand rapidly. Postwar broadcast receivers will generally be provided with wave bands for receiving programs from the many FM stations which will dot the country. Research has produced many other important applications of frequency modulation in communication and signaling services.

Undoubtedly the most advanced contribution that research has made to the progress of radio during the past 25 years is electronic television. Its potential value and importance to the public and to the radio industry are incalculable. It, too, makes use of the newly opened por-



SCIENTIFIC DEVELOPMENT OF MANY DIFFERENT TYPES OF ELECTRON TUBES IS ONE OF THE MAJOR ACTIVITIES AT RCA LABORATORIES. HERE, AN EXPERIMENTAL TUBE IS BEING AIR-EXHAUSTED UNDER CAREFULLY CONTROLLED CONDITIONS.

www.americanradiohistory.com

tions of the radio spectrum, but television research has extended into many other fields. It has produced many advances in electron and cathode-ray tubes. Among them are the Kinescope by which the received picture is displayed, and the Iconoscope and Orthicon tubes which are used in television cameras. Many other new features have been developed in circuits and accessories to enable these essential tubes to function effectively. Not the least of them are advances in fluorescent materials which have found many other valuable applications, as in lighting.

Television is ready to render another mass communication service of excellent quality. It will serve both the home and the theatre and will employ many thousands of workers in factories, stores, shops and studios.

Television broadcasting stations will require networks for connecting them into national systems similar to present sound broadcasting systems. Ordinary wires cannot be used for this purpose. Fortunately, research has made available both coaxial cables and radio relays which can be used for linking television broadcasting stations. Radio relays operate on the extremely high frequencies of the new radio spectrum. They will utilize a single frequency throughout the circuit, will be provided with highly directive transmitting and receiving antennas, and will require a power output of only a few watts. Unattended relay stations will be located at intervals of about thirty miles.

Radio relays will provide the wide transmission channels required, not only for television, but also for high speed facsimile and other modern services. They can be utilized in aircraft communication, navigation and control services. They can serve as terminal stations for connecting mobile craft of all kinds with telephone or other lines of communication.

Radio Facsimile Advances

Still another service possessing large possibilities, but yet in its infancy, is the transmission and reception of facsimile copies of writings and pictures. The daily papers are illustrated by reproductions of photographs taken on the other sides of the oceans but a matter of hours or minutes before they appear on the news stands. These are transmitted by radio facsimile equipment. Facsimile broadcast receivers and facsimile duplicators for use in offices, factories, and business establishments represent only some of the possibilities of this product of research.

Research has found many valuable applications for electron tubes and their circuits in industrial processes. Chief among them is radio frequency heating which is used for seasoning, drying, gluing, welding, soldering, riveting and tempering a wide variety of materials.

While all of these advances have been great contributions to our peacetime economy and welfare, by far the most significant achievement of this quarter century of advanced research is the groundwork which it laid for instant service in time of national peril. When this story can be told, it will be a glorious chapter in the history of science and will prove beyond peradventure of doubt that continuous and persistent research is essential both to the preservation and to the prosperity of our Nation.

Paris Circuit Reopens

DIRECT radiotelegraph communication between New York and Paris, suspended since June, 1940, by German occupation of the French capital, was re-established on September 16 by R.C.A. Communications, Inc.

For the present, the New York-Paris circuit is carrying only Government and press messages; no commercial traffic can be accepted. Movement of press dispatches from the war fronts in France and Germany was greatly facilitated.

The Paris circuit is one of the United States' oldest radio communication links, having been opened in December, 1920. After the Germans took over Paris, direct radiotelegraph service with France was maintained through Bordeaux and Roanne. This service was discontinued when the United States broke off relations with the Vichy government.

Paris is the second great European capital with which RCA has re-established direct radio communication. The circuit between New York and Rome was re-opened on June 13.

A DEVELOPMENTAL ULTRA-HIGH FREQUENCY TUBE IS TESTED BY RESEARCH SCIENTISTS IN AN ALL-COPPER SHIELDED ROOM AT RCA LABORATORIES.

www.americanradiohistory.com

RADIO ON THE HIGH SEAS

The Electron Tube Has Brought Great Changes in Maritime Radio, Replacing Old Spark Transmitters and Greatly Increasing Efficiency of Communications.

By Charles J. Pannill

President,
Radiomarine Corporation of America

RADIO as applied in the maritime field may rightfully be considered as the pioneer of the vast radio industry as we know it today. While the general public is more familiar with radio as a source of entertainment and information, maritime radio was "rocked on the cradle of the deep" long before Marconi was able to transmit his first signals across the Atlantic.

The first twenty years of radio development, or until the formation of RCA in 1919, may be termed the "Spark Age". Transmission was largely by means of spark sets, while reception depended upon crystals such as were used in the earliest simple types of broadcast receivers. The quarter century, from 1919 to 1944, may be considered as the "Vacuum Tube Age", and it is within this period that Radiomarine Corporation and its predecessor companies have pressed steadily forward in developing new devices and services for the Merchant Marine.

How far marine radio has progressed may be seen in the fact that emergency and distress calls, once the primary purpose of radio communication at sea, now form but a small part of a service that is many-sided and world-wide in scope.

Vacuum tube transmitters for shipboard service and for use in coastal stations began to be available in practicable and rugged designs about 1921. Since the majority of merchant vessels at this time were already equipped with spark types of transmitters, which were made and installed during World War I, it was desirable to make the transition from spark to vacuum tube with a minimum of expense. This led to the development of the so-called converted spark sets in which high-power vacuum tubes and their associated oscillating circuits were substituted for the spark gaps in the radio transmitters. In addition, vacuum tube radio receivers were installed, all of which greatly increased the range of communication and the safety of life and property.

Change to Short Waves

The early vacuum tube transmitters and receivers were designed to operate in the low and intermediate frequency bands from 100 to 500 kilocycles. Although very efficient when used over sea water, they have fundamental limitations when distances of several thousand miles must be covered. This led to the development, by Radiomarine, of short wave apparatus so as to permit transmission and reception on frequencies between 2,000 and 18,000 kilocycles for long range communication.

Beginning in 1925, Radiomarine introduced the first modern shipboard direction finders employing superheterodyne circuits and automatic mechanisms for correcting deviations in radio bearings. These developments led to widespread application of marine direction finders which not only enabled vessels to avoid hazards during unfavorable weather conditions, but also permitted the maintenance of schedules so that ships were not delayed during thick weather.

System Is Extended

As the number of shipboard radio installations expanded and with the increased traffic to be handled between ship and shore, Radiomarine extended its system of coastal stations on the Atlantic, Pacific and Gulf Coasts. A powerful station on Cape Cod, Massachusetts, and a similar station near San Francisco were used to handle large volumes of radio traffic with all classes of passenger and cargo ships. In addition, ten other stations along the Coasts and on the Great Lakes were maintained to provide both local and long distance communication as required at the principal ports in the United States.

With the passage of the Communications Act of 1934, and the ratification of the International Convention for the Safety of Life at Sea in 1936, several new devel-

IN THE DAYS BEFORE THE ELECTRON TUBE WAS HIGHLY DEVELOPED, THIS RADIO ROOM ABOARD THE SS ADRIATIC WAS A MODEL IN MARINE COMMUNICATIONS.

www.americanradiohistory.com

ONE OF THE FINEST SHIPBOARD RADIO INSTALLATIONS EVER CREATED WAS DESIGNED, BUILT, AND INSTALLED ON THE FORMER SS AMERICA BY RADIOMARINE CORPORATION OF AMERICA. LEFT: RADIO DIRECTION FINDER IN THE "WHEEL HOUSE." ABOVE: THE SHIP'S MAIN RADIO OPERATIONS ROOM.

opments were made by Radiomarine to enable ship owners to comply with the new regulations. A new crystal-controlled 200-watt intermediate frequency transmitter was designed and installed on hundreds of vessels to provide the most modern transmitting facilities. In addition, the equipment was arranged to operate, in an emergency, from storage batteries so that a vessel in distress would not have to depend upon power from the engine room in order to carry on radio communication.

Another important development comprised a complete radio transmitter and receiver installation for use in the lifeboats of passenger ships, as required by law. Still another development was an improved high frequency transmitter of 200-watt rating with both crystal and master oscillator frequency control to provide communication over distances of 3,000 or more miles.

The same leadership was also demonstrated in the field of radiotelephone communication for small vessels. Such equipment which, by the nature of its service, must be used by non-technical personnel, permits the yacht owner, the tugboat captain, and others on all types of small craft to enjoy complete two-way communication with the land line telephone system, as well as to communicate from boat-to-boat.

The automatic distress alarm has proved to be a valuable device in summoning aid at sea. This equipment, which is turned on in the radio room at all times when the radio operator is not on duty, is designed to actuate alarm bells upon receipt of the international auto alarm distress signal. In 1937, Radiomarine began installations of the first all-electronic type of auto alarm, and up to the present time approximately 3,000 vessels have been equipped with this device.

Special Unit Built

In the field of large passenger vessels, which require the most complete type of radio installation, Radiomarine in 1940 made available custom built equipment for the 35,000 ton *S.S. America*. This installation comprised three independent 1-K.W. transmitters for low, intermediate and high frequency service, as well as a 600-watt, high frequency, radiotelephone transmitter. For reception and for control of the various transmitters, a special operating console was designed. The *America* installation also included a separate emergency transmitter, receiver and auto alarm, a 75-watt radiotelephone for use by the navigating personnel, and a modern direction finder for taking radio bearings directly from the wheelhouse of the vessel.

With the impact of war in 1941, Radiomarine was in a position to devote and expand its entire facilities to the production of radio equipment for both military and commercial types of vessels. The long range construction program of the Maritime Commission, begun in 1936, had resulted in the development of standard radio installations for the various types of "C" class ships, and also for tanker vessels. Several of the small radiotelephone units originally developed for private craft were quickly redesigned to meet the requirements of the U. S. Navy. Large quantities were built for all types of auxiliary craft. New models of direction finders were placed into production, some types being designed for Maritime Commission vessels and other types for military applications.

"Package" Installation

When the large scale program for building more than 2,600 Liberty ships was undertaken, Radiomarine produced a complete radio installation in a single "package", designed to be installed in a minimum of time and with standard wiring so that any shipyard could readily install and connect the unit.

www.americanradiohistory.com

In the latter part of 1943, when the Maritime Commission designed the new Victory ship, Radiomarine developed the first combination intermediate and high frequency installation of the console type.

Design Lifeboat Equipment

Lifeboat radio equipment was designed primarily for applications on passenger vessels. Such equipment, being powered from storage batteries, was not suitable for the smaller type of lifeboats utilized by large numbers of cargo and tanker vessels. Accordingly, in 1940 and well in advance of subsequent new Government regulations requiring cargo vessel lifeboat radio equipment, Radiomarine developed a compact combination radiotelephone and radiotelegraph transmitter-receiver unit, all powered from a hand driven generator. This apparatus has been of inestimable value in saving lives at sea, and, because it includes facilities for telephone communication, can be used by any member of the crew without requiring knowledge of the telegraph code. More recently, Radiomarine has designed a new compact binnacle type of lifeboat radio, which includes not only telephone and automatic telegraph features, but also provides long distance communication on a high frequency. This development removes the limitation of distance range on the standard 500 K.C. distress frequency and also enables radio bearings to be taken to locate the lifeboats over great distances.

Maintains Wide Service

In safeguarding vessels from submarine attack, when "radio silence" is maintained by ships, it is necessary to prevent any signals from leaking out from the oscillating tubes in radio receivers. Radiomarine developed a special intermediate and high frequency receiver to meet these rigid requirements.

To maintain its farflung service, Radiomarine, in addition to its main office in New York City, has twenty-one branch offices located in the principal ports of the United States. In addition, Radiomarine has affiliates where service is maintained in the principal foreign ports throughout the world. Complete service facilities to maintain or repair shipboard radio installations are highly essential during war or peace if vessels are to maintain their schedules and to safeguard the movement of the vessels while at sea.

Win Production Awards

The outstanding performance of Radiomarine during the War has been recognized by the U. S. Government. On October 8, 1942, Radiomarine was awarded the Army-Navy "E" Pennant for high achievement in the production of war material. On March 8, 1943, the Company received the Maritime "M" Pennant and Victory Fleet Flag from the U. S. Maritime Commission for outstanding production. The third gold star to be added to the Maritime "M" Pennant for continued production efficiency was awarded August 16, 1944. A third star for the Army-Navy Flag was awarded to Radiomarine on September 6, 1944.

In closing, I desire to pay special tribute to the Engineering and Production staffs of Radiomarine for developing and producing the various models mentioned herein. They have done a splendid job, and to them goes much of the credit for our success.

LONG BEFORE PEARL HARBOR, RADIOMARINE BEGAN TO EXPAND ITS PRODUCTION LINES TO MEET THE NEEDS FOR RADIO EQUIPMENT OF THE MERCHANT MARINE AND OTHER GOVERNMENT SHIPPING.

RCA VICTOR OUTLINES POLICY FOR VETERANS

Beneficial Arrangements Made for Re-employing Service Men Returning from War to Work.

A COMPREHENSIVE policy for the re-employment of war veterans—women as well as men—has been announced by the RCA Victor Division, Radio Corporation of America, which has approximately 6,000 former employees serving in the armed forces.

According to Forrest H. Kirkpatrick, the company's Personnel Administration Director, policy includes beneficial arrangements that go well beyond the broad federal laws enacted to protect service men's re-employment status. It outlines specific provisions for extensive retraining and upgrading programs, recognition of seniority rights, insurance privileges, rehabilitation programs, and vacation allowances.

Unique in the training program provisions is a "protection of rights" clause for returning veterans who desire and obtain company approval to take special training offered by the Government before returning to the company. The policy provides that any veteran who indicates, within forty days of his discharge from military service, his intention to return to RCA after a period of such training may be granted a "leave of absence" up to one year. In some instances this period may be extended beyond the year by mutual agreement of the company and the veteran.

Special consideration will be given handicapped service men, according to RCA's policy. "Former employees who have disabilities resulting from service in the armed forces," it declares, "should have opportunities for work and proper job placement. When a disability makes it inappropriate for a former employee to resume his old job or a comparable one, efforts will be made to place him in the highest paying available job for which he is qualified."

Buy War Bonds

www.americanradiohistory.com

SOCIAL ASPECTS OF RADIO

Broadcasting of Entertainment, News and Education as a Service to the Public Performs an Economic Mission Which Has Genuine Social Significance.

By Frank E. Mullen

Vice-President & General Manager, National Broadcasting Company, Inc.

BROADCASTING is so young an art that it is still too early to appraise its social effects with any degree of finality.

In considering the results of sound broadcasting, a few examples of accomplishments and trends during its quarter-century of progress will serve as at least a partial indication of its far-reaching social influence.

At the present time, the outstanding service of broadcasting is the role it plays in connection with the war. When the National Broadcasting Company was formed in 1926, there were no news programs. Prior to the Munich crisis in 1938, news was still a relatively minor item on the broadcasting schedules of the networks. But today, approximately 20 per cent of NBC's total network program hours are devoted to news reports and news commentary. The public has learned to get its news first from radio. In view of the profound significance of international affairs in the postwar world, it is likely that the broadcasting industry will continue to maintain complete world news coverage and retain its present position of news leadership.

Approximately an equal amount of time on the NBC network is occupied with programs designed for the purpose of furthering the war effort and building morale on the home front. During 1943, NBC devoted an average of more than ninety-three network program hours a month, or three hours a day, to such programs. During the first seven months of 1944, this average has been increased to 118 a month, or nearly four hours a day.

Outstanding among NBC's war effort programs is the Army Hour. It has been on the air over NBC every Sunday afternoon since April, 1942, and has built up a regular listening audience of many millions. The Army Hour program is written by the Radio Branch of the Public Relations Bureau of the War Department, and is produced jointly by the Army and NBC.

Other important war effort programs have enlisted nurses, nurse's aides, home-nursing students and blood donors for the Red Cross. Housewives have been furnished important information to aid them in the conservation of foods and materials. Besides the Army, the work of the Navy, Marine Corps, Coast Guard and Army Air Corps has been described and explained to the American public in many NBC programs.

Broadcasting started in an election year, 1920—which, by coincidence, happened to be the first year that women had the right to vote in a national election. On Election Night of that year, the late Dr. Frank Conrad broadcast the returns of the Harding-Cox presidential election, from Station KDKA in Pittsburgh. Historically, therefore, November 2, 1920, is considered the birthdate of public broadcasting.

In every Presidential election since that year, broadcasting has played a part of increasing importance, and in each election the total popular vote has broken all previous records.

Complete coverage of the Republican and Democratic National Party conventions has been furnished by NBC in each Presidential Election year since the company was founded. It is NBC's policy not to sell time to any political organization prior to the close of the party conventions. Our convention broadcasts are entirely on the basis of an unsponsored, impartial public service, and we have to cancel many hours of profitable commercial business in order to put the convention programs on the air.

In the entertainment field, prob-

ONE OF BROADCASTING'S OUTSTANDING CONTRIBUTIONS TO THE WAR EFFORT IS THE "ARMY HOUR," BROADCAST BY NBC. IN THE SCENE BELOW, A "PICKUP" IS MADE FROM THE FIRING RANGE AT FORT BENNING, GA.

WEBER AND FIELDS, FAMED COMICS, PARTICIPATED IN NBC'S FIRST BROADCAST ON NOVEMBER 15, 1926.

www.americanradiohistory.com

ably the most important social contribution of broadcasting has been to increase the public appreciation of good music. NBC has a notable tradition in this respect. The inaugural program of NBC on November 15, 1926, from the Ballroom of the Waldorf-Astoria Hotel, featured a symphony orchestra under the direction of Dr. Walter Damrosch. Dr. Damrosch's Music Appreciation Hour later became an outstanding example of the power of radio in the fields of both music and education, and was heard weekly by millions of school children throughout the United States. On January 21, 1927, Grand Opera was broadcast for the first time to a nationwide audience, when NBC broadcast the garden scene from "Faust" from the stage of the Chicago Civic Auditorium. On December 25, 1931, occurred the first network broadcast of a complete opera, when NBC inaugurated the famous Metropolitan Opera Saturday afternoon series with "Hansel and Gretel" from the Metropolitan Opera House in New York.

The first symphony orchestra ever created exclusively for radio was organized by NBC in 1937, and the illustrious Maestro Arturo Toscanini was engaged to head and conduct it. Under his brilliant leadership, the NBC Symphony Concerts became the outstanding musical event in radio. In addition to Maestro Toscanini, the NBC Symphony Orchestra has been conducted by many other distinguished guest conductors. In 1943, General Motors Corporation assumed the sponsorship of these programs and, by maintaining the same high standards of leadership and performance which made them famous, is rendering a service of the utmost importance to the American people.

Lighter music, of course, is always popular on the network. Aside from its entertainment value, popular music heard over the radio has educated many listeners progressively toward an appreciation of the more serious composers.

During 1943, 46 per cent of NBC's total network program hours were sold to national advertisers. The balance, 54 per cent, were devoted to non-commercial programs for which NBC and its affiliated stations furnished time and facilities and received no remuneration. Great efforts are taken by the NBC management to maintain a balanced program structure.

Public Service Grows

In 1937, NBC was fortunate to enlist the services of Dr. James Rowland Angell, President Emeritus of Yale University, as the company's Public Service Counsellor. Under his able direction, the public service program schedules of NBC have grown in scope and effectiveness and have enlisted the active interest not only of millions of listeners, but of numerous educational, cultural, philanthropic and Governmental organizations. The NBC Inter-American University of the Air presents an integrated schedule of educational programs which are now "assigned listening" in more than a hundred colleges and universities throughout the United States.

No reference to the history and progress of NBC programs would be complete without mentioning the company's Code of Program Policies which has governed the preparation and supervision of NBC programs for the past ten years. Standards of fairness and good taste in the handling of program material of all kinds are laid down in the NBC Code, together with principles and practices relating to commercial announcements. The Code has not only served as a guide for the NBC program and sales staff, but as a model for the entire broadcasting industry.

While it is natural to consider programs responsible for the social impact of radio, broadcasting also performs an economic mission which has genuine social significance. It has become a vital arm of distribution of American products and services. As such, radio is responsible for the employment of far more men and women in the factories, stores and offices of our national advertisers than the estimated 400,000 who are employed directly in the radio field itself.

We are on the threshold of vast changes in the technical development of broadcasting. The social impact of television, when radio becomes a seeing-eye as well as a listening-ear, challenges the imagination.

Television, with its great power of visual demonstration, as against the power of exposition through sound alone, will vastly further all educational processes.

And as a great new medium for the distribution of products through advertising, the advent of television will be another economic milestone of vital importance.

LEFT: WOUNDED WAR VETERANS SEE TOPNOTCH TELEVISION PROGRAMS AS THEY CONVALESCE IN NEW YORK HOSPITALS. CENTER: ONE OF RADIO'S GREATEST PROGRAMS IS THE NBC SYMPHONY, UNDER THE BATON OF MAESTRO ARTURO TOSCANINI. RIGHT: ROBERT ST. JOHN ON THE AIR WITH A NEWS FLASH ON D-DAY.

www.americanradiohistory.com

ADVANCES IN TELEVISION

Zworykin and Morton See Television About to take Its Rightful Place in the Entertainment Field—They Trace Historic Milestones Which Put Television on the Threshold of the home.

By V. K. Zworykin and G. A. Morton
RCA Laboratories

THE past quarter of a century has seen television develop from a hobby, indulged in by a few of the more adventurous experimentalists, into a system which is about to take its rightful place in the entertainment field. The picture has changed from a faint flickering image, which could scarcely be dignified by the name of picture, to a clean steady black and white reproduction equal in quality to a 16 mm. motion picture.

The greatest single factor making possible this advance was the introduction of electronic equipment to take the place of the earlier mechanical devices. It is in this phase of the development that RCA has contributed more than any other organization in the country.

As early as 1919, a system based entirely on electronic devices was recognized as a possible solution to the enormously complicated problem of television.

Looking back at the situation in 1919, a very fundamental obstacle which stood in the way of building any kind of a television system producing pictures with the definition necessary for real entertainment value was the lack of amplifier tubes capable of handling the required frequency band width. The frequency band needed to transmit the video signal of a 525-line picture is at least 4½ megacycles. The development of amplifier tubes by RCA to achieve this is one of the most brilliant stories in radio history. Without this engineering feat, television as known today would not be possible.

Related to the development of amplifier tubes is the problem of power transmitting tubes capable of operating at frequencies suitable for television transmission. In 1919, this problem had scarcely been considered. By the early 1920's, the development of the high-frequency transmitting tubes had begun and from then until now power tubes operating in the 100-megacycle region continued to be improved until they are now adequate for covering the 40- or 50-mile service radius permitted by these frequencies.

Obstacles Overcome

In tracing the history of television during the past twenty-five years it will be seen that the lack of amplifiers, transmitters and other circuit components was not, however, the outstanding obstacle in the development of the field. Actually, the most difficult problem which had to be overcome was that of suitable devices for converting the light image of the scene being televised into an electrical signal, and reconverting the electrical signal back into a television picture.

Electronic devices for these purposes had been proposed longer than twenty-five years ago; for example, Boris Rosing's cathode-ray receiving tube in 1907 and Campbell Swinton's electronic pick-up tube in 1911.

In 1923, a major obstacle was overcome with the introduction of the storage principle as embodied in the Iconoscope. This offered the possibility of a theoretical increase in sensitivity of nearly 400,000 times, and brought television into the realm of practicability.

Of course, the actual working out of the Iconoscope from its initial form into the present practical tube took many years. This has been almost exclusively an RCA development.

In 1939 a new type of Iconoscope, the Orthicon, was introduced by RCA. It employed a low-velocity scanning beam which overcame both the inefficiency of storage and the spurious shading signal.

Early in the 1920's, serious work had begun on electronic tubes for reproducing television pictures. The principle upon which these tubes are based is that of allowing a sharply defined narrow cathode-ray beam to strike a screen of fluorescent material which becomes brilliantly luminous at the point of impact of the electrons. By deflecting the beam back and forth across the screen in a series of straight parallel lines a scanning pattern can be formed, corresponding to that of the pick-up device. The intensity of the light at every point of the screen is controlled by modulating the electron current in the cathode-ray beam with a suitable control grid.

From almost the start of this period, it was apparent to most of those working in the field that eventual solution to the problem lay in the cathode-ray tube. However, as with the pick-up tubes, a long period of development lay ahead before the cathode-ray receiving tube could be considered practical for a home television receiver.

The Kinescope, also an RCA development, was such a tube. In it coaxial cylinders, together with suitable circular apertures, form the electrostatic electron lens sys-

DR. V. K. ZWORYKIN, ASSOCIATE RESEARCH DIRECTOR, RCA LABORATORIES, EXHIBITS AN ICONOSCOPE, "EYE" OF THE TELEVISION CAMERA.

www.americanradiohistory.com

ABOVE: TELEVISION CAMERAS PICK UP THE SCENES OF A DRAMATIC PRODUCTION IN NBC'S RADIO CITY STUDIOS. LEFT: FROM THIS CONTROL ROOM, PROGRAM DIRECTORS SUPERVISE THE PRODUCTION.

tem which produces and modulates the fine cathode-ray beam. The beam is made to sweep out the scanning pattern by deflecting it with magnetic fields produced by properly shaped deflecting coils through which current having a sawtooth wave shape flowed. Other types of Kinescopes employed electrostatic deflecting plates to move the beam. Since the Kinescope was first developed, the electron gun has been improved steadily so as to operate at higher voltages, deliver more current, have better control characteristics and give a smaller spot.

The first cathode-ray tubes used natural Willemite for their screens as it, among the then available phosphors, appeared to have the most suitable characteristics for television work. These screens gave black on green pictures which left a great deal to be desired both in color and intensity. Furthermore, the material was not very stable and the screens were expensive to make. As part of the RCA television research program, a laboratory designed and equipped especially for the purpose was set up to study the problem of phosphors. The results obtained have been very gratifying. It has been possible to develop phosphors which give a black and white picture, have more than five times the efficiency of the earlier screens and which are both stable under intense beams of high-voltage electrons and economical to produce.

Tube Image Projected

Up to the outbreak of the war all commercial home receivers used direct-vision viewing tubes, that is Kinescopes or cathode-ray tubes with the picture viewed directly on the screen end of the tube. This imposed a practical limitation to the size of the picture that could be obtained, because of the physical size of the tube. The larger home receivers employed a twelve-inch Kinescope which gave a fairly satisfactory picture size, but made it necessary for the audience to sit quite close to the set if they wished to see all the information conveyed by the picture. However, for a number of years before the war, active work had been in progress in developing a small tube giving a very bright picture which could be projected through a suitable lens system onto a large viewing screen. These projection Kinescopes were based on the same principles as the direct-viewing tubes, but employed guns, operating at higher voltages, which delivered a much more intense beam to the fluorescent screen. The screens of course had to be processed in such a way as to be stable under these operating conditions. By 1937 it was possible to demonstrate a projected picture on an 8 x 10-foot screen, which could be viewed without undue fatigue in a well darkened room, although the picture brightness was not all that might be desired.

The next big step forward was the substituting of a Schmidt optical system for the more conventional lens. Essentially, this system consists of a spherical mirror which reflects the light from the projection Kinescope onto a viewing screen, an aspherical lens element being placed at the aperture of the mirror to correct the aberrations of the system. Such an optical system makes possible many times more efficient utilization of the light from the Kinescope and brings projection television well into the realm of the practical. Both projection home and theatre television receivers have been demonstrated and the results are so outstanding that the future of this type of instrument is unquestionably assured.

During the development of the cathode-ray terminal tubes described above, similar progress had been made in the circuit components which are, of course, just as essential to television in its final form as the Iconoscope and Kinescope. Keeping pace with the new amplifier tubes, better amplifier circuits were developed having improved signal-to-noise ratios, flatter frequency responses and greater stabilities. Synchronizing circuits and deflection generators have been simplified and made more reliable. The high-voltage power supplies required in the home receiver have been made more practical. In other words, the whole system has been integrated into a practical unit.

Throughout this period of development, improvement in manufacturing and production methods have more than kept pace so that, in spite of the fact that the present day television sets are incompa-

www.americanradiohistory.com

HIGH ON THE TABLE OF PROGRAM FARE IN TELEVISION IS SPORTS, BOTH INDOORS AND OUT. HERE, NBC'S CAMERAS SCAN A MAJOR LEAGUE BASEBALL GAME.

rably higher than the earlier models, their cost in terms of man hours is actually less.

An historical summary such as this would not be complete without at least a brief mention of the improvements which have been made in programming and studio technique. Early workers were satisfied if the picture of some simple object, for instance the head and shoulders of a model, could be successfully transmitted. This was extended to include larger and larger groups, until the studio of today resembles that for making moving pictures, with provision for staging complete plays, concerts and other interesting material. The lighting is arranged for maximum flexibility, several cameras mounted on special dollies are provided so that the pick-up can be switched from one to another as the action demands, while special boom microphones receive the sound from the desired point without interfering with the picture. The picture is monitored from a control room so arranged that it overlooks the studio, making it possible to completely coordinate the sequence of the program.

Television transmission from moving picture films has also been developed to a very high level, and experience has shown that films either alone or in combination with stage productions provide excellent program material.

Current event programs have also proved very successful. A portable pick-up unit and transmitter forms part of the National Broadcasting Company's television equipment in New York.

Research and development over the past twenty-five years, representing several million man hours of hard, honest work and thought have brought television to a point where its entertainment value is comparable with that of the moving picture. Engineering field studies and field tests have defined service areas of transmitters, proved the feasibility of chaining stations by cable and radio relay links, and paved the way for practical telecasting. Professional entertainers, artists, stage managers and directors have studied and tested the various phases of program production. Thus, the engineering and operational framework of a complete system has been completed. In other words, television is now ready for the public.

The question of the future technical developments of television is one of great interest to the engineer. Perhaps the foremost question is: What about color television? Color is definitely in the experimental stage. It has been successfully demonstrated under carefully controlled conditions, but is far from ready for general use. This applies both to pick-up and receiving equipment. Before color attains the widespread applicability required by television broadcasting, much time and effort must be expended in its development.

Continued developments and improvements in black and white television are inevitable. Advances in the pick-up tube and its associated equipment will enable the transmission of pictures under conditions which are now impossible. Some of the principles required for these new devices are already known, some remain to be discovered. Further work on the Kinescope, particularly of the projection type, will make possible larger and brighter pictures.

The continued investigation of circuit problems, of the requirements for high definition and of most agreeable contrast relations will make it possible to greatly improve the quality of the picture within the limits of the present television transmission standards. All this will take time and great effort but its accomplishment is certain.

What lies in the future for commercial television can only be conjectured. To those who have worked in the television field the universal acceptance of this new means of communication and entertainment seems inevitable. It will bring a visual representation of plays, stories and events which can now only be heard by radio. Furthermore, to the casual listener to whom the radio is serving as an incidental background to some other activity, it provides a window through which he can glance to see who is performing. In other words, the radio audience will no longer be "blind".

ARTIST'S CONCEPTION OF HOW A HOME TELEVISION RECEIVER WILL FIT INTO THE FAMILY SCENE WHEN THIS NEW SERVICE IS EXPANDED AFTER THE WAR.

www.americanradiohistory.com

THE "KNOW-HOW" IN RADIO

Shannon Tells How Experienced Engineering Talent and Products Provide an All-Important "Arsenal" in Supplying the Armed Services.

By Robert Shannon

General Manager,
RCA Victor Division

RCA's manufacturing experience dates back fifteen years, when the assets and facilities of the Victor Talking Machine Company were consolidated with the selling and merchandising organization of RCA into what is now known as the RCA Victor Division. This event came a full decade after the formation of the Radio Corporation of America.

Prior to the acquisition of the Victor Company's manufacturing facilities, and later of a number of radio tube plants from the General Electric and Westinghouse companies, RCA was completely dependent for its production of radio equipment upon the two big electric companies. As the home radio business became more competitive, this arrangement proved so cumbersome, so slow, and so costly that RCA was at a great disadvantage in the commercial markets.

On December 26, 1929, the RCA Victor Corporation was organized. Its corporate purposes were defined, generally, as: to manufacture and sell radio, sound recording and reproducing apparatus, records, etc., and the taking over of the assets of the Victor Talking Machine Company, together with the manufacturing and sales rights of RCA, Victor, RCA Photophone, and various other corporations. Thus the way was opened for the fulfillment of a dream which David Sarnoff, then Executive Vice President, had long entertained.

Starting literally from scratch, and in the early stages of the world's most severe economic depression, RCA Victor had to build a new manufacturing and engineering organization as well as an expanding sales organization. As the depression became more severe, for the first time in the new industry's history, radio sales fell off sharply, and RCA Victor found itself with what were then considered enormous plant facilities. Some painful compression and streamlining had to follow.

Plant Facilities Expand

There was a hard road ahead for the new organization—of learning how to build better products, at less cost, in order to be more competitive in each of the fields in which we operated. But, as economic conditions improved, RCA Victor's fortunes also improved. Reviving markets, coupled with a growing proficiency in the manufacture of equipment for each of our fields, soon indicated that far from having the headache of an excess of manufacturing facilities, RCA Victor would have to prepare additional facilities.

RCA Victor's first important expansion of manufacturing facilities took place in 1937, when our idle plant in Indianapolis was opened and expanded. Here was centralized the manufacture of all types of sound apparatus and associated equipment, and standard types of glass tubes, to relieve the growing factory load on our tube making plant at Harrison, N. J. Also, additional record pressing facilities were installed at Indianapolis to take care of a rapidly expanding record business and to provide another strategic geographical distribution point.

At this time, RCA Victor decided to make a determined bid for a larger share of the small radio set market. An integral part of this plan was the acquisition of additional manufacturing facilities. Accordingly, in 1940 RCA Victor acquired a modern type factory building in Bloomington, Indiana. Only six months later, RCA's first one-story, straight line production factory was going full blast. Shortly before the war, our Bloomington plant was producing the finest small radios ever to bear the RCA Victor trade mark, at the rate of over a million a year.

The production of custom-built equipment for the U. S. Government has always been very difficult because of rigid specifications which are set down concerning materials, performance characteristics, and penalties for failure to deliver on specified dates. Also, most of these orders were for small amounts of apparatus. However, RCA had been steadily building up the volume of its government business. When the war broke out, RCA's outstanding research and

PRE-WAR TELEVISION RECEIVERS ROLLING OFF THE FINAL ASSEMBLY LINE AT THE CAMDEN, N. J., PLANT OF THE RCA VICTOR DIVISION. THEY WERE THE LARGEST MODELS, TRK-12, BUILT BY RCA.

www.americanradiohistory.com

engineering background, its experienced engineering talent, and manufacturing "know-how" attracted a large volume of Government contracts for the development and manufacture of the most difficult and complex types of radio-electronic equipment. As a consequence, some of the most thrilling chapters in our Company's history has been written in our engineering laboratories and on our production lines.

Almost overnight, and far ahead of most others in the radio industry, RCA began the enormous task of converting virtually all of its manufacturing facilities from civilian to war production. Whole departments and factory floor areas had to be dismantled. Machinery and other equipment had to be relocated in our 4½ million square feet of factory space, in numerous multi-storied buildings.

Not the least important problem of war conversion was the successful training of an army of people to do work which was far different from that required in our normal operations. Many of the workers were new and inexperienced and had to receive extensive training. For example, hourly workers, alone, now on our payrolls number about 23,700, an increase of about 77% over January 1, 1941.

Near the end of 1941, RCA Victor acquired an additional tract of land adjoining our Indianapolis plant. On it were a number of old, low-cost homes and other structures. Our country's need for types of equipment that RCA was able to build was grave and urgent. The story of how this new tract of land was converted into a modern war plant is a dramatic one of speed, ingenuity and resourcefulness. Bulldozers literally swept the old structures off the land to accommodate the building of three additional factory units, each measuring 250′ wide by 500′ long. These three factory units literally rose out of the ground at 90 day intervals. Even as the roof of one factory unit was being finished, production machinery was moved in; and before construction on the next factory unit had begun, production was already coming off the line in the first one.

Since this war has been called both a radio war and a war of movement, in which communications and electronic apparatus play a vital role, it was inevitable that the requirements for electron tubes by the U. S. armed services and our Allies, would far exceed the productive capacity of the entire industry. As the leaders in the field of electron tube manufacture, it was to be expected that RCA would receive a large part of the responsibility of producing electron tubes in every category.

One of the first steps taken at our Harrison plant as well as in Camden and elsewhere, was to rent large warehouse space into which we could move virtually everything that was not actually needed in the production of vitally needed war goods. In Camden, a large structure was erected for this purpose.

Tube Factory Built

However, the Government's needs for cathode ray, power, and special purpose tubes were so great that it was found necessary to provide additional manufacturing space of a kind never before available. Plans for a new factory were drawn up, and with funds provided by the U. S. Navy, a tract of land was purchased just outside of Lancaster, Pa. Within less than six months the most modern tube manufacturing plant in the world had begun the task of producing power and special purpose tubes in quantities that had never before been envisioned. There are no more critical devices than the electron tubes made at our Lancaster plant, and they are being made not only for our requirements to fit into radar and electronic apparatus, but for virtually all manufacturers of such equipment.

Prior to the war, because of the small volume of special purpose tubes that were needed for peacetime purposes, many of the operations were made with hand tools. Urgent war needs stimulated RCA engineers into bringing about a remarkable mechanization of many of these processes. They developed many new types of extremely ingenious machines.

Many new production techniques had to be developed at all of our plants to make possible the manufacture of greater quantities of special apparatus. An example of the ingenuity and skill of RCA Victor factory engineers is in the making of diamond dies. Before the war, diamond dies used in drawing extremely fine wires were made in Germany. Under the stimulus of the war emergency, however, RCA engineers soon developed fine diamond drills that operate at much higher speeds and with far greater accuracy than those of German manufacture. Some of them draw wire as fine as a human hair while revolving at a speed better than 200,000 revolutions per minute.

Almost from the very beginning of the war production program, certain metals became extremely scarce. Here, too, RCA Victor's manufacturing organization displayed great resourcefulness. A substitution program was inaugurated to determine what other materials could be used in place of the scarcer items.

PRODUCTION LINES OF THE RCA VICTOR DIVISION TODAY ARE TURNING OUT VAST AMOUNTS OF RADIO-ELECTRONIC EQUIPMENT FOR THE ARMED FORCES.

www.americanradiohistory.com

RADIO'S NEW SERVICES

Research and Engineering Have Developed Radio Far Afield of Telegraphic Communication—New Instruments Aid Industry and Science

By E. W. Engstrom
Research Director, RCA Laboratories

THE history of radio, perhaps more than that of any other technical achievement of modern times, has been one of constant expansion. Starting as a purely telegraphic communication activity, the radio industry rapidly developed to a point where it was not only competing on equal terms with the telegraph and cable but, by enabling communication with moving vehicles of transportation, such as boats, airplanes and automobiles, it provided services which was impossible with the older systems requiring direct wire connections.

As we entered the present war, the later research developments of facsimile, television and FM were just starting on their way to bring sight and improved sound into our homes. RCA research work in radio and electronics did not stop there, however. Even while television and FM were coming out of the laboratory, research was progressing on other services and developments which were aimed at further expanding the usefulness of radio and electronics to mankind. Many of these developments have only a distant relationship to the parent—communications.

The general principles which apply to the field of radio-frequency heating have been known to radio engineers for many years. They have applied them in the manufacture of radio tubes, in heating up the internal tube elements to drive off gasses during the exhaust process. It is only in the past few years, however, as a result of research, that successful efforts have been made to apply these principles to the solution of difficult production problems outside the radio industry. The generation of heat by means of radio-frequency equipment is relatively costly. Radio-frequency power may be seriously considered in a manufacturing process if it accomplishes one or more of the following results: (1) speeds up a manufacturing process; (2) produces a better product; or (3) performs a manufacturing operation that cannot be done by any other means. These conditions are met in many instances and heating by radio-frequency power is increasing in application by industry generally.

Two Kinds of Heating

The particular properties exhibited by radio-frequency heating divide the heating applications into two distinct categories, sometimes called dielectric heating and induction heating.

Objects made of materials which are poor conductors of electricity may be heated uniformly throughout by passing electric currents through them. Thus, heat is generated in every part of the material and the whole mass rises in temperature uniformly. This type of heating is known as dielectric heating.

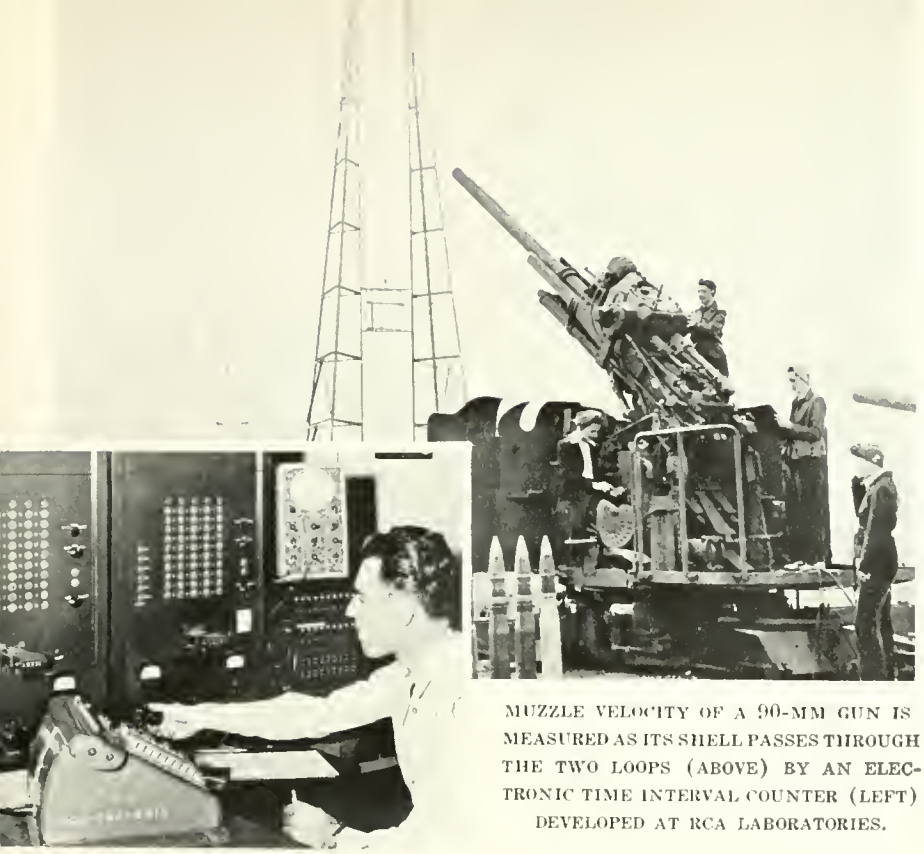
One of the early problems to which dielectric heating was applied by RCA research was the drying of rayon thread. Here, with the aid of equipment for producing a partial vacuum, it was possible to reduce the drying time from 100 hours to less than an hour. Furthermore, a better product resulted when radio-frequency was substituted for more conventional methods of drying.

In the fabrication of wood parts with thermo-setting glues and in the bonding of thermoplastic sheet materials, dielectric heating also speeds up the manufacturing process. The RCA electronic "sewing machine" has been devised to join thin sheets of plastic material in a continuous operation by the use of radio-frequency energy. In the heating of plastic preforms used in molding and in the heating of impregnated laminations for propeller blanks, the manufacturing process is speeded and a better products results from the use of radio-frequency power.

Recently, research in dielectric heating has been turned toward the problem of dehydrating liquids. Radio-frequency heating has been successfully applied by RCA to evaporating the water in solutions

CYRIL N. HOYLER (LEFT), DR. GEORGE H. BROWN, AND R. A. BIERWIRTH INSPECTING THE PENICILLIN DEHYDRATING APPARATUS THEY DEVELOPED AT RCA LABORATORIES.

www.americanradiohistory.com



MUZZLE VELOCITY OF A 90-MM GUN IS MEASURED AS ITS SHELL PASSES THROUGH THE TWO LOOPS (ABOVE) BY AN ELECTRONIC TIME INTERVAL COUNTER (LEFT) DEVELOPED AT RCA LABORATORIES.

of penicillin, and equipment is now in commercial operation for this purpose in the plant of E. R. Squibb and Sons at New Brunswick, New Jersey. In this application, radio-frequency heating has the advantage that it provides a more continuous and simplified manufacturing process and dehydrates the material in a much shorter time than was required by the previous method.

When radio-frequency power is applied to the heating of good conductors such as metals, the currents causing the heating are induced in the object by bringing it into the field of an induction coil which carries radio-frequency current. This type of heating is therefore called induction heating. When good conductors are heated in this way, the induced current, and consequently the heat, concentrates in a thin outer layer or "skin" of the material.

If this type of heating is produced very rapidly, the center of the material will remain cold while the "skin" rises to a high temperature. The principle of self-quenching may then be used since, as soon as the source of heat is removed, the cold center will quickly cool the hot surface just as if the material had been plunged into cold water. Case-hardening in extremely thin layers may thus be accomplished. Recent applications of induction heating have been made to the hardening and tempering of surgical needles and the surface hardening of automobile cylinder walls. In these cases, a manufacturing operation is performed which previously seemed impossible.

Microscope Developed

An outstanding development of radio-electronic research in a different field is the electron microscope.

The electron microscope provides useful magnifications up to 100,000 diameters—50 to 100 times greater than is obtainable with the best light microscope. Many problems of colloidal physics, metallurgy and biology are now being solved by direct observation with the electron microscope. For the first time, the scientific worker is able actually to see the effects of his experiments on the particles and structures that lie in the size range just a little larger than simple molecules.

The fundamental research in electron optics is also making it possible to replace conventional methods of chemical analysis by purely physical methods. As important development in this type of analysis makes use of the fact that the forces which hold each electron in place, in any particular atom, are a characteristic of the type of atom.

The recently developed electron microanalyser is also an instrument of this class. In it, however, the principles of electron optics, developed for the electron microscope, are applied to enable the measurements to be confined to extremely minute areas of a specimen. This new instrument adds to the extension of vision already provided by the electron microscope the possibility of making an elemental analysis of the structures observed. It is a good example of how man, having been given vision in a new world, immediately devises implements which increase his facility of operation in that new world.

In the field of electronic control devices, phototubes have long been a most important element. Much research has been carried on with the aim of improving these tubes. The most outstanding advance in this respect is perhaps the development of practical secondary-emission multipliers. The multiplier makes it possible to build phototubes with a response measured in amperes per lumen rather than microamperes per lumen as is the case with the simple phototube.

The present position of light-sensitive devices, advanced though it is, represents only the beginning of the development, both with respect to photo-emissive surfaces and the apparatus in which they are used.

One of the newest applications of electronics in the field of measurements is the electronic projectile speed measuring equipment developed through RCA research. Until recently, this device could not be described since it was developed for use by the Government Proving Grounds. It is used in determining the performance of all sizes of guns used by our army and navy as well as the uniformity of their ammunition. The equipment consists of an electronic counter which measures, to an accuracy of one hundred thousandth of a second, the

www.americanradiohistory.com

DR. JAMES HILLIER (LEFT) AND DR. V. K. ZWORYKIN OPERATING THE ELECTRON MICRO-ANALYZER DESIGNED TO GIVE AN ELEMENTAL CHEMICAL ANALYSIS OF ULTRA-MICROSCOPIC PARTICLES OF MATTER.

time of flight of a projectile between two coils of wire.

Mechanized sound is normally associated with broadcast receivers and public address systems. Paralleling the growth in other fields of electronics, however, sound is also finding, through research, an expanding scope of utility. High-intensity sound has been used to sterilize, pasteurize, homogenize, and emulsify liquids and to degas and alloy molten metals. Sound has been used to detect flaws in materials. The application of modern acoustic techniques has resulted in an improved acoustic stethoscope. Physiological and psychological studies of hearing combined with progress in acoustics and electronics have made possible a hearing aid of high fidelity.

Noise Increase Noted

The ever-increasing mechanization of factory, office and home has produced a tremendous increase of noise. Means are being developed to combat noise at its source as well as reducing its effect by the use of acoustic absorbing materials.

It is appropriate to mention the importance of radio-electronic research in the war, although we cannot go into details regarding specific projects. This has been a war where armies, navies and air forces have moved and struck with unprecedented speed. Radio and electronic instruments have made this speed and mobility possible.

Glimpse at Future

Speculations as to future developments are frequently and extravagantly expressed in looking toward post-war conditions. Men working in fields of science, however, are usually reluctant to give such predictions. Nevertheless, this article on the non-communication fields of electronics would seem incomplete if some brief glimpse at the future possibilities in these fields were not included. It should be pointed out, however, that although a new development is being thought of or is perhaps even being worked on by research groups, this must not be taken as indicating that a commercial product based on this development will appear on the market shortly after the cessation of hostilities. Frequently, it requires several years between the research work and the marketable product. With this word of caution against expecting too many new products too soon, there may be interest in taking a quick glance at things the radio and electronic research men are thinking about in the fields under discussion.

In the post-war period, uses of radio and electronics for control and navigational purposes will greatly expand. The pre-war limitations of visibility which interfered with the free movements of airplanes, ships and ground vehicles will be removed. They will receive "sight" thru the broad application of radio and electronics.

Electronics will find many new roles, some of which have scarcely yet been visualized in the scientific mind. Presently unused kinds of "light" will add new and greater vision to our eyes. In the fields of measurement, computations, processing and control, electronics will provide new and better methods of doing our daily tasks in the home, the laboratory and the manufacturing plant.

If properly directed, research in radio and electronics can be a major factor in helping to solve some of the human problems in the post-war period. The new products resulting from electronic research, for example, should help to solve the problem of unemployment for those released from our armed services at war's end. Research in radio and electronics should have as its goal the application of its developments to the benefit of all peoples throughout the world. Only then will it be able to make its fullest contribution to a bright and useful future for all mankind in the days of peace ahead. In all this, RCA will have a major part.

PERRY C. SMITH, DESIGN ENGINEER, INSPECTS A NEW UNIVERSAL MODEL OF THE RCA ELECTRON MICROSCOPE.

www.americanradiohistory.com

AN EXCITING ERA AHEAD

From Wireless and Phonograph to Broadcasting and Television, Radio Has Developed as an Industry That Promises New Entertainment for the Home.

By Thomas F. Joyce

General Manager, Radio, Phonograph and Television Dept.
RCA Victor Division

THE World Almanac carries a list of "Great Inventions," going back to Galileo's discovery of the pendulum in 1581. Of the 250-odd entries, roughly 200, or four-fifths, have occurred in the last century—a mere eye-wink in the calendar of time. These include the phonograph, radio, and television for the home. Not only were these devices discovered within that period; they were also *perfected* to a remarkable degree.

Only 24 years elapsed from the time of Edison's invention of the phonograph to the formation of the Victor Talking Machine Company. Count 44 years from that landmark in home entertainment, and we find ourselves well through the radio cycle, and on the very threshold of the Television Age. Here, within 68 years, is encompassed the whole 3-part history of hearing and seeing the world from your armchair.

Thomas Edison first succeeded in recording and reproducing sounds in 1877, but the invention was largely of academic interest until Berliner introduced the disc record and reproducer in 1897. He called it the "Gramaphone." One of these early Gramaphones was brought for repairs to Eldridge Johnson's machine shop in Camden. Johnson was fascinated by it. He redesigned it and patented a number of improvements. He converted it from a toy or novelty into an instrument suitable for the home. In the Fall of 1901, he formed the Victor Talking Machine Company, which acquired Berliner's patents as well as Johnson's own.

From here out, the story becomes a business fairly tale. From a $500 business the first year, the volume skyrocketed to $3,000,000 in three years, and by 1905 had reached $12,000,000. Both mechanically and aesthetically the Victrola was constantly improved, reaching its climax in the famous Orthophonic of the mid-twenties.

Here the story of the acoustic phonograph fittingly ends. Radio, a lusty newcomer, was feeling its strength and calling for something new.

Prediction Fulfilled

But long before radio had won its spurs, a rising young business executive had made a prediction. Let's go back to 1916. "Radio" was then unknown. It was the age of "wireless." Only four years had passed since the sinking of the Titanic had reemphasized the need for an improved wireless-telegraph communication system. David Sarnoff was Assistant Traffic Manager in the old American Marconi Company. One day, he submitted a report to his superior in which he envisaged programs of concerts, lectures, sports, etc., reaching a vast audience by means of a "radio music box," to be sold complete with amplifying tubes and loudspeaker for $75, and predicted that in a few years' time millions would be sold. He recommended that his company take the lead in this development.

Three years later, the Radio Corporation of America was formed. Before long, Lieut. Gen. James G. Harbord was named President and David Sarnoff Vice President and General Manager. Under this congenial team, and the talented associates they gathered about them, RCA quickly took the lead in developing radio for the home.

In 1922, RCA marketed its first "wireless receiving apparatus" manufactured "in large quantities," and initiated a nationwide distribution system. These sets ranged from a crystal receiver at $25.50 to the 4-tube Aeriola Grand at $409, complete with accessories. Sales were apparently excellent, but the Company's executives displayed commendable caution in print. In the Board Report of 1922, I find this classic of conservatism: *It is the opinion of the officers of your Corporation that radio broadcasting is here to stay. . . .*

Throughout the 'twenties, the engineers of RCA and its associated companies contributed many improvements to receiver design. Radios improved aesthetically, too; they began to look like furniture. Finally, RCA introduced A-C Radiotrons, permitting operation from the light socket. It was considered a great step when these tubes were first applied successfully to the Superheterodyne cir-

FULL-PAGE ADVERTISEMENT RUN BY RCA IN 1923 FEATURED ADVANTAGES OF TWO TUBES OVER ONE IN A RADIO RECEIVER.

www.americanradiohistory.com

BEFORE THE WAR TERMINATED DOMESTIC MANUFACTURING ACTIVITIES, A HIGH MARK IN CRAFTSMANSHIP WAS REACHED IN THIS RCA 10-TUBE COMBINATION RADIO-PHONOGRAPH INSTRUMENT.

cuit, which RCA had introduced for battery operation in 1924, and which eventually became standard for the industry.

Following RCA's purchase of the Victor Talking Machine Company, and the business depression of the early 'thirties, radios began to approach the high degree of perfection that we know today. Small table sets, farm and automobile receivers, portable radios, all found a ready market. It was an era particularly of refinements in circuits and improved convenience for the customer. RCA engineers continued in the forefront with such developments as the Magic Brain, the Magic Eye, electrical push-button tuning and the camera-size Personal Radio, made possible by RCA's development of miniature tubes.

Radio and Phonograph Merge

The merger of radio and phonograph is an interesting story in itself. In the mid-twenties, RCA began supplying Victor and Brunswick with radio mechanisms for inclusion in combination radio-phonographs. These instruments, with their newly developed automatic record changers, enjoyed a moderate success, but they were cumbersome, expensive and subject to mechanical disorders. Then came the Depression, and with it, almost complete extinction of the phonograph. Records, to the public, were out of date, an anachronism. Meanwhile, RCA engineers had developed electrical recording and applied the principle of radio amplification to phonographic reproduction, with results which far surpassed any previous quality. But the public had to be sold. Virtually single-handed, RCA set about doing the job by means of advertising and publicity. The spark was provided by an inexpensive record-player attachment, and its wide distribution through the Victor Record Society. More turntables meant more record sales and a growing appreciation of the vastly improved techniques. Soon the public was again clamoring for recorded music and sales of all kinds of record-playing equipment boomed. Fewer and fewer straight radio consoles were sold. A fine radio-phonograph had become the ideal of every American home.

Coincidental with their work on radios and radio-phonographs, the RCA Laboratories were engaged in exploring many new fields . . . FM, radar and facsimile, among others. They were especially active in television. Here again, Mr. Sarnoff and his associates were years ahead of the times. While television was just a word to most people, RCA's President authorized a research, development and field testing program that to date has cost more than $10,000,000. I think it is safe to say that RCA has contributed more to the technical development of television, as well as more in terms of dollars, than all other companies combined. As a result, television today is very much of a finished product. Later developments will be an extension of the fundamental principles already established.

Television was introduced formally by RCA at the World's Fair in New York, in 1939. Commercial television broadcasting began on July 1, 1941 and NBC's station, WNBT, was the first commercially licensed station to go on the air. Before the War interrupted, several thousand RCA Television Receivers were sold, mostly in the New York area. In spite of the highly restricted nature of wartime telecasts, these owners as a group have remained well satisfied with their purchases (now 3 to 5 years old).

It has been well said that "the history of radio is the history of RCA." As we stand on the threshold of tomorrow's exciting era of sight *and* sound, the Radio Corporation of America appears to be in a better position than ever to lead the way.

NO LARGER THAN A CAMERA, THE RCA PERSONAL RADIO CREATED A SENSATION IN 1940.

www.americanradiohistory.com

RESULTS OF PIONEERING

Remarkable Expansion of Radio Reveals How Science and Industry Have Worked Together to Create New Products and Services of Great Usefulness.

By Meade Brunet

General Manager,
Engineering Products Department,
RCA Victor Division

THE world suddenly found itself on the threshold of a new Radio Age in the year following the signing of the 1918 Armistice. During the war the radio-telephone had materialized from what hitherto had been only a dream of scientists. Now it became possible to send voice and music by wireless waves, instead of merely the dots and dashes which had been transmitted from ship to ship and over short distances on land. At this auspicious moment in the history of communications, the Radio Corporation of America was formed.

Prior to the outbreak of World War II, RCA was one of the U. S. Government's important sources for the development, design and manufacture of extremely essential—and in many cases highly complex—radio, sound and electronic equipment which is playing an unparalleled role in the winning of the war.

Twenty-five years of continuous research by RCA engineers have resulted in the development of highly specialized radio equipment for use in a wide variety of fields. Radio today has many facets, such as aviation radio, emergency communication systems for police and fire departments, ship-to-shore, transoceanic radio communication, facsimile, electron microscopy, AM and FM broadcasting, television, navigational aids, beacons, beams, ultra high frequency equipment, very high frequency apparatus—and in fact, new worlds still beckon.

Electron Microscope

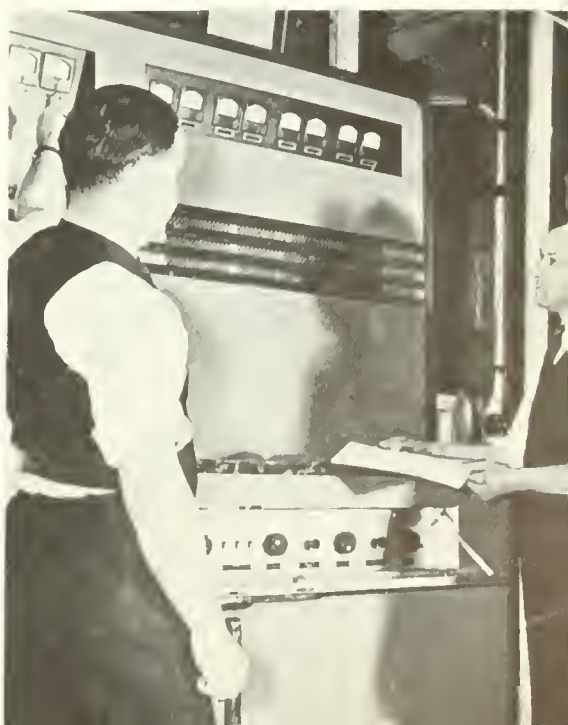
In the late 20's, it was discovered that electrons had a wave length, similar to that of light, and that they could be focused with an electrical lens in exactly the same manner that rays of light could be controlled with a glass lens. In a very short time, experimenters realized that these principles could be utilized in building a microscope using electrons instead of light.

Considerable work had been done on electron tubes, electron optics, television and electron circuits in the RCA Laboratories, so the principles of the Electron Microscope were well known. The expert knowledge thus gained was applied to the development of a practical Electron Microscope, which would be ideally suited to the research laboratory, control laboratory and industry. This work was undertaken in 1938. In 1940, the first commercial RCA Electron Microscope was delivered to the American Cyanamid Laboratories. Today more than 60 of these instruments are in use throughout the world, performing invaluable service in the war effort.

Two new and improved models were introduced in May, 1941—the Universal Electron Microscope and the Console Electron Microscope. The Universal Model is an instrument of great diversification designed primarily for the organization requiring an all-purpose instrument; whereas the Console model has been designed for maximum simplification and is primarily for use in the smaller laboratory, as well as in applications for routine tests.

Few scientific instruments have become of such universal application and importance as the Electron Microscope, which is serving the fields of biology, bacteriology, metallurgy, chemistry, zoology, agriculture and industry. Yet the field of the usefulness of this instrument, commercialized by RCA only four years ago, has scarcely been touched.

BELOW: INTO THE STREAMLINED DESIGN OF THIS MODERN BROADCAST TRANSMITTER, RCA HAS PUT THE TECHNICAL "KNOW-HOW" DEVELOPED FROM MANY YEARS OF EXPERIENCE. RIGHT: THE SAME HIGH SKILL WAS APPLIED TO THE DESIGN OF PRE-WAR TELEVISION TRANSMITTING EQUIPMENT.



www.americanradiohistory.com

SOUND RECORDING EQUIPMENT WAS INSTALLED BY RCA IN THE NEW YORK OFFICES OF OWI FOR USE IN OVERSEAS BROADCAST TRANSMISSIONS.

The use of radio in the emergency communications field was established about fifteen years ago when the Federal Communications Commission granted the first licenses for police service. Other public service agencies soon recognized the value of the communications medium, and the FCC sanctioned the use of radio by Fire Departments, Public Utilities, Forest Services, Geophysical Survey, Highway Patrol and other uses.

The purpose of radio in such services is the transmission of important information which cannot be conveyed immediately by any other means. Most emergency communications applications involve the use of mobile units, which can be contacted only by radio.

The first radio installations in this field were of the one-way type where messages could be transmitted only from headquarters to mobile units. These systems operated on the medium frequency band just above the standard broadcast frequencies. RCA then entered into the pioneering development of apparatus to operate in the 30-40 mc portion of the spectrum. This notable contribution revolutionized the emergency communications field. It made possible the design of two-way equipment where messages could be transmitted in both directions between headquarters and mobile units. It reduced the effect of atmospheric interference, eliminated such long range interstation interference and elaborate antenna systems, and provided frequency channel space for small as well as large communities.

RCA'S DEVELOPMENTS IN RADIO FACSIMILE RECEPTION, NOW TURNED TO WAR PURPOSES, MAKE POSSIBLE THE PRINTING OF NEWSPAPERS IN THE HOME.

Pioneer in Relaying

RCA also pioneered in automatic, unattended radio relaying. The Pennsylvania Department of Forests and Waters System and the famous Pennsylvania Turnpike Network are outstanding examples of "firsts" in this field. Large areas are served by these systems, whose unattended relay stations automatically pass on received signals to the next station and so on until the entire network is covered.

Frequency modulated equipment for the emergency services was developed in the 30-40 mc band. This type of equipment offers great advantages and developments of the past few years will provide standards of performance never before possible.

When conversion to peacetime manufacture again permits production of apparatus for the emergency services; new services, such as two-way radio for railroads, will be established. New portions of the frequency spectrums will be explored and put to use and new devices which are restricted to war use will be applied. The future of the Emergency Communications Field is one of great promise.

Prior to the war considerable work was done on the use of facsimile equipment in the emergency services. These developments found ready application in the war program and tape facsimile apparatus is playing an important part in armored force communication. The knowledge gained in this military application will provide a valuable medium for emergency communication use when production of equipment for such purpose is resumed.

In the 25 years since RCA was founded, aviation communications have successively shifted from the low frequencies, to the medium high frequencies and finally to the Ultra high frequencies. This trend has been materially assisted by the many new techniques and components which RCA research has made possible.

RCA developments in vacuum tubes have led the industry and have furnished the nucleus around which improved apparatus has been built. RCA miniature tubes, for example, have made possible the development of new airborne radar and radio equipment at lower weight and size than ever before. RCA television developments have provided the advanced cathode ray tubes, without which certain military aviation equipment would be impossible.

Turning to specific aviation applications, the first commercial production of the "streamlined egg" loop antenna was made as early as 1934, and has since become an almost standard feature on every modern airplane. The anti-static

www.americanradiohistory.com

value of the metallically shielded loop, which came out of RCA marine developments, has become so important that such a loop is now required by law on all air transport planes.

One of the major advances in aviation radio came from a combined RCA-Sperry Gyroscope Company project which resulted in the automatic direction finder. This invention abolished the necessity for pilots turning either the loop or the airplane in order to get a bearing on a distant station.

In 1941, RCA's automobile radio experience was applied to private airplanes, with the result that expensive ignition shielding was made unnecessary by the installation of RCA receivers under RCA supervised airplane production line techniques. This cut the cost of private plane receiver installations nearly 50 per cent.

All Types of Equipment

RCA makes every type of equipment used in broadcasting stations, from the microphone to the antenna. Practically every broadcasting station is now equipped with RCA microphones, and RCA studio amplifying and record reproducing equipment are universally used.

As of 1944, 324 standard broadcasting stations are equipped with RCA transmitters—more than that of any other manufacturer. Forty per cent of the total licensed power in the United States is being broadcast from RCA transmitters. A number of FM broadcasting transmitters have been delivered and RCA is prepared to manufacture a complete line of FM equipment after the war. A large number of standard band and short-wave broadcasting transmitters have also been supplied foreign countries and U. S. Government agencies.

Many advanced design features for AM and FM broadcasting transmitters have been developed by RCA engineers, and their pioneering research work on antenna and ground systems has proved of great value to broadcasters.

The universally known RCA velocity microphone improved the fidelity of the broadcasting system and its familiar design has literally become almost another RCA trademark.

Aircraft Television

RCA may be justly proud of its pioneering development of television transmitting equipment which varies all the way from the pick-up tube through to the transmitting antenna.

In 1937, RCA developed and constructed its first aircraft television system. The experience gained in that work has since been used to great advantage in the development of the first high frequency television system for relay work.

In the industrial field, RCA television has found important use in one of the nation's large industrial plants. Such equipment is expected to have a wide field of usefulness in observing dangerous or inaccessible industrial or testing processes.

In the military field, RCA's outstanding position as the pioneer and leading supplier to the Armed Forces is unchallenged. History will record the part it is playing in the war effort.

The more widespread use of electronic apparatus made it necessary for RCA to develop special devices which would make it possible for users of RCA communications equipment to test and measure the performance characteristics of their equipment to insure maximum operating efficiency.

The revelation of RCA's spectacular contribution of electronic products in this highly-specialized World War II must of necessity await the end of the war. When the story can be told, it will become a classic in industrial history.

Broadly speaking, there are two types of Government business. One consists of a relatively small number of contracts that entail large factory runs and large monthly shipments. The other is to produce a wide diversity of highly intricate products requiring extensive research, development engineering and manufacturing "know-how." Because of RCA's obvious qualifications and experience in producing the more difficult types of electronic apparatus, that is the field in which RCA was able to perform greater national service.

In peacetime, the added experience and new skills gained in the engineering and manufacturing of these critical wartime products will be applied to the design and production of the most advanced communications and electronic apparatus that has ever borne the RCA trademark.

LEFT: FM "TURNSTILE" ANTENNA DEVELOPED BY RCA AND INSTALLED FOR A PHILADELPHIA STATION. CENTER: FIELD INTENSITY METER USED FOR MEASURING COVERAGE OF FM AND TELEVISION STATIONS. RIGHT: RADIO-TELEPHONE EQUIPMENT IN A POLICE CRUISING CAR.

www.americanradiohistory.com

ALADDIN'S ELECTRONIC LAMP

Tube Paces Progress of Era and is a Magic Weapon, Aiding and Protecting Soldiers and Sailors on Fighting Fronts Throughout the World.

By L. W. Teegarden

General Manager,
Tube and Equipment Dept.,
RCA Victor Division

IF ALADDIN were living and performing his incredible feats of magic today, he might well wish to modernize his equipment by discarding the famous lamp! Yes, the *electron tube* is the modern successor to Aladdin's Lamp because tubes literally pace the progress of the electronic era.

There is a *magic weapon* which is aiding and protecting our men on fighting fronts throughout the world. At the same time, there is a magic tool which is helping our men and women at home to achieve unprecedented feats of production in American war plants. Weapon and tool are the same—*The Electron Tube.*

Of its numerous and varied wartime uses, little may now be said—except that it is helping to seek out and destroy the enemy wherever he may be.

Almost as little is generally known of the industrial uses of the electron tube. Most of us have seen it open doors in busy railway stations, or know that it is functioning quietly, but efficiently, behind the tuning dials of our radio sets. It is generally known that the electron tube has been serving us for years in radio broadcasting; in the recording and reproduction of sound for motion pictures and for phonograph discs; in long distance telephone; and in numerous other unobtrusive, but important ways.

Comparatively few know that the electron tube has been rapidly extending its usefulness so that it is helping to solve many problems in industry. For example, in the accurate matching of colors; in testing and inspecting; in making accurate measurements; in providing safety controls; in high-frequency heating equipment; in controlling intricate manufacturing processes with a precision impossible with human or mechanical control alone; and in almost countless other ways.

Perhaps the term "electron" tube is a bit new and somewhat confusing; yet, at one time, they were generally known as "radio" tubes, then "vacuum" tubes. But neither term was precise, since they are used today for many non-radio purposes and some of them contain gas. Hence the term "electron" tubes, the element that *controls and powers* electronic devices.

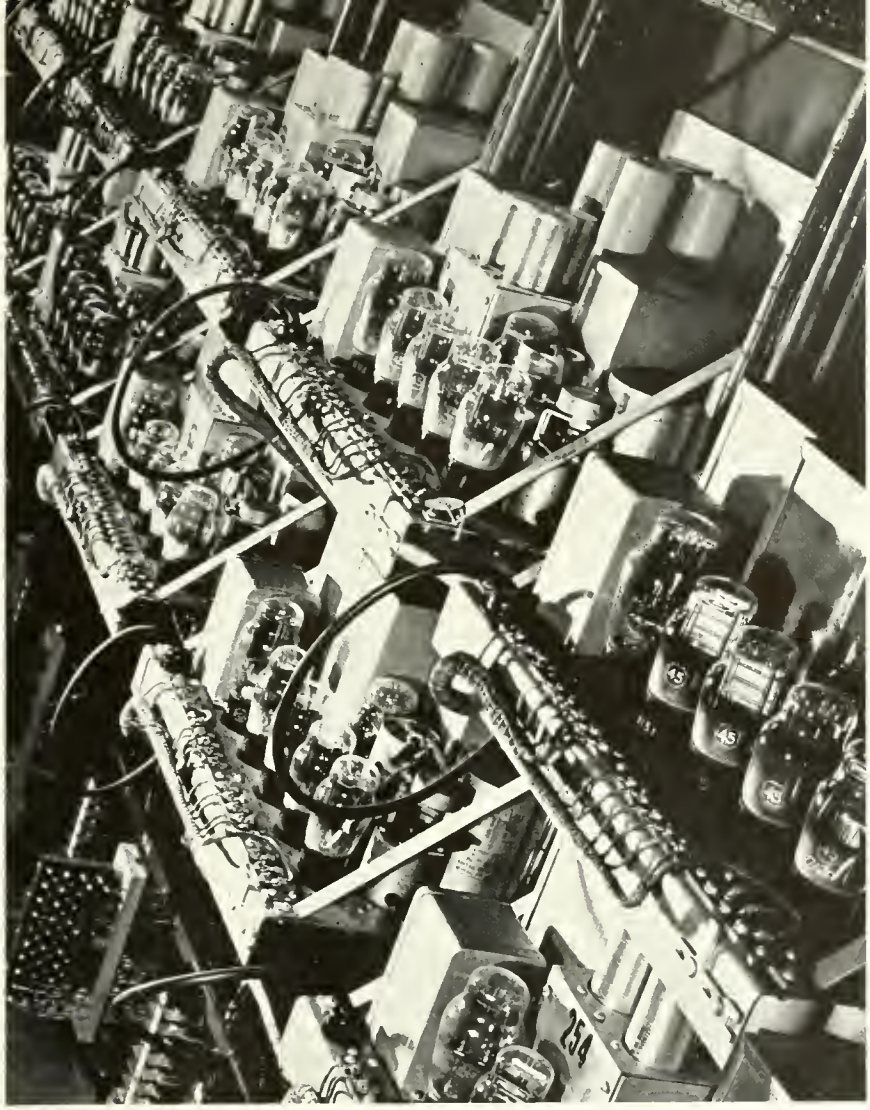
Introduction of the AC powered radio tube by RCA made possible all-AC operated radio sets, powered from a convenient electric wall socket. Similarly, the development of the Iconoscope, or electronic eye of the television camera, and the reproducing Kinescope or "screen" of the home television receiver, made possible practicable, all-electronic television. A special development in phototubes—another form of electron tube—made possible the development of RCA's famous ultra-violet method of recording sound-on-film which brought new realism to sound motion pictures.

In 1940, the "Personal Radio" receiver made an auspicious debut on the market. It was no larger than a camera and could be carried everywhere conveniently. That personal radio was *historically important.*

The advent of miniature tubes stimulated engineers to re-design and scale down other radio com-

BELOW: MAGIC TUBE OF TELEVISION IS THE ICONOSCOPE, "EYE" OF THE CAMERA THAT PICKS UP SCENES AND TRANSLATES THEM INTO ELECTRICAL IMPULSES. RIGHT: MANUFACTURING THE KINESCOPE, WHICH REPRODUCES IN A RECEIVER THE SCENES SCANNED BY THE ICONOSCOPE.

www.americanradiohistory.com



THIS FINE PHOTOGRAPH OF "TUBES AT WORK" SHOWS THROUGH THEIR VERY NUMBER THE VITAL PART THEY PLAY IN MODERN ELECTRONIC EQUIPMENT.

ponents—condensers, coils, speakers, batteries, and other parts—all of which made possible greater flexibility in the application of electronic devices to the home, to aviation, to shipping, to industry, to the armed services, and wherever space and weight are important considerations.

RCA's famous metal tubes, too, are still another example of progress through tube leadership. Some years ago, RCA pioneered in the manufacture of metal encased electron tubes to supplant many glass types because of technical, physical and manufacturing advantages.

The whole future of radio, sound and electronics is dependent on electron tubes. It is an open secret that many of the electronic advances, like Radar, now playing important wartime roles, can be expected to play important peacetime roles.

Electronic power generation, made possible by high-frequency power tubes, to heat plastic preforms, solder, harden, anneal, glue, dry, and otherwise treat a variety of materials, is finding ever-widening fields of use in industry. Electronic test and measuring equipment, safety controls, precision selection and automatic control equipment foreshadow the greater "electronization" of industry.

Developments in the field of "electron optics" have not only advanced television, but have produced the famed RCA electron microscope.

Exploration not only of the Ultra-High Frequencies, but also of the Super-High Frequencies, gives promise of providing an almost limitless number of channels for additional services. More extensive use of public address and sound amplifying equipment is being found in every field of human activity.

Through the years, RCA men and women working in laboratories, offices and factories, have acquired a unique "know-how" about electron tubes. This "know-how" has resulted in a remarkable record of successively lowered costs and improved performance which has advanced immeasurably the science of electronics. It has, in effect, placed the United States in a position of world leadership in the design, development and production of radio, sound and electronic equipment.

Our country and the United Nations have therefore called upon RCA and other tube manufacturers to produce enormous quantities of electron tubes. That is why there has been such a shortage of tubes for civilian radios.

The many electronic devices that one hears about from day to day, and those that are being planned for tomorrow, all have one thing in common — they all use *electron tubes*. As the "control element" in every piece of electronic equipment, tubes are the nucleus about which the machine or device is created. That is why tubes pace the progress of the electronic era — and that, too, is why *tubes are truly the keys to progress in the radio industry.*

War Programs Increase

NBC sustaining programs devoted 419 hours, 42 minutes to the war effort during the first six months of 1944, a gain of approximately 30 percent over 1943, a survey by Program Analysis reveals. In the same period WEAF, the network's New York outlet, carried war effort programs and announcements on a sustaining basis totaling 145 hours, 4 minutes, 1,725 announcements and 1,114 programs—almost sixteen a day—accounted for the network time.

www.americanradiohistory.com

SOUNDS OF PROGRESS

Application of Radio Devices and Methods to the Recording and Reproduction of Sound Has Widened Its Use in Motion Pictures and Other Fields—Radiothermics is New Service to Industry.

By Edward C. Cahill

General Manager,
Industrial & Sound Department,
RCA Victor Division

IN WAR ZONES sizzling with the heat of battle, RCA sound equipment is directing military personnel and helping to protect the lives of our fighting men. In Allied military posts throughout the world, it is training, instructing, orienting and helping to maintain the morale of both men and women in uniform.

On the production front, RCA industrial sound is increasing workers' efficiency and saving valuable production time, while RCA electronic heating is dramatically increasing the efficiency and speed of many industrial processes.

The electronic equipment accomplishing these spectacular services includes motion picture and sound recording and reproduction equipment, public address and plant sound systems, radio-frequency heating, or radiothermics, and other industrial devices. Some of these sound products have resulted from RCA's years of continuous research in the electronic field. Others have been created more recently to meet emergency war needs.

Among the newest, and perhaps least generally known of the many RCA electronic products, are those being used in industrial processes, especially in the fields of plastics, metals, and textiles.

Older, and more widely known, is the application of electronic sound to silent films, which made the motion picture a more complete and realistic medium of mass entertainment.

RCA's spectacular contributions to the motion picture field date back to 1928. In that year, which witnessed the birth of the "talkies", the RCA Photophone Company was organized as a subsidiary of the Radio Corporation of America.

Sound on Film

In the early days of the "talkies", sound was recorded on phonograph discs and reproduced by playing the discs in synchronization with the moving film. It was RCA engineers who pioneered in developing the technique, which is now standard, of recording sound on the film with the picture. In 1930, RCA contributed the first completely AC-operated motion picture sound equipment.

Marked improvements in sound quality of motion pictures were effected by RCA developments, such as the Rotary Stabilizer, which insured the smooth, uniform movement of film through both recording and reproducing machines. RCA's magnetic drive recorder eliminated "flutter" which had been caused by unsteady film speed in recording. In 1932, RCA's "High Fidelity" sound reproducing systems, newly designed throughout, made their debut and constituted one of the most important contributions toward bringing realistic sound to the motion picture.

Another major advance in motion pictures came in 1935, with RCA's introduction of ultra-violet light recording and printing to overcome photographic distortion of the sound waves on film. Continuous improvements in RCA loudspeakers have provided increasingly greater efficiency in reproduction and distribution of the full range of sound.

In 1940, RCA introduced an entirely new type of motion picture sound recording and reproduction which gave a realistic third-dimensional effect of sound and music. Produced for Walt Disney's FANTASIA, the new development was christened "Fantasound". Soon after its introduction, a simplified version, called RCA Panoramic Sound, was developed in the RCA research laboratories. This adaptation supplements modern standard sound systems at a small fraction of the cost of the elaborate Fantasound system.

At the beginning of World War II, RCA was accounting for a large part of all the motion picture theatre sound equipment sold in the United States. Luxury picture palaces and crossroads movie houses on every continent are using RCA equipment, and RCA recording equipment has been adopted by

CHEERY WORDS AND MUSIC PICKED UP BY THE MICROPHONE (RIGHT) AND REPRODUCED BY THE LOUDSPEAKER (LEFT) IN PLANT BROADCASTING SYSTEMS HAVE ADDED IMMEASURABLY TO WAR PRODUCTION MORALE AND EFFICIENCY.

www.americanradiohistory.com

such leading movie producers as Warner Brothers, Columbia, RKO, Republic, 20th Century Fox, Walt Disney, The March of Time, and Pathe News. Abroad, British pictures have been predominantly RCA recorded, while in Latin America, studios are equipped almost exclusively by RCA. Today, RCA is the only organization actively engaged in every phase of motion picture sound, from the studio to the theatre.

In the war program, RCA theatre and film recording equipment has been playing a vital role, being used to make and to screen sound motion pictures for entertainment, training and orientation of troops, and for combat records to aid in the shaping of war strategy.

New Picture Projector

Of particular interest among developments in design and construction which have sprung directly from wartime requirements is the new RCA 16 mm. projector developed for the U. S. Signal Corps. Shock-mounted on rubber in a tough plywood case, this projector has been engineered to function even after being dropped on a concrete floor from a height of 18 inches. Another major war contribution is RCA's Magicote lens-coating process. Before the war this process provided improved lenses for motion picture cameras and projectors. Now it is helping to provide superior binoculars, telescopes, and fire control apparatus for American troops.

Not confined to the entertainment field, electronic sound now reaches into nearly every phase of human experience. Installations of equipment for sound amplification and inter-communication have been made in restaurants and dining rooms, baseball parks, department stores, transportation terminals, hotels, banks, and night clubs. RCA sound systems are also installed in power plants, courtrooms, prisons, and police stations.

Sound Systems in Churches

Many churches now have RCA sound systems, supplemented by the new 26-note carillon which takes the place of costly and space-consuming bells. Schools are other users of RCA sound equipment, including 16 mm. sound films, for instruction and entertainment. The RCA Telekom System is installed in many business offices, providing instant, quiet inter-communication which saves time and reduces the load on telephone facilities.

In the 1930's the RCA plant broadcasting and industrial music system was born in the Harrison, N. J., plant of RCA Victor. Installations have since been made in leading steel, chemical, textile, automotive, shipbuilding, aircraft plants, U. S. Navy Yards, and other vital industries.

Shortly before the war, RCA became active in the field of electronic power heating, that is, heating with high-frequency power obtained from an electron tube oscillator. Urgent demands of war production have since dictated the direction of development in this field. Even in its short history, electronic heating has made possible dramatically increased accuracy, thoroughness, efficiency, and speed in such processes as molding and bonding of plastics and wood products; case-hardening, welding, soldering, annealing, and tempering of metals; seaming of fabrics; and drying of textile yarns.

As with electronic heating, so with every phase of radio, sound, and electronics, RCA scientists and engineers have pioneered in history-making advances. The priceless experience and skill which has thus been accumulated during the past twenty-five years insure even greater RCA industrial and sound products for the next quarter-century of progress.

Coastal Station Opens

Radio station WPA of Radiomarine Corporation of America, located at Port Arthur, Texas, resumed operations with ships at sea on October 15 by authority of the Federal Communications Commission.

Serving the Port Arthur area and the Gulf of Mexico, station WPA, operates on both short and long range channels allocated for marine communication. It is the third of twelve Radiomarine coastal stations, closed since the early days of the war, to resume ship-to-shore radio telegraph service as now needed for the safety of men and ships.

Last February Radiomarine resumed operation of WNY, New York, and WOE, Lake Worth, Fla., for commercial message traffic.

RCA IS A LEADER IN APPLYING ELECTRONICS TO NON-COMMUNICATIONS PURPOSES. LEFT: DEMONSTRATING A 16-MM SOUND MOTION PICTURE PROJECTURE. CENTER: DETONATING EXPLOSIVE RIVETS USED IN AIRPLANE MANUFACTURE. RIGHT: HEATING PLASTIC PRE-FORMS FOR MOLDING INTO FINISHED PRODUCTS.

www.americanradiohistory.com

"NIPPER" LISTENS IN

Radio's Alliance With the Phonograph and Use of Electronics in the Production of Records Keep "His Master's Voice" a Symbol of Tonal Quality—How Discs Are Made.

By J. W. Murray

General Manager,
RCA Victor Record Activities
RCA Victor Division

THE insistent purr of a buzzer cuts across the studio, hushing abruptly the babble of voices, the scraping of fiddle strings and the random tunes of the reeds. It's the "get ready" warning.

Musicians adjust their chairs, poise instruments, and fix their eyes on the conductor standing before them. In an adjacent control room, sound technicians carefully make last-minute inspections of their equipment.

Suddenly the buzzer sounds again —two quick, warning sounds.

The conductor silently signals for attention, then spreads his arms in a sweeping gesture and a great concord of music pours forth from the orchestra.

Music Recorded

Round and round in slow rhythm, turntables in the control room spin their even way, and a cutting needle dips smoothly and accurately into a wax-coated disc.

Another masterpiece of melody is being etched indelibly on a Victor record to be added to the world's musical treasures.

With this impressive routine in an RCA Victor recording studio in New York, or Chicago or Hollywood, a whole chain of events is set into motion—an interdependent series of activities in engineering, manufacturing, packing, shipping, advertising, promotion and distribution.

With all of these interdependent activities functioning, the "Music America Loves Best" finds its way from the recording studio into millions of homes, in war plants or on some far-off military outpost.

"Nipper" Becomes Famous

The old Victor Talking Machine Company, and later RCA Victor, spent millions on scientific development of the phonograph, on the improvement of recording methods, in signing up the world's finest artists, and in advertising the advantages of recorded music. It is interesting to note that Victor acquired the famous oil painting of the dog "Nipper" from an English painter, Francis Barraud; and in the first 25 years spent $24,000,000 in making the dog, listening attentively to "His Master's Voice", one of the world's best-known and best-loved trademarks.

In 1930, the phonograph joined hands with its erstwhile rival, radio, when the Radio Corporation of America acquired the Victor Talking Machine Company. The depression caused Victor record sales to drop to a mere 3,000,000 discs in 1933, but through those dark days RCA engineers were making continuous improvements in recording and sound reproduction. The phonograph kept pace with progress so that it was ready for a comeback when the world economic situation improved and people once again had money to spend for the good things of life.

With the advent of more prosperous days, the popular demand for recorded music increased so fast that the industry's record production was unable to catch up with it. In 1942, RCA Victor attained a new all-time high in record production of 59 million units. This total is especially significant when compared to the 250,000 units produced by Victor in 1901; the 55 million units produced in 1921, the previous all-time high; and the slightly more than 3 million produced during the depths of the depression. Records have scored a comeback in popular favor that has few if any parallels in industrial history.

World War II brought many problems to record manufacturers. It was soon realized in this country, as it had been in England, that recorded music is of great importance to national morale. It helps entertain and refresh the spirits of the people at home, who are working longer hours and living under the stress and worry of wartime. To service men in camps and at battle stations all over the world, recorded music is like recapturing a few moments of "home"; it has been of inestimable value in relieving the tensions that precede and follow combat. In the war factory, too, recorded music is helping to relieve fatigue and inspire production soldiers in their job of making American fighting men the best equipped in the world.

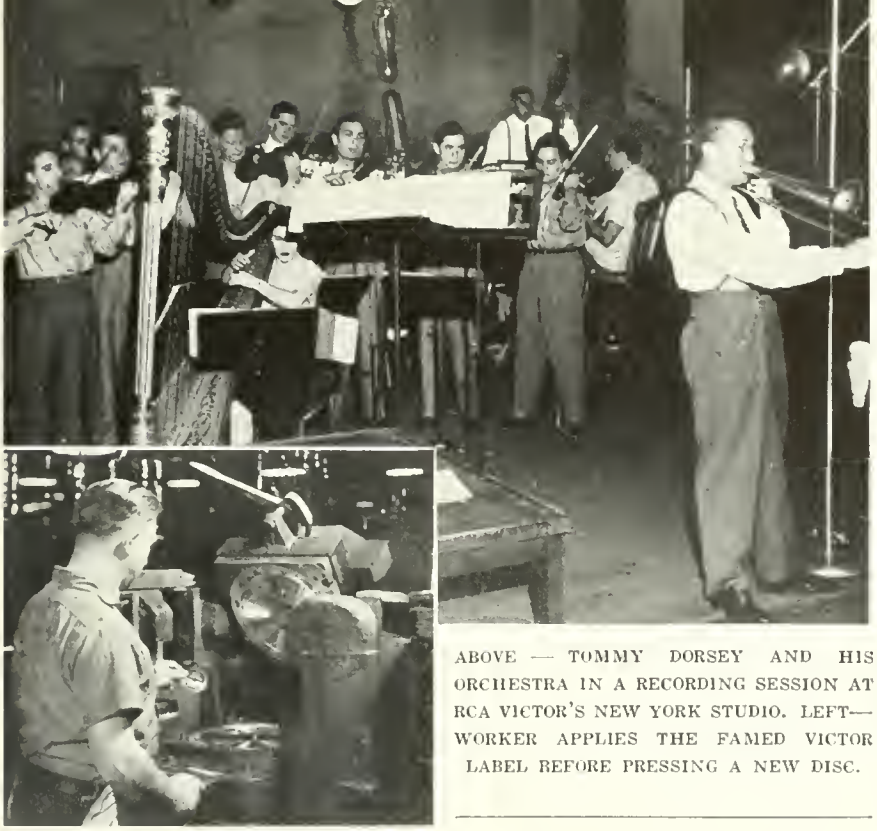
Production Maintained

In the face of rapidly increasing demand for records, the industry was confronted with limited manufacturing facilities, manpower shortages and scarcity of materials.

Despite all existing problems, RCA Victor has continued to maintain a high standard of quality and to keep up a flow of records which has served to fill most fundamental needs. In order to bring the benefits of recorded music to the greatest number, RCA Victor has had a wartime policy of concentrating its production on those types of music desired by the greatest number in every category of musical taste.

From time to time, through the years, there has been speculation about so-called "revolutionary" new methods of recording. For example, it is pointed out that entire symphonies can be recorded on a strip of film, or tape, or a wire. RCA is in close touch with such

www.americanradiohistory.com



ABOVE — TOMMY DORSEY AND HIS ORCHESTRA IN A RECORDING SESSION AT RCA VICTOR'S NEW YORK STUDIO. LEFT—WORKER APPLIES THE FAMED VICTOR LABEL BEFORE PRESSING A NEW DISC.

developments, through its great research laboratories and its experience in motion picture sound, radio, and allied fields. Some of the "new" recording methods have already found fields of usefulness in sound motion pictures, in the armed services, and some phases of commercial recording. RCA naturally is interested in developing the ultimate possibilities of these recording techniques for the benefit of each of the fields in which it operates.

Records Ideal Medium

However, it is our considered opinion that nothing now contemplated in the laboratories or in use commercially at present shows any signs of offering such flexibility, tonal fidelity and simplicity—at low cost—as do the present high quality disc and phonograph.

Records are the most convenient and economical way through which to hear the music we want as performed by the world's greatest artists, at our will. Records provide music of exceptionally high quality in such a simple form that a child can make full use of them. Moreover, the disc method offers the important advantage of pre-selection. We may hear any portion of a symphony or all of it, as our tastes and desires dictate. The perfection of automatic record-changing mechanisms of low-cost within recent years has made it possible to pre-select a symphony or musical program that can be played for more than an hour.

New Applications

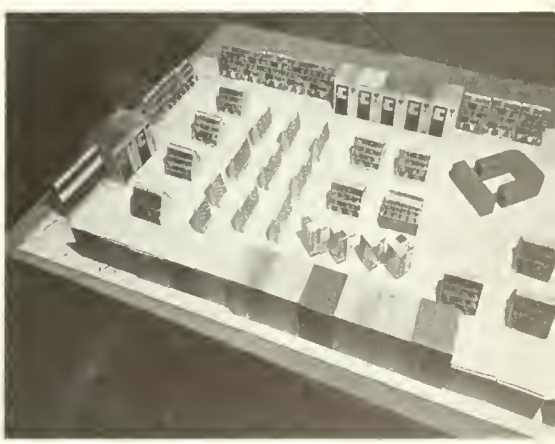
There is every indication that public appetite for music of every type is still on a sharp swing upward. Radio, the concert hall, and the stage only partially satisfy this appetite. Moreover, recorded music is finding new and valuable applications in many fields.

Industrial music—playing of recorded music over internal plant broadcasting systems — has come into wide use in England and in our own country during the war, because of its value in relieving workaday fatigue and improving morale. As wartime restrictions on the manufacture of industrial broadcasting systems are lifted, there will be a commensurately larger demand for records in this activity.

In the field of education, records have still to attain a large part of their potential usefulness, not only in the field of music appreciation where records have pioneered, but also in supplementing other studies. The study of geography and history can be made infinitely more dramatic and lasting through the use of records. Such recordings as Raymond Massey's readings of Abe Lincoln in Illinois, and President Roosevelt's Declaration of War Speech give greater point to printed history.

When the war is over, music lovers may look forward to many improvements in recorded music, but not necessarily overnight. There is every indication that improved record compounds will be found in the synthetics or plastics, to provide better records, with less surface noise and which are less liable to breakage. Further progress will be made, too, in developing the techniques of recorded orchestral music for the dimensions of the home, as distinguished from performances designed for the concert hall. This means even more natural quality than today.

With popular interest attaining continuously new heights and with steady technical and manufacturing improvements in sight, the record industry and all those who benefit from its output—music lover, student, educator, factory worker, and record-dealer — may look forward with confidence to another great era for recorded music.



MINIATURE LAYOUT OF SELF-SELECTION STORE FOR RECORDS DEVELOPED BY RCA VICTOR AFTER TWO YEARS OF RESEARCH IN RECORD MERCHANDISING.

www.americanradiohistory.com

RADIO 'ROUND THE EARTH

Future of Radio is Called "International" With New Markets in Prospect as People Throughout the World Seek to Gain the Benefits That Radio Spreads Across the Hemisphere.

By Jay D. Cook

Managing Director, International Department, RCA Victor Division

THE Radio Corporation of America is now, and always has been, internationally minded. The present-day scope and complexity of the international business of the RCA Victor Division derives from nearly half a century of diverse history, beginning as it does with the activities of the old Victor Talking Machine Company at the turn of the century.

International radio communication was the principal business of the Radio Corporation of America at the time of its formation in 1919. It was therefore natural that as its interest in product selling and merchandising developed, the Radio Corporation of America should promptly carry the promotion of each of its new businesses into the foreign markets.

The contract which the Radio Corporation of America entered into with the Polish Government in 1923, under which the latter Government purchased a 200 kw Alexanderson alternator which was installed by RCA at Warsaw, represented the first important foreign sales transaction consummated by the newly created American radio industry. That transaction provided Poland with its first means of trans-oceanic communication and marked an era for the international radio field.

The development of relatively low-cost, long distance short-wave radio communication apparatus by RCA further stimulated the sale abroad of radio communication apparatus. The first high power (20 kilowatt) short-wave communication transmitter installation was shipped abroad by RCA to the Argentine in 1926; in 1927, a similar installation was shipped by RCA to Khabarosk, Siberia, and in 1929 a newly designed 20/40 kilowatt transmitter was installed by RCA at Mukden, Manchuria.

In 1930, still another new field in radio communication was pioneered by RCA when it made the first ultra-high frequency radio communication installation for the account of the Mutual Telephone Company in Hawaii to provide inter-island telephone communication.

After the birth of the radio broadcast entertainment business in the United States the commercial development of this new industry was quickly carried to the international markets by RCA. In 1922, the first radio broadcast transmitter shipped abroad was installed in Buenos Aires by RCA and opened the market for the sale of broadcast receivers for home entertainment in Latin America. With the development of high power broadcast transmitters by RCA, the first 50-kilowatt radio broadcast transmitter was shipped by RCA to Italy in 1929.

To the world-wide sale of radio communication apparatus, radio broadcast station equipment, and radio receivers for home entertainment, RCA added a new business when electronically reproduced sound was coupled with pictures in the cinema industry in 1927. In addition to the cultivation of this new business activity through its already established channels abroad, RCA set up subsidiary operations in England and Australia to specialize in this new industry.

With the consolidation of the Victor Talking Machine Company and the Radio Corporation of America in 1929, RCA acquired a well established foreign distribution organization, experienced in the sale of specialty products. This distribution supplemented the electrical distribution channels upon which RCA had been previously dependent for the export sale of its radio broadcast receivers. Thus strengthened in its international merchandising activities, and for the first time possessed of complete control over its production facilities through the acquisition of the Victor factories, both at home and abroad, the International Department of the RCA Victor Division was enabled to embark on a program of development of products especially designed for the needs of the export market.

With these factors in mind, RCA developed a line of export broadcast receivers which proved very successful and enabled RCA to attain an outstanding position among American exporters of radio ap-

MOBILE CINEMA UNIT EQUIPPED BY RCA PARKED IN FRONT OF THE OFFICES OF RCA PHOTOPHONE PTY., LTD. IN SYDNEY, AUSTRALIA.

www.americanradiohistory.com

paratus during the ten-year period prior to the war.

Concurrent with the growth and development of our international merchandising activities, it became increasingly apparent that we were in a position to handle efficiently allied products of other manufacturers in addition to our own products. Thus, in 1938 we undertook the sale of coin-operated phonographs in Canada, and the year following extended this activity to other markets of the world. In 1939, we began the export distribution of a line of electrically operated washing machines, ironers and vacuum cleaners for the home, and recently have made arrangements for the post-war export distribution of electrical household refrigerators.

To foster the expansion of our international sales of radio communication apparatus, as well as of radio broadcast station equipment, it became necessary to design a line of special export products. Before World War II began, sufficient progress had been made in that endeavor so that RCA's line of export transmitters found considerable military application by the allied governments. This resulted in our securing important war orders direct from many of the allied governments prior to our entry into the war, and subsequently RCA received very substantial orders for the same products through Lend-Lease. As a consequence, standard RCA trademarked communication equipment in large quantities has played an important role in all the important theatres of war and has created many new friends throughout the world.

HIGH OVER THE TURBANED HEADS OF NATIVES, THE RCA MONOGRAM SPELLS OUT ITS MESSAGE OF GOOD RADIO IN A FRENCH MOROCCO TOWN.

PERUVIAN SUB-DEBS AND THEIR FRIENDS TUNE-IN A SOUTH AMERICAN BROADCAST ON AN RCA VICTOR TABLE MODEL RADIO RECEIVER.

Supplementing the RCA line of radio communication apparatus, we have made arrangements to handle the export sale of complementary products so that post-war, we will be in a position to supply complete communication systems to solve even the most complex problems.

The development of our motion picture sound recording and reproduction business abroad gave rise to problems, the solution of which again required the design of special products for export sale. Progress was made through the development of the so-called "standard" line of theatre reproducing equipment, as well as of the portable sound-film recorder.

In order to improve our commercial position in this field, and to meet the efforts of competition, we have made arrangements to handle and promote the sale of virtually a complete line of equipment required by a motion picture exhibitor. This entry into the "Theatre Supply" business in export will have the effect of more than doubling the potential future dollar volume of export sales of theatre equipment to exhibitors.

RCA has always had an enviable reputation in the international market for the quality of its electron tubes, especially because of the ability of RCA tubes to perform satisfactorily even under the extremely rigorous conditions so frequently imposed on electron tubes in export service. It was largely due to this fact that RCA was able to obtain and hold a preeminent position wherever American radio tubes are exported. Because of the renown of its tubes, RCA quickly became, at the outset of World War II, the preferred American supplier to the allied governments, with whom it was RCA's privilege to work out many of the technical military problems in electronics.

At the present time, RCA Victor has wholly owned subsidiaries in Canada, Mexico, Brazil, Argentina, England and Australia, and has a controlling interest in subsidiaries in Chile and India, as well as a minority interest in two companies in enemy-held territory in China. RCA also has a minority interest in a second company in Australia, and through R.C.A. Communications, Inc., has wholly owned communication companies in Cuba, Puerto Rico and Haiti; also, minority interests in communication companies in Argentina, Brazil and Chile.

RCA's international business has grown steadily throughout the years. Our company has established an excellent foundation upon which our international future can be built with confidence.

www.americanradiohistory.com

SERVICE IS THE KEYNOTE

Widespread Use of Radio and Electronic Equipment in Homes, Theatres and Industry Necessitates a Corps of Expert Technicians and Field Engineers to Keep the Machine in Peak Performance.

By W. L. Jones

Vice-President & General Manager, RCA Service Company, Inc.

FROM the moment the first piece of apparatus bearing the RCA name came off the assembly line, RCA assumed a two-fold responsibility. The first was that this apparatus would work properly upon installation, and second, that it would serve a long and useful life. Out of this basic responsibility of satisfying the customer, RCA's service activities were born.

Since those early pioneer days, RCA's service responsibilities have grown to encompass not only every type of home radio receiver, but every type of radio, sound, or other electronic apparatus bearing the RCA trademark.

Came 1928, and Al Jolson in "The Jazz Singer". The "Talkies" revolutionized the motion picture industry, by adding sound to sight.

Sound motion pictures were to have a profound affect on RCA service operations. Thousands of theatres were to be equipped with special sound apparatus which required personnel skilled in its construction, installation and operation.

Contract service to theatres was inaugurated, and it was to mean the building of a unique company department, a manufacturers' service organization which, while backing RCA products in the field, was also a commercial enterprise in its own right. Through the years this service to theatres grew steadily, and at the outbreak of World War II, there were more than 3,000 signed for RCA Service.

Start New Service

During the latter part of the 1930's, another service was inaugurated which was to greatly influence service operations during the coming war. The RCA television exhibit at the World's Fair, and the merchandising of television receivers in the New York metropolitan area, brought a new demand for technical men skilled in ultra-high frequency work. Thus was formed, together with theatre service engineers, the nucleus of a world-wide force which was later to be foremost in recognition by the Navy for its work on radar and other electronic equipment.

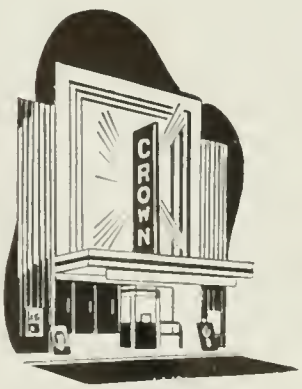
Long before Pearl Harbor, it was recognized that our fundamental duties would become twofold. The first was to meet the needs of the Armed Forces for trained personnel to install and maintain military electronic equipment, and the second to meet increased domestic service demands because of loss of operating personnel to the military, and the growing scarcity of replacement equipment.

Service Is World-Wide

In the two and one half years since Pearl Harbor, volumes could be written about the experiences of the Government Service Group. A world chart shows that they now cover practically the entire globe on every major battlefront.

Other home front fields have developed rapidly. Contract service was introduced two years ago on paging and music systems in industrial plants. Today, a number of important war production units, such as Wright Aeronautical, Bendix, Grumman, Arma, and many others depend on RCA Service to keep their plant broadcasting systems in good operating condition. The Boston, Brooklyn, Philadelphia, and Charleston Navy Yards are also included in our list of sound service customers.

RCA Service Company, Inc., was formed as a separate RCA subsidiary early in 1943 for the more efficient handling of the technical servicing and installation activities



THEATER SOUND

HOME TELEVISION

INDUSTRIAL SOUND

ELECTRONIC HEAT

www.americanradiohistory.com

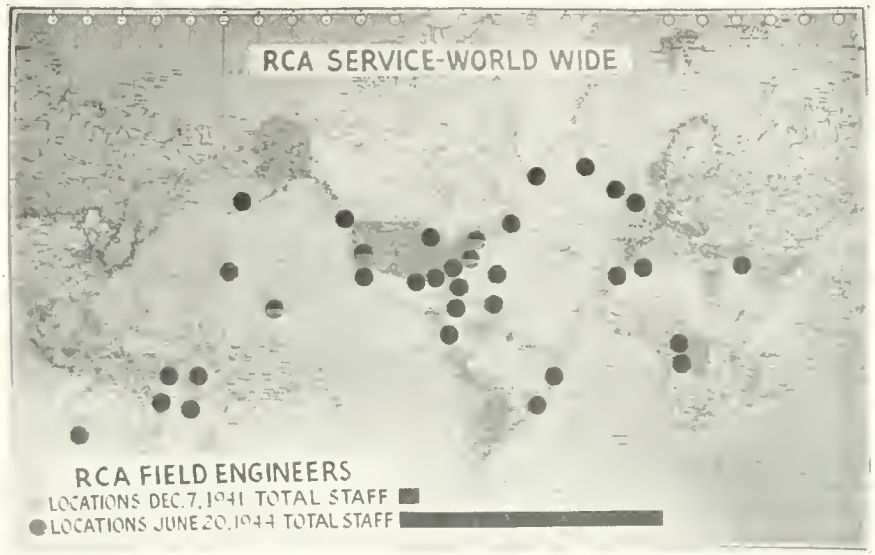
of the RCA Victor Division. Today there are nearly 400 employees engaged in the business of providing RCA Service.

To peer into the future is always hazardous. However, RCA Service is planning for continued steady growth in the coming years.

Service Needs Expand

We see contract service not only for theatre sound, but for theatre television. We see the coming need for skilled service personnel when home television makes its bow after the war. Beginning in Eastern Metropolitan areas, service needs will naturally expand as television broadcast links are added. More men will be required as the network develops South and West. At the same time, there will be millions of new radios purchased, and field educational programs for distributors and dealers will continue as in the past. We see rapidly increasing service demands in the near future in the industrial electronic heat field. The potential requirement for both equipment and service in the Industrial Sound field are tremendous. And when you stop to think of the Electron Microscope, 16 MM film machines, police, aviation, and other communications equipment, Beverage Inspection machines, facsimile, broadcast and television transmitters, and so on —well, just let your imagination carry on.

But, whether the future sees a wrist model of a personal radio, or a 1,000 KW transmitter, RCA Service will be ready and able to handle it efficiently and promptly.



THE DOTS ON THIS MAP OF THE WORLD SHOW HOW FIELD ENGINEERS OF RCA SERVICE HAVE EXTENDED THEIR WORK INTO THE MAJOR THEATERS OF BATTLE.

WEAF-FM On Display

Using newly assigned call letters WEAF-FM, the National Broadcasting Company's frequency modulation station in New York began 7-day-a-week operations on Sepember 24. The station will transmit network programs only, from 3 to 11 p.m., daily.

The transmitter, located in the Empire State Building, has been operating since 1939 on an experimental basis with call letters of W2XWG.

Sponsored programs falling within the period of WEAF-FM's operating time will be carried complete with commercials without an added service charge. This dual service plan was proposed earlier this year in a statement issued by Niles Trammell, NBC President, who said:

"Recognizing that cooperation with advertisers is necessary to ensure a sound economic foundation for frequency modulation, NBC proposes that no additional charge be made to advertisers for the use of Companion FM stations during their developmental period. The rate of the standard band stations and the FM stations will be established on the premise that it is a single service, for one charge until such time as the combined total audience of both standard band and FM stations increases to a point where rate adjustments become desirable."

RADIO BROADCAST

BATTLE ANNOUNCE

UNDER WATER SOUND

RADAR

www.americanradiohistory.com

AWARDED LEGION OF MERIT

COL. DAVID SARNOFF

LIEUT. COL. T. H. MITCHELL

FOR "exceptionally meritorious conduct in the performance of outstanding services," Col. David Sarnoff, President of the Radio Corporation of America, who has been in active military duty overseas, received the Legion of Merit Medal on October 11.

Shortly after Colonel Sarnoff went overseas in the Spring of 1944, Supreme Headquarters of the Allied Expeditionary Force announced from London that he had been assigned Special Consultant to the Communications Branch of the Public Relations Office of the SHAEF.

A dispatch from France reported that Colonel Sarnoff was largely responsible for the reopening of communications between France and Great Britain and America. Before that, in London, he directed D-Day communications which made [illegible] coverage possible.

The citation in part reads:

"Colonel Sarnoff's [illegible] to him and his [illegible] and great diplomacy in [illegible] the French [illegible] in [illegible]."

THE Legion of Merit Medal for "conspicuous achievement" and performance of "lasting benefit to the military service" was awarded to Lieut. Col. Thompson H. Mitchell, Vice President and General Manager, RCA Communications, Inc., on October 16. The award was for the period July, 1942 to July 1944, when he served as communications engineer in charge of the Traffic Operational Engineering Section of the Army Communications Service, Washington, D. C.

The citation in part reads:

"His resourcefulness, [illegible] and faculty for improvising solutions to problems were of inestimable value in rendering adequate [illegible] military communications [illegible] shortages of sufficient personnel and equipment during the early part of the war. His [illegible] and extensive knowledge of the [illegible] communications field were largely instrumental in obtaining emergency use of commercial facilities without impairing commercial service, and over-burdened [illegible] traffic. . . . He [illegible] to the success of the War Department [illegible]."

SUSTAINING, SPONSORED PROGRAMS SHARE TIME

NBC Survey of First 6 Months of 1944 Shows Near-Equal Division in Network Operations

SUSTAINING and sponsored programs shared almost equally the network time of NBC during the first six months of 1944, according to a survey recently completed by the Program Analysis section of the Research Division.

Of the [illegible] hours, [illegible] minutes of total operations, commercial broadcasts accounted for [illegible] hours [illegible] minutes. In the corresponding 1943 period, the network operated [illegible] hours and [illegible] minutes with sustaining programs accounting for [illegible] hours and [illegible] minutes and sponsored shows taking up the remainder of [illegible] hours [illegible] minutes.

A further break-down of the time reveals that entertainment programs occupied [illegible] per cent of the time and Public Service presentations [illegible] per cent.

In the [illegible] hours were devoted to classical programs and [illegible] hours to semi-classical numbers.

Over the six-months period the News and Special Events Department [illegible] hours of network time.

Other categories covered by the survey include [illegible] hours; general entertainment, including popular music, drama, variety and quizzes, [illegible] hours.

Course in Television

First television course to be recognized for credit toward a university degree was started in October [illegible] Studio [illegible] by John F. Royal, NBC Vice President in Charge of Television. The course is given by [illegible] in cooperation with the NBC University of the Air.

Forty persons are enrolled in the [illegible]-week course, representing [illegible] per cent of the total applications for admission.

www.americanradiohistory.com

Science Urged As Aid to Peace

www.americanradiohistory.com

They developed this new system, which consists of a spherical front mirror and an aspherical lens. The mirror looks like a shallow bowl, and the lens is flat on one side, with the opposite side having a special surface contour. The mirror arrangement resembles the one astronomers have used for many years to view the solar system.

The projection system is mounted near the floor of the receiver cabinet, and it projects the image straight up onto a flat mirror inclined at 45 degrees to the incoming beam of light. The mirror throws the image onto a translucent screen which is built into the front of the cabinet. The arrangement presents the advantages of compactness, and a cabinet need not be larger than the present floor model radio console.

Relaying by Radio

C. W. Hansell, Research Division Head of Radio Transmission at RCA Laboratories, read a paper on "Radio Relay Systems". He reviewed briefly twenty years of RCA radio relay system development which resulted in 1940 in the demonstration of a system for automatic relaying of the present standard television. The system operated on frequencies of 450 to 500 megacycles, used frequency modulation with amplitude limiting in repeaters, and included a repeater retransmitting the waves on the same frequency as they were received.

The requirements and problems of relay system designs were told by Mr. Hansell, who provided formulas based on reasonable assumptions for calculating required repeater gain, output power and antenna heights for various spacings between repeaters and various operating frequencies. Preliminary analysis indicates that repeater spacings of 35 to 45 miles should result in minimum overall operating costs, for systems which might be set up soon after the war.

A striking characteristic of radio relay systems is that the space circuits are more efficient conveyors of power than existing coaxial cables when both are required to accommodate present and future television modulation band widths. Television radio relay systems require much less repeater gain than the cable relay systems.

The high frequencies and great antenna directivities which will be used for radio relays, designed to handle television and other new services, make it possible to use each frequency band over and over again not only in geographically separated areas but, with some limitations, for circuits in and out of the same city. This efficient use justifies generous frequency band assignments to radio relay systems and holds the promise that radio relay networks will provide a new national public service.

A high degree of freedom from noise and from interference from undesired stations in the reception of FM radio programs is made possible by a new advance in the design of FM receivers. It was described at the conference by its inventor, George L. Beers, RCA Victor engineer.

Mr. Beers told of an FM receiving system in which a continuously operating local oscillator is frequency-modulated by the received signal. This represents a new approach to the problem. A substantial selectivity improvement has been obtained in the new system by designing the oscillator to lock-in only with frequency variations occurring within the desired channel.

Another important feature of the Beers system is a material improvement in the stability of the receiver from the standpoint of overall feedback. This results from the fact that the locked-in oscillator arrangement provides a substantial voltage gain at a different and lower frequency than the intermediate frequency employed in the receiver.

Improvements in the heat treating of metal products made possible by the use of electronic power concentrations up to 20,000,000 watts per cubic inch were described at the conference by Dr. Wesley M. Roberds, development engineer of the RCA Victor Division.

Among the advantages of such concentrations for heat-processing, he said, are product quality improvements growing out of closer control and more uniform effects. Additional advantages include increased production resulting from savings in process time, greater heating efficiency, and greater convenience.

"When intense heat concentrations are mentioned," he said, "one immediately thinks of the oxy-acetylene flame or the electric arc. In the case of the torch, the transfer efficiency from source to work is extremely low, so that heating equivalent to that produced by an electrical power concentration in the work of 5 kilowatts per square inch is about the maximum attainable at present. In electronic induction heating it is not difficult to put 100 kilowatts into a square inch of surface area with an overall efficiency of 50 per cent."

30 Million Showrooms

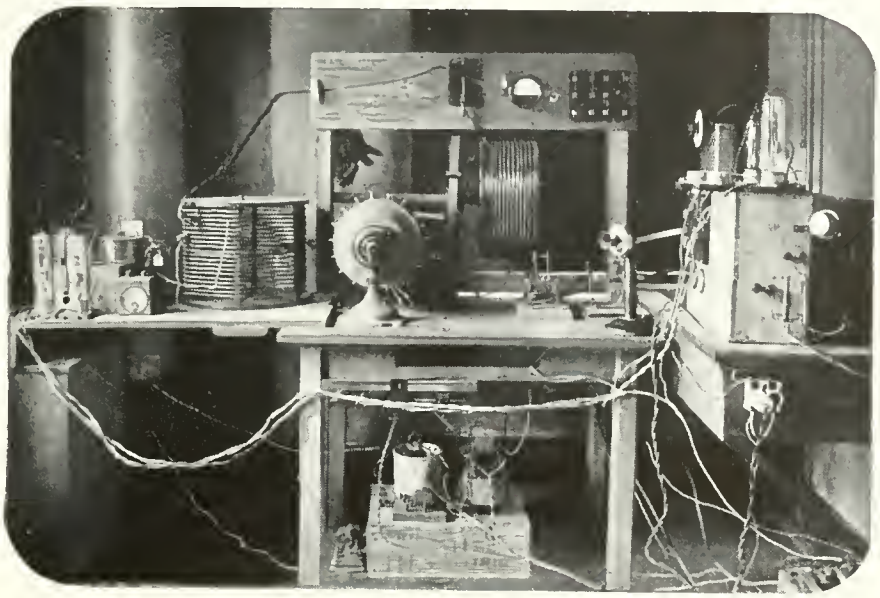
Offering 30,000,000 showrooms in the home—as compared to the 1,770,000 retail showrooms used to display the nation's prewar merchandise—television can be one of the most powerful forces in expanding postwar business to the degree that is necessary to advance America's economic welfare during the postwar era.

This prediction was made by Thomas F. Joyce, of the RCA Victor Division, in an address on October 17, before the annual Boston Conference on Distribution. It is based upon Mr. Joyce's estimate that by 1955, 30,000,000 homes will be equipped with television receivers with which to see merchandise as well as hear it described.

"A strong, nation-wide consumer demand is a necessary requisite to full production," Mr. Joyce said in prefacing his analysis of television's part in future American business. "We need to arouse the spirit of the people, and their will to do, if we are to generate more wealth in the form of goods and service. Television is the most powerful force on the horizon for setting into motion this kind of static wealth. In order to provide full employment during the postwar period without the use of extensive 'made' work projects, production and consumption of consumer goods must be increased a minimum of 50 percent over the prewar peak."

www.americanradiohistory.com

A PIONEER THEN...

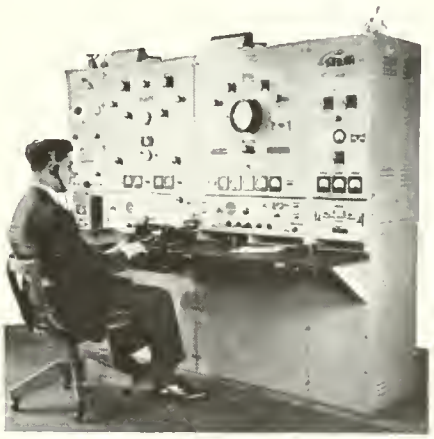


A LEADER NOW!

Twenty-five years ago, RCA was an outstanding pioneer in the field of marine radio communications.

As RCA entered new fields it entrusted to Radiomarine this important work. Over the years Radiomarine has established itself as the leader in providing the marine world with the finest in radio equipment in ship-to-shore and shore-to-ship communication services.

Today Radiomarine looks forward to the leading pioneer role it will once more play—this time in the coming Electronic Age.



Now—a ship-radio station in one unit

RADIOMARINE
CORPORATION OF AMERICA

A SERVICE OF RADIO CORPORATION OF AMERICA

www.americanradiohistory.com

*trail blazings

The National Broadcasting Company was formed in 1926. It was the *nation's first radio network*. Today it is America's number one network in programming, in facilities and in its service to the American people.

Indicative of the reasons "why", are the following excerpts from the NBC log. Commonplace today, these broadcasts were startling innovations in the radio broadcasting picture when they appeared *first on NBC* —

******The broadcast on January 1, 1927 of the historic Annual Tournament of Roses Football Game at Pasadena . . .*

FIRST broadcast to the Eastern Seaboard of an event originating on the Pacific Coast.

******The broadcast of one act of "Faust" from the stage of the Chicago Civic Auditorium on January 21, 1927 . . .*

FIRST Opera transmission on any network.

******The symphony concert short-waved to America from Queen's Hall in England, February 1, 1929 . . .*

FIRST scheduled international program.

******The Christmas broadcast from America to Holland and England, December 25, 1929 . . .*

FIRST short-wave program beamed abroad.

******The December 25, 1931 broadcast of "Hansel and Gretel" direct from New York's Metropolitan Opera House . . .*

FIRST of a regular series of Grand Operas broadcast in their entirety.

******The establishment of the NBC Symphony Orchestra November 13, 1937 with Arturo Toscanini as conductor . . .*

FIRST full Symphony Orchestra to be devoted exclusively to broadcasting.

******The telecast by NBC television station WNBT of the opening day ceremonies direct from the World's Fair Grounds, April 30, 1939 . . .*

FIRST public television broadcast in the United States which inaugurated the first regular high-definition television service in America.

These milestones are significant of NBC's consistent pace-setting record in the broadcasting industry. They are examples of a pioneering spirit worthy of NBC's pioneering parent company—Radio Corporation of America—leader for a quarter century in every phase of radio and electronic research and development.

National Broadcasting Company

America's No. 1 Network

A Service of Radio Corporation of America

www.americanradiohistory.com

"THE MUSIC AMERICA LOVES BEST"

LOUIS CALHERN, star of more than 50 plays and motion pictures . . . master of ceremonies

RCA's great program over NBC Network keeps old friends and makes new ones

To millions, RCA's "The Music America Loves Best" has become a high spot on their radio dials. In addition to featuring America's best-loved music, it presents the world's greatest artists . . . names as familiar as the music itself.

Each week it keeps and makes friends for RCA—friends we shall be glad to have when peacetime production is resumed. This is your program too. Tune it in every Sunday at 4:30 p.m., EWT, over NBC.

JAY BLACKTON, conductor of the RCA-Victor Orchestra and Chorus

A Few of the Stars Who Have Appeared

PERRY COMO

ALLAN JONES

JEANETTE MACDONALD

GRACE MOORE

ARTUR RUBINSTEIN

GLADYS SWARTHOUT

RCA

1919 1944

25 YEARS OF PROGRESS IN RADIO AND ELECTRONICS

RADIO CORPORATION OF AMERICA

RCA Victor Division, Camden, N. J.

LEADS THE WAY...*in Radio...Television...Tubes...Phonographs...Records...Electronics*

www.americanradiohistory.com

25 Years that Created a New World of Radio 1919-1944

From 1919 to 1944 . . . RCA has pioneered in the science of radio and electronics . . . from world-wide wireless to national network and international short-wave broadcasting . . . from electron tubes to electron microscopes and radiothermics . . . from the hand-wound Victrola to the automatic radio-phonograph . . . from television to radar.

Twenty-five years of service to the nation and the public have made RCA a symbol of achievement and progress . . . RCA is a monogram of quality in radio-electronic instruments and dependability in communications throughout the world.

From the First World War to the Second, RCA developed and expanded its "know-how" in skilled engineering and production so vitally needed to meet the demands of war . . . these qualities will be reflected in the peacetime products of RCA.

RADIO CORPORATION OF AMERICA

30 ROCKEFELLER PLAZA, NEW YORK CITY

RCA LEADS THE WAY . . In Radio . . Television . . Phonographs . . Records . . Tubes . Electronics

RCA
1919 1944
25 YEARS OF PROGRESS IN RADIO AND ELECTRONICS

www.americanradiohistory.com