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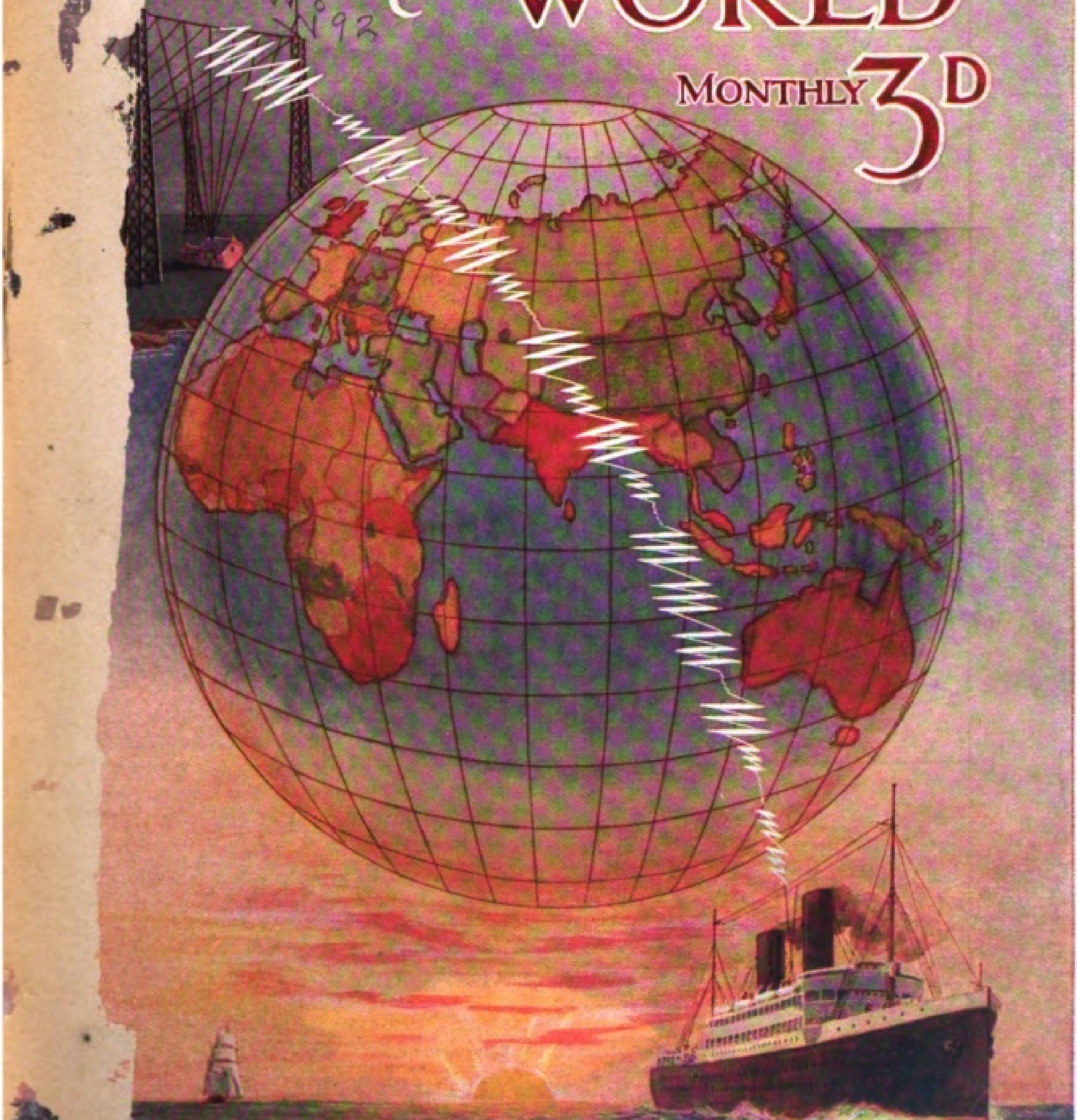
# WIRELESS WORLD

MONTHLY 3D





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**The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.**

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THE WIRELESS WORLD

Vol. 2.—No. 14. (New Series) May, 1914. Subscription 5/0 per annum post free. Price 3d. Post Free 5d.

# Sparks in Ship's Rigging

A *DAILY NEWS* correspondent is alarmed by the "frequency of sparking in the rigging" which he states that he noticed on board the vessel in which he made a voyage recently, and he suggests that "here is a matter of some importance to shipowners and others, which would repay investigation." It is as well to state at once that the matter complained of has been thoroughly investigated and the danger found to be practically non-existent. In April, 1912, at the instance of a firm of shipowners, the Marconi Company carried out exhaustive experiments with the view of ascertaining whether there was any actual danger in the presence on board oil ships of sparks arising out of the use of the wireless plant. A quantity of naphtha was placed in a saucer and lodged as near as possible to a heavy spark, and a piece of waste saturated with naphtha was also placed close to the spark electrodes, but in neither case was the vapour ignited by the spark. A similar test was applied to the small sparks which obtain at minor parts of the apparatus, but it was not until a continuous spark was allowed for a very long period (which would not occur in actual practice) that the naphtha was eventually ignited.

The tests—which were all the more important as naphtha is one of the most inflammable cargoes carried—convinced the officials who carried them out—the superintending engineer of the shipping company and a representative of the Marconi Company—that fumes of naphtha would never be sufficiently dense inside the wireless cabin to permit of ignition. Outside the rigging this would be even more obvious.

Notwithstanding these tests, the Marconi Company have, at the request of some shipowners, enclosed the sparks, which are a necessary part of the transmitting apparatus, either in glass tubes or with a covering of gauze.

The sparks which may occur outside the wireless cabin in the rigging, when they do occur, are produced by induction, and have such a small heat value as to convince us that they would be totally incapable of igniting gas, even if it were possible for gas to accumulate in the open air in the neighbourhood of a spark. For the same reason, we do not think these sparks could ignite the driest inflammable material.

It may be suggested that sparks might occur within the ship itself, but this has never been noticed, and, in fact, with the comparatively small power which is used in the wireless installations on merchant vessels, the possibility of any spark within the ship itself is difficult to conceive, as the holds would be screened by the metal plating of the ship from any induction effect produced by the transmitting apparatus.

In discussing the foregoing we deal with the high potential and high frequency portion of the wireless apparatus. There is also to be considered the low voltage circuit which supplies the transmitting apparatus with electric current from the ship's dynamo. All wiring, however, in connection with this is identical in every way to wiring carried out for electric lighting and motive power, so that no greater risk from fire arises, as far as the low voltage portion is concerned, than it does out of the use on board of electric lamps and motors.

MR. S. M. EISENSTEIN

# Personalities in the Wireless World

## MR. S. M. EISENSTEIN.

***Director of the Russian Company of Wireless Telegraphs and Telephones.***

THERE are few Russians who have not heard of Mr. S. M. Eisenstein, but his name is not so well known in England, therefore this short account of his life and work should be of interest to our readers.

Mr. Eisenstein was born in Kief, and here his early life was passed, for at Kief University he found adequate pabulum for the demands of his extraordinary mentality. Then to complete his studies he went to the University of Berlin and afterwards to the Charlottenburg Polytechnic.

It was in the year 1900 that Mr. Eisenstein commenced working at wireless telegraphy, but it was not until 1904 that he obtained his preliminary wireless patent and established a private experimental laboratory in his native town. He did not at first attach much value to his experiments and merely considered his invention from the standpoint of a hobby, but he was soon to find that even if he himself had so modest a consideration of his achievements, other people could esteem his discovery at its true value. It happened in this way. The present Minister of War, General Soukomlinoff, at that time commanding the troops of the Kief division, was one day in conversation with a certain gentleman who remarked casually that a young friend of his was attempting to telegraph without wires. General Soukomlinoff immediately became interested, nor rested till he had tracked down Mr. Eisenstein, and, through the intermediary of friends, persuaded him to carry out his experiments on a larger scale. Not only did he make the suggestion but he prevailed on the War Office to provide the young scientist with sites for the erection of stations, so that communication could be established over 150 miles. The War Office were as enterprising as their chief; they not only granted what was required of them, but gave every assistance possible, and, further, appointed a special commission, of which the Grand Duke Peter Nikolaevitch was President, to watch results. They were in every way satisfactory, and eventually the War Office purchased the experimental stations. Nevertheless, great as his success had been, Mr. Eisenstein was not content to rest on his laurels, but continued to make improvements, even as late as 1907. Meanwhile, Mr. Eisenstein had been approached by the War Office to undertake the construction of further military stations, and other departments of Russia's Government followed their example, so that in the year 1907 it was found necessary to form a company, and headquarters were removed from Kief to St. Petersburg.

At first two or three small workshops did duty for office and factory, but within only a few months these proved entirely inadequate for the increase in staff which the increasing business necessitated; therefore, a large factory was built, which is to-day the factory of the Russian Company of Wireless Telegraphs and Telephones. Not only was the young company successful in satisfying the Government, but soon convinced the Ministry of Trade and Commerce that the manufacture of wireless apparatus was destined to be an important industry and one to be placed on a proper commercial basis. The result was that regulations were issued by the Ministry forbidding the placing of orders for wireless apparatus abroad.

In 1911 occurred the most important event which has yet been recorded, or indeed, is likely to be recorded, in the annals of the company. Already negotiations had been opened with the Marconi Company with a view to coalition. The result was that the Russian Company of Telegraphs and Telephones acquired a wider interest in the affairs of wireless telegraphy, under practically the same organisation as before, with Mr. Eisenstein as Director and Principal Technical Adviser to the Company.

Latterly Mr. Eisenstein has added to his labours by taking up the editorship of the only existing wireless journal printed in the Russian language. Nothing as regards Mr. Eisenstein's brilliant attainments, but only this personal touch: He is a man who inspires trust, as "straight as a die," and this, combined with a great geniality, has made him hosts of friends.

# New Methods for the Production of Continuous Electric Oscillations and for their Utilisation in Radio-Telegraphy*

By G. MARCONI.

IT may be said that from its beginning up to the present time practical radio-telegraphy has depended upon the utilisation of discontinuous electric oscillations; that is, of successive groups of oscillations of unequal amplitude produced by the discharge of a condenser or Leyden jar.

As is well known, electric oscillations produced by the discharge of a condenser were first investigated by Henry and Lord Kelvin, afterwards studied mathematically by Clerk Maxwell, and finally verified experimentally by Hertz.

It is now well known that if two conductors at different potential be electrically connected together by means of a spark, if the resistance of the circuit be not too high, the potentials of the conductors only reach equality after a greater or lesser number of electrical oscillations. As a consequence of this the conductors become for a short time the seat of an alternating current which may be of extremely high frequency.

If one of the conductors be the earth and the other a vertical wire, we have the essential features of the system with which, in 1895, I initiated my experiments in wireless telegraphy. Successive improvements have increased the reliability and range of the apparatus. This is well shown by the development of wireless telegraphy which resulted from the syntonic coupling of the antenna to an oscillating circuit, as first described in my English patent of April,

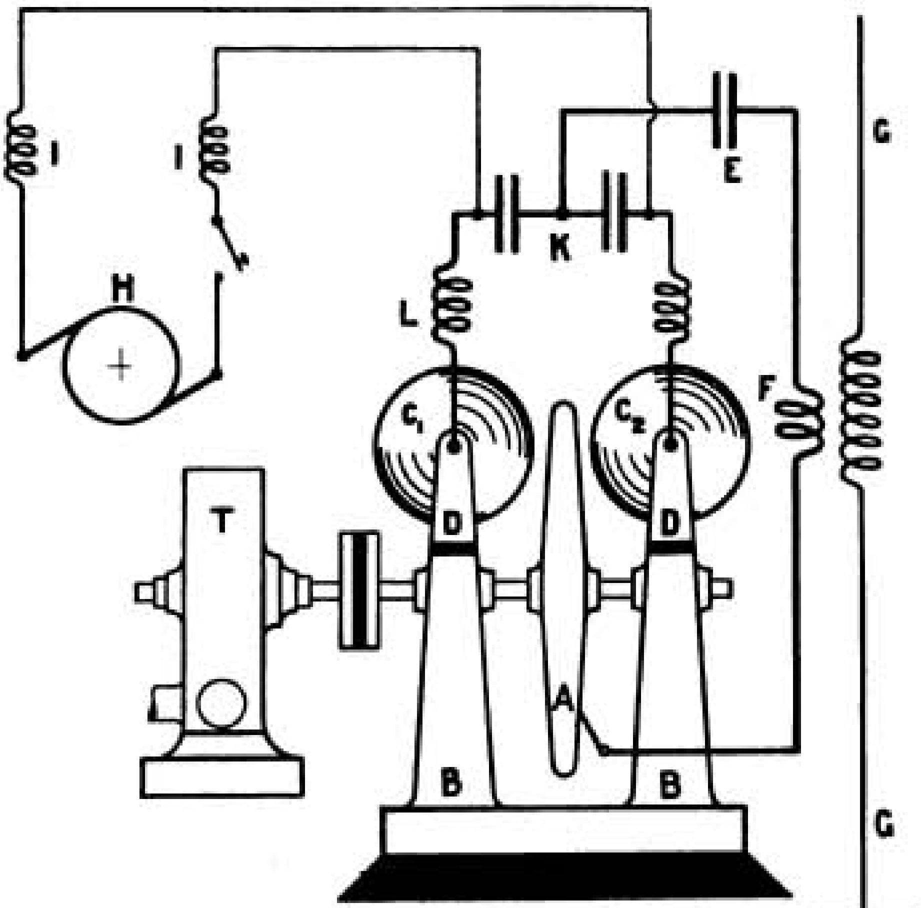



*Fig. 1.*

* Translation of a Communication made to the R. Accademia dei Lincei in Rome, on March 1st, 1914

1900, and in the lecture which I delivered before the London Society of Arts on May 15th, 1901.

The damping or decrement of the oscillations generated in the way I have referred to, and the interval of time separating the consecutive groups of oscillations (an interval necessitated by the relatively long time required to change the condensers) present certain difficulties in regard to wireless telegraphy, and still greater difficulties in the case of wireless telephony. For this reason many workers in this branch of science have been seeking a method for the production and radiation of continuous oscillations.

There are two fairly well-known methods for the production of continuous waves. One is the so-called "Duddell Musical Arc," perfected by Poulsen; the other, the high frequency alternator typified in the Goldschmidt machine.

It is not my present intention to examine these two systems in detail, but I shall only say that certain difficulties in working which have so far been an obstacle to their practical application exist in both systems.

The first arrangement by which I succeeded in producing continuous oscillations is described in my English patent of April 11th, 1907 (Fig. 1). It consists of an insulated metallic disc, A, which is rotated at a very great velocity by means of a turbine or electric motor. Adjacent to the periphery of this main disc are placed two other discs, $C_1$ and $C_2$, which are also rotated at a high rate of speed. These I will call side discs.

The two side discs are connected by means of brushes to the outside plates of two condensers, K, connected in series, and these condensers are in turn connected through resistances and inductances to the terminals of a high potential continuous current dynamo, H, or else to a high potential battery.

The main disc is connected to the inside plates of the two condensers, and forms part of an oscillating circuit consisting of the condenser, E, in series with the inductance, F, the latter being connected either directly or inductively to the aerial wire, G.

When the condensers are charged from a generator or a dynamo of sufficiently high potential, an electric discharge occurs between the side discs and the main disc (this discharge being neither a spark nor an ordinary arc), and continuous electric oscillations are produced in the circuit, of a frequency depending upon the inductance and capacity of the circuit itself.

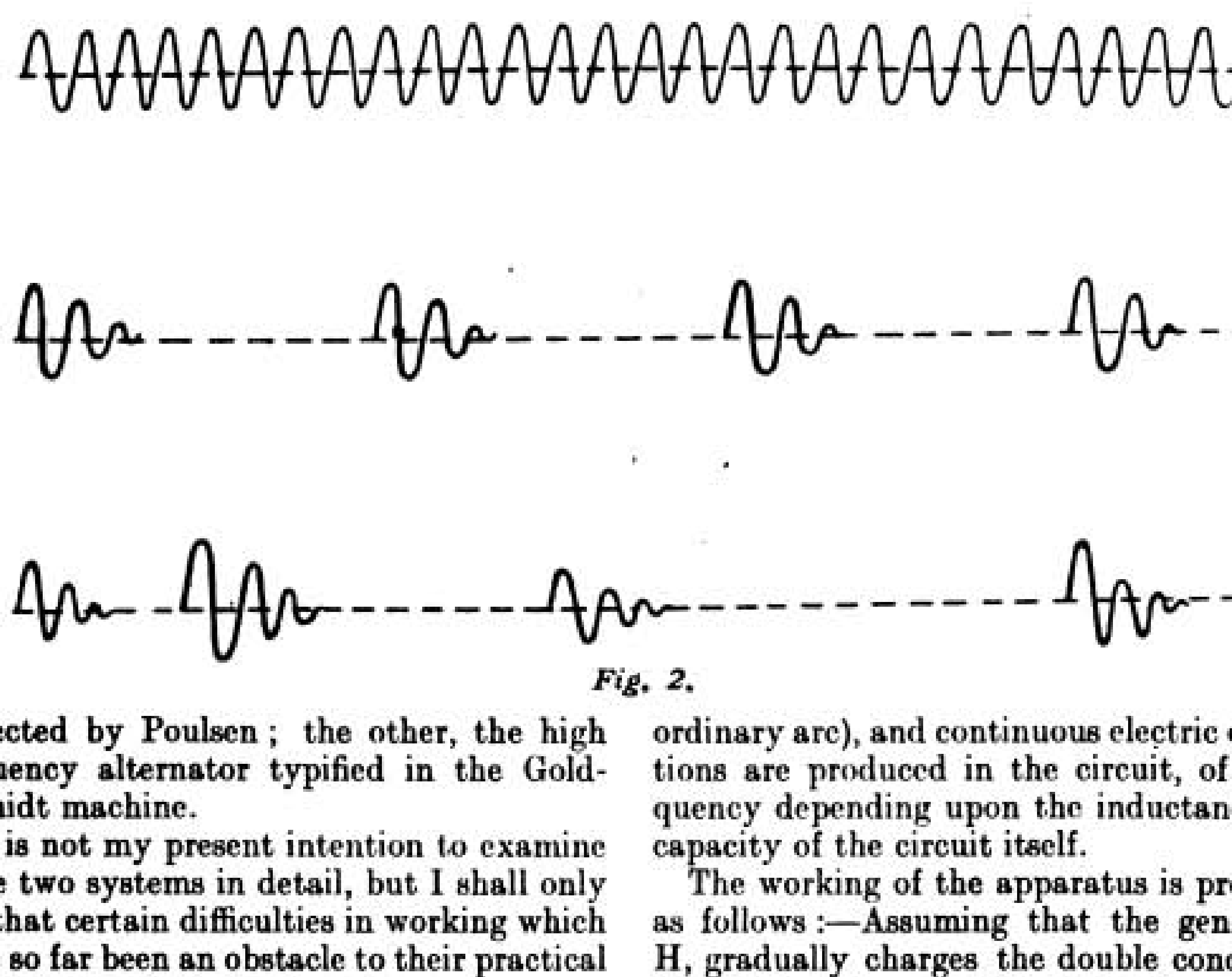


*Fig. 2.*

The working of the apparatus is probably as follows:—Assuming that the generator, H, gradually charges the double condenser, K, and that the potential at the discs, $C_1$ and $C_2$, becomes, say, positive at $C_1$ and negative at $C_2$, then at a certain instant this potential causes a discharge across one of the small gaps, suppose the one between $C_2$ and the main disc, A. This discharge will in turn produce an oscillation through the inductance, F, and the condenser, E, and this oscillation, on reversing, will naturally pass from the main disc, A, to the disc, $C_1$, the latter being already charged to an opposite potential. The charge of the condenser, E, will again reverse, acquiring energy at each reversal from the condensers, K, which are kept charged by the generator, H.

This cycle can continue indefinitely; the losses which take place in the oscillating or radiating circuits being replaced by the generator, H.

If the main disc is stationary, an ordinary arc at once occurs across the gaps between the discs without any oscillations being produced.

This system has so far proved practicable for small powers, but has the disadvantage of not being quite reliable.

Another arrangement of mine for the production of continuous oscillations which is now being used for Transatlantic work, and with which unlimited power can be employed, is based on the principle of causing successive

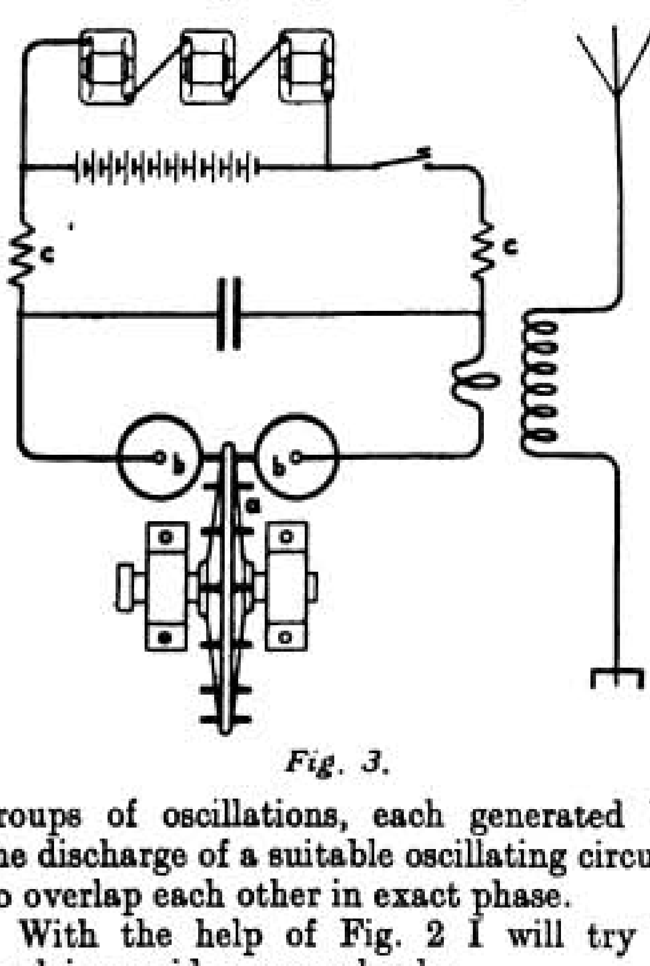


*Fig. 3.*

groups of oscillations, each generated by the discharge of a suitable oscillating circuit, to overlap each other in exact phase.

With the help of Fig. 2 I will try to explain my idea more clearly.

In the third line of this figure are shown groups of damped oscillations occurring at irregular intervals: in the second line are shown more frequent groups of oscillations occurring at equal intervals; and in the first line are shown continuous oscillations.

In the third line we have the condition which existed in the old spark systems, where the groups of oscillations followed each other at irregular intervals.

The close and regular groups of oscillations, which represent a very great step in the art of wireless telegraphy, are obtained by the employment of the apparatus illustrated in Fig. 3, which consists of an insulated metallic disc, *a*, having metallic studs fixed at regular intervals on its periphery, perpendicular to the plane of the disc. This disc is rotated at a high velocity between two other discs, *b b*, by means of a suitable motor. The studs of the central disc are of such length as almost to touch the two side discs, thus closing the circuit at regular intervals. This sudden closing of the circuit greatly diminishes the resistance of the spark, with a corresponding diminution in the damping of the wave; while the opening of the circuit, as soon as the studs of the central discs have passed the peripheries of the side discs, *b b*, stops any oscillations which may still exist in the condenser circuit. In this way, given a proper value of coupling between the condenser and radiator circuits, the energy of the condenser circuit passes entirely to the radiator without the occurrence of the usual reaction between the coupled circuits.

The advantage of this system lies in the radiation of regular groups of electric oscillations, the intervals between the groups being such as to produce in the receiver or in the telephone of the receiving apparatus a musical note which is easily distinguishable from the sounds and noises produced by the disturbances caused by atmospheric electricity.

The system of discontinuous waves to which I just now referred is that at present used in all the high-power stations erected by the Marconi Company.

My idea in adopting the arrangements which I will now describe was to obtain groups of oscillations so close together and in such exact phase that their combined effect on a resonant circuit should be to induce and maintain a high-frequency alternating current.

The system of continuous waves to which I now refer is based on the cumulative effect of a series of discharges, having the same period and in phase, acting inductively on a common radiator.

In fact, if we carefully consider the system shown in the second line of Fig. 2, it is clear that, if it were possible to bring the various groups of oscillations sufficiently close to gether, a continuous oscillation could be obtained; in the ordinary apparatus, however, two difficulties arise. The first difficulty is caused by the time required to charge the condenser, it being obvious that the condenser cannot be charged and discharged at the same time; and the second difficulty is due to the fact that the successive groups of oscillations must be in phase with each other as well as with the oscillations in the radiator.

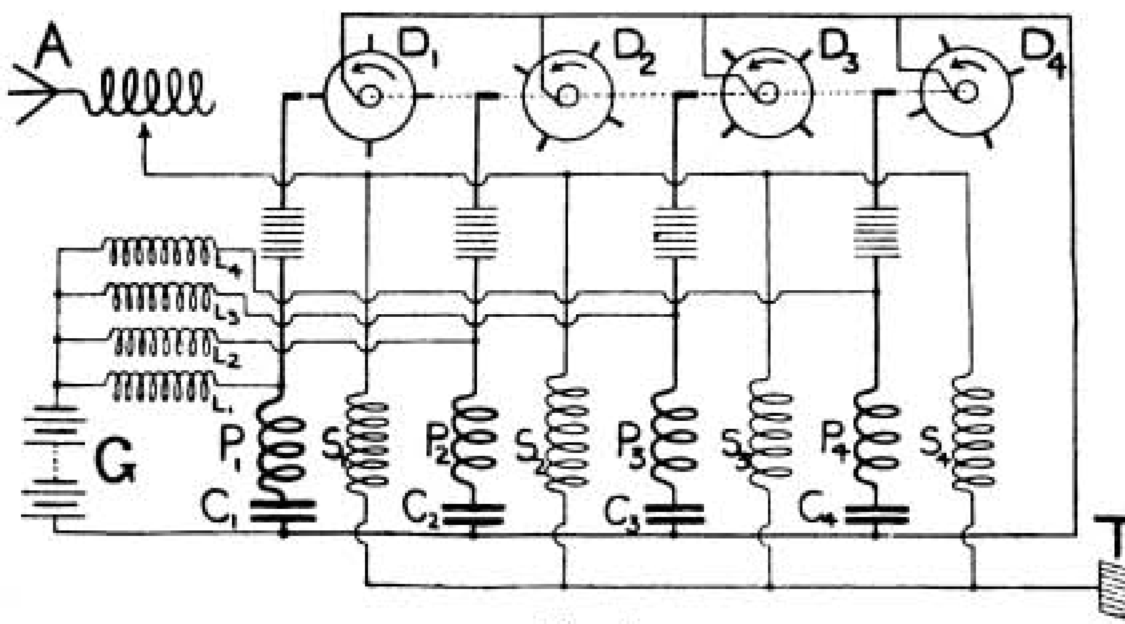



*Fig. 4.*

Attempts to obtain rapidly succeeding groups, but without reference to their phase, have already been made by various workers in this field.

I believe that I have solved the problem by the use of the apparatus which I will describe with the aid of Fig. 4.

In this system are employed a number of oscillating circuits, 1, 2, 3, 4, charged from the same source of energy through respective inductances. Each discharge circuit includes a toothed metallic wheel, $D_1$, $D_2$, $D_3$, $D_4$, a condenser, and an inductance coupled to the radiator or to an intermediate circuit which in this case is inductively connected to the radiator.

The toothed wheels are insulated from each other, but rigidly mounted on the same shaft, and so fixed that the condensers discharge and recharge in succession at regular intervals one after the other; so that at a given velocity the interval between the beginning of the discharge of one condenser and the beginning of the discharge of the next condenser is equal to the period of oscillation of the aerial or intermediate circuit, or else it may be an exact multiple of the said period of oscillation.

To make certain that the beginning of each discharge occur at precisely the right moment, the discharge circuit is provided with an auxiliary spark which is timed by means of another disc (omitted from the diagram); this spark is of a greater potential than the main discharge, and is obtained by means of small auxiliary condensers.

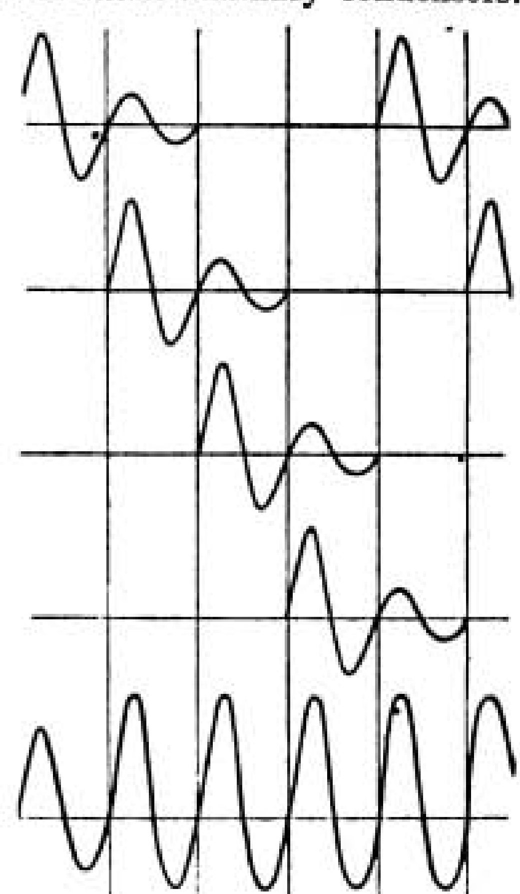


*Fig. 5.*

The final effect of this system is shown in Fig. 5, where the oscillations produced in rotation by the four circuits and the resulting continuous oscillation induced in the aerial are indicated.

In regard to this system for the production of continuous waves, the Technical Committee appointed by the British Government to report on the merits of the existing systems of long-distance radio-telegraphy, and especially upon their capability for continuous communication over distances of 2,000 miles, stated in their official report, dated the 30th April, 1913, that my system—the system described above—was the only one which they had seen in successful operation over long distances.

It might be thought that the greatest velocity hitherto obtainable with revolving discs could not allow of a sufficiently high frequency for radio-telegraphic purposes; but this difficulty does not occur with stations working over distances of 4,000 kilometres or more, in which oscillations of a frequency higher than 50,000 periods cannot be usefully employed.

As long as it was considered necessary to employ waves of hundreds of thousands of periods such as are produced by the discharge of ordinary condensers, it seemed hopeless to attempt to construct alternators or other machines capable of producing oscillations of so high a frequency.

Ten years ago it was generally thought that frequencies at least as high as 100,000 periods per second were necessary for radiotelegraphy. The experience which I have obtained in long-distance transmission has shown me that frequencies above 40,000 periods are considerably less effective than are lower frequencies. I have also noticed that, using the same amount of energy in each case, waves ten or more kilometres in length are propagated at considerably greater distances than are waves of one kilometre or less. This discovery has greatly facilitated and encouraged the investigation and construction of high-frequency alternators, as well as the study of the other methods to which I have already referred.

In order better to illustrate the principle by which I have been able to join consecutively in phase a series of groups of oscillations so as to produce continuous oscillations, I will make a practical experiment, which I will explain with the assistance of the diagram shown in Fig. 6.

I cannot, however, show here an arrangement working in exactly the same way as that which I have already described, because no high potential continuous current is available.

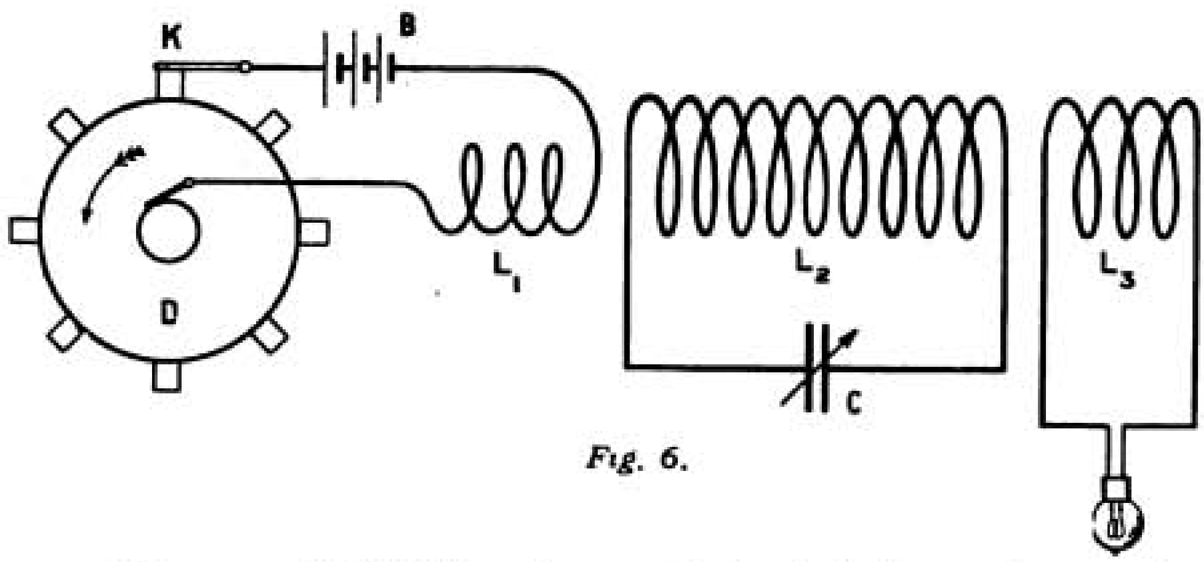



*Fig. 6.*

Instead of the condensers charged to a high potential, I have here an inductance, $L_1$, charged, if I may use the word, with a current furnished by a battery, B.

When the brush, K, makes contact with one tooth of the disc, D, a current passes through $L_1$, and when the contact is broken by the rotation of the disc the energy of the magnetic field of $L_1$ is inductively transferred to the circuit, $L_2C$, causing the circuit, $L_2C$, to commence oscillating with the frequency of its own electrical period. If the velocity of the toothed disc, D, be so arranged that successive teeth make and break contact with the brush, K, in such a way that each group of oscillations be in phase with the preceding group of oscillations, then all these groups of oscillations, if sufficiently close, will act so as to add their effects together, producing continuous oscillations in the circuit, $L_2C$.

It is evident that the production of continuous oscillations can only occur when the velocity of the disc is such that all the oscillations produced in the circuit, $L_2C$, are in phase; otherwise the different groups of oscillations would tend to interfere with and neutralise each other.

We shall now see how a lamp can be lighted by means of the oscillations induced in the circuit, $L_2C$, when such oscillations are in phase.

From this experiment it can also be seen: (1) That maximum and minimum values of current are obtained by varying the capacity of the condenser, C, within given limits—that is, by adjusting the electric period of the circuit while the velocity of the disc is kept constant; (2) further, that maximum and minimum values of current are obtained when the period of the circuit is kept constant while the velocity of the disc is varied within given limits.

[*Experiment made here.*]

The use which is now beginning to be made of continuous waves is not really owing, as some people seem to think, to special properties possessed by these waves whereby they ought to cover great distances with less expenditure of energy than that required by discontinuous waves, but is rather due to the desire to obtain in the receivers better syntonic effects which would, firstly, reduce to a minimum the disturbances caused by atmospheric electricity; and, secondly, make it possible for a greater number of neighbouring stations to work without interference.

In regard to the elimination of atmospheric disturbances, I have found in practice that accurate tuning and loose coupling between the circuits of the receiver do very little towards diminishing the objectionable effects of these disturbances.

Electric waves due to nature, of which at present we have really very little knowledge, have the property of electrically impulsing the aerial systems of receivers, causing them to vibrate electrically to their own natural period, which is necessarily that of the wave which it is desired to receive.

The disturbing effect of these natural waves—commonly called X's by wireless operators—rapidly increases in intensity as the receiver is tuned to longer waves. In this may probably be found the explanation of the fact that long waves traverse great distances with smaller losses than do short waves.

The effect obtained in practice by weakening the coupling of the receivers is to cut down the signals in about the same proportion as the X's, and consequently little advantage is obtained thereby. Nevertheless, there is some difference between the waves produced by atmospheric discharges and those utilised for the transmission of radio-telegraphic signals; this difference allows the objectionable effects of the disturbing waves to be eliminated—at any rate, to some extent.

With discontinuous waves such as those produced by the disc system shown in Fig. 3, the succession of groups of waves produces in the telephone of the receiver a characteristic musical note, which is easily distinguishable from the sounds produced by atmospheric disturbances. The ability to produce a clear and characteristic sound is of extreme importance, and I have not yet found any system which will give such reliable results as those in which a musical note is used.

The so-called X's generally consist of an electric impulse or of a short irregular succession of electrical impulses producing an instantaneous inductive effect, often of considerable intensity.

The sounds produced in the telephone of the receiver by the musical spark are caused by a very large number of small impulses following each other at short and regular intervals.

Modern receivers are so constructed as to take advantage of this difference between X's and signals; thus the objectionable effects of atmospheric disturbances are to a great extent eliminated.

In Fig. 7 is shown the receiver which has been used for more than two years in the Transatlantic stations. Here P is the primary of an oscillation transformer connected to the receiving aerial, and S is the secondary.

Nos. 1 and 2 are two sensitive crystals or Fleming valves, with their corresponding potentiometers, each adjusted for maximum sensitiveness, while the other is disconnected from the circuit, so that when both are connected together they produce opposite effects, and do not allow the passage of either signals or X's. It is then found that if the potentiometer, $P_2$, be adjusted so that the opposing E.M.F. produced by $P_2$ is only just sufficient to leave the crystal No. 2 in a non-conductive state while signals are being received, then the received oscillations will be efficiently detected by crystal No. 1, while the disturbances or signals of greater intensity will make the impulses of current from crystal No. 2 oppose those from crystal No. 1.

By making the resistance of No. 2 a little less than that of No. 1 even better results can be obtained.

Experience acquired in the use of continuous waves, especially when using auxiliary sparks, has suggested a new method of reception, which has been developed by Mr. H. J. Round. This method has been successfully employed for very long distances; it offers the advantage of using the principles employed for the reception of continuous waves, and of producing in the receiver a characteristic note dependent on the period of oscillation of the transmitted waves. The arrangement employed is simply a modification of my receiver which I have already described. The system of two opposing detectors which I invented is used with this arrangement.

These detectors are arranged so as to oppose their effects, but also in such manner that each can only receive signals if the latter be very strong. The crystals or detectors are then acted upon by a buzzer in a circuit, B, which emits a very short wave, with the result that for very short intervals of time the crystals become conductors.

In this way the energy stored up in the circuit, SK, is freed for very short intervals. It follows that if the groups of waves produced by the buzzer have a period slightly different from a sub-multiple of the period of the received waves, then the signals are received as a clear musical note.

In this manner, if the frequency of the received wave be 50,000 periods and the buzzer produce 4,900 groups per second, a discharge will take place through the telephone every ten oscillations. These discharges are stronger or weaker according as the short-wave groups coincide with the points maximum or minimum potential of the wave which is being received. The cumulative effect of these discharges produces a note of 1000 per second.

This method of reception is somewhat analogous to my system for the production of continuous waves which I have already described.

In my view, methods for the reception of continuous waves are now at the commencement of their development, and open up a new and large experimental field which promises to play a prominent part in the progress of wireless telegraphy and wireless telephony.

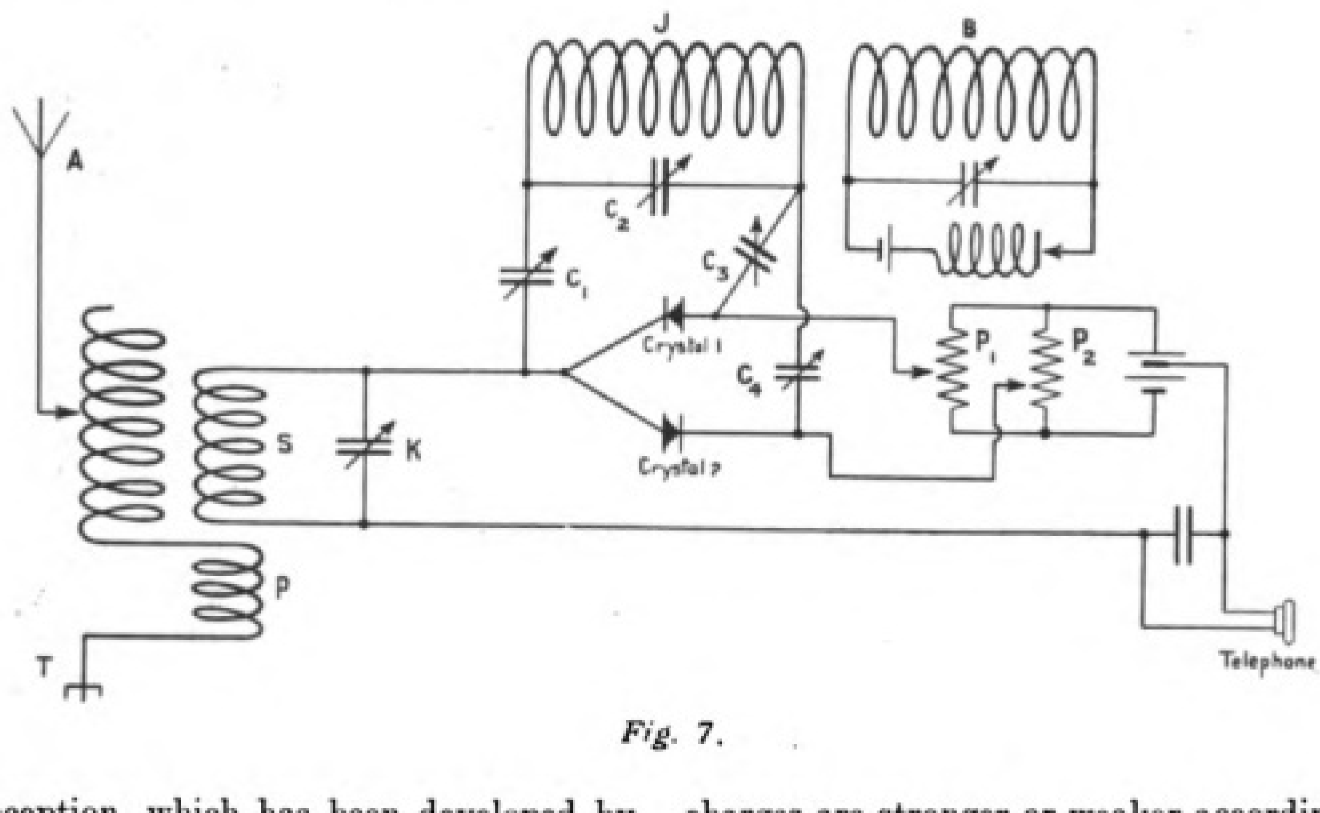



*Fig. 7.*

# Romance of the Telephone

## *Forecast of Wireless Achievement*

DR. J. A. FLEMING, lecturing on "Improvements in Long-Distance Telephony" at the Royal Institution on March 27th, called attention to some of the great advances made of late years both in the scientific theory and in the practical appliances of telephony.

With regard to wireless telephony, Dr. Fleming said:

"The treatment of this subject demands a lecture in itself and not merely a few concluding sentences at the end of one. Suffice it to say that telephony conducted without interconnecting wires has been achieved over distances of several hundred miles as an experimental feat, but cannot yet be said to have entered into the field of practical everyday service. A brief outline of the method is as follows:—

"At the transmitting station we establish all the arrangements now used for producing continuous long electric waves of rather less than ten miles in wave length, and preferably about four or five miles. These waves are radiated from an antenna wire and must be perfectly continuous; that is, emitted without break or interruption; or at least, if they are produced by spark discharges, the spark frequency must be above 20,000 per second. At the receiving station there are the usual arrangements for receiving by telephone signals as in radio-telegraphy.

"The only difference is that at the sending station in the base of the antenna is inserted a microphone of such current-carrying capacity as to bear 5 or 20 ampères or more passing through it. This microphone varies the resistance in the antenna circuit when speech is made to it. This in turn causes a fluctuation in the amplitude of the stream of continuous electric waves being emitted. It, so to speak, makes waves on waves, and at the receiving station the telephone is influenced by these secondary and slower modûlations of wave amplitudes.

"The frequency of the steady stream of waves emitted by the sending station must be such that it is above the limits of audition; that is, more than 20,000 per second, and preferably about 40,000. An unbroken wave-train of this frequency cannot affect the telephone directly. If, however, the amplitude of the electric waves radiated is varied in accordance with the lower frequency of speech, these undulations of amplitude in the high-frequency wave do affect the telephone in the receiver, and the speech, altered to the transmitting microphone, is heard.

"The continuous wave-train can be produced either by a high-frequency alternator, such as that of Goldschmidt, or by the continuous wave disc generator of Mr. Marconi, or by some form of Poulsen or Moretti arc generator.

"The chief difficulty is that of constructing a microphone which shall be able to carry the large oscillatory currents which flow up and down the antenna.

"Professor Majorana and Professor Vanni in Italy have devised ingenious liquid microphones. A multiple carbon microphone is commonly used, and Dubilier has devised a water-cooled arrangement called a relay microphone.

"The Vanni microphone is constructed as follows: A jet of water, which may be made slightly conducting by the addition of acids or salts, emerges from an ebonite mouthpiece and falls between two inclined metal plates. One of these plates is fixed and the other is connected to the diaphragm of a telephone. The liquid falls on to one plate and bounces off on to the other and makes an electrical connection between them. The movement of the diaphragm sets up oscillations in the liquid column and also varies the distance between the plates, and therefore alters the thickness of the connecting film of liquid, and hence its electrical resistance. If one of these plates is connected to a transmitting antenna and the other to the earth we have the means of varying the resistance in the antenna circuit, and hence the amplitude of the emitted electric waves, so as to modulate them in accordance with the waveform of the speaking voice.

"At the receiving end the arrangements are not different from those used in wireless telegraphy for telephonic reception. The receiving antenna is coupled to a condenser circuit which has in it a crystal or valve receiver and a telephone.

"The valve rectifies the continuous waves, but the uniform current produced does not *per se* affect the telephone If, however, modulations of amplitude are produced by speaking to the transmitter at the sending station, the receiving telephone is affected by these variations of amplitude and responds only to the waves on the waves or variations in the amplitude of the continuous waves. The receiving operator then hears the words uttered to the distant transmitter.

"The limiting factor is therefore the current-carrying power of the speaking microphone or transmitter.

"Time will not permit of reference to the details of all the experiments on this subject made by Fessenden and others in the United States; Poulsen in Denmark; Ruhmer, Goldschmidt, and the Telefunken Company in Germany; Colin and Jeance in France; Marconi, Majorana, and Vanni in Italy; and Ditcham in England. Suffice it to say that this lineless telephony has been successfully conducted up to 500 or 600 miles distance.

"The chief difficulty in obtaining greater ranges is that of constructing a voice-varied resistance, or so-called microphone transmitter, which shall be able to carry large currents up to 50 or 100 ampères and vary these currents faithfully in accordance with the waveform of the speaking voice.

"Wireless telephony across the Atlantic will be possible when we are able to modulate power to the extent of 100 or 150 kilowatts.

"A very promising method of varying the amplitude of the emitted waves appears to be by the insertion of a speaking microphone in the exciting circuit of a high-frequency alternator such as that of Goldschmidt. It will be thus possible to modulate in accordance with the waveform of articulate speech a large antenna current without actually passing that current through any form of microphone. The modulated current is then merely a small current of a few ampères.

"Summing up the position, we can say that lineless telephony up to 500 or 600 miles is now possible, and there appears to be no insuperable obstacle to prevent it from being conducted across the Atlantic Ocean. If this were ever done, and the New York to San Francisco line telephony accomplished, it might be possible with one repetition of a message to speak articulately from London to places in California. Long before this is achieved, however, wireless telephony will doubtless have come into use for moderate distances between ships and ship and shore. Mr. Marconi has recently directed much attention to this subject with the object of improving the speech transmission and simplifying the apparatus. He has invented for this purpose new and effective transmitters and receivers and conducted demonstrations between ships of the Italian Navy.*

"It would be an advantage to possess a simple and easily worked form of wireless telephone apparatus that could be installed on ships for intercommunication, so that ships' officers and others who have not had the special training necessary to read Morse signals by ear could on necessity communicate with distant vessels by actual speech and call for help in the hour of need.

"From this brief statement on a small portion of this subject it will be seen that we have by no means come to the end of invention in connection with telephony.

"Achievement has been great since Alexander Graham Bell gave us, thirty-eight years ago, the exquisitely simple receiver which bears his name and at once made possible commercial telephony, when coupled with the invention of the microphone and carbon transmitter made by Hughes and Edison and other great pioneers.

"Let no one, however, think that the field is exhausted. The chief problems have been solved, but those who come to the task with adequate powers of scientific investigation or original invention still find in the various departments of practical telephony an abundant opportunity to enlarge our knowledge or improve a means of communication which, even if it contributes at times to test our patience, has yet become so essential to our modern life."

* See WIRELESS WORLD, April, 1914, p. 35.

# An Outpost of Empire

*The Marconi Station on the Falkland Islands—the most Southerly Colony of the British Empire—has already performed good work. Here one of the Operators is shown indulging in a favourite pastime—Penguin Shooting.*

NOT many people know where the Falkland Islands are. You have Scotch blood in you if you do. For these little islands which look at first glance almost like the drips from that huge stalactite of South America, and contrive to be within the Postal Union, are monopolised by Scotsmen—and sheep. There are some 2,300 males on the islands, and about three-quarters of a million sheep.

There are also 905 women, but the Government report artfully accounts for this small proportion by remarking that of the 2,300 males over 1,100 are engaged in the whaling industry.

Yet for all their small population the Falklands are one of those go-ahead little places which civilise themselves in obscurity or in spite of it. The latest proof of progress is an addition to the local architecture in the form of a wireless station. But telephones already exist, and are to be installed in private houses. Boy Scouts also flourish, and held their first meeting on July 23rd last year. And the toothbrush is becoming a comparatively common object in the islands!

At least, so says an impressive sentence in the last official report.

There is not much that is kind about the scenery of the Falkland Islands to be said, so it is better left unsaid. The area suffers from a Scotch and English climate. It rained on 240 days in 1912, and failed to be windy on 105. During the rest of the time the wind blew with varying violence. The Spaniards christened the islands "Malvinas," meaning land of bad winds. And not without cause, for the land is so gale-swept that not a single tree can be found to take root in its peaty soil, and the inhabitants have had to abandon their national dress.

Still, dry spells do occur sometimes, when the supply of water becomes so short that the inhabitants are afraid to have a bath or even to wash any clothes, and under pressure of circumstances are compelled to wash and shave in bog water, which is jet black and has a far from pleasant odour.

Even eating, that refuge of the bored, brings little consolation. There is not much to consume except mutton—mutton broth, and mutton that lacks even that ingenuity in disguise.

"Good old 365" on the menu suggests a new adventure in ports, but it is not the complement to walnuts—merely mutton, for "365" is one of those depressing local jokes signifying "mutton every day in the year."

Fruit and vegetables, except potatoes, are only for the plutocrat. But occasionally, over a peat fire that carries memories of Ireland, one may cook a penguin's egg, boiling it for fifteen minutes, then plunging it into cold water and stripping its shell off to leave a delicate jelly-like morsel—delicious!

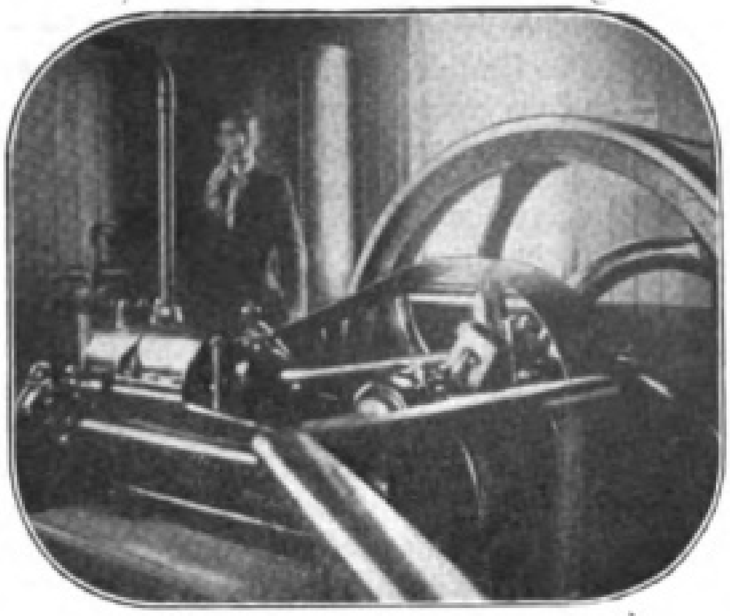
From the point of view of the sportsman alone does this Robinson Crusoe country hold some attractions. Wild life is abundant. Sea lions, sea elephants, seals, whales, penguins, black oyster catchers, two species of shags or diving birds, upland and Relp geese, loggerhead and ducks are to be seen in their natural haunts, and provide the inhabitants with many a trip of the bogland, where two miles are more gruelling than four over the roughest ground in the Homeland.

Apart from the sport, the tedium of life is only relieved by the arrival of the monthly mail from Scotland and uncertain visitations from hordes of bluebottles, which invade the sheep stations and drive the 800 Scotch souls in Port Stanley almost to the verge of dissipation. The bluebottle is said to have been introduced on the West Falkland by the ss. *Salembria*, in 1878, and a warm welcome still awaits any surviving members of her crew who may wander this way again.

News is as scarce as other good things in the islands, and the inhabitants never cease to bless the introduction of wireless, which will enable them to impress upon the world that Scotland still survives on the globe.

*General View of the Port Stanley Station.*

The wireless station is situated on Cape Pembroke, two miles from Port Stanley, the capital of the islands, which has been likened to a small town in the Scottish Highlands. It was opened for public service on November 1st, 1912, communication being maintained with Cape Virgins, Bahia Blanca, Cerrito and Rio Grande del Sul on the South American mainland. The station, a 5 kw. one, is designed to give a night range of not less than 1,000 miles, when corresponding with a similarly equipped station. There are two masts of the sectional steel type 220 feet in height, placed 600 feet apart, and supporting an aerial of the twin T multiple wire type consisting of 9,000 feet of silicon bronze wire. The equipment consists of a horizontal slow-speed oil engine generating 15 h.p., driving by belt at 5 kw. 70-cycle alternator of the stationary armature revolving field type. On the same shaft is driven an exciter and disc discharger. The condensers are of the Poldhu type contained in earthenware jars and immersed in oil, and are controlled by means of a Swiss commutator. The transformer is designed for 300 volts 20 amp. primary current, and delivers 20,000 volts off the secondary terminals. In conjunction with the transformer an air-cooled iron core adjustable low-frequency inductance is used in order to bring the primary circuit into resonance with the alternator frequency.



*A Peep into the Engine Room*

In addition to the power plant an auxiliary coil set has been installed, working either from the exciter or storage battery and having a range of 250 miles. The wave lengths employed are 600, 900, 1,200 and 1,500 metres.

An interesting feature of the earth system is that, in addition to the usual circular earth plates, the power house, being externally constructed of sheet iron, is used as a counter capacity to the aerial. The receiving apparatus consists of a standard magnetic detector and multiple tuner, and a valve tuner capable of receiving wave-lengths over a range of from 100 to 4,000 metres. Owing to the dampness of the climate, special attention has been given to insulation and materials used in construction. Wood has been used only where essential, and all apparatus has been insulated with porcelain. The aerial has been insulated with a new type of porcelain rod.

*Operators' Quarters.*

Though the station is nominally designed for a 1,000 miles range at night, Rio Grande, a distance of 1,200 miles, is spoken every night, and the signals are strong and clear. With the large aerial and valve receiver the Falkland Islands station is able to get practically every station in the South Atlantic. On January 16th, 1913, a daylight efficiency test was arranged with a ship station steaming towards the Falklands, and communication was established each way at 462 miles, the ship station having readable signals from the shore at 485 miles.

Quite early in its existence the Falklands station was able to render valuable service. On November 12th, the Pacific Steam Navigation Company's R.M.S. *Oravia* struck the Billie Reef, seven miles from Port Stanley, at 10.30 p.m. Assistance reached her at 11.30 p.m., and when the passengers were landed in bad weather at 4 a.m. the next morning they found comfortable quarters and every attention waiting them in Port Stanley, the arrangements having been carried out by wireless while the work of rescue was going on. By wireless passengers were able to send reassuring messages to their friends, and communication was established with the same company's ss. *Huanchaco*, 600 miles away, which called for the rescued passengers and mails. Later advices show that the station continues to work splendidly, and whalers in the Antarctic have found it a convenience, the traffic being relayed through Monte Video. It is hoped that the station will soon be in communication with Punta Arenas; then a really good all-day service will be established.

There is no cable to the Falkland Islands, and in the ordinary way no news of the disaster could have reached the outside world for two weeks.

A further development is expected by joining up the West Falklands and South Georgia to the central station at Port Stanley. This will bring the most isolated islands of the group into touch with the outside world.

# A Marconigram

A TOUCH on the keys, a crackle,
A glow in the aerial wire,
Then, cleaving the night
With the speed of light,
Issued a message—in fire !

Next, as a buff " Marconi,"
It reached Miss Eleanor Shadd ;
'Twas very concise,
But extremely nice,
And Eleanor's heart was glad.

Quickly, Eleanor, quickly !
Time and the hour slip by ;
The poor little page
Has waited an age
For the expected reply !

What was this urgent business ?
" Sparks " is inclined to guess ;
The'phone at his ear,
He is ready to swear,
In dashes and dots spelt—" YES ! "

DOUGLAS R. P. COATS.

# Portable Wireless Telegraph Stations

THE Greek Government has just completed negotiations with the Marconi Company for the supply of fourteen field stations. Eight of these are to be motor-car sets of 1½ kw. power, and the remaining six to be special ½ kw. pack sets with 54 ft. masts.

The motor-car stations will be mounted on special lorry type chassis, and so arranged as to be entirely self-contained and suitable for use in rough country. Each chassis will be made with special clearances, fitted with solid tyres and a 40 h.p. motor. The maximum range for each station will be approximately 250 miles, with a guaranteed minimum of 150. Eight men will be required to take charge of each of these motor-car stations, which when erected will cover some 1,300 square yards. The masts will be 70 ft. high and the average height of the aerial 56 ft. The total weight of a motor-car station, including an estimated average weight for the personnel, will not be more than 7,600 lbs.

The pack stations are of a special type with 54 ft. masts, but the apparatus is so constructed that it can be carried easily on five horses. For these stations the maximum range is approximately 80 miles, and the guaranteed minimum 50, with a total gross weight for each station of 969 lbs.

A commission of officers has been instructed by the Greek Government to visit the works at Chelmsford, in order to supervise the manufacture and mounting of the stations, and the commission has, further, been granted full facilities to carry out the necessary tests and, ultimately, accept the stations for the Government.

*His Excellency the Russian Minister of War, General Soukomlinoff, inspecting cavalry stations at the Works of the Russian Company of Wireless Telegraphs and Telephones. On the right of His Excellency is Mr. A. Simpson (Managing Director) and on his left are Mr. P. Balinski and Mr. S. M. Eisenstein, directors of the Russian Company.*

# Aerials and their Radiation Waveforms.—II.

By H. M. DOWSETT.

THE author has shown in the April WIRELESS WORLD that the form of the waves radiated from different types of aerials can be readily obtained by simple geometrical construction, working from the basis of the waveform for $\frac{1}{4}\ \lambda$ in the aerial—corresponding to a $\frac{1}{2}\ \lambda$ in space—which must first be accurately determined.

The Marconi directional aerial is one of the most useful and interesting types to study.

It consists essentially of a bent aerial with a large ratio of length to height. This is the simple case—the first, therefore, to be considered. If the ratio of fundamental wave-length to length of aerial is also large the directional effect is more pronounced.

Fig. 1 shows a half-wave leaving a bent aerial whose ratio of height to length is 1 : 7 and ratio length to wave-length 1 : 5. In Fig. 2 two complete waves are shown getting away.

The relative areas of the waves sent off (1) in the direction opposite to that in which the aerial is pointing, here called 0°, (2) at 180° to this direction, indicate that there is a gradual decrease in wave energy from one to the other; but this does not explain the directional effect—the fact that at some intermediate direction, near, but not necessarily at, 90°, the strength of received signals reaches a pronounced minimum, considerably less than in the direction 180°. It has been pointed out by Prof. Pierce* that a complete and satisfactory explanation of this effect has not yet been given, although several writers have attempted to solve the problem, notably Prof. Fleming.

The author's solution is developed in the following diagrams.

Fig. 3 shows the elevation and plan of the first complete wave leaving an aerial of the same dimensions as shown in Figs. 1 and 2, but drawn to a larger scale.

The wave has the shape of a flattened hemisphere, and parallels have been drawn on the plan to indicate the projection of a spheroidal surface. P is the point of generation of the wave, O the apex. Sectional planes are shown cutting through the wave in various angular directions round the aerial, and the shaded areas give the plans of these sections.

*"Principles of Wireless Telegraphy," 1910, pp. 299-302.

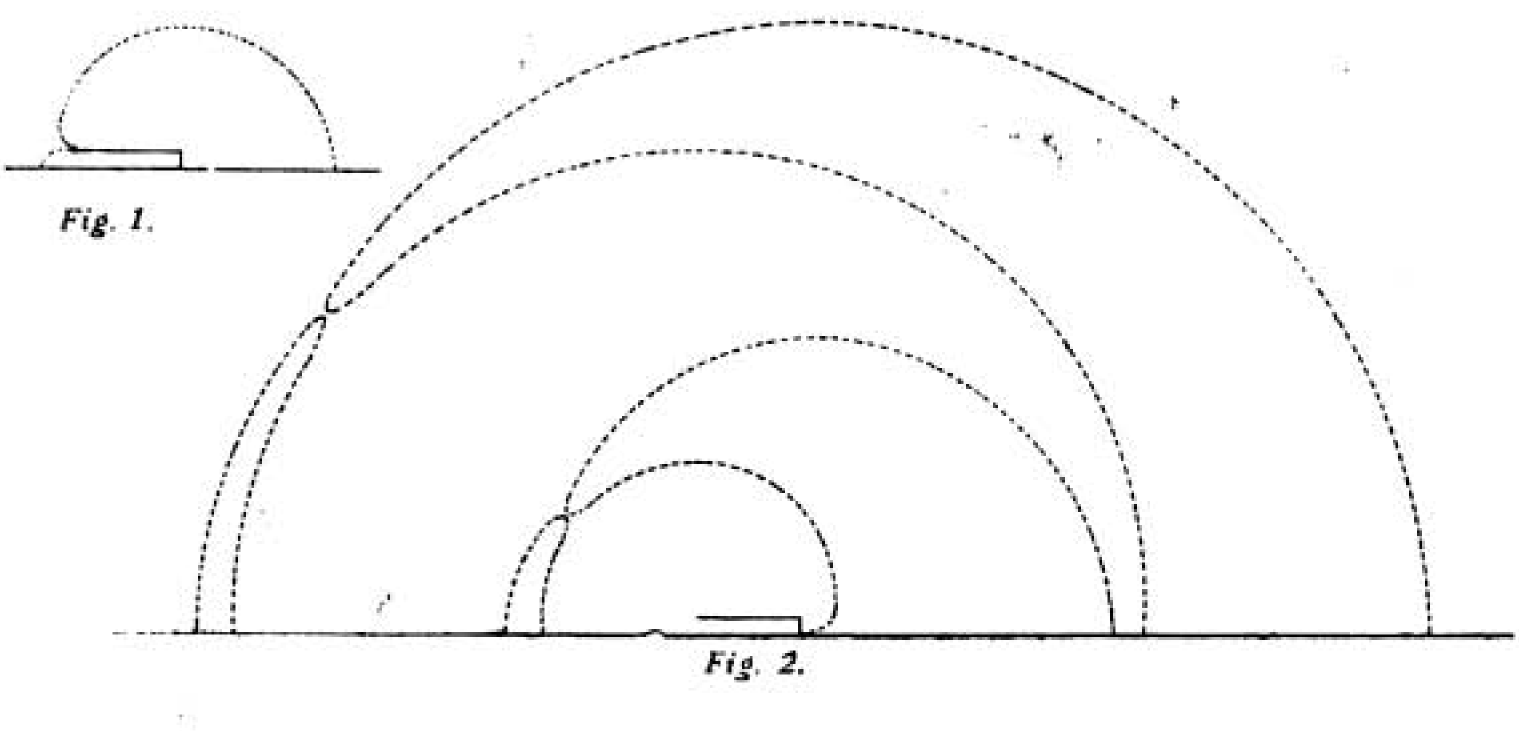


*Fig. 1.*

*Fig. 2.*

The radial lines, P 20°, P 40°, P 60°, etc., are the lines of advance of the wave foot, O 20°, O 40°, O 60°, etc., the corresponding lines on the wave front, and the sections are completed by the lines on the wave back which extend from O to the ellipsoid where the wave enters the earth.

A simple examination of this diagram at once discloses the important fact that, in addition to the decrease in wave sectional area in proceeding from 0° to 180°, the wave plane which at 0° is vertical gradually leans over until at 90° it reaches a maximum inclination of nearly 60° from the vertical. It then commences to right itself, and at 180° it is vertical once more.

This behaviour is the cause of the directional effect. The lean-over weakens the wave by inducing earth currents whose intensity is proportional to the sine of the angle of inclination of the wave-plane from the vertical, or, in other words, to the shaded areas in Fig. 3.

This indirect loss is additional to the direct loss by radiation of the wave into the earth as it leaves the underside of the bent aerial, and the two together result in the curve of wave energy known as the "beetle" diagram.

A secondary result of this lean-over, which cannot be disregarded, is that it diminishes the picking-up power of the receiving aerial if this aerial is not inclined in the right direction.

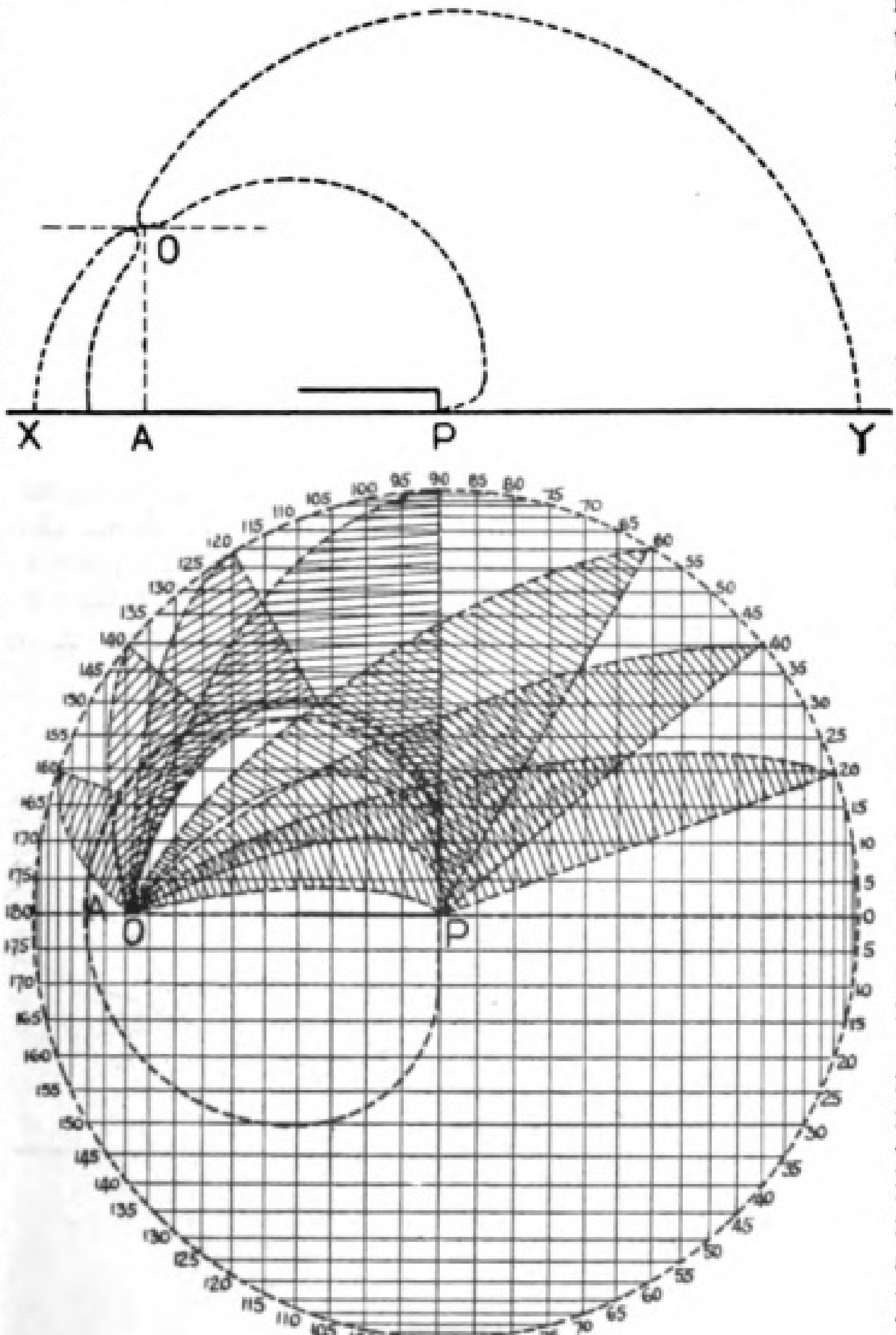


*Fig. 3.*

One of Hertz's experiments—illustrated in Fig. 4—was to take a grid of parallel wires and to interpose it between his transmitter and receiver. When the wires were parallel to the transmitter, or tangential to the lines of electric strain, the grid absorbed the waves and the receiver remained unaffected; but if the grid were turned at right angles to this direction it absorbed nothing, and the receiver responded.

Let the grid remain in the first-mentioned position and represent the receiving aerial, but let the transmitter be turned to represent the inclination of a wave-plane, then Hertz's results will be repeated; the wave will tend to pass the aerial without being absorbed.

In order to draw a polar diagram for the aerial shown in Fig. 3, it will first be necessary to find the true wave areas in the different directional planes.

This can be done in the manner shown perspectively in Fig. 5.

Let PA 20° be the sectional plan of the wave in the direction 20°; extend the wave base until a perpendicular can be dropped on it from A. Then, the altitude of the wave peak, OA, being known, the true area of the wave, PO 20°, compared with its plan, will be in the proportion of OB : AB, where $OB = \sqrt{(OA)^2 + (AB)^2}$; also the inclination of the sectional plane from the vertical will be $\tan^{-1}\frac{AB}{OA}$.

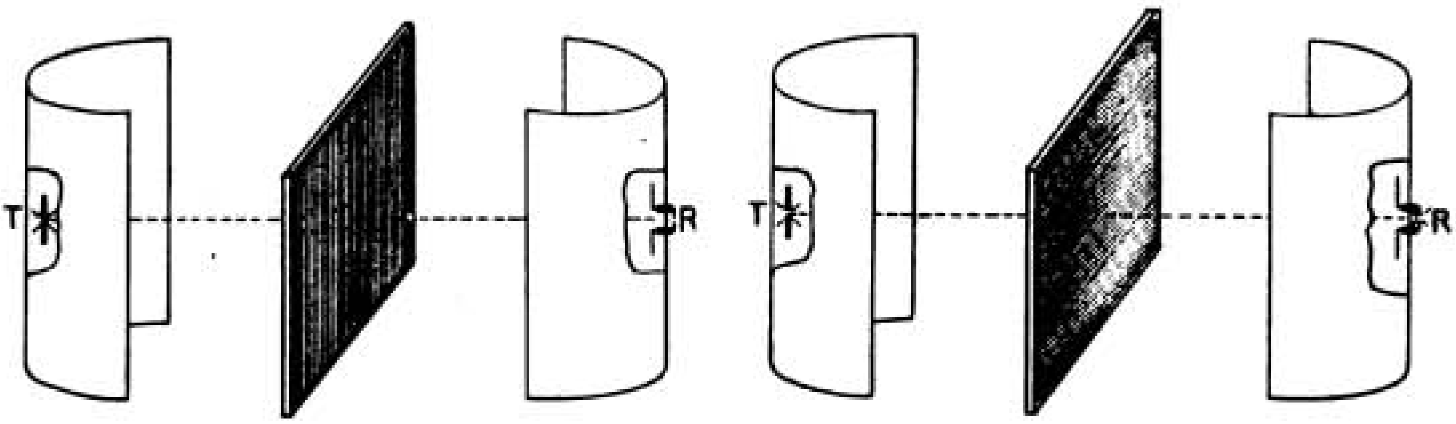



*Fig. 4.*

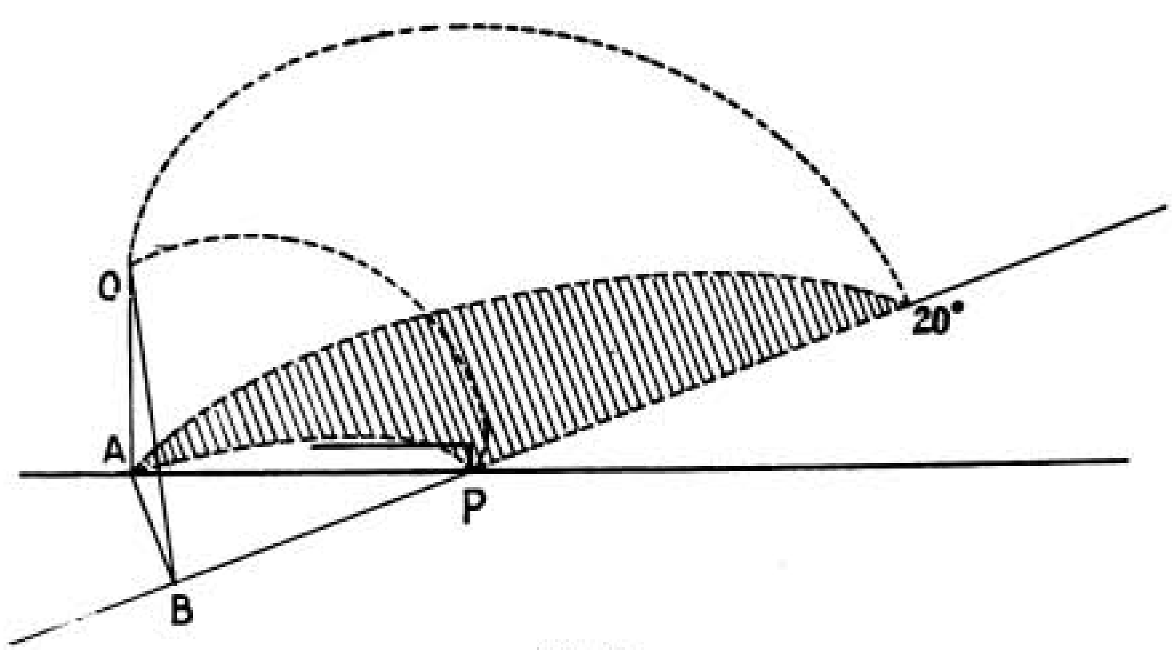



*Fig. 5.*

The lengths of the perpendicular dropped to the baselines of the various planes can be obtained from Fig. 6.

All the wave areas in plan and elevation Fig. 3 have been measured by planimeter; those in plan have been corrected to obtain the true wave areas in the manner already described; the final relative values have been plotted and the mean curve is shown in Fig. 8, with ordinates measured from the left. The curve shows that in proceeding from 0° to 180° the wave area first falls off slowly, then quickly, then slowly again.

The next question to consider is the relation between wave area and wave energy. Owing to radiation into the earth in the direction 180°, it is obvious that as the area decreases the wave energy decreases but does it decrease in the same proportion?

The perspective diagram, Fig. 7, which shows the field of electric strain proceeding

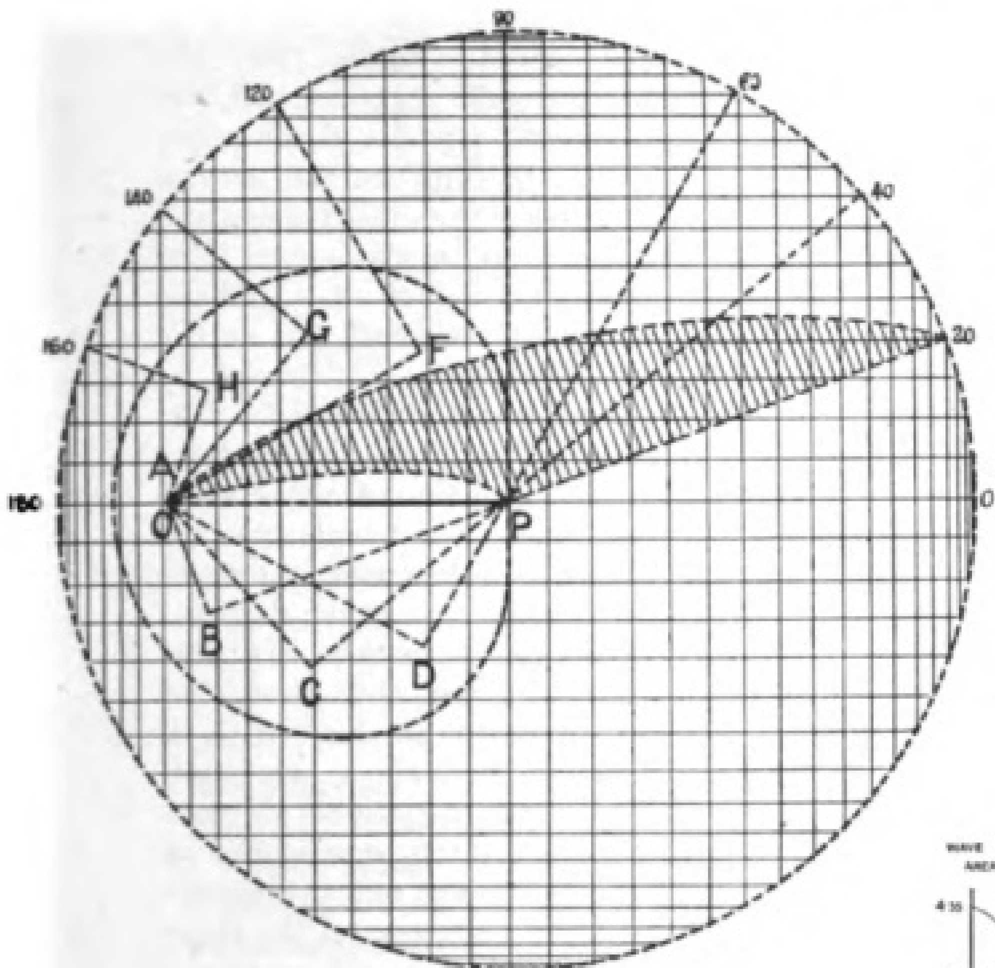



*Fig. 6.*

from the end of a bent aerial—having a ¼ λ in it—to the earth—assists us to the conclusion that the wave area is not directly proportional to the wave energy.

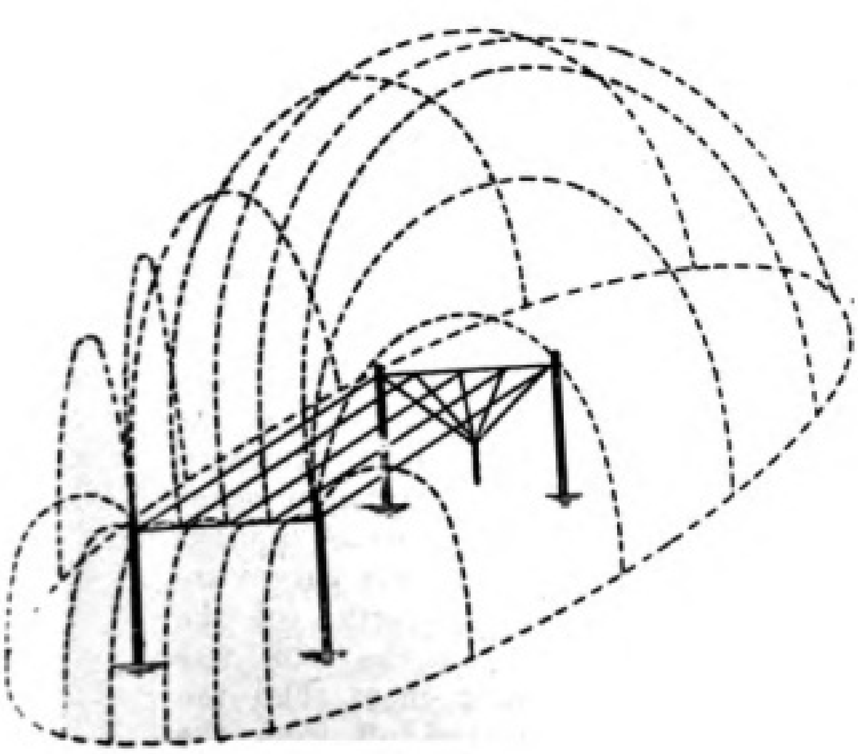


*Fig. 7.*

For, if the aerial be regarded as one plate of a condenser, and the earth as two other plates laying in the directions P 0° and P 180°, the intensity of the electric field from the aerial to either earth plate will be in the inverse proportion to the distance of that earth plate from the aerial—that is, in the inverse proportion to the length of the lines of electric strain, or to the capacity in the two directions.

Fig. 7 shows that the length of the strain lines is a minimum at 180°; it then increases slowly, then quickly, and near 0° its increase once more slows up, and finally becomes a maximum at 0°.

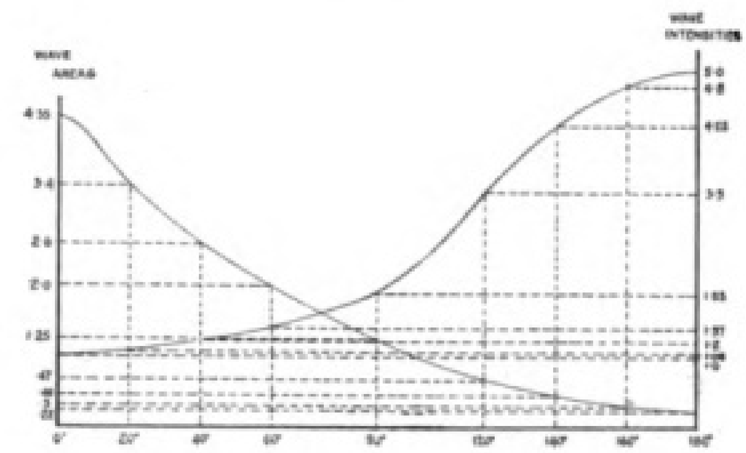



*Fig. 8.*

**The intensity in the direction 180° is roughly five times the intensity in the direction 0°.**

**A curve of approximate values is given in Fig. 8, the ordinates being measured from the right.**

**Material is now available, and is given in the following table, for plotting a polar diagram—Fig. 9—of wave energy for this aerial.**

| Directional Plane. | Plan Area. | Inclination from Vertical. | True Area. | Wave Intensity. | Wave Energy. | Energy lost by Induction. | Useful Energy. |
|---|---|---|---|---|---|---|---|
| 0° | — | 0° | 4·35 | 1·0 | 4·35 | — | 4·35 |
| 20° | 1·64 | 28° 51′ | 3·4 | 1·05 | 3·57 | 1·72 | 1·85 |
| 40° | 1·88 | 46° 21′ | 2·6 | 1·2 | 3·12 | 2·26 | 0·86 |
| 60° | 1·63 | 54° 47′ | 2·0 | 1·37 | 2·74 | 2·26 | 0·48 |
| 90° | 1·07 | 58° 41′ | 1·25 | 1·85 | 2·31 | 1·98 | 0·33 |
| 120° | 0·55 | 54° 47′ | 0·67 | 3·3 | 2·21 | 1·81 | 0·40 |
| 140° | 0·33 | 46° 21′ | 0·45 | 4·25 | 1·91 | 1·38 | 0·53 |
| 160° | 0·14 | 28° 51′ | 0·3 | 4·8 | 1·44 | 0·69 | 0·75 |
| 180° | — | 0° | 0·22 | 5·0 | 1·10 | — | 1·1 |

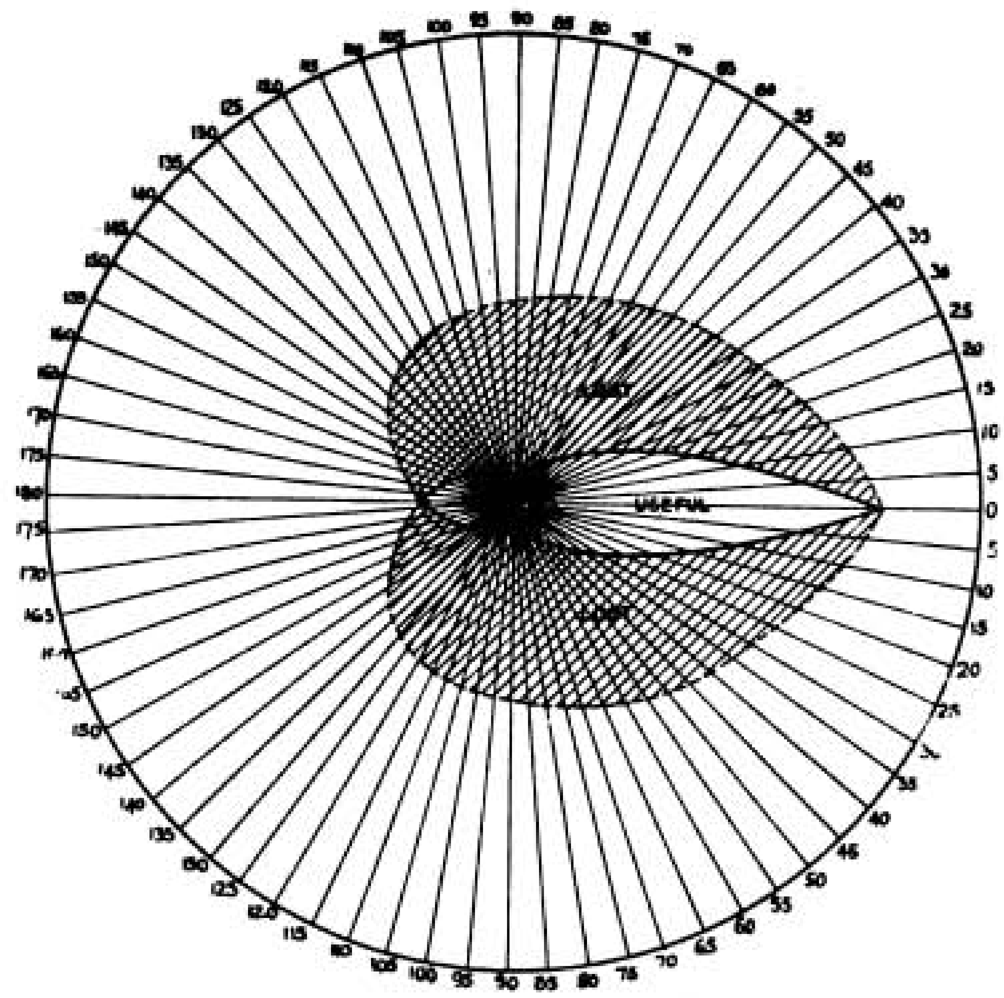



*Fig. 9.*

It will be seen that in the present case the minimum occurs at about 90°.

But its position is not fixed at this angle for all aerials, it depends entirely on the height, length, and fundamental of the aerial.

## Characteristic Curves of Detectors.

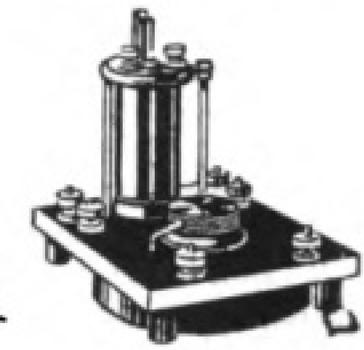
MR. PHILIP R. COURSEY writes to us as follows: "With reference to the criticism of my Physical Society paper on 'Characteristic Curves of Detectors,' &c., on page 9 of the last (April) number of THE WIRELESS WORLD, I would like to point out that in my opinion it is not altogether justified by the facts. In the first place, no attempt was made to compare the various detectors with the Marconi magnetic detector in the matter of sensitiveness, the magnetic detector being merely employed as a means of *calibrating* the apparatus on each occasion, as described in the paper; and as for this purpose constancy is the only desideratum, it obviously did not matter what resistance telephones were used, so that solely for convenience the same ones were employed throughout, instead of the proper 120–150 ohm ones.

"Secondly, the use of the same resistance telephones for all the tests, although not fair to some detectors as far as the actual figure for the sensitiveness is concerned, yet serves the purpose of the paper —viz., to compare the general features of the sensitiveness and differential curves—not their numerical values—as the shape of the curves would not on the whole be much influenced by the telephone resistance. Further, in such a series of tests as this, the use of the correct resistance of telephones (or even the approximately correct resistance) for each detector would be a matter of some difficulty, as the range of resistance to be dealt with in different crystals is so great, while large variations of resistance are often experienced at different points, and at different boosting voltages, on the same crystal.

"As a matter of fact, the use of 2,000 ohm telephones about represents the conditions that obtain in an average amateur's station, and so from that point of view the figures given may be of some interest, although it is obviously impossible for anyone to state that a particular detector has a definite sensitiveness with respect to another, as the conditions of operation of the crystals themselves vary so greatly.

"With reference to carborundum being one of the most sensitive detectors known, this is doubtless the case provided the right kind of crystal is obtained; but the ordinary carborundum purchaseable from the usual sources has *not* a very great sensitiveness, and the figures that I gave are amply borne out by the letter from Mr. J. S. Bickford published in the same issue. It is also worthy of note that the variation in the numerical value of the sensitiveness between different specimens of carborundum seems much more marked than in the case of other crystals, while the shapes of the curves are more or less physical properties of the material; but in any case the table was intended to give nothing more than the sensitiveness figures picked off from the curves obtained with the particular crystals used and under the conditions named."

# The ENGINEERS Note Book



[Under this heading we propose to publish each month communications from our readers dealing with general engineering matters of various kinds in their application to wireless telegraphy, and we would welcome criticisms, remarks and questions relating to the matter published under this heading. We do not hold ourselves responsible for the opinions and statements of our contributors.]

## The Effect of Salt on Concrete.

THE letter which we published in the April issue of this magazine (p. 33) with regard to the subject of salt water for concrete mixing has brought the following replies:

Mr. H. KEMPTON DYSON writes:

"Salt water retards the hardening of concrete, but after about twelve months the strength is not materially affected. Sea sand is quite suitable for concrete work if proper precautions are taken in its use. It is sometimes not well graded, being either too coarse or too fine, or too uniform in size of grain; also if the sand be taken from the top of the beach, where it is not wetted by every tide, it might contain an excessive amount of salt due to the drying of spray upon it. If, however, the sand does not contain more than the usual amount of salt left by being saturated with salt water in the ordinary way, it is suitable for use, and if the concrete be made thoroughly dense by employing sufficient cement to fill the whole of the voids or interstices between the sand and the particles of coarse material the work should be completely satisfactory for foundation work. If it were required to carry a great load it might be necessary to leave it an extra month or two to gain sufficient hardness if salt water and sea sand be used."

* * *

B. P. writes to us as follows on the same subject:

"There is only one serious objection to the use of salt water for mixing concrete, namely, that it causes the Portland cement to set very slowly, with a consequently prolonged period of 'seasoning' to gain the full strength of the material. This delay obviously prohibits the use of sea water on many contracts in which it is essential that the work should be completed in the shortest possible time.

"The objection to the use of sea sand is due to the weakening of the finished concrete in which it has been mixed. This weakening is caused by a thin coating of solid salt round each particle of sand, and renders a costly process of repeated and thorough washing necessary to remove it. The defect arising from the presence of salt in this case is similar to that arising from the presence of floury dust on the larger pieces of the aggregate, whether broken stone, clinkers, or breeze; the minute particles prevent the cement binding closely to the surface of the larger pieces, and the structure of the finished concrete is considerably weakened thereby. For mass concrete work this is not of much importance, but for reinforced concrete or foundations for high-speed machinery too much care cannot be taken in the selection and preparation of the sand and aggregate; in fact, in order to secure the best results as much care is requisite as a competent engineer is accustomed to give to the selection of the cement.

"If there is any doubt concerning the suitability of any material obtainable locally, but which it is imperative to use, ample time should be taken to mature and test a number of samples of concrete containing it.

"A rough means of judging the suitability of sand is that the better it is for moulding, the worse it is for use in making concrete. For instance, it must not 'bind' or be capable of 'standing up' by itself when cut by a shovel, and must not be able to be smoothed with a trowel to a bright surface.

"The following hints from *Concrete and Constructional Engineering* are well worth memorising:

"'Don't measure ballast without screening; you want to know how much is sand and how much gravel.

"'Don't use a loamy, greasy, or dirty aggregate of any kind.

"'Don't use the same mixture for all classes of work; for instance, 1 : 2 : 4 will do for foundations, and $1 : 1.\frac{3}{5} : 3.\frac{1}{5}$ is wanted for floors.

"'Don't use water until the materials are mixed dry, so as to show a uniform colour.

"'Don't use sea water when you can obtain fresh.

"'Don't use dirty water on any account.

"'Don't add water all at once, add it gradually.

"'Don't make concrete so wet that it flows like a liquid.

"'Don't mix it so dry that it will not enter between any reinforcing rods or wires.'"

* * *

MR. MAGNUS VOLK, of Brighton, informs us that he has made thousands of blocks on the seashore over which the tide has passed. About six years later, when some of the blocks had to be removed, nothing but blasting could break them up; and he is prepared to send a specimen to any reader who would like one. He adds that "Anglo-Indian" need not fear adverse results from using sea water for concrete mixing.

* * *

## Wire Ropes.

J. G. P. writes: "Your correspondent 'F. E. R.' says that the best method of capping—'in fact, the only satisfactory method'—is the cone-shaped casting filled in with white metal. His argument is that the efficiency of such a capping is from 95 to 99 per cent., whereas that of a spliced capping is only from 60 to 80 per cent.; also that the first method 'does not require skilled labour, as is the case with a spliced capping.'

"In his advocacy of the white-metal filled cap, he conveniently ignores two important points. The first is that an improperly made white-metal capping is very much weaker than an improperly made spliced capping; and the second is that it is easy to detect if a spliced capping is well made, while it is often quite impossible to be sure (by inspection) that the other capping has been properly made. With the latter there is always the danger that the wire has been injured by excessive heating, or that it has not been properly cleaned, points about which the inspector cannot be certain when he comes to inspect the finished capping, whereas a momentary glance at a spliced capping (before serving) is enough to make sure as to its satisfactoriness."

* * *

## Boiler Covering Compound.

"WIRELESS ENGINEER" sends us the following two recipes for a cheap mixture for covering boilers in order to prevent loss of heat:

(1) Take 1 bushel of fireclay, 1 bushel of ordinary clay, 1 bushel of cow-dung, $\frac{1}{4}$ bushel of ashes (not the finest dust), $\frac{1}{2}$ gal. of coal-tar, and a little plasterers' hair as a binder; mix well together.

(2) Take 6 parts of sifted ashes (not the finest dust), 4 parts of fireclay, 1 part of ordinary clay, 2 parts of plaster of paris, 1 part of flour, 2 parts of cow-dung, $\frac{1}{5}$ part of coal-tar; add sufficient plasterers' hair to bind, and mix with a little water to the consistency of stiff plaster.

Considerable ingenuity can be displayed in making up such compositions; all that is required being (*a*) substances that prevent heat-loss with some success, and (*b*) substances that will make the whole composition of the nature of plaster. Fireclay (mixed with common clay) with plasterers' hair provides the plaster portion, while for the poor heat-conducting material ashes (not too fine), coke breeze, cow-dung (or very finely chopped straw), cork-dust, fossil-earth, short hair, &c., may be successfully used. An essential point in the application of such compositions is that a certain regular procedure must be observed, or the material will crack and fail to hold. The first coat should be some of the material thinned with water to a stiff paste, and rubbed on with the hand or with a coarse cloth or a brush. This only makes a thin rough coat, which is allowed to dry and forms a key for the next layer. The second coat is about $\frac{3}{4}$ inch thick, applied with a trowel, left with a rough surface, and allowed to dry. Another coat, $\frac{3}{4}$ inch or 1 inch, follows, left rough and allowed to dry. The next is usually the final coat, and is trowelled smooth. All coats, from first to last, are put on while the surface is fairly hot. Each coat is allowed one day to dry before the next is applied.

# Administrative Notes.

**Station Jurisdiction.**

By an order recently issued by the United States Navy Department, the naval radio stations at the Puget Sound Navy Yard and Tatoosh Island have been transferred from the jurisdiction of the commandant at the Puget Sound Navy Yard to the wireless officer at Mare Island, Cal. This places every station in Alaska and on the Pacific Coast under the direct supervision of the Mare Island Navy Yard. Another order states that every enlisted man who has served two years as a radio operator on shore duty will be sent to sea as soon as practicable, and men who have seen considerable sea service will be sent to take their places.

* * *

**Amateurs in Australia.**

The Postmaster-General recently granted 20 licences for private wireless installations in different parts of Australia. This makes a total of 423 stations—194 in New South Wales, 177 in Victoria, 8 in Queensland, 20 in South Australia, 15 in West Australia, and 9 in Tasmania. In each case the station is merely for experimental purposes by students. The licences granted do not permit the holders to use the stations for more than experimental purposes. A bond has to be given that no messages received will be disclosed. Each student is compelled to pay a licence fee of one guinea.

* * *

**Dominican Republic.**

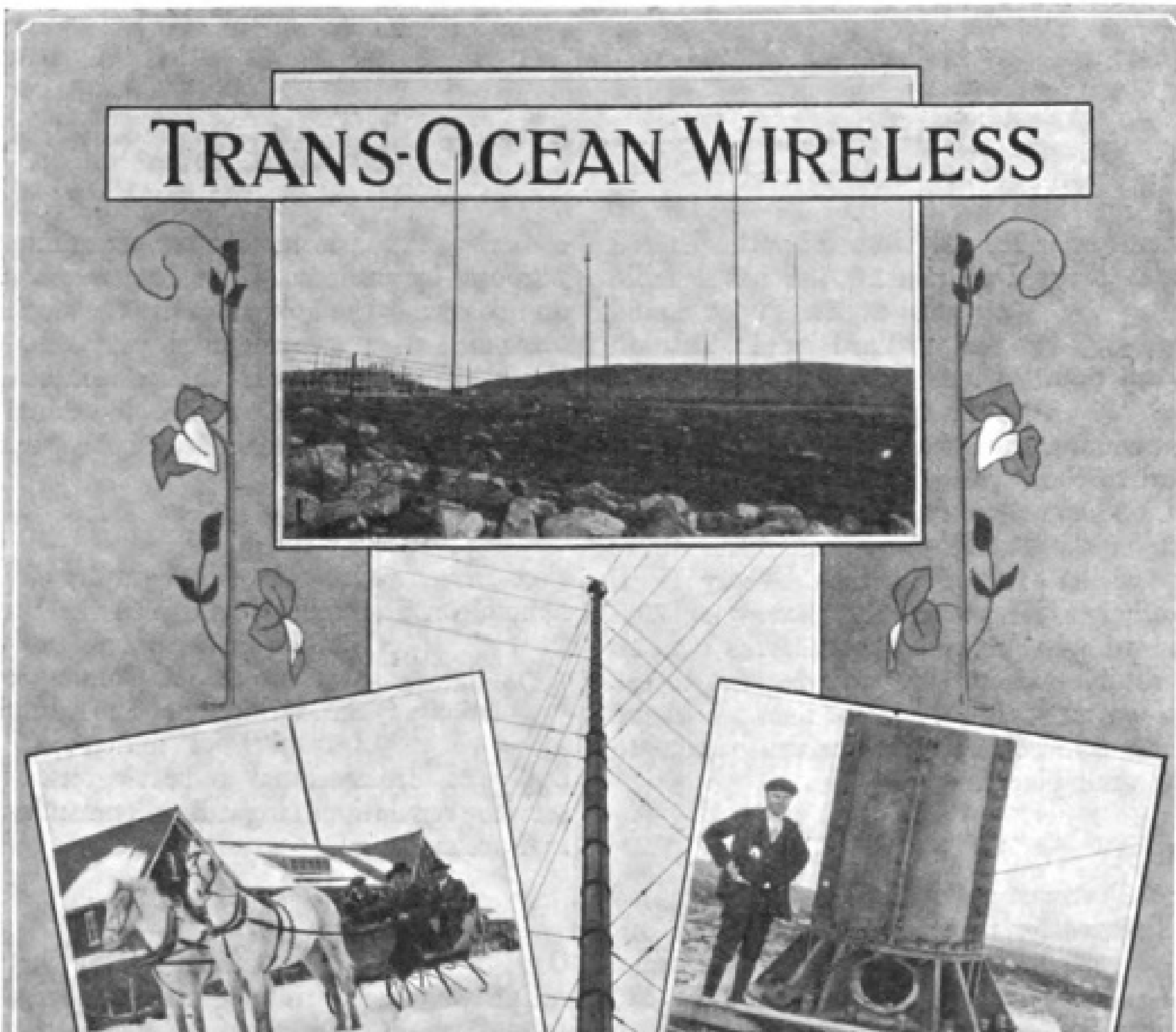
The Director-General of Telegraphs of the Dominican Republic has advised the Berne Bureau of the opening of the stations at La Romana and Santo Domingo. The Administration have undertaken to apply to international radiotelegrams the service regulations regarding transmission and accountancy.

* * *

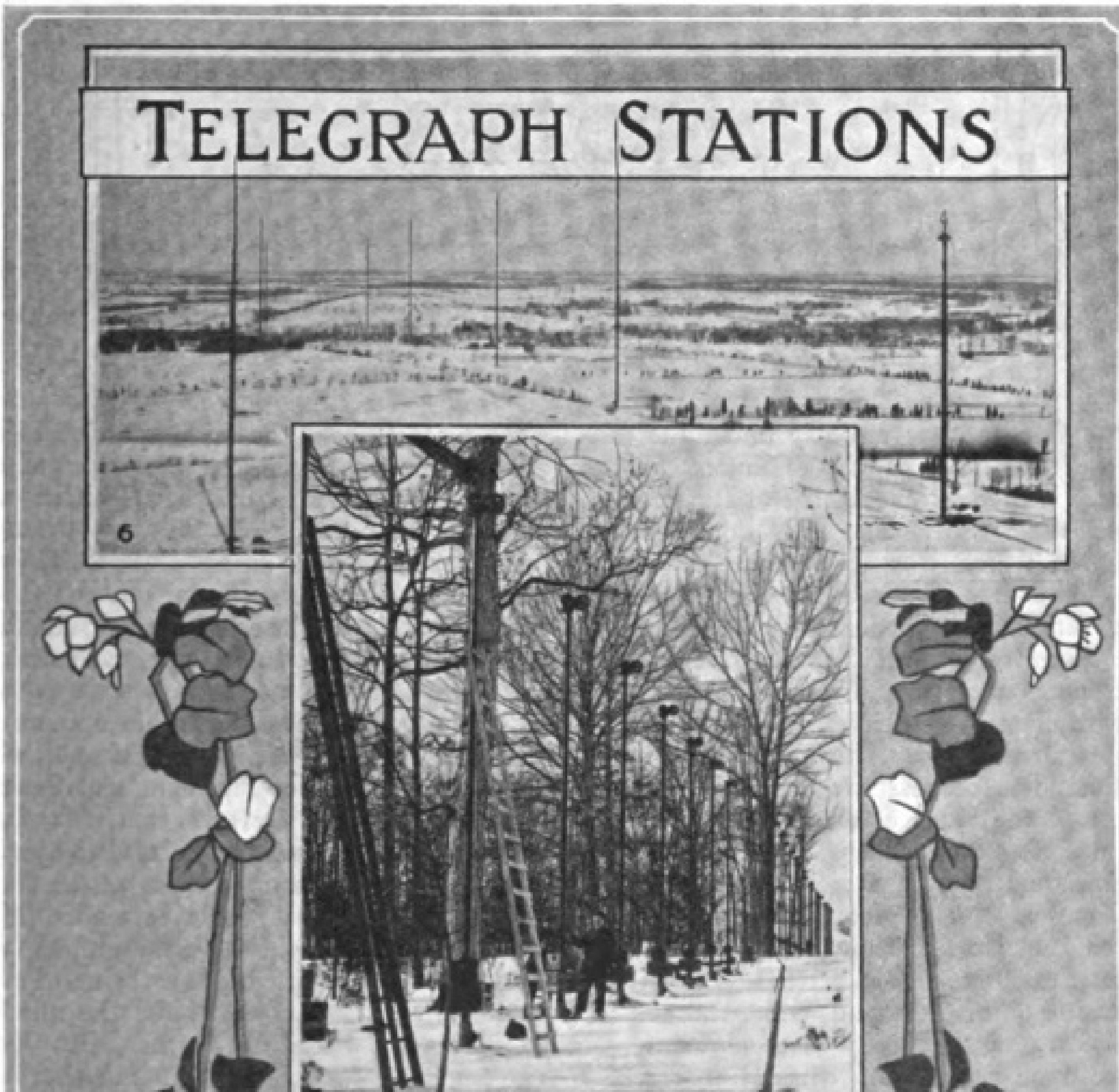
On March 25th the United States Senate ratified the international convention relating to safety of life at sea, including the accompanying regulations signed at the international conference in London in January last.

**The following Coast Stations have recently been opened.**

| — | Call Letter. | Range in Nautical Miles. | Normal Wave-length. | Nature of Service. | Hours of Service. |
|---|---|---|---|---|---|
| BRITISH NORTH BORNEO: | | | | | |
| Sandakan ... ... ... | VQB | 400 | 600 | General public | — |
| ITALY: | | | | | |
| Brindisi ... ... ... | ICE | 270 | 600 | ,, ,, | Continuous |
| NEW ZEALAND: | | | | | |
| Awanui Radio ... ... | VLA | — | — | ,, ,, | 6.30 p.m. to midnight, continuous watch for distress calls |
| Awarua Radio ... ... | VLB | — | — | ,, ,, | Ditto |
| SAN DOMINGO: | | | | | |
| Romana (La) ... ... | HIB | — | 600 | ,, ,, | Local time: 8 a.m. to noon, 2 p.m. to 5 p.m. |
| San Domingo ... ... | HIA | — | 600 | ,, ,, | Ditto |
| SIAM: | | | | | |
| Bangkok ... ... ... | HGA | By day, 300; by night, 600 | 600 | Official... ... | — |
| Singora ... ... ... | HGB | By day, 300; by night, 600 | 600 | ,, ... ... | — |




*1.—Transmitting Station, Stavanger, Norway. 2.—Belmar, N.J. (U.S.A.) The only means of transportation. 3.—Top of 400 ft. mast at Carnarvon. 4.—Base of the same mast. 5.—Belmar, N.J., operators' quarters.*




*6.—New Brunswick, N.J. (U.S.A.), looking down the mast line. 7.—New Brunswick, straining pillars. 8.—Carnarvon, view of station building when nearing completion.*

# NOTES OF THE MONTH

THERE was recently under the consideration of a Committee of the United States House of Representatives the "Seamen's Bill," one of the aims of which was to promote safety of life at sea. The evidence given before that Committee has now been issued in the form of an official publication, and that portion of it which refers to wireless telegraphy is notable for the fact that representatives of the shipping lines and commanders of vessels gave striking testimony to the value of wireless, and declared themselves emphatically in favour of the compulsory equipment of ships—passenger and cargo. "The greatest of all as a life saver" is what Mr. Thomas F. Newman, the general manager of the Cleveland and Buffalo Transit Co., of Cleveland, Ohio, claimed for wireless, and such value does his company place upon it that, notwithstanding the fact that the Government requires ships on a route of 200 or more miles only to be equipped, all the vessels of his line are fitted with wireless, although the mileage is 176. Important as are the humanitarian grounds on which Mr. Newman based his opinions, he made it quite clear that commercial considerations are not ignored, and we welcome, therefore, the unqualified recommendation that "every freighter on a voyage of 200 miles . . . every boat navigating the Great Lakes should, as an investment proposition, carry wireless."

* * *

Nearly all the witnesses were asked for their opinion as to the advisability of compelling freight steamers to be equipped with wireless telegraphy, and in each case the answer was in favour of this being done. Indeed, the unanimity of the witnesses on this particular point forms one of the most striking features of the evidence given before the Committee. As a "passenger man," Mr. J. S. Morton, of the Graham and Morton Transportation Co., of Chicago, whose vessels run across Lake Michigan, hesitated to pass an opinion on somebody else's business, but he could not help thinking that it would be an advantage and an element of safety for freight vessels on the Lake to be equipped. In this opinion he was supported by Mr. A. A. Schantz, who, speaking as the Vice-President and General Manager of the Detroit and Cleveland Navigation Co. (which he claimed to operate the largest number of steamers on the Great Lakes), urged that it would be a good thing to have all the freight vessels equipped with wireless. He regarded this as being of even more importance than to have the number of lifeboats prescribed by the Bill. Even the smaller companies have found that it is an advantage to equip their vessels with wireless, as Mr. E. B. Atwood, President of the Cape Cod Steamship Co., testified. Mr. Atwood told how when he was first approached in 1911 he gave instructions for wireless to be fitted for this reason. "Supposing we had a propellor drop off half way down, we could tell the towboats to come there, and they could be there in an hour. We could have a dozen towboats there from the city of Boston. Or, if the engines should break down, it would be a nice thing to have." After more than two years experience Mr. Atwood was able to come before the Committee and state with regard to wireless: "It proved to be one of the best things we ever had." His attitude is best summed up in the following extract from his evidence: "If I could not have but one, I would have one boat and the wireless rather than a hundred boats without wireless." Mr. H. W. Thorp, Vice-President and General Manager of the Goodrich Transit Co., went even further than some of the witnesses and suggested that the Government should equip all national life-saving stations with wireless.

* * *

Although the lines represented before the enquiry were mainly those navigating the Great Lakes, the recommendations and the reasons for making them can be applied to almost every class of vessel; they were put forward in all seriousness by leading shipowners representing very large interests, and running their vessels under conditions which are often as hazardous as those prevailing in other seas, and are therefore entitled to every consideration. There is no need to refer here to all the evidence given, as this would merely emphasise the views already brought out, which, in our opinion, are sufficiently important as they stand. Mention should, however, be made of the evidence given by Captain F. J. Simpson, of the Shipmasters' Association, who said he would welcome very much the equipment of freight vessels, and in this he was supported by Captain Hellary, in command of the SS. *Persian*.

* * *

The second reading of the Home Rule Bill which was passed in the House of Commons on April 6th, 1914, was responsible for a remarkable use of wireless telegraphy. For the first time in Parliamentary annals this means of communication was adopted for the purposes of a division. The Government Whip found that two members of his party were on board the *Mauretania*, *en route* from New York, and were to arrive at Liverpool that afternoon. Accordingly he sent a message to the vessel urging them to come to Westminster and vote in the division. On arrival at Liverpool the two members took the first train to London and reached the House of Commons in time to record their vote.

* * *

We cannot close this review of the past month without referring to the ceremony which took place at Godalming on Wednesday, April 15th, when a public memorial to the *Titanic* wireless hero, Mr. "Jack" Phillips, who died during the performance of his duty, was unveiled by the High Sheriff of Surrey. As the ceremony took place just as we were closing for press with this number we must hold over until next month an illustrated account of the proceedings and the full report of Mr. J. St. Leo Strachey's eloquent tribute.

## Directory of Amateur Wireless Stations.

We must shortly close for press with the Directory of Amateur Wireless Stations, concerning which an announcement appeared in the last two numbers of THE WIRELESS WORLD, and those of our readers possessing the Post Office licence who have not yet sent in particulars of their stations are now reminded that, unless we receive these particulars on or before May 15th, they will not be included in the Directory.

The following particulars are required:

Name and address of the owner of the station.

Call-letters.

Whether the station is for transmitting and receiving, or receiving only.

Transmitting range, in miles.

Transmitting wave-length, in metres.

Receiving range.

Usual hours of working.

General remarks.

Secretaries of wireless associations and clubs will oblige by sending names of their officers, address of headquarters, call-letters and any other useful information.

This Directory, when complete, will be distributed free of charge to our readers.

## "Wireless World" Index and Binding Cases.

The Index to Volume I. of THE WIRELESS WORLD is now ready, and will be sent free of charge to any reader requiring a copy, provided a halfpenny stamp is sent with the application to cover cost of postage.

Cloth cases for binding the first volume of THE WIRELESS WORLD have also been prepared, and these are on sale at 1s. each (postage, 3d. extra). A limited number of bound copies of Volume I. of THE WIRELESS WORLD are available, price 4s. 6d. net each copy (postage, 8d. extra).

Applications for binding cases and copies of bound volumes should be sent with full remittance to the Marconi Press Agency, Marconi House, Strand, London, W.C.

# Maritime Wireless Telegraphy

ON Sunday, March 29th, the Chilian transport *Maipo* arrived at Falmouth, showing unmistakable signs of having encountered terrific seas. She was seen to have a heavy list to port, some of her boats had gone, the ventilators had been broken, hatches were stove in, and there was water in the holds; yet, even in such a condition, she might be considered a lucky vessel, for she had narrowly escaped disaster in the Bay of Biscay.

*Operator of the "Maipo," E. Estanislas, who, for three days and nights stuck to his post in spite of the violent weather.*

On Thursday, March 26th, her steering gear went wrong, and she soon found herself in such a distressed condition that her captain thought it necessary to send wireless messages for help. A north-westerly gale was raging, with seas running mountains high, and the *Maipo*, which had developed a heavy list, was labouring in the trough in a helpless condition. Her S.O.S. call speedily brought rescuers; the *Otway*, the *Sierra Cordova*, the *Kaiser Wilhelm II.*, the *Californie* and the *Northam*, and other vessels came to her aid and stood by her for some hours, but resumed their voyages when they found the distressed vessel only wanted towing, and that the *Northam* was prepared to perform this duty as soon as the weather moderated. After a time the weather moderated and the vessel was able to proceed under her own steam. The transport had a crew of 105 officers and men.

* * *

The total number of vessels plying on the Pacific Coast fitted with wireless and operated by the Marconi Wireless Telegraph Co. of Canada is now 24,

* * *

New York has been keenly interested in the salving of the British freighter *Queen Louise*, which recently stranded near Sea Girt, New Jersey. The work has been carried out under the new methods of salvage which were introduced, with the help of the Government, by the late John Arbuckle. Wireless telegraphy played an important part in the rescue, so that we think it will interest our readers to give some description of the proceedings.

Once on a time salvage companies' vessels—which, by the way, were entirely private commercial concerns—would "take over" a derelict vessel, and nothing more would be heard of the state of affairs or the progress of their work, even by the owners of such a vessel, until the cargo was landed and compensation paid.

Mr. Arbuckle entirely reorganised these slipshod methods. He was encouraged to his work by the amendment of the navigation laws and the decision of the Government to keep revenue cutters in constant readiness in time of stormy weather so that they might hasten to the relief of any vessel in distress. Already by this means many hundreds of lives and millions of dollars' worth of property have been saved without a single charge being levied upon the beneficiaries.

The wreck of the *Queen Louise* was a case in point. The Government has at this station two revenue cutters which are both fitted with wireless: one is the *Itasca* and the other the *Forward*.

The Marconi Company's offices at New York were rung up with a request for the company to wireless the *Itasca*, which was stationed off Manasquan, to report the condition of the steamer and the chances of moving her into deep water. In a few moments the report came through that the *Queen Louise* was undoubtedly in a bad fix—the sand was gathering about her doing its worst to pile up and hold her in its grip; worse than that, she was lying nearly broadside to the beach. On receipt of this important information an arrangement was quickly reached for two salvage companies, working upon a per diem basis, to undertake the task. By the employment of two instead of one salvage crew the shipping of the *Queen Louise's* cargo of tin was greatly expedited, and that made a considerable difference both to the owners of the ship and the underwriters.

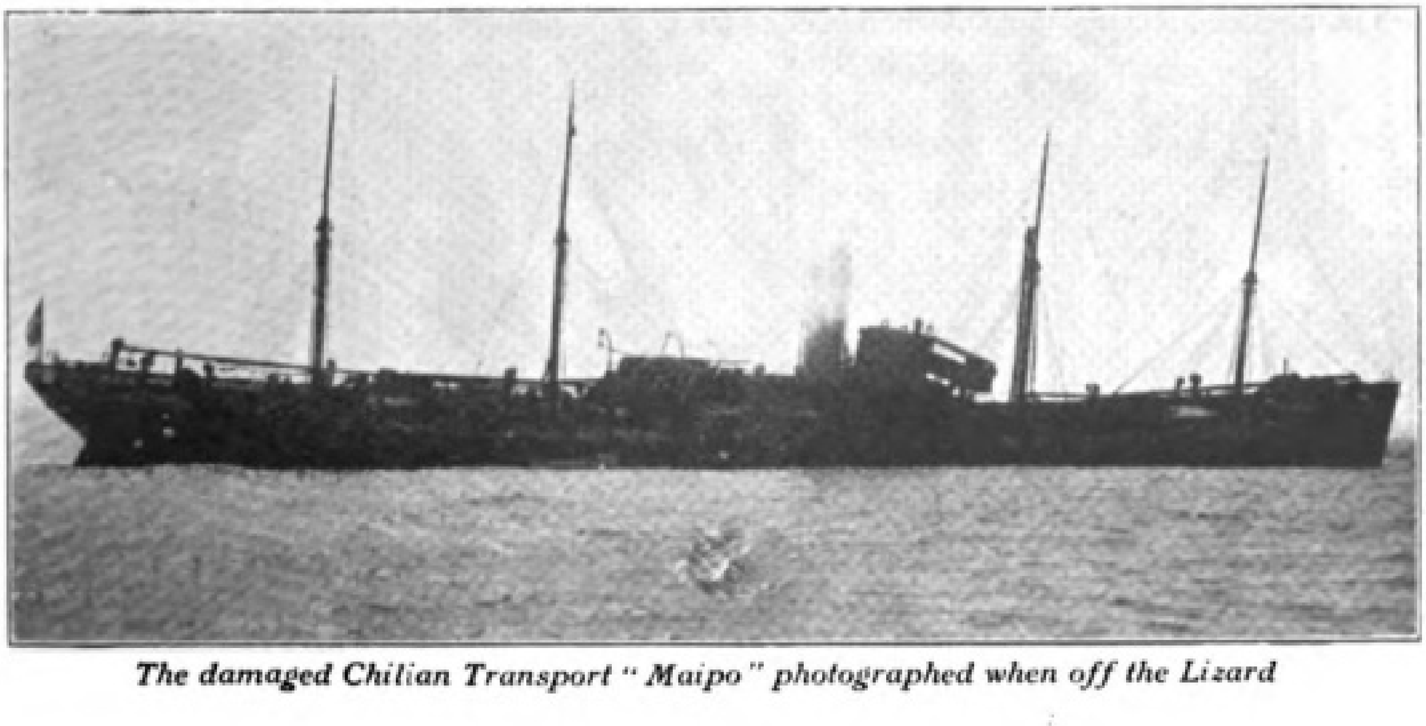
The work of salvage was difficult and somewhat tedious, and when it was accomplished the task of refloating the *Queen Louise* was commenced. The revenue cutters, the *Seneca* and *Itasca*, were connected up in tandem and assisted by the tug *Donohue*. On another line were three more tugs, with the little *Forward* lying near by, between them and the cutters. Here is where the *Forward's* wireless outfit showed its value.

* * *

When the *Itasca* was called back to the scene to lend her aid, and the cutter *Seneca* also arrived, a wireless equipment was hastily extemporised for the *Queen Louise*. It was a makeshift affair; for energy recourse was had to a few dry batteries and bell wire answered for the antenna. Some operative details were missing, but the wireless operator from the *Itasca* bridged this difficulty by his skill and ready adaptability. This is what happened. By means of this crude plant the captain on board the freighter was able to communicate directly with the revenue cutters and with the *Forward*. The *Forward* in turn megaphoned instructions to the tugs on her flank, and in this fashion all of the salvage vessels worked in unison and in just the right way. Their well directed efforts, after some hours of struggling, finally got the *Queen Louise* free, so that she could make for New York unassisted.

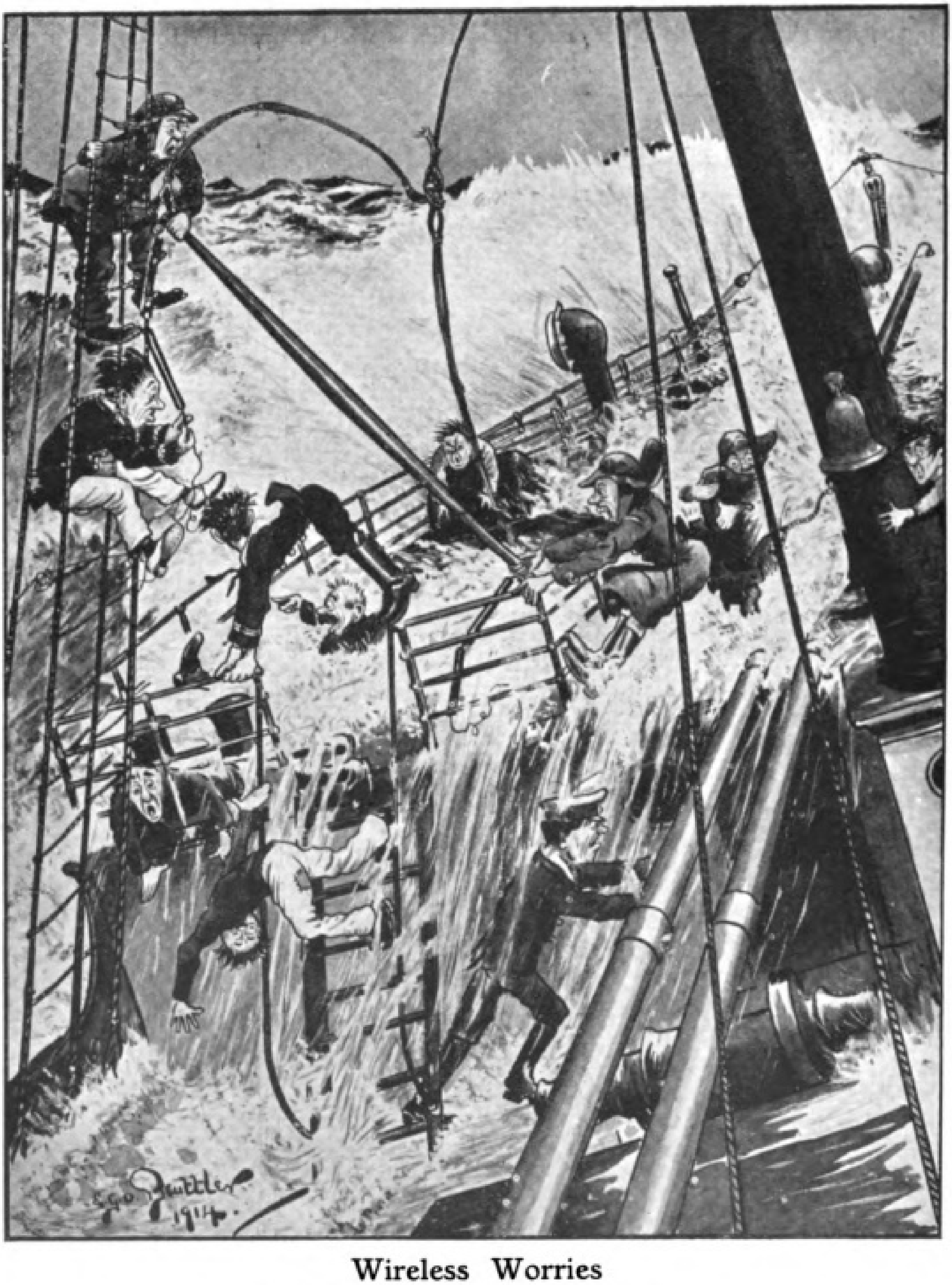
* * *

All who were engaged in this task had good reason to be proud of their achievement—not many years ago the *Queen Louise* would have been abandoned as a total loss, for, with the sand piling up about her, she would soon have become unmovable. It was only a question of seizing every possible moment, a task not to be accomplished without the assistance of wireless telegraphy. Furthermore, without combined action the tugs and salvers could never have refloated the vessel against the suction of the sand; only the united pull of tugs and salvers could do that, and such unison was entirely due to the constant service of the wireless telegraphy between the vessels. *Triumphans Marconi!*



*The damaged Chilian Transport "Maipo" photographed when off the Lizard*

# CARTOON OF THE MONTH



**Wireless Worries**

*Repairing an Aerial in Bad Weather.*

# Among the Operators

*[This section is devoted to recording items of particular interest to wireless telegraph operators.]*

Operator Snoeck, who was in charge of the station of the SS. *Noordwyck*, when that vessel became disabled through losing her screw, has just been presented with a gold watch, suitably inscribed, by the ship's owners, Messrs. Erhardt & Dekkers, in recognition of his services and the excellent working of the station on that occasion.

*Mr. P. A. Snoeck*

Operator D. Manson, of the Pt. Edward Wireless Telegraph Station, has been presented with an engraved gold locket by Messrs. Pickands, Mather & Company, Managers of the Interlake Steamship Company of Cleveland, Ohio, in recognition of his services during the storm on the Great Lakes, on November 9th, 1913.

A bronze tablet will be hung in the lobby of the Y.M.C.A. in Los Angeles, Cal., as a mark of respect to Donald C. Perkins, wireless hero of the steamship *State of California*, which sank in Gambier Bay, Alaska, on August 18, 1913. Perkins, who was a graduate of the wireless school of the Y.M.C.A. in Los Angeles, sacrificed his life in order to save others.

A letter from Secretary of Commerce, William C. Redfield, to Mr. Luther, Secretary of the Y.M.C.A., eulogising young Perkins, together with the wireless operator's photograph, will be framed and hung in the Y.M.C.A. lobby. Mr. Redfield, in the course of his letter, states :—

"The evidence shows that Mr. Perkins was off duty at the time of the disaster and that he presumably could have saved his life, if that had been to him the supreme thing. He went, instead, back to his post, sent his subordinate to assist in getting out the boats and remained himself, like a faithful soldier, at his station.

"The brief story of his self-sacrifice should be high among the honoured traditions of your institution. It shows that there are heroes of peace as well as of war, who, without the inspiration and excitement of battle, can face death with a quiet mind, fearlessly doing their duty to the end."

A Government Examination in Wireless Telegraphy was held at the Marconi House School, London, on April 1st, 2nd and 3rd, resulting in the undermentioned students securing First-Class Certificates for "Proficiency in Wireless Telegraphy":—C. Burgess, P. C. Grant, W. Higgins, J. A. H. Saich, W. E. Thorp, H. Turner, D. Condon, W. A. Guy, O. S. Kinipple, A. L. Seers, E. C. Tozer, N. G. Widger, D. A. G. Curd, D. Harvey, W H. Mills, C. G. Taylor, A. Turner, T. Wright.

We have frequently referred in this magazine to the remarkably long distances attained by Marconi ship installations in Australian waters, communications of over a thousand miles being of common occurrence. It is usually a matter for regret that the land line transmission does not keep pace with the wireless, for a message which has been transferred a thousand miles or so from the steamer to the coast in a fraction of a second often takes hours to arrive at its destination. An interesting case, not only of long distance wireless communication, but also of rapid delivery, has just been brought to our notice. The steamship *Miltiades* (Operator J. Moody), on the Australian run, recently dispatched a message to the Perth station, the address on the telegram being Melbourne. At the time of transmission the *Miltiades* was in Lat. 40. 4′ S. and Long. 83. 54′ E., the distance from Perth being 1,616 miles in a straight line. The distance from Perth to Melbourne, overland, is 1,394 miles, so that the total distance traversed by the message was 3,010 miles. The ship itself was 2,796 miles from Melbourne. The time taken by the message in its long journey from the ship to the addressee's house was only two hours, or an average of over 25 miles a minute!

Mr. G. H. Sellars has returned to London from service on the SS. *Salsette*, the fast P. and O. mail steamer plying between Aden and Bombay. Mr. Sellars completed 16 months foreign service, and he is now making one voyage on the P. and O. SS. *Caledonia*, and proposes to take his foreign service leave on his return in May.

Mr. H. E. Penrose has returned from Trinidad, where he has been installing 1½ kw. ship sets aboard the SS. *Balantia* and *Berbice*, of the R.M.S.P. Co.

Mr. W. J. Thompson, who was operated on for appendicitis at Colombo, has now completely recovered, and has returned home as passenger on the SS. *Nyanza*.

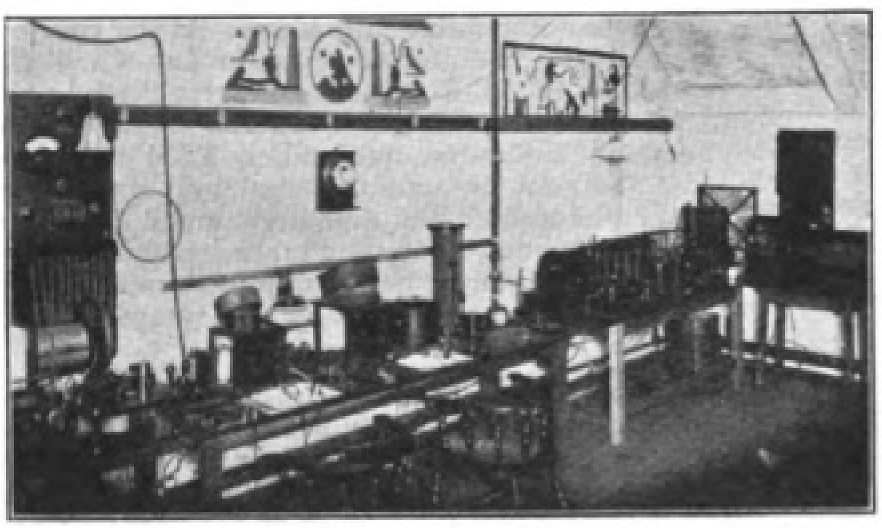
A special issue of the *Post Office Circular* has just been published containing the decisions of the Postmaster-General in regard to the recommendations of the Select Committee of the House of Commons which last year inquired into the question of the wages and conditions of service of postal employees. In the main the findings of the Committee with regard to pay and emoluments have been followed. The advances in wages extend throughout the whole of the Post Office service, and where they have not already come into operation they will be dated back to February 2nd. Wireless operators will earn 32s. during their first year, and 35s. a week during the second. On passing the technical and manipulative examination and being accepted on the staff they will receive 40s. a week, and then by annual increments of 3s. they will rise to 70s. a week. The hours of duty will be 45 a a week. Wireless overseers will receive £200 a year rising to a maximum of £230.

# Amateurs' Experiences

## *Experimental Wireless Station at Warminster*

By L. CLAUDE WILLCOX.

JUST over fourteen years ago my father purchased a 10-inch coil for his professional use, and I suddenly found, on returning from school, that I had 12 real live volts and 10 inches of lightning to play with.



*1. General View of the Station.*

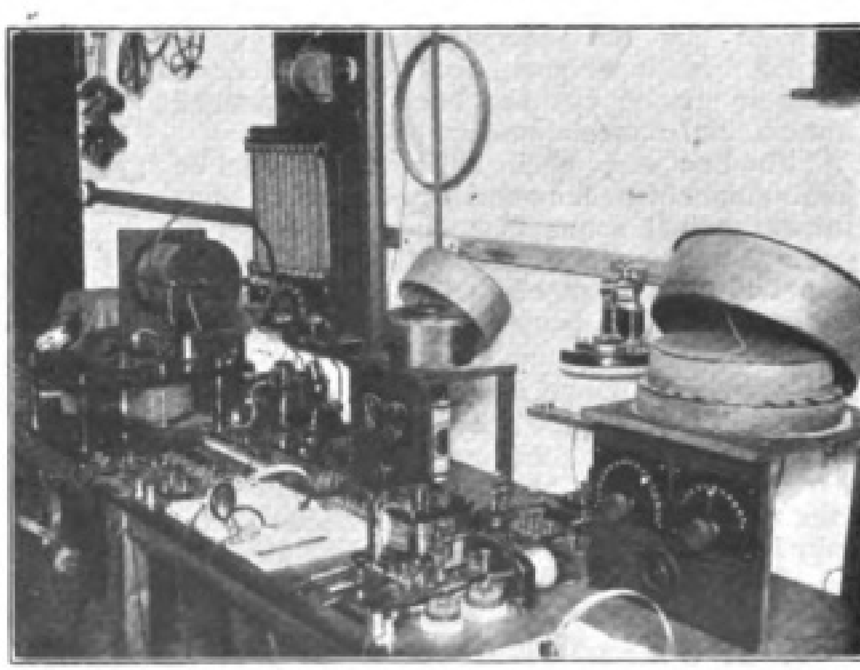
My father, who is keen on matters scientific, at once agreed with me that a coherer should be made and experiments tried with wireless. The results, as one would expect from a home-made coherer, were *nil*, so we bought a coherer and relay, and, without any difficulty, at once succeeded in ringing a bell across the room, and eventually in different parts of the house.

The next step was to try and signal over longer distances. Two 20-ft. poles were purchased and 20 ft. of copper rod for each pole, and insulators, made of glass bottles, were fixed.

The transmitter was fixed up in a summer house, and the receiver, about 200 yards away, in a similar building. Having only one receiver and one transmitter it was necessary to have some means of replying, and as the stations were not in sight of each other, owing to trees, it was necessary to run some way and flag-signal—a course which was most unsatisfactory, as the man at the other end was always adjusting something instead of looking. A telephone was subsequently erected, and this formed a more satisfactory means of communication between the two stations than even the wireless did, although quite satisfactory signals were, on many occasions, received.

I remember, about this time, staying on board the *Vernon* and being shown the wireless then in operation, and thinking how wonderful it was with about 20 h.p. to be able to send and receive about ten miles.

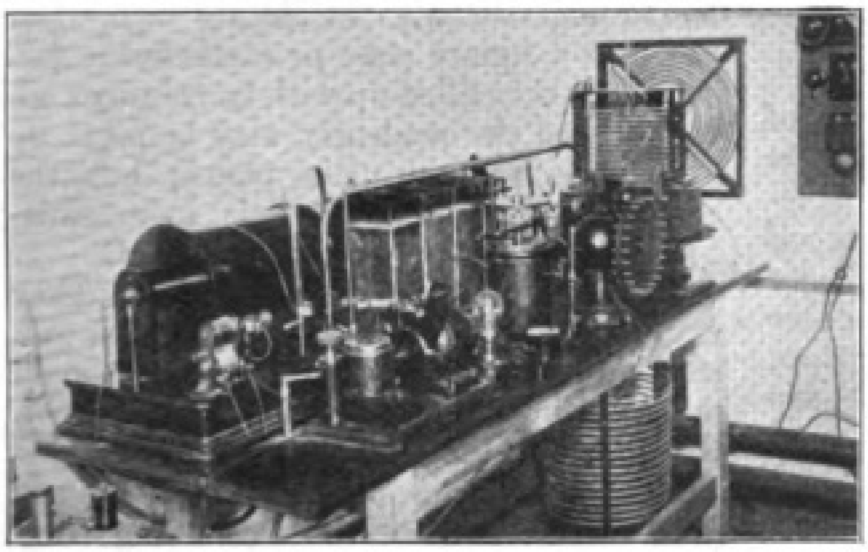
For several years after this I was unable to carry on the experimental work that I should have liked, but I was asked to demonstrate my apparatus across the room at University College,



*2. Receiving Gear and Switches.*

Bristol, where I was a student, at a lecture that was being given on the subject.

It was not until November, 1910, that I really took up the matter in earnest again. I had just made the acquaintance of an ardent experimenter and we decided to attempt to communicate with each other. I rigged up an aerial, and very shortly after, through my friend's help, got plenty of signals. Transmission was not such an easy matter, but after many weeks of "fuse blowing" and "exploding of mercury breaks," signals were just heard at the other end, and now the 22 miles is covered with an inappreciable amount of power.



*3. Transmitting Apparatus.*

My station is erected in the old club room of the Castle Inn (now the premises of the Warminster Motor Co.), where our forefathers used to sit and drink the good ale brewed on the premises, and from which room communication with the outside world was only by means of a trapdoor, still in existence, through which the mystic password which allowed one to enter was whispered. Now that magic password "WUX" comes in through a piece of cable in the skylight.

People have such different ideas about experimental stations; some try to get as many stations as possible all at once, and some try to get few. I think it should be the aim of experimenters to try and tune out everything, except the one (your experimental friend) you happen to be working with, at a given time.

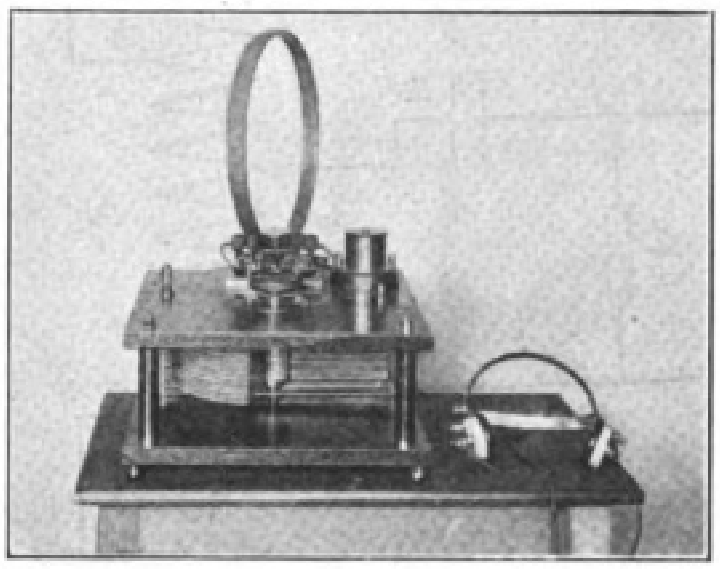
The accompanying photographs of my station as it is to-day may be of interest.

Fig. 1 is a general view of the various receivers and transmitters, all of which are home-made, with the exception of the coil (transmitting), phones, and an odd switch or two.

Fig. 2 is the transmission table, underneath which can be seen the extra inductance for producing a long wave, which I have special permission to use for a certain purpose. The mercury break, in the centre, produces a note two octaves above middle C.

Fig. 4 represents a home-made wave-meter, which I can use either as an incoming or outgoing wave-meter, or as a variable condenser pure and simple.

I shall be pleased to show my station to experimenters who may be interested, by appointment, or give any information I can to others who sit and scratch their heads and "wonder"—like all experimenters find it necessary to do.



*4. Wave-meter with Detector and 'Phone.*

## Aerials.

Wireless telegraphy is making progress in the Church Lads' Brigade ranks, and one of the pioneers has achieved notable success. The Rev. Francis M. Trefusis, an enthusiast in "wireless," has made and fixed apparatus for receiving air waves on the top of St. Andrew's Drill Hall, Rowbarton, Taunton, used by the parochial company of the Brigade, and the Postmaster-General has granted him the necessary licence.

# The Amateur Handyman

## Transmitting with a Motor Cycle Coil.

By A. L. MEGSON.

NOT the least interesting part of amateur wireless experimenting is transmitting. It may not be generally known, perhaps, that a motor-cycle coil used in conjunction with a simple helix gives sufficient power to transmit readable messages up to a distance of five or even more miles. In the set I use signals are strong up to two miles, and are easily read at five miles. On one occasion I received readable signals from a friend seven miles away, using a coil of this description.

The method of connecting up is shown in Fig. 1. The helix A is made up as follows :—

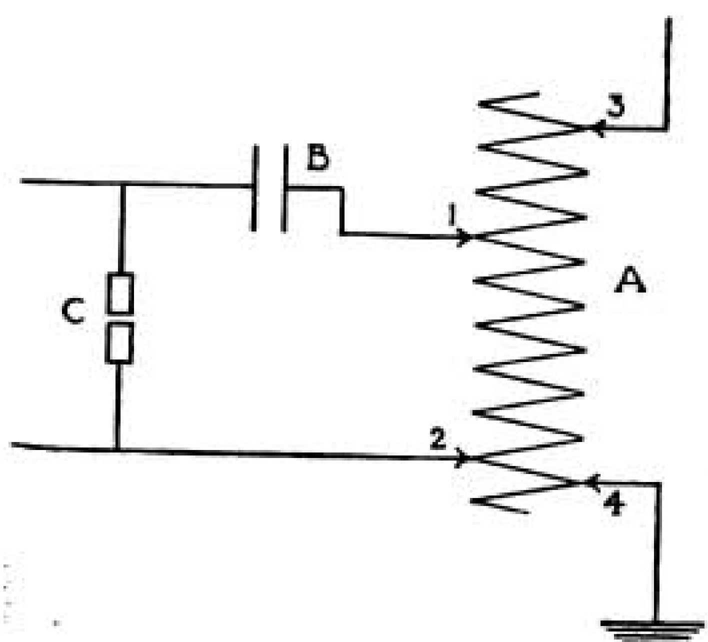



*Fig. 1.*

On a cardboard tube about 12 inches by 6 inches is wound, say 30 feet of $\frac{3}{16}$-inch diameter copper or aluminium wire spaced about $\frac{3}{8}$ inch apart. The clips 1, 2, 3, 4 are ordinary tie-clips soldered on to flexible wires.

The condenser B consists of ten pairs of zinc plates 4 inches by 2½ inches, separated with glass plates slightly larger. By arranging them in two pairs and two lots of four pairs each, either two, four, six, eight, or ten pairs may be used to vary the capacity. The zinc and glass plates should be tightly bound together with insulating tape, then put into a square glass or earthenware jar. The jar is then filled up with transformer oil. If preferred the condenser may be made up of tinfoil between glass plates, but the condenser described above is more satisfactory. The spark gap is shown at C.

The electrodes should be of zinc. They can be made from battery zincs turned to a suitable size in the lathe. The ends should not be rounded, but left square, as shown in the drawing. The tuning is done by varying the position of the clips on the helix and also the capacity of the condenser. If a 4-volt lamp is placed in the aerial or earth lead and the position of the clips on the helix varied the lamp will glow brightly on pressing the key when the correct tuning has been arrived at. When transmitting to my friend I tried several methods of tuning by including more or fewer turns of helix or altering the capacity of the condenser and also the distance between spark gap, and by this means the correct position was easily arrived at. The disadvantage was that I could be heard more or less loudly on almost any part of his tuning coil, and I was requested by several amateurs not to transmit while the big stations such as Paris and Cleethorpes were sending. To improve matters in the way of tuning I constructed a small oscillation transformer. This is quite a simple piece of apparatus, and is shown in Fig. 2, E being the primary and F the secondary. The method of construction is as follows :—On a cardboard cylinder 3 inches diameter and 4 inches long is wound quite closely about twenty turns of No. 12 D.C.C. copper wire. This is the secondary. This is then placed inside another cylinder 4 inches diameter and 4 inches long. A helix of six turns of copper or aluminium wire is then wound to fit inside the larger cylinder; the space between the two cylinders in which the helix lies is then filled up with paraffin wax. A round top and base should be fitted (5-inch gas pottrasses are suitable); four terminals should be fitted on the top, two each for primary and secondary; the 4-volt testing lamp can also be mounted on the top.

The connections are shown in Fig 2.

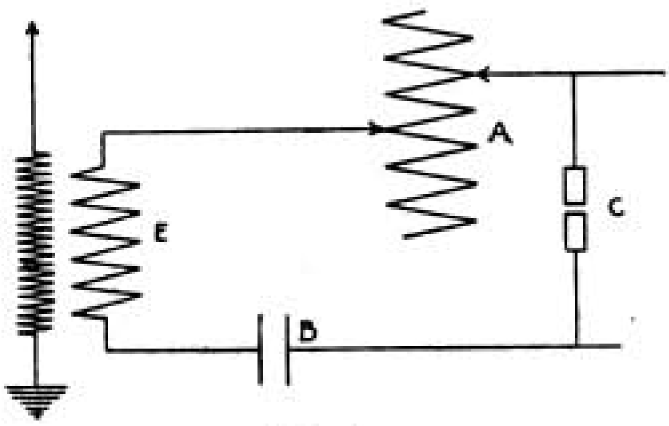



*Fig. 2.*

This arrangement enabled me to tune very much finer. With the plain helix only, when my friend was listening to a commercial station, he could not tune me out, but when I used the oscillation transformer he found I was quite sharply tuned and did not interfere with the other stations. There are several amateurs within range of my station, and we found no difficulty in getting into touch. I think it is advisable to use a small coil only for distances up to four or five miles. It is more easily manipulated, the expense is much less, and accumulators only require recharging about once every month.

* * *

## Magnetically Operated Detector.

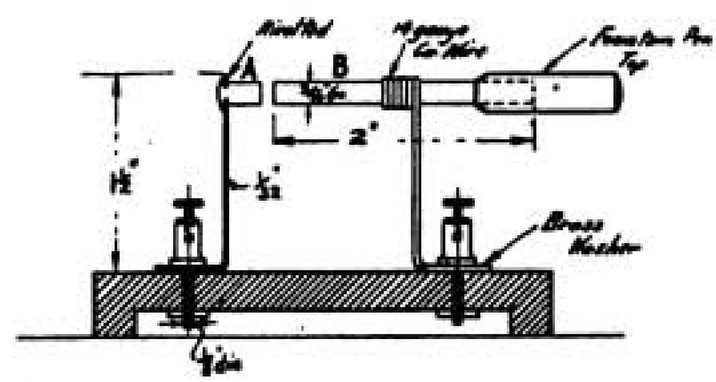
D. S. R. (Bishop's Stortford) writes: "J. F. E. C. gives a diagram and description of a magnetically operated detector of his own design. He omits to state whether pole pieces are provided with small brass plugs to keep the soft iron armature from actually touching them, for were this to happen the residual magnetism remaining in the magnet when the current is switched off would be sufficient to keep the armature down, and therefore cause the crystal to remain in contact, which is not the object of the arrangement. Incidentally the detector terminals are not shown."

We have submitted this letter to J. F. E. C., who now replies: "There is no necessity for fitting the pole pieces with non-magnetic plugs. The strength of the spring for carrying the soft iron armature, together with the adjustment of the screw, C, prevents the soft iron armature from touching the pole pieces, even when too great a current than necessary is used. It must be borne in mind that when working, the vertical movement of the spring bar at the position of the armature is scarcely 1/64th of an inch. When the adjustment of the whole instrument is *correct*, the control current may be switched on 'all at once,' without the aid of the variable resistance. The switching off of the current lifts one crystal from the other, giving absolute protection. The controlling current of the detector may be connected up in a simple manner to the main 'change over' switch, thereby saving the working of two independent switches. Detector terminals were not shown in the diagram, but in practice *they are fitted*."

* * *

## Some Wireless Apparatus.

A spark gap which gives good results for small power is shown in the accompanying diagram. It consists of a piece of aluminium rod $\frac{3}{16}$ inch diameter riveted on to a piece of brass strip $\frac{1}{32}$ inch thick. The other portion has five turns of about




14 gauge copper wire wound round it. The effect of this is to allow B to be advanced to, or retarded from, A by a screwing action. The end of the wire is brought down and soldered on to a brass washer. Terminals are used to fasten A and B on to the ebonite base. An old fountain-pen top is filled with molten sealing wax and stuck on the end of B.

GIBSOR.

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Newport Secondary Education Committee have decided to start a class of instruction in wireless telegraphy at the Technical Institute, under Mr. W. B. Edwards, chief inspector of wireless telegraphy at Newport Post Office.

# Among the Wireless Societies

**Birmingham.** — *An Exhibition.* — The first annual exhibition of the Birmingham Wireless Association was held on March 26th and 27th at Queen's College, and was so well attended on each evening that on the next occasion the exhibition will probably extend over three or probably four evenings.

The platform in the hall was occupied by four model aerials, Eiffel Tower, Nauen, Poldhu, and a reproduction of the "Wireless Compass" aerial, as supplied to a ship.

An interesting exhibit, from an historical point of view, was one lent by Dr. J. R. Ratcliffe, and consisted of the first receiving set which was ever demonstrated in Birmingham. The detector is one of the original filings coherer type, and this actual one was sent to Dr. Ratcliffe by Mr. Marconi shortly after he had got his first message across from the Isle of Wight to the mainland.

The Marconi Company exhibited the instruments used in connection with the "Wireless Compass," a multiple tuner and magnetic detector.

An exhibit which appealed to the members consisted of some "Cartwheel jiggers" from the Derby Wireless Club, whose chairman and secretary were present at the exhibition.

The first annual meeting of the Birmingham Wireless Association was held on April 6th, at Geoffrey Buildings, John Bright Street.

Capt. A. Handley, President of the Society, resigned owing to continued ill-health, and a resolution was passed expressing the members' appreciation of the support he had given the Society during the past year.

The report stated that there are between sixty and seventy stations in the Birmingham district, most of the owners of which are members of the Association. The


*View of the Birmingham Exhibition.*

Secretary pointed out the need for further financial support, and after discussing the advisability or otherwise of raising the subscription, it was decided that it should be left at 5s., but with a monthly levy of one shilling; this to take effect for as long as the Association continued to meet in its present premises.

The following officers were elected: Hon. Sec., Mr. J. B. Tucker; Asst. Hon. Sec., Mr. H. H. Whitfield; Treasurer, Mr. P. S. Beaufort; Auditor, Mr. C. L. Ray; Committee—Messrs. H. Beresford, A. C. Chatwin, G. Dennison, H. Littley, G. H. Lloyd, C. L. Ray, and J. J. Shaw. The name of the new President will be announced later. The following are vice-presidents of the Association: Mr. E. Ansell, Mr. W. F. B. Bartram, Capt. A. Handley, Dr. W. E. Sumpner, and Mr. J. B. Waine.

* * *

**Croydon.** — *Receiving Circuits.* — The Croydon Wireless Society held its April meeting on the 4th ult., at the Polytechnic. Owing to illness, Mr. Chas. Ward was unable to deliver his promised lecture, and his place was filled by Mr. R. E. H. Carpenter, who gave a short lecture on Receiving Circuits and Loose Couplers. An interesting discussion followed.

* * *

**Derby.**—*Discussion on Aerials.*—At the meeting of the Derby Wireless Club on April 1st, Mr. J. W. Downes gave a paper on "Aerials," which was of especial interest to beginners. This was followed by a general discussion and an account by Messrs. Taylor and Lee of their visit to the Birmingham Wireless Association's excellent exhibition. The Club held a meeting on Saturday, April 18th, in the clubroom, to give neighbouring corresponding members an opportunity of meeting other members and visiting some of the local stations.

* * *

**Liverpool.**—*The New Club Room.*—A meeting of the Liverpool and District Wireless Society was held at the New Club Room, 12, Goree Piazzas, on March 19th. It was decided to hold weekly meetings on Thursdays, commencing at 8 p.m., and to arrange any additional meetings that might be required, a responsible member of the Committee being in charge.

**London.** — *Wireless Receivers.* — The March meeting of the Wireless Society of London, held at the Institution of Electrical Engineers on the 30th ult., was devoted to a discussion on wireless receivers. Mr. H. J. Lucas, of West Malling, who opened the discussion, took as his starting point the diaphragm of the telephone receiver, and he gave results of some experiments he had carried out. With diaphragms over 2 inches in diameter the results were unsatisfactory; all the diaphragms he had tested between sizes 1⅜ inch and 2 inches were equally sensitive to faint signals provided other factors remained constant. The smaller sizes gave a crisp, thin, penetrating note, while the larger sizes gave a sonorous note of larger volume and lower pitch.

Passing to the more important point of the permanent magnetic system, Mr. Lucas said he had obtained his best results with a powerful field, which was the quality that the design should aim at. This ruled out all receivers of the single pole type, where more than half the field was lost through magnetic leakage. Circular ring magnets appeared to be commonly used in modern wireless receivers, but Mr. Lucas favoured the horse shoe type, as he found that with this type the field was frequently very strong. He suggested that two should be the minimum number of magnets used; he had seen as many as five in one 'phone, but the objection to a large number was that it increased the weight; however, efficiency should not be sacrificed in order to produce a very light head-gear.

The pole pieces should be placed as centrally as possible, so as to give a maximum pull on the diaphragm. Their permeability should be high and hysteresis losses kept low. When the earlier manufacturers were under the effect of the high-resistance obsession a number of 'phones were made with very large pole pieces, the idea being to obtain a high resistance by means of the length of the wire in each turn. The high resistance was certainly obtained, but very little in the way of signals. The failure here was due to the fact that the minute currents involved, combined with the high resistance, were unable to produce the requisite degree of magnetic saturation in such a large mass of metal. When the same current was applied to the same number of turns and to a smaller mass of metal better results were obtained.

The resistance to which a receiver should be wound depends on the detector, the factors governing the relationship between them being whether the detector is voltage or current operated and the actual resistance of the detector itself. The resistance of the receiver should approximate to that of the detector. Different adjustments of different detectors would give varying resistance values, but the majority were high, and there appeared to be no limit to the resistance to which the 'phone could be wound. The highest he, Mr. Lucas, had tried was 5,000 ohms per 'phone with 7,000 turns per bobbin. He considered, however, that maximum results for average detectors could be obtained with 2,500 ohms per 'phone with 6,000 turns per bobbin.

The winding capacity of the bobbins being fixed and also resistance which was desired being known, it remained to choose a gauge of wire which would fill the available space with useful turns. The result was not so good when the same number of turns of a finer wire was used in less space.

The quality of the fine gauge wire used in this work varied considerably; samples of 49G. had given less turns per unit space than samples of 46G., due to the insulation of the former being too thick.

The adjustment of the diaphragm with respect to the pole pieces was of the utmost importance. Generally, the best position would be with the diaphragm as close to the poles as possible without touching, but in practice this was found to be undesirable, for the diaphragm in this position was very unstable and a slight jar would jolt it down on to the pole pieces. When the receiver was so adjusted and quite cold the diaphragm would sometimes stick down, but after use for a longer or shorter period the expansion of the different parts caused by the heat of the head resulted in the diaphragm taking its proper adjustment. If this took place within a few seconds the receiver should not be interfered with.

In practice the usual adjustment was not carried so close to the pole pieces, but each receiver should be adjusted on its own merits. The best method of adjustment was on the aerial with test receivers for purposes of comparison. A medium pitched note was useful for this purpose, as the receiver could be adjusted to favour high or low pitched notes at will.

Coming now to the question of thickness of the diaphragm, Mr. Lucas said this depended entirely upon the 'phone under test. On a small diaphragm a thickness of 4 mils. would be suitable. The question also depended upon the strength of the magnetic field, and where the field was comparatively weak a thinner diaphragm might be substituted with advantage. For large diameter with a powerful field about 8 mils. was suitable.

The best type of receiver might have any diameter diaphragm from 1⅝ inches to 2 inches. Pole pieces should be small and placed closely together, the winding spaces being designed to achieve this object.

The permanent magnet system should be such as to ensure a powerful field, and the material should be the best obtainable, particularly in the case of steel for permanent magnets, the iron in the pole pieces, and the selection of the wire for winding.

Mr. S. G. Brown's new Reed receiver marked a considerable step in advance, but Mr. Lucas was convinced that the possibilities of the present type of receiver were by no means exhausted, and he had demonstrated that the last word had not been said in sensitiveness, working along the old lines. He suggested that a good field for research would be the study of the acoustic of the instrument with a view of improving it on the line of sympathetic vibration, also the effect of different materials used as diaphragms, such as mica and celluloid.

MR. F. J. CHAMBERS, who followed Mr. Lucas, said that the Admiralty specification, which insisted upon lightness, probably militated against the production of good 'phones. The question of undamped diaphragm and tuning to a particular note frequency seemed to go together. It was not merely the case of adjusting the circuit so that the capacity and inductance were right, but it was also necessary to keep down the damping, otherwise good selectivity would not be obtained.

DR. J. ERSKINE-MURRAY emphasised the line of distinction between 'phones employed for wireless and 'phones employed for articulate sound. MR. E. RUSSELL-CLARKE also took up this line; he suggested that there should be two distinct types of 'phones, one for wireless and the other for talking, and that in the former the amplitude of the diaphragm vibration should be as great as possible for the incoming current. An extremely strong permanent field was required in designing a wireless 'phone and this was practically impossible with the diaphragm.

MR. A. A. CAMPBELL SWINTON (who presided) pointed to the importance of a strong magnetic field in the telephone receiver, which the Hon. Charles Parsons, of turbine fame, foresaw twenty years ago. For wireless telegraphy a 'phone was required that would give audible signals with the least possible expenditure of energy. Very strong fields introduced disadvantages, such as extra damping and interference if the insulation possessed any magnetic qualities. Varnished wire, if obtainable, was therefore, better than silk-covered wire. These disadvantages apart, however, it was necessary to have the strongest field that it was possible to obtain.

MR. H. H. HARRISON predicted that the wireless 'phone of the future would weigh about 20 lb.; but it would not be a diaphragm telephone; it would be of polarised iron and the sound would be produced by the molecules of the iron.

Another speaker suggested that it was time to adopt more scientific methods of classifying telephones and testing them. If the 'phone diaphragm was too undamped, it was difficult to know where the dash finished and the dot started.

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**Newcastle.**—*Opening of New Premises.*—The formal opening of the Newcastle-on-Tyne and District Amateur Wireless Association took place on March 21st, at 29 Ridley Place, the headquarters of the Association. Mr. N. A. Collard occupied the chair, and Prof. W. H. Thornton, of the Armstrong College, formally opened the Association's premises. Dr. Thornton in the course of his remarks gave a brief outline of the history of wireless telegraphy from the time of its earliest inception up to the present day, and at 4 p.m. transmitted the first message —" Full attendance, going strong "—to the North Eastern School of Wireless Telegraphy in Eldon Square, Newcastle, who replied as follows: " Message received O.K. Wish you every success."

Following the formal opening an exhibition of telegraphic (wireless and otherwise) apparatus was held, which remained open until 10 p.m. Among the exhibits was a portable transmitting and receiving set lent by the Marconi Company, together with other apparatus, and operated by Mr. White, the company's representative. Apparatus was also lent by members of the Association, and this included experimental sets made by Mr. E. T. Payne, of the Post Office Engineering Staff, who also conducted several electrical experiments throughout the day.

## Forthcoming Meetings.

WEDNESDAY, MAY 6TH.

*Birmingham Wireless Association.*—Meeting at Geoffrey Buildings, John Bright Street, 7.30 p.m.

*Derby Wireless Club.*—Mr. C. L. Drury on " The Care and Maintenance of Accumulators," at 47, Full Street.

*Dublin Wireless Club.*—Mr. J. Smyth, on " Duplex Working," at 11, Lower Sackville Street, 8 p.m.

FRIDAY, MAY 8TH.

*Northampton and District Wireless Club.*—Meeting at the Club Room, " Garibaldi," Ash Street, 8 p.m.

TUESDAY, MAY 12TH.

*Leicester Model Engineering Electrical and Wireless Association.*—W. H. Shardlew on " Rough and Ready Engineering and Wireless Experiences," at 1a Church Gate, 7.30 p.m.

WEDNESDAY, MAY 13TH.

*Derby Wireless Club.*—Mr. R. Briggs on " Radiation," at 47, Full Street.

*Radio Scientific Society.*—Mr. W. R. Wade on " The Wireless Chart," at 43, Thomas Street, Manchester, 7.30 p.m.

*Dublin Wireless Club.*—Experimental work, etc., at St. Pancras, Harold's Cross Road, Terenure, at 8 p.m.

WEDNESDAY, MAY 20TH.

*Radio Scientific Society.*—Mr. R. Thompson on " High Frequency Phenomenon," at 43, Thomas Street, Manchester, 7.30 p.m.

*Derby Wireless Club.*—Mr. A. T. Lee on " Field Work," at 47, Full Street.

*Dublin Wireless Club.*—Mr. W. D. Douglas, " Designs for a simple Lattice-Work Mast," at 11, Lower Sackville Street, 8 p.m.

TUESDAY, MAY 26TH.

*Wireless Society of London.*—Mr. G. G. Blake on " The Use of the Electric Arc in Wireless Telegraphy and Telephony (the speaking Arc, the Musical Arc, and a Water-cooled Arc in Hydrogen)," illustrated, at the Institution of Electrical Engineers, Victoria Embankment, W.C., 8 p.m.

WEDNESDAY, MAY 27TH.

*Northampton and District Wireless Club.*—Exhibition of Portable Receiving Apparatus by Mr. A. E. Farmer, at the Club Room, Ash Street, 8 p.m.

# "They that Walk in Darkness"

A WIRELESS APPEAL FOR THE BLIND. HOW THE BLIND MIGHT USE WIRELESS.
SPECIAL INTERVIEW.

MR. MARCONI'S invention has saved thousands of lives; now it has come to the aid of those afflicted ones who without its assistance would be hopeless. For the first time on record "wireless" was used for the purpose of benevolence when, on March 28th, King George's appeal on behalf of the National Institute of the Blind, Great Portland Street, London, was sent out to ships at sea.

The appeal was first forwarded from London by Mr. C. Arthur Pearson, hon. treasurer of the institute, and transmitted over the land lines to the Marconi high-power station at Poldhu, which is utilised for transmitting news and private messages to ships at sea. Those ships on which the ocean newspaper is published have a receiving range from Poldhu of 1,500 miles. The appeal was at the same time forwarded by wireless over the ocean by the Marconi Transatlantic system to Cape Cod, Massachusetts, which carries on a service similar to that of Poldhu and has an equally powerful range.

The actual message ran as follows:

### King George and the Blind.

#### First Wireless Appeal on Record.

King George, in opening the new premises of the National Institute for the Blind on March 19th, wished God-speed to the appeal for books in Braille for the sightless, which his Majesty said would "break down the barriers shutting out the blind from the common interests of life."

King George further said, "I am confident your appeal for funds will stir the imagination of many who unreflectingly enjoy the blessings of sight."

Books in Braille are practically the only solace of the blind, and in view of his Majesty's speech, which guarantees the genuineness and urgency of this appeal, may we ask you to arrange during voyage subscriptions to this first appeal on record made by wireless? The appeal is made to all on board British ships, and even to sympathetic friends on ships flying other flags who are grateful they are not blind.

Kindly send proceeds to Lord Mayor's Fund for the Blind, Mansion House, London.

This message sent you gratis by kindness Marconi Company.

(Signed) ARTHUR PEARSON, Honorary Treasurer, National Institute for the Blind, Great Portland Street, W.

This message was sent out from the two stations and received by all the ships adapted for receiving long-distance messages. It was addressed to the captain of every ship, and his good offices were asked in organising a collection on board and in giving publication to the appeal in the ocean newspaper. Each wireless operator re-transmitted the appeal to every other ship he met which does not happen to be adapted for receiving messages from Poldhu or Cape Cod. In this way every ship in the North Atlantic received the King's appeal.

There were also a number of ships on the South Atlantic routes which were within range of Poldhu, and they also received the appeal, which was published in their newspapers and re-transmitted to other ships not adapted for receiving long-range messages. In the same way a large number of ships on the Mediterranean received the message from Poldhu and re-transmitted it to other ships.

The message as received by all vessels on the above routes was offered in turn by them to every merchantman met with, so that within a short time it travelled all over the Pacific, South Atlantic, and Indian Oceans. Thus there was formed not merely a wireless chain, but a world-wide wireless mantle in aid of the blind throughout the Empire.

**How the Blind can use Wireless.**

This demonstration of the use of "wireless" for the purpose of benevolence finds its counterpart in an interview we have had with a gentleman who, though afflicted with blindness, is nevertheless keenly interested in wireless telegraphy, and thinks it can become of great service to the blind.

"The sense of hearing is extremely keen in the case of a blind person, and this is a valuable asset to anyone taking up 'wireless.' To learn a system of signalling like the Morse Code is comparatively child's play, and many blind men would have no difficulty in putting it into practice.

"The sense of tone is often very acute in the blind man, and among my acquaintances is a man who has a note for everything which will produce a sound when struck, and with the more resonant materials, such as china and glass, he will state what the note is.

"Wireless receiving outfits would undoubtedly keep the more progressive type of blind man in touch with the daily events of life. The daily news service which is sent by 'wireless' to ships at sea would be a blessing to those who are unable to get someone to read the newspapers to them every day, and it must be remembered that the blind person is entirely dependent upon others for his news of common events. Imagine with what eagerness a blind man would put on the 'phones and listen for the Poldhu daily news, and in the morning at breakfast tell of the happenings of the day before!"

We were assured in the course of our interview that the blind wireless amateur is not likely to take merely a passing interest in the practical side of the science. As we all know, not a few young men are attracted to wireless telegraphy and enter into it with unbounded enthusiasm, but they tire of it almost as quickly, and for all practical purposes cease to be interested. Discarded and weather-wrecked aerials are no uncommon sight, and they offer abundant proof of the temporary attachment of the amateur to wireless.

Speaking as a blind man whose interest has only just been aroused in the art, our informant assured us that wireless is regarded as a coming essential in the life of the educated blind. The simplicity of the receiving apparatus, the delicacy of touch which will enable the blind man to handle an ordinary crystal detector, and the fact that batteries and other accessories are not required, makes the outfit ideal for the individual in question.

From a scientific point of view it has yet to be shown that the blind are incapable of advancing theoretical knowledge and practical applications of wireless. The educated blind men have extraordinary intuition and introspection. Many of them are firm believers in the possibilities of telepathy and in wireless they perceive a valuable stepping-stone to that end. We heard of a few enthusiasts who claim to have succeeded in establishing communication by telepathic means, and this fact encouraged our informant in his pursuit of knowledge of wireless. Those who are following the kindly example of His Majesty the King and Her Majesty the Queen in assisting the cause of the blind can do worse than spend a little in placing small wireless receiving sets in the hands of a number of blind men having an undoubted predilection for matters scientific, but who are at present unable to gratify any of their desires owing to lack of funds; for even the working blind man earns but little, either in a professional or industrial capacity.

Of the possibilities of the blind man making use of transmitting apparatus, he did not speak so hopefully. "Where outside assistance is available in keeping batteries and contact breakers, etc., in order, he might use sending apparatus if arranged on the simplest scale. The restrictions imposed by the Postmaster-General as to the power which may be used also tends to put the transmitting apparatus out of court for the blind man. It is therefore unlikely that his practical interest in wireless will extend beyond the use of a receiving outfit."

The suggestion was made that the principal institutions in the country which are concerned with the education of the blind should have wireless receiving outfits, and that the Postmaster-General should grant licences for their use, in instructing the blind and enabling them to keep more closely in touch with the affairs of the outside world. Lecturers might also arrange to visit these institutions from time to time and give interesting details of the developments and possibilities of wireless telegraphy and telephony. They would be assured of attention and consideration such as they are sometimes denied with sighted audiences.

# QUESTIONS AND ANSWERS

*Readers are invited to send questions on technical and general problems that arise in the course of their work or in their study. Such questions must be accompanied by the name and address of the writer, otherwise they will remain unanswered.*

C. B. (Chelmsford) says the connections given him in our answer in the January number work very well; but he now wishes to use his "buzzer" for a different purpose; he wants to put a crystal and potentiometer in the circuit so as to test the efficiency of the detector before connecting to earth and aerial. Instead of doing this, he had better arrange the buzzer so as to give "trial signals" when the detector-circuit is all connected up and ready for distant signals. He will find a great deal of information about buzzer-connections in the "Handbook of Technical Instruction for Wireless Telegraphists," by Hawkhead.

He asks also: "Is an iron pump, fixed to a 1½ in. lead pipe which runs underground for about 22 ft. to a well, a good earth?" The lead pipe sounds as if it would make a satisfactory earth; we should take the earth-lead direct to the pipe and not to the pump. There is always the danger of jointing-material being used which may spoil the connection. In such cases it is well to assume that your earth is good, until you find that signals want improving: then try improving the earth. Bare wire just buried and running under the aerial is a helpful addition very often. There is not much to choose between the two aerials he suggests; he should try them both, for his own instruction, and for the sake of comparison he should make both of them twin or both fourfold.

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D. N. (Plymouth) gets "absolutely no results" on his receiving apparatus and wants to know why. We have published descriptions and diagrams of various ways of connecting up a crystal receiver, but D. N. has chosen the one which we have fought against over and over again—putting the high resistance silicon detector direct in the aerial circuit and at the point of lowest potential—the earth-lead. Among the innumerable things which he ought to read carefully in THE WIRELESS WORLD, we may mention the Instructional Articles, and the replies to W. E. D. (February, 1914) and A. C. (March). Moreover, it is very easy to get no results with a silicon detector. His method of connecting up his testing-buzzer is bad; the buzzer should be used as described in the Instructional Articles. He does not say what value of capacity his "blocking condensers" have; one of them might be suitable for shunting the telephones. His aerial sounds all right, but the lower end is painfully low.

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A. J. A. (Gibraltar).—(1) You say, "When the wave-meter is in tune with the aerial circuit, by noting the condenser-reading and referring to the calibration chart we immediately find the value of the wave-length." How is this? For does not this depend on the value of the inductance of the wave-meter? (2) How can one ascertain the minimum wave-length of a wave-meter with any inductance? Say, with a given condenser and a given inductance I find that at a point "X" on the variable condenser, the wave-length is 300 metres. Supposing now I insert a larger or smaller inductance: how can I tell to what point to move the condenser to obtain the same wave? (3) With the coils usually supplied for amateur work, must a sending condenser be inserted, or is the condenser usually supplied with the coil sufficient?

*Answer.*—(1) Certainly, but the wave-meter is calibrated with its own particular inductance (usually carried in its lid), and as this remains always the same the calibration curve is always true. (2) You cannot, unless you know how the value of the condenser varies with its scale-reading—that is to say, you must have a "calibration curve" or "chart" of the condenser. Then, if you know you have halved your inductance, you must change the condenser till its capacity is twice what it was, and the resulting wave will be of the same length as the first; and so on, for various values of inductance; for obviously the product C x L remains unchanged. (3) The condenser supplied with the coil has nothing whatever to do with the "wireless" circuits: it is in the primary (direct-current) circuit, and helps the contact-breaker to work properly.

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"Kumpus" (Bournemouth) raises a question about the aerials of the trawler *Columbia*, of which illustrations were published in the January WIRELESS WORLD.—The actual aerial-wires do not appear at all in these photos; in the first picture the two vertical lines consist of the rope for hoisting the ordinary compass-aerial, passing over two pulleys attached to the transverse stay, the object of the second pulley being to keep the down-haul clear of the aerial. In the second picture the aerial is "up" and the aerial-insulator is seen pulled up to the right-hand pulley, but the actual wires are not visible.

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W. A. M. (Liverpool).—No. 22 is suitable for the primary of a receiving jigger, No. 28 for secondary, using crystals. Don't worry about the "ratio" of turns the important thing is to get the secondary in tune, using a very small variable condenser across it. For instance, the maximum value of this condenser might well be 0·0002 microfarad: then calculate the required inductance of the secondary, and wind it accordingly, using one of the formulæ given from time to time in these columns. We agree with you that you probably want more tuning inductance to receive Clifden: you should have about 30,000 microhenries. Putting your single-slider coils in series would help, and you could increase their effective value by putting a variable condenser (going up, say, to 0·01 mfd.) *in parallel* with them. This method gives very fair tuning, but signals are not so strong as if the right amount of inductance were added. We recommend you to try adding your small aerial to the big one for Clifden. Also, when trying to get such a station for the first time, it is advisable to dispense with your jigger and simply tune up your aerial-earth circuit by the added inductances, connecting your crystal to the top of these so as to get the high potential point. You seem to be getting excellent results; we are glad to have helped you. If you are being upset by the nearness of G. L. V., why not try to "balance him out" by one of the Marconi methods, such as the one described in the September, 1912, issue? For wave-lengths see the 1914 edition of the "Year-Book of Wireless Telegraphy and Telephony."

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E. N. E. (Leigh) has a two-slide tuning-coil; he connects the lower end permanently to earth, one slider to the aerial and the other to the crystal, and thence through battery and potentiometer, and telephones, to earth. He receives very nearly all stations much louder when the crystal-slider is at the "free" end of the coil (the aerial slider being somewhere along the coil), but on the other hand, F.L. is somewhat louder when the crystal-slider is half-way down the coil. Thus he can "tune" out undesired stations when receiving Paris. He asks the reason for this.

One possible reason is as follows: in such a tuning-coil, there is an "auto-transformer" action; that part of the coil between aerial and earth forms the primary, and the whole coil the secondary; there is, therefore, an inclination to get a high potential at the free end. This high potential is good for the crystal-receiver; hence most stations are louder when the crystal-slider is near the free end. Now the section of the crystal depends on its unsymmetrical characteristic curve (see Instructional Articles); if a very strong instantaneous voltage is applied (as by an atmospheric, or by a very strong highly damped signal) it may be too strong to be rectified by the crystal—some of the current will "get through" in both directions and will therefore not affect the telephones. This is one of the Marconi methods of cutting out atmospherics and jamming, though usually two detectors are used in parallel, one sensitively adjusted to rectify in one direction, the other less sensitively to rectify in the other; then a very strong highly damped wave will get through both and will not affect the telephones. A suitable crystal, however, will combine the effect of these two detectors in itself; and it is possible that yours is doing this, so that when your crystal-slider is at the free end, FL signals give too high an instantaneous voltage; whereas by putting the crystal to a point of lower voltage, it behaves normally and gives stronger signals. You cannot get Norddeich well, and yet you say you do not think our remarks to "W. V. H.," in February number, apply in your case. Nevertheless, we cannot feel sure that your circuits are properly in tune; FL is no indication of this. Try putting a very small variable condenser (a glass test-tube, for instance, with sliding coatings) across the secondary of the auto-transformer referred to above; also try a variable condenser across the telephones, and make sure that movement of the potentiometer-slider *in either direction* weakens signals, so that you are really working on the sensitive point of the crystal. For wave-lengths and call signals consult the "Year Book of Wireless Telegraphy and Telephony, 1914."

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GEORGE (Walthamstow).—(1) We do not recommend joining the free ends. (2) There is no need for a variable condenser, especially with a direct-coupled circuit like your "auto-transformer"; but a very small one is advisable, across the "secondary"; this might take the form of a glass test tube with sliding coatings. (3) You should certainly get "Eiffel." (4) No need to have everything ready before applying for a licence.

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C. A. L. (Bedford) asks why he does not get Paris. His tuning coil is 32 cm. long, 11 cm. diameter, "and with an inductance of 21,975 cm." It has a single slider and is wound on jam jars. His receiver is a single one of 2,000 ohms., and his aerial is 80 ft. long with an average height of 30 ft. A silicon-gold detector completes the apparatus.

*Answer.*—You say your tuning-coil has an inductance of 21,975 cm., but we think you mean that it has a length of wire of that number of centimetres; do not forget that "a centimetre of inductance" is a definite unit of inductance and is not the same as the centimetre which is a unit of length. If your coil really had only 21,975 centimetres of inductance, you would have about 200 times too little inductance for Paris; for 21,975 cm. is equivalent to about 22 microhenries, and you will require for your aerial about 4,000 microhenries. And yet if you mean 21,975 cm. of length of wire, we are still puzzled at your not getting Paris; for this would mean that you have about 600 turns, giving an inductance of about 10,000 microhenries, which would be ample. As you do not give the size of the wire, we are left in doubt as to what you actually have. Let us hear about it.

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C. F. (Stockport).—With regard to the formulæ you suggest for the values of a condenser, we do not see how they can possibly be right, whatever units they may be meant to be in. The fundamental formula for the capacity of a plate condenser is $C = \frac{A}{4\pi d}$ where C is the capacity in electrostatic units, A is the area of one plate, and $d$ is the distance between them. Brought into practical units, this becomes:—

$$\text{Cmfds.} = \frac{\text{Area (sq. cms.)}}{113 \times 10^{3} \times d\ \text{(cms.)}}$$

which is quite different to what you suggest. One of the simplest ways is to remember that 1 sq. metre of plate placed 1 cm. away from a similar plate, with air between, has a capacity 0·00088 mfds. With glass between, the value would be about 7½ times as great; with ebonite, about 2½ times; waxed paper, from 2 to 4 times. Why have you not last year's "Year Book of Wireless Telegraphy and Telephony"? Anyhow, make sure of this year's.

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F. R. A. S. (London) wants to receive Eiffel time signals and no other. He asks for short answers to the following questions:

(1) Aerial, free ends not connected together. Is this right? *Answer.*—Yes.

(2) Direction approximately pointing towards Paris (it is an inverted L). Is this right, or should it be at right angles? *Answer.*—For best results the free ends should point *away from* Paris, but it is better to have them pointing *towards* than to have the aerial at right angles. We think it will be satisfactory as it stands.

(3) Leading-in tube of corrugated ebonite. It is intended to fix this tube in the middle of a window (glass) pane. Is it worth while the trouble of piercing the glass? *Answer.*—It would be quite satisfactory to fix the ebonite tube in a board, and close down the window till it meets the latter.

(4) Aerial inductance. 225 turns, No. 22 wire, 6 in. diameter, 7½ in. long, s.s.c. wound on cardboard tube shellaced externally, then shellaced after winding and baked. Need I paraffin it now, or should I have paraffined it instead of using shellac? *Answer.*—No need to paraffin; it would have been better to bake it first before shellacing to drive out the natural moisture, but it will do as it is. By the way, this coil will just about tune your aerial to Paris; it won't give you much to spare.

(5) Single ear-piece 2,320 ohms. good enough? *Answer.*—Yes.

(6) Need I paraffin my jigger tubes? *Answer.*—No; shellac is good enough.

(7) Would a magnetic detector be more reliable than a crystal? *Answer.*—Yes, but your jigger-secondary would not then be suitable; you could easily make a suitable one, however, or dispense with a jigger.

(8) Where can I procure small quantities such as $\frac{1}{16}$ oz. of No. 50 copper wire? *Answer.*—We fear you will have great difficulty in getting smaller quantities than ¼ oz., and can suggest nothing.

We congratulate you on the way you have put your queries; only the exceptional clearness of your letter could have induced us to deal with such a plethora of questions.

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H. G. H. (Paris).—Very little to choose between your three suggested aerials; we assume that in (1) and (2) the wires are actually "clear" of the tree. On the whole, for all-round reception, we should prefer No. 2.

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F. L. (Oxfordshire).—As a start towards getting the distant large stations try the simplest arrangements and not the loose-coupled jigger. Start with the connections of fig. 5, Instructional Article in THE WIRELESS WORLD, November, 1913. If your crystals (you do not say what kind they are) are some which do not need a battery and potentiometer, use the same connections but omit these two things. But if you are using carborundum, or a good many of the other kinds, you will need a potentiometer of say 400 ohms. and at least a 4 volt. battery. You notice that no condenser is necessary for these connections, but you had better put one across the telephones and adjust it to the best value. When you have got good results like this, go on to the more perfect circuit shown in fig. 6 of same article.

J. L. (Neuilly).—(1) You suggest using the displacement of the telephone-diaphragm to make and break a circuit comprising another telephone in series with a battery, thus relaying up the signals; using an adjustable contact just pressing on, or just not pressing on, a contact fixed to the centre of the diaphragm. But the movement of the diaphragm is infinitesimal, at any rate for weak signals. For very weak signals the movement is probably molecular only; for very strong signals your arrangement might be made to work. After all, a very well-known telephone relay used in wireless is only a highly developed and perfected form of your idea. (2) Your receiving station is about 10 kilometres from the Eiffel Tower, and you find that when a steam-whistle is blown about 250 yards away, the signals from Eiffel become louder. This is probably because the whistle vibrates the crystal in its holder, and you get the advantage of a well-decohered coherer-action in addition to the ordinary crystal action. (3) See the new "Year Book of Telegraphy and Telephony," 1914 edition.

BEGINNER (Bognor).—(1) A long insulated wire is laid on the ground in a line with the distant transmitting station, and the end nearest the latter is connected to the receiving-gear. The earth is formed either by an ordinary plate earth or by another similar wire laid out in line with the first and in the opposite direction. (2) We see no reason why your friend who said that you could pick up signals using gas-pipes in the house should be wrong; very likely he has tried it successfully with very strong signals. (3) For calculating the natural wave-length of an aerial approximately without using a wave-meter, see reply to "W. S.," August, 1913; "Omega," November, 1913, and others.

G. C. M. (Wisbech), using a double-slider tuning-coil, gets Paris, Cleethorpes, Norddeich, etc., but wants to get further—Africa and Spain, for example. He therefore proposes to make a loose-coupled inductance. As a means of increasing the *range* we do not recommend this: an amateur's aerial, when used for receiving the quite disproportionately long waves sent out by the big stations, is well adapted to the direct-coupled systems. "G. C. M." will find this explained not only in these columns but also in the Instructional Article (p. 520 of November, 1913). What he might well do is to increase the height of the aerial; to lay down auxiliary earths in the form of wires on the ground below his aerial; to vary the value of the condenser across the telephones (none shown in diagram); to cut out his blocking condenser and to put a small variable one (not more than about 0·0002) across his sliders, and the crystal in series with the telephones across this condenser. Probably the easiest thing for him to improve is his crystal. If he wants to make a "jigger," he might make the primary 5 in. diameter, of No. 22 wire and 4 in. long; secondary to slide inside this (lower end only entering) of No. 28 or 30, and say 12 in. long with a glass test-tube condenser across it, and the crystal connected to the upper end. The upper part of the secondary might be divided into four *separate* instalments of winding, which could be joined up by (say) tie-clips; in this way various ranges would be obtained with the one variable condenser, and there would be no "overhanging" unused part of the secondary electrically connected to the used part.

M. V. (Brighton).—If I erect the double aerial the upper components at right angles to each other there still remain the vertical components, which are necessarily parallel for about 80 ft.; assuming the receiving aerial is insulated, will it rob the sending aerial very much?

*Answer.*—The two halves of your T need not commence close to the 90 ft. mast; near the mast you should have the rope lines, so that the cross of the T would not be near the mast nor near the down-lead of the long aerial, except at the very bottom where the down-leads of the T would have sloped towards each other and would be near the other down-leads. So that, although the vertical components must be more or less parallel (in one plane), they can be so far away from each other for the greater part of their length that their mutual effect would not be serious.

AMATEUR (Londonderry).—(1) We have not the remotest hint as to whether you are trying to receive long or short waves; nor as to the values of your various coils. If you are trying to get shortish waves, such as ships or other amateurs, use the connections of fig. 6, November, 1913, Instructional Article. (2) Copper-pyrites and zincite is quite a good detector; so is zincite-bornite. It is unwise of you to shrink from the name of carborundum. (3) The primary is just as good inside your secondary as outside. (4) Zinc and tinfoil are equally good (provided the connections of the latter are sound), but we do not think much of slate as a dielectric. Try glass. (5) What is the "jigger," which you tell us you know well in golf, used for? Well, in a jigger-circuit you are lifting up the voltage of the oscillations, to suit the crystal which requires high potential: in the old days when the term was first applied, it was to suit the coherer. It is not a beautiful word, but it has "come to stay"; see our remarks on p. 340 of August, 1913.

E. W. R. P. (London).—In what combinations are the following used: Zincite-bornite, galena, copper pyrites, iron pyrites, silicon, tellurium, smalltite, and graphite? *Answer.*—Of making up crystal combinations there is no end; probably you would be able to get some kind of "detector" effect if you combined any one of the crystals you mention with any other; but the best-known combinations are: Zincite-bornite, zincite-tellurium, zincite-chalcopyrite, galena-graphite, galena with steel-point contact, copper-pyrites with tellurium or zincite, silicon with gold point or steel, smalltite with silver-wire contact, galena-tellurium, iron-pyrites and metal point, silicon with arsenic, antimony or bismuth, molybdenite in metal clips; best of all, a good piece of carborundum.

H. E. A. (London).—I should be very glad if you would explain how "L," the self inductance, is calculated. The formulæ you give, p. 342 (August, 1913), $l(\pi DN)^2$ (c.g.s. units) does not appear to be correct nor to be deduced from any data that I can ascertain. Neither does the usual one for flux-turns $\frac{4\pi IT}{10l} \times$ Area seem to give it (T = total turns, I = current in amps). Dr. L. Cohen, in his article (WIRELESS WORLD, January 14th, p. 607), gives several values of L, which neither of the above formulæ give. Why is not the sum of the two, L and $L_2$ constant in each case? You can express your answer in terms of the calculus if you like. Two other questions: (2) In your connections for a potential divider why should not the H.F. current go through the low resistance of the cells instead of through the high resistance of the portion of the resistance? (3) Is copper aerial wire enamelled for electrical or chemical reasons? If the latter, would not plain wire in the country be just as good?

*Answer.*—We did not "give" the formula; it was put to us by our querist, and we remarked that it was "sufficiently" (which the printers mis-printed) accurate. As a matter of fact it is directly obtained from the expression (which you give) for flux-turns. For: inductance = voltage produced when current varies at 1 ampere per second, therefore:

$$L = \frac{4\pi \times 10 \times T}{10l} \times \text{Area} \times T$$

in a coil of T total turns, since 1 ampere equals $\frac{1}{10}$ abs. unit; or $= \frac{4\pi T^2}{l} \times$ Area.

Also the expression in question $= l(\pi DN)^2$ where N is number of turns per centimetre, equals

$$\frac{l^2 N^2 \pi^2 D^2}{l} = \frac{4\pi T^2}{l} \times \text{Area.}$$

(2) We do not quite know what connections you refer to; but in any case there would be no harm in the H.F. current going through the low resistance of the battery instead of the potentiometer; the latter is only required to regulate the *continuous* voltage applied to the detector. (3) We

know of no reason why aerial-wire should be enamelled, except to protect it from chemical deterioration under special conditions. We do not use enamelled wire ourselves. Various electrical "reasons" for enamelling it have been given, but none of them, so far as we are aware, is sound.

A. L. H. (Fishguard) asks how the telephone condenser should be varied in relation to the readings of the tuner, how it alters the tone of the signals. *Answer.*—The value of the telephone condenser is quite independent of the readings of the tuner. The latter has to deal with high-frequency resonance—that is, it "tunes" to frequencies of the order of half-a-million or so—while the adjustment of the telephone-condenser has to do with low-frequency resonance, putting the telephone-circuit into tune with the spark frequency, or its harmonics, which are measured in hundreds per second. The fact that the adjustment of the telephone condenser alters the *tone* of the signals is due to its putting the telephone-circuit more or less into resonance with different harmonics, which thus become reinforced and determine the tone and timbre of the composite sound heard in the telephones.

H. T. (Shalford).—(1) In paragraph 55 of your series of Instructional Articles, it is stated that the single circuit receiver is useless for short waves. The two-slide inductance is not referred to in that paragraph. Can it be used for short waves if a condenser is inserted in circuit ? In the description of a two-circuit receiver, reference throughout is made to a primary which is in two portions, one of which is the aerial tuning inductance, and the other portion for acting inductively on the secondary. Is this arrangement merely to conveniently reduce size of coupler ? Or can all the primary be in one helix, in which case would it not have a greater inductive effect on the secondary and give better signals ? If two portions are used, how can the required proportions be roughly ascertained ?

(2) I have made a two-slide inductance coil as follows: Dr.=6 in., 495 turns of No. 20 Cu. wire length=21 in., and should be obliged if you would give me the most effective "join up" for general purposes. I am using telephones of 4,000 ohms. combined resistance, and a detector of copper pyrites and zinc with blocking condenser. I find no advantage from a potential divider. I have two variable condensers available, one of large and one of small capacity. Aerial of two aluminium wires (No. 14) 4 ft. apart, is 35 ft. in height at one end and 30 ft. the other. I have also a loose coupler with a stationary secondary in which the coupling is altered by means of tappings taken to two switches by which varying portions and positions of the coil are put in circuit; but the results are rather better with the two-slide inductance. ["H. T." here gives an account of his present join-up.]

*Answer.*—(1) Your idea is right, but you would weaken signals by spoiling the receptive power of the aerial; the smaller the condenser put in series with the aerial to produce tuning, the weaker the signal received. So this is not an efficient way of receiving waves short enough to be nearly in tune with the aerial alone.

(2) It is possible to have too tight a coupling as well as too loose a coupling, and unless a very large amount of inductance is required in the aerial circuit for tuning, a short primary winding coupled to the lower end of the secondary is enough to give the best coupling. If, however, the additional inductance needed in the aerial is very great, the short primary winding bears only a small proportion to the total inductance of the aerial circuit and the coupling becomes weak even in its tightest position. In such a case turns should be taken from the external inductance and added to the primary winding. The danger of trying to get all the tuning-inductance into the primary of the jigger is that it surrounds the whole length of the secondary and prevents the latter from having a free, highly insulated, high-potential end. See numerous "Answers" in previous numbers.

R. A. B. (Durban) has been experimenting with the magnetic detector of the double pattern, which has a duplicate set of windings as "spares" in case a wire breaks on the one set. He finds that if he uses the two sets together—connecting both primaries in parallel and both secondaries in parallel also—he "can obtain twice the strength of signals and read ships and other stations which were otherwise very weak and some inaudible."

It is a very well-known fact that under some conditions the combination of the two sets is advantageous; for a long time it was used for transatlantic reception. Its chief application arises when the magnetic is being used for longer waves than those for which it was designed; for instance, the combination gave increased signals on the long transatlantic waves because the detector was designed for ship-waves; but it would not give stronger signals than a single-set properly designed for the long waves. We are inclined to think that "R.A.B." is using a detector designed to work with the multiple tuner, with a *shortened primary winding* specially adapted for the *tuned* side of this instrument. Finally, we may remark that there are several devices which if used at the right moment will improve the sensitiveness of the "magnetic"—speeding up the band, for instance, for signals of high note-frequency; these are known to expert operators and can be used by them, but the instrument as it stands is best for average conditions.

M. D. X. (Colchester), seeing that we recommended "W. I." to keep the far ends of his twin aerial *free*, insulated the far ends of his own aerial which hitherto had been joined together, and failed to get any improved signals. He wants to know why ?

We recommend keeping the far ends separated because no useful object is served by joining them, while, on the other hand, though most waves come in equally strong if they *are* joined, certain waves set up oscillations in the closed circuit thus formed, and therefore are slightly weakened; so that while, in perhaps nine cases out of ten, the two arrangements are equally good, the free one is the better on the whole.

He also wants to know whether he would improve signals by adding a third wire between his twin-wires (spaced 9 feet). He would improve things a little.

Finally, he asks for particulars of a choking-coil for insertion between his transmitting condenser and transformer, on his ½ k.w. set. He does not mention the value of his capacity, though he gives his frequency (40). If he will read carefully our answer to "M. X. X." in the January number, and also the article in the "Year Book" to which he refers, he will see that to design the proper choking coils to give low-frequency resonance several more data are required. If he merely wishes the coils to act as protections for his transformer he should call them "air-core choking coils": these might be wound of No. 28 enamelled wire, on a 2 in. tube, length of winding 4 in.

T. M. (Ribble).—*Answers.*—(1) The tuning coil has nothing to do with the distance from which you can receive; but the fact is that all the powerful stations (and with so low an aerial you would only be likely to receive powerful stations for any distance) use very long waves, and your coil is not big enough to tune up to these. In previous answers we have given particulars of coils for tuning up to the big stations. Your wire is unnecessarily thick for this purpose.

(2) Your 12 ft. end is terribly low; you should try and heighten this at all costs.

(3) Leave all four wires separate at the low end, and prolong each one at the high end so as to form a quadruple lead-in sloping down from the high end. At present you are leading in from a point which is neither an end nor the centre of the aerial.

(4), (5) and (7). Yes.

(6) Not necessary.

(8) See (3). Not important whether covered or uncovered.

(9) Deep enough, but a plate with sharp edges is better than a bath with rounded edges. You might also lay out some bare wires just buried under the ground beneath the aerial, or bury several plates in addition to the present.

# The Sealing Disaster off the Newfoundland Coast.

THE record of wireless telegraphy is indissolubly connected with the record of disaster at sea. Yet this not in an untoward sense. Rather its mission is the exact reverse, for wireless brings to the watchers on the outposts of humanity the cry for help from those distressed, then swift as the light it carries back an answer of hope and encouragement from ready helpers. Once again it has fulfilled its high purpose, and has stepped into the breach when all the other forces of civilisation were powerless to assist. We refer to the recent disaster which befell the sealing fleet off Newfoundland.

*A "Whitecoat," the most sought after Seal.*

On April 2nd the world was horrified by a wireless message despatched from the steamship *Florizel*, in Belle Isle Strait, which reported that 120 men of the sealer *Newfoundland* were caught in a blizzard on Tuesday, March 31st, while they were out on the ice floes three or four miles from their ship.

The sealer *Bellaventure*, which is also fitted with a Marconi installation, was one of the first to receive the news, and immediately steamed to the scene of the disaster to see if she could be of any assistance. She was nine hours ramming her way through four miles of ice in her efforts to reach the stricken *Newfoundland*. On her arrival she found the survivors in a pitiable condition, while a large number of the sealer's party were still missing. Immediately she joined the *Florizel* and another sealer, the *Stephano*, which happened to be near the scene of the disaster, in an organised search among the ice-floes.

The same day her captain wirelessed the following message to St. John's :—

"I have on board 34 survivors, five being serious cases. I have also aboard 58 dead, and think that the total number of dead is at the very least 70. Reports from the steamer *Newfoundland*, through the *Florizel* and the *Stephano*, which are nearer her than I am, say she is not yet certain how many men she had on the ice when the blizzard began.

"They report having aboard seven dead and two alive. We three ships are working towards the *Newfoundland*, but the ice is very heavy and tight."

Later, about 3.30 p.m., she detailed news :—

"I have just reached the steamer *Newfoundland*, and have checked the figures by her roster, and find she had 189 total crew. Of these 112 are safe, but 36 are on sick list. Total dead is 77, of which 69 bodies have been recovered, the remaining eight being lost amid the floes. I am now leaving to proceed to St. John's. Fear slow progress, as the ice is heavy and tight.

"The *Stephano*, which is also lying alongside the *Newfoundland*, will report the names of the dead."

At 5 p.m. a further message was despatched which conveyed the first tidings of the loss of another sealer, *The Southern Cross*, in the same hurricane :—

"I have worked into loose ice, and expect to reach St. John's early on Saturday morning."

The Government then chartered the Reid steamer *Kyle*, which is provided with a wireless equipment, to sail at midnight in search of the *Southern Cross*. The American scout ship *Seneca*, which was patrolling the iceberg zone below Cape Race, also took up the search.

Their efforts were in a measure successful, and on April 5th the *Bellaventure* steamed into St. John's with 69 dead and 50 survivors of the *Newfoundland's* crew. Her captain gave the following account of the disaster :—

"Tuesday morning opened fair. The barometer showed no storm, and four ships put out over a thousand men to seek for seals. The storm began about noon. Most of the *Newfoundland's* men went on board the *Stephano*, which was the nearest vessel. The skipper advised them to rejoin their own ship as he was starting to recover his men. They thereupon started to return to the *Newfoundland*, while the *Stephano* went in the opposite direction where her men were working. The crew of the *Newfoundland*, however, lost their way in the blinding snowdrifts, and the skipper of the *Newfoundland*, which was not fitted with wireless, supposed that his crew were on board the *Stephano*. The *Stephano* was whistling for hours, but no men appeared, and she concluded that they had rejoined the *Newfoundland*.

"On Wednesday the blizzard raged all day. Neither ship knew the actual conditions. The storm abated on Wednesday night. At daylight on Thursday morning, when Captain Rendell was preparing to start his men over the ice floes again, he sighted strangers coming towards his ship. The enfeebled movements of the nearest man caused forebodings, and these were confirmed when the man stated that 150 of the *Newfoundland's* men had been adrift for two days and nights, and he feared that the majority had perished.

"Captain Rendell promptly hurried his entire crew with food, stimulants, blankets, and stretchers to the rescue. This work occupied the whole of Thursday. The last man to be saved had been 59 hours adrift without food or warmth, being rescued just before sundown. This man, however, was practically unscathed, though he went blind the day after his rescue. The physicians, however, think that he will recover his sight."

Of the *Southern Cross* nothing more has been heard, and it is now practically a certainty that the whole of her party, numbering between 170 and 180 men, have been lost.

*The Sealer "Bonaventure," sister ship of the "Bellaventure," which was first to receive news of the disaster by means of her wireless. Both have been fitted with Marconi apparatus.*

# INSTRUCTION IN WIRELESS TELEGRAPHY

*(Second Course)*

# (I) Masts for Wireless Telegraph Stations

[The article in the March number completed the first course of instruction. The present is the first of a new series of articles, which will deal chiefly with the application of the principles of wireless telegraphy. Those who have not studied that series are advised to obtain a copy of "The Elementary Principles of Wireless Telegraphy," which will be ready shortly, price 1s. net, and to master the contents before taking up the course of instruction commencing with the present article. An announcement concerning the second examination will be made shortly.]

ONE of the first things to be considered in the design of a wireless telegraph station is the mast to be used for supporting the aerial.

As explained in the first series of articles, the masts used should be as high as practical considerations will allow, and it is therefore necessary to know something about the construction and erection of them.

Masts may be classified under two main headings—namely, "Portable masts" and "Permanent masts."

PORTABLE MASTS.

**700.**—The most important points to be taken into consideration in the construction of portable masts are :—

(1) Rigidity.

(2) Lightness.

(3) Compactness when dismantled.

(4) Simplicity and speed of erection and dismantling.

(5) Cheapness.

Gain of any one of these points can only be achieved at the expense of one or more of the others, so that the design becomes a matter of making the best compromise. The rigidity of a mast is obtained in two ways—firstly, by staying it at suitable intervals along its length, and secondly, by making the mast itself stiff. The stiffness of the mast depends firstly upon the material of which it is made, and secondly upon its diameter. In materials we have the choice of various kinds of wood, bamboo, steel and aluminium.

Bamboo is perhaps the stiffest material obtainable, weight for weight, but unfortunately no two pieces of bamboo are of exactly the same size, so that when several pieces have to be joined together to make up a mast, trouble will be experienced on account of the several pieces not being interchangeable. Of the various kinds of wood, spruce is perhaps the most suitable on account of its lightness. Ash is considerably stronger and tougher, but is somewhat heavy, and is difficult to procure in long lengths.

Aluminium is the lightest metal obtainable, but is not very suitable for the construction of portable masts on account of its softness making it easily liable to damage. Some of the aluminium alloys are better in this respect, more especially duralumin, but the cost of these alloys is in most cases prohibitive unless weight is of the very utmost importance.

Steel is probably the best material to use for most kinds of portable masts of anything above 30 feet in height, for it is not expensive and can be "drawn" to very accurate dimensions; also it lends itself well to any kind of treatment, such as brazing, welding, etc.

**701.**—Whatever material is decided upon, the next point to consider is how to distribute the material to the best advantage. **A tube is far stronger and stiffer than a solid rod** of the same cross-section that is of the same weight. For this reason nearly all portable masts are made hollow. Steel and aluminium can be obtained in tubes of any desired diameter and of various thicknesses, but if wood is used for the material, in order to make the mast hollow it is built up of a number of strips securely glued and nailed together and bound at intervals with steel wire.

Fig. 1 shows a piece of a wooden mast built up in this way, where " A " is one of the six strips of wood of which the mast is built. These strips of wood are all cut and planed to the exact shape required by machinery, so that they all fit together to form a round or hexagonal mast.

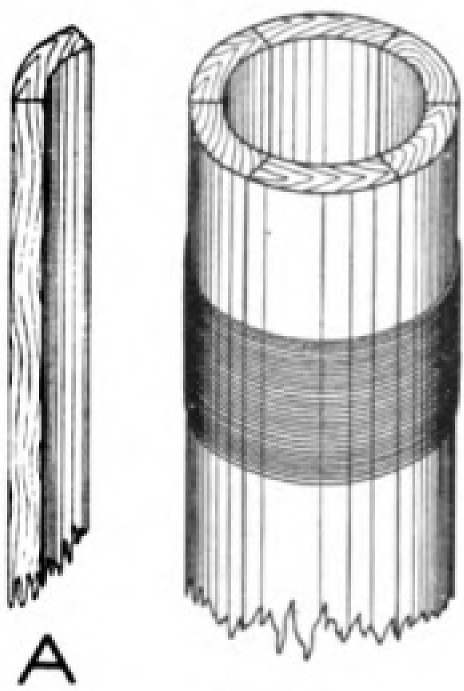


*Fig. 1.*

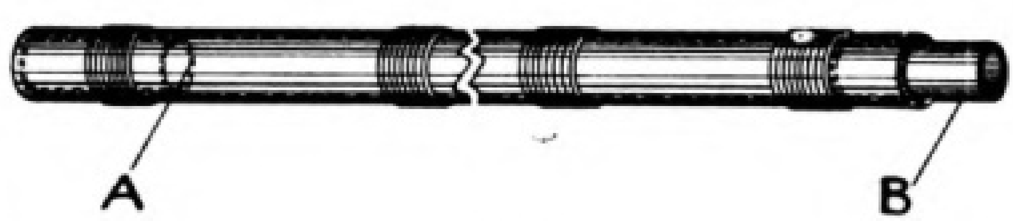


*Fig. 2.*

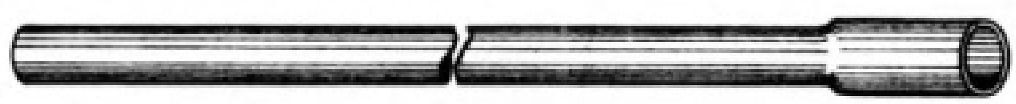

*Fig. 3.*

**702.**—The next point to consider is **compactness.** A mast twenty or more feet long would be obviously very awkward to carry about in one piece. For this reason portable masts are divided up into a number of sections. The length of the sections into which they are divided will depend chiefly upon the method of transport intended.

Thus, if the masts are to be carried by carts, the sections can be as much as 12 or 15 feet long. If, however, they have to be carried on pack-horses, the length of each section should never exceed 6 feet, and even this length is uncomfortably long, for when a horse is walking, anything on its back tends to swing see-saw fashion, and this swinging will be greatly exaggerated if the load which is being carried has any considerable length.

There are several ways of dividing up a mast so that the pieces may be quickly joined together, or dismantled when required. In the case of a wooden mast, such as is shown in Fig. 1, it is usual to insert a piece of steel tube some 6 or 8 inches in length into one end of the section to form a socket, and to insert a slightly smaller diameter piece of tube into the other end, projecting some 6 inches, to form a plug. Such a section is shown in Fig. 2, where " A " is the steel tube forming the socket, and " B " is the steel tube projecting to form a plug. By plugging the top end of one section into the bottom end of the next, a mast of any desired length can be built up.

It is useless to make the plug itself out of wood, for in wet weather the wood swells, making it impossible to connect the mast together, or if the wood gets wet after the mast has been joined up, it is a very difficult matter to separate the sections.

In the case of masts made of steel or aluminium tube, the tube itself can be expanded at one end to form a socket for the next tube, as shown in Fig. 3.

There is one disadvantage in dividing up a mast in this way—namely, that the mast when dismantled takes up rather a large space. No matter what means of transport is used, space is of the utmost importance, and all the hollow space inside the mast sections is wasted.

In order to obviate this disadvantage, some portable masts are made telescopic—that is to say, each section of the mast is made a smaller outside diameter than the inside diameter of the one beneath it, thus allowing one tube to slide inside the other.

**703.**—A simple form of telescopic mast is shown in Fig. 4, where "A," "B" and "C" are three sections, each one being smaller than the one beneath it; "D," "D" are "fids" which pass through the top of the lower section and the bottom of the upper section in order to keep the mast extended when erected.

All telescopic masts, however, have four great disadvantages which more than neutralise their one advantage of compactness.

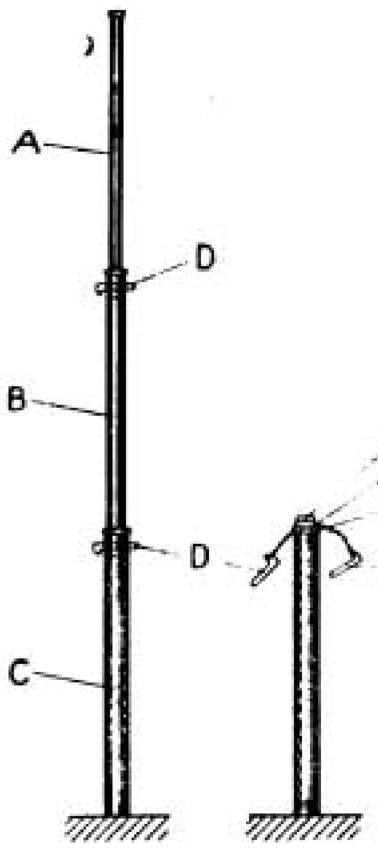


*Fig. 4.*

(1) They are very expensive, chiefly owing to the large sliding surfaces which must be very accurately in line, and also owing to the somewhat elaborate mechanism which is required to erect them.

(2) They are very heavy, for the reason that each section must necessarily be larger than the one above it, and as the top or smallest section must be sufficiently strong to carry the strain of the aerial, it follows that the lower sections will be much stronger than is necessary to carry this strain.

(3) A small accident resulting in damage to any one of the sections may easily put the whole mast out of action, for a bend or dent in any one of the lower sections would interfere with the telescopic action, making it impossible to either erect or dismantle the mast.

(4) The mast sections are not interchangeable, so that if the masts are to be

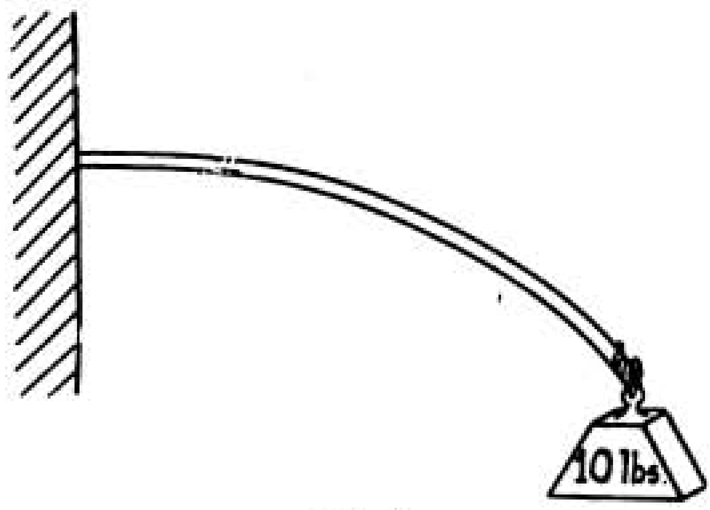


*Fig. 5.*

used in a remote locality, as is usually the case with portable wireless telegraph stations, either a whole spare mast must be carried with the station, or the risk must be taken of a small accident putting the whole station out of action until either the mast is repaired locally or a new mast sent from the base. This risk is no small one, for accidents in erecting or dismantling masts are not at all uncommon, owing to the difficult conditions under which they have often to be erected.

STRAIN ON MASTS.

**704.**—A mast will withstand a very much greater strain acting straight down its length than it will on acting at right angles to its length.

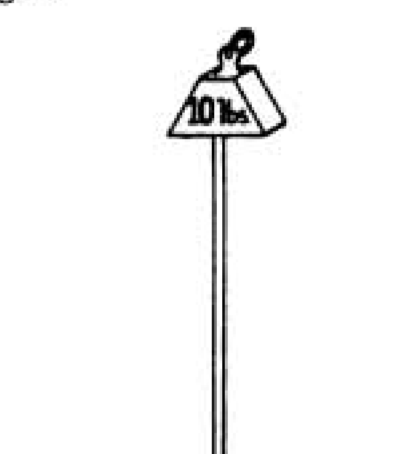


*Fig. 6.*

A simple experiment with a stick about ½ in. diameter by 5 ft. long, will readily illustrate this point. If we exert a pull of say 10 lb. on one end of the stick in a direction at right angles to its length, as shown in Fig. 5, the stick will probably break, or at all events bend very sharply.

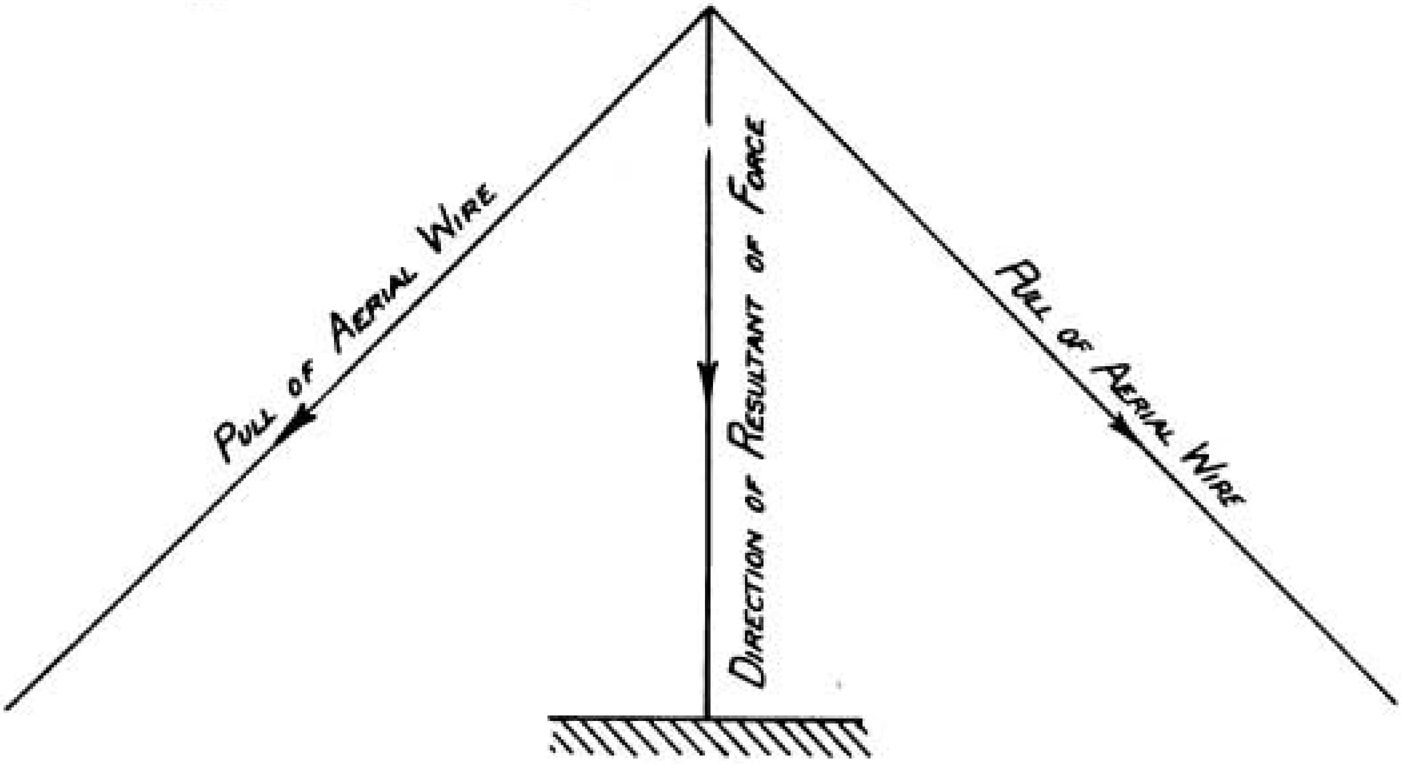


*Fig. 7.*

If, however, we exert the same force on the end of the stick in a direction in line with its length, as shown in Fig. 6, the stick will withstand it easily.

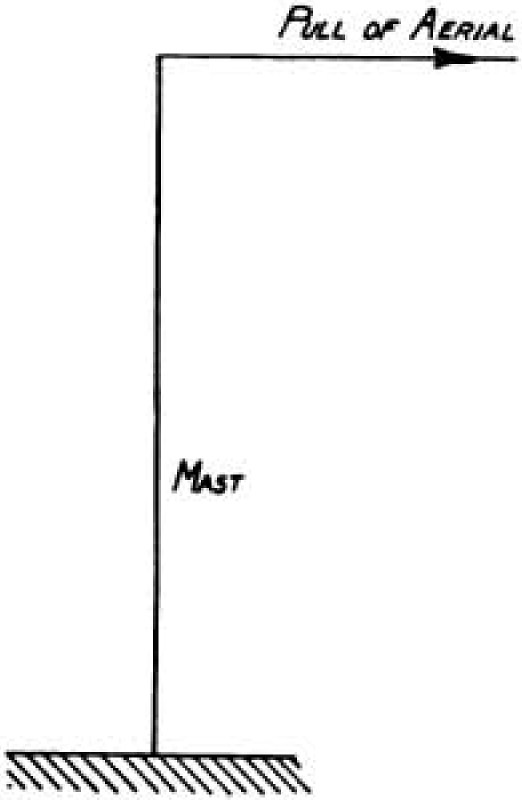


*Fig. 8.*

In the case of a mast supporting an umbrella aerial, as shown in Fig. 7, the result of all the forces exerted by the wires is a force acting straight down the length of the mast, and therefore the best advantage is being made of the strength of the mast.

But in the case of a mast supporting a horizontal aerial, as shown in Fig. 8, where the aerial is attached to the top of the mast, the force exerted by the aerial is at right angles to the length of the mast, and therefore the strength of the mast is not being used to the best advantage.

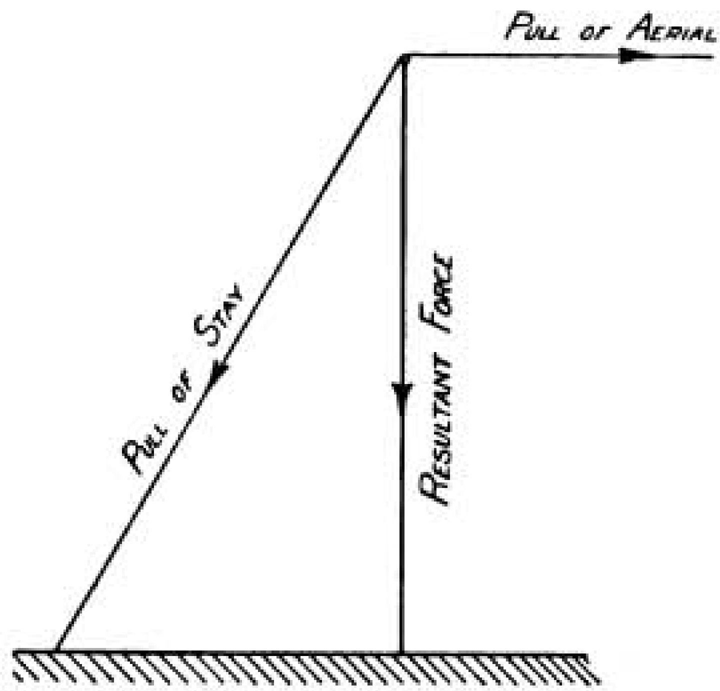


*Fig. 9.*

If, however, we attach a stay to the top of the mast, and connect the stay to a point on the ground some distance from the foot of the mast, as shown in Fig. 9, the pull of the aerial will be carried by the pull of the stay, and the resultant of the two forces—*i.e.*, the force exerted by the aerial in one direction, and the force exerted by the stay in another direction—is a force acting straight down the length of the mast.

**705.**—A very simple way of calculating the amount of the force acting on the stay and that acting on the mast is by drawing a parallelogram, as shown in Fig. 10.

Assuming that the aerial is exerting a horizontal pull of 200 lb., and we take one inch to represent a pull of 100 lb., then we may draw a horizontal line, A, B, 2 inches long, to represent the pull of the aerial.

The force exerted by the mast will be in a vertical direction; therefore we may draw a vertical line, A C, representing the direction of the force exerted by the mast.

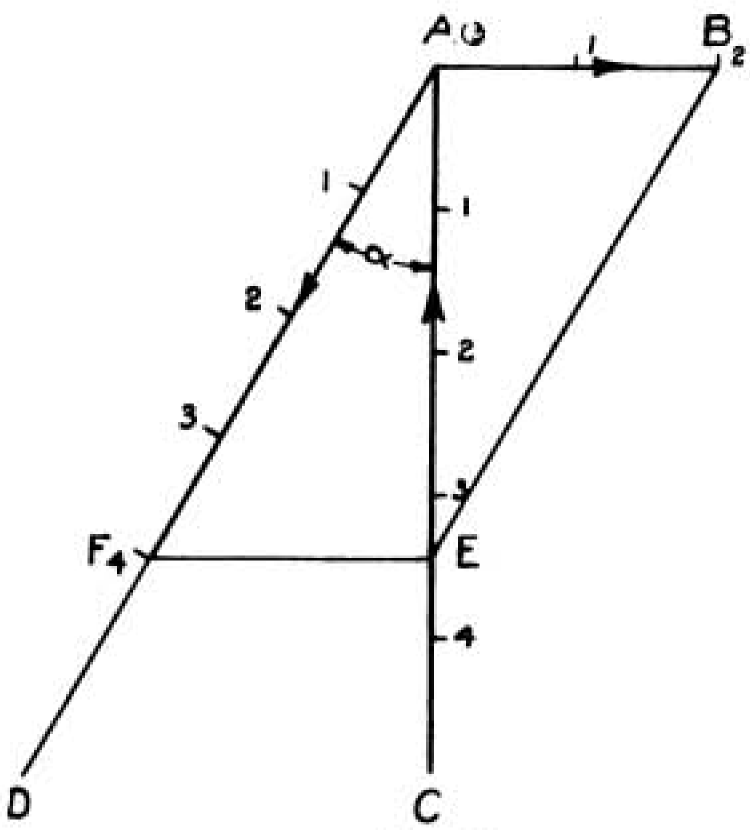


*Fig. 10.*

Further, we may draw a line, A D, representing the direction of the force exerted by the stay, the angle, O, being the same as the angle formed by the stay and the mast.

If now we draw from the point B a line parallel with the line A D, this line will cut the line A C, at the point E, and the length of the line E A in inches will represent the force exerted on the mast in hundreds of lb. Further, if we draw from the point, E, a line parallel with the line, B A, this line will cut the line, A D, at the point, F, and the length of the line, A F, in inches will likewise represent the force in hundreds of lb. exerted by the stay.

Measuring these lines in the particular case shown in Fig. 10, where the angle between the mast and the stays is 30°, we find that the line, A E, is about 4 inches long, and therefore the force required to be exerted by the mast, or the pressure on the mast is 350 lb., while the line, A F, is about 4 inches long, and therefore the force required to be exerted by the stay or the pull on the stay is 400 lb.

By making similar diagrams for various angles between the mast and the stay, as shown in Fig. 11, it will be seen that the greater the angle the less the strain, both on the mast and on the stay.

Obviously, then, **it is an advantage to increase the angle at which we stay a mast,** more especially in the case of portable masts, where anchor pegs have to be used for attaching the stays to the ground, and in soft ground a comparatively small pull would be required to pull them out of the ground.

There are, of course, practical limitations to the extent to which we can do this, for if we make the angle too great, not only is a large open space required in which to erect it, but also the necessary length of the stays increases very rapidly after an angle of about 30° is reached.

In practice it is usual to make the distance from the foot of the mast to the anchor peg equal to half the length of the mast, as shown in Fig. 12. The angle between the mast and the stay is then about 27°.

### BUCKLING OF MASTS.

**706.**—Let us now make a few further experiments with the thin stick described in paragraph 504.

If we take two such sticks of exactly the same diameter and length, one of which is perfectly straight and the other very slightly curved, as shown in Fig. 13, it will be found that the straight stick will carry a far greater weight than the bent stick.

If we increase the weight on the bent stick gradually, and carefully watch the effect, it will be seen that the bend increases

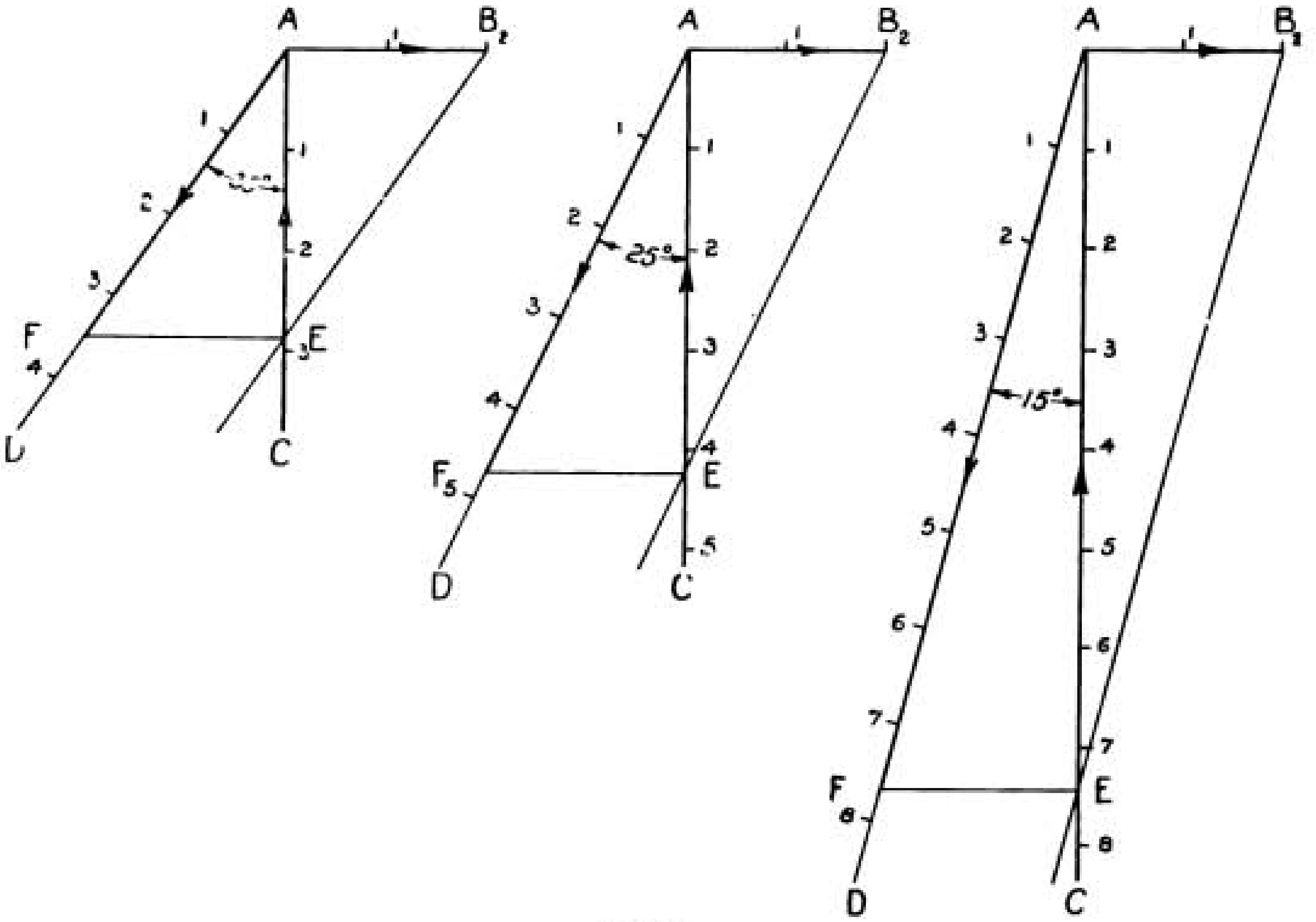


*Fig. 11.*

gradually as the weight is increased, until it reaches a certain critical bend, depending upon the nature of the wood of which the stick is made. As soon as this critical point is reached, a small increase in the weight will cause the stick to collapse and break.

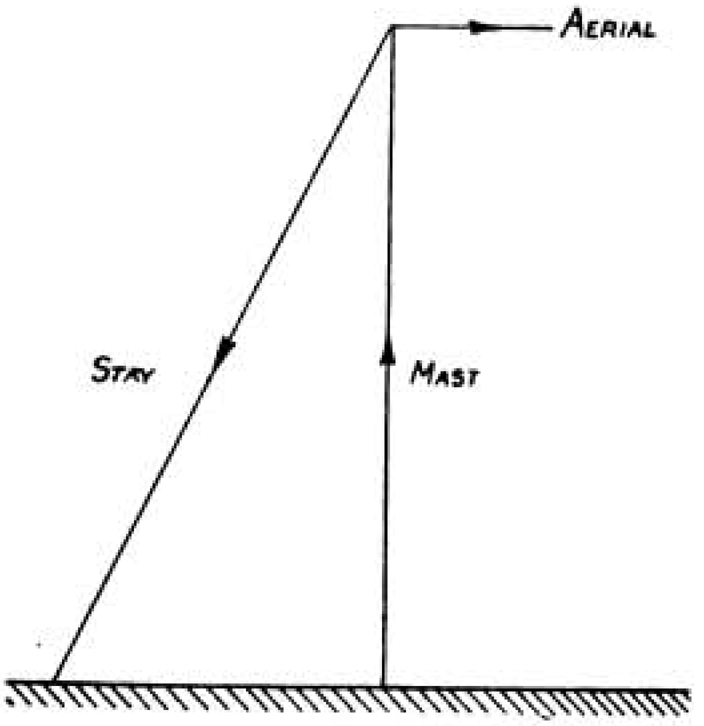


*Fig. 12.*

We will suppose, for the purpose of explanation, that this critical point is reached when the weight applied is 20 lb., and that 21 lb. is necessary to break the stick.

If now we apply a weight of 21 lb. to the straight stick it will be found that it carries the weight without any sign of breaking. If, however, we apply a side pressure in the middle sufficient to *start* a slight bend, the stick will immediately collapse in exactly the same way as the other stick.

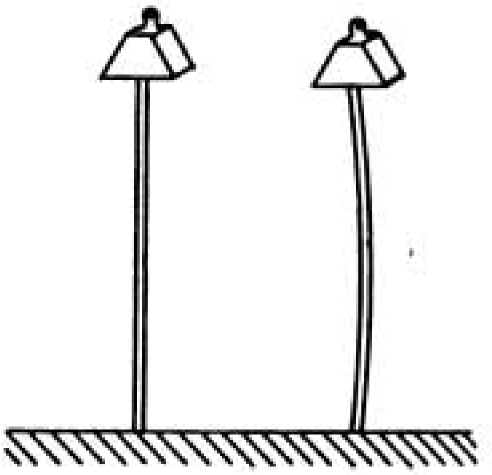

*Fig. 13.*

Only a very slight side pressure is required to start the bend or "buckle." In the case of a mast in the open, the pressure of the wind will be found quite sufficient; but in any case, all masts made up of a number of sections will have a slight bend in them to start with, owing to the play between the plugs and sockets.

If now we take the same sticks and cut down their length by one half, it will be found that exactly the same effects will be produced by applying pressure to the ends, except that it will now take about four times the weight to reach the critical point

In practice it is found that **the weight a given stick or mast will carry is, approximately, inversely proportional to the square of its length.**

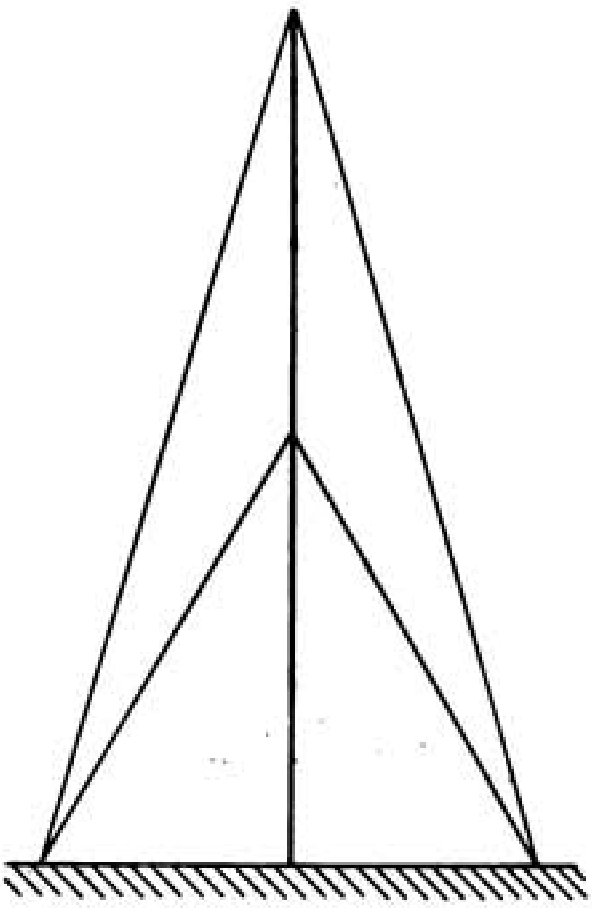

*Fig. 14*

By staying the middle of a stick or mast in such a way that the point of attachment of the stays cannot move sideways as shown in Fig. 14., we have in effect converted the stick into two sticks, each of half the length, one on top of the other. Thus, by staying a stick or mast in the middle we more than double the weight or pressure it will carry.

## The Marconi Examination.

ARRANGEMENTS in connection with the examination for members of the Territorial Force, the Cadet Corps, the Boys' Brigade, the Church Lads' Brigade, and the Boy Scouts' Association are now well in hand. Until all the entries were received we were unable to make any definite arrangements for the holding of the examinations, and as entries have reached us from all parts of the United Kingdom this task has been no light one. However, it has been faced in a resolute manner, and everything is now in order to enable us to hold the examination some time in May in accordance with our original intention.

The actual date on which the examinations will be held will be decided as soon as the various examination centres have been chosen. As we have to close for press with this number of THE WIRELESS WORLD during the middle of April we are unable to make an announcement in the present issue. The arrangements, however, are likely to be complete as soon as these lines appear in print, and all candidates whose entry has been admitted will be advised by post of the date and hour of the examinations and of the respective centres at which they should present themselves. We will endeavour to arrange as far as possible for each candidate to sit for examination in his own town.

The large number of entries received for the examinations and the fact that candidates have come forward from all parts of the United Kingdom testify to the widespread interest which our scheme has aroused, notwithstanding its limited scope. The new series of instructional articles which commences with this number is supplementary to that scheme, and the examinations which will be held next year will be wider in their appeal and will probably include overseas readers. The arrangements in connection with this are being carefully considered and an announcement will be made at an early date.

# Contract News

The Great Lakes Touring Company have contracted with the Marconi Wireless Telegraph Company of America to instal a wireless outfit on the wrecker *Favorite*. Instruments especially designed for lake use will be built and a reduction will be made in the charges for wireless services in proportion to the number of vessels so equipped.

* * *

The *Venture*, of the fleet of the Union Steamship Co. of British Columbia, is now being fitted with a $1\frac{1}{2}$ kw. set by the Canadian Marconi Co., who have also received orders from the Canadian Pacific Railway to instal sets on four additional boats trading on the West coast. Other vessels recently equipped with wireless telegraphy by the Canadian Company are: *Adventure*, owned by The Harvey Company of St. John's, Newfoundland, by $1\frac{1}{2}$ kw. set. Call letters "V.O.K."; *D. H. Thomas*, owned by the Dominion Coal Company of Sydney, N.S. ($\frac{1}{2}$-kw. set). Orders have also been received to instal $1\frac{1}{2}$ kw. sets on the *Lady Laurier* and *Stanley*, belonging to the Department of Marine and Fisheries of the Canadian Government there. These two vessels were fitted with coil sets in 1905 and 1904 respectively, which will, in future, serve as Emergency Gear.

**Vessels fitted with Marconi Apparatus since the last issue of the "Wireless World."**

| Name. | Owners. | Installation. | Call Letters. |
|---|---|---|---|
| *Candia* | P & O. Line | $1\frac{1}{2}$ kw. and emergency | MPH |
| *Borda* | " " | " " | MFQ |
| *Benefactor* | T. & J. Harrison | " " | MOE |
| *San Isidoro* | Eagle Oil Transport Co. | " " | MJO |
| *San Wilfrido* | " " " " | " " | MPK |
| *San Antonio* | Cia Mexicanade Vapores San Antonio S.A. | " " | XBE |
| *Great City* | W. R. Smith & Son | " " | MKW |
| *Waiwera* | Shaw, Savill & Albion | " " | MRV |
| *Cassis* | Anglo-Saxon Petroleum Co. | " " | MPO |
| *Kaipara* | New Zealand Shipping Co. | " " | GYQ |
| *Hurunui* | " " " | " " | GCQ |
| *Whakatane* | " " " | " " | MRI |
| *Corcovado* | Pacific Steam Navigation Co. | " " | MIE |
| *Chaudiere* | Royal Mail Steam Packet Co. | " " | GDK |
| *Star of England* | Commonwealth and Dominion Line | " " | MAK |
| *El Aguila* | Compania Mexicana de Petroleo | $\frac{1}{2}$ kw. and emergency | XBF (temporarily assigned) |
| *Manistee* | Elders & Fyffes, Ltd. | " " | MLR |
| *Zent* | " " " | " " | MMP |
| *Matina* | " " " | " " | MLT |
| *Pacuare* | " " " | " " | MLY |
| *Nicoya* | " " " | " " | MLV |

**The following German Ships have been equipped by the "Debeg."**

| Name of Ship. | Owners. | Call Letters. |
|---|---|---|
| *Camilla Rickmers* | Rickmers | DLR |
| *Jupiter* | D. A. P. G. | DJU |
| *Secundus* | Hapag | DUS |
| *Nicomedia* | " | DYQ |
| *Nicaria* | " | DYP |
| *Tijuca* | H. S. D. G. | DUC |
| *Segovia* | Hapag | DGV |

## OVERSEAS NOTES.

### Canada.

The Marconi Wireless Telegraph Co. of Canada have completed the erection of the Canadian Government stations at Kingston, Port Burwell and Toronto, and are now operating them on behalf of the Government. Kingston was placed in commission on February 1st and the two latter on February 15th. These stations complete the Canadian chain, which extends from Port Arthur at the head of the Lakes to Cape Race on the Atlantic.

### India.

In spite of his occasional complaints, the wireless amateur in this country is in a highly advantageous position compared with his brother experimenter in many countries abroad. The communication which we recently published from a reader in New Zealand showed that the Government restrictions had practically put an end to the activities of the amateur in the colony, and it would appear from a letter which has just reached us from India that the amateur's lot in the Dependency is not a happy one. The authorities refuse to grant licences to private individuals, and even go so far as to forbid the importation of wireless apparatus. The rigour of their prohibitive measures is well illustrated by the following incident, which our correspondent assures us took place. The Calcutta Port Defence Volunteers decided to form a wireless section and ordered two portable sets to be sent out to them from England. On arrival of the sets at the port of destination they were held up by the Customs authorities for some months, and it is not until quite recently that they were released and handed over to the Volunteers. Little wonder, then, that the amateur is not very numerous in India, and that those which exist carry on their experimental work more or less surreptitiously to escape the vigilant eye of the police sergeant armed with authority to arrest the delinquent. Our correspondent asks what station has the call letters VWC, which he hears called up by the Fort every night but which never seems to answer. Calcutta Radio has the call letters VWC.

### South Africa.

It is reported from Johannesburg that the Post Office authorities are considering the establishment of a wireless telegraphy station at Springs, east of Johannesburg, to communicate with Nairobi, and thence with Malta, at a cost of £120,000 sterling.

### United States.

According to a recent census report 285,091 wireless telegrams were sent in the United States during 1912, representing an increase of 84·4 per cent. in five years. The total receipts of four companies during 1912 were £137,404, compared with £21,924 in 1907.

* * *

Point Isabel, a coast town 22 miles from Brownsville, Texas, is to have a wireless station erected by the United States Navy Department. Lieutenant-Commander A. J. Hepburn, U.S.N., has closed an option with landowners at Point Isabel, and within six months it is expected that actual work on the station will be under way. There is now an appropriation of £10,000 for this station, but Lieutenant Hepburn stated that before the contract is let it is expected that this amount will be increased to at least £12,000.

* * *

The House Committee on Appropriations had before it on March 21st an appeal from Secretary Redfield in which other members of the Cabinet joined for an appropriation of $50,000 for the establishment in Washington of a wireless research laboratory in connection with the Bureau of Standards. Acting Secretary Galloway, of the Department of Agriculture, wrote that the weather bureau contemplated sending warnings to vessels at sea, and said that any advancement in the science of wireless communication would be of great assistance to that bureau. The committee is expected to act favourably upon the request.

* * *

Dr. H. S. Kinmouth has sold to the Marconi Wireless Telegraph Co. of America a small piece of land from his farm in "The Garden of the Gods," near the Marconi plant at the head of Shark River, Belmar, N.J. the site will be used for a tower to hold a balancing line to run east and west with the Marconi plant. The company has a "balancing line," as it is called, running north and south.

# The LIBRARY TABLE

**THE YEAR BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY, 1914.** Published by the Marconi Press Agency, Ltd., Marconi House, Strand, W.C. Pp. 850. Illustrated. Price 2s. 6d. net.

Although the Year Book of Wireless Telegraphy and Telephony is just entering upon its second year it has already made itself indispensable to all who are interested in wireless, and the 1914 edition, which makes its appearance to-day (May 1st) has been eagerly awaited during the past few days, especially as the first edition has long since been out of print.

A close comparison with its predecessor, the 1913 edition, brings home to one with redoubled force the enormous strides made even in the short space of one year in the scientific and commercial development of wireless telegraphy. The 200 odd pages, in which are set out in small, closely printed, yet clear and easily readable type, the land and ship stations of the world, with particulars of the ranges, rates, hours of working, character of service, call letters, and other information that everyone wants to know about, afford the most eloquent testimony to that development. This information has been brought thoroughly up to date and is supplemented by a list of all the stations, arranged in the alphabetical order of their call letters. A new and revised edition of the wireless map of the world has been added.

The chronological record of the development of wireless telegraphy goes back to 1831 and deals concisely with all events from that date up to the end of 1913. Even the proceedings of the International Conference on Life Saving at Sea are dealt with, and the whole of the section of the Convention relating to wireless telegraphy is reproduced. The International Radiotelegraphic Convention again appears and the section containing the laws and regulations of the principal countries concerning wireless telegraphy has been thoroughly overhauled and considerably enlarged.

It must not be supposed, however, that the Year Book is only a record—deeply interesting and useful though that " record " is—of the world movements in wireless telegraphy of the past year. It touches on all the great technical questions that lie before us and illuminates them in such a manner that those who run may read. The article on " Waves and Wave Motion " which Dr. J. A. Fleming contributes should enable the reader to obtain clear ideas of the *modus operandi* of wireless telegraphy. Dr. J. Erskine-Murray, in the course of an interesting article, analyses typical cases of " freak " communications and deduces from these, in conjunction with the known and fundamental physical facts of the case, a true idea of the function of the atmosphere without the use of any explanatory hypotheses. Dr. E. W. Marchant deals with the measurement of the strength of wireless signals. Mr. Arthur Hinks, F.R.S., contributes an article on " Wireless Time Signals and Longitudes," and Mr. R. G. K. Lempfert, Superintendent of the Forecast Division of the Meteorological Office, discusses the application of wireless telegraphy to the collection and distribution of information regarding the weather, which has already assumed considerable dimensions and which is destined to play an even larger part therein in the future. Mr. G. E. Turnbull deals with "Wireless Telegraphy in the Merchant Service," and Mr. C. E. Prince with the "Problems of Wireless Telephony." There is much valuable technical data and a large number of useful formulæ and equations, as well as a very full glossary and dictionary of technical terms in English French, German, Italian and Spanish.

It is impossible to convey in a brief review an adequate idea of the extraordinary extent and variety of the information compressed into this wonderful work. All the old features which were of value in the 1913 edition have been retained and many new ones added, chief among which we may mention that entitled "International Time and Weather" signals. Biographical notes inform us "who's who" in wireless, and there is a useful list of books on the subject as well as a directory of the amateur wireless clubs in England and America.

This 1914 edition of the Year Book is undoubtedly a standard work of reference on the subject of wireless telegraphy, and is of interest alike to the scientist, the engineer, the commercial, and the amateur.

* * *

THE WONDERS OF WIRELESS TELEGRAPHY. By J. A. Fleming, D.Sc., F.R.S. 3s. 6d. net, 279 pp. Illustrated. London: Society for Promoting Christian Knowledge, Northumberland Avenue, W.C.

To many of our readers Dr. Fleming is well known as a distinguished worker in the world of wireless and as the author of standard books on the subject which are invaluable to those who propose to take up wireless telegraphy in a serious spirit. Many workers in this young branch of telegraphy have developed their professional career upon the foundations laid by the study of Dr. Fleming's masterly works. The book now under notice appeals to a totally different and more numerous class than do those already referred to, and "is put forward," as the author modestly claims, "as a little attempt to furnish the general reader with a fairly non-technical account of the underlying principles and practical achievements of wireless telegraphy." The aim has been entirely successful. In the fascinating story which is placed before him the "general reader" should have no difficulty in following the wonderful development of wireless telegraphy.

The opening chapter of the book is devoted to a concise summary of modern views on electricity, atoms and electrons, and deals with the facts which support the assumption that space is filled with a medium called æther, not directly appreciable by our sense of touch, but through and by which all luminous and electrical effects are transmitted from place to place, and in addition may perhaps be the primordial basis of all we call material substance. A chapter is devoted to electric oscillations and electric waves, and this should prepare the reader to follow without difficulty the explanation given in succeeding chapters of the means and methods by which wireless telegraphic messages are sent and received. The development of a well organised system of intercommunication over land and sea is described and an interesting outline is given of the historical development of practical wireless telegraphy by means of long electric waves, and in the concluding chapter the author sketches the future of wireless telegraphy.

* * *

"TESTING OF ELECTRICAL MACHINERY FOR NON-ELECTRICAL STUDENTS," by J. H. Morecroft and F. W. Hehre. (London: Constable & Co. 6s. net.)

It is now usual in most universities and technical colleges to require the engineering students to take a course of electricity, and the book before us has been written to suggest a course of practical work suitable for those who do not intend ultimately to specialise in that subject.

The book opens with a brief analysis of the characteristics of machines, and specific particulars are given regarding the tests to be performed. The reader who expects to find a complete analysis of the different types of machines will be disappointed, for such a work is impossible, and, indeed, it is questionable whether a complete analysis would serve the purpose. The theory given in the book will not enable the average student to dispense with lectures on electricity, but it contains many hints which should be helpful to him.

# Commercial Information

## American Marconi Company.

THE balance-sheet of the Marconi Wireless Telegraph Co. of America for eleven months to December 31st, 1913, shows a surplus of $178,251. The directors point out that it was necessary to make very large and unusual expenditures during the year; but it is confidently expected that the extraordinary conditions which called for them will not occur again. These expenditures aggregate over $60,000, and were caused: (1) by dismantling of sundry land stations, which were found unnecessary owing to consolidation of the property of the company and the defunct United Wireless Co.; (2) Increased expenses necessary on ship stations to conform with the new Government regulations; (3) Large increased expenses on account of stock transfers, caused by issue of the new stock and transfer of temporary securities into those of a permanent nature. (4) Owing to disturbed labour conditions on the Pacific coast the company was put to increased expense to maintain the integrity of its service and to preserve its independence in the conduct of its business. Another important matter which should be taken into account, and which makes a considerable difference in its balance-sheet, is the number of large orders unfilled, both on private contracts and contracts with the United States Government, which remained open at the close of the year, and which, while showing a profit, could not be properly taken into the account, inasmuch as the profit had not then been definitely ascertained. Since the close of the year the majority of the orders have been filled, and profits assured for the current year.

The work of erection of the high-power long-distance stations is progressing, and they are expected to be completed and open for business early in the summer. As to the Pacific stations, everything seems favourable to the service with Honolulu commencing before June 1st. A Bill has just been passed by the Philippine Assembly granting the company, subject to the approval of the Secretary of War, the right to erect a high-power station in the Philippines which will work with Honolulu, Japan, and China, and it is hoped at an early date to receive the approval of the War and Navy Departments enabling us to proceed with the work of location and installation. The Imperial Japanese High-power station, which is being constructed to work in connection with its Honolulu high-power station, is not yet completed. Land has been purchased at Chatham and Marion, Massachusetts, the former for a transmitting station and the latter for a receiving station, for high-power work with Norway. The Norwegian Government station also is now under way.

Satisfactory arrangements have been completed with the Western Union Telegraph Co., under which connection will be made between its main operating rooms in New York, San Francisco, Boston, etc., and the new high-power stations in New Jersey, California, and Massachusetts. These wires will be equipped with the latest devices for direct and expeditious exchange of traffic. A "business-getting" organisation has been perfected, and representatives will be located in New York, Chicago, New Orleans, and San Francisco, who will be in charge of a capable corps of canvassers which will keep in touch at all times with the cabling public and inform them of the Marconi superior facilities and reduced rates. The tendency of governments everywhere to enforce and enlarge wireless regulations, making it obligatory for all ocean and lake-going craft to be equipped with wireless, increases the demand for Marconi equipment.

During the recent snowstorm in the vicinity of New York, which played havoc with all overhead systems of wires, one railroad which the company had equipped with its wireless apparatus was able to run its trains and handle its traffic without cessation or delay. The company were able to extend facilities and aid to other railroads, giving them service with New York, Philadelphia and Baltimore. As a result they have had many inquiries from railroad officials, and expect to build up a substantial business in train wireless.

Wireless as a means of communication in rough and undeveloped countries is also recognised. In Alaska, for instance, the difficulties of maintaining overhead lines are well known. The company are arranging to construct several high-power stations along the Alaskan coast and in the interior, and steel has already been shipped for stations to be constructed at Ketchikan and Juneau for commercial business with Seattle and Astoria, Washington. There are good prospects for good business. Negotiations are in progress with the Cuban Government to take over and operate on a joint basis several wireless stations which that Government has been maintaining independently.

The report continues: "We are gratified to be able to report a favourable decision by Judge Van Vechten Veeder, of the United States District Court, in our suit against the National Electric Signalling Co. for infringement of patents, by which the validity of all three patents on which the suit was brought is fully sustained, and by this decision Marconi is now for the second time officially recognised in this country as the inventor who made commercial wireless telegraphy a possibility, and this decision as it stands to-day will have a far-reaching effect on competing wireless companies."

## The Share Market.

LONDON, *April* 21.

The Marconi issues for the past month have shown a little variation, their prices being governed by the position of the stock markets generally. The closing prices are: Marconi Ordinary, £3 6s. 3d.; Marconi Preference, £2 13s. 9d.; Canadian Marconi, 7s. 9d.; American Marconi, 16s. 3d.; Spanish and General Wireless Trust, 10s. 0d.; Marconi International, £1 8s. 9d.

## PATENTS.

### Marconi Action in U.S.A.

As we were able to announce briefly in our April issue, the action brought by the Marconi Wireless Telegraph Company of America against the National Electric Signalling Company (Fessenden's system) in the United States Circuit Court for infringement of Lodge's patent No. 609154 (corresponding to English patent No. 11575, of 1897, which has been prolonged for seven years) and Marconi's patent No. 763772 (corresponding to English patent No. 7777, of 1900, which was upheld in the English courts a few years ago) ended on March 18th in a judgment for the plaintiffs. The judgment, which thus corresponds with those which have been delivered in other countries, declares both patents to be valid and to be infringed by the defendants' system.

Judge Van Vechten Veeder, in the course of his decision, went exhaustively into the history of wireless signalling from the days of Egyptian signal fires down to the Marconi inventions. He said:—

> Maxwell, in 1863, had speculated on the possibility of the production of electric waves which would detach themselves from a source of origin; Hertz, in 1887–1888, had proved experimentally that Maxwell's theories were correct; Lodge, in 1889, had repeated Hertz's experiments; Branly, in 1890, had repeated Hertz's experiments, and had also discovered that certain substances, in addition to Hertz's ring resonator, were detectors of electric waves; Crookes, in 1892, had forecast the possibilities of wireless telegraphy by the utilisation of Hertzian waves; Lodge, in 1894, had reviewed the experiments of Hertz and Branly and some of his own, touching the form which electric waves took when emanating from their source of origin, and upon substances which would detect these waves; Popoff, in 1895, in similar experiments had noted that he could detect the existence of a distant thunderstorm, and expressed the hope that wireless telegraphy could be accomplished by the utilisation of Hertzian waves. But no one had described and demonstrated a system of wireless telegraph apparatus adapted for the transmission and reception of definite intelligible signals by such means. This was the state of scientific knowledge and practice when in 1896 Marconi applied for his first patent.

Accordingly, I find that the evidence establishes Marconi's claim that he was the first to discover and use any practical means for effective telegraphic transmission and intelligible reception of signals produced by artificially formed Hertz oscillations.

More than fifty pages of Judge Veeder's decree is given up to a discussion of the third Marconi patent, which has been held to be valid in Europe. Of the manner in which Mr. Marconi achieved his final wireless triumph with instruments made under this patent he said :—

"With this apparatus Marconi communicated across the Atlantic in 1901 and claims in issue constitute the essential features of apparatus which has since made possible communication over a distance of 6,000 miles. It has been used in more than 1,000 installations by Marconi, and is admittedly an essential feature of the wireless art as at present known and practised."

## Patent Record.

The following patents have been applied for since we went to press with the April number :

1914.

6588. March 16th. John Hays Hammond, jun. Movable bodies, such as vessels, air-craft and road vehicles, controlled by radiant energy.

6700. March 17th. Henry Fothergill. Apparatus for radiating and receiving electro-magnetic waves on aeroplanes, airships, and the like.

7257. March 23rd. Samuel D. Williams. System of duplex or multiplex wireless telegraphy and telephony.

7701. March 26th. Leslie Bradley Miller. Portable transmitters for use in wireless telegraphy.

7922. March 28th. Adrian Francis Sykes. Microphones especially suitable for use in radio-telegraphy.

8568. April 4th. John Hays Hammond, jun. Gaseous or vacuized detectors for radiant energy and method of controlling the action thereof.

Capt. H. Riall Sankey delivered an interesting and instructive lecture in the Corn Exchange, Chelmsford, on "Wireless Telegraphy," on April 8th. The platform was fitted with complete apparatus, and, together with this and lantern slides, Capt. Sankey was able popularly to explain to a very large audience the technicalities of the science. Signals were received and made audible to the audience, who were enthusiastic in their appreciation of such an insight into one of the chief wonders of modern times. The arrangement of the apparatus for the demonstration was in the hands of Mr. H. M. Dowsett, who was assisted by Mr. J. J. Barden, Mr. W. H. Nottage, Mr. S. J. Willis, and Mr. R. Cryan. The Mayor of Chelmsford presided.

## Wireless to the North.

Captain Murray, the Member for Kincardineshire, has received a communication from Captain Norton, M.P., Assistant Postmaster-General, announcing the definite sanction of the Treasury for the erection of a wireless telegraphy station in the neighbourhood of Stonehaven, in that county. The station is to be used to serve as a substitute for the ordinary telegraphic service in the event of the main overhead lines to the North being interrupted.

The contract for the erection of the station is being placed with the Marconi Company.

According to the Liverpool *Journal of Commerce*, wireless telegraphy between England and Manxland is assuming tangible shape, Lord Raglan having declared that telephonic communication was practically financially prohibitive. Lifelong experienced maritime captains and globe-trotters interviewed emphasised the comparative security and unique importance of insular wireless installations, instancing the breakdown of the main telegraphic cable some time ago between Manghold and St. Bees Head, cutting the island completely off for a week from the outside.

* * *

The hydro-aeroplane entered a field of usefulness when a Curtiss flying boat, the *Edith*, operated by Charles O. Witmer, was used to overtake a ship at sea to deliver important mail and other papers to passengers on board. The steamship *Miami* had left Nassau, but owing to a low tide lay-to inside the bar, three miles off Cape Florida. A high wind arose and swept the water on the bar further out to sea, leaving the ship unable to proceed. By wireless the captain was able to communicate his position to Miami, and the aviator then set out on his mission, which he successfully accomplished.

## STAFF PENSIONS.

WE cannot gainsay that the action of modern economic forces has practically broken down the personal relationship that existed between the employer and his workpeople in the days before the joint stock principle gained possession of the industrial world, but we do not thereby admit that the spirit of fraternal co-operation which was then fostered only by the benevolent employers has been destroyed. On the contrary, that spirit finds expression to-day in the treatment which many commercial companies mete out to their staffs, and it is in welcome contrast of the conception of a joint stock company as a soulless organisation, which one is apt to gather from the legal text-books.

The action of the directors of the Marconi Companies in establishing a superannuation fund for the benefit of members of their permanent staffs is well in keeping with that spirit. The fund came into operation on April 1st last, and its purpose is to secure to those who subscribe towards it pensions averaging approximately half their annual salaries. Fixed annual contributions will be paid by the Company and by the members until the age of 60 is reached, when retirement will become compulsory (unless an exception is made by the directors), and the pensions will accrue immediately. In the event of a member dying before attaining the pension age, the contributions paid by him and by the Company will, with £3 per cent. compound interest, be paid to his legal personal representatives.

The generosity of the directors of the Company and zeal for the welfare of the members of their staffs do not stop at the superannuation fund, however. They are of the opinion that in the event of the early decease of a member some further provision should be available for those dependent on him, and they have arranged for a guarantee by the North British and Mercantile Insurance Company, which will secure to the legal representatives of the deceased member a sum equal to twice the annual amount of the pension selected by him when he joined the fund. The additional contribution required for securing this benefit will also be borne by the Company and the member jointly.

The Company's contributions in respect of members who leave before they have completed ten years' service and contributed to the fund for five years, will be placed to a Benevolent Fund, out of which payments will from time to time be made to members who, by reason of accident or distress, need assistance.

# Positions of Engineers

## (April 11th.)

Gray, A., Chief Engineer.
Anselmi, S. C., Towyn.
Barrington, R. N., Carnarvon.
Beatson, A., Carnarvon.
Benning, B. S., London.
Blinkhorn, A. B., London.
Boome, G. J., London.
Borghese, G. G., Clifden.
Boucicault, P., Carnarvon.
Boyle, C. W., Clifden.
Brown, W. H., Cork.
Burrowes, F. E., Yacuiba, Bolivia.
Burrows, H. M., Carnarvon.
Casperd, C. C., Clifden.
Chevallier, J. C. E., Yacuiba, Bolivia.
Childs, H. B. T., Carnarvon.
Clark, J. P., London.
Cole, W. B., Ferrol.
Cooke, R. R., London.
Croaker, P., Devizes.
Dashwood, S. L., London.
Davis, W. J., Carnarvon.
Demont, R., En route for Bolivia.
Denham, W., Chelmsford.
Dobell, H., Chelmsford.
Dockray, S. T., Punta Arenas.
Dowsett, H. M., Chelmsford.
Eisler, P., London.
Entwisle, G. H., London.
Entwistle, W. S., London.
Ewen, H. A. E., London.
Fellowes, H. S., Poldhu.
Fielding, W. F., Newcastle.
Flanagan, F., Poldhu.
Flood-Page, A., London.
Franklin, C. S., London.
Galster, J., Stavanger, Norway.
George, E., Special leave.
Gilmour, R. J., Liverpool.
Golland, E., London.
Green, E., London.
Groser, S. R., Cadiz.
Hill, L. D., Letterfrack.
Hobbs, T. E., London.
Hughes, C. H., on leave.
Hunter, M. B., Poldhu.
Ichino, E., London.
James, C., Egypt.
Johnson, J. N., Ferrol.
Jones, D. H., London.
Jupe, A., Newcastle.
Keith, C. H., Punta Arenas.
Kemp, G. S., Haven.
Kent, A. D., Antwerp.
Kift, A. A., London.
Kindersley, R. G., London.
King, L. H., Leafield.
Korber, F., Clifden.
Kos, S. F., London.
Lacy, T. S., Carnarvon.
Ladner, A. W., Poldhu.
Landon, G. H., Clifden.
Leary, J. J., Returning from Chili.
Linsell, A. A., Chelmsford.
Loveband, A. W., London.
MacCallum, H., Clifden.
Marden, E. S. D., Egypt.
Mathias, E. L. A., Clifden.
Maunder, W. R., Carnarvon.
McKay, C. A., Glasgow.
McCullough, H., Riberalta, Bolivia.
McLellan, A., Annual leave.
Meikle, G. C., Poldhu.
Merton, H. F. J., Belfast.
Montague, E. C., Poldhu.
Moore, A. E., London.
Morris, A. J., Clifden.
Mott, W. F., Glasgow.
Newman, F., London.
Nicholls, H., Punta Arenas.
Paget, P. W., Chelmsford.
Parkin, T. D., Genoa.
Payne, D. H., Carnarvon.
Persichetti, C. S., London.
Picken, W. J., Letterfrack.
Pitcairn, R. F., London.
Pole, A. T., Riberalta, Bolivia.
Poyntz, J. M., Carnarvon.
Prince, C. E., Chelmsford.
Privett, P. E., Poldhu.
Quick, R. C., London.
Rackstraw, N. C., Hull.
Rattray, C. G., Sick leave.
Rice, R. K., London.
Richmond, H., Leafield.
Ridley, W. O., London.
Robinson, F. E., Broomfield.
Round, H. J., London.
Rust, N. M., Letterfrack.
Ryan, C. P., Glasgow.
Sauve, H., Teneriffe.
Savill, A. G., Brazil.
Shaw, H. E., Poldhu.
Sherborne, A. K., London.
Smith, S. B., Towyn.
Stacey, F., London.
Steen, H., Stavanger, Norway.
Strickland, R. H., Punta Arenas.
Tisshaw, H. S., Towyn.
Topham, F. C., Clifden.
Tremellen, K., London.
Triggs, E., Glasgow
Trost, O., Stavanger, Norway.
Turner, W. G. A., Carna von.
Tyler, E. G., London
Venn, W. H., Newcastle.
Volter, E. F. W., London.
Vyvyan, R. N., London.
Wells, N., Broomfield.
White, J. D., on leave.
Whitmore, G. S., London.
Willis, M. F., Carnarvon.
Witt, B. J., Towyn.
Wood, W. H., Liverpool.
Woodward, P. J., Carnarvon.
Wright, G. M., Chelmsford.

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# Positions of Operators

## (April 9th.)

Abbott, S. H. V., *Panama.*
Adam, J. S. H., *Berrima.*
Adams, F. W., *Michigan* (Warrens).
Adams, G. E., *Minnetonka.*
Adnitt, C. H. H., *Edinburgh Castle.*
Akehurst, C. J., *Highland Laird.*
Akerman, A. R., *La Negra.*
Albrow, H. V., *John Pender.*
Alderton, C. G., *Beacon Grange.*
Alford, L. W. G., *Waimana.*
Allchurch, H. P., *Devonian.*
Allen, G. A., *Cassis.*
Allison, W., sick leave.
Allnutt, C. M., *City of London.*
Allott, N. E., *Chili.*
Allsworth, H. P., *Ivernia.*
Alston, S. K., *Itassuce.*
Alton, T. F., *Chaleur.*
Ambler, P., *Orcoma.*
Amott, F., *Maryland.*
Anderson, G. A. L., *Empress of Britain*
Anderson, G. D., *Elephanta.*
Anderson, L. N., *Saxonia.*
Andrews, A., *Philadelphian.*
Angill, A. G., *Irishman.*
Arbuckle, D., *Grampian.*
Aris, B. F., *Waipara.*
Arlaud, C., *Sardinia.*
Armstrong, C. C., unattached.
Armstrong, S., *Magdalena.*
Arnold, A. C., *Appam.*
Arrowsmith, G., *Tarquah.*
Ashbrook, J., *Arabic.*
Atkinson, J., unattached.
Atkinson, W. F., *La Correntina.*
Atkinson, W. H., *Narragansett.*
Auvache, J. E., *Medina.*
Avery, F., unattached.
d'Avigdor, A. H. D., *Ultonia.*
Bailey, F. M., *Arabic.*
Bailey, H. H., unattached.
Bain, W. R., *Kelvinbank.*
Baker, E. A., *Khiva.*
Baker, F. H., *Orteric.*
Baker, J. R., *Orissa.*
Balding, G., *Grantully Castle.*
Baldon, C. T., *Oxfordshire.*
Balfour, G. W., *Mauretania.*
Ballard, A. E. R., *Oruba.*
Bamford, E., *Michigan* (Warrens).
Bamford, J. R., *Dominion.*
Banbery, W. C., *Durham Castle.*
Band, H. J., *Star of Australia.*
Barber, C. E., *Highland Brae.*
Barber, W., *Den of Airlie.*
Barker, L. T., *Matura.*
Baron, C. E., *Huanchaco.*
Barrell, W. S., on leave.
Barron, T. G., *Baron Jedburgh.*
Bartlett, C. H., *Matatura.*
Baxter, B. O., unattached.
Beamon, T., *Ascot.*
Bean, H. H., *Englishman.*
Beardmore, G. A., *Caledonian* (Leyland).
Beatson, F., *Walmer Castle.*
Beckett, G. N., *Pancras.*
Beckett, J., *Corinthian.*
Beilby, W., *Uranium.*
Belcher, H. F., *Armadale Castle.*
Bell, A., *Highland Laird.*
Bell, E., *Karema.*

Bell, J. A., *Raeburn*.
Bellhouse, G. L., *Benefactor*.
Belton, D., London School.
Bernard, R. A., *Kansas*.
Beynon, A. R., *Kanawha*.
Biggins, J., *Canadian*.
Bilton, W. W., *Hantonia*.
Birch, A., *El Argentino*.
Birtwistle, W., *Himalaya*.
Blake, E., on leave.
Blezard, J., *Magdalena*.
Blight, W. T., *Mamari*.
Bliss, G. E., *Carnarvonshire*.
Blizzard, R. E., *Tara*.
Blow, A. G., *Highland Laddie*.
Bloxham, A. I. W. H., *Asturias*.
Blundell, E. T., sick leave.
Boileau, J. M., *Patuca*.
Bolster, A., *Teesta*.
Boon, N. A., *Bogota*.
Boorne, E. V., *Takada*.
Bower, A. B., *Berwick Castle*.
Bowling, J. E. K., *China*.
Bowman, H. A., *Welshman*.
Boxer, H. R., *Hurunui*.
Boylan, J. A., *Garth Castle*.
Bradfield, T., *Aronda*.
Bradley, F. A., *Chignecto*.
Brain, R. L., *Haverford*.
Bramley, J. R. C., *Italia*.
Bransby, A. H., *Highland Brigade*.
Branton, S. V., *Pera*.
Breen, J. J., *Ausonia*.
Bremner, J., *Barranca*.
Brennan, J., *Empress of Britain*.
Brett, C. H., *Limerick*.
Brewer, C. H., *Calabria*.
Bridges, W., *Desna*.
Bright, A. E., sick leave.
Brindle, F., *Kathiawar*.
Brookes, J. F., *Miami*.
Brophy, M. J., *Canadian*.
Brown, A. C., *Galician*.
Brown, A. H., *Demerara*.
Brown, A. R., *Motagua*.
Brown, J., *Potaro*.
Brown, J. A., *Ekma*.
Brown, S. W., *San Eduardo*.
Brown, Stanley W., *Deseado*.
Browne, A., *Huasco*.
Browne, C., *Alsatian*.
Brun, L. S., *Hesperian*.
Bruton, A. F., unattached.
Bryan, H. F. B., *Sardinian*.
Bryant, P., *Andania*.
Budge, J., *Quillota*.
Bull, J. G., *Montrose*.
Burgess, A. F. T., *Ucayali*.
Burgham, G. M., *Sumatra*.
Burke, M. M., *Columbian*.
Burnett, W. C., *Ruthenia*.
Burnett, W. J. T., *Mongolian*.
Burrows, T. R., *Borda*.
Butler, J., *Ivernia*.
Butterworth, J. M., *Lanfranc*.
Buttle, J. G., *San Tirso*.
Caldwell, A. C., *Suevic*.
Caldwell, J., *City of Paris*.
Calver, F. N., *Mauretania*.
Calver, G. H., *Megantic*.
Cameron, R. S., *Pardo*.
Camfield, J., *Bohemian*.
Campbell, M. J., *San Urbano*.
Candy, W. H., *Montcalm*.
Carey, J. P., *Drumcree*.
Carnaby, N. E., *Egypt*.
Carruthers, G., London School.
Carter, B. A., *Massilia*.
Carter, W., *Chagres*.
Cauvin, M. A. J., *Manxman*.
Cavanagh, H. S., *Alaunia*.
Chadwick, J. G., *Adriatic*.
Chapman, J. G., *Orama*.
Chapman, T. J., *Neuralia*.
Charles, E. E., *Royal Edward*.
Chesterton, A. J., *Itapura*.
Cheyne, J., *Manhattan*.
Chick, C. A., *Llandovery Castle*.
Chick, O., unattached.
Chick, W. H., on leave.
Child, L. J., *Orissa*.
Church, G. R., *Minnetonka*.
Church, T. M., *Etonian*.
Clark, F., *Cawdor Castle*.
Clark, J. W., unattached.
Clark, J. W. A., *Pathan*.
Clark, L. B., unattached.
Clark, P. S., *Assaye*.
Clarke, A. H., *Nevasa*.
Clarke, A. M., *Nankin*.
Clarke, H. T., *Comrie Castle*.
Clarke, J. G., *Cestrian*.
Clarke, W. F., *Calypso*.
Clarke, W. J., unattached.
Clarkson, G., *Crown of Toledo*.
Cleary, L. B., *City of Glasgow*.
Cleaver, W. W., *Arzila*.
Cleverley, E. S., *Amazon*.
Clifford, A. J., *City of Bombay*.
Cobham, A., *Franconia*.
Cocks, H., *Ingoma*.
Coffey, P. J., *San Gregorio*.
Coldwell, G. A., *El Cordobes*.
Coleman, T. H., *Gloucestershire*.
Collier, F. R., sick leave.
Condon, W., *Mount Royal*.
Connell, J., Liverpool Depôt.
Cook, E. J., *Llanstephen Castle*.
Cook, F., *Armenian*.
Cook, G. E., *Athenic*.
Cookson, V., *Sachem*.
Cormack, D. B., *Scindia*.
Cormack, W. L., *Gujurat*.
Cottam, H. T., *Persia*.
Cousens, E. C., *Nubia*.
Cousens, W. T., *Clearway*.
Cowhey, K. S., *Laconia*.
Cox, E. J., *Knight Templar*.
Cox, L. H., *Eupion*.
Cox, W. G., *Baltic*.
Coyah, W. D., *Mongolian*.
Craigie, J. A., unattached.
Craven, W. M., *Themistocles*.
Crawford, J. G., *Andorhina*.
Crofts, A., *City of Durham*.
Croke, L. G., *Mantua*.
Crookes, W. D., unattached.
Crosby, S., *Asian*.
Cross, S. R., *Megantic*.
Crossman, C. H. G., *City of Chester*.
Cruess-Callaghan, S., *Koranna*.
Cryan, W. J., unattached.
Cunningham, J., *Lucerie*.
Cutbush, H. R., *Karroo*.
Dale-James, W. R., *Marmora*.
Daly, D. G., *Trent*.
Daly, R. H., unattached.
Damen, O. G., *San Dunstano*.
Daniels, J. H., *Missouri*.
Darby, P. T., *Francis*.
Darracott, R. P., *Alnwick Castle*.
Davey, A. W., *Erinpura*.
Davies, F., *Caronia*.
Davies, J. E., *Orduna*.
Davies, J. I., *Mimiro*.
Davies, W., Liverpool Depôt.
Davis, A. C. J., *Ellora*.
Davis, G. E., *Desabla*.
Davy, W. H. G., *Hatumet*.
Dawson, B., *Canopic*.
Dawson, R., *El Paraguayo*.
Day, E. J., *Palena*.
Dean, F. L. W., *Californian*.
Dean, J. J., *Botanist*.
Denison, P., *Den of Crombie*.
Dennis, F. L., unattached.
Devereux, S. H., *Royal George*.
Dewey, G. H., *Lancastrian*.
de Witt, D. T., *Barneson*.
Dick, J., *Niwaru*.
Dicks, A. G., *Rangatira*.
Dickinson, A., *Peru*.
Dixson, E. W., *Namur*.
Dods, L. A., unattached.
Doherty, P., *Moldavia*.
Donnan, W. J., *Indian*.
Donnegan, J. J., *Berwindmoor*.
Driscol, J. R., *Waiwera*.
Duff, J., *Corsican*.
Duncanson, J., *Goorkha*.
Durston, W. J., *Cambrian*.
Dyer, E. W., *Corinthian*.
Earl, H. E., *Avon*.
Earl, W. F., *Pardo*.
Earle, H., *Huallaga*.
Ebbetts, F. T., *Manora*.
Eccles, P. B., *Delphic*.
Eddington, D. F., *Oruba*.
Edwards, W. G., sick leave.
Egan, M. B., *Gaika*.
Elliott, B. S., *Empress of Asia*.
Ellis, R. O., *Sicilia*.
Emanuel, R., *Arawa*.
Emery, B. F., *Egra*.
Empson, T. L., *Bankura*.
Entwistle, A. M., *Aragon*.
Erbach, E. W., *Matina*.
Evans, A. W. N., *City of Baroda*.
Evans, C. F., *California*.
Evans, T. H., *Indore*.
Fagg, G. K., *Andes*.
Farman, A. H., *Zent*.
Farmery, J. C., *Calypso*.
Farrell, R. T., *Swazi*.
Ferguson, R., *Empress of Ireland*.
Findlay, J. N., *Whakarua*.
Firman, A. R., *La Rosarina*.
Firth, P. S., *Idaho*.
Fitton, F., *Victorian* (Leyland).
Fitzgerald, J. M., *Potomac*.
Fletcher, L., *Carmania*.
Foran, E., sick leave.
Ford, H., *Empress of Ireland*.
Foster, R. T., *Tagus*.
Fowler, W., *Chan-Guinola*.
Fox, L. C., *Paparoa*.
Fox, W., *Knight Companion*.
Foyle, H. J., *Kentucky*.
Fraser, R., *Caledonia*.
Fry, F. A., *Hubert*.
Gadd, W. C., *Mashobra*.
Gale, B., *Teutonic*.
Gale, W., *Plassy*.
Gallagher, H. J., *Omrah*.
Garbutt, H. W., *Kia Ora*.
Gardner, F. T., *Nigeria*.
Gardner, R. S., unattached.
Garrett, E. W., *Philadelphian*.
Garwood, F. W., *Akabo*.
Gascoign, R. A., *Oriental*.
Gibb, J., *Wayfarer*.
Gibson, A., *Georgic*.
Giles, A. D., *Peru*.
Giles, R. W., *Manxman*.
Gill, C. J. A., *Georgian*.
Gillett, B. A., *Caribbean*.
Golding, J. H., *Guildford Castle*.
Goodsell, W. B., *San Valerio*.
Gordon, C. S., Telegraph Office, Marconi House.
Gornall, J., *Karina*.
Graham, T., *Winifredian*.
Graves, D., *Vandyck*.
Graves, W. P., *Hypatia*.
Gray, F., *Uranium*.
Gray, J. H., *Carpathia*.
Gray, W. F., *Mongolia*.
Green, E. H., *Campanello*.
Greene, A. L., *Highland Pride*.
Greenstreet, P., *Whakarua*.
Gregory, R. V., *Potaro*.
Gregson, A. J., *Normannia*.
Gregson, E. A., *Carthaginian*.
Greig, A. F., *Campanello*.
Gresham-Barber, K., *Macedonia*.
Griffith, J. T. R., *Munster*.
Griffiths, A., *Vauban*.
Grover, A. F., *S.Y. Lysistrata*.
Groves, W. G., *Zealandic*.
Gullen, F., *Mechanician*.
Hagon, W. R., *Manzanares*.
Hague, W. J., *Duendes*.
Haining, A. J., *Kildonan Castle*.
Halcrow, A., *San Jeronimo*.
Hall, H., *Caraquet*.
Halsall, T. H., *Hesperian*.
Hamlet, M. B. W., *Peru*.
Hancock, L. A., *Devanha*.
Hanson, A. E., *Bempton*.
Harding, R., sick leave.
Hardy, C. L., *Bovic*.
Hardy, H. E., *S.Y. Doris*.
Hardy, R. S., *Laurentic*.
Harford, R., *Minneapolis*.
Harlow, E., *St. George*.
Harris, A. J., London School.

Harris, C., *Royal George*.
Harrop, T., *Danube*.
Hart, H. P. J., *Nyanza*.
Hartigan, M. J., *Sardinian*.
Hatfield, A. H., *Tunisian*.
Hathaway, A. D., *Rimutaka*.
Hawes, H., *Hydaspes*.
Hawkes, G. E., *Letitia*.
Henderson, W. C., *Jose de Larrinaga*.
Hendry, A. O. R., *City of Naples*.
Henry, R. J., *Nicoya*.
Herbert, C. W., *Medic*.
Herbert, T., *Sicilian*.
Herd, H., *Corsican*.
Hewitt, S., sick leave.
Hickling, W., *Berbice*.
Hicks, W. J., *El Zorro*.
Hill, A. E., *Otranto*.
Hill, A. G., *Invertay*.
Hill, E. G., *Ghazee*.
Hill, G. R., *Vauban*.
Hill, V. J., *Anglian*.
Hindle, T., *Tyrolia*.
Hitchner, J. W., *Barpeta*.
Hoare, H. R., *Corinthic*.
Hobbs, P. R., *Abosso*.
Hodge, T. H., *Chilka*.
Hodgson, W. H., *Chinkoa*.
Holden, H., *Kandahar*.
Holden, T. F., unattached.
Holker, N., *Saldanha*.
Holland, E. J., *Barjora*.
Holliday, P., *Demerara*.
Holman, C. G., *Colonian*.
Holmes, T. B., *Historian*.
Hooley, T. E., *Star of India*.
Hooper, P. H., *Galeka*.
Hopps, R. G., *San Zeferino*.
Horne, T., *Snaefell*.
Horwood, H. J., *Alaunia*.
Hosking, L. G., *Palermo*.
Howard, E., *Ausonia*.
Howard, J. Q., *City of Birmingham*.
Howard, W., *Hermione*.
Howlett, W. J., *Manitou*.
Huggins, W. T., *Baroda*.
Hughes, C. L., *Highland Harris*.
Hughes, C. K., *Sagamore*.
Hughes, L. K., *Olympic*.
Hughes, W. J., *Campania*.
Hugo, V. S., *Minneapolis*.
Humphreys, E. H., *Wilcannia*.
Hunt, F. G., *Drumcliffe*.
Hunt, G., *Victoria*.
Hunt, H. P., *Ballarat*.
Hunter, A. E., *Galeka*.
Hutchinson, W. E., *Highland Corrie*.
Inder, W. W., unattached.
Ingle, G. W., *Indus*.
Iredale, J. J., *Canada*.
Isherwood, T. P., *Afric*.
Jacobs, A. G., *Ascanius*.
James, F., *City of Poona*.
James, R. C., *Kasenga*.
James, R. H., *Royston Grange*.
Jamison, A. F., *Stephen*.
Jefferies, F., *California* (Anchor).
Jeffries, A. H., *Leinster*.
John, W. L., unattached.
Johnson, F., *Denis*.
Johnson, W. A., *San Fraterno*.
Johnston, M., *Kasama*.
Jolly, E. E., *Briton*.
Jones, A. E., *India*.
Jones, A. V. G., *Naneric*.
Jones, C. E., *Engineer*.
Jones, C. F., *Quillota*.
Jones, H., *La Blanca*.
Jones, J. P., *Calgarian*.
Jones, O., *Garth Castle*.
Jones, R., *Columbia*.
Jones, Richard, *El Uruguayo*.
Jones, T. G., *Canopic*.
Jones, W. A., *Canada*.
Julius, A., *Æneas*.
Kean, O. P., *Hawkes Bay*.
Keen, F. L., *Saxonia*.
Kenworthy, H. D., *Goorkha*.
Kelly, C., London School.
Kelly, K. C., *Norman*.
Kett, H. S., London School.

Kinder, F. V., *West-Meath*.
King, B., *Colorado*.
King, R. R., *British Sun*.
King, V. M., *Araguaya*.
Kingsbury, A., *Makarine*.
Kingsford, J. R., *S.Y. Sapphire*.
Knapman, W. H., *Simla*.
Knox, T., *Pretorian*.
Lacock, F. J., *Scandinavian*.
Lambert, E., *South Point*.
Lambert, G. H., unattached.
Lambert, L. J., unattached.
Langham, A. E., *Charles E. Harwood*.
Langley, A., *Goorkha*.
Law, C., *Shenandoah*.
Law, S., *Pannonia*.
Lawson, A. L., *Araguaya*.
Lawton, A. H., *Flamenco*.
Lea, R. H., *Highland Enterprise*.
Learman, E. E., *Highland Rover*.
Leche, W. J., unattached.
Ledger, F. H., *Highland Warrior*.
Ledward, T. A., *Aguila*.
Lee, G., *Musician*.
Lee, R. A. C., *S.Y. Cassandra*.
Lee, W., *Mexico*.
Leech, H. S., *Cymric*.
Leeds, K. F. N., *Ellenga*.
Lees, E. A., *Huayna*.
Lees, J. H. D., *Commonwealth*.
Lefebure, H. H. R. A. C., *Baron Napier*.
Leighton, L. H., *Narragansett*.
Leith, R., *Lusitania*.
Leith, S. A., sick leave.
Lemon, S., *Campania*.
Lever, G. H., *Marquette*.
Lewington, W. H., *Gloucester Castle*.
Lewis, W. T., *Laconia*.
Lewis, S. P., *Buffalo*.
Lewis, S. W., *Desna*.
Lightfoot, H. J., *Darro*.
Lillis, W., *Mesaba*.
Lindsay, M. J., *Demosthenes*.
Lines, W. T., *Bovic*.
Linnell, F. J., *Rotorua*.
Lister, C., *Caribbean*.
Litchfield, C. P., *Den of Ruthven*.
Lithgow, W. H., *City of Colombo*.
Little, H. T., *Exmouth II*.
Lock, H. G. W., *Letitia*.
Longton, C. E., *Letitia*.
Lovelock, J. D., *Delaware*.
Lovett, F. J., *Melford Hall*.
Lovibond, R. A., *Parana*.
Lucey, J., *Candia*.
Lund, A. C., *Norman*.
Lush, J. K., *Nestor*.
Lynch, G., *Caledonian*.
Lyons, J., *Oronsa*.
Macdonald, J., *Marina*.
Machan, J. W., *City of Corinth*.
Mackenzie, C. F., *Itapuhy*.
Mackintosh, J., *Bohemian*.
Macleod, S. E. S., *Calabria*.
Macrae, C., *Cedric*.
Macrae, K., *Balmoral Castle*.
Madgwick, G., *Isis*.
Makin, A. E., *Motagua*.
Maltby, P. B., *City of Bristol*.
Mangan, D. D., *Chirripo*.
Mares, A. H., *Castalia*.
Marriott, J. E., *Dunluce Castle*.
Marsh, J. E., *Welshman*.
Marshall, W. T., *Scandinavian*.
Martin, P. B., *Olympia*.
Martin, S. F., *Nagoya*.
Martlieu, J. E., *Briton*.
Massey, C. T., *Mesaba*.
Massey, W., *City of Dunkirk*.
Masters, C. E. E., *Asturias*.
Mather, J., *Andania*.
Matthews, E. M., *Nicolo de Larrinaga*.
Matthews, W. C., *Eskimo*.
Mattinson, E. V., *Cassis*.
Mattock, P., *Victorian* (Allan).
Maudsley, C. V., *Caronia*.
Maurice, J., *Guildford Castle*.
Mauro, O. G., *Junin*.
May, A. H., *Manitou*.
May, P. B., *Armadale Castle*.

Maycock, T. C. C., *Star of Scotland*.
Mayer, E. D., *Edinburgh Castle*.
McCarthy, C. F., *Polaric*.
McCarthy, C. J., *Nile*.
McCarthy, C. M., *Cassandra*.
McCormack, G. N., *Cymric*.
McCormack, M., unattached.
McCormick, D. C., *Sandon Hall*.
McCreath, R. V., *Drumlanrig*.
McCrohan, T., *Inca*.
McCutcheon, W. J., *Reventazon*.
McEnery, T. C., *Imperial*.
McGhee, W. J., *Alsatian*.
McKenna, J. M., *Crofton Hall*.
McLachlan, D., *Cheynne*.
McMillan, J., *Hesperides*.
Melling, H., *Denbigh Hall*.
Meredith, M. W., *Italia*.
Middleton, P. G., *Hilary*.
Miles, J. L., *Ulysses*.
Miles, L. J., *Victorian* (Allan).
Miller, D., *Balantia*.
Miller, W., *Persic*.
Miller, W., *Start Point*.
Mills, L. C., *Star of Ireland*.
Mitchell, F., *Khyber*.
Mitchell, P. M., *Grantully Castle*.
Mitchell, S. W., *Appalachee*.
Mole, H., *Custodian*.
Monsey, M., *Scotian*.
Montgomery, B. H., *Chaleur*.
Moodie, T., *City of Lahore*.
Moody, J., *Balmoral Castle*.
Moon, A. T., *Angora*.
Moore, J. J., *Quernmore*.
Moores, J. H., *Arankola*.
Morgans, R. H., *Lackawanna*.
Moriarty, D. J., *Matoppo*
Morris, C. E., *Kalomo*.
Morris, P., *Deseado*.
Morris, T. P., *C. A. Canfield*.
Morrison, L. D. G., *Barala*.
Morrison, J. D., *Saturnia*.
Morse, W. S., *Vandyck*.
Moss, C. O., *Antony*
Mountain, R. H., unattached.
Mowe, F. H., *S.Y. Valiant*.
Mulhall, J. P., *Caraquet*.
Munday, R. A., *Minnewaska*.
Munroe, H., *Saturnia*.
Murch, R. W. B. *Berwindvale*.
Murphy, D. *Wakatane*.
Murphy, E., *Pannonia*.
Murphy, H. P., *Ortega*.
Murphy, J., *Mantaro*.
Murphy, W. F., *Californian*.
Murray, T. W., *Ardeola*.
Muschamp, T., *Briton*.
Myron, G., *Tritonia*.
Nailer, E. I. F., *Borderer*.
Nash, R. H., *Herefordshire*.
Naylor, A. T., *Gascon*.
Needs, W. A., *Nellore*.
Nelson, G. H., *Winifredian*.
Nethercoate, J. K., *Bayano*.
Newby, F. W., *Parana*.
Newman, W., *Highland Watch*.
Newns, L. S., *Canning*.
Nicholas, W. G., *Columbia*.
Nicholls, G. J. G., *Huntsman*.
Nicholson, A., *Taroba*.
Nicholson, J., *Colonian*.
Nightingale, F., *Bandra*.
Nixon, C. S. C., *Dewa*.
Noble, H., *Palma*.
Nolan, J. J., *San Hilario*.
Norwood, F. R., *Warwickshire*.
Nowlan, C. F., *Moto*.
Obey, W. C., *Runic*.
O'Brien, G. W., *Marere*.
O'Carroll, M. E., *Cassandra*.
O'Connor, A. W., unattached.
O'Connor, J., *Iroquois*.
O'Connor, P., *Principello*.
O'Connor, P. J., *Ionian*.
O'Connor, T., *Montfort*.
O'Donnell, T. J., *Laurentic*.
O'Halloran, T., sick leave.
O'Keeffe, P., *Vedamore*.
Oliver, C. A., *Maloja*.
Oliver, F. G., unattached.

Oliver, H., *Arcadia*.
O'Riordan, T., *Marengo*.
Osborne, A. J., *Tunisian*.
Osborne, A. E., *Sutherland Grange*.
Osborne, J. Edward, *Cluny Castle*.
Osborne, J. Edwin, *Ruapehu*.
Osborne, R. F., *Trent*.
O'Sullivan, C. F., *Turcoman*.
O'Sullivan, D., *Mount Temple*.
O'Sullivan, J. P., unattached.
Overall, E., *Marquette*.
Owen, A. W., *Dakar*.
Owen, L. L., *El Toro*.
Owen, R. M., *Carpentaria*.
Owen, W., *Aaro*.
Packer, R. H., *S.Y. Iolanda*.
Palmer, H. M., *Pakeha*.
Pannett, W. E., *Menominee*.
Parker, C. T., *Dover Castle*.
Parker, E. P., on leave.
Parkinson, W., *Kathlamba*.
Patrick, R. V., *Kildonan Castle*.
Payne, J. H., *Peshawur*.
Payne, T. A., *Arcadian*.
Pearson, W. E., *Oronsa*.
Peover, F., *Tropic*.
Penketh, G., *Cardiganshire*.
Pennington, C. J., *Star of Victoria*.
Penrose, H. E., unattached.
Pepper, W. H., *Llanstephen Castle*.
Perfect, A. E., *Inanda*.
Perkins, C. W., sick leave.
Perkins, H. J., leave
Perlman, A., *Bloemfontein*.
Peterson, T. G., *Marere*
Pettingill, W., *Orsova*.
Phelan, N. J., *Orita*.
Pink, Alfred, *City of York*.
Pitchford, G. R. J. W., *City of Benares*.
Pitkeathly, W., *Michigan* (Red Star).
Planterose, E. A., *Arabia*.
Pollard, F. G., *Arlanza*.
Ponsford, W. H., *Lancastrian*.
Pope, H. W., *Crown Point*.
Porter, H. R., Liverpool Depôt.
Pott, G. M., *Grampian*.
Potts, A. S., *Quilpue*.
Potts, J. W., *Tonawanda*.
Power, W., *Cretic*.
Preece, E., *Surat*.
Preston, M. A., *California* (P.S.N.).
Proughton, A. J., *Ascania*.
Quinlan, J. F., *Oroma*.
Railton, N., *Marere*.
Ralphs, P. L., *San Isidoro*.
Rapsey, C., *Patia*.
Ratcliffe, L. G., *City of Calcutta*.
Ratcliffe, T. C., *Avon*.
Rattee, S. G., *Merion*.
Raw, W., *Oderley*.
Rawsthorne, W., *Paeuare*.
Rea, J., *Aracataca*.
Read, C. A., Liverpool Depôt.
Redgate, H. J., *Kumara*.
Reid, H. S., *Highland Loch*.
Reid, S., *Haverford*.
Reid, W. H. W., *Benalla*.
Renshaw, P. J., *Ultonia*.
Renshaw, R. W., *Lusitania*.
Renwick, W. D. R., *Highland Heather*.
Revell, J. L., *Dunluce Castle*.
Reynolds, A. J., *Galileo*.
Reynolds, F. W. J., *Carnarvonshire*.
Rhodes, T., unattached.
Ricci, R. E., *Tainui*.
Rice, H. W., Carmania.
Rice, P. F., *Indrabarrah*.
Ridley, J. M., *Vitruria*.
Rivett, F. W., *City of Edinburgh*.
Robb, T., *Toronto*.
Roberts, C. O., *Oropesa*.
Roberts, D., sick leave.
Roberts, G., *Virginian*.
Roberts, M., *North Point*.
Robertson, C., *Remuera*.
Robertson, D., *Cardiganshire*.
Robertson, J. K., *Sachem*.
Robinson, F. V., *Highland Piper*.
Robinson, L., *Glenetive*.
Robinson, S., *Suveric*.
Robson, E. W., *Cameronia*.

Roden, C., *Walmer Castle*.
Rodway, J. C., sick leave.
Rookes, C. E., *Turcoman*.
Rosney, P. J., unattached.
Ross, W. M., *Pretorian*.
Rowdon, W. A., *Aidan*.
Rowlands, H., *Manistee*.
Rowlatt, F. W., Liverpool Depôt.
Rundle, E. H., *Kumeric*.
Rushforth, A., *Potosi*.
Rushworth, F. B., *Sicilian*.
Rushton, F., *Carpathia*.
Russ, E., *Cretic*.
Ryan, J., *Agadir*.
Ryan, V. A., *Manhattan*.
Ryan, W. T., *Montreal*.
Salmon, J. B., *Highland Glen*.
Salmon, J. L., *Empress of Russia*.
Salter, T. H., *Asian*.
Salway, R. L., *Anglian*.
Sanders, C. T., *Arcadian*.
Sanderson, L. T. N., *Star of England*.
Sandison, J. L., *Baltic*.
Sandham, T. D., *City of Lincoln*.
Sandford, J., *Merion*.
Sandon, W. E., *Star of India*.
Sang, H. K., *Athenia*.
Sarll, S. R., *Circassia*.
Sayer, H. T., *Great City*.
Scales, C. W., *Atlantian*.
Schanch, H. S., *Crofton Hall*.
Schofield, A., *Guatemala*.
Scott, M., *Knight Bachelor*.
Scott, R. C., *Esmeraldas*.
Scully, E., *Navahoe*.
Searl, C., *Empress of Asia*.
Sedding, N., *Elmina*.
Seddon, W., sick leave.
Seeney, H. W., *Berbice*.
Sellars, G. H., *Caledonia* (P. & O.).
Sequeira, H. C., *Malda*.
Sharp, E. W., *Thongwa*.
Sharpe, C. H., *Ascania*.
Sharpe, F., *West Point*.
Sharpe, W. H., unattached.
Sharples, E., *Kaluna*.
Shatwell, E., *Dover Castle*.
Shaw, A. H. H., *Armenian*.
Shore, R. M., *Ozonian*.
Shrimpton, E. T., *Kaipara*.
Silvester, W. H., *Hull Trawler*.
Simmons, H. F., *Pachitea*.
Simmons, J. M., *Victoria*.
Simpson, J. C., *Galician*.
Simpson, T. A., Callao Depot
Simms, W. R., *Oceanic*.
Sinclair, D. H., *Herbert G. Wylie*.
Single, G., *Darroo*.
Skinner, J. S., *Andes*.
Slater, F., *Iberian*.
Sloggett, S. D., unattached.
Smith, A. C., *Antillian*.
Smith, A. F., *Intaba*.
Smith, D. A., *Highland Heather*.
Smith, F. J., *Oriana*.
Smith, F. J. D., *Michigan* (Red Star).
Smith, H. F., *Ionic*.
Smith, H. S., *Novara*.
Smith, L. J. G., *Arlanza*.
Smith, P. S., *Celtic*.
Smith, S., Liverpool Depot.
Smith, W., *Salmo*.
Smith, W. H., *Inkosi*.
Smythe, G. W., on leave.
Snow, H. C., *Christopher*.
Snow, W. E., *Hyacinthus*.
Snowden, H., *Kingstonian*
Soans, R. T., *Ionian*.
Soar, R. A., *Asturias*.
Solway, H. E., *Stephano*.
Sotheran, A. W., *Banca*.
Southam, R. W., *Otway*.
Spence, R. S., *Devonian*.
Spicer, S. W., *German*.
Spiers, J., *San Ricardo*.
Sproat, H., *Mexico*.
Sproat, D. M., *City of Marseilles*.
Spurgeon, W. P., *Geelong*.
Standen, T. F., leave.
Stanley, H. J., *Nore*.
Stannard, C. E., *City of Norwich*.

Stansbridge, S., *Adriatic*.
Stansfeld, D. R., *Miltiades*.
Starkey, J., *Kinfauns Castle*.
Stephen, A. K., *Gascon*.
Stephenson, J. A., *Highland Hope*.
Stevenson, A., *Gaika*.
Stevenson, P., *Nicaru*.
Stevenson, J. L., unattached.
Steward, E. H., sick leave.
Stewart, L. C., *Virginian*.
Stewart, W. M., *Caledonia*.
Stickland, A. G., *Muritai*.
St. John, H. W., *Minnewaska*.
Stocker, A., Canadian Cruiser *Margaret*.
Stone, J. B., *Olympic*.
Strong, R., *Walton Hall*.
Stubbs, T. H., *Agadir*.
Studholme, J. J., *Patrician*.
Sturdy, H., *Quilpue*.
Styles, A. C., on leave.
Summerlin, S. C., *S.Y. Alberta*.
Summers, E. R., *Calabria*.
Sutherland, D., Glasgow Depôt.
Sutherland, W. G., unattached.
Sweetnam, R., *Delta*.
Syme, W. A., *Orvieto*.
Tamplin, L. H., *Danube*.
Tayler, G. R. W., *Arzila*.
Taylor, A., *Tortoguero*.
Taylor, A., *Chignecto*.
Taylor, A. W., unattached.
Taylor, H. W., *San Lorenzo*.
Taylor, R. F., *Seal*.
Taylor, W., *Osiris*.
Taylor, Wilfred, *Etonian*.
Taylor, W. G., *German*.
Teahon, S., unattached.
Terranneau, E. G., *Nerehana*.
Thomas, G., *Cambrian*.
Thomas, G. H., *Edward L. Doheny*.
Thomas, H., *Itatinga*.
Thomas, W., sick leave.
Thomas, W. H., unattached.
Thomasson, F., *Franconia*.
Thomasson, H., *Orotava*.
Thompson, A., *Cevic*.
Thompson, A. J., London Depôt.
Thompson, A. T., sick leave.
Thompson, W. J., on leave.
Thomson, F. A., *Highland Scot*.
Thomson, G., *Salsette*.
Thomson, J., *Highland Watch*.
Thomson, J. R., *Monmouth*.
Thomson, R., *Carthaginian*.
Thornton, J., unattached.
Threlkeld, T. G., *Worcestershire*.
Tilford, G. L., *Perugia*.
Timperley, J. H., *Kelvinia*.
Tunbridge, A. O., *Galway Castle*.
Turner, G. E., *Gloucester Castle*.
Turner, J., *Salamis*.
Tyler, G. R., *Sagamore*
Tyler, W. E., unattached.
Underwood, H. G., *Karonga*.
Utting, R. T., *Tongariro*.
Veale, R. J., *Dominion*.
Vincent, J., *Malta*.
Vincent, J. R., *Beltana*.
Waddoup, J. B., *Cameronia*.
Wainwright, A. C. L., *Baron Erskine*.
Wakeling, G. P., *Elysia*.
Walker, H. P., Callao Depôt.
Walker, R. S., *Kingstonian*.
Walker, S. R., sick leave.
Walker, T. R., *Anchises*.
Wall, D. G., *Kenilworth Castle*.
Wallace, W. W., *Roseric*.
Wallworth, W. A., *Cedric*.
Walsh, L., *Monmouthshire*.
Walsh, S. P., *Scotian*.
Ward, A., *Highland Harris*.
Ward, H., *Galway Castle*.
Ward, J. N., *Ceramic*.
Ware, W. R., *Monmouthshire*.
Warner, E. L., *Falaba*.
Warner, N. S., *San Antonio*.
Warren, H. G., *Keelung*.
Wasley, J. G., *Eagle Point*.
Waters, F. H., *Englishman*.
Waterworth, A., *Principello*.

Watkins, L., *Lake Manitoba.*
Watkinson, E. A., *Kenilworth Castle.*
Watson, G. H., *Athenia.*
Watts, B. O., *Arazon.*
Webb, C. B. N., on leave.
Webb, R. A., Callao Dépôt.
Weller, C. A., *Ruahine.*
Weller, E. S., *City of Delhi.*
Wellington, C., *Antillian.*
Weselby, A., *Kabinga.*
Wheeler, N. B. W. M., *Oceanic.*
Whitaker, C. H., *Mendi.*
White, A. G., *Kioto.*
White, V., *Den of Ogil.*
Whittaker, H. A., *City of Madras.*
Whittred, H., London School.
Wickers, H. M., *Itacuera.*
Wignall, R. M., *Orcoma.*
Wilcocks, A. E., *Perugia.*
Wilkins, A., *Hildebrand.*
Wilkins, J., *Celtic.*
Wilkings, D. A., *Rappahannock.*
Wilkinson, E., *Amazon.*
Wilkinson, J., *Atlantian.*
Willett, F. W., *Kasembe.*
Williams, A. C. *Orontes.*
Williams, F. A., *Cestrian.*
Williams, D. F., *Tagus.*
Williams, G. H., *Royal Edward.*
Williams, G. V., *Digby.*
Williams, J., *Chan-Guinola.*
Williams, J. R. T., *Tokomaru.*
Williams, J. T., unattached.
Williams, J. T., *Clement.*
Williams, T. D., *Milwaukee.*
Wills, H. C., *Malwa.*
Wilson, H. O., *Limari.*
Wilson, N. J., *Athenia.*
Wingrave, D. W., *Balantia*
Winser, F., *Coconada.*
Wood, C. B., *Aysen.*
Wood, C. E., *C.S. Restorer.*
Wood, D., *Columbian.*
Wood, T. A., *Oslo.*
Woodhouse, W. A., *Norseman.*
Woodth, F., *Swanmore*
Woods, L. J., *Oronsa.*
Woodward, J. E., *Comanchee*
Woollam, M. W., *Manchester City.*
Woolley, L., *Kinfauns Castle.*
Woolway, C. J., *Statesman.*
Wright, E., *Brodstone.*
Wright, F. M., *Menominee.*
Wright, G. J., *Llandovery Castle.*
Wright, T. G., *Edavana.*
Wroughton, E. N. M., *Marathon.*
Wyard, L., *Oriana.*
Wyatt, F. C., *Kenuta.*
Wyatt, R. C., *Borneo.*
Wyett, A. W., *Mooltan.*
Yelding, A. T., *Kafue.*
Yelland, W. P., *Sunda.*
Yorston, J. F., *La Marguerite.*
Young, F. E., *Empress of Russia.*
Young, J., *Galicia.*

The following have been appointed to the staff of the Société Anonyme Internationale de Télégraphie Sans fil, of Brussels :—

Affonso, J. dos A.
de Cordova, L. G.
Devesa (Ferol), F.
Feyto (Balaguer), J.
Fredskilde, J. C. V.
Huber, H. J.
Fortuno (Santelaria), E.
Macara, M. L.
Madsen, J.
Madsen, M.
Ramos, M. da S.
Rann-Nielsen, N. H.
Romeo (Leon), C.
Samuelsen, T. F.
Underlien, L. P. R. J.

The following have resigned from the staff of the Société Anonyme Internationale de Télégraphie Sans fil, of Brussels :—

De Moerloose, J. C.
Grimberghs, G.
Pulster, J. P.
Van Zijst, D. C.

The following have been appointed to the staff of the English Marconi Company since March 14th :—

Ashbrook, J., March 19th.
Bean, H. H., April 3rd.
Brophy, M. J., March 26th.
Brun, L. S., March 19th.
Bryant, P., March 19th.
Cavanagh, H. S., April 1st.
Dean, F. L. W., April 2nd.
Duff, J., March 19th.
Eddington, D. F., March 19th.
Gregory, R. V., April 6th.
Hill, V. J., April 2nd.
Hilton, F., March 26th.
Iredale, J. J., March 26th.
Jolly, E. E., March 19th.
Lillis, W., March 31st.
Mitchell, P. M., March 20th.
Naylor, A. T., March 30th.
Porter, H. R., March 26th.
Pott, G. M., March 14th.
Read, C. A., March 26th.
Sandford, J., March 19th.
Sandison, J. L., March 19th.
Stewart, W. M., March 14th.
Taylor, W. G., March 24th.
Ware, W. R., March 31st.
Whittred, H., March 23rd.

The following have resigned from the staff of the English Marconi Company since March 14th :—

Firth, A., April 1st.
Thornton, J., April 6th.
Vick, F. R., March 28th.
Yates, A. L., March 28th.

# Trans-Ocean Operators

## (Positions April 15th).

Belcher, H. J., Clifden.
Bisping, A., London.
Brown, W., London.
Cotter, W. J., Clifden.
Digby, J. P., Clifden.
Gallivan, T., Clifden.
Gordon, C. S., London.
Gray, J. D., London.
Halliday, W. C., Carnarvon.
Hibberd, P. J., Poldhu.
Irvine, A. J., Clifden.
Moore, A., London.
Noakes, F. W., London.
Norris, C. H., Clifden.
Pain, C. W., Clifden.
Pettyfer, P. H., Clifden.
Pink, A., Clifden.
Reeves, G., London.
Rogers, J., Clifden.
Skeet, F., Clifden.
Smedley, B. B., Clifden.
Smith, J., London.
Smith, S., London.
Stickles, T., London.
Treacy, P. J., Poldhu.
Webb, T., Clifden.

RESIGNATION : Relfe, T. W., London, April 4th.

## Personal.

According to the *New York Tribune*, Governor John W. Griggs, a director of the Marconi Wireless Telegraph Co. of America, contemplates becoming a candidate to succeed Mr. James E. Martine in the United States Senate. As Governor of New Jersey and later as Attorney-General in President McKinley's Cabinet, Mr. Griggs attained a wide reputation.

The expansion of the business of the Marconi Wireless Telegraph Company, of Canada, on the Pacific Coast has necessitated the establishment of an agency at Vancouver. Offices have been taken in the Howe Office Building in that city, and Mr. S. DeWinter, who was formerly in the Canadian Government Service, has been placed in charge.

Mr. Elihu Cunyngham Church has engaged to apply the principles of scientific management to the Marconi Wireless Telegraph Company of America. Mr. Church has evolved his own theories of efficiency, which have been widely adopted by many of the leading industrial corporations of the United States, and the operation of his plans for scientific management and commercial wireless telegraphy will be watched with interest.

## Obituary.

We regret to record the death of the wife of Mr. C. C. Howe, who is employed on the staff of the Marconi Company at Chelmsford. Mrs. Howe, who had been ill for some time, passed away in Cornwall, whither she had gone in the vain hope of recuperating her health. Much sympathy is felt with her bereaved husband.

## Marconi Athletic Club.

The annual general meeting of the Marconi Athletic Club (London) was held on April 7th. Mr. H. W. Allen was in the chair, and there was a fair attendance. The three retiring general members of the committee—viz.: Messrs. H. W. Allen, W. W. Bradfield, and W. R. Cross, were unanimously re-elected, as was also Mr. F. B. Lord, the hon. secretary. Messrs. Martin, Bailey, and Balderson were elected members of the Catering Committee. Following these preliminaries, a pleasant little episode took place when the club made a presentation to Mr. Martin as testimony of their appreciation of his services in organising the catering at the Acton Sports Ground throughout last year.

Afterwards the rules for the Inter-Departmental Lawn Tennis Challenge Shield Competition were discussed and eventually agreed upon. The general control of the competition will be in the hands of the Marconi Athletic Club (London) and of the Chelmsford Marconi Athletic Club. The staffs of any other districts in the provinces or abroad may affiliate themselves to either of these clubs for inclusion in the competition. The Chairman then announced that the Willock Lawn Tennis Singles Challenge Cup would be competed for this year on the "knock-out" system.

The scheme of the Cricket Committee for awarding the challenge cup presented by Mr. H. S. Saunders was also laid before the meeting. It was at once approved.

### The Musical Society.

A concert has been arranged for Thursday, April 30th, and active rehearsals of the various items of what promises to be a most entertaining programme are in progress.

### The Debating Society.

A proposition that "the present time is opportune for the assumption by the State of the control of railways" was debated on Monday, April 6th. Captain Sankey was in the chair, and Mr. Sampson opened a strong case in favour of the motion, emphasising the point that under State control there would be good prospects of improved rates, and the present overlapping of railway interests would be prevented. Mr. W. T. Steverson made an energetic reply, and eventually won his case, a good majority voting in his favour.

### Proposed Art Exhibition.

It is proposed to hold an exhibition of pictures and photographs in Marconi House on June 17th, 18th and 19th, and all members of the Marconi and associated Companies are invited to contribute. Original work is particularly called for, but copies, so described, will be gladly received and exhibited if space is available.

The Painting Section will include pictures and designs in oil, water-colour, tempera, or other medium. A special section will be devoted to black-and-white subjects, and will include designs both architectural and otherwise. A limited number of loan pictures of exceptional artistic interest may be added.

In the Photographic Section exhibits of any size, entirely the work of the contributor, may be entered for competition under the following classes: I. Landscape or seascape; II. Portraiture or group-studies of figures; III. Still life, flower studies, &c.

An entrance fee of 3d. will be made for each exhibit, which will form a fund for prizes to be awarded to the best exhibits in each group.

Apart from the competition, it is desired to arrange a show of sketches and photographs of real topographical interest; but such need not necessarily be the personal work of the contributors.

We would draw the attention of all members of the staff who either travel or are resident abroad, and so have exceptional opportunities of obtaining unique sketches and photographic studies which would be of great interest to their English colleagues, to this notice; and, indeed, we anticipate a hearty response to the invitation. Intending exhibitors must send their names, together with particulars of their exhibits, to Mr. Bernard C. White as early as possible. All exhibits must be framed or mounted on rigid mounts and furnished with hooks for hanging. They should be delivered at Marconi House not later than June 1st.