# THE WIRELESS WORLD



In the Faröe Islands

Measuring Continuous Waves

Wireless in Guatemala

DEC^R 1917

7^D NET

The
WIRELESS
· WORLD ·

Volume V. No. 57. DECEMBER, 1917.

# Bringing near the Far-away Islands

## *Some Personal Experiences of a Wireless Operator*

By W. B. COLE

WRITERS of fiction have woven no end of romance around the wearers of the silver greyhound, "King's Messengers," who spend their lives in ceaseless travel between the British Foreign Office and the various diplomatic centres of the world. In its way, the rôle of the wireless engineer is every bit as dramatic. He may be called upon at any moment to pack up his traps and be off to fulfil his mission in life, that of bringing some unit of the human race, thousands of miles away, into closer touch with its fellows. We play our part in the business of the world in every part of the habitable globe,

"From Greenland's icy mountains to India's coral strand."

Let me instance this from my own recent experience.

Just returned from Spain, I was suddenly called upon to proceed to a little-known archipelago, lying half-way between the Orkney Islands and *Ultima Thule* (known to modern geographers as Iceland). This island group is composed of no fewer than twenty-three separate units, only eighteen of which contain any permanent inhabitants. They lie right out of the beaten track of ocean ships, 250 miles north of the extremest promontory of Scotland, and a little further still from the Western Coast of Norway.


It is with this latter country that their history has been connected from the earliest days. The first colonists appear to have settled in the Viking era. A Norwegian chief, named Grim Kamban, who pitched his tent in Suderö in 825 A.D., is said to have found a small monastery, or settlement of Scotch and Irish monks, who had brought with them sheep from their native mountains and proved that they throve well in their new surroundings. The legend of these sheep-farming monks, however, seems open to suspicion, in view of the fact that the chronicler endeavours to found thereon a very doubtful origin for the name Faröe, in which the primitive etymologists professed to recognise a reference to the word *faar*, meaning sheep. There seems little doubt that, as a matter of fact, on account of their distance from inhabited centres they were dubbed the *Far-Oë*, or "Far-away Islands."

However this may be, they shared in the fate of Norway and Iceland, falling during the Middle Ages under the rule of Denmark. We find, by the way, an admirable illustration of the "nook-shotten" nature of this archipelago during the readjustment of Europe which took place at the close of the Napoleonic era in 1814. Pressure was put upon Denmark to surrender her sovereignty over Norway; but Iceland and the Faröe Islands remained under Danish rule, because the negotiators of the (1814) Peace of Vienna *did not know that there were such islands in existence!*

It will be seen from the foregoing remarks that, important as wireless telegraphy may be to the most populous countries in the world, its value to such isolated communities as these is beyond all price. I may frankly confess that when my orders first reached me my acquaintance with the destination towards which I was bound was not many degrees removed from the total ignorance of the diplomatists at

Vienna above referred to. When, in due course, I arrived upon these shores I found myself in a climate by no means as rigorous, from the point of view of temperature, as I had expected. This is due to the beneficent action of the Gulf Stream, whose warm current keeps the average winter temperature at the level of about 38·5 Fahrenheit. At the same time, the waters in whose bosom they lie prevent the summer temperature from rising above 50·9 Fahrenheit. The islands, therefore, possess an equability of temperature which can be rivalled by but few localities in the world. A further result of this compromise between two contending forces of nature consists of the moistness of the atmosphere. Great masses of clouds, heavy rainfall and constant winds constitute the leading characteristics of the Faröes. Only 86 days in the year are free from rain, and only on six days (at an average) do they enjoy cloudless sunshine, whilst the mean percentage of calm days falls as low as 7 per cent. The northern and western coasts are mountainous and rocky, liable to be shrouded in sea fogs, and surrounded by strong tidal currents and stormy seas. The cliffs rise to sheer heights varying from 1,700 to 2,000 feet. In the easterly and southerly directions the cliffs slope gently down to the shore, and we find a littoral indented with numerous fjords of varying depth. The mountain heights are terraced, and present the appearance of having been constructed by piling flat rocks upon each other, beginning with the largest at the base. The highest elevation is reached on Osterö (East Island), where Mount Slattaratind reaches a height of 2,900 feet.

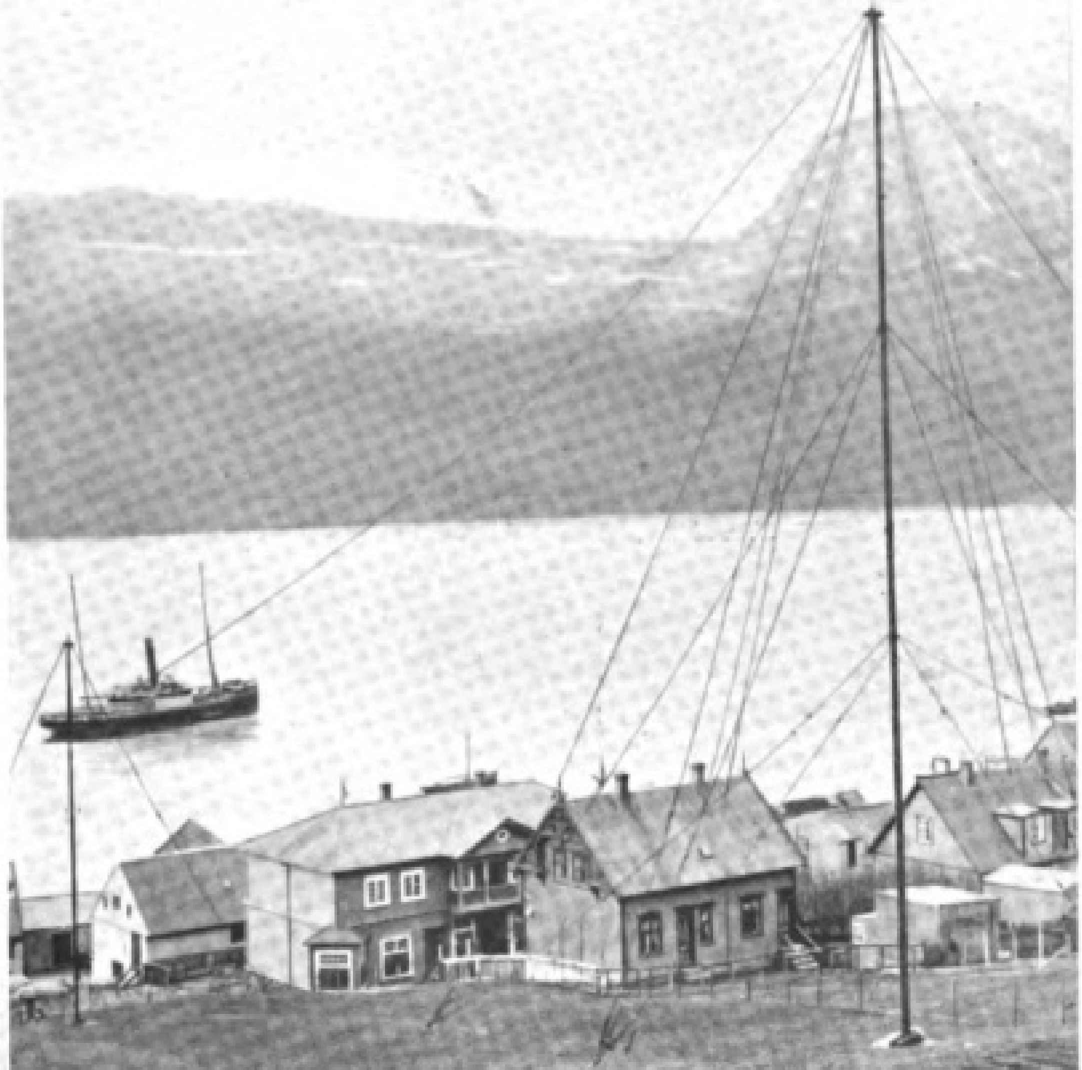
A TYPICAL BIT OF FAROE-ISLAND COASTLINE.

The whole of the 510 square miles composing the superficies of the islands is formed of basalt, which at Frödebö (on the Island of Suderö) appears in beautiful specimens of isolated prismatic columns, which split up the rays of daylight and produce wonderfully beautiful colour effects. The action of water and weather has evolved many curious formations, some of them resembling men's faces, some ships in full sail, and a great body of legendary lore has centred itself round these curious natural phenomena. Here and there may be seen lofty columns, supporting vast arches, composed of huge masses of rock, beneath which yawn caverns whose floors are covered with the sea. In some cases such tunnels extend right through the island. We have an instance of this on Nolsö (Needle Island), which owes its patronymic to the vast cavern, 100 feet in height and 600 feet long, which pierces the island from end to end. This boring is situated about half a mile from the southern extremity, and the island thus follows the configuration of a gigantic needle. "Needle Island" forms a happy hunting ground for the geologist, containing within itself nearly all the characteristic rocks and minerals of the Faröes. Although coal of a clean and shiny appearance exists in fair quantities on the island of Suderö, the poorness of its quality and the difficulty of transport cause peat to be used as the national fuel. An abundance of this material, chiefly composed of rotted sedge and bog-cotton, may be found practically everywhere.

SOME CRAGS ARE CARVED INTO WEIRD SHAPES BY THE ACTION OF WIND AND WEATHER.

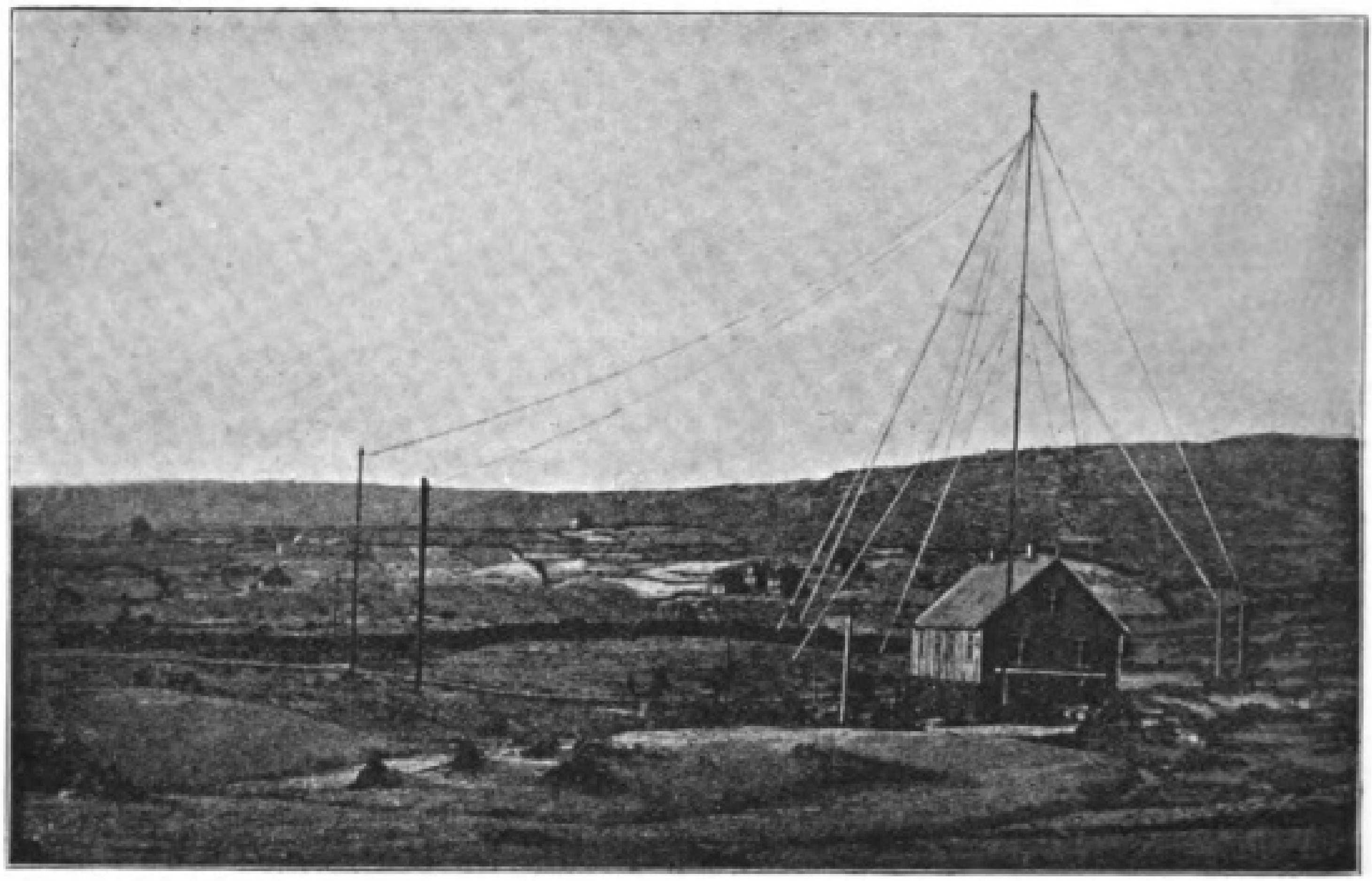
Probably the favourite god of the heathen Vikings was Thor, the Hammerer, and the old Viking association of the Faröese is exemplified in the fact that Thorshavn* is the name of their capital. This city, which contains 2,300 out of the 20,000 inhabitants who form the total population of the archipelago, stands on the Island of Stromö at a point where the "Needle Island" (five miles long by one mile broad) forms a natural breakwater to the harbour.

* See illustration, page 591.



TVERAA WIRELESS STATION ON THE ISLAND OF SUDERÖ.

I found the inhabitants, who are mainly of Norse descent, as simple and grave in their manners as they are industrious in their habits. Hospitable to a degree,



THORSHAVN WIRELESS STATION, AND THE UPLANDS WHICH SURROUND IT.

their reception of myself was most kindly, and in all the countries whither my wanderings have taken me I have in the Faröes felt—less than anywhere else—as though I were living in a foreign country. When I first caught sight of the national costume, I could not at once remember what chord of memory it stirred. 'Twas some time before I realised that the brown coat of native material and the red-and-blue cloth cap bore a strong resemblance to the characteristic garments worn by Neapolitan fishermen. Black knickerbockers fastening at the knee, decorated with gilt or silver buttons, grey stockings, and yellow untanned sheepskin shoes tied round the ankles with many strands of white wool give the finishing touches to a dress both striking and picturesque.

The Saga of St. Olaf, the king who ruled Norway at the time when Canute occupied the throne of England and Denmark, narrates how the Norse monarch summoned to his Norwegian capital representatives from the Faröe Islands in order to impress upon them that

> "the law and land privilege which he set them should be observed in the Faröe "Islands, and also the scatt (taxes) be levied which he laid upon them."

Oaths of obedience were duly sworn by the Faröese; but the ship subsequently sent with the tax collectors on board somehow or other never arrived! Nowadays Denmark is the Suzerain country, and the Danes leave the administration in the hands of a local Parliament. They also summon two members, elected annually, to represent the islanders in the Danish Assembly at Copenhagen. Of these, one member is attached to the Landsting, or Upper House. This member is chosen by the Faröese Parliament. The delegate sent to the Folketing, or Lower House, is elected by the direct suffrage of the Faröe electors. The islanders are ruled by a governor, a sheriff, a judge, and the chief priest; whilst Sysselmen (deputy governors) administer affairs in local centres. Women possess votes on the Town Council; and it is said to be due to their influence that all intoxicating liquors are barred public sale. Such commodities can only be purchased at the club or imported privately. The House of Parliament holds its sittings annually in Thorshavn, and the session is opened with prayer and a sermon from the chief priest. Following the model of Iceland and Denmark, the national religion is Lutheran. I found also an Evangelical Mission, founded more than forty years ago by a Scottish minister, whose son and other disciples are carrying on the good work initiated by him.

Thanks to the rugged formation of the surface, there are no railways in the islands, and no roads of any length, with the result that communication between one village and another is mainly carried out by sea, to the neglect of the rough tracks across the hills. Three lighthouses have been established for the assistance of navigation, as well as shore lights in most of the principal harbours, but no fog-horns are maintained. On all the islands rocks of varying size may be found scattered everywhere. The stratum of earth is so thin that it sometimes amounts to no more than eight inches in depth, whilst even in the arable valleys it seldom

THORSHAVN, THE CAPITAL OF THE FAROE ISLANDS. VIEW OF THE CITY AND BAY.

exceeds four feet. The bright spots in an otherwise gloomy landscape consist of the cultivated fields, which shine out at times during the summer and winter.

*(To be continued.)*

# PERSONALITIES IN THE WIRELESS WORLD

DR. BALTH VAN DER POL, JNR.

THE subject of our biography, Mr. Balth van der Pol, Junior, was born at Utrecht (Holland) on January 27th, 1889. After going through the regular curriculum of elementary and secondary education in that town he proceeded to the University in Utrecht in 1911 for the purpose both of specialising there in the subjects of mathematics and physics. After the usual three-year course he graduated as *Candidaat* (a degree equivalent to the B.Sc. of London) in 1914; and, after a further two years' devotion to the study of experimental and theoretical physics, under Professors Julius and Ornsten, achieved the distinction of *Doctorandus* in 1916. His interest in the theory and practice of wireless telegraphy dates back to 1904; and, as year succeeded year, he found himself more and more attracted by the fascination of this new development of Electrical Science. Probably Mr. van der Pol was one of the first physicists in Holland to devote serious attention to radiotelegraphy from the physical and mathematical point of view, and—there being no physical laboratories in Holland specially equipped for research work in wireless—he came over to England in the fall of 1916, and studied for a year under Professor J. A. Fleming in the Research Department of the Pender Electrical Laboratory at University College, Gower Street.

In the summer of 1917 he went into residence at Cambridge in order to engage on research work in connection with the propagation of electric waves over the surface of the earth, under Professor Sir J. J. Thomson in the Cavendish Laboratory. At the moment of writing Mr. van der Pol is still devoting himself to this work.

Readers of THE WIRELESS WORLD know that he is a valued contributor to our own magazine. The paper on the "Wave-length of Antennæ with Fly-wheel Coupling," which appeared in our November issue, is from his pen, and has attracted much attention from scientists. Over and above a number of articles which he has published elsewhere, he is responsible for monographs on the production of alternating current which have appeared in the Proceedings of the Koninkl. Academie van Wetenschappen at Amsterdam. An important paper was read before the Physical Society of London by him in the course of the current year, on the subject of "The Wave-lengths and Radiation of Loaded Antennæ."

# Some Further Notes on the Measurement of Continuous Waves

By D. J.

In the October issue of the Wireless World the measurement of continuous waves was considered from a more or less theoretical point of view, without more than a passing reference to some of the difficulties encountered in the practical working of an oscillating wave-meter. These difficulties are worthy of consideration and can be overcome by suitable modifications of design based on experimental results.

The circuit described in the previous article, though giving excellent results, can be profitably simplified without detracting from its efficiency as a receiver and generator of undamped oscillations. From the first circuit (reproduced in Fig. 1) it is seen that sustained oscillations are produced by having a separate reaction coil coupled to another coil of variable wave-length. This coupling is, of course, fixed and should not be altered, as a variation of coupling also produces a variation of wave-length to a certain extent.

For practical purposes, then, it is really unnecessary to have two separately wound coils, which would entail extra care in construction. The same principle may be applied in a more practical manner than shown in Fig. 1 by using a single coil wound with fine insulated wire and having a tapping taken from about half-way. Fig. 2, which illustrates this, also shows the modifications necessary to make the circuit similar to that given in the first diagram. The telephone receivers and sheath battery are still in the sheath circuit, and the grid circuit consists of the lower half of the coil, the half-way tapping going to the positive side of the six-volt accumulator and the extra lower end of the coil being connected to the grid of the valve.

By revising the circuit of Fig. 1 in this manner the construction of the wave-meter becomes simpler and, if anything, more effective. In the original circuit it was necessary to take care that the two coils were wound correctly relative to each other, as otherwise there would be an opposing effect by the reaction coil, and the system would refuse to oscillate. By using a single coil, with a tapping half-way, as shown in the second diagram, the general construction becomes simpler and it is impossible to have the coils reversed. The circuit can therefore be connected up without previous trial, and is certain to oscillate.

It is not intended to give any detailed particulars regarding the actual number of turns of wire, etc., or any such minor points of construction. They will vary according to individual requirements, and the actual construction presents no difficulties. It will not, however, be out of place to draw attention to one or two details of general design which will result in an efficient measurer of continuous waves.

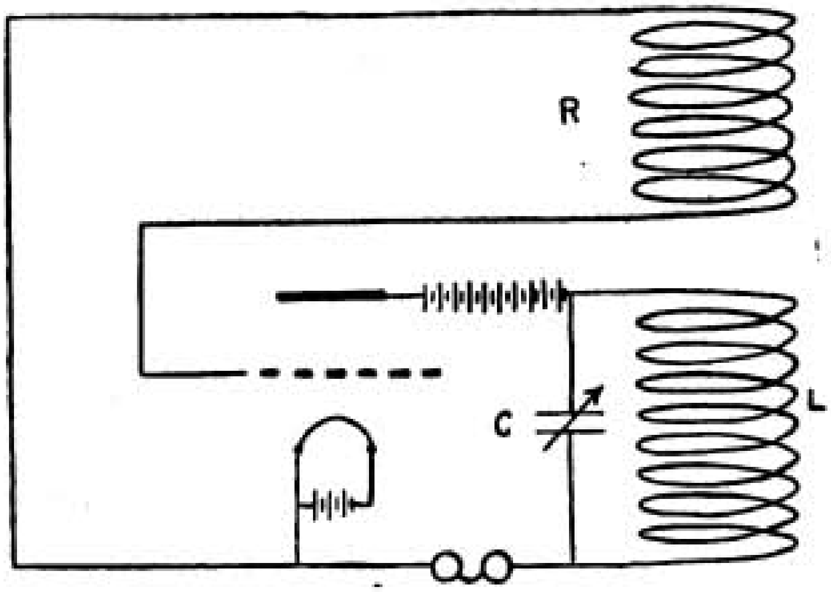



FIG. 1.

The reaction coil *R* in Fig. 2, as in Fig. 1, is of fixed inductance, having a value about equal to the portion of the coil included in the sheath circuit —*i.e.*, the lower half. This reaction coil is aperiodic, and the oscillations which take place in it, when the circuit oscillates, are forced. One end of this coil is connected to the grid of the valve and the other end is joined to the positive side of a six-volt accumulator. It is connected to the positive side in order to make the circuits oscillate more readily. If the connection is made to the negative side of the accumulator the valve will oscillate, but it requires a sheath battery of greater voltage to make it do so. The accumulator used need not necessarily be a six-volt one, but that is a suitable size. An accumulator of higher voltage can be used and will require less voltage on the sheath battery to make the valve oscillate. On the other hand, the filaments of most valves at present in use will soon burn out if more than six volts are put across them. A six-volt accumulator is therefore a suitable source of current for lighting up the valve.

The sheath circuit coil—the lower coil in Fig. 2—is about the same size as the reaction coil, and has in parallel with it a variable condenser *C*. One side of this condenser is connected to the same side of the accumulator as the grid circuit coil. The other side of the condenser is connected to a pair of low resistance 'phones. The other side of the telephones are connected to the negative side of the sheath battery, the positive of which is connected directly to the sheath of the valve.

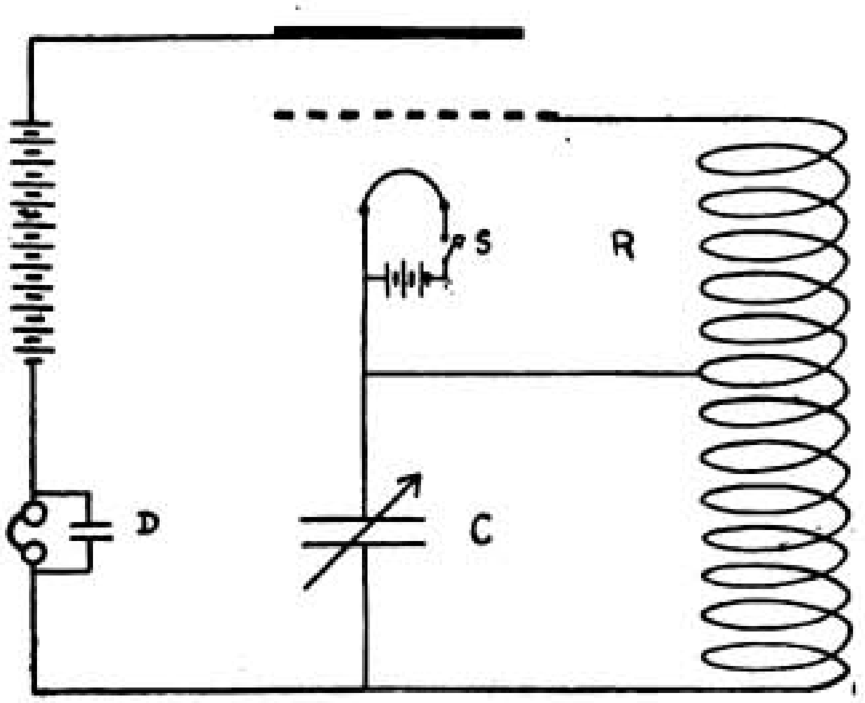



FIG. 2.

The inductance in the sheath circuit is of such a value that when the variable condenser *C* is set to its minimum capacity the sheath circuit is turned to the minimum wave-length

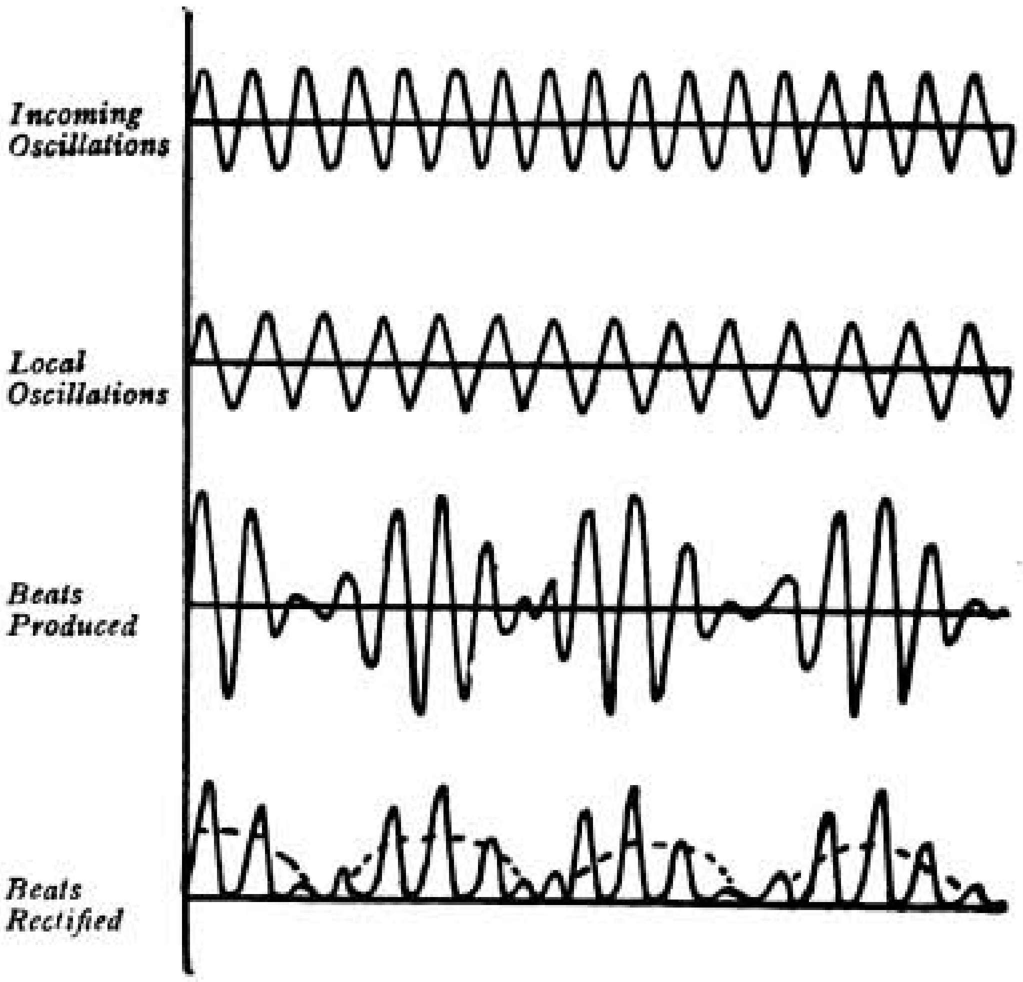



FIG. 3.

it is required to measure. All variations of frequency are made by varying the condenser *C*, which is of such a value that when set to its maximum capacity the sheath oscillatory circuit is tuned to the highest wave-length to be measured. The frequency of the continuous waves emitted by the apparatus is therefore regulated solely by a small variable condenser, which will give a very wide range of wave-lengths. The calibration of such a wave-meter is discussed later.

The telephones are of the low-resistance type, although high-resistance 'phones can be successfully used. Changing from high-resistance 'phones to those of low resistance causes an appreciable change of wave-length, however. Owing to the inductance of the coils, high-resistance telephones give the sheath oscillatory circuit a slightly greater wave-length. To obviate this effect on wave-length a small fixed condenser *D*, of about ·002 mfd., is placed across the telephone terminals. This condenser does not affect tuning, but offers an easier path for oscillations than through the telephones, which, even when of the low-resistance type, possess considerable impedance, which tends to prevent the valve oscillating. Comparison of results obtained with and without the condenser shows that the oscillations are appreciably feebler without the condenser.

The sheath battery in Fig. 2 may consist of four or five ordinary flash-lamp batteries, giving a voltage of about 20 volts. This voltage is ample to give fairly strong oscillations. The valve, in fact, will easily oscillate on 10 volts, and even 6 volts. If 8 volts are used for lighting the filament it will oscillate on about 3 volts. The battery, however, especially if it consists of small cells, should be of sufficient voltage to produce fairly strong oscillations, to allow for a drop of voltage after it has been used for some time. There is another and more important reason, however, for having the oscillations in the wave-meter fairly strong. It has already been stated in the previous article that, in addition to receiving continuous waves, the wave-meter also sends out waves of variable length, which can be picked up on any instrument designed for the reception of such waves. Immediately the filament current is switched on by means of the switch *S*, sustained oscillations are set up which will continue all the time the valve is lit up. These oscillations set up continuous waves of a definite length which, though incapable of travelling more than a short distance, are still sufficiently strong to influence a continuous wave receiving instrument when brought within a few yards of it.

Without any alteration to the circuit the wave-meter is also capable of being used as a measurer of received waves, since the valve is oscillating both for sending and receiving, and since the telephone receivers are always in circuit. When, therefore, waves emitted from a transmitting station reach the wave-meter additional oscillations are set up in it which form beats with the feeble local oscillations already taking place.

The relation between the strength of these local oscillations and the strength of the oscillations in the transmitting apparatus has a very important bearing on the correct measurement of continuous waves. Let us only consider for the moment the case of an oscillating wave-meter similar to the one described being used to measure the length of waves emitted by a continuous wave-transmitting station of small power.

If the wave-meter be held at some distance from the transmitter, the oscillations set up in the wave-meter by the transmitter will be of approximately the same strength as those already taking place. The amplitude of these oscillations produced by the transmitter may be varied at will by moving the wave-meter closer to or further away from the transmitter aerial or earth lead. The case where the amplitudes of the two sets of oscillations are exactly equal is shown in Fig. 3. The first line shows the incoming oscillations set up in the wave-meter by the continuous wave transmitter. The second line shows the local oscillations taking place inside the wave-meter. The third line shows the beats produced, while the fourth line shows these beats rectified. It is these rectified beats of audible frequency that produce the note in the telephone receivers. The dotted line represents the movement of the telephone diaphragm.

Fig. 3 only shows very roughly what takes place in the wave-meter when the amplitudes of the two sets of oscillations are equal. This is the best condition, though not by any means essential.

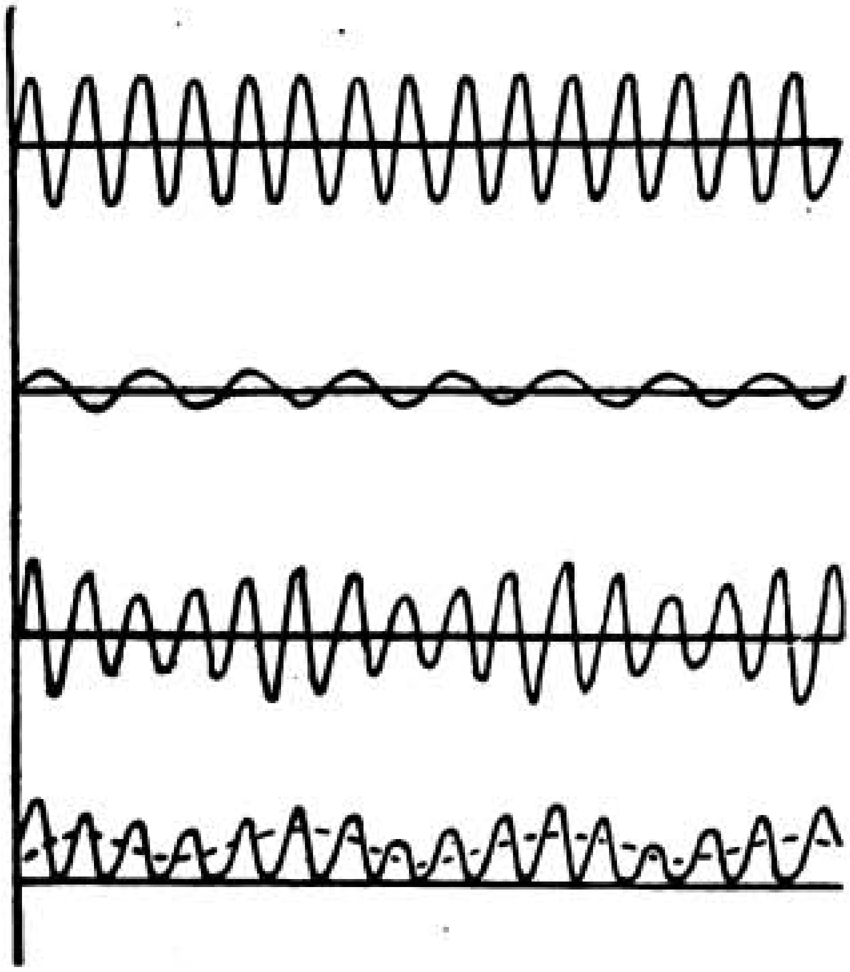


FIG. 4.

Fig. 4 shows what takes place when the wave-meter is too near the aerial and the oscillations produced in the wave-meter by the transmitter are very much stronger than the local oscillations. When this happens much less accurate results are obtained. If the wave-meter be held too close to the transmitting instrument, so that conditions are as illustrated in Fig. 4, instead of hearing the characteristic chirp when the wave-meter condenser is turned round, only the very high notes are obtained, and between the two limits is a long silent interval. The length of this silent interval depends upon the relative amplitudes of the superimposed oscillations in the wave-meter. The nearer the wave-meter is to the sending instrument the greater will be the disproportion between the local oscillations and those from outside, and therefore the longer will be the silent interval.

By taking the middle of the silent interval as being the correct wave-length rough results may be obtained. Such a course, however, is very undesirable, particularly if the silent interval is more than a very short distance. The wave-meter should always be at such a distance that the peak of the wave seems very sharp, and so that no silent interval is heard at all. This result may be obtained either by strengthening the local oscillations in the wave-meter, so as to correspond more with those emitted by the transmitter, or by taking the wave-meter some distance away. This latter method is often inconvenient, as it is desirable that the operator who is working the transmitting set should be able to make the necessary adjustments to send on a certain wave-length, without having to go away from his instruments. In order to obviate such inconvenience the wave-meter should have a sheath battery of about 40 volts. It will then be found unnecessary to move the wave-meter away from the set.

In order to obtain the greatest accuracy, however, the best plan is to have the wave-meter and its telephone receivers at a considerable distance from the sending set. The tuning is sharper and no mutual effects between wave-meter and instrument are produced.

Very misleading results are often obtained by having the wave-meter too near the set or aerial. Frequently the fundamental wave is too strong and produces little and sometimes no effect in the telephones. On the other hand, complications arise owing to the weak harmonics generated in addition to the fundamental waves. These harmonics frequently produce much louder chirps than the fundamental waves when the wave-meter is too close to the instrument, and so may give rise to incorrect assumptions. At a distance, though, these harmonics are too weak to influence the wave-meter, which will then only respond to the real fundamental waves. It would be as well, perhaps, to point out that it is not sufficient to move the wave-meter alone away. The telephone leads and the operator wearing the receivers should also be at some distance from the instrument.

Let us now consider the use of the wave-meter in conjunction with a continuous wave-receiving instrument. The oscillations in both instruments are now more of the same order and the wave-meter may be brought close up to the receiving set without causing complications.

From this it is seen that to measure transmitted waves the sheath battery of the wave-meter should be of higher voltage than is necessary for the other uses of the wave-meter in conjunction with receiving apparatus. A switch may be used if considered desirable to give, say, either 40 volts or 15 volts from the sheath battery when the wave-meter is required to receive or send respectively. Such an arrangement is, however, really unnecessary, as an average voltage enables the wave-meter to be used for both purposes.

The actual calibration of the wave-meter, already briefly discussed, presents several difficulties. The variable condenser of Fig. 2 may either be calibrated in actual wave-lengths or in degrees. The latter method is, of course, to be preferred, and when used a card is required similar to that on a Marconi wave-meter, giving the wave-lengths which correspond to the different degrees on the condenser. This system allows of periodical checking of the accuracy of the wave-meter.

The wave-meter is so sensitive that the slightest changes of wave-length can be observed to within a few metres. The slightest alteration of the position of the hand will vary the wave-length to a measurable extent. Even the changing of the valve would necessitate a recalibration of the wave-meter if particularly great accuracy were required. For practical purposes, however, one or two metres make no difference and sufficiently accurate results may be obtained by the use of the wave-meter described.

# A Jig-Saw Puzzle and its Solution

At the beginning of November the Admiralty published a mysterious message about a mysterious boat. The text ran as follows :

> An attack was made on our vessels patrolling the Belgian coast by an electrically controlled high-speed boat.

This paragraph naturally aroused considerable comment, and the daily Press set to work to build their theories upon the subject. The larger proportion of them would appear to have taken it for granted that the electrical control spoken of must be wireless, and in some instances our contemporaries published accounts of the work which had been done with wireless controlled boats at the end of the nineteenth and earlier part of the twentieth century, both in Europe and America. Mr. Archibald Hurd, writing in the *Daily Telegraph*, gave it as his opinion that the boat mentioned in the Admiralty message was nothing but a development of the Brennan torpedo vastly increased in size. Such instruments are controlled from the shore by wires working upon a drum, and necessarily possess but a limited range. Mr. Hurd seems to have been the nearest to the truth, for our official "Mystery Men," a week after their first paragraph, issued a further *communiqué* which provided the solution. This later communication ran as follows :

> The electrically controlled motor-boats used on the Belgian coast are twin petrol-engined vessels, partially closed in, and travel at a high speed. They carry a drum with between thirty and fifty miles of insulated single-core cable, through which the boat is controlled electrically. The fore part carries a considerable charge of high explosive, probably from 300 lb. to 500 lb. in weight.
>
> The method of operating is to start the engine, after which the crew leave the boat. A seaplane, protected by a strong fighting patrol, then accompanies the vessel at a distance of three to five miles and signals to the shore operator the helm to give the vessel. These signals need only be starboard, port, or steady. The boat is zig-zagged while running. This may be either intentional or unintentional.
>
> On being steered into a ship the charge is exploded automatically.

# Digest of Wireless Literature

## A Phonetic System of Teaching Telegraphy.

At the present time when so many young men are learning telegraphy for the purpose of entering the wireless service, our readers will be interested in a new system of instruction developed in the United States by Mr. C. H. Weiser, an engineer on the staff of the Bell Telephone System. In an article which appears in our American contemporary, *The Telegraph and Telephone Age*, Mr. Weiser considers the method of teaching usually employed and criticises it from his point of view. He then outlines the principles of his phonetic system.

By the phonetic system of instruction in telegraphy, says Mr. Weiser, the student does not learn the code of dots and dashes. He is taught the composite sounds of the letters as they might be made in a message sent at the rate of eighteen to twenty words per minute. For example, five or six letters are selected and sent over and over again until the composite sounds are firmly fixed in the mind. Gradually the other letters, numerals and punctuation marks are added. Long before the entire alphabet has been mastered the students are receiving small words made up of letters the sounds of which they have already learned. This method continues until the students are able to receive from eighteen to twenty words per minute, at which time they are taught to send. Peculiar as it may seem, many of the students even learn to send to a great extent before they know what the component dots and dashes are. Of course, this is not a part of the system, but it was brought out by the students themselves, who sometimes get hold of the instructor's key and amuse themselves by trying to reproduce sounds which they have heard the instructor make.

By this method a young man of ordinary mental ability is said to be able to become a fairly competent operator in three or four months.

The advantages of this system are said to lie in the fact that the very trying and difficult processes of mental analysis and synthesis are eliminated. The student not knowing the dots and dashes hears only the composite sounds of letters or words, which are sent at the rate of speed which he would ordinarily hear them in active service. He either knows or he does not know, hence he spends no time in analysing and placing some particular sound and associating some series of sounds with the code which he has fixed in his memory. If he misses a letter, therefore, he is able to recognise the next succeeding letters, for the reason that he forgets the fact that a letter has been omitted, with the result that he learns to receive very difficult and complicated words. This method, although open to criticism, is certainly interesting, and may readily be tried by means of the Marconi official gramophone records.

ALEXANDERSON HIGH-FREQUENCY ALTERNATOR.

The rapid development of all matters relating to continuous-wave telegraphy has had the effect of increasing the interest in high-frequency alternators. Many such machines have been produced in the past, but few have turned out to be satisfactory in practice. One of the most successful high-frequency alternators yet produced is that known as the "Alexanderson," the invention of Mr. E. F. W. Alexanderson, of the General Electric Company of America.

In a recent issue of the *Wireless Age* Dr. Alfred N. Goldsmith devotes an article to this highly interesting machine, dealing with both its mechanical and electrical aspects.

There are many mechanical problems connected with high-frequency alternators. For example, the rotary portion of this machine needs to rotate at an enormously high speed. This makes it practically impossible to utilise any elaborate system of winding on the rotor, for the strains set up by the centrifugal force are extremely high. In the Alexanderson machine this difficulty is overcome in an ingenious manner, for the rotor, although revolving at something in the neighbourhood of 330 revolutions per *second*, carries no windings whatever, and consists merely of a disc of solid metal.

The machine is of the inductor type (that is, with a stationary armature and field, but with a rotating element which causes a pulsating field to cut the armature conductors) and is provided with a novel arrangement of the magnetic circuit, allowing the construction of a rotor which can be operated at extremely high speeds. In one form of the machine the rotor consists of a steel disc with a thin rim and much thicker hub shaft for maximum strength (that is, with a width that progressively diminishes from the shaft out, so that the strain on the material outward because of the centrifugal force is the same from the shaft to the outer rim). The field excitation is provided by two coils located concentrically with the disc and creating a magnetic field, the lines of force of which pass through the cast-iron frame, the laminated armature support and the disc. The flux also passes through the narrow air gaps on each side of the disc rotor. The two armatures are secured in the frame by means of a thread, in order to allow the adjustment of the air gap. Instead of poles or teeth the disc is provided with slots which are milled through the thin rim so as to leave spokes of steel between the slots. The slots are filled with a non-magnetic material (phosphor bronze) which is riveted in place solidly, in order to stand the centrifugal force and to provide a smooth surface on the disc, so as to reduce air friction. The disc is usually made of chrome nickel steel.

With this type of machine it is possible to produce a 200,000-cycle current by direct generation. This is by far the highest frequency which has as yet been produced directly by an alternator.

On the mechanical side there are many interesting points in connection with these machines, and in one of the alternators described in the article the oiling system is provided with an interesting protective device The oil which is returned to the reservoir strikes a small pivoted shovel. Its weight depresses the shovel against a controlling spring tension. Should the flow of oil cease for any reason the shovel flies up and automatically opens the driving motor circuits. In this way any danger of unoiled bearings "freezing" is obviated. In this set the alternator is driven by a

110 or 200-volt direct current shunt motor. The motor speed is 2,000 revolutions per minute, and it is raised to the requisite 20,000 revolutions by a 1 to 10 helical-cut gear. The oil pump is driven from the motor shaft.

Mr. Alexanderson has had built a 50-kilowatt 50,000-cycle alternator, and considerably larger machines are said to be under test and construction. One big machine illustrated in the article has proved capable of furnishing 85 kilowatts for brief periods. Operating at 3,500 revolutions per minute its bearings and shaft construction are similar to those of normal high-speed turbines. The direct generation of radio frequencies by a machine working on the principle of a simple alternator is possible only by the use of a very low voltage winding, so that with this type of machine it is necessary to use a transformer between the machine and its output circuit.

---

# Lord Northcliffe's Object Lessons

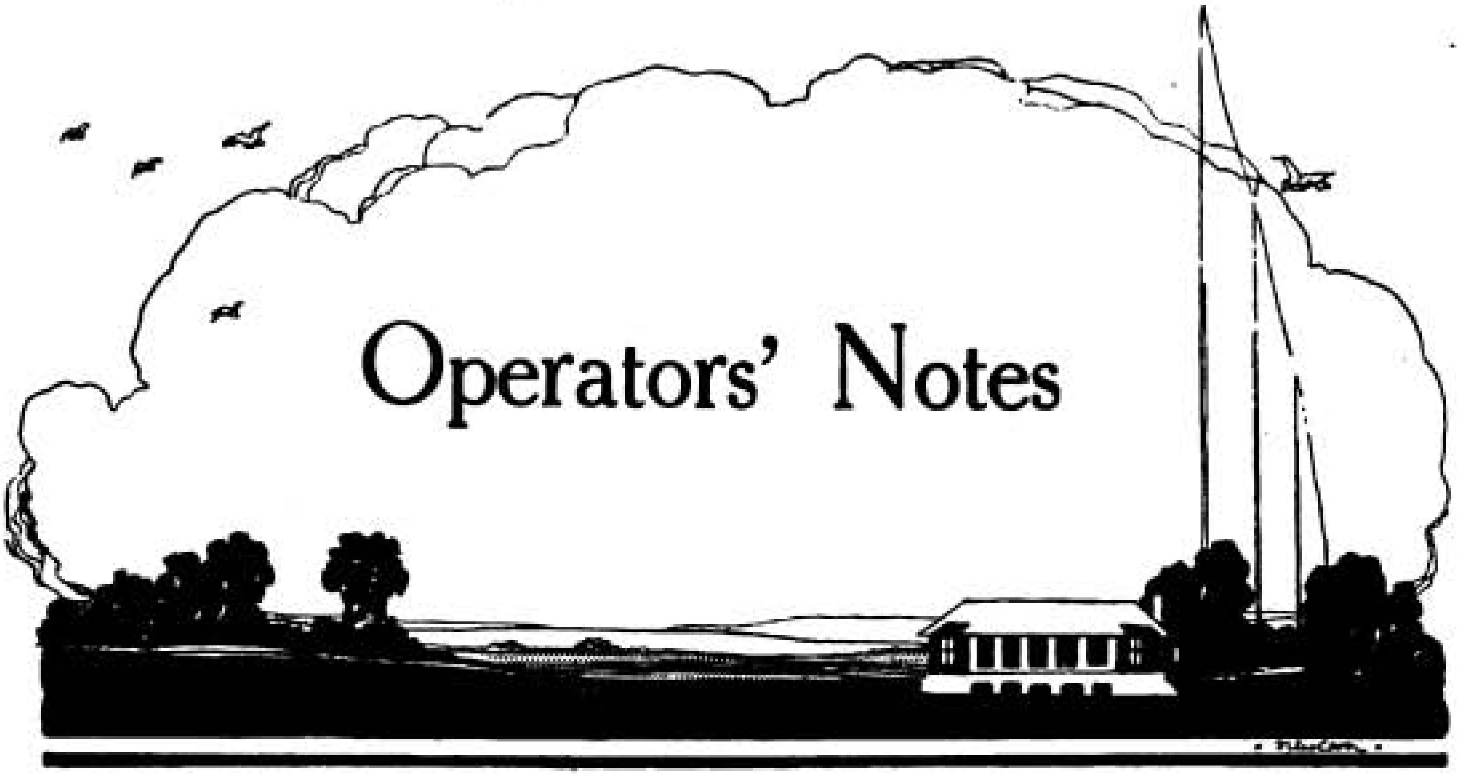
## *Interesting Experiences in U.S.A.*

LORD NORTHCLIFFE, who is energy personified and a recognised admirer of American enterprise, has, since his return to England, expressed his delight at having come into personal contact with the leaders of a country which enjoys the reputation of being peculiarly free from the incubus of tradition and official discouragement. Judging from reports to hand the great progressive American corporations took every care to justify their reputations, and occupied the spare moments of their distinguished visitor with unique exhibitions.

One of these, intended to demonstrate the wonderful network of telephonic communication which so great a continent affords, was given recently by the President of the American Telephone and Telegraph Company, Mr. Theodore Vail, when Lord Northcliffe was invited to compare telephonically the distinctive roars of the Atlantic and Pacific Oceans on their respective seaboards.

The westward circuit employed in this experiment, which spanned 3,400 miles, contained 6,800 miles of hard drawn copper wire, or approximately 2,960 tons of this valuable metal, the wire alone at the present valuation representing a capital outlay of considerably over £300,000, apart from the sum sunk in the 130,000 poles necessary for the support of the main line, and the maintenance of a continent-wide staff of repairers.

Trans-continental telephony on the scale attained by the American Telephone and Telegraph Company is a wonderful achievement, but we have no hesitation in predicting that a very few years will be sufficient to provide for Lord Northcliffe and all interested the still more remarkable achievement of wireless telephony over equally great intervals of territory and with appliances costing a mere fraction of that now required for the installation of metallic circuits. In this connection, it may be recalled that by the aid of the Fleming valve satisfactory wireless speech was conducted between New York and Paris before the war, and extraordinary developments in apparatus suitable for such work have been made since that date.



# Operators' Notes

## *The Elementary Principles of Chemical Equations*

By HAROLD WARD

EQUATIONS may briefly be described as the "shorthand" of chemistry, and it is of the utmost importance that all students of electricity should understand this "shorthand," at least sufficiently for the complete comprehension of chemical equations relating to the action of various cells, more especially with regard to secondary cells. For this reason the writer believes that the following article will be of assistance to those not conversant with elementary chemistry.

All materials may be broadly classified into two divisions—namely, elements and compounds.

An element is a pure, simple substance which up to the present has defied scientists in their efforts to decompose it into a group of other substances. Elements are divided into two groups—metals and non-metals, and again into three more groups as follows: An extremely fluid element is termed gas, but all gases are not elements. A partially fluid element is termed a liquid. All liquids are not elements; in fact, very few are at ordinary temperatures. The most commonly known liquid element is mercury, which is, of course, a metal. The remaining group are known as solids. Most elements are solids, though not all solids are elements.

The sign used to denote an element is frequently the first, or first two, letters of its name. Where these represent another element starting with the same letters the sign for one is taken from the Latin or Greek name of that element. For example, Co stands for cobalt; therefore Cu has been adopted for copper, whose Latin name is cuprum. The sign for an element is called its "symbol."

A chemical compound is a group of elements combined by chemical action, and is expressed by a "formula" composed of the symbols of its component elements, as $H_2O$, which is the formula of the compound water. The significance of the figure 2 we shall learn later. The formula of a "mechanical compound," that is one that is formed by mixing and not by chemical action, such as certain ores, is denoted by a dot placed between the component elements or compounds, as ($Cu_2S.Fe_2S_3$), which is the formula for chalco-pyrites, a copper ore composed of two distinct compounds. The building up of a compound from its elements is termed " synthesis."

Symbols and formulæ stand for more than the mere name of elements and compounds. To appreciate this the definition of the terms " atom " and " molecule " must be understood. An atom is the smallest portion of an element that can exist as an element, whilst a molecule is the smallest group of atoms forming a compound that can exist alone. All atoms of any one element are equal to each other in weight and properties. The number expressing the comparative weight of an atom is called its "atomic weight " (A.W.). The atomic weight of an element is usually taken by comparison with an atom of hydrogen. Thus, since an atom of oxygen is sixteen times as heavy as an atom of hydrogen, its atomic weight is 16, whilst hydrogen is said to be unity, or 1. Atomic weights may be found by referring to tables of elements contained in most books on chemistry.

We can now proceed further with the explanation of the formula $H_2O$. The small 2 following the symbol H, and placed a little below it, signifies that two atoms of H are used in forming one molecule of water. Therefore the complete meaning of $H_2O$ is that two atoms of H combine with one of O to form water, and that the composition by weight is two parts H and sixteen O, so that in, say, 18 pounds of water we should find on analysis 16 pounds oxygen and 2 pounds of hydrogen.

An " equation " is the representation of a chemical action, and since matter is indestructible it follows that after a compound has been decomposed, its components still exist in the same quantities, though in a different state ; therefore both sides of an equation must be equal. The formulæ to left of equations always represent the materials at the start of an action, and those to the right the materials and their state after the action.

The passage of an electric current through water causes its decomposition into hydrogen and oxygen, and the action is simply explained by the following equation :—

$$H_2O = H_2 + O$$

which is "shorthand " for the statement that each molecule of water has been separated into two atoms of hydrogen and one atom of oxygen, or two parts by weight of hydrogen and sixteen parts by weight of oxygen.

Consider a more complicated equation :—

$$2H_2O + 2SO_2 + O_2 = 2H_2SO_4$$

which shows that two molecules of water ($H_2O$), when mixed with two molecules of sulphur dioxide ($SO_2$) and a molecule of oxygen, produce sulphuric acid ($H_2SO_4$).

Where a formula is placed in a bracket and has a figure outside it shows that more than one molecule is taken into consideration, as :—

$$Pb(NO_3)_2$$

which is lead nitrate, and shows that this chemical compound is formed of one atom of lead (Pb) in combination with two molecules of the sub-compound formed of one atom of N and three atoms of O.

There are a number of other signs employed in more intricate equations, but it is unnecessary to go into the explanation of these here as they do not occur in elementary electro-chemistry.

# "Practical Wireless Telegraphy"

## *An American Volume on Radiotelegraphic Practice*

By ELMER BUCHER

**Reviewed by Lieut. Bertram Hoyle, R.N.V.R.**

THIS eminently practical book from the States adds another useful volume to our treatises on wireless telegraphy.

An outstanding feature of the volume consists of the large number of clear figures and diagrams of connections with which the text is illustrated. In addition we also find that important statements and deductions are in heavier type than the remainder of the book, which adds to the general convenience for reference.

Parts I. and III. are devoted to a simple and concise elucidation of the elementary principles of electricity and magnetism, a very necessary foundation for the applications thereof which follow later on.

Charging motor-generators, and motor-alternators with their operating circuit diagrams such as one is likely to come across on board ship and elsewhere, in both British and American practice, are dealt with in Part IV., whilst in Part V. the author passes on to a disquisition on accumulators, both with regard to their construction and maintenance, elucidating his text with charging diagrams of the various systems in use. This important section, we are pleased to see, is given clearer and more comprehensive treatment than that to be found in the average book on wireless telegraphy.

These five sections of the book occupy the first 80 pages or so, and are sufficiently complete to give the average operator all the elementary electricity and magnetism as applied to his particular branch of electrical science that he is likely to require in the earlier stages of his prectice.

The remaining 240 pages are devoted to purely wireless apparatus and wireless measurements. Part VI. describes the radio-transmitter and gives clear explanations of the interchange of energy between inductance and capacity. It also illustrates the emission of waves from an aerial, and explains damping, with its mechanical equivalent used for purposes of analogy.

The subsequent section of the work gives illustrations and descriptions of the appliances used in connection with the radio-transmitter, and deals almost exclusively with American designs and practice. Looking through the book as a whole, one is rather disappointed by the relatively small amount of data given in Part VIII., which deals with aerials. Much useful and practical information might have been inserted in a book of this sort. We may instance, for example, such subjects as Staying, Aerial Capacity Calculations, Stay- and Aerial-span wire-tensions, etc.

The adjacent section (Part IX.) of the book deals with the complete standard Marconi receiving sets in general use. Full diagrams and clear photographs render the study of this somewhat difficult part of the subject less arduous, the diagrams of connections are (as usual) somewhat intricate, but the student should find that the indexing in the adjacent text clears matters considerably for him.

Part X. consists of a short section on emergency transmitters, which are so essential for the safety of all ships carrying wireless. The sets are of the utmost simplicity, and operate quite independently of the ship's main current supply. This set, because of its not being in general use and because of its apparent insignificance, has been given in the past rather scant study by authors and students alike. Its important *rôle*, in case of breakdown of the main set, or through failure of the ship's supply for any reason, must be obvious to all operators on board ship. Operators should know their emergency sets perfectly, and always have them ready for instant use. With this end in view, an interesting and useful part of the book has efficiently covered the ground.

Part XI., on practical radio-measurements, treats of the methods and instruments (wavemeters, decremeters, etc.) used in measurements of ordinary accuracy, and also methods of high precision. The calibration of a wavemeter from a standard is dealt with; the "three-way" method being explained, the latter constituting the means employed for creating sub-standards. In addition is given the more usual but somewhat less accurate direct-coupled method.

Part XII. goes into the details of the standard marine sets, in use in the American Marconi Company, including an interesting submarine panel set. Although these sets differ somewhat from those sent out by the English Marconi Company, they give valuable information for all wireless students and operators, and demonstrate the underlying principles of small sets.

A short account is then given in Part XIII. of the radio-goniometer, its construction and use.

Part XIV. deals with the various types of continuous wave generator, the high-frequency alternator generating currents of radio-frequency direct being given very thorough treatment.

Following on this, one comes to the necessary receivers for these continuous waves, Part XV., the Tikker, Heterodyne Receiver, Goldschmidt tone wheel being explained and illustrated.

The concluding section, Part XVI., deals with some of the large transoceanic stations, and gives some interesting technical data hitherto not appearing in print, of such stations as Carnarvon, New Brunswick, Kahuku (Hawaiian Islands).

Finally, this comprehensive book contains in its appendix suitable questions on each of the parts, which should be of assistance to instructors as well as to students.

Although sections of the matter included in this volume have appeared at one time or another in certain other books and periodicals, there is also a very great amount of new matter here presented. One other noticeable and pleasing fact about it is that the reader's patience is not tried by the insertion of wearisome historical matter taking up valuable space. Each subject starts off with the various pieces of up-to-date apparatus, and the descriptions and explanations are clear and to the point.

This book, we feel sure, should appeal to students, operators and experimenters alike; and no doubt will soon be found on many book shelves here in Great Britain.

# Wireless Telegraphy In the War

### The Affair of the Scandinavian Convoy.

The recent review of the naval situation delivered by Sir Eric Geddes, the First Lord of the Admiralty, in the House of Commons on November 1st was worthy of the service which he represents. No praise could say more. Every Englishman to whom a verbatim report is available will doubtless have perused it *in extenso.* One section of it possesses peculiar interest for wireless men, and with regard to that section we desire to place a few comments before our readers. We refer to the incident of the sinking by enemy raiders of the Scandinavian convoy on October 17th last. For the convenience of any of our friends who may not have the text of Sir Eric Geddes's speech in front of them, we think it well to preface our remarks by extracting the portion of it upon which we intend to comment. We divide the First Lord's speech into two parts—(1) The Sequence of Events, and (2) The Admiralty Explanation.

#### (1) The Sequence of Events.

"On October 16th the two destroyers *Strongbow* and *Mary Rose*, with three "small but armed vessels, only one of which was fitted with wireless, escorted a "convoy of twelve ships bound for the Shetland Islands from Norway. During "the night one of the three smaller armed vessels—the one which was fitted with "wireless—dropped back to screen a ship of the convoy which had to stop owing "to her cargo having shifted. The convoy was then accompanied by the destroyers "*Strongbow* and *Mary Rose*, both of which had a wireless installation, as well as by "two other small craft which were not so fitted. About 6 a.m. on the 17th, just as "day was breaking, the *Strongbow* sighted two ships to the southward, which were "closing fast. Visibility was about two miles. *Strongbow* challenged, and receiving "an unsatisfactory answer at once gave orders for action. The enemy's first shot "wrecked her wireless room and did other damage, and, in spite of the great gal-"lantry with which she was fought by her captain, officers, and crew, she was sunk. "The other destroyer, *Mary Rose*, was immediately attacked by the two German "vessels and blown up by a shot in her magazine. The two enemy vessels, which "later detailed reports show were of a very fast cruiser class, then proceeded to "attack the vessels of the convoy, sinking nine of them. Owing to the fact that the "escort vessel which was fitted with wireless had been detached to screen a ship "whose cargo had shifted, and owing to *Mary Rose* being sunk immediately and "*Strongbow's* wireless being put out of action by the first shot, no message reached "the Admiral Commanding the Orkneys, the Commander-in-Chief of the Grand "Fleet, or the Admiralty, that the convoy had been attacked until the surviving "ships arrived at Lerwick. The Admiralty did not receive the information until "7 p.m."

(2) THE ADMIRALTY EXPLANATION.

"Dealing first with how the convoy was attacked without the enemy raiders "being intercepted, I would ask the House to recollect the true facts:

"(1) That the area of the North Sea is 140,000 square nautical miles.

"(2) That we have a coast here subject to attack by raiders of 566 nautical "miles in length from Cape Wrath "to Dover, and

Photo] [Elliott & Fry

SIR ERIC GEDDES, FIRST LORD OF THE ADMIRALTY

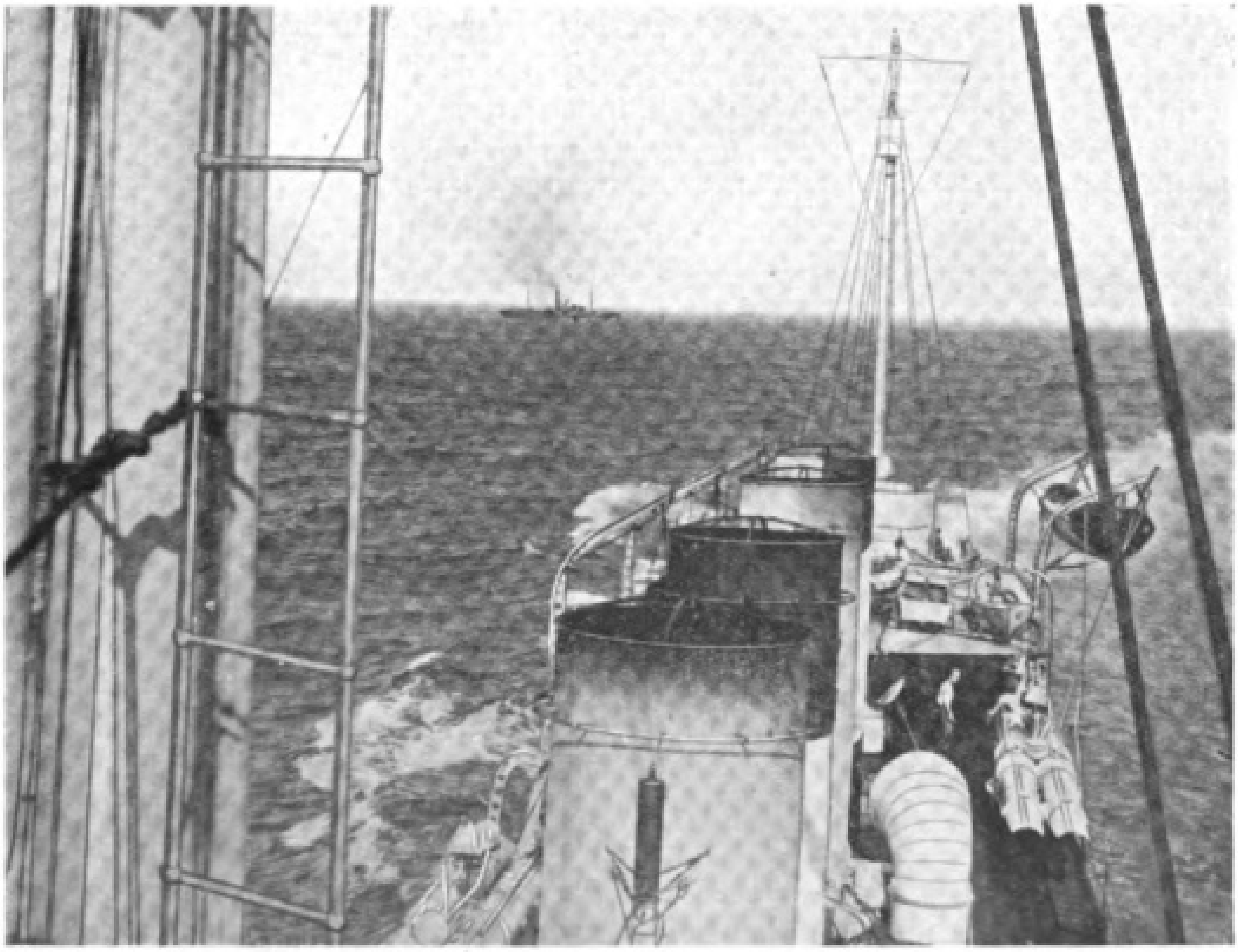
"(3) That the area of vision "for a light cruiser squadron with "its attendant destroyers at night "is well under five square miles— "five square miles in 140,000.

"It is not desirable that I "should state how many of the light "cruiser squadrons which we possess "could possibly have been in the "North Sea at the time; but at "any rate hon. members will see "that with these areas it is practi- "cally impossible with the light "forces at the disposal of the Navy "—even if they were all devoted to "this purpose—entirely to prevent "sporadic raids of this kind, either "upon our coasts or upon an isolated "convoy like this. The watching "fleet must invariably be at an "enormous disadvantage as regards "the disposal of its forces compared "to the fleet which lies behind land "defences and plays a game of 'tip and run.' By a concatenation of circum- "stances, which I have described, no wireless information of the raid was received "from the escort or the convoy. Having regard to the disposition of our forces "on the 17th, we are entitled to say that had we received wireless information— "and with three vessels suitably fitted it is reasonable to expect that we should "have received that information — the British Navy would have asked no "better chance than it then had to intercept the raiders on their return journey."

* * * * * *

The initial point which I have to make is that, in the account above set forth, it is "Wireless, wireless, all the way." The first specific statement with regard to the equipment consists of an admission that, over and above the two destroyers that carried wireless as part of their regular equipment, only one of the "three small but armed vessels" which completed the escorting squadron was equipped with aerials. What happened? One of the convoyed vessels was obliged to fall behind "owing to her cargo having shifted." She could not be left to the tender mercy of the enemy. Therefore the only armed trawler wirelessly equipped was left behind to look after her. Seeing that the possession of such apparatus puts every ship so fitted, as well as any vessel sailing in her company, potentially under the protection of the whole British Fleet, this in itself meant a loss of a third of the escorting strength of the convoy. The German cruisers, who were too powerful to have anything but the wireless to dread, being fully aware of the protection thus afforded, appear to have devoted their first endeavours towards depriving the two destroyers of any chance of summoning aid. The first shot directed against the *Strongbow* wrecked her wireless room, and her consort, the *Mary Rose*, being speedily "blown up by a shot in her magazine," would appear also to have been rendered incapable of transmitting wireless to the British cruiser squadron. So much with regard to the actual destruction of the victims.

Now, what has the Admiralty to say by way of explanation of the fact that the enemy ships escaped without paying the penalty for their temerity? We find this explanation to be of a twofold character:



A DESTROYER CONVOYING MERCHANTMEN. [*Newspaper Illustrations*

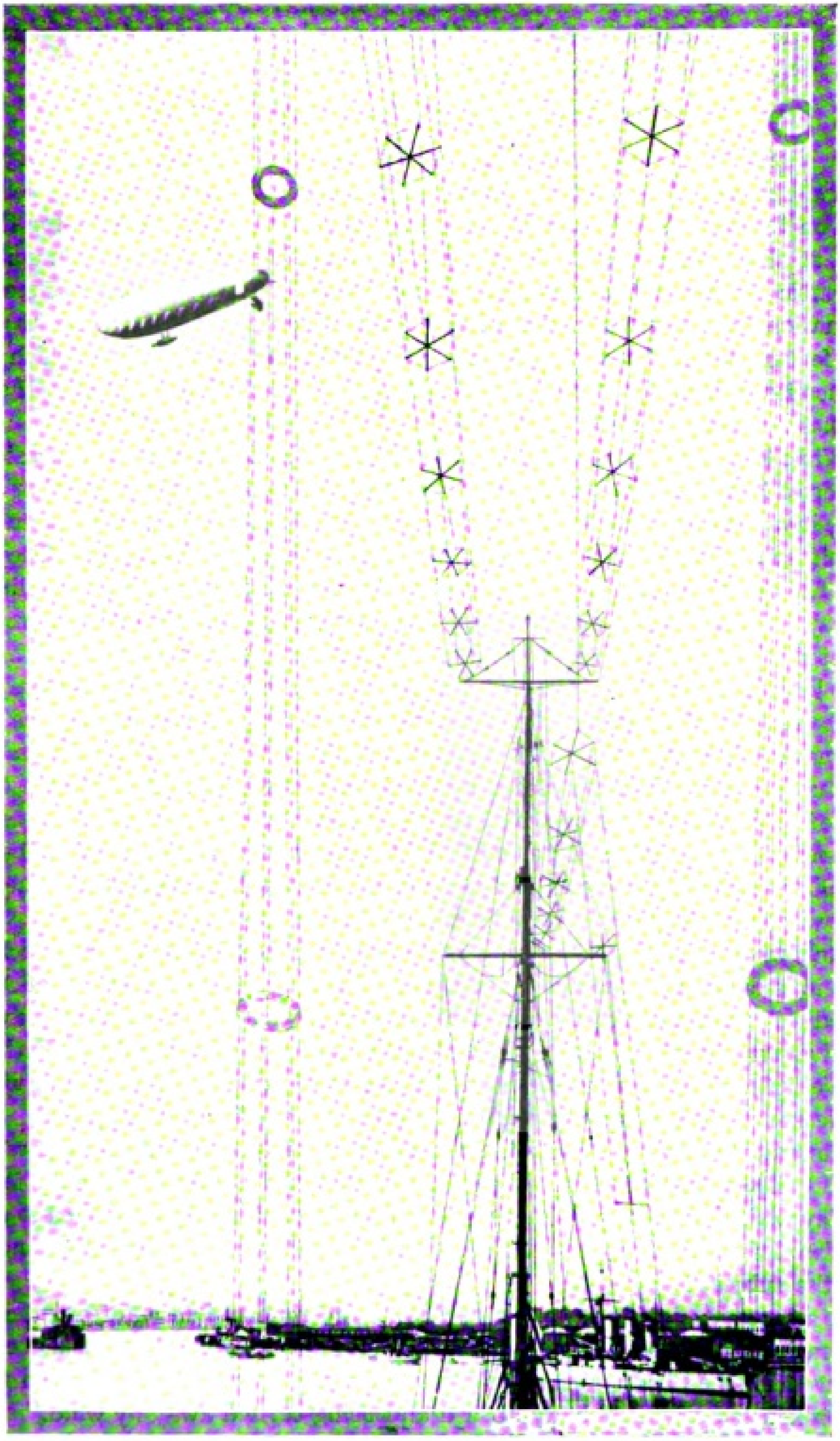
C

(1) That owing to the wide area to be patrolled it was impossible for any British cruising squadron to be within visionary or auditory distance of the fight, and
(2) That "by a concatenation of circumstances no wireless information of the raid was received from the escort or the convoy."

The first plea is perfectly sound. It is obviously impossible, even for the gigantic British Fleet, supplemented by those of its Allies, to quarter the ocean wastes at all times and without intermission. With regard to the second plea, however, we must confess ourselves to be rather less convinced. One would have thought that an interval must have elapsed between the realisation by the British commanders of their hopeless outmatching and the destruction of their wireless of a sufficient length to enable them to send out a message announcing that fact to the commander of the nearest cruising squadron and through him to the Supreme Fleet Command. Indeed, is it not a primary duty of a British commander to advise that he is engaging the enemy even before the first shot is fired? We have the assurance of the First Lord that no such message was received, and this implies either (*a*) that no attempt was made on the part of the *Strongbow* or *Mary Rose* to communicate the information, or (*b*) that the vessels which ought to have received it (if sent) failed for some reason to do so, or (*c*) that no wireless station either ashore or on one of His Majesty's ships was within range of the destroyers' wireless sets. Sir Eric's remarks as to "the disposition of our forces on October 17th" seem to put out of court our final hypothesis, and we are, therefore, obliged to fall back on one of the first two. The second would imply negligence of a kind which is at total variance with the traditions of Britain's Navy, and we are, therefore, inclined to surmise, in the absence of specific information, that perhaps the gallantry of the noble British officers in command of the two destroyers led them to refrain from transmitting appeals for help until it was no longer in their power to do so. If our guess be correct, instructions have doubtless been given which will obviate any such fatal delay on future occasions.

It would, moreover, be a matter of considerable interest to know whether if all or a large portion of the vessels being convoyed had been fitted with wireless telegraphy a message could have got through to the British Command which would have ensured, not perhaps the safety of the ships attacked, but the infliction of adequate punishment upon their attackers.

We have in former issues repeatedly pointed out the invaluable services rendered to the enemy by their naval Zeppelins, which—able to remain in the air at a great height with the whole of the sea and coast area spread out like a map before them—can watch every movement both of their own and of the British vessels. The powerful wireless plant with which they are now equipped can convey priceless information of any action in progress both to their own vessels taking part therein and to their naval base. No reference is made in the British official account of any such assistance which the enemy may have had, but it is obviously within the bounds of possibility. In any case, it is quite evident that the enemy not only possessed full knowledge of the strength of the convoy's escort, of what ships were or were not equipped with wireless, and of the space of time required by themselves to return to a place of safety. We have sometimes wondered whether armed escorts in charge of convoys could not include a unit capable of carrying hydroplanes. The period of warning with regard to any approaching danger would be substantially increased by such



[Italian Official Photo.

THE "GEMINI" OF MODERN WAR.
AIRCRAFT AND WIRELESS IN AN ADRIATIC PORT.

means. In these days of vessels capable of a speed undreamed of in pre-war days every minute is (potentially, at all events) of supreme importance.

"GREAT WAS THE FALL THEREOF."

It is difficult quite to understand why Germany chose once again to try a Zeppelin raid against this country. In the eternal pendulum-swing which is ceaselessly going on between Attack and Defence the balance had worked out—for the time being, at all events—on the side of the latter, and England enjoyed immunity from this particular form of invasion over a considerable period. The most reasonable explanation for the resuscitation of this form of activity would appear to be that some feature (or features) had been developed in the construction, which caused our enemies to hope for a revival of the immunity which they had lost. If so, that hope has not been fulfilled.

What happened was, shortly, this: On Friday, October 19th, a considerable number of Zeppelins, estimated (according to the British official reports) at about a dozen, invaded our aerial territory. They appear to have directed their attentions towards two different districts, one northerly, the other southerly. They navigated the ocean of air at such a height and under such atmospheric conditions as to escape the British anti-aircraft artillery altogether, and the defence had to be entrusted almost entirely to our planes. With regard to what went on in the upper air, so long as the airships were over English soil, the public is still in the dark. We have been allowed to gather that a severe wind storm was raging, and the intense cold, naturally prevalent at the vast altitude to which the Zeppelins ascended, must have had its effect intensified by the force of the wind. At any rate, the log-book of L. 49, which was captured entire, shows that the temperature conditions were such at the altitude of 22,000 ft. as to put their engines out of action. The propelling machinery stopped, and these great airships became derelict, like vessels at sea when their engines have broken down.

But, more than this, they completely lost their bearings. In our article, published in the August issue under the title of "Navigation in the Ocean of Air," we pointed out that, except at comparatively low altitudes, these aircraft navigators steer their way by means of the wireless messages they receive from their Fatherland.

We little thought when we penned those words that our statements would so soon be exemplified in actual practice. For this is exactly what happened. Unable to communicate by wireless with their bases, on account of their dynamo breakdown, they lost all power of judging their position, so that, when in daylight on the following day they wished to ascertain their position, they found themselves obliged to descend from their lofty altitudes, and the French anti-aircraft guns speedily enlightened them upon the subject!

A somewhat significant paragraph went the round of most of our daily contemporaries, calling attention to the first wireless message which reached the raiders after crossing the Channel on their return voyage. This read: "Zeppelin training ship broken loose with nobody aboard and being carried away by wind." Such a message must have produced a most encouraging impression upon men engaged in a frantic endeavour once again to get into touch with their wireless directives.

The net result was that, out of the dozen raiders (more or less), five at least, and possibly more, were destroyed—a rather heavy proportion of casualties, even

# Hunting U-Boats by Sound


[*Reproduced by special permission of the "Graphic."*

The auditory sense comes in where the visionary organs fail. The sea-planes watch and wireless the presence of the lurking foe, whilst the patrol boats listen-in, not merely for wireless, but for indications such as may be given by apparatus of the character illustrated above. It will be noticed that the same "silence room" is used for both radiotelegraphic and "listening" reception.

for Germans. As to whether the honours fell to our French Allies, or whether some of the glory was shared by ourselves, it matters not a jot. The cause is all one, the fronts are all one; if it be France's turn to-day, 'tis ours to-morrow.

A representative of the *Chicago Daily News* visited the wrecked Zeppelin L 49 at Bourbonne-les-Bains, and has communicated some interesting impressions. He speaks scathingly of the makeshift appearance of the work everywhere, stating that any English or French workman would have been ashamed of such construction and workmanship.

> One notable exception, however, was the wireless room and installation, which closely resembled that of a Transatlantic liner of the latest type. According to a French expert who was sent to examine the apparatus, it included several new features of some importance.

We notice in a comment made by one of our contemporaries that the question is asked whether it had occurred to any one on this side to try and jam Zeppelin-wireless when the machines are over our coasts, and thus to blind them on any future occasion. The particular form of artificial interference with ether waves technically known as "jamming," consists of the setting up of a series of waves (preferably of about the same length as that on which the message it is desired to jam is being sent) which will prevent the listening-in operator from making out the words composing the sentences which he desires to hear. As far as Zeppelin raiders are concerned this may be attempted either when they are sending their messages to the German base or when the German base is advising them by return message of their whereabouts.

We do not know whether our contemporary has any knowledge as to whether jamming was adopted or not at either stage. The public may, however, rest assured that the proper authorities have considered the matter, and have adopted the procedure which appears to them to be the more advisable.

### "Jamming" in Warfare.

The process of deliberate interference with a rival installation at work, familiarly known as "jamming," constitutes one of those events which are "oftener prated of than seen." As a rule, it is better policy to proceed with one's own communications rather than attempt to interfere with the enemy's. In fact, it is a case of giving preference to the sound military practice of setting your own initiative instead of following that of the enemy. However, there are occasions when jamming forms a legitimate and advisable course to pursue. Such an occasion occurred for the enemy at the start of the duel between the British converted cruiser *Alcantara* and the German raider *Greif* in the spring of 1916. It is quite plain that these odd commerce destroyers, which the Germans constantly endeavour to get away from their bases, and which on rare occasions succeed, are fitted with a particularly powerful wireless equipment. It is natural that it should be so, because they have a number of difficulties to contend with which do not fall to the lot of our own cruisers.

The narrative supplied to one of our Hampshire contemporaries by Mr. Clyde Townshend, a young Southampton wireless operator, recalls an occasion when the *Moewe* carried out the same manœuvre as the *Greif*. Mr. Townshend was serving on board the *Netherby Hall*, a steamship of the Ellerman Line, when, at a distance of 600 miles from the Brazilian coast, the look-out of his vessel sighted what appeared to be an ordinary steamer right ahead. Whilst two miles off she changed her course and came up to the starboard side of the *Netherby Hall*, hoisting the German ensign and firing a shot across the bows of the Englishman. As soon as Mr. Townshend started to obey the captain's orders and endeavoured to send out the S O S signal he found that the operator on the *Moewe* also got to work and jammed the *Netherby Hall's* message to such purpose as to completely " dish " them. Mr. Townshend continues :

"Not long afterwards two boatloads of officers and men came along-"side, and one of the Germans dived into the wireless room for me. I had "expected such an arrival, and, as I knew what his object would be, I "smashed all my instruments. He was furious, but I was glad I had "spoiled his game."

In common with the rest of his companions the young operator remained on the *Moewe* three days, a witness of the marvellous ingenuity with which the Germans disguised their ships. Now they would increase the number of her funnels and masts, lengthening them at will. Now by a number of canvas screens they would convert a cruiser bristling with guns into a dowdy-looking tramp. The *Moewe's* captain put our captive operator on board a Japanese prize and sent him with a number of others into Pernambuco, whence, in due course, he reached Liverpool.

## Our Italian Allies

AT the moment of writing our friends in Italy are in the throes of a great débacle. Britain's sympathies go out to them, and our help also. Our illustration (below) taken during the defiling of their armies back from the mountains they had fought so hard to win, will illustrate the hardships they had to suffer in the retreat.

ITALIAN TROOPS DEFILING BACK TO THE PLAINS FROM THE MOUNTAINS.

# Realism and Romance in Central America

## *How Wireless has been Missed in the Past and What it may do in the Future*

WHEN New York was a commercial infant, Boston a mere village, and Chicago yet unknown, there were three cities in the American hemisphere which occupied the pre-eminence in population, wealth and magnificence. These were the cities of Guatemala and Mexico in the northern, and Lima (Peru) in the southern, quarter. Forgetful of the fact that the old Spanish conquistadores established their sway north as well as south of the Isthmus of Panama, Englishmen in general are apt to confine to the regions geographically located in the latter situation the title and the characteristics of "Latin America."

The Republic of Guatemala, lying south-eastwards of Mexico, is almost shut off from the Atlantic Ocean by British Honduras on the north and by the Republic of Honduras on the south-east, only a very short piece of coast line at the extreme end of the Gulf of Honduras being included in her boundaries. Puerto Barrios and Livingston constitute the chief ports of the Republic on the Atlantic seaboard. The latter, lying at the mouth of the River Dulce, owes its progress to the issue in 1883 of a proclamation throwing the port open to general commerce. On the Pacific Coast lie San José (the chief port), Champerico and Ocos, all of them mere open roadsteads provided with iron piers. The development of the country, however, is greatly hampered by the absence of serviceable roads, which are for the most part represented by rough mule-tracks. A railway line from Puerto Barrios on the Atlantic to Guatemala City was started in 1884, and, after some considerable delay, has eventually been carried through. The idea of its originators was to link by this means the Atlantic and Pacific Oceans, and we understand that ere long this event will be fully consummated, to the immense enhancement of trade and prosperity. There remains, however, a vast amount of room open for further development of communication, for—apart from this main line—railway enterprise is represented here by two short lines of railway, totalling in sum 150 miles.

The importance of the aid of wireless in developing the resources of a republic so rich in mineral and agricultural wealth can hardly be over-estimated. No long line of wire must be maintained against the constant ravages of storms and earthquakes, of animal pests, or of vegetation choking itself (to say nothing of the puny efforts of man) in its superabundant luxuriance. No large staff of more or less skilled men are required for constant inspection and repair of the means of verbal communication. All such labour can be left for the purpose of establishing throughout the country the vital links of road and rail. At the present moment radiotelegraphy is solely represented by a pair of American stations at Guatemala City and Puerto Barrios respectively. Our illustration (on page 620) has been reproduced from a photograph representing the station located in the capital, which recently came into our hands. President Cabrera, the able and energetic statesman who presides over the destinies of his country, is fully aware of the importance of wireless to his native land, and important steps in furtherance of its installation are likely to be heard of ere long.

The pages of Guatemala history teem with Romance. At the beginning of the sixteenth century, when Hernando Cortes was in the midst of his brilliant conquests in Mexico, his exploits became known to the Indian tribes in the South and the native kings sent an embassy offering their allegiance. Alvarado, one of his most trusted lieutenants, with but 300 Spanish soldiers and a large body of natives, established the dominion of Spain and received the homage of the natives at the foot of the volcano Antigua, on a spot afterwards claimed for the site of the capital city. For fifteen years thousands of Indians were kept at the work of erection, and all seemed prospering, when, in September, 1541, came a calamity which entirely destroyed the place and buried more than half the inhabitants under the ruins. A series of earth shocks started the disaster, and these were followed by an enormous body of water rushing down from the mountains, which forced with it large pieces of rock, trees and *débris* and buried the town with an avalanche of earth and ashes. The first capital had been overwhelmed for ever. The cathedral, which was buried to the roof, has since been largely uncovered, and the same course has been followed by the palace, which, however, was ruined by the cataclysm. Over its remains to-day stands a low-browed house with an inscription above its door reading "*complimentaria escula para niños*"—a free school for girls.

GUATEMALA CITY—A VIEW IN THE MAIN STREET.

A GROUP OF GUATEMALAN INDIANS, SNAPSHOTTED AT CHAMPERICO.

The second city of Guatemala was erected about three miles from the original one, a little further down and nearly at the foot of the volcano. Again the earthquake of 1773 repeated the work of destruction, and all that remains of the second capital city are ruins of churches, monasteries, convents, and miles of public and private residences, large and costly, some with walls still standing, liberally adorned with carved stones, but roofless, without doors or windows, and with trees growing within their enceinte. Only 10 per cent. of the houses have been rebuilt; the rest remain in ruins.

The present city is the third capital of that name. It occupies a wide plateau, not far off 5,000 feet above sea-level, and seventy-two miles by rail north north-east of San José, its Pacific port. Its streets are wide and roughly paved, built in geometrical symmetry. Its houses comprise almost invariably but a single storey, a form of precaution adopted against earthquake action. Its extensive suburbs are inhabited chiefly by Indians.

The Spaniards maintained a harsh and greedy rule over the country for 300 years, a period during which the vice-royalty of Guatemala embraced all that is now known as Central America. Then came independence, definitely proclaimed in 1821. A large amount of the progress the country has made in modern days stands to the credit of the genius and energy of President Barrios, who, after studying the conditions of social and political economy in the United States and Europe, employed the resourcefulness and energy which he undoubtedly possessed in a remarkable degree to their introduction amongst his own people. He worked his way from obscurity to presidential rank and consolidated his grip of supreme power by sheer competency and good, though stern, government. Then, by means of one of the most dramatic *coups d'état* which have ever been enacted in the New World, he strove to re-establish the hegemony of the five Latin-American States of Central America—Mexico, Guatemala, Honduras, Nicaragua, Salvador. This centralisation had existed during the first years after the emancipation from the yoke of Spain, and all concerned had suffered from its dissolution.

GUATEMALA CITY—THE PICTURESQUE VALLEY OF THE HERMIT VIEWED FROM THE OLD SPANISH FORT.

It would be interesting to speculate how far the possession of wireless telegraphy could have enabled President Barrios to succeed in his ambitious project of reunion. Much of the opposition which gradually smothered the attempt came from abroad. Barrios despatched a number of messages to foreign governments by overland wires to La Libertad for transmission by cable from that place. None of them reached their destination, because, La Libertad being in the Republic of San Salvador, the control lay in the hands of the Commandant of that port, who—under the orders of his own President Zaldivar—seized the office and suppressed the messages. Thus both the Old World and Uncle Sam were kept in ignorance of the motives and intentions of the Central American patriot. Both official and public opinion abroad declared strongly against the Guatemala ruler, and this reacted not only upon the inhabitants of the other republics, but also upon those of his own State. It is possible to conceive that had the Guatemala

PEASANT WORKING A HAND-MADE SPINNING WHEEL OF A SPANISH TYPE USED CENTURIES AGO.

chief possessed high-power wireless stations that could plead his cause before the public bar of the civilised world, which really condemned him unheard, his project might have had a different termination. As it was, his cause was lost before Rufino Barrios fell in mortal combat with the Salvadorians.

There are a number of interesting features in the country which inevitably attract the notice of visitors from abroad. The characteristic dress worn by the women of Guatemala forms one of the prettiest costumes to be found in any part of the American hemisphere. Although somewhat swarthy in complexion, these daughters of Eve excite general admiration by their beauty of form. The peasant belles wear but two garments—a *guipil* and a *sabana*. The former consists of a square piece of cotton, embroidered in brilliant

ROAD UP THE VOLCANIC PEAK OF FUEGO.

WIRELESS IN GUATEMALA CITY.

colours, with an aperture for the head. The ends of this piece of finery are tucked in the belt, thus giving it much the same shape and appearance as a loose "peek-a-boo" blouse. The skirt is a straight piece of plaid cotton of brilliant colours, modelled on Scottish tartans. Wound tightly round her limbs it is secured at the waist by a sash, usually of scarlet woven by the wearer's hands from the fibres of the pita grass. These belts in their texture resemble the Persian camel's-hair shawl, and often cost months of labour. Frequently the name of the owner, or a motto, is woven into the texture. Dressmakers' bills are not heavy, the aristocratically small hand of the Guatemala maiden manufactures all that its owner requires, even down to the sandals which cover her pretty little feet. Every traveller remarks upon the small size of the hand and foot characteristic of the population.

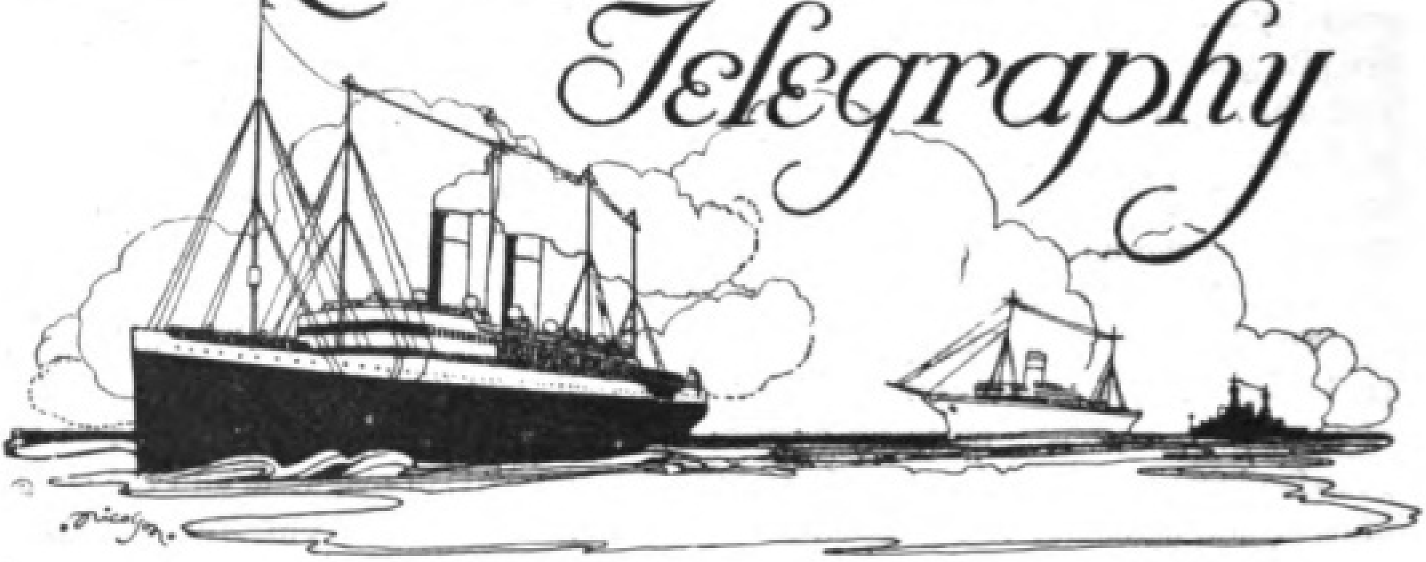
Of course, it is only the peasant class that wear this costume; those belonging to Society array themselves in the latest Paris and New York creations. One habit of the latter, however, possesses a more questionable character. It is that of an over-fondness for plastering their faces with a paste made of magnesia and the white of eggs, adding colour to taste. We are not altogether alone in our protest against this tendency to self-adornment, which we can assure the Guatemalan fair sex is really superfluous. A good story is told of a Swiss lady-principal in charge of a large seminary in Guatemala City. She issued an edict of total prohibition against the use of this plaster by the aristocratic young ladies committed to her care. The boarders were easily controlled; but it is said that, with regard to day scholars, she found herself obliged to follow the practice of standing at the seminary entrance every morning, armed with a basin of water, a sponge, and a towel.

A COUNTRY SCENE WITH THE VOLCAN DE AGUA IN THE BACKGROUND.

The men of the countryside wear short trousers like bathing trunks, and a white cotton shirt; whilst they shoe their feet with cowhide sandals. The shirt is kept for occasions of ceremony and worn only in town. President Barrios nearly created a revolution by his decree that the peasants should wear clothing, and had to station policemen on all the roads leading into the city in order to confiscate the cargoes borne by those who did not comply with his regulations and wear their shirts. A plea of poverty he answered by supplying cloth for the garments.

In Guatemala we have a rich country awaiting opening out; and in that development wireless telegraphy cannot but play an important part.

# Maritime Wireless Telegraphy



### What Wireless Means at Sea.

The following condensation of a report to his owners, made by the captain of a Dutch trading vessel, will illustrate more graphically than any amount of comment exactly what wireless means to men who "go down to the sea in ships." Wireless won its first public laurels by life-saving at sea; and, as time goes on, the dependence of all vessels upon radiotelegraphy grows ever more and more.

The *Noordam*, owned by the Holland-America Line, left New York on July 11th, 1917, for Rotterdam. After clearance papers had been quickly obtained, some delay arose on account of the extension of British minefields in the North Sea. Eventually, trusting in the favourable issue of negotiations which were going on with regard to the opening of a new safe thoroughfare and convinced that he would get timely wireless warning of the arrangements made, the captain decided to push on. Knowing that exact navigation was compulsory, he ordered the chronometers to be rigidly controlled by the wireless time signals daily provided, through the long-distance stations at Paris and Washington.

About 450 miles out, they received a communication from the wireless coast station at Bergen, in Norway, indicating the area of the new minefields and advising them that the lightships would be moved to fresh positions, so as to indicate the revised free passage. These readjustments of lightship positions were also mentioned in the message. On the following night the Scheveningen long-distance station, working at a distance of 500 miles, confirmed this information, and asked them to re-lay the particulars to the s.s. *Zyldyk*. At this point the captain remarks:—"Seeing that the *Zyldyk* is not fitted with wireless, we were unable to do so."

The following morning Scheveningen spoke again, giving full details of the new lightship positions, and advising them that the tug *Thames* would await them near the North Dogger-Bank. As the latter tug was fitted with wireless, they were to get into communication with her, a procedure which "proved to be of the greatest utility to us in finding the rendezvous," says the captain. They met the *Thames* and passed the Southern Dogger Bank Lightship together. Supplementary information and directions reached them, also by wireless, from the lightships. At 3 p.m. the *Noordam* struck a mine, and, as the ship was taking in much water, the captain ordered the radiation of the distress call, and two hours later torpedo boats turned up in response thereto. By means of wireless messages continued to be constantly interchanged between the *Noordam* and the vessels standing by her, with the result that the stricken ship was ultimately able to be salved and anchored off the Hook of Holland. Direct communication as to the state of affairs, from hour to hour, was established with the shipowners through the intermediary of the radio stations at Scheveningen and Nieuwediep, and the naval commander of the latter station supervised, through the same medium, the assistance which was rendered.

MR. T. A. VAN DER VLIES, THE SENIOR WIRELESS OPERATOR OF THE "NOORDAM," IN HIS CABIN.

UNHONOURED AND UNSUNG.

It is curious to reflect how slow the British public is to appreciate the men of the Merchant Service, to whom it owes so much, or, at all events, to translate its appreciation from words to deeds. It was not until after centuries of immunity for profiteering sharks and ten years of Parliamentary agitation that Samuel Plimsoll induced Parliament, in 1876, to legislate against the systematic overloading and deficient equipment of ships. To-day upon the merchant seaman's sterling qualities and indifference to danger the existence of every man, woman and child in this island depends, yet the British Government, which does (very properly) make provision for the wives and families of men in the fighting services, leaves those of the merchantmen to fend for themselves as best they can.

Captain E. W. Braithwaite, writing in one of our Leeds contemporaries, draws a vivid picture which we regret that space does not permit us to reprint in full. He shows us a "tramp," rusty and unkempt, lurching with her perilous cargo along the ocean highway at a speed of barely eight knots. Suddenly a loud cracking sound is heard from the Marconi room aft of the fiddley. A few moments later the wireless operator scurries up to the bridge with a message just arrived over the aerials which he has copied out for the captain's perusal. A minute or two after he had entered the captain's room, the latter—despatching the telegraphist back to his post—hurries on to the bridge, and, in response to his orders, the course, which had previously been straight, follows a zig-zag line. Ever since his vessel entered the Mediterranean the captain had not doffed his clothes, snatching a little sleep on his settee when and how he could. As he and his mate, with anxious gaze, turn their binoculars now on this quarter of the sea and now on that, his mind goes back to the little back street at home and the wife struggling to maintain appearances and to keep the boys at a decent school, on his £26 a month, in the face of increased prices and cost of living.

Suddenly comes a hail: "Submarine on the starboard bow!" He thrusts the handle of the telegraph down to full speed astern and yells to the steersman "Hard a-port!" The wireless operator radiates from his aerials the S.O.S. appeal for help. Before the ship can be got round, however, she is struck, loses way, and the throb of her engines ceases for ever. The boats are lowered, and in the dark the captain calls out, "Are you there, chief?" A voice answers, "Yes, but the second and third trimmers got it in the neck." With a deep breath the captain says quietly, "Well, keep close to me and hail occasionally; we'll stay here till daylight, someone may pass soon."

They toss to and fro in their little boats. The captain cannot sleep, and his thoughts characteristically run, as he awaits the help which wireless may bring, not of the danger he has been through, but of his lost ship, his pay which ceased with the sinking thereof, and the precious kit which had gone down with her.

There Captain Braithwaite leaves him, with an expression of hope that "no "shadow of the workhouse shall fall across the life of him and his family or the men "who sail with him, or across that of their belongings."

THE "NOORDAM," WITH A PORTRAIT OF MR. H. BRINKERT, THE JUNIOR WIRELESS OPERATOR, INSET.

# The Passing of Rooney

## *The Story of a Slip and its Atonement*

By "PERIKON"

ROONEY repeated it at intervals as he sat in the locked back room of the deserted *Auberge de l'Étoile d'Or* and listened to the crunch of the enemy troopers' jackboots on the gravel path outside.

What he repeated was, "I've been a failure." He hissed it through his shut teeth and dug his nails into his palms till the untrimmed edges seared his flesh. Also he cursed.

He cursed war. He cursed his captors. But most of all he cursed the cloying scent of the cream-hued honeysuckle which hung heavy in the close little room. Even with the windows closed it was overpoweringly strong. Rooney hated it. It was the cause of the mind pictures which danced and swung before his mind's eye with such devilish vividness. He saw another cottage which was overgrown with the blossom. He saw someone who lived there. He couldn't blot out the image, and again he hissed a string of blasphemy betwixt his grinding jaws.

He told himself that he had been a waster. That he had been the cause of the disaster which had overtaken his detachment. That he had been an Almighty Failure.

Rooney belonged to Z pack. 'Twas only a few days ago that they had entrained at the "Shot" sidings. He recalled how they had been whirled down to Southampton Docks. How they had led their horses between canvas screens to the berth where the big buff-funnelled Leyland boat was lying. How theirs had been the last detachment on board. How the choleric Navy man at the gangway had sworn at his horse for stopping dead and refusing to budge.

He recalled the casting off. The tugs ahead and astern. How the shipping in Southampton Water had dipped ensigns and boomed hoarsely on their syrens. How the troops on board the *Winefredian* had stood to attention. He recalled the big R.M.S.P. inward bound, which had passed them, and how they had been saluted from the bridge and cheered by the passengers. He recalled other ships all inward bound. A Union-Castle liner, a big Harrison tramp and—most significant of all—a Hamburg-Amerika packet with the British ensign at the truck and the German flag below it. It was all very vivid. He turned the pages in the sketch-book of his memory and saw again the semaphore on the chequered fort below Netley. He watched it spell out "Good-bye—Good luck." The *Winefredian* gathered speed. As the motion quickened he had gazed astern till the masts of the Niton station were lost in the heave of the Channel swell. Once more he passed the British destroyers and noted how the spray flew all along their ugly length. Then came Boulogne, the cattle trucks and the quaint locomotives with their thin, shrill whistling. After that they had gone south on the main P.L.M. line to Amiens and thence branched off on the Le Cateau track.

Memory recalled it all "fresh as paint," yet Rooney somehow expected to wake up in Stanhope Lines and find the lot of it nothing but an ugly dream.

At Le Cateau Rooney's detachment had detrained, saddled up and gone forward with their brigade.

The day was just breaking when they arrived. They had moved forward when it was light, forward in the direction of the frontier. As they went, the peasants everywhere had loaded them with food and wine. The people gave Rooney and his comrades little white metal tokens and medallions bearing the images of the Virgin Mary and the saints. And so along the cobbled highway they had pressed on through Landrecies, and after some hours swept past the grass-grown forts of Maubeuge with their weather-beaten brick buttresses. Beyond the forts they saw the belts of fresh blue wire, and further on still they had passed long lines of freshly dug trenches at which the red-trousered French infantry were working like beavers.

Then, on the *pavé*, they had passed the frontier posts and crossed into Belgium.

That night they had put up in a field, erected the station, and picketed their horses. Somewhere in the neighbourhood of midnight they had dismantled in haste, saddled their mounts, pulled up their picket line and galloped back along the highway toward Maubeuge with a patrol of enemy cavalry on their heels. Then they had learned the force was falling back in the direction of Le Cateau. What language they had used! As they clattered along the roadway they were halted every now and again by pickets of French infantry.

Then came daybreak. The peasants, when they realised that the enemy was not far distant, had hurriedly gathered their household goods and valuables and crowded the highways. But one desire was theirs: escape from the oncoming German armies. He had seen aged men hobbling on their sticks and grey-haired old women trotting in company. Mothers hurried on with frightened round-eyed children clutching at their skirts. The roads were thronged with loaded vehicles of every pattern, size and shape, from tiny dog barrows to huge lumbering waggons fashioned of untrimmed timbers and drawn by spans of big sad-eyed white oxen. Huge slow beasts they were, which plodded deliberately onward with a gentle sway. At times the entire span would be in step. It had seemed to Rooney, as he watched them, as though they were moving to the sound of some slow, wistful air, audible to themselves alone.

They had passed no end of these old-fashioned carts with their oxen. In course of time they left it all far behind. Now and again they would give an agitated mother and her children a lift for a kilometre or two, or perhaps help upon their way an aged couple exhausted by the hurry, the bustle and the excitement of the flitting.

Then night came on, just as they began to cross the Maubeuge defences. A kilometre or so to the south they had picketed down for the rest of the night, their horses in a lather, their clothing smothered in dust and grit. Dead-beat to a man. As the morrow's sky grew grey they had started along the Le Cateau road once more, hurrying back along the cobbles. There were rumours of Maubeuge having been occupied by the enemy. Rumours of entire brigades having been surrounded, annihilated or captured. On the roadsides they had passed big three-ton motor lorries, ditched and abandoned owing to some minor fault. As they approached Landrecies they had noticed the growing confusion. Mixed columns of infantry, artillery, bridging trains, and supply lorries jostled one another in hopeless disorder: their one clear conception the road to the south and the necessity of following it.

Z Pack had rattled through Landrecies, then past Le Cateau, and had kept going till dawn. They had stopped and erected in the big pasture at the south end of the village of Busigny. Rooney had been detailed to establish communication with G.H.Q., whilst the remainder of the detachment rode off to water their horses. It was then that Rooney had failed. He had been dead-beat, famished and heavy-eyed, and he muttered as his head had drooped on his arm, "To hell with the enemy. They can shoot me, I'm beat." He fell into a stupor. He was too tired, too exhausted for sleep. He had gone past the stage, like the drunkard who drinks himself sober.

Suddenly he felt someone shaking him roughly by the shoulder. He paid no attention till he was dragged from the trail to the ground. Then he jumped up, blinking, to find a circle of dusty grey cavalrymen round him. He took in their helmets, their steel lances and their sweat-stifled mounts, and it flashed on him that he was a prisoner. That the wagon had fallen into the hands of the enemy. He had blasphemed too late! He looked round for the others and the detachment horses, but they had disappeared. Captured, maybe, or killed. Out on the roadway he saw a squadron of enemy cavalry cantering past to the south. As they rode they gazed dully at khaki-clad Rooney and the dust-covered wagon with its twin masts and aerial wires slung across the pasture. Like himself they were dead-beat.

Rooney had been startled to hear the corporal in charge of the patrol demand his paybook and papers in passable-enough English. Rooney did as he was ordered, and handed over the contents of his pockets. The corporal ran through them, retained the letters and paybook, and handed back the remainder.

"Your name, number and rank?" had queried the German. Rooney had supplied the details and the corporal compared them with the entries in his book.

"What is the wagon here?" next asked the cavalryman.

"That," Rooney had retorted, "is for you to determine. I've given you all the information you're entitled to. What's more, it's all you'll get."

"So you refuse to enlighten me?" growled the corporal.

"I do," snapped Rooney.

"Very well, you will be under lock and key until the Herr Lieutenant arrives. March!"

And Rooney had been escorted to the *Auberge de l'Étoile d'Or* and locked in the back room, where he now sat, muttering, blaspheming, and black with smouldering hate against everything, himself included.

The Uhlan trooper who guarded him crunched up and down past the window. Rooney racked his brains for a method of escape. The only exits were the door and window. The room had no chimney. Neither did it possess anything heavy enough to throw at the trooper as he passed the panes. Rooney decided to crash through the window and chance overpowering the sentry. But people only did that in "Penny Dreadfuls," so he told himself. 'Twas idiotic to think of it. No, he gave it up. He was lagged. There was no way out. He had been a failure, and now he must face the medicine. Serve him right for behaving as he had in face of the enemy. But he'd like to give them a run for their money. If only he could escape. But no. The gloom of despair weighed heavily upon him. There was nothing to be done. Nothing, but to settle down and submit to the loathsome decree of Fate.

Then the millionth chance presented itself.

Two of the enemy horses were tied to the green railing outside the window—a big-boned chestnut and a rakish, long-tailed grey. Their head ropes had been left comparatively slack. The grey's near fore somehow got over the chestnut's rope. The chestnut's head was pulled down. He was vicious, and, resenting the pull, had swung his quarters round and lashed out at the grey. The grey accepted combat and lashed out in retaliation. It all started in a second. The trooper, with the cavalryman's predominating instinct for the welfare of his mount, drummed probably into horsemen ever since the days of Cæsar, sprang forward, shouting. Rooney didn't see exactly what happened next. There was a flash of shoes, and he saw the trooper go over like a ninepin, kicked senseless. Rooney swung his boot through the panes and crashed through, bleeding like a boar. He pulled the trooper clear. The horses were quiet now, and cowered close to the railing much as badly frightened mongrels would. They were waiting on the punishment which they sensed was coming.

However, Rooney had no time for the horses. Not yet. He was out for bigger game—the trooper's uniform. And he got it. The fit would have made the enemy regimental tailor weep. The tunic was large and the overalls, too, and the jackboots at least three sizes too roomy. Luckily the helmet was a working fit, otherwise Rooney would have been discovered earlier than he was. He wiped his face, rushed at the saddle and blankets handiest, flung them on the big-boned chestnut, drew the girth and surcingle tight, snapped the bit into the horse's jaws, undid the head-rope, leaped astride the saddle and dug his spurs in. Wild plans flew through Rooney's head. If he could get the wagon out of it as well. His brain worked rapidly. He looked towards the pasture. The masts were down and—a fresh surprise—a pair of enemy draught horses had been "hooked in." They were taking the wagon off, then. The driver and trooper on guard were leaning against the trail talking. In a flash Rooney decided. He put the big chestnut to the hedge. The chestnut sailed over, gathered himself, and cantered forward.

The driver and trooper looked up, swung round and gazed at Rooney. He was on top of them before they realised he wasn't one of themselves. Rooney was no cavalryman. The sabre on the saddle was unwieldy in his hot hand, but he managed. He dismounted, turned the chestnut loose, jumped at the draught rider, mounted and lashed the horses into a gallop with the flat of the enemy sabre which he still held clutched in his right hand.

He was on the road to the south and clear of the village in a flash, the wagon swaying and roaring, the hoofs of the horses hammering flickers of sparks from the iron cobbles.

As he hurtled forward Rooney told himself that he was well inside the enemy outposts. He might get through, but ten to one he wouldn't. They'd have the roads picketed. His borrowed sabre wouldn't have a look in against trained troopers with lances and sabres they knew how to use.

Anyhow, he'd see. He pushed the hot helmet back on his head and again lashed the plunging animals. He'd noticed something on the roadway ahead. As he neared it he saw it was a dust cloud. He saw lance tops and helmets above the eddying smother and knew it for a hostile patrol. He was gaining on them.

Apparently they were moving forward cautiously. Another five hundred yards and he saw the rearmost figure swing round in its saddle. Suddenly the patrol swung sharply round on its haunches and strung itself across the *pavé*. He noticed the hesitation of the troopers as they picked out his uniform. He could see them fingering their sabres and gripping their carbines. He heard them shouting. Fifty yards off them. There was a muffled report almost drowned by the drumming of Rooney's horses and the roar of his wheels and he felt the sharp rushing draught of a bullet hiss past his cheek. Rooney swung his sabre clear of the traces and lashed out.

The patrol split like a sliced lemon and through he crashed. The whirling off-wheel of the swaying limber caught an enemy horse on the flanks and sent it reeling with its rider into the ditch.

Rooney urged his pair of "draughts" forward. Next instant a huge hammer seemed to crash on his shoulder blades, and he knew he was hit. He fell forward on the saddle with his team still galloping madly southward. His grey army shirt became sodden. It clung to his skin. He became dizzy and dim of eye, but he kept his horses going. Then after hours, as it seemed to him, he heard more shouting, another report, and again the hiss of lead about his ears. He gave one mighty effort, pulled himself erect in the saddle and through the fastly thickening fog coming down on his weary eyes he saw a group of khaki-clad lancers.

He cast the sabre from him, and threw up his hands. The horses slackened and pulled up, streams of sweat running from their heaving flanks.

"I'm British," gasped Rooney. "Wagon is British, too. Z Pack Wireless Wagon. Hand over Brigade Sig. Officer Third Brigade. I'm done ; Rooney, the waster, done. Done," and his voice trailed off in a moan. He saw their haggard dusty faces as they crowded round to give him aid. Then Rooney felt the scent of honeysuckle. Not cloying, but sweet and fragrant. He saw the little white cottage. His grey-haired mother. She was smiling on him. Behind the cottage a mist was rising. A soft grey mist which seemed to beckon Rooney. A mist suggestive of tranquil dream cities, of rest and of peace.

He entered that mist. At least the soul of him did.

* * * * *

Vex not his ghost. Oh, let him pass, he only hates him
That would upon the rack of this rough world
Stretch him out longer.

(*King Lear, Act V, Sc.* 3).

# Notes of the Month

**MR. W. D. DUDDELL**

Everyone in the world of wireless will learn with profound regret of the death, on Sunday, November 4th, at his residence in Victoria Street, Westminster, of Mr. William Du Bois Duddell. Although only 45 years of age, this well-known scientist had reached the forefront of his profession, having held the post of President of the Institute of Electrical Engineers. To wireless men perhaps the most interesting factor of his work is that connected with the "Singing Arc," from which the Poulsen arc was evolved. Like many other distinguished members of the world of science, he had placed his energies at the disposal of his country since the outbreak of war, and at the time of his death was a member of the Admiralty Board of Inventions and Research, the Munitions Inventions Committee, and the Advisory Council for Industrial Research.

Professor W. D. Marchant, who was closely associated with Mr. Duddell, is contributing to our January issue an appreciation of his life and work.

### Wireless Apparatus on British Ships.

An amendment of the Defence of the Realm Regulations requires that every British sea-going ship of sixteen hundred tons gross tonnage or upwards in respect of which a licence to install wireless telegraph apparatus has been granted by the Postmaster-General shall be so equipped and provided with two certified operators with suitable accommodation. Previously the order related to British ships of three thousand tons gross tonnage.

### Wireless Rewarded.

Official recognition of wireless achievements is still making headway. We notice in a Supplement to the *London Gazette* that T. E. Fletcher, R.N.R., a wireless telegraphist of the First Class, and F. R. Nicholls, R.N.R., a wireless man of the same standing, have been awarded the Conspicuous Gallantry Medal. Wm. Statham, R.N.R., also a wireless telegraphist, shares in the high distinction. It is quite evident that the reluctance (perhaps not unnatural) of the authorities to go outside the actual fighting men in awarding distinctions of this kind has been finally overcome; and it is gratifying to notice that the gallantry so frequently displayed under most trying circumstances of nerve and courage by radiotelegraphists no longer escapes the eye of those who are responsible for the bestowal of these tokens of official recognition.

### DETECTIVE RADIOTELEGRAPHY.

The utility of wireless equipment on aircraft is too obvious and has been too frequently demonstrated to need much emphasising. Amongst the Admiralty Records recently issued for publication we notice an interesting incident wherein wireless played the part of a detective. It appears that a seaplane engaged on patrol service overheard a hostile wireless signal. The operator was able to judge from the strength of it that it emanated from a source located no great distance away. He accordingly scouted around to try and spot the enemy signaller, and ere long sighted a large submarine lying on the surface a mile ahead. Flying at eighty miles an hour the seaplane whizzed over the enemy craft and released a bomb which, well aimed, despite the frantic shelling of the U-boat's guns, tore a great rent in her hull. Meanwhile three more hostile submarines came up in line abreast, and these were in their turn reinforced by three hostile destroyers and two seaplanes. The British aviator, however, stuck to his prey despite all odds, dropped a second bomb and finished the job before—his bombs exhausted—he returned to the base. It is no small tribute to his coolness as well as intrepidity that the British aviator was able to carry home with him photographs of the sinking submarine and its would-be rescuers.

### U.S.A. RESTRICTIONS.

We desire to call the attention of our readers to the fact that in the list of restrictions on exports from America published in Lloyd's List at the end of September all radio and wireless apparatus and their accessories are included amongst the commodities for whose importation a permissive licence must be obtained from the Exports Administrative Board of the Bureau of Foreign and Domestic Commerce before shipment. This restriction is imposed in accordance with the proclamation issued on August 27th, 1917, by the President of the United States, and applies to all shipments going forward by any vessel clearing from U.S.A. ports on and after August 30th last.

### DEATH OF A DISTINGUISHED FRENCHMAN.

Captain Camille Tissot, one of the leading French radiotelegraphic scientists, and an old colleague of Colonel Ferrié, passed away at Arcachon on October 1st last. One of the pioneers in wireless telegraphy, Captain Tissot's work has been much appreciated, and his loss will be widely and sincerely mourned. We hope next month to include in our pages a brief obituary from the pen of André Blondel, President of the *Comité Français de T.S.F. Scientifique.*

# On the Matter and Elimination of Strays

## *An Investigation under the Auspices of the Dutch East Indian Department of Telegraphs*

By CORNELIS J. DE GROOT, Sc.D., E.E., M.E.
(Engineer of the Department of Telegraphs, Dutch East Indies)

*Continued from page 525 of our November issue.*

EVERY means, such as loose coupling in the receiver and simultaneous detuning of the intermediate circuit, and also Marconi's balanced detectors (which helped for all types of strays to a certain degree), was based only on the principle of weakening of strays to a greater extent than the signals, and therefore could attain only partial success. The Marconi balanced crystal receiver is shown in Fig. 3. Later in this paper I shall describe a device of my own, employing only a single detector, but giving similar results to those which Marconi obtained, but with two detectors. I shall describe also several other devices, the principal one of which might be expected to be completely successful.

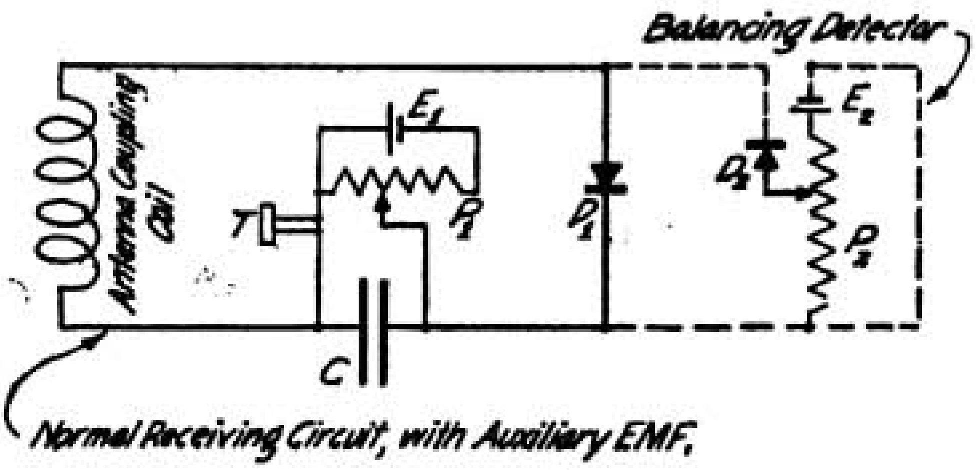



FIG. 3.—MARCONI BALANCED CRYSTAL RECEIVER.

As to the existing device, *with the exception of the last-mentioned one,* none proved as effective as the musical character of the transmitting note, which, as stated, enabled the high selectivity of the ear to pick out signals through strays of from 100 to 500 times as great intensity.

Before proceeding to the last portion of this paper, an explanation of my own as to the origin and propagation of the dominant type of strays (those of type 3), which are not covered by Dr. Eccles's theory, will be given. I shall first describe several arrangements which I devised to eliminate strays and interferences from other stations.

(*a*) The first device is similar in action to Marconi's balancing detector, but needs only one detector. It is effective against very heavy strays, but especially against interfering stations. The arrangement consists in applying to a carborundum-steel detector an additional constant e.m.f. in the reverse direction from that generally used. The diagram of connections is shown in Fig. 4, and will be seen to be the same as that of the Marconi balancing scheme with the exception of the omission of the second crystal. The e.m.f. E1 is reversed so that the direct current flows in that direction for which the crystal shows the smallest conductivity. As is generally known, this weakens the reception to something like 50 per cent. of the available rectified current as against the optimum rectification obtained by applying the e.m.f. in the right direction. Still, reception is many times stronger than when using the detector without any additional applied e.m.f.

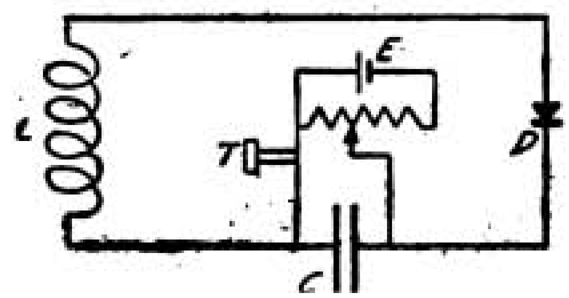



FIG. 4.—STRAY REDUCING CIRCUIT OPERATING WITH REVERSED AUXILIARY E.M.F.

On the other hand, the reverse applied steady e.m.f. changes the characteristics of the detector, as Fig. 5 shows. The result is that weak signals are received much more loudly in proportion and absolutely than stronger ones, and that for a certain strength of signal and the corresponding applied e.m.f. there is no rectified current at all and therefore no reception.

I was easily able to make the loud signals from a steamer in the neighbourhood of one of our stations inaudible by applying a suitable e.m.f. in the reverse direction. At the same time, signals 100 times weaker were being received from a distant station. As regards strays, the device operates in the same way as the balancing detector scheme; that is, there is only one strength of strays which can be made completely inaudible. Stronger strays are weakened and signals are similarly weakened, suppression depending upon their intensity. The device is therefore much more useful for the elimination of powerful interference from stations of constant loudness; and particularly so since these can be cut out with increasing ease the louder they are. On the other hand, the device is only very partially successful against strays, which is also the case with Marconi's device. To explain the operation of the device I shall consider Fig. 5. This represents the well-known direct current characteristic of the carborundum-steel detector. As is generally known, the best working conditions are obtained at the bend B of the positive part of the curve, say for an additional applied e.m.f. of +V volts. The best value of V depends to some extent on the strength of the incoming signals.

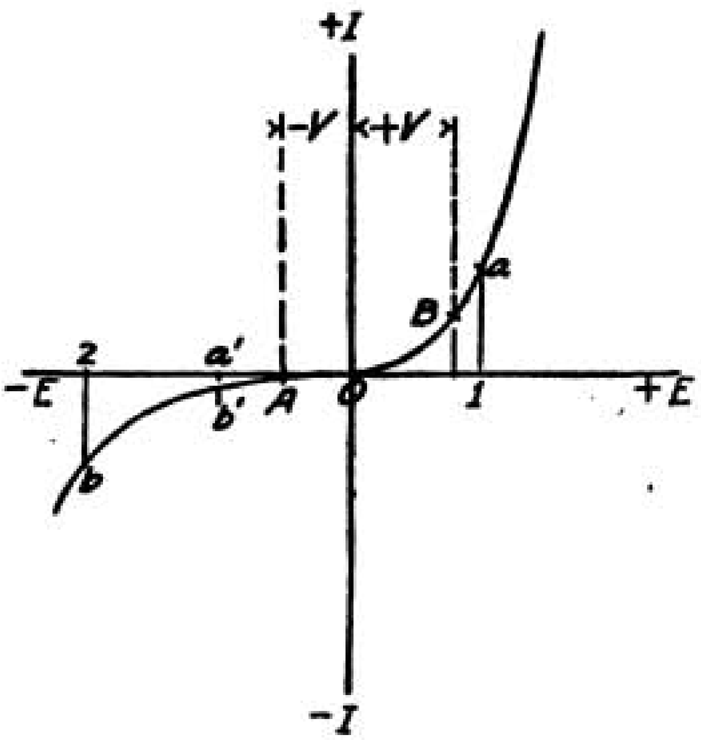



FIG. 5.—CHARACTERISTIC OF A CARBORUNDUM-STEEL DETECTOR.

If we apply instead of the positive e.m.f. +V a negative e.m.f.—V we see that the additional alternating e.m.f. 2A1 will give no response whatever, since the areas of A2b and A1a are equal and opposite in sign. A loud signal, therefore, gives *no response*, although a weak signal does. For instance, a signal of one-third the former amplitude a'AO will give the response corresponding to the resulting negative area Aa'b'.

We see that we have no reception of strong signals but at the same time a perfect reception of weak signals. We can cut out very powerful interfering stations in this way. It is clear from Fig. 5 that the stronger the interfering signal is the higher the negative voltage which must be applied to cut out interference perfectly. Since, on the other hand, the loudness of the signals for which reception is intended depends largely on the value of the applied negative e.m.f., the best working conditions are obtained for the value of —V between O and 2. The arrangement works best for the very strong *interfering signals* which are compensated for by this large negative voltage. The arrangement is thereby best suited to long distance stations, situated near harbours or other centres of heavy traffic, and consequent interference.

The effectiveness of the arrangement against strays is quite clear, since Fig. 5 shows that the weaker the signal the smaller the response, proportionately speaking. For strong signals the response becomes zero. While for excessively strong signals the response begins again, the rectified current is in the opposite direction to the applied constant e.m.f.

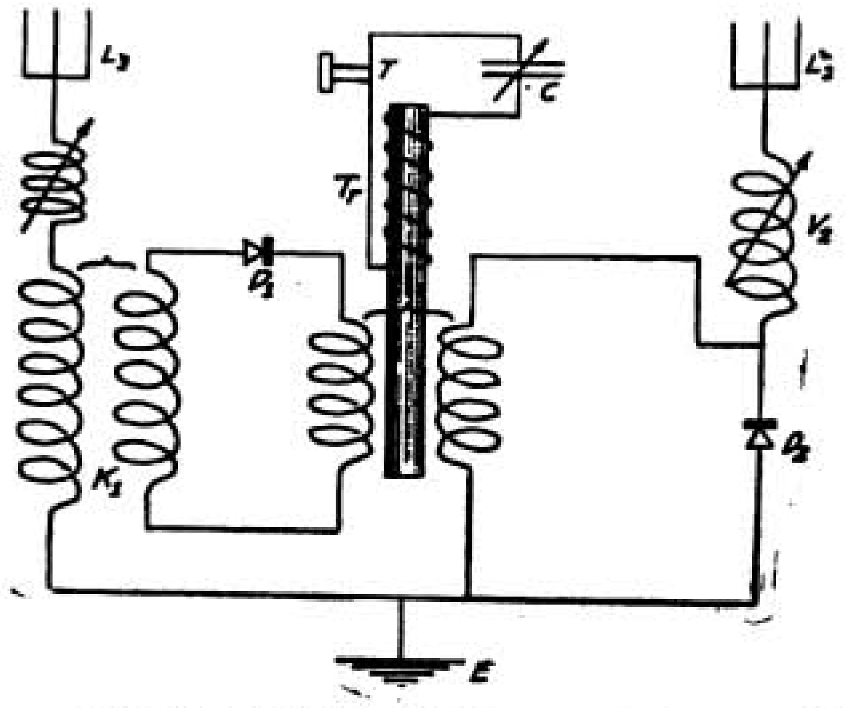



FIG. 6.—COMPENSATION OF PERIODIC STRAYS AT AUDIO FREQUENCIES.

(*b*) Another arrangement was tried, which was effective only against interfering stations to some extent, but did not weaken incoming signals at all. Though the arrangement is of no use against strays, it is briefly described here, since it is useful in many cases.

The Landangan station, when receiving from Oiba on the 1,600 meter wave and working on the large antenna, was always interfered with by ship stations in the harbour of Panarockan, 15 km. (nine miles) distant, and Soerabaie, 180 km. (110 miles) distant on the 600 meter wave. This interference was overcome in some tests by tuning a small antenna (which is referred to in the description of the stations) to the interfering 600 meter waves. As soon as this was accomplished the interference was practically eliminated, especially when resistance was introduced in the smaller antenna so as to make the damping of both antennas the same. This tuning was very sharp, and the success of the arrangement was not due to a screening action, since the two antennas were not in the same line with the interfering station. The action must be due to compensation of the incoming interfering signals in the main antenna by re-radiated energy from the compensation antenna.

(*c*) The third arrangement, which was tried, was in the direction of the elimination of strays, and its diagram is given in Fig. 6.

Two receiving antennas, $L_1$, $L_2$ of the same shape and dimensions, were installed near enough together (ten or twenty meters or thirty to sixty feet apart), to make them respond in the same way to strays. (For the aperiodic disturbances this distance could be easily increased, but for periodic disturbances the distance of separation must be small compared to the wavelength of the strays in order to get the induced e.m.f.'s in phase). On the other hand, the antennas must be placed sufficiently far apart so that signals set up in the one which is made aperiodic ($L_2$) shall not cause currents in the tuned antenna ($L_1$).

One of the antennas, $L_1$, is tuned to the incoming signal and coupled to the detector circuit, $D_1$, in the ordinary way. The detector $D_1$ will rectify signals as well as strays and send the rectified current into the telephone ; or as in the case of the drawing into the differential transformer *Tr*. The antenna $L_2$ is tuned either to the same or preferably a longer wavelength, thus making it less sensitive to the signals and more sensitive to the long wave strays. The detector $D_2$ is switched directly into this antenna, thus making it aperiodic or nearly so. This arrangement makes it almost impossible to receive any distant signal on the antenna $L_2$, but loud signals on wavelengths different from these to which $L_1$ is tuned and strays give a response that is nearly as loud as can be obtained on the tuned antenna $L_1$.

The rectified current is sent to the same telephone mentioned before ; or, as in the case shown in the drawing, to the differential transformer *Tr*. However, this second current from the aperiodic antenna $L_1$ is arranged to act in the opposite direction from that of $D_1$. The telephone *T* is either connected in series with $D_1$ and $D_2$, or, as in the drawing, in a third winding of the differential transformer and in series with the condenser *C* to permit tuning to the spark frequency. Since $D_2$ does not respond to distant signals, there will be heard in the telephones the signals from $D_1$ only, whereas the strays rectified by $D_1$ and $D_2$ tend to compensate. By varying the coupling *K* this compensation can be made complete.

This device will only permit complete compensation of strays of different loudness when the characteristics of both detectors $D_1$ and $D_2$ are similar. This is easily accomplished by using carborundum crystals with the best applied e.m.f. As soon as this is applied the characteristic for rectified currents as plotted against incoming alternating current is almost a straight line. This scheme was tried in practice, but; since the two equal antennas were not available, compensation could be obtained only for rather weak couplings, *K*, with a consequent loss of signal strength. The results were encouraging enough, however, to warrant repeating the trials on a larger scale and with proper apparatus. The results of these more elaborate and confirmatory tests will be published in the Proceedings within a short time. I am entirely convinced that this compensation device combined with the Dieckmann cage around the antenna to cut off aperiodic strays solves the problem of the elimination of strays. It will be seen that the same principle of compensation just described for the rectified or audio frequency currents is available too for the radio frequency currents. However, the currents to be compensated for in this case must be of the same frequency, decrement, and phase, thus introducing difficulties not encountered with audio frequency compensation. For audio frequency compensation it is sufficient that both rectified currents should be equal in frequency. Radio frequency compensation requires two antennas tuned to the same

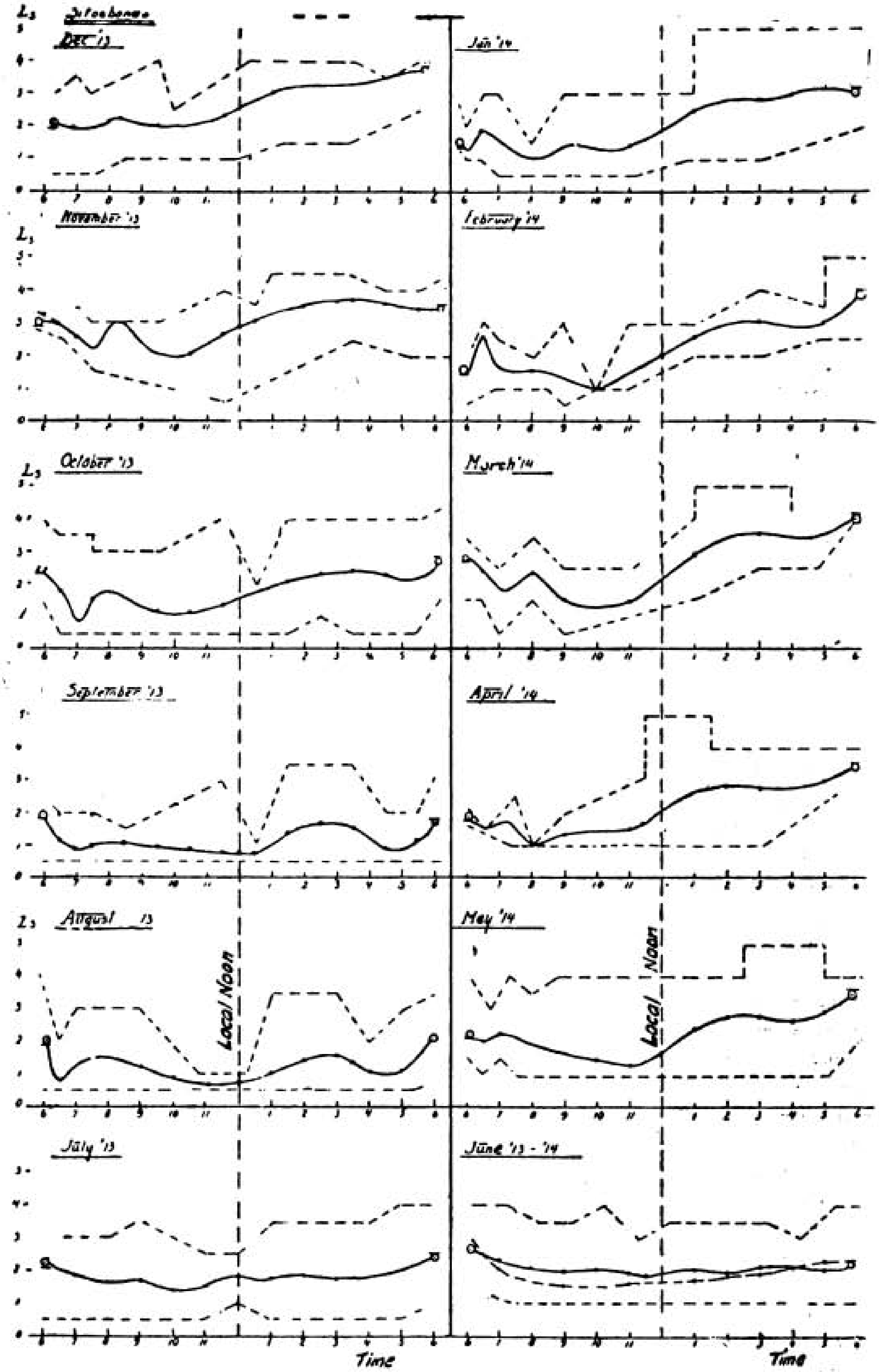

Dec '13
Jan '14
November '13
February '14
October '13
March '14
September '13
April '14
August '13
May '14
July '13
June '13 - '14
Local Noon
Time

FIG. 7.

wavelength and close together and having the same decrement. Consequently, in this case, the use of an aperiodic compensating antenna is not possible.

In order to get compensation at radio frequency two antennas of the same size and wavelength must be used, one of which is more sensitive to incoming signals than the other and both of which must be equally sensitive to strays. This could be done by having a directive aerial pointed toward the receiving station, in either a directive antenna in the minimum receiving position relative to the sending station or a non-directive antenna for compensation. In both cases a great loss of signal strength will be involved, since the compensating antenna will not only compensate strays but also the incoming signals to at least a large extent. I therefore prefer compensation of the rectified audio frequency current rather than radio frequency compensation.

## PART 4.—THE AUTHOR'S SUGGESTIONS RELATIVE TO THE ORIGIN AND PROPAGATION OF TYPE 3 STRAYS.

Since the theory of Dr. Eccles does not hold good for this type of strays, I attempted to suggest another solution. To begin with, it is necessary to consider the curves of daily and monthly variation of strays. In Fig. 7 are given the curves of daily variation, averaged over every month of the year, for all strays received during the daytime at the Landangan (Siteobondo) station. The year during which the observations were made began in June, 1913, and ended in June, 1914. The averages for these two years (that of June, 1914, being dotted) agreed very well.

The strays indicated by the letters "*Ls*" are plotted vertically in accordance with their scale of values from 0 to 5 as given in Part 3 of this paper. The average value for every hour of the day (in true solar time of the place under consideration) is the heavily drawn black line. The dashed lines indicate the limiting (that is, the highest and lowest) values observed during the hour in question.

We see that, although the average line could be drawn for the daily variation, the individual values during the same hour on different days in the months may be widely divergent on both sides of the average. It is clear also that morning and afternoon curves are symmetrical only for those months of the year during which the altitude of the sun is a minimum (that is, June, July and August). Symmetrical curves of this type are common for European stations.

These months of maximum sun's altitude covered the period of the latest trade wind (or east monsoon), and we shall call the daily variation curves during these months, the "east monsoon characteristic." We shall indicate this type of characteristic by the sign ⌣, meaning that during these months strays slowly fall from the sunrise point *o* to noon and then slowly rise until sunset $\bar{o}$. It will be seen that the characteristic for the month of August is already changing into a second type of characteristic, and that a change is also occurring during the month of May. It is only during these months that the stations fully fulfil their contract.

As the altitude of the sun increases it will be noticed that the characteristics continually change, not so much in the morning but chiefly in the afternoon. The characteristic then becomes of the general shape indicated by its sign ∽ as found in the characteristic during the months of September, October, March, April and May. As has been stated, August is of an intermediate form. This characteristic we shall call the "intermediate period characteristic." It is found during stormy periods when neither of the two types of trade wind dominates. On the average, communication is possible in the morning during these months, but during the afternoon contractual requirements could not be met.

With the latitude of the sun still increasing and the west trade wind (the west monsoon) becoming permanent, the characteristic takes the form indicated by its sign ∽, with high values in the morning during the months of November, December, January and February. During some days in this period no communication can be handled, since the signals also fade in intensity as do the strays in the morning.

We shall study hereafter the meaning of the signs employed in these characteristics.

Figure 8 gives the average daily variation over the whole year, with night

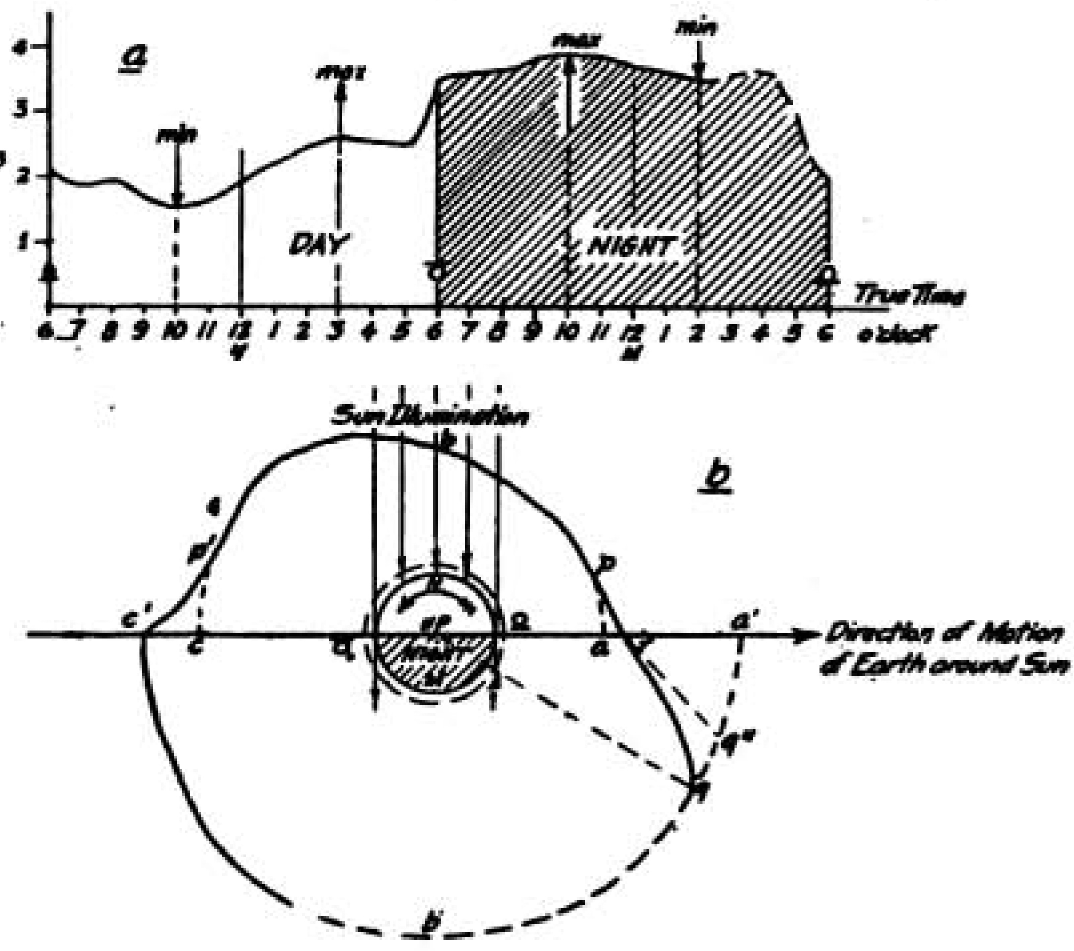



FIG. 8.—AVERAGE DAILY VARIATIONS OF STRAYS THROUGHOUT THE YEAR.

observations included. It must be admitted, however, that the dashed portion of the night curve is to be critically considered, since not many observations were available during such times, the stations being generally closed during that part of the night. We see that the average day of the year gives a high value during the night time for the stray intensity (namely, class 4; that is, requiring a signal strength of 250 to 500 times audibility for satisfactory communication). About two hours before sunrise the strays began to weaken until at 10 o'clock in the morning the minimum is reached. Then the strays increase until three in the afternoon, remain almost constant until an hour before sunset, after which they rise sharply to the night value.

*(To be continued.)*

# "THE UNSOLDIERLIKE SUB."

## A LETTER FROM THE FRONT.

THERE has come to hand quite recently a letter from a Captain with B.E.F., which is well worth reprinting in its entirety here, both in view of its distinctive difference from the majority of "letters from the Front" and of what has been lately published regarding the remarkable extent to which "Pelmanism" is being adopted by officers of His Majesty's Army and Navy.

Here is the letter in question :

"I should like to call your attention to the facts of the story of my Pelman Course.

"When I began I was looked upon with disfavour by the C.O. of my battalion at home as being a sleepy, forgetful, and unsoldierlike sub. When I began your course my star began to rise—I had the ability but had not been able to use it. I left the home battalion with my C.O.'s recommendation as being the best officer he had had for more than a year, and came to France.

"I was then appointed as a second-lieutenant to command a company over the heads of four men with two 'pips,' and have now three stars and an M.C.

"That I was able to make use of my abilities so successfully I attribute entirely to the Pelman System."

As an isolated letter the foregoing might fail to carry much weight. But when it is taken as typical of some hundreds of similar letters from Army and Navy officers, then, indeed, one is forced to concede that there must be "something in Pelmanism."

More than forty Generals and Admirals and well over 300 naval and regimental commanders—to say nothing of 4,000 other officers and a multitude of N.C.O.'s and men—have adopted Pelmanism since the outbreak of war, and every day brings reports from them as to substantial benefits derived.

Let us take a few examples. A Naval Captain reports promotion to the command of a fine cruiser—thanks to his Pelman training. A Lieutenant-Colonel reports "a step in rank" within two months of starting the Course. A Major writes attributing his majority *and his D.S.O.* to the same agency. A General and a Rear-Admiral also write giving testimony which it is, at present, inadvisable to publish. There is not a rank or unit of either Service which has not supplied convincing evidence of the fact that Pelmanism is truly the short road to progress.

The evidence produced by the Pelman Institute is amply sufficient to sweep away the last vestige of doubt, it forces one irresistibly to the conclusion—and it is the right conclusion—that, as "TRUTH" says, "The Pelman Institute places the means of progress within the reach of everyone."

### AN AMAZING FACT.

The amazing fact is that, however sweeping this statement may appear, it is literally true! There is no case upon record in which the conscientious student of "Pelmanism" has failed to reach the coveted goal—whether that goal be promotion, financial betterment, social or professional advancement, or aught else.

As to results, the difficulty is to select the most representative ones. Here is a random selection, which could be multiplied a thousandfold from the Institute's records:

**—Placed my practice on a satisfactory basis (Doctor).**
**—Rise of £145 per annum.**
**—Doubled my turnover.**
**—Salary improved 300 per cent.**
**—Literary prize of £250.**
**—My income has gone up 300 per cent.**
**—Substantial increase in my salary.**
**—Increase of salary of 50 per cent.**
**—Increased turnover and salary.**
**—My turnover has beaten all records.**
**—My business has increased considerably.**
**—Salary exactly doubled.**
**—Added £80 to my Commission Account.**
**—I have had a 40 per cent. rise.**
**—Salary increased, also a 10 per cent. bonus.**
**—My salary has been increased by 60 per cent.**
**—The means of making my income double.**
**—Greatest increase in business.**

Thus in every direction—financial, professional, social, and educational—the Pelman System is daily helping thousands of men and women of every trade, profession, and occupation to attain success.

And what is the cost? A half-hour or so devoted each evening for a few weeks to a most fascinating course of study; not study in the humdrum sense of the word, but a real mental recreation. Most students of the Pelman Course openly express regret when the lessons have terminated; so deeply interesting do they find them.

From business and professional women eulogistic letters are received by the thousand, and many of them actually reproach the Pelman Institute for *understating* the value of the Course. For instance, a Solicitor writes:

**"I used to think that the claims made for 'Pelmanism' must be fantastic; now I consider them to be understatements of the truth."**

It is useful to bear in mind this comment (typical of many) when one is tempted to think that the announcements made by the Institute are in any degree exaggerated. *As a matter of sober fact, every statement made here or elsewhere by the Pelman Institute can be handsomely justified by a reference to the records of the Institute.*

A student of the course recently wrote: "If people only knew, the doors of the Pelman Institute would be literally besieged by eager applicants." Even as a purely social and intellectual factor, Pelmanism well repays the few hours required for its study.

**SHOULD IT BE NATIONALISED?**

Many prominent people—including a Member of the House of Lords and many other men and women—are insisting that the Pelman Institute should be taken over by the Government, so that the whole nation may receive the benefits of "Pelmanism." Many present students of the course support this view.

In the meantime the directors of the Institute have temporarily arranged a substantial reduction in the fee to enable readers of THE WIRELESS WORLD to secure the complete Course with a minimum outlay.

**To get the benefit of this liberal offer, application should be made at once by postcard or by letter to the address below.**

A full description of the Pelman Course is given in "Mind and Memory," a free copy of which (together with "TRUTH'S" special report on "Pelmanism," and particulars showing how to secure the Course for one-third less than the usual fee) will be sent post free to all readers who send to the Pelman Institute, 145, Wenham House, Bloomsbury Street, London, W.C.1.—(ADVT.)

OPERATOR STANLEY ASHTON.

The ship has been overdue for a very considerable period, and it is officially presumed to be lost with all hands. We are sure all our readers will join with us in expressing deep sympathy with Mr. Smith's parents.

### Twice Torpedoed.

Mr. Edmund Stanley Ashton, of Flaxton, near York, was 20 years of age. Educated in York he entered a solicitor's office on leaving school and remained in this employment for three years, after which he took a course in wireless telegraphy at the North-Eastern School of Wireless, Leeds. Here he obtained his Postmaster-General's First-Class Certificate and joined the Marconi Company in December, 1916, proceeding to sea almost immediately on the ship to which he remained attached to the end. This vessel recently became a victim of a German submarine and was torpedoed but not sunk. From this disaster Mr. Ashton was rescued by a passing steamer, which in turn was torpedoed, and we deeply regret to state that Mr. Ashton was killed instantaneously. In this particularly sad case we hope Mr. Ashton's parents will feel partially consoled by the fact that he died bravely in the service of his country equally with those who have given their lives in the trenches.

### Lost at Sea.

Mr. Frederick Roberts Cunningham, of Edinburgh, is another brave operator who has lost his life as a result of his ship being torpedoed. Mr. Cunningham, whose home was in Edinburgh, was 17 years of age and educated at Portobello. On leaving school he entered an ironfounder's, leaving this employment to study wireless telegraphy at the North British Wireless School, Edinburgh. Here he obtained his First-Class Certificate, and joined the Marconi Company as recently as September last, losing his life at the torpedoing of the first ship to which he was appointed. We offer our condolences to Mr. Cunningham's parents in their time of trouble.

OPERATOR F. R. CUNNINGHAM.

### Drowned.

Yet another case is that of Mr. Hugh Glen Forsyth, of West Gourock, a young Scotsman 20 years of age. On leaving school Mr. Forsyth entered the office of a sugar broker in Gourock, and made a study of wireless telegraphy at the North British Wireless School, Glasgow. On obtaining his First-Class Certificate, Mr. Forsyth came to London and joined the Marconi

OPERATOR HUGH G. FORSYTH.

Company, entering the school in November, 1915. Afterwards he made his first trip to sea on the s.s. *Walmer Castle*, and then, after making one trip on another vessel, was appointed to his last ship in June of this year. Falling a victim to an enemy submarine the vessel sank, Mr. Forsyth unfortunately losing his life in the disaster. The heroism of the young operators who have given their lives in the service of their country is still not fully appreciated by the general public. After the war and when more can be told, the Roll of Honour will truly be a roll of gallant deeds.

SUNK BY THE ENEMY.

Mr. John Henry Greenway, of Walton, Liverpool, was born at Nottingham in 1892 and educated at the same place. Before joining the wireless service he was employed in a hosiery business in Nottingham and also on the Lancashire and Yorkshire railway as a mechanic. When in this latter employment he studied at the Liverpool Wireless Training College, taking evening classes first of all and later finishing his course in the day time. At this school he obtained a Second-Class Certificate and came to London to join the Marconi Company in April, 1916. After a short course in London he was appointed to the staff and made his first trip to sea on the s.s. *Royal George*, transferring to the s.s. *Obuasi* in October, 1916. After sailing on two other vessels he was appointed to his last ship in August of this year and had served on her for two months when she was torpedoed by a submarine. We deeply regret to say that Mr. Greenway lost his life in the disaster, and we take this opportunity of expressing our sympathy with his relatives in their time of trial. It cannot be too often insisted upon that these young men are giving their lives as truly for their country as if they fell in active military service against our common foe.

OPERATOR J. H. GREENWAY.

# Australia Favours Automatic Telephones

**THE automatic telephone is reported to be attaining great popularity in Australia. About twenty exchanges providing services for 35,000 instruments are already in operation, and hundreds of extensions are now on order. The idea has also found favour in Australian official circles, for Australia House, the imposing new headquarters of the Commonwealth in the Strand, London, is being equipped throughout with the automatic system of the Relay Automatic Telephone Company.**

# Instructional Article

NEW SERIES (No. 9).

*EDITORIAL NOTE.—In the opening number of the new volume we commenced a new series of valuable instructional articles dealing with Alternating Current Working. These articles, of which the present is the ninth, are being specially prepared by a wireless expert for wireless students, and will be found to be of great value to all who are interested in wireless telegraphy, either from the theoretical or practical point of view. They will also show the practical application of the instruction in mathematics given in the previous volume.*

---

## ELECTRICAL MEASURING INSTRUMENTS.

**46. Low-Frequency Instruments.**—Several types of instruments used in continuous current measurements are available for use in an alternating-current circuit, while some would give quite inaccurate results. In the measurement of an alternating current or voltage the value required is the r.m.s. value, therefore the indication of any instrument to be of use on an alternate-current circuit must depend on the **square** of the current flowing in the circuit.

Instruments which indicate on the r.m.s. value can be divided into three classes :

(1) Electromagnetic.
(2) Hot wire.
(3) Electrostatic.

In Class 1 are those instruments which depend on the magnetic effect of the current. If a coil of wire traversed by an alternating current acts on a soft iron core the readings are proportional to the r.m.s. value, provided the magnetisation of the core is low, thereby ensuring that the permeability is constant. Instruments based on this principle are known as **Soft Iron instruments**. Another method is to pass the current through two coils in series. The planes of the two coils being inclined to each other. This type of instrument is known as the **Electro-dynamometer type**. A third type, known as **Induction type instruments**, is that which depends on the rotation of an eccentric metal disc between the poles of an electromagnet.

Instruments in Class 2 depend for their action on the heating effect of a current. The current is passed through a thin wire, which becomes heated. The wire therefore becomes elongated, and by a suitable magnifying arrangement the amount of elongation due to the rise in temperature is measured.

The instruments so far summarised are available for the measurement of both current and voltage. When used as voltmeters they must be so designed that the current flowing in the instrument is proportional to the P.D. at its terminals, and must be independent of the frequency of the supply. This means that the reactance of the instrument is negligible compared with its resistance.

Electrostatic instruments, as their name implies, depend for their action on the attraction of oppositely electrified plates—one or more plates being movable, the other plate or plates being fixed.

Since the current flowing between the plates of this instrument is negligible, it is only suitable for the measurement of potential difference.

Instruments to be accurate when used on alternating-current circuits must be :

(1) Independent of wave-form.

(2) Independent of frequency.

There are many different make of instruments designed so that the losses from these causes are reduced to a minimum, but in which the working principles are the same. It is only possible, therefore, to give a brief summary of the action of a typical instrument of each class.

**47. Moving Iron Instruments.**—Under certain conditions moving iron instruments are fairly accurate on alternating-current circuits when the frequency of the supply does not exceed about 300 periods.

The underlying principle of all moving iron instruments is the repulsion between two similarly magnetised pieces of iron. The current is passed through a coil consisting of a few turns of wire if for an ammeter, and many turns of wire if for a voltmeter. Inside this coil is fixed a small piece of soft iron. Near this iron is another similar piece of iron mounted so that it is free to rotate in one direction, and a pointer is fixed at one end.

The current passing round the coil causes the two pieces of iron to become similarly magnetised. The iron free to move will therefore be repelled, causing the pointer to move across a scale, the amount of deflection produced depending on the strength of the current.

When iron is subjected to a magnetic field produced by an alternating current the magnetisation of the iron will follow the strength of the magnetising field, and will therefore go through a complete hysteresis loop for each period. This leads to an absorption of energy, and consequently a lower reading than should be obtained. If, however, the iron is only feebly magnetised, the permeability may be considered to be constant, and therefore hysteresis can be neglected. The instrument will therefore be correct on frequencies somewhat below and above that on which it was calibrated.

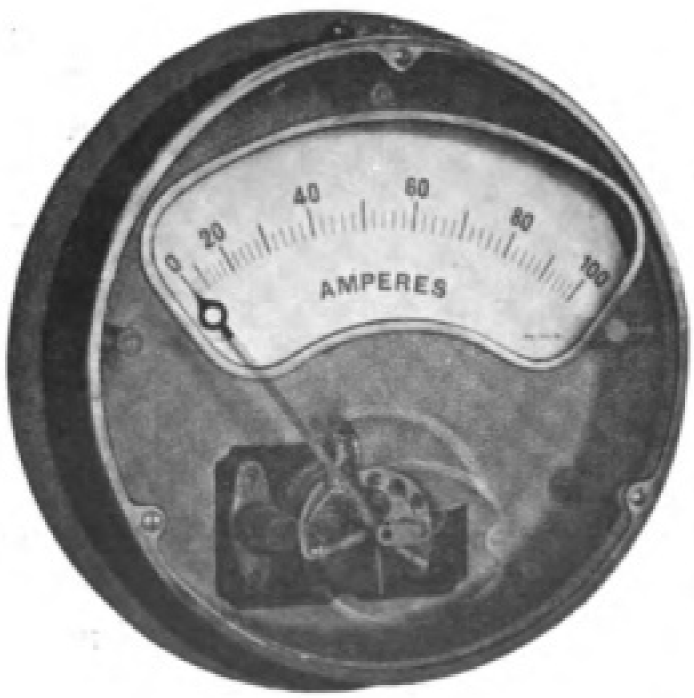



FIG. 39.

Moving iron instruments are generally fitted with a damping device owing to the unsteadiness of the needle. The damping usually has the form of a thin vane moving into a small tube closed at the opposite end known as an "air-damper." Fig. 39 shows a moving iron instrument with an air-damper.

**48. Hot-Wire Ammeters and Voltmeters.**—All hot-wire ammeters and voltmeters depend for their action on the heating effect of a current. In the well-known type made by Johnson & Phillips, the current traverses a thin wire made of platinum silver, and stretched between two supports as shown in Fig. 40.

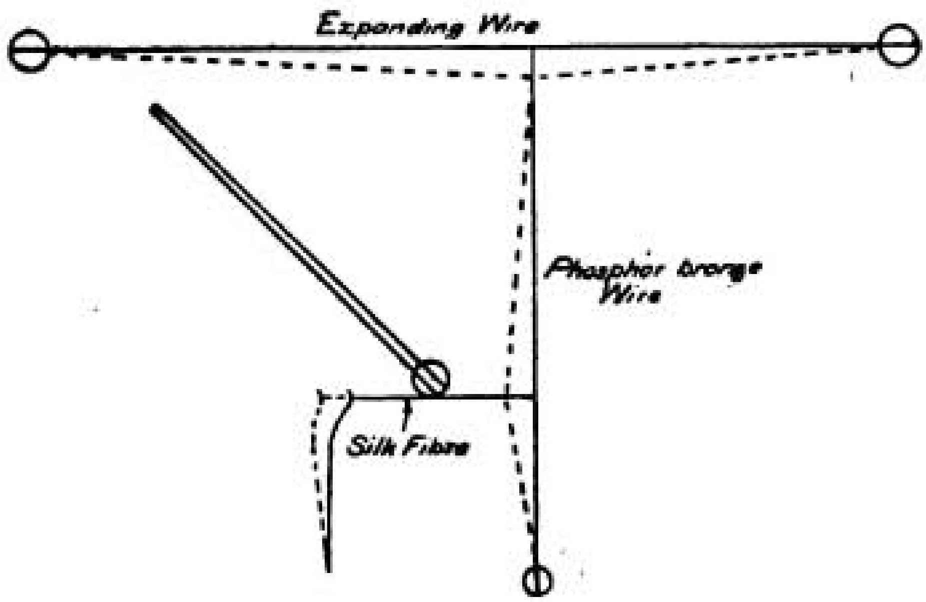



FIG. 40.

About the centre of this wire is attached a fine phosphor-bronze wire, the other end of which is clamped in a support. To this wire is attached a silk fibre which passes once round a small pulley, and is held in a state of tension by the spring, *S*. To this pulley is fixed a pointer which moves over a scale.

In order that the instrument shall not be affected by changes of temperature the whole is mounted on a compensation plate made of bronze, which has about the same coefficient of expansion as the wire. One support of the platinum silver wire must, of course, be insulated from the base.

A zero adjustment is provided at one end of the platinum silver wire in order to correct any zero inaccuracy.

Mounted on the spindle of the pulley is a thin disc of aluminium (not shown in Fig. 40). The disc swings between the poles of a horseshoe magnet and acts as a damper.

When the current heats the wire the expansion is taken up by the phosphor-bronze wire, which expansion is in turn taken up by the spring acting through the silk fibre, thus giving a double magnification of the initial expansion. The pulley, therefore, revolves, moving the pointer over the scale.

Unless the instruments are only required to measure small currents a shunt would be used, which is contained in the instrument for currents to about 200 amps. In the case of the hot-wire voltmeter a high non-inductive resistance is connected in series with the hot wire.

**49. Electrostatic Voltmeters.**—Electrostatic voltmeters are constructed to measure up to about 200,000 volts, but for the low-tension circuit of a wireless telegraph set a voltage above about 600 volts would rarely be used. To measure a pressure of this order the switchboard pattern of the multicellular type of voltmeter is used.

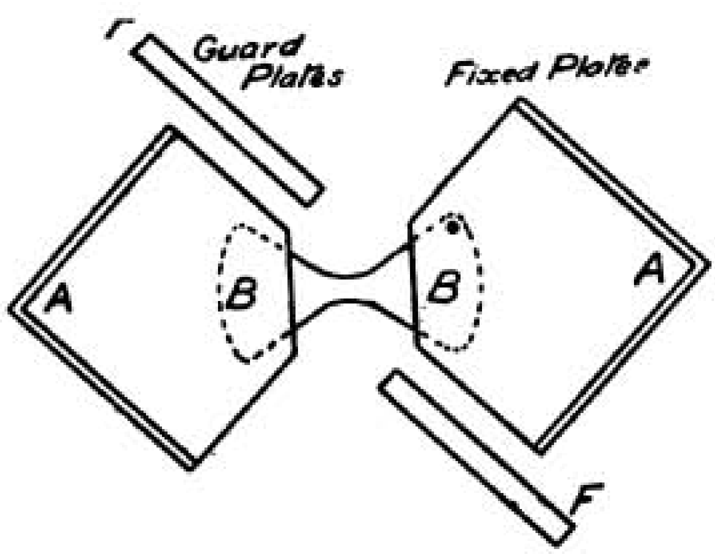



FIG. 41.

In this form the voltmeter is constructed of a number of separate cells arranged vertically. A number of quadrant-shaped vanes, to which a pointer is attached, are suspended by a phosphor-bronze strip so that they are free to rotate in a horizontal plane, and so spaced that they hang centrally between

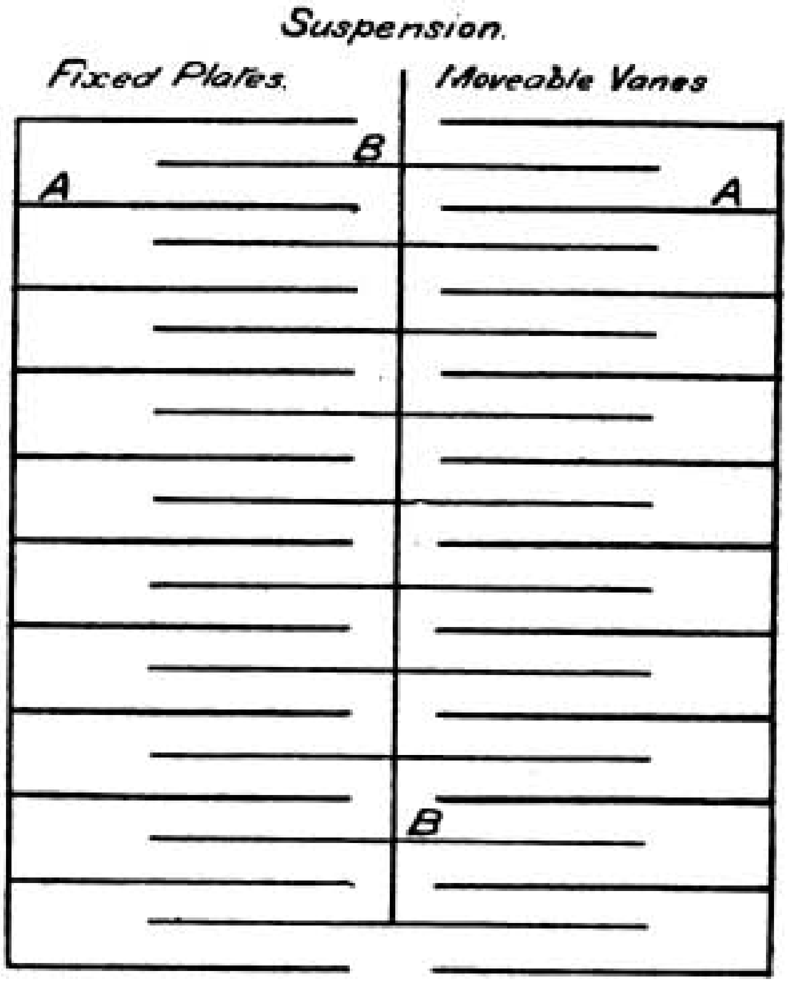



FIG. 42.

the fixed plates. Fig. 41 shows a plan of the instrument: *AA* are the fixed cells, *BB* are the movable vanes, while *FF* are two vertical guard plates. Fig. 42 is an elevation of the cells and vanes without the guard plates. These plates are electrically connected to the movable vanes, which are connected to one terminal of the instrument not insulated from the case. The fixed plates are connected to the other terminal insulated from the case.

When the voltmeter is connected to the mains, the vanes and guard plates become charged, and therefore the vanes are repelled from the guard plates and attracted into the fixed cells, until the tension on the phospher-bronze wire is balanced by the electrical force. The electrical force or deflecting torque will depend on the square of the difference of potential so that the instrument will read the r.m.s. value of the voltage.

**50. Wattmeters. Single phase.**—Commercial wattmeters are usually constructed on the electro-dynamometer or induction principle, but whatever the principle the instrument has two separate circuits, the one being the current circuit and the other the pressure circuit.

The current circuit carries the whole or a proportional part of the current and is a fixed coil called the field coil. In the electro-dynamometer type the pressure circuit is a movable coil with its plane at right angles to the plane of the field coils. This coil is connected through a high resistance across the mains. A pointer moving across a scale is attached to the pressure coil. The method of connecting the instrument is shown in Fig. 43.

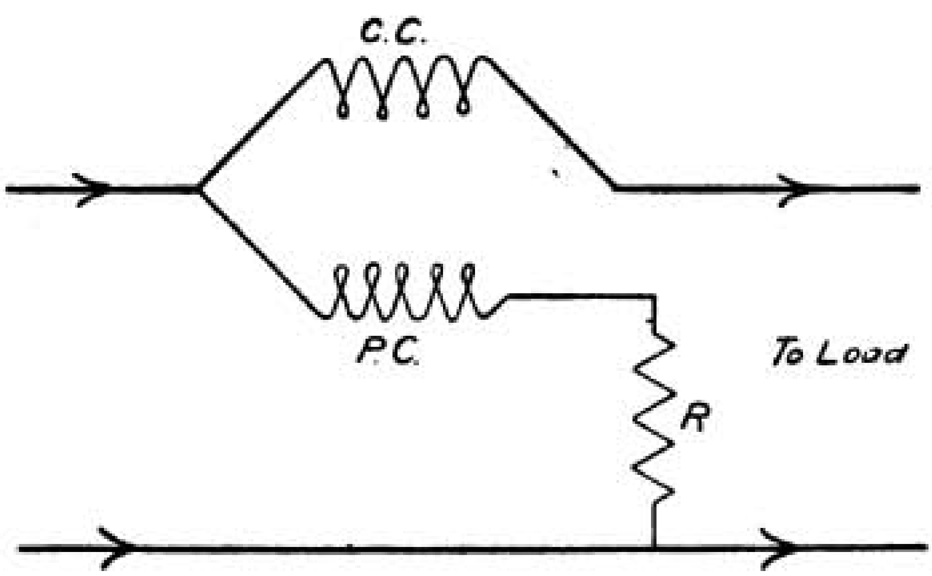



FIG. 43.

The currents flowing through the field and pressure coil create a magnetic field, and the pressure coil being movable assumes such a position that the electrical force is balanced by the controlling force on the coil, generally a small spring.

Let the current in and the voltage of the circuit be in phase, that is unity power factor. Then the currents in *CC* and *PC* will be a maximum and the torque exerted on *PC* will be greatest. The wattmeter will therefore indicate the product of the current and voltage. Now, if the current is 90° out of phase with the voltage, when $\cos \theta = O$, there will be zero current in the pressure coil when the current in the field coil is a maximum and conversely, maximum current in the pressure coil and zero current in the field coil. The wattmeter will therefore read zero, there being no torque on the pressure coil. Therefore, for any value of $\theta$ between *O* and 90° the deflection of the wattmeter will be proportional to $\cos \theta$. The wattmeter thus indicates $C \times E \times \cos \theta$, which is the true watts in the circuit.

**51. Power-Factor Meters.**—It has already been shown that the power-factor of any circuit can be calculated from the readings of voltage, current and watts, but instruments known as power-factor meters have been devised, whereby the power-factor of a circuit can be directly measured.

|Such an instrument is shown in Fig. 44, and consists essentially of a field coil, and two pressure coils mounted at right angles to each other and carrying a pointer.

The field coil, *CC*, carries the main current, as in the wattmeter. One of the pressure coils, $PC_1$, Fig. 44, is connected through an inductive resistance, $R_1$, across the mains. The other pressure coil, $PC_2$, is connected through a non-inductive resistance, $R_2$, across the mains.

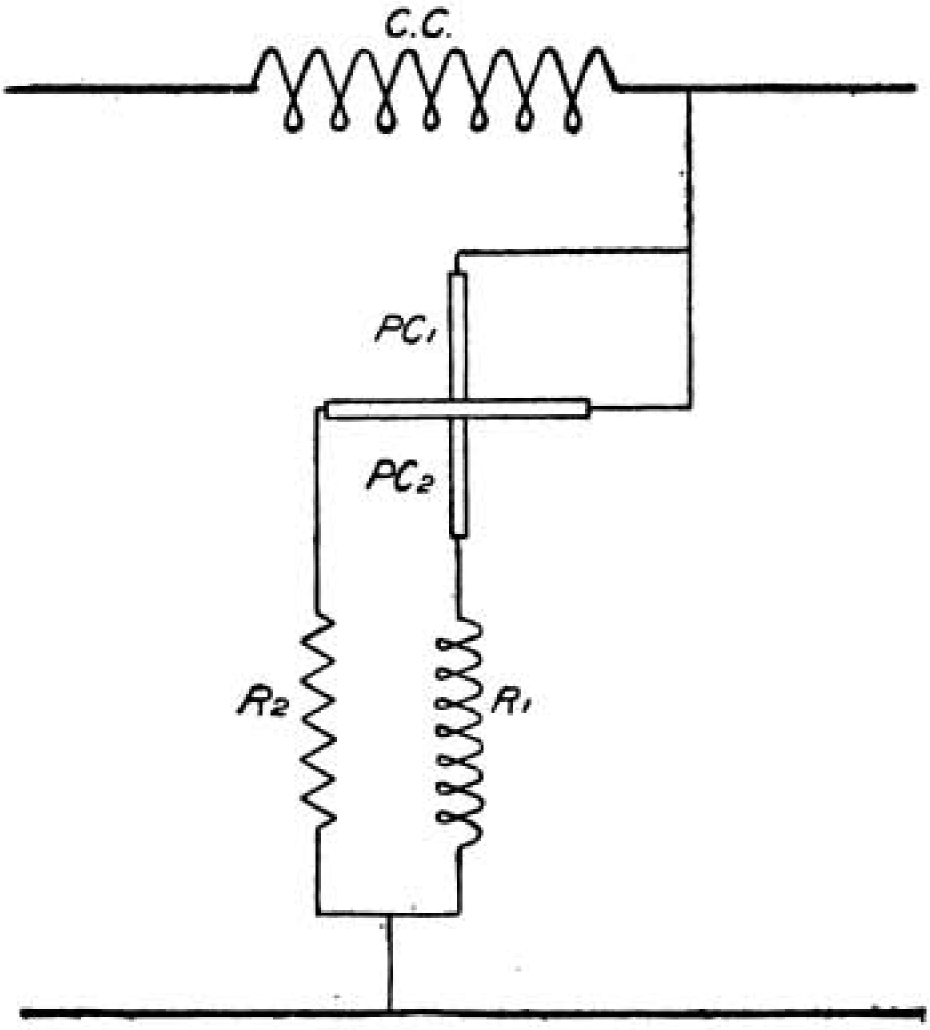


FIG. 44.

Now let the inductance of $R_1$ be sufficiently great to cause the current in $PC_1$ to lag 90° behind the voltage, that is 90° out of phase with the current in $PC_2$. Suppose the current in *CC* is in phase with the voltage, that is the circuit has unity power-factor. There will then be a torque exerted on $PC_2$, since the current in *CC*, and $PC_2$, are in phase. There will be no torque exerted on $PC_1$, owing to the current in $PC_1$ being 90° out of phase with the voltage and consequently the current in *CC*.


FIG. 45.

Now, if the power-factor of the circuit is reduced, and the current lags more and more behind the voltage, the torque exerted on $PC_1$ becomes greater, while the torque on $PC_2$ becomes gradually less. The coils will therefore take up some definite position with every power-factor, which position can be read on a scale.

Since the coils $PC_1$ and $PC_2$ are both the deflecting and controlling force, the actual deflection is independent of the strength of the currents flowing in each circuit, as long as the ratio of the strengths and the phase relationship is the same. The deflection is therefore independent of the voltage. The instrument should, however, be used with only the frequency for which it is designed, as any other frequency will alter the value of the reactance of $R_1$ and $PC_1$.

The instrument is usually calibrated for power-factors, each side of unity thus indicating both leading or lagging currents, and is shown in Fig. 45.

**52. Frequency Meters.**—One method of measuring the frequency of an alternating current is to measure the current flowing through a choking coil and the drop in volts across the coil. This method being inconvenient and often impracticable, owing to the impossibility of inserting a choking coil in the circuit, is liable to error due to wave form.

Another and much more simple and direct method is that due to Professor Ayrton, in which the natural frequency of various lengths of thin steel is utilised.

An alternating current, the frequency of which it is desired to measure, is passed through a small electromagnet. In the field of this magnet are arranged a number of thin steel strips. These strips or "reeds," as they are sometimes called, are

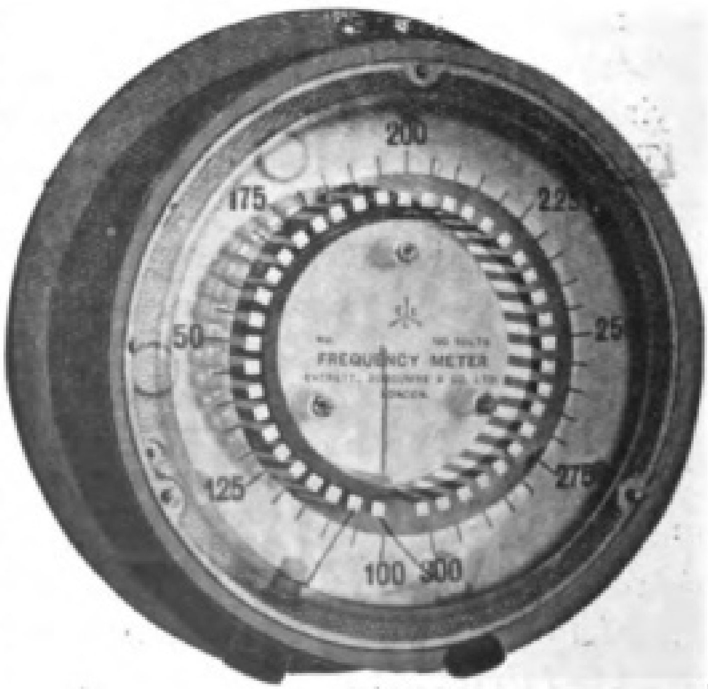



FIG. 46.

adjusted to vibrate at known frequencies. Then, when the current traverses the electromagnet, the reed which has a natural frequency nearest to the frequency of the alternating current will be caused to vibrate. Thus all the reeds in the instrument will vibrate in turn when the period of the alternating current corresponds with the natural period of each reed. It may occur that the reed on each side of the correct one is set in vibration, but the correct reed will have a greater amplitude than the other two.

The tops of the reeds are turned over to form a small rectangle and are usually printed white. A type of frequency meter is shown in Fig. 46.

Meters based on this principle are made to indicate a frequency up to about 1,500 periods, but above this frequency the reeds become too thin to be of practical use.

(*To be continued.*)

*The author is indebted to Messrs. Everett, Edgcumbe & Co. for photographs of the instruments illustrated.*

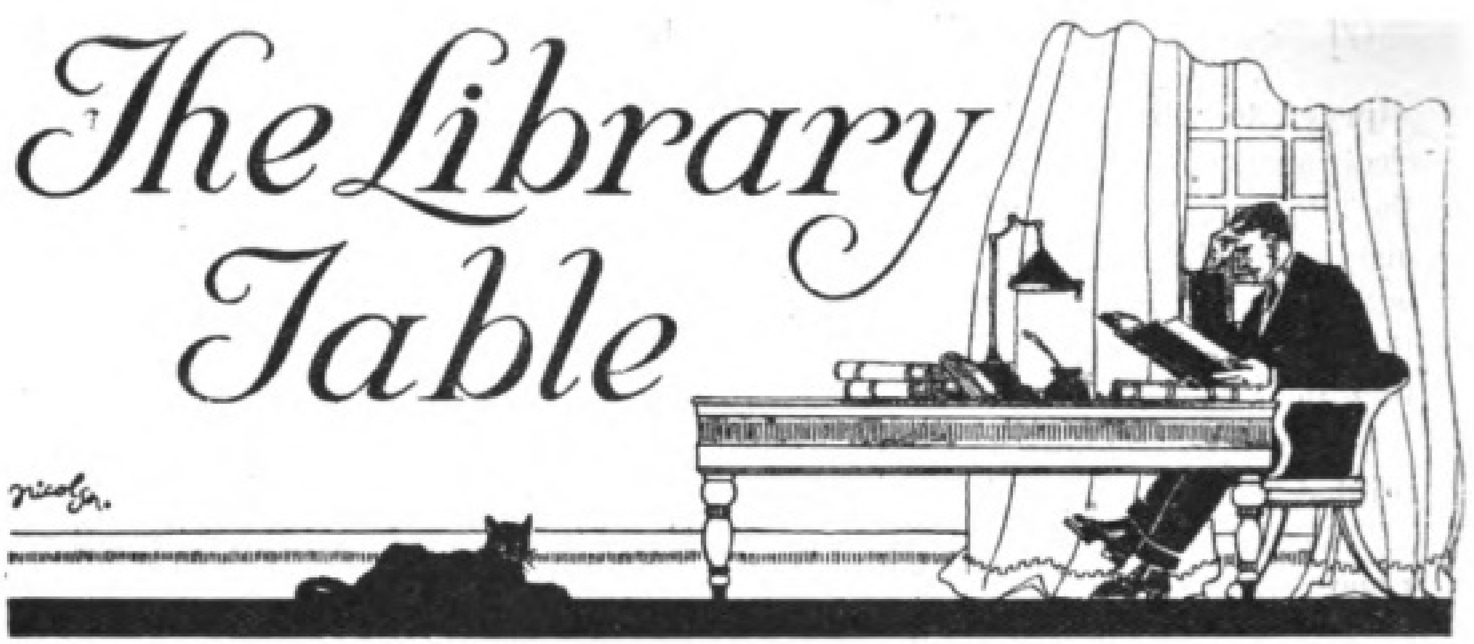
# A Visit to a Destroyed German Installation

A PARTY of Union of S.A. Members of Parliament, whilst making a tour of the Protectorate, paid a visit to the wireless station at Windhoek (South-West Africa Protectorate), and a description of the station was given to them by Captain Kellaway. The motor power consists of two Diesel oil engines. The large A.C. generators are designed for a single-phase output of 250 kw. at 500 volts and 350 cycles. The transformers are of the oil type, designed to step up from 500 volts to 52,000 volts. There are five masts, each 390 ft. high, weighing roughly 30 tons each, all insulated and maintained in position by steel wire cables. The transmitting aerial consists of 20 silicium-bronze cables, ten running south-east and ten south-west from the apex. The two receiving aerials consist of ½-in. diameter silicium-bronze cables. The battery comprises 128 Tudor cells of 270 ampere-hour capacity. It was explained that the transmitting plant of the wireless station was inoperative owing to the removal of essential parts by the Germans. The receiving of messages is being maintained.

It will be remembered that Windhoek was occupied on May 12th, 1915, by General Botha in the course of his methodically successful South-West African Campaign. So sensible was the enemy of the value of this high-power station that all particulars thereof had been kept as a State secret up to the time when it fell into our hands. The justification of the enemy's high estimate of the importance to them of this radiotelegraphic installation was demonstrated by the fact that, as soon as Windhoek and its equipment fell into our hands, the enemy's resistance practically ended.

# The Share Market.

BUSINESS in the various Marconi issues has been very active during the past month. There has been very considerable investment buying, and prices are well maintained: Ordinary, £3 5s.; Preference, £2 13s. 9d.; American, £1 1s. 6d.; Canadian, 10s. 6d.; Spanish, 11s.; Marines, £2 12s. 6d.




*THE WONDER BOOK OF THE NAVY. Edited by Harry Golding. Ward, Lock & Co., London, Melbourne and Toronto.* 3s. 6d. *net.*

It is an excellent idea to embody in a collection of short readable chapters a number of original papers likely to interest British boys and girls in naval matters. The importance of their Navy to the inhabitants of Great Britain was brought home as early as the reign of King Alfred. That importance has gone on increasing ever since. Only the other day the present writer, in response to some questionings put by his little girl, turned up and re-read for the child's benefit the contemporary description of the Battle of Sluys contained in the pages of Froissart. This famous naval victory was won by Edward III. against the French on June 24th, 1340, and the chivalrous French chronicler acknowledges that the English fought it in the face of odds reckoned at ten to one.

The volume, which lies before us as we write, consists of a series of chapters contributed by various authors, most of them well-known marine experts, like Mr. Archibald Hurd and Mr. Gerald Fiennes. We find included in the contents not only essays, but short stories planned so as to illustrate points connected with various phases of naval life. We were specially struck by a convincing little tale from the pen of M. G. Johnstone, which deals with the torpedoing of a British merchant vessel by a German submarine.

Of course, the object of such a volume is not merely to interest, but to instruct, and one of the most useful papers written with this direct aim in view consists of the article devoted to explaining the evolution of the various types of warships. Mr. Archibald Hurd has, in this article, displayed his gift for compressing much information in a small compass without losing the interest of the reader. The "Training of Naval Officers" would appear to have been contributed by a service man under the veil of anonymity. The world outside our islands has not been forgotten. Mr. Gerald Fiennes has seen to that. He deals in his own picturesque way with "The Empire and the Navy," as well as with the Fleets of our Allies, and contributes a special article upon the subject of the Navy of the U.S.A.

We naturally turn with considerable interest to the article in the volume dealing with wireless telegraphy. The opening paragraph seems to indicate that the writer is not properly informed upon his subject. He actually asks his readers to believe that "one of our greatest Admirals installed efficient wireless telegraphy in British "men-of-war before the public had ever heard the name of Marconi!" There is no necessity for anonymity here. Sir Henry Jackson is the Admiral referred to. That gallant officer would be the first, if the matter were referred to him, to deny a statement the inaccuracy of which is perfectly well known to anyone who possesses even a "nodding" acquaintance with wireless. No ether-wave telegraphy was put into practice before Marconi, and it is a matter of regret that the editor and publishers of this instructive volume should not have entrusted the writing of this chapter to someone a little better informed upon the subject he undertook to treat. "T. N.," who is responsible for the misstatement above referred to, implies also that British naval men employ an independent system. They do not. Although certain modifications have been made in naval instruments, in order to suit the special requirements of the fighting Service, the system employed in the Navy is that of Marconi. Technical men, moreover, steer clear of the inaccuracy of writing the distress signal S O S as "S.O.S." Perhaps that is a minor point; but straws show which way the wind blows.

All of us who have to deal with block making and printing in these troublous times are only too well acquainted with the difficulties which beset every step of the way. For this reason, although we should criticise the blocks and their printing under peace conditions, we do not think it fair in present circumstances to go beyond an expression of sympathy with the publishers for not having been able to do more justice to subjects so carefully chosen and well selected. Some of the colour work is very good.

* * * * * *

*THE FLYING BOOK. London: Longmans, Green & Co. 3s. 6d. net.*

It is very evident that there cannot be an adequate "Who's who" in the world of aviation until peace is signed and the records of the gallant pilots of the world's armies become public property. For this reason we prefer to describe this publication in its present arrangement as a singularly compact aeronautical "Enquire within"—one that will particularly appeal to the ever-growing circle of aircraft manufacturers and allied industries.

The information provided regarding the standard machines now under production is naturally limited by the necessity for silence upon war types, but there is much interesting data dealing with machines which may figure prominently in civil life later on. This, however, is by the way. *The Flying Book*, which is one of the publications alive to this certain development in aerial locomotion, is a very attractive book of reference. The numerous silhouette drawings and brief descriptions give the book the nature of a pocket edition of the more expensive "Aircraft of the World," and this alone should recommend the publication to hundreds who though keenly interested in aviation cannot afford a standard work.

Not the least interesting feature of the present issue is a series of chatty summaries on topical subjects. That on "The Aeroplane in War" raises the question whether the aeroplane has created the present trench fighting or whether this peculiar kind of warfare has given the aeroplane what the author is pleased to term "the chance of a lifetime." Leaving this to the judgment of history the writer turns to more concrete matters, and we are informed, amongst other things, that the camera and wireless telegraphy have rendered yeoman service. In the absence of official confirmation on this point we are pleased to have this acknowledgment from an authority on the subject.

# Patent Records

9585. July 3rd. Marconi's Wireless Telegraph Co., Ltd., and H. M. Dowsett and W. Platt. Improvement in electrical interrupters.

9855. July 7th. A. Kowalski. Spark dischargers producing impulse excitation and high-frequency sparks. (Convention application, Switzerland, July 25th, 1916. Patent No. 108,309. *Open to inspection.*)

9897. July 9th. Marconi's Wireless Telegraph Co., Ltd., and V. M. Smart. Improvement in electric buzzers.

9898. July 9th. W. H. Grinsted. Thermionic detectors for alternating currents.

9910. July 9th. J. Bouteille. Sound-generating apparatus. (Convention application, France, July 7th, 1916. Patent No. 107,977. *Open to inspection.*)

10119. July 12th. Messrs. Creed & Co., and N. F. S. Hecht. Means for producing high voltage discharges.

10182. July 13th. A. Kowalski. Blow-out spark discharger for impulse excitation and for high spark frequencies. (Convention application, Switzerland, June 2nd, 1917.)

10211. July 14th. J. G. H. Brookes. Aerial electric dispatch or transmission apparatus.

10525. July 21st. A. E. Ericson. Radio-controlled torpedoes.

10748. July 26th. British Thomson-Houston Co. (*General Electric Co., U.S.A.*) Wireless signalling systems.

10830. July 27th. D. W. Brown. Utilisation of high-frequency oscillations in wireless installations.

11217. August 3rd. A. Garbarini, G. Gautier, and L. Mauclaire. Electric arc lamps with rotary arcs in connection with wireless telegraphy and telephony.

11298. August 4th. F. P. Driver and the Osram-Robertson Lamp Works. Means for supporting electrodes in ionic tubes.

11360. August 7th. Société Francaise Radio-Electrique. Alternate current generator and group converter. (Convention application, France, August 4th, 1916.)

11380. August 8th. M. Santangels. Thermo-electric generators.

11658. August 14th. E. Binnetti. Apparatus for concentration of electric waves in a single direction or upon a fixed point.

11990. August 21st. Akt. Ges. Brown Boveri et Cie. Means for uniform distribution of current to direct current units connected in parallel. (Convention application, Germany, August 21st, 1916.)

12191. August 24th. R. J. Jensen. System of protection of three-phase alternating current system.

12266. August 27th. W. S. Dennett. Electrical condensers.

12421. August 29th. Marconi's Wireless Telegraph Co., Ltd., and C. S. Franklin. Receivers for wireless telegraphy. (No. 12441.) Reflectors for wireless telegraphy and telephony.
(No. 12577, September 1st.) Receivers for wireless signals.

12712. September 5th. P. D. Lucas and the Osram-Robertson Lamp Works. Receivers for wireless telegraphy.

12911. September 8th. Marconi's Wireless Telegraph Co., Ltd., and C. S. Franklin. Wireless telegraph transmitters.

# Questions & Answers

Note.—*This section of the magazine is placed at the disposal of all readers who wish to receive advice and information on matters pertaining to both the technical and non-technical sides of wireless telegraphy. There are no coupons to fill in and no fees of any kind. At the same time readers would greatly facilitate the work of our experts if they would comply with the following rules :* (1) *Questions should be numbered and written on one side of the paper only, and should not exceed four in number.* (2) *Replies should not be expected in the issue immediately following the receipt of queries, as in the present times of difficulty magazines have to go to press much earlier than formerly.* (3) *Queries should be as clear and concise as possible.* (4) *Before sending in their questions readers are advised to search recent numbers to see whether the same queries have not been dealt with before. This will save us needless duplication of answers.* (5) *The Editor cannot undertake to reply to queries by post, even when these are accompanied by a stamped addressed envelope.*

---

"Seniors" (London).—The double twisted gold braid on the cuff of their uniform is worn by Marconi operators who are sailing as officers in charge of wireless installations. The single braid is worn by the assistant operator. Just as soon as the operator takes charge of an installation, he is entitled to wear the double braid, even although he may have only served a few months in the company.

---

E. T. B. (Malta).—Thank you for your complimentary remarks regarding our magazine. The advances in wireless science are such that but for war restrictions and the secrecy which surrounds so much modern research we should publish month by month a steady flow of articles dealing with new instruments and apparatus. We are pleased to know that, in spite of the restrictions imposed upon us, our magazine still makes a strong appeal to the amateur, who has restrictions placed upon *him!*

With regard to your queries, most of the information for which you ask we cannot give, as such details are considered to be of a "constructional" nature. With regard to question 3, as to whether Leclanche cells are suitable to work in the grid and sheath circuits, the answer is yes. It is customary to use small dry cells for this purpose, and as they are merely modifications of the Leclanche cell containing a paste instead of a liquid it is obvious that the Leclanche cell will serve equally well.

---

E. B. (Hornsey).—We cannot give you any particulars regarding any Government wireless station in the United Kingdom, for reasons which will be obvious to you.

---

F. R. (Bickley).—Whether or not the slight defect you mention would debar you from acceptance by the Marconi Company depends upon the verdict of the company's doctor. If, as you say, you can walk and run as well as anybody and the doctor finds that the defect would not hinder any of your activities as a wireless operator, you would, of course, pass.

---

G. R. H. (Liverpool).—(1) The duties of the officer in question are to supervise the equipping and maintenance of wireless apparatus on aeroplanes, airships and those stations on the ground used for receiving and transmitting messages to aircraft. (2) The pay depends, of course, upon the military rank, and, obviously, a major would receive more pay than a second lieutenant.

---

E. P. (Belfast) does not give his full postal address, and therefore is liable to have his letter ignored. However, the question he asks is frequently put to us, and we would like this opportunity of making the matter clear. Briefly, our correspondent asks whether after the war a large number of the operators will be dismissed from the Marconi Company's service as being no longer required. The answer is most emphatically no. The present demand for wireless operators is not merely a war-time demand for war-time work. Men are required to take up positions on all the new ships being built and on the numerous smaller vessels already built, but not previously equipped with wireless telegraphy. The present boom in shipbuilding is, of course, likely to continue for some while, and merchant ships now fitted with wireless telegraph installations will naturally retain them after the war, and therefore the operators will still be required. Our correspondent can rest assured that if he joins the wireless service of the Marconi Company his position will be permanent, provided his conduct remains satisfactory. In other words, to use a well-known American phrase, "It's up to him."

---

J. H. (Malta) gives neither his name or address, and therefore we cannot answer his questions.

C. H. S. (Trowbridge) asks (1) What is the pay and dress of a wireless operator in the Navy and mercantile marine respectively? (2) Could he take charge of a wireless plant on a battleship if he could manage the 1½ kw. set? (3) In which branch is there the best chance of rapid promotion—Navy, mercantile marine, R.F.C., or R.E.? (4) How could he obtain a position in a land station? (1) An illustrated article dealing with the pay and uniform of wireless operators in the Navy appears in our issue for October, 1916, to which we would refer our correspondent. The pay of the Marconi Company's operators in the mercantile marine commences at 25s. per week (board and lodgings on board ship being provided free), and is increased to 30s. per week as soon as the operator takes charge of an installation, which may take place in a very few months. Annual increases are given up to a maximum of £3, and additional allowances are made when the man is employed on shore. Full particulars regarding the pay and prospects of wireless operators can be obtained by application to the Traffic Manager, The Marconi International Marine Communication Company, Limited, Marconi House, Strand, W.C.2. The uniform is well illustrated in our advertising columns. (2) A good knowledge of the 1½ kw. set is not in itself sufficient to enable a man to take charge of a wireless plant on a battleship. Installations on H.M. vessels vary considerably, some being of very high power and of a complicated nature. Before a man can take charge of a wireless installation on board a battleship he has to pass a certain examination set by the Admiralty. (3) This is a question which cannot be answered in a few words Everything depends upon the man and his particular abilities. Men have gained rapid promotion in all of these services, but whether a particular individual would rise quicker in the Navy than in, say, the R.F.C. cannot even be guessed at without a personal knowledge of the man. (4) Operators on land stations controlled by the Marconi Company are chosen for their special qualifications. On big power stations the operators have to be highly expert telegraphists able to handle heavy traffic for considerable periods on end, competent to work Wheatstone apparatus, to punch "slip," and carry out other special duty. Frequently the operating room is several miles from the actual transmitting apparatus and such operators are not required to take full charge of the wireless apparatus, which is under the control of an engineer. On the other hand, low power stations resemble installations on board ship, and for these posts it is usual to appoint men who have had experience at sea. In any case the chances of a young man without wireless or other telegraph experience obtaining an appointment to a land station are remote.

---

S. A. D. (Kensington).—(1) Consult our advertising columns. You will see that there is a wireless school very near you where evening classes can be obtained. We cannot undertake to recommend individual schools not under the control of the Marconi Company. (2) The Marconi Company are not now conducting evening classes for boys unable to attend the day school.

---

W. K. (Newcastle-on-Tyne).—We understand that a school of wireless telegraphy is being opened by the educational authorities in Dublin at the Kevin Street Technical School. Apply to the Headmaster, Kevin Street Technical School, 18, Rutland Square, Dublin, for particulars. (2) The Marconi Company have no office in Dublin. The answer to both parts of question 3 is yes. (4) A practical knowledge of wiring and armature winding is certainly useful to a wireless operator, for it enables him to understand better the construction of the converters and motor generation used. Such a knowledge should facilitate his promotion to the rank of inspector.

---

A. B. C. (Liscard).—Thank you for the information contained in the first part of your letter. In answer to your first question a wireless operator would not be allowed to take a dog on board. In these circumstances your second question does not need a reply.

---

H. W. J. (Sydney) can have his questions answered if he sends his full name and address.

---

**THIS MAGAZINE CAN BE SENT FREE TO OUR TROOPS ABROAD BY LEAVING IT AT A POST OFFICE.**