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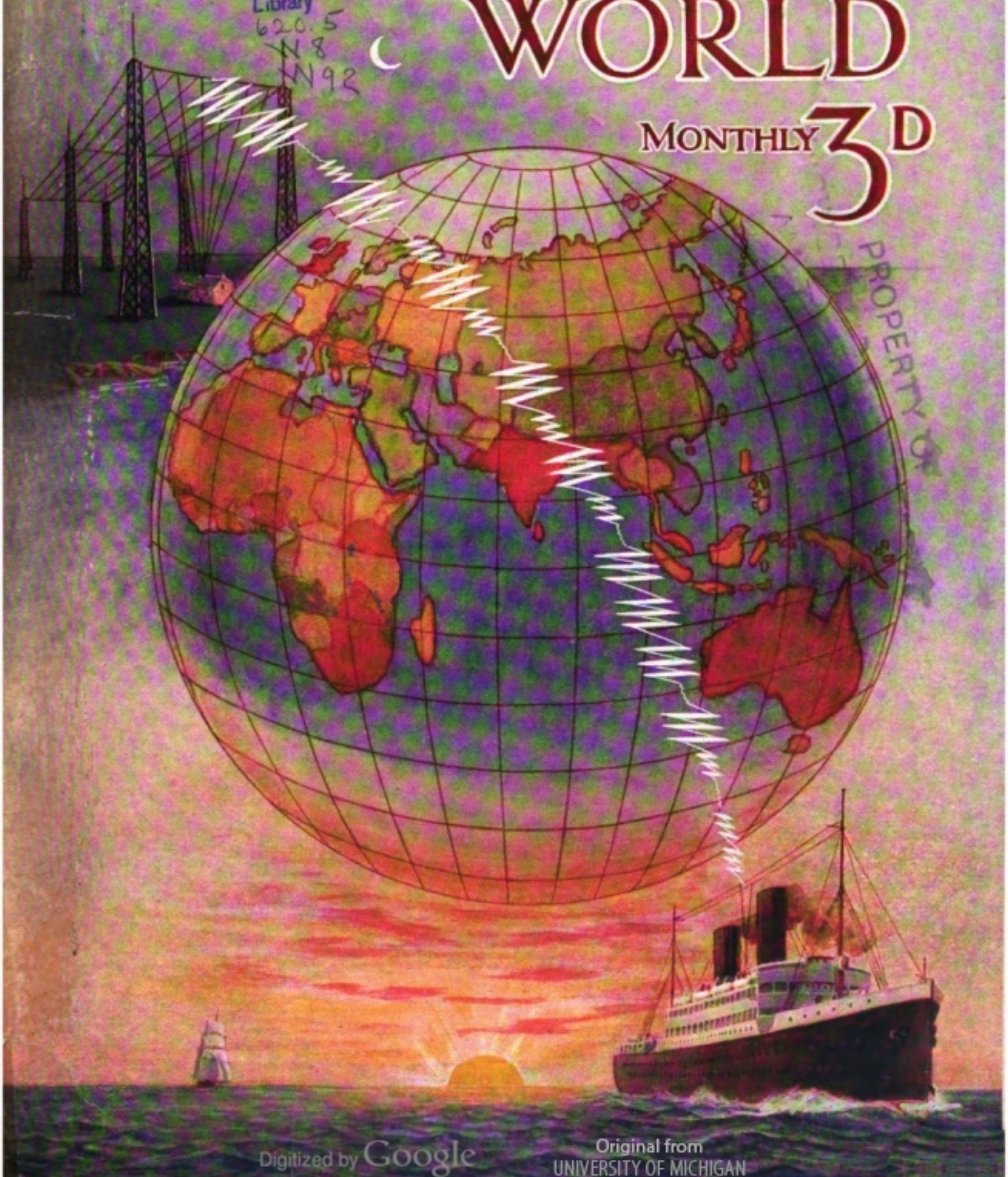
WIRELESS WORLD

MONTHLY 3D



THE WIRELESS WORLD

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The Effects of the War

THE fine spirit of determination to resist and overcome the enemies of this country which has been manifested by all classes throughout the land, is no small consolation for the affliction of war that has been cast upon it. The calm, stern, implacable sentiment which from the highest to the most humble has impelled all classes is one of the finest assets that England possesses. That sentiment, that spirit, has banished from the minds of the people all thought except a desire to serve the country.

At the call of duty a considerable number of our colleagues have responded, not only for active service in the field, but in the passive vocations at home which are also necessary to help this country to victory. The result is the omission from the WIRELESS WORLD this month of several of the usual features of the magazine, among them the fifth instalment of the series of instructional articles. Our efforts to encourage among the members of the Territorial Force, and the Cadet Corps, the Church Lads Brigade, the Boy Scouts' Association, and similar organisations, the study of wireless telegraphy and the application of this invention in the field should now begin to bear fruit, and it is possible that many of those who acquired their knowledge of the subject from the study of these pages, and who by their proficiency have secured for the companies to which they are attached complete sets of portable wireless telegraph apparatus, will find scope for the application of that knowledge in the present period of stress. We hope that in the quieter times that lie ahead the study of wireless telegraphy will be resumed in earnest, and that students will derive stimulus from the knowledge of the services which wireless can play on occasions when the security of the country is threatened.

Other features which are omitted this month include the Positions of Engineers and Operators in the Service of the Marconi Companies, and the list of vessels equipped with wireless apparatus. Had we been able to insert these features as usual, they would have made exceptionally interesting reading. But the supreme law of loyalty to the country has over-ridden every other impulse, and for the present, at all events, such information must be withheld.

Our readers will notice that the present issue is a slimmer volume than any of its immediate forerunners. This is due to the anticipated shortage of printing paper, which is one of the consequences of the war. Although the WIRELESS WORLD is well supplied for normal demands for some months to come, it is not possible to foresee with certainty how far the shortage may affect us, especially if the war should be a lengthy one. We have therefore been compelled to economise in this direction as much as possible, and we beg the kind indulgence of our readers for the omission of or delay in publishing several of our usual features. It is needless to add that these features will be restored at the earliest opportunity.

DON EMILIO ORTUNO Y BERTE

Personalities in the Wireless World

His Excellency Don EMILIO ORTUNO Y BERTE

(Postmaster-General of Spain.)

ON June 26th, 1908, was inaugurated the Spanish national service of wireless telegraphy. This great advance on her system of communications passed unnoticed by the majority of the public, yet if her wireless service were taken away from her to-day the loss would paralyse her national and industrial affairs. The official chiefly responsible for the inauguration of the service was His Excellency Don Emilio Ortuno y Berte, who, as one of Spain's most brilliant engineers, was fully alive to the importance of such a scheme of national intercommunication. Senor Ortuno for long has had the confidence both of the Court and the Spanish public, and certainly his life-work merits such confidence. As a boy he studied both in England and Germany, as a young man he went to the famous Lycee of Saint Louis, in Paris, where he completed a special course of engineering and mathematics; from there he passed to the Madrid Engineering School, where he acquitted himself so well that, at an age earlier than most students, he was accorded a professorship in engineering. He afterwards added a subsidiary branch of electro technics to the curriculum under his charge, and his energy and capacity combined to make this course one of the most popular in the university, and eventually world-renowned. The scientific work of Senor Ortuno has been prolific, but unfortunately no single volume or row of volumes can be brought forward as proof of his tireless energy. The greater part of his labours have been absorbed in the compilation of a multitude of reports and reviews, so that, as far as the uninitiated world is concerned, they are lost among the dusty piles of blue books and scientific magazines.

From his earliest days Senor Ortuno took a keen interest in politics, which ultimately induced him to become a candidate for a parliamentary seat. His candidature received generous support, for he had already proved his title to the confidence of his constituents, as in 1898 he represented Spain at the International Congress of Navigation, and his work in that capacity redounded both to his own and his country's honour.

In 1899 he was elected for the first time a member of the Spanish Courts, and, in spite of the ups-and-downs of politics, has held his seat without interruption to the present day, and for this very good reason —the public are appreciative of his devoted services, which could only be replaced, if at all, with the utmost difficulty. He is an eloquent orator, logical and clear in argument, and a man who can persuade his hearers to grant his wishes.

After holding the sub-secretaryship to the President of Council, he was appointed in 1908 Director-General of Posts and Telegraphs. He immediately set himself the gigantic task of reorganising the whole of this branch of public service, and, as a result, a law was passed by the Spanish Parliament on June 14th, 1909, reorganising the posts in Spain, setting up postal exchanges, postal bonds, parcels post, savings bank, and creating a scale of stamp duties.

At the date of his assumption of his duties as Postmaster-General the Bill for inaugurating the wireless telegraph service of Spain became law, and Senor Ortuno has, throughout his ministry, spared himself no pains to perfect the inauguration of this system and carry out the provisions of the Act. The result is that Spain is possessed of a very complete and effective service, which has already borne fruit in increased commercial and international advantages.

Whenever the opportunity has occurred Senor Ortuno has demonstrated his enthusiasm for wireless telegraphy, and he was amongst those present when the great station at Aranjuez was opened by the King and Queen.

PARLIAMENTARY DIARY

House of Commons, August 8th.

Merchant Shipping Bill.

The House of Commons Committee on the Merchant Shipping (Convention) Bill devoted a great deal of time to the question of the supply of wireless telegraph apparatus to ships before sending the Bill to the House for the report stage. The International Convention on the Safety of Life at Sea, it will be remembered, stipulated that a wireless installation should be compulsory on all steam ships on foreign voyage carrying more than fifty persons, whether passengers or not. The Merchant Shipping Bill, which recently passed through one of the Standing Committees of the House of Commons, gives statutory effect to this as to the other terms of the Convention.

When the clause relating to wireless telegraphy came on for discussion on July 21st, Mr. John Burns, the Minister in charge of the Bill, said that the Board of Trade had been in communication with the Marconi Company and had had conferences with the representatives of the shipowners, the result of which was not an agreement, but a provisional arrangement that would form the basis of an ultimate agreement.

This provisional draft was contained in a letter from Mr. Godfrey C. Isaacs, the Managing Director of the Marconi International Marine Communication Company, Ltd. This letter, which was dated July 17th, 1914, and was addressed to Sir H. Lewellyn Smith, K.C.B., was in the following terms :—

> "SIR,—In reference to the Merchant Shipping (Convention) Bill, 1914, now before Parliament, I write to put on record that the draft proposed agreement between the Board of Trade and the Marconi International Marine Communication Company, Ltd., whom I represent, has been now for some time past under discussion between the Board of Trade and myself.
>
> "Unfortunately, owing to circumstances, it has not yet been possible finally to complete that draft agreement, but as a result of some recent meetings which have taken place, I am in a position to make the following statement of the points upon which at present we are in agreement, provisions for which will be inserted in the agreement when finally settled :—
>
> "1. That the agreement is to apply to any British ship, within the meaning of the Merchant Shipping Acts, registered in the British Isles, or if the Board so desire in India or in the Crown Colonies, but not to ships registered in any of the Self-Governing Dominions.
>
> "2. The Company will agree to fit and instal a wireless installation which will satisfy the provisions of the Bill on any ship on being required by the owner to do so, and to maintain and repair such installations up to the standard of efficiency required by the Board of Trade, the shipowner to provide and maintain the necessary 'shipowner's apparatus.' A *pro forma* specification of a one-half kilowatt installation has been agreed between us; but if the construction of the ship and her masts will not admit of such ship making use of a one-half kilowatt set to the extent required by the Bill, the Company will supply at a price to be ascertained as hereinafter mentioned a 1½ kw. set, of which also a *pro forma* specification has been agreed.
>
> "3. The company will agree, so long as the wireless installation remains their property, to supply such operators as are required by the shipowner. The shipowner may supply the necessary operators himself, but must obtain the approval of the company to any operator so supplied (such approval not to be withheld unreasonably or in the case of a competent and respectable operator being nominated by the shipowner); but in that event the shipowner shall maintain the wireless installation at his own expense.
>
> "4. Any agreement between the company and the shipowners shall be for a period of one year, and determinable by the shipowner at the end of the first or any subsequent year; but if the shipowner determines the agreement he is to pay to the company the 'appropriate sum' of compensation in respect to the cost to them of providing and fitting the installation. The system of compensation is that set out in the usual existing agreements between shipowners and the company, and is based upon the principle that the life of a hired installation is ten years, and that

compensation is payable on that footing, the amount varying according to whether the installation can be utilised by the shipowner or the company or is capable of being re-utilised.

"5. The shipowner may elect to purchase outright the wireless installation for the 'appropriate sum' of purchase, and if such election is exercised during the currency of a hiring agreement such appropriate sum will be subject to a deduction at the rate of 5 per cent. per annum for the period during which rent has become payable, with a maximum deduction of 25 per cent. off such sum.

"6. The company shall quote to the Board of Trade the figures which they consider proper to be charged to the shipowners in respect of services and supply of installations and other matters under the agreement, and such quotations are to include amongst other things—

"(1) The amount of the rent payable by the shipowner to the company in return for their supplying him with an installation and operators, and the benefit of their organisation throughout the world and for their maintenance of the said installation;

"(2) The purchase price of an installation if bought outright by a shipowner; and,

"(3) The compensation payable by a shipowner in the event of his putting an end to an agreement for hire (otherwise than by purchase).

"The Board of Trade shall thereupon appoint two persons to examine into the figures so quoted with a view to ascertaining whether they fairly correspond to the prices charged to shipowners by the company in respect of services, installations, and other matters as near as may be similar during either—

"(*a*) A fairly selected recent period, or,

"(*b*) The three years 1910–12, both inclusive,

(the Board of Trade to be at liberty to chose which of these two systems they will adopt), and making no addition on account of any extra demand for wireless installations or services expected to result from the conclusion of the International Convention on Safety of Life at Sea or from the passing of the present Bill, and the company will supply to such persons or to the Board of Trade all such information as may be necessary or proper to enable them to arrive at a just conclusion, including what period is the proper one to work upon under alternative (*a*).

"7. If, after examination and report, the Board of Trade do not accept the figures quoted, or the company does not agree to figures acceptable to the Board of Trade, the question as to what the figures shall be shall be referred to a referee to be mutually agreed upon, or, failing agreement, to be nominated by some independent person.

"8. The figures shall not be subject to any further revision until after the expiration of three years from the date when they were last ascertained. But, if after the expiration of three years from the date when any of the figures was last ascertained, either the Board or the company shall give six months' notice, the figures shall be subject to revision in the same manner as that provided for their ascertainment, and, in determining whether any change shall be made in the figures, regard shall be had only to the question whether and to the extent to which the cost of providing the services has been increased or reduced, as the case may be.

"9. It is, of course, understood that nothing in the agreement imposes any obligation on any shipowner to obtain a wireless installation or operators or other services from the company, rather than from any other source of supply.

"10. The agreement shall be construed and take effect according to English law, and shall be in force for twenty years, and thereafter from year to year subject to six months' written notice of termination by either party given at any time after the expiration of the twenty years.

"11. I also represent Marconi's Wireless Telegraph Company, Ltd., and on behalf of that company express its willingness to produce its books, so far as may be necessary, for the purposes of the proposed agreement, and also to satisfy you that the Marconi International Marine Communication Company, Ltd., is possessed of sufficient authority in connection with the patents to enable it to enter into the proposed agreement.

"While the formal agreement between the Board of Trade and the company, which embodies many clauses giving effect in detail to various points which have to be worked out in an arrangement of this character, remains to be completed—which I will do all I can to get completed forthwith—I make this present statement for the consideration of the Board of Trade, so that it may be clearly understood that I am to-day prepared, when the agreement is fully settled, to include these terms at least."

This letter formed the subject of debate at the meeting of the Committee on July 23rd.

MR. HOLT moved to insert in the Bill a provision that its requirements relating to wireless telegraphy should not apply to any ship until the Board of Trade should have made arrangements to secure that the necessary apparatus and the services of operators should be supplied to the shipowner at a reasonable price based upon the actual cost to the supplier, together with a reasonable profit, without regard to exclusive or patent rights.

SIR HENRY NORMAN did not think the proposed agreement was necessary. He could not support Mr. Holt's amendment, as he considered it would be undesirable to fix a rate of profit because the prices of apparatus for wireless telegraphy must vary enormously from time to time as the result of competition, and the requirements of various classes of ships varied.

MR. BURNS said the draft proposal, which had been magnified into a draft agreement, was entered into by the Board of Trade with a view to protecting shipowners. The Board of Trade, the Post Office, and the skilled staff of both departments, met representatives of the shipowners, and it was at the request of the latter that the Marconi Company, as the premier company, was communicated with. The draft proposal would not interfere with free competition. It was not a part of the Bill, or an appendix to it, and the Board of Trade was not pledged to any system of wireless telegraphy.

MR. HOLT said the discussion had satisfied him that the shipping interest had been under a misapprehension, and he asked leave to withdraw the amendment. He suggested that the installation of wireless apparatus should not become compulsory until six months after the Board of Trade should have published rules in accordance with the Bill.

MR. BURNS: Agreed.

The amendment was withdrawn.

MR. BURNS said the Committee had expressed a desire that the form of negotiations into which his department had entered should not be proceeded with, and, therefore, so far as he was concerned, it was dropped.

LORD HENRY CAVENDISH BENTINCK moved an amendment to Clause 15 to omit the words limiting the Clause to ships which carried 50 or more persons. He said he was told that the cost of installing wireless telegraphy would be about £200 per year per ship, which in a fleet of 20 vessels would make about £4,000 a year, but he would point out that if this installation were made there was a possibility of a very considerable saving.

MR. GLADSTONE, supporting the amendment, submitted that the standard of safety of life at sea for Great Britain could not be governed by the standard of the most backward country which had taken part in the Convention. Great Britain could only occupy one position in this matter, and that was that she must lead the way in promoting safety of life at sea.

SIR ARCHIBALD WILLIAMSON said he thought they would be doing something which he thought was unnecessary and almost revolutionary if they carried the amendment.

SIR GILBERT PARKER said he was very much in sympathy with both the mover and the seconder of the movement in their desire to promote safety of life at sea, but he was rather concerned with the effect of the amendment on small ships.

MR. J. M. ROBERTSON said he believed that if the amendment were carried it would make the carriage of wireless telegraphy compulsory on everything that floated.

MR. HOLT opposed the amendment, and said he thought it would involve very heavy expenditure on the owners of small ships.

MR. BURNS said this was a Convention Bill. It kept pace with that Convention, and they asked Parliament to establish by this Bill the minimum standard agreed upon by the Convention.

The amendment was negatived without a division, and Clause 15 was added.

On Clause 16, which empowers the Board of Trade, on consultation with the Postmaster-General, to make rules with respect to wireless telegraphy installations and service on British ships registered in the United Kingdom.

MR. SANDYS moved an amendment to make the clause obligatory instead of merely an enabling clause; and Mr. Burns agreeing, the amendment was made.

The Bill was ordered to be referred to the House of Commons.

* * *

St. Kilda Wireless Installation.

MR. JAMES HOGGE asked the Secretary for Scotland whether the wireless installation at St. Kilda is out of use; whether the Postmaster-General is prepared to seek the authority of the Treasury for taking it over subject to a guarantee to cover the whole net cost for ten years; and whether there is any likelihood of the Board of Agriculture, in carrying out the work of the late Congested Districts Board, guaranteeing this amount or, alternatively, the Highlands and Islands Medical Committee.

MR. M'KINNON WOOD: I am informed by the Postmaster-General that the facts are as stated in the first two portions of the question. The Highlands and Islands Medical Service Board are maintaining a nurse in the island, and they do not consider that any further part of their funds should be applied towards the cost of the wireless installation. The Board of Agriculture are not prepared to give the guarantee in question.

* * *

Wireless Telegraphy in China.

MR. WALTER GUINNESS asked the Secretary for Foreign Affairs, on July 28th, whether his attention had been drawn to an announcement from Shanghai that a complete chain of Telefunken wireless stations is in process of completion in China; whether he was aware that the Chinese Government had intended to authorise Marconi's Wireless Telegraph Company to issue £2,000,000 Chinese bonds in payment of Marconi wireless stations in China on the basis of a formal contract; whether he could state which of these two companies was to receive the wireless privileges in China; and what steps he could take to protect the interests of Marconi's Wireless Telegraph Company, with which the Government is in contractual relationship.

SIR E. GREY: I have seen the announcement referred to by the hon. member, and am aware that a preliminary understanding of the nature described was entered into between the Marconi Company and the Chinese Minister of Finance. The company have been informed that His Majesty's Government are prepared to afford them such support as they properly can, and will no doubt apply for support whenever they consider it necessary. I have, however, no information as to which of the two companies is to receive the wireless privileges of China.

MR. KING: Can the right hon. gentleman say whether full value, in the stations that are being erected, is being given for this loan of £2,000,000.

SIR E. GREY: That is a matter, if I understand the question aright, as between the Chinese Government and the people with whom they are making the contract. In all cases of application for a contract, where there is competition between a British company and a foreign company, the British company will receive diplomatic support.

Conditions for Testing Wireless Stations.

THE attention of owners and operators of radiotelegraph stations is called to the fact that considerable interference is being caused near large centres of population by stations conducting tests without due regard to the traffic being simultaneously carried on. Commissioner E. T. Chamberlain, of the Bureau of Navigation, United States Department of Commerce, gives notice that stations desiring to conduct such tests should communicate with the local radio inspector by letter or telephone, stating the probable length of time that will be required. A station conducting tests or temporary experiments should "listen in" to determine that no interference is being caused, and during the test should listen in frequently for the interference signal, Q R M. The station conducting tests must also transmit its official call signal frequently.

Overseas Notes

INDIA.

Two Marconi engineers have arrived in Bombay to erect the Indian link in the Imperial wireless chain. The station will be at Kirkee, on the outskirts of Poona, 120 miles inland from Bombay.

* * *

RUSSIA.

The *Deutsche Verkehrszeitung* announces that there has been established in Russia a service of meteorological reports transmitted every morning through the coast stations of Reval, Riga and Libau, informing ships of the atmospheric conditions prevailing over the Baltic Sea and the neighbouring country. The reports summarise the information collected from ten meteorological stations by the Nikolajewiski at St. Petersburg, and concern barometric pressure, wind, the state of the sky, and the temperature. A special report is transmitted whenever it is considered necessary to warn mariners of the approach of a tempest or exceptional atmospheric conditions. In addition, the Reval station transmits at 11 a.m. each day (St. Petersburg time) reports concerning the displacement of lightships, wrecks, derelicts or other obstructions observed along the shipping routes, the location of buoys or the lighting of navigable waters.

* * *

UNITED STATES.

Captain W. H. G. Bullard, of the United States Navy, who is in charge of the naval wireless service, and who has his headquarters under the shadow of the three steel masts which form the centre of the naval wireless system at Arlington, Va., seven miles from Washington, has just presented to the Naval Institute an interesting review of the development of naval wireless telegraphy in the United States.

The first trial of wireless on American warships was made late in 1899, directly after the British ships had proved its possibilities. The armoured cruiser *New York* (now the *Saratoga*), the battleship *Massachusetts* and the torpedo boat *Porter* were the first to be equipped. At about the same time the Highlands Light station in New York harbour was established as the first shore station of the naval radio system.

Congress for the first time took notice of wireless in the Act of June 24th, 1910, which was amended by the Act of July 23rd, 1912. Further laws were passed in that year and the President proclaimed the Berlin Wireless Convention, since succeeded by the London Wireless Convention, establishing general rules for wireless as to ships throughout the world.

Some of the later extensions of wireless were the establishment of the station on the ground of the American Legation at Pekin, China, for communication between officials of the United States Legation and vessels of the Asiatic fleet and the Panama Canal station. It is erected half way across the Isthmus, near San Pablo. The name given to it, Darien, is the name of one of the early explorers of that region.

The Mexican trouble led to further extension to take the place of interrupted land lines and for exchanges with the ships. Isabel, Tex., near the mouth of the Rio Grande, was chosen as the central point of operation on the Atlantic side and San Diego on the Pacific side.

There are now 49 naval shore stations, those at outside points being three along the Panama Canal; one at Guantanamo Bay, Cuba; one at San Juan, Porto Rico; seven in Alaska and outlying islands; two in the Philippines; one at Hawaii, one at Guam and one at Pekin, China, with other projected stations in Samoa and elsewhere rapidly nearing completion.

Warnings of icebergs and derelicts are sent to sea from the Arlington station following the time signal and weather reports. At such times ships are listening on the long wave of Arlington, 2,500 metres, and their receiving circuits are tuned to receive the ice or derelict report. Incoming ships are compelled, under the London Safety Convention, to report information concerning ice and derelicts; this goes through the Hydrographic Offices to the Arlington station, and then seaward and to other stations.

This information, being of an urgent character—icebergs, derelicts, cyclones and typhoons—is sent under a special signal, called the safety signal, repeated at short intervals, ten times at full power—(TTT). On receiving this all radio stations are required to keep silent, in order to let the danger warnings go broadcast.

Aerials and their Radiation Waveforms. V.

By H. M. DOWSETT.

"LINES of force," or "lines of electric strain," as they are now more generally called, are used to show: (1) The direction of the electric intensity in a dielectric; (2) the value of that intensity by means of their density.

In Fig. 1 the air condenser, A, has the same surface area as the condenser, B, but it has twice the thickness. Let A and B be charged to the same potential.

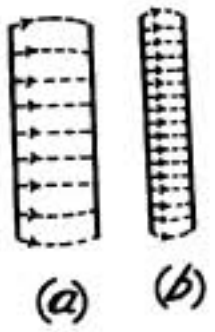


Fig. 1.

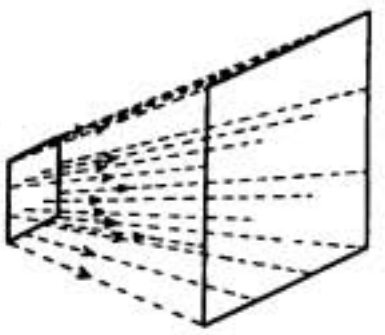


Fig. 2.

Then the direction and value of the electric intensity in the dielectric in the two cases is shown by the direction and number of the strain lines drawn between the condenser plates. B has twice as many lines as A as its capacity, and therefore its electric intensity, is double A. In these and the following diagrams the external condenser field is omitted.

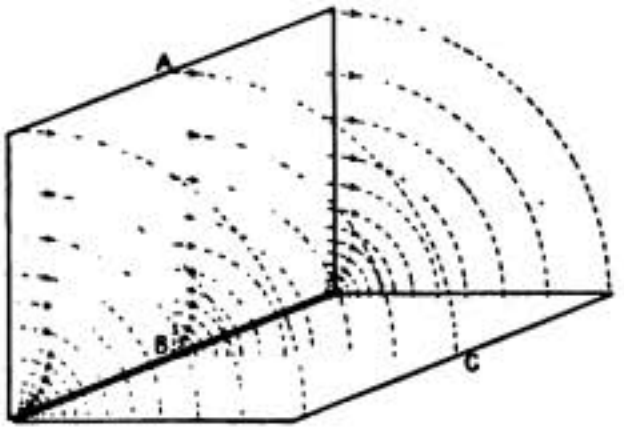


Fig. 4.

Fig. 2 shows an air condenser, the plates of which are of unequal size. The intensity steadily increases from the large plate to the small plate.

Fig. 3 (*a*) is a special case of particular interest in wireless telegraphy. It shows the air dielectric strained between a plate of definite area and a wire of negligible thickness compared with its length.

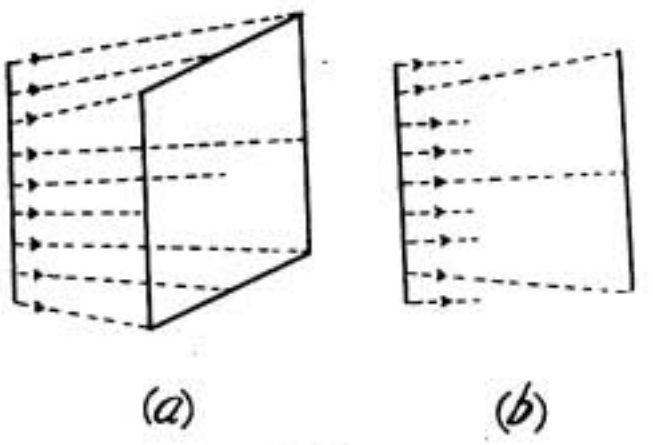


Fig. 3.

If a section be taken through this wire and the plate it will show more lines leaving the wire than end on the plate—Fig. 3 (*b*).

Now suppose the condenser, B, Fig. 1, has its two plates opened out so that they are at right angles to each other. Then the field, A, B, C, Fig. 4, gives the intensity

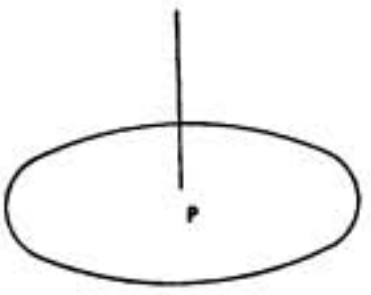


Fig. 5.

through a section of this condenser; the field from the edges of the plates is not shown. The distance apart of the section lines, A B, and B C, per unit of length increases, and therefore the capacity dimi-

nishes as the distance along them from B increases. Then the electric intensity, and therefore the number of lines per unit of length, must be shown to diminish in the same proportion.

If the horizontal plate be made circular and the vertical plate be replaced by a very thin wire mounted vertically over the centre, and of a length equal to the plate radius, then the field between the wire and the plate will have some of the characteristics of the fields in both Fig. 3 and Fig. 4.

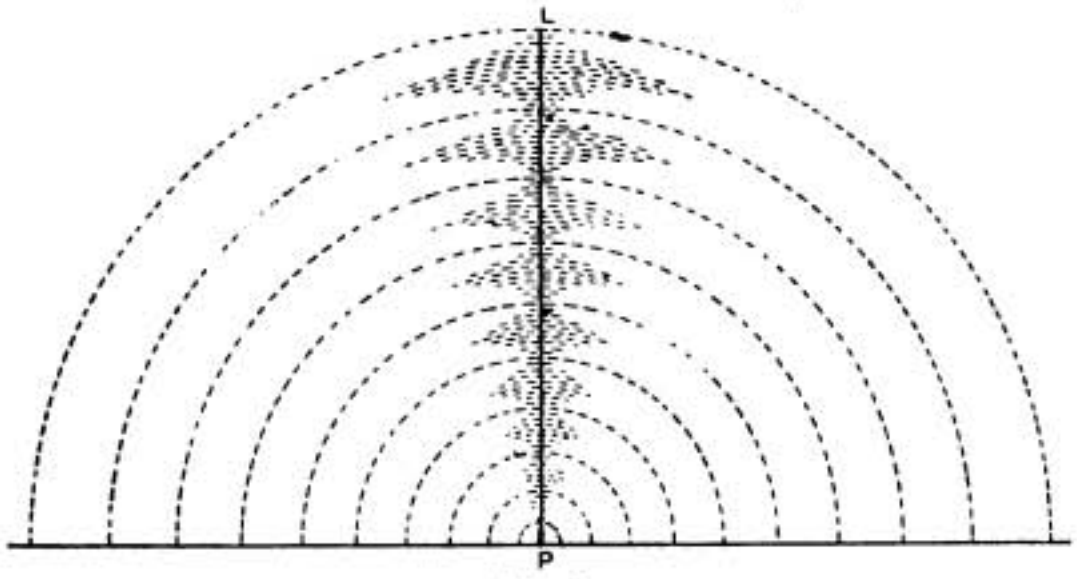


Fig. 6.

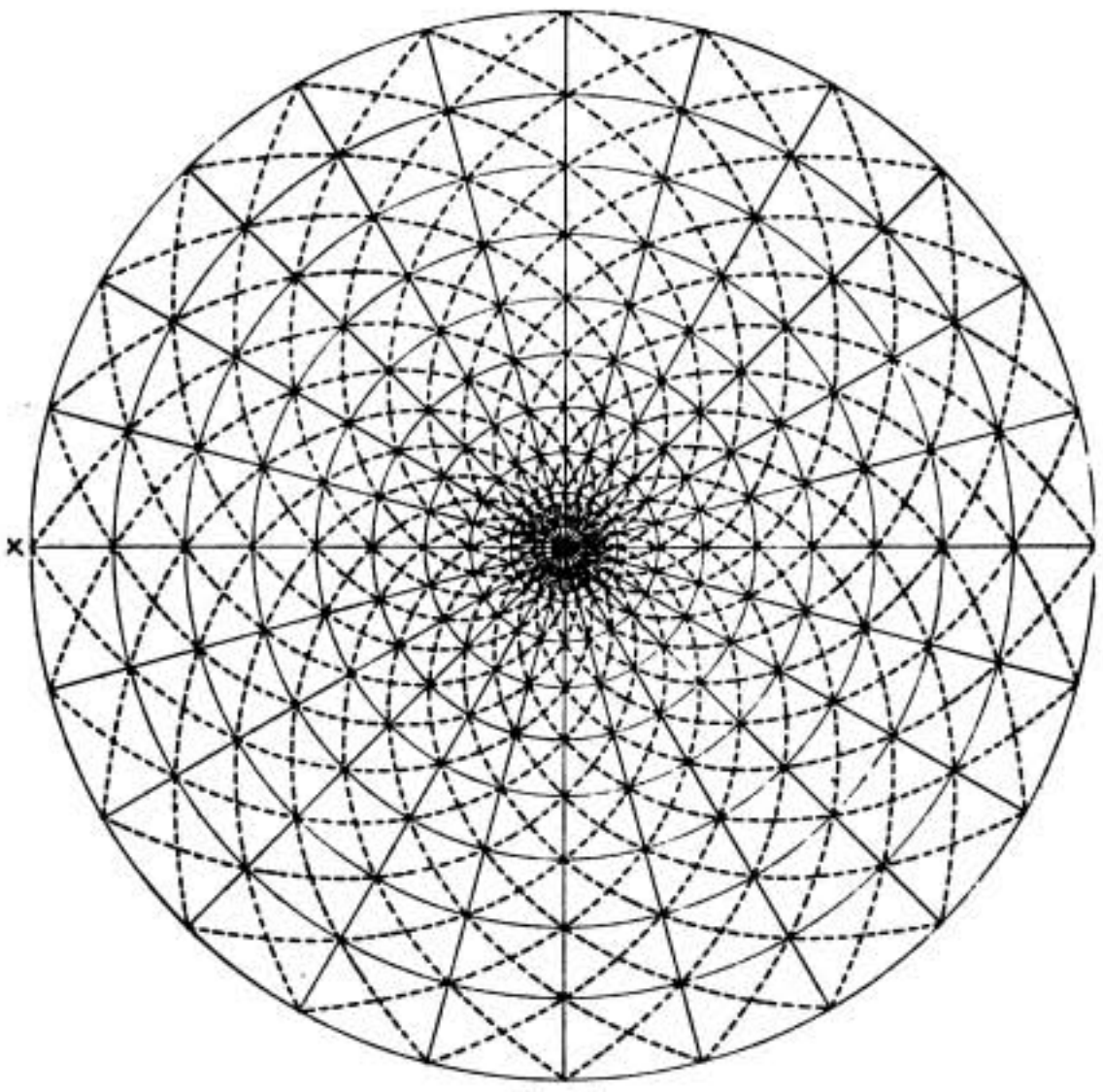


Fig. 7.

In the first place, the field proceeds from a *line* to an *area*, and therefore in section

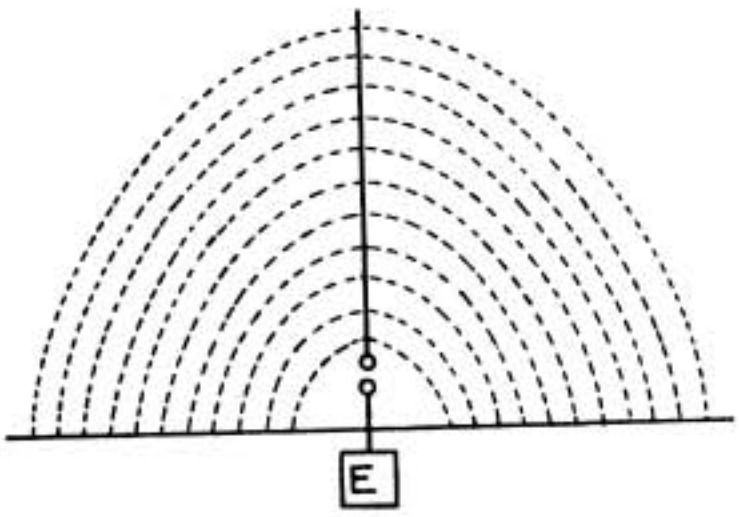


Fig. 8.

there should be more lines shown leaving the wire than reach the plate.

In the second place, the density of the lines shown reaching the plate should decrease with increase of distance from the nearest point of wire and plate. But the density does not decrease so quickly as in Fig. 3.

Instead of being inversely proportional to the distance from the foot of the wire—which results from a parallel field—it is inversely proportional to the *square root* of the distance.

The lines which leave the wire for the plate follow curves which are practically quadrants struck from the point, P, where the wire, if extended, would meet the plate. The units of plate area on which they end increase in direct proportion to the radii of the quadrants, so that the greater length of path is balanced by the greater area of plate, and thus the capacity per unit length of the wire remains the same all the way up. Therefore the density of the lines leaving the wire should be the same at all parts.

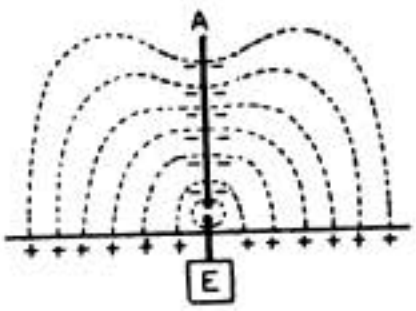


Fig. 10.

As the area of plate for the same number of strain lines increases directly with the distance from P, the density of the lines on a section through the plate must be proportional to the square root of the distance from P.

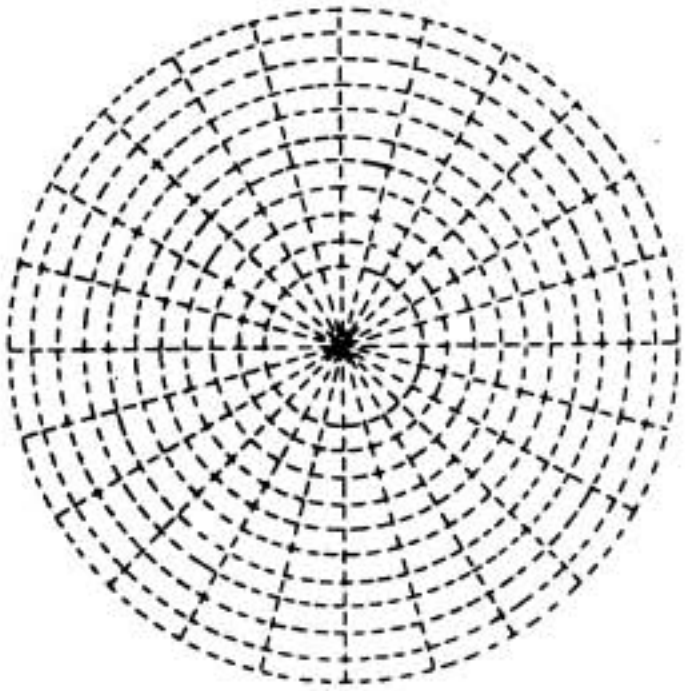


Fig. 9.

Thus we finally arrive at the field shown in Fig. 6.

The case is identical with that of a charged and insulated vertical aerial and a good conducting earth.

Fig. 7 shows a plan of the earth below such an aerial erected at P, divided into areas so that an equal number of strain lines ends in each area.

To draw this plan, divide the line, P X, in such a manner that the length of the divisions increases as the square root of the distance from P. Describe circles, with P as centre, and these points as radii, and divide the 360° of circular angle into a number of equal parts—in the present case each part is 15°. Then if the intersections of the radii and the circles are joined in the manner shown, the earth plan will be divided into equal intensity areas as required. And these

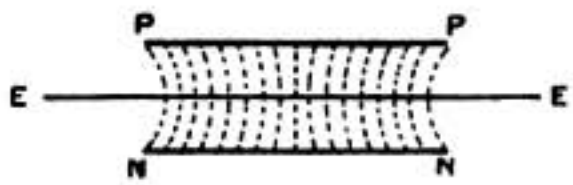


Fig. 11.

equal intensity areas in the present case are also equal capacity areas.

The numerical relation between the lines shown leaving the aerial and those which reach the ground section can be obtained as

follows, it being assumed that the aerial is vertical and has negligible capacity :

Let X_l=density of lines along a length of aerial l.

Then X_l lines will also cover an earth area of radius l.

Therefore, $X_l = \pi l^2$.

Then the mean density along the radius

$$l = \sqrt{\frac{X_l}{\pi}}.$$

If instead of the density over the whole length of the aerial l, X_l = density over unit length of aerial at any distance, d, from the foot of the aerial ;

Then the mean density, X_a, per unit length at same distance, d, along the earth from foot of aerial is

$$X_a = \sqrt{\frac{X_l}{\pi}} \times \frac{1}{\sqrt{d}} = \sqrt{\frac{X_l}{\pi \times d}}.$$

As an example, if the length of the wire is 10 units, and it is charged to the same potential all the way up, so that the intensity in section per unit of length is 10, then the intensity along a radius of the plate one unit distance from P will be 1·78, and at ten units distance from P it should be 0·56. Thus there should be only one line in every 5·6 leaving the foot of the wire, and only one in every 17·8 leaving the top of the wire, which should show on the plate section.

Let us now examine some diagrams from standard works on wireless telegraphy showing fields of electric strain surrounding charged aerials.

Figs. 8, 10, 12, and 14 have been copied from the originals with considerable care so as to reproduce without exaggeration all their peculiarities.

Fig. 8 is a copy of Fig. 18, p. 346, from J. A. Fleming's *Principles of Electric Wave Telegraphy*, 1906 edition.

The first point to notice is that the strain lines do not start truly normal to the aerial, nor do they end normal to the earth. This is a fault which has been corrected in the 1910 edition, as shown in Fig. 10, which is a copy of Fig. 21, p. 407, from that book. The fact that static strain lines always begin or end on a conductor normal to its surface is ot considerable importance, as it has much influence on the shape of the electric field and on the subsequent behaviour of the electro-magnetic field in motion.

The next thing to notice in Figs. 8 and 10 is that the density of the field is the same all along the acrial. This results, as we have seen, when an aerial having the same capacity everywhere per unit of length is charged at all points to the same potential.

But all the strain lines shown leaving the aerial reach the same section line through the earth, and they are also equally spaced along it. This method of drawing them is inaccurate from the reasoning at the beginning of this article.

Consider for a moment only that part of the field near the earth ; the equal capacity

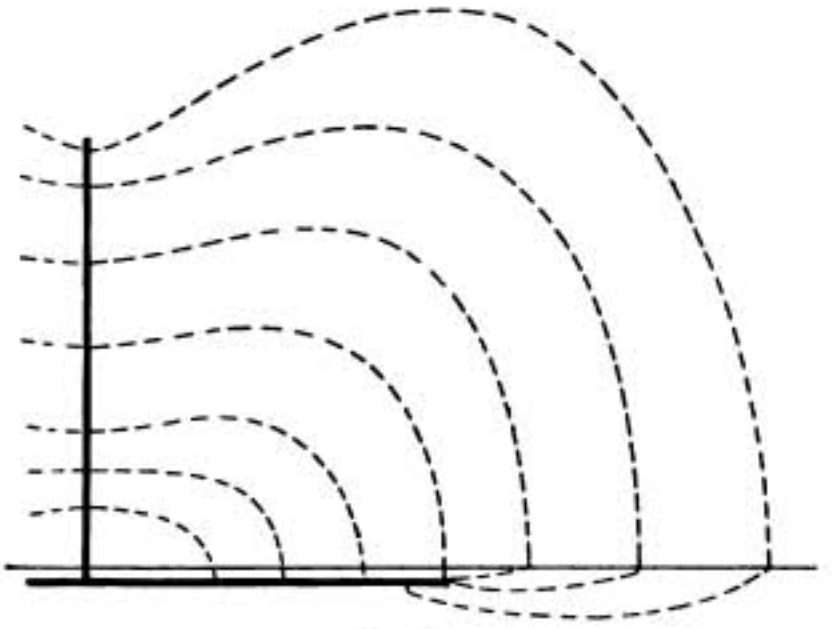


Fig. 12.

areas to agree with Figs. 8 and 10, and corresponding to Fig. 7, would be as shown in Fig. 9.

The strain lines would be confined to certain radii, along which they would be equally spaced ; but their spacing at equal distances from the foot of the aerial would increase with the distance. Such an arrangement is incompatible with the homogeneous character of the ether in which they occur.

A further examination of Fig. 8 shows that the lines leaving the aerial cover a greater length than the same lines when they reach the ground—that, in effect, their density on the aerial is *less* than along the earth. This is equivalent to drawing the field of an air condenser, as shown in Fig. 11, with its strain lines bending *in* towards the neutral plane instead of bending *out*—an obvious error. Fig. 10 is more correct in showing a greater total density along the aerial than along the earth.

This is in agreement with the general shape of the strain line curves, which indicates that the aerial has appreciable capacity, and therefore tends to congest the strain lines and to slow down their speed of propagation while they are in its neighbourhood.

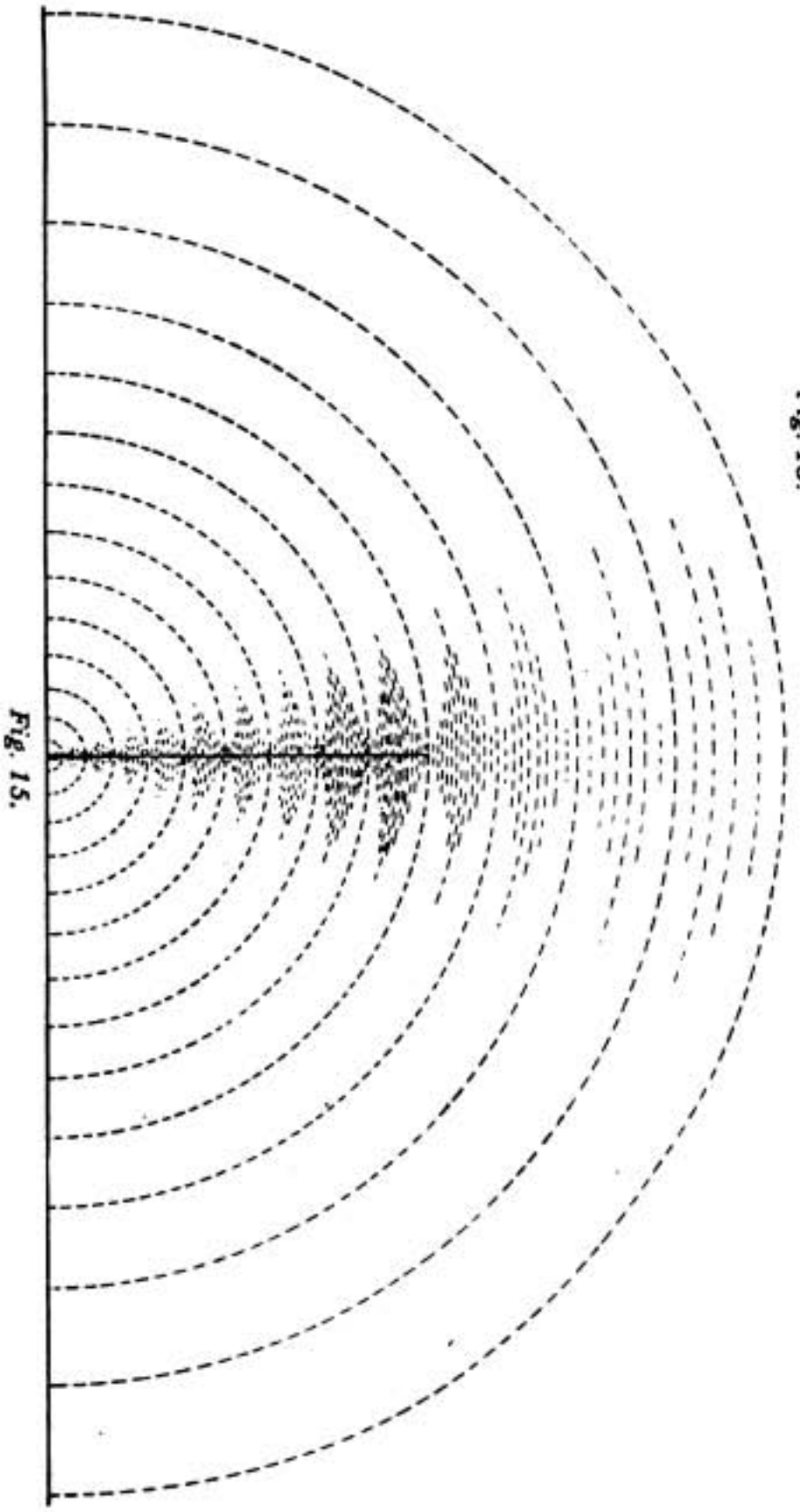


Fig. 15.

The next diagram to analyse is Fig. 12, which is a copy of Fig. 132, p. 148, from J. Zenneck's *Leitfaden der Drahtlosen Telegraphie*, 1909 edition. Prof. Zenneck does not give a diagram of the electrostatic field surrounding an insulated and charged aerial, but in Fig. 12 he shows the field from an aerial having a current antinode at its base.

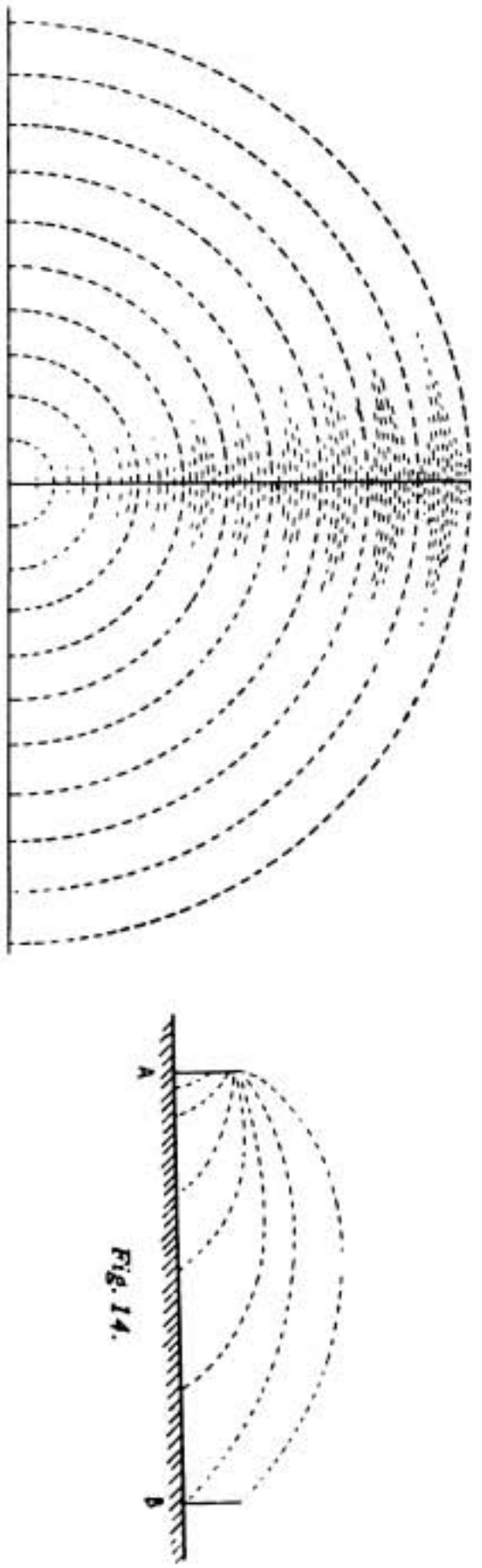


Fig. 13.

Fig. 14.

This corresponds to the field of an aerial excited through an inductive coupling, and having a potential antinode at the top and a potential node at the bottom.

To begin with, then, the density of the strain lines should steadily increase all the way up, in proportion as the electric intensity increases. But the density first decreases and then near the top increases. This top increase of density may be intended to represent the increase due to the point end of the aerial, in which case it is carried too far down, or it may represent a slowing down of the wave as it reaches the end of its travel, but there is no slowing down unless there is a capacity area at the top of the aerial, and this is not indicated in the diagram. The wave has the same speed from the foot to the top of the aerial, and is reflected back as a standing wave at the same speed.

All the lines shown leaving the aerial end on the earth. This is the usual practice in making such drawings, but it is faulty.

The density of the lines meeting the earth section decreases considerably with increase of distance from the aerial. This would be a fairly correct representation if the field considered were that of a charged and insulated aerial, as has been already pointed out, but the aerial has a potential quarter-wave in it, so that—as is shown in Fig. 13, which represents this case, the effect of aerial capacity, however, being omitted—the spacing between the lines along the earth does not decrease more than 25 per cent. from the foot of the aerial to quarter-wave distance from it.

Finally, Fig. 12, like Fig. 10, by the curve of the strain lines and their comparative congestion on the aerial, indicates appreciable capacity in the aerial system.

An important question is raised by Fig. 14, which is a copy of Fig. 10, p. 30, from J. Erskine Murray's *Handbook of Wireless Telegraphy*, 1913 edition. The question is; "What is the effect at a distance of a static charged aerial?"

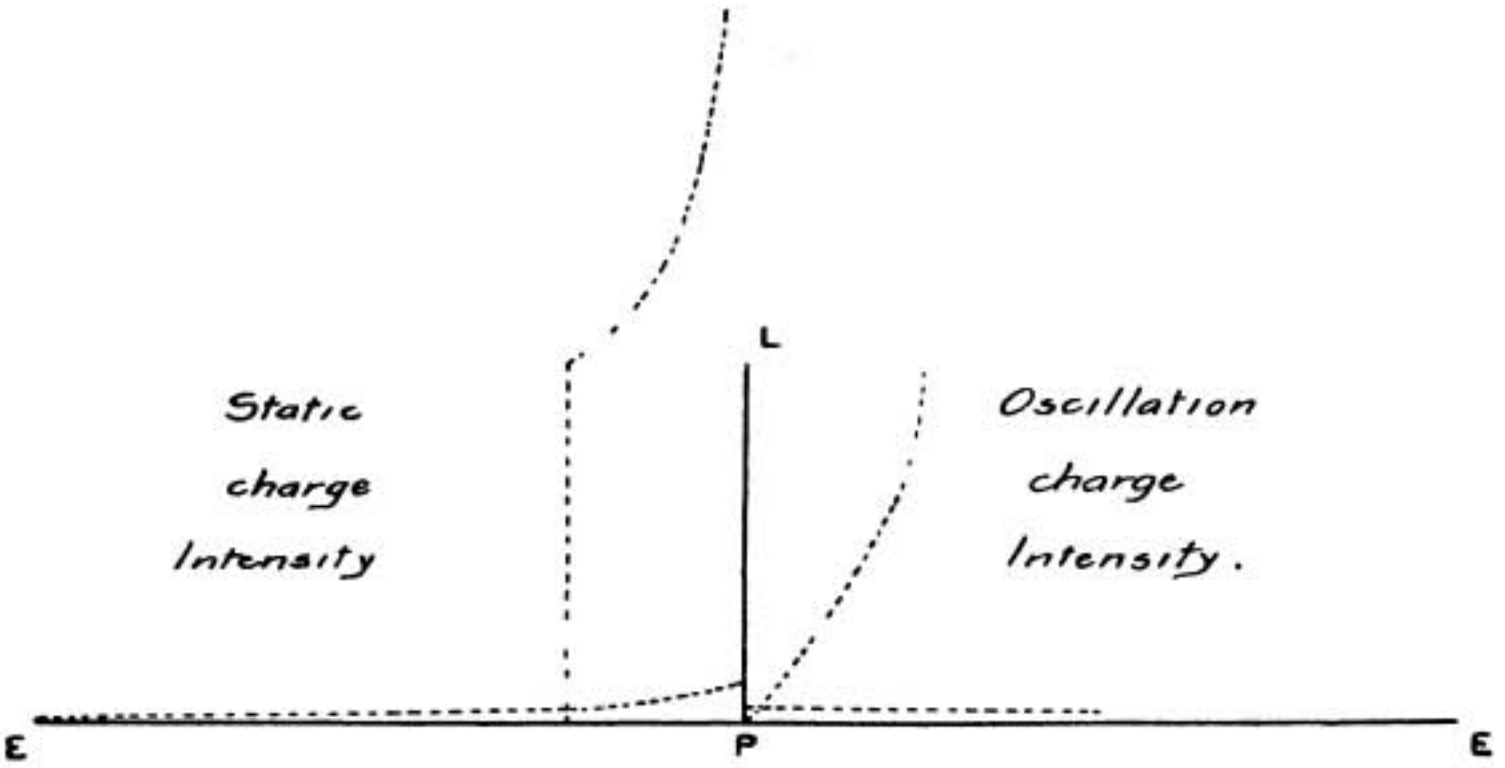


Fig. 16.

Dr. Murray's view, as shown by this diagram, is clear, and that it expresses his considered opinion is evident from the fact that it has appeared in each edition of his book since 1907. The object of the diagram is to show that the strain lines from the static charged transmitting aerial actually extend as far as the receiving aerial, when the receiving aerial is a short distance away. By "short distance" is implied at least several miles, or very many fundamental wave-lengths.

That Dr. Murray's view is wrong can be demonstrated.

If the initial strain lines covered the earth to such a great distance, "every wave train (would commence) with an odd wave of great length," to quote from Dr. Murray.

An aerial, therefore, if measured for capacity by a static charge and discharge method should give a very much greater value than when measured by a high-frequency method. But this is not so. The capacity values by the two methods are practically identical.

Fig. 14 shows a field obviously generated from the aerial, and influenced by a projecting force from the aerial. It cannot be said to represent in any way a state of strain developing in the medium *outside* the aerial. The part played by the earth also is merely passive, to receive the strain lines dropped upon it; in no way does it influence their direction.

Fig. 14 expresses the common non-technical view of the function of an aerial, the only view which could be understood by the layman before the conception of an ether had been made clear to him.

Also it might satisfy the Planck theory extremists, who would dispense with the ether altogether.

Dr. Murray's diagram is intended to explain why an aerial, when charged by an induction coil and discharged without a spark taking place, could affect a receiving station at a considerable distance. If no oscillations were produced no waves could be sent off, yet the slow charge and discharge made itself felt.

What other explanation can be offered if the static strain lines from the transmitting aerial do not reach the receiving aerial?

The explanation is in the inherent properties of the ether itself. The ether resists distortion; it shows no evidence of slip between its parts. One part of it cannot be strained without affecting every neighbouring part; the whole of it resists distortion of a part.

The strain in the ether between aerial and earth has the nature of a *tension*. If the ether cannot slip, this tension must be felt outside the original strained ether volume as something of the nature of a *shear*. This shear will be transmitted outwards from ether shell to ether shell, and the lines of shear will naturally follow the contour of the ether shells. There will be a maximum intensity immediately above the aerial. The shear lines will bend down to the aerial in proportion to the value of the aerial capacity, but they will not touch it.

It is this ether shear which affects receiving aerials at a distance. When released it can never have the character of a high frequency oscillation, and its damping must be enormous.

Fig. 15 shows the shear strain along the surfaces of the ether shells outside the aerial earth condenser. As the shear is distributed through the *volume* of the ether, the intensity above the aerial and in line with it should fall off as the cube of the distance from P, the common centre of the shells. The density along the earth can be obtained from these values in the way already described.

Fig. 16 gives a clear idea of the manner in which the intensity along the aerial, above the aerial, and along the earth is distributed under the two conditions of static charge and oscillation charge.

The intensity value for Figs. 6, 13, 15, and 16 are given in the following tables:

Length of aerial = L = 10 units. Intensity, or Density of lines at top of aerial, in any given plane = X_l = 10 units.

	Quarter Wave Along Aerial.					Static Charge on Aerial.		
Distance from foot of aerial = l	Phase angle of wave = θ	Sin	Density along aerial = $X_l \sin\theta$	Density along earth section = $\sqrt{\frac{X_l \sin\theta}{\pi d}}$	Spacing of lines on earth section = $\frac{I}{\text{density}}$	Density along aerial = X_l	Density along earth section = $\sqrt{\frac{X_l}{\pi d}}$	Spacing of lines on earth section = $\frac{I}{\text{density}}$
1	9°	0·15	1·5	0·705	1·42	10	1·78	0·56
2	18°	0·31	3·1	0·701	1·425	10	1·26	0·79
3	27°	0·45	4·5	0·69	1·45	10	1·03	0·97
4	36°	0·59	5·9	0·685	1·46	10	0·89	1·12
5	45°	0·71	7·1	0·672	1·48	10	0·79	1·25
6	54°	0·81	8·1	0·655	1·52	10	0·73	1·37
7	63°	0·89	8·9	0·636	1·57	10	0·675	1·48
8	72°	0·95	9·5	0·615	1·62	10	0·63	1·58
9	81°	0·98	9·8	0·589	1·69	10	0·59	1·68
10	90°	1·0	10·0	0·564	1·77	10	0·56	1·77

STATIC ETHER STRAIN BEYOND AERIAL.

Distance from foot of aerial L_1	Density *above* aerial $X_l = X_l \times \left(\frac{L}{L_1}\right)^3$	Density along earth section = $\sqrt{\frac{X_l}{\pi d}}$	Spacing of lines on earth section = $\frac{1}{\text{density}}$
11	7·52	0·466	2·14
12	5·78	0·396	2·52
13	4·55	0·334	2·99
14	3·65	0·288	3·47
15	2·96	0·250	4·0
16	2·44	0·220	4·54
17	2·03	0·195	5·13
18	1·71	0·174	5·75
19	1·45	0·156	6·41
20	1·25	0·141	7·1

DIGEST OF WIRELESS LITERATURE.

Crystal Rectification.—A. E. Flowers has subjected crystals to very low and very high frequencies to determine the magnitude of the rectification at the high frequencies used in wireless telegraphy. The low frequencies used in the present investigation were 60 ~ and 2000 ~; the oscillations ranged from 10^4 to $6{\cdot}8 \times 10^5$ ~ per sec.

The results obtained are summarised in the *Physical Review* as follows:—(1) The rectification at high frequency tends to be greater than at low frequency with the larger currents, and but very little different for small currents. (2) For very small currents the rectification tends to disappear, particularly for large contact areas and low current densities. (3) The rectification ratio for small currents is nearly proportional to the square of the rectified current and nearly proportional to the first power of the total or R.M.S. current. (4) Even very large contact areas will rectify well with large currents. (5) The rectification ratio for very small currents may be improved by the use of very small contact points, but a much larger potential is required to get the same amount of current. (6) The current density must be equal to or greater than a given minimum value for good rectification. (7) Resistance in series with the galena crystal rectifier greatly decreases the rectification ratio even for the same potential difference on the terminals of the rectifier. At 2·5 volts the rectification ratio was 61 per cent. at 60 ~, and 63 per cent. at 180,000 ~.

The Capacity of Radio-Telegraphic Aerials. The capacity considered in a Paper by Prof. G. W. O. Howe before the British Association is the actual static capacity, and not the equivalent capacity of the antenna considered as part of an oscillatory circuit. The accurate calculation of the capacity of a multiple-wire horizontal aerial with its leading-down wires would be a difficult mathematical problem, quite unwarranted by the practical requirements of radio-telegraphy. When raised to a potential above or below that of the earth, the charge is distributed over the antenna in a way which is not easy to calculate, but which must be such that all parts of the antenna are at the same potential. If the antenna were made up of a great number of short pieces, placed end to end, but insulated from each other, it would be possible to distribute the charge uniformly, but the potential would then vary from point to point in a way which is easily calculated. If now we assume that all the separate pieces of wire are connected, electricity will flow from points of high to points of low potential until the potential is everywhere the same. The assumption made in developing the various formulæ is that this final uniform potential is equal to the average value of the potential when the charge was uniformly distributed. This is only approximately correct, but the accuracy is more than sufficient for all practical purposes. This method has been applied to antennæ of all the types usually employed, and formulæ have been established for each type. A large number of numerical examples have been worked out, and the results are given in tables and curves, so that the capacity of any antenna can be read off directly from its dimensions.

The King Honours Commendatore Marconi.

OUR readers will, without exception, we are sure, be gratified to learn of the honour awarded to Commendatore G. Marconi by the King.

On July 24th the King conferred upon him the Honorary Knighthood of the Grand Cross of the Victorian Order. Not only is the distinction one of the highest tributes that His Majesty has it in his power to confer on a foreign subject, but the manner of bestowal was such as to make the honour doubly acceptable. Commendatore Marconi was summoned by telegram to Buckingham Palace, where he was received by the King, who spent half an hour chatting to him and himself pinned the decoration of the Order on the great inventor. In the course of conversation the King showed an intimate knowledge of wireless telegraphy, especially as applied to naval purposes, and was deeply interested in all that Commendatore Marconi had to tell him of his latest discoveries and of the application to naval purposes.

Commendatore G. Marconi.

The Royal Victorian Order was created in in 1896 for bestowal by the Sovereign upon those subjects whose personal services it might be desired to recognise and upon any foreign prince or person whom the Sovereign might think fit to honour. It consists of five classes—the Knights Grand Cross, the Knight Commander, the Commander, and the members of the 4th and 5th classes. The holder of the Knight Grand Cross takes precedence after the Knight Commander of the Indian Empire and before the Knights Commander of the Bath (K.C.B.)—that is to say, he ranks 8th in the 14 classes of Knights.

The number of distinguished foreign personages who have been so decorated is very limited, and of Italian subjects, Commendatore Marconi is the third. The two other holders of the title are His Royal Highness the Duke of the Abruzzi and the Marchese di San Giuliano, Italy's eminent foreign minister.

The honours which have been conferred on Mr. Marconi in recognition of his services to mankind have been legion. He is a knight of Italy, of France, and now we can offer him our congratulations on his accession to a knightship of England.

NOTES OF THE MONTH

IT is perhaps advisable to remind our readers that the war will in no way interfere with the forthcoming courses of study, which will shortly be commenced, at all centres of wireless teaching. An idea has gained credence that the dislocation of the aerials of all experimental wireless stations will interfere with such study, and that, until the war ceases, it will be useless to commence a course of training for operators' certificates. This is entirely erroneous, for practice in sending and receiving messages can quite well be gained without the meretricious adjunct of actual contact with outside wireless; besides, nearly every school possesses a practice set which can be worked between room and room, and which combines all the advantages of actual outside reception and transmission, while it in no way contravenes the rules recently established by the Postmaster-General prohibiting the use of experimental stations in war time.

* * *

On the eve of the publication of the WIRELESS WORLD Directory of Amateur Wireless Stations the outbreak of war was announced, and the publication of this book has perforce had to be postponed. It cannot now be published until quieter conditions prevail. It is with considerable regret that we have been compelled to come to this decision, for the book will be the most complete of any work of its kind, containing the names and addresses and all interesting information relating to amateur stations. It is probable that, when work on this directory can be resumed, many alterations will have to be made, but our readers may rest assured that it will be published at the very earliest opportunity.

* * *

Some time ago prominence was given in the Press to a mysterious S.O.S. call which was received at the Japan wireless station of Osezaki from a vessel, presumably the *Siberia*, in the Japan Sea. It was popularly believed that this signal was an ill-timed jest sent out by some irresponsible amateur; and, amongst other papers, the *Times*, in calling attention to the fact, submitted that definite steps should be taken to prevent such misuse of wireless communication. Shortly afterwards, however, the s.s. *Persia* arrived at Yokohama, and the mystery was cleared up. It appears that the operator on this vessel was in touch with the *Siberia* at the time the supposed message was sent out, and learned that for several hours the *Siberia* had been endeavouring to get into communication with her sister ship, and in order to do so had sent out her call letters—M. B. S. These, in the Morse code, would read :

— — — . . . . . .

Now the operator at Osezaki happened to get in touch with the vessel as she was on the last word of the signal—S. (. . .). The *Siberia* was sending out the call letters in continuous succession, so that they reached Osezaki in the form S. M. B.; this would read :

. . . — — — . . . .

But the receiver did not pay sufficient attention to spacing, and so took down the call in this form :

. . . — — — . . .

which is, of course, the distress signal. It is satisfactory to find that the supposed violation of the international wireless regulations was due to a very simple mistake, and was not the outcome of malicious deception. It has been thought desirable, in view of the misinterpretation of the *Persia's* call signal, to change her letters,

and so avoid any similar *contretemps* in the future

* * *

The arrangements made by the Committee for Radiotelegraphic Investigation of the British Association, and the Committee recently appointed by the Commission Internationale de Telegraphie sans Fil, for investigating the phenomena of the Solar Eclipse on August 21st, were seriously interfered with owing to the outbreak of war. The plan of the Committee was to investigate "strays" and to measure the strength of wireless signals during the period of eclipse, and arrangements had been completed for the wireless stations of Bobrouisk, Paris, Norddeich, St. Petersburg and Nauen to participate in this scheme. Each station was to send out signals for two minutes once every twenty minutes from 10 h. to 11 h. 40 m., and from 13 h. 20 m. to 15 h. 30 m. While, during the period of total eclipse, that is, from 11 h. 40 m. to 13 h. 20 m., they were to send out signals once every 10 minutes. But since the principal stations have been taken over by their respective Governments for military and naval purposes, it was impossible to carry out the programme as arranged. Nor could assistance be obtained of private stations as all these have been dismantled. It will be a considerable time before another total eclipse will occur under such favourable conditions for investigating the strength of wireless signals. This setback in their work is greatly to be deplored; but War knows no friend, and the affairs of nations which become the affairs of humanity must first be set in order before knowledge can march forward in the path of progress.

* * *

Added interest is given at this moment to the lecture delivered before the Royal United Service Institute by Col. Fullerton, in which he dealt with the application of wireless telegraphy to aircraft, and its importance for military and naval reconnaissance. A station consists of four main parts—viz., the aerials, the transmitter, the receiver, and the switch. The chief difficulties from the aeronautical point of view are the weight of apparatus and the aerials, but recent work in this direction has gone very far to minimise the disadvantages from this source. In a dirigible the weight is not of much importance as there is usually ample lifting power available, but in aeroplanes this is not the case, hence the weight must be reduced as much as possible. For both classes of machines the aerials are generally trailing wires arranged with a slip joint in the event of their catching in trees, buildings, etc. In the case of the airships, the metal framework sometimes takes the place of one aerial.

Col. Fullerton described a Marconi 1½ kw. set, which is employed for dirigibles. The total weight of this station is 293 lb., and it consists of the following parts: Transformer, 108 lb.; condenser, 52½ lb.; transmitting jigger, 30 lb., with receiver, change-over switch, key, spark gap, and choker. The whole apparatus occupies a space of 36 in. by 32¼ in. by 22 in. The arrangements for the aerials depend upon the particular kind of "dirigibles." The approximate range is 300 miles. Smaller and much lighter types are provided for application to aeroplanes.

* * *

A book has been published by Messrs. G. Bell & Sons, entitled *Rhyming Thirds*. It is edited by Mr. W. L. Paine, a schoolmaster, and consists of verse and prose extracts from essays of "mute inglorious Miltons," who are still in their teens. Many are the surprises in the volume, for the extracts are all touched with spontaneity, and the spontaneity of a schoolboy is a thing incalculable. One expects modernity in such a collection but scarcely to the extent exemplified in the following poem. It is written by a boy of 13—C. J. J. In form it approaches the most rhapsodic effusions of M. Marinetti or Ezra Pound. Its theme is the *ultimum verbum* of science—wireless telegraph:—

The Apparatus: . . . — — — . . .
1st Class Operator (slowly): "S.O.S."
2nd Class Operator (excitedly): "What?"
1st C.O. (reading from apparatus):
"In mid-Atlantic
"Lat. 40—Long. 42,
"Struck ice—water—"
2nd C.O. (interrupting): "Who?"
1st C.O.: "We're the Corantic
"The water's up to the boiler s side."

But, seriously, the poem is interesting as showing how potently wireless telegraphy appeals to the mind of a boy.

PSYCHOLOGY AND TELEGRAPHY.

MANY of our readers will be interested in the following extract from an article bearing the above title, which appeared in *The Telegraph and Telephone Age*, New York; the article was written by Mr. E. E. Bruckner :—

The sub-conscious mind is that inner man that, when directly impressed, as in hypnotism, enables a diffident person to talk fluently, a rheumatic to walk, a stutterer to enunciate faultlessly. It permeates the entire body, like the pores of a sponge, and its influence may be felt wherever directed.

The sub-conscious mind may be impressed through the conscious mind as effectively, though sometimes more laboriously (due to inability readily to concentrate), as by direct means.

A deep desire for a stronger arm, a steadier nerve, and more perfect signals—provided the supplicator knows the difference between good and bad Morse—and absolute confidence in the ability of the sub-conscious to bring such desire to a complete realisation, are the prerequisites to success.

Confidence is an essential element in the application of psychologic principles and laws for the same reason that absolute faith in the power of the hypnotist on the part of the victim is necessary before the "operator" can subdue opposing forces. As a matter of fact, the operator or hypnotist does nothing; it is the confidence the subject has in the "ability of the operator" that is the real anæsthetic.

A strong desire, then, and perfect confidence are the indispensable essentials and the specific. If the suggestions are followed by an agreeable sensation—as if something akin to an electrical current were flowing down the arm, which is almost invariably the case—it is a good sign.

In conclusion, the sub-conscious mind may be likened to the phonograph. The The impression made upon the wax record has a conscious source, and from the record it is reproduced mechanically.

"ATMOSPHERICS"

(From the "Spectator.")

THERE'S a little green devil that sits all the day
Up aloft with his feet on aerial wires;
He's booked for the duty and has to obey,
But I guess he would like to get back to the fires—
Yes, I'm sure he would like to get back to his fires.
It's all right in the day with the sun shining strong,
But at night, to keep warm, he will dance on the wires,
And then—atmospherics start coming along!
The X's, the X's,
Oh, bother the X's!
For that's when the X's start coming along!

You've picked up a ship at the deuce of a range,
Or you're taking the news and can only just hear,
And the devil gets cramped and decides on a change—
Stands up, swings his arms, thinks of you with a jeer!
Shuffles down, prances up, heel and toes—(with a jeer!)
And begins his own dance to his own little song,
And there's not a word more of your message you'll hear—
For now atmospherics are coming along!
The X's, the X's,
Oh, bother the X's!
"Very strong atmospherics" are coming along.

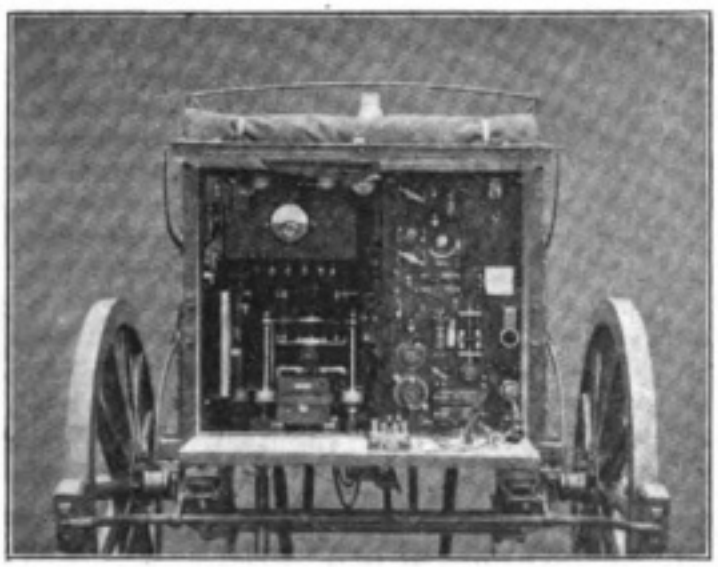
He's fond of a hornpipe, and good at a jig,
A valse he calls "slow" and a minuet "old"—
For such stately dances he "don't care a fig,"
What he wants is something to keep off the cold.
But oh! when the night is especially cold,
It's tango, plus cake walk, plus popular song!
It'll turn your hair gray, it'll make you grow old
When X's in ragtime start coming along!
There's nothing that vexes
So much as the X's,
When X's in ragtime start coming along!

JOHN ENGLISH.

Wireless in the War

A resumé of the work which is being accomplished both on land and sea, and of the precautions taken by the World's Governments to protect their wireless communications, with special reference to the Regulations issued by the British Postmaster-General.

THE great struggle which for so long has been predicted and which is likely to be fraught with such immense consequences to the world is now a terrible reality. Germany and Austria are at death grips with their neighbours, and England, in the name of loyalty and



A Marconi Portable Wireless Station equipped for military purposes and ready for immediate use.

honour, has unsheathed her sword to help her allies and is bringing all the resources of her great Empire to their aid. It is not the first occasion in which she has so distinguished herself. Scarcely a century ago, in the same cause, she confronted the greatest warrior the world has ever seen—and won! But a hundred years have seen vast changes in military organisation and equipment. Only one asset remains unaltered—the loyal devotion and courage of her Empire's sons is the same to-day as it was yesterday. But of the changes in her equipment: for the first time in her history she brings into play a new factor in warfare—Wireless Telegraphy—and the part which the great invention is playing in the game of war is no slight one.

From the very outset the Government took over all the wireless stations of the Empire. Even before the declaration of war the order for the first fleet, which had left Portland after the great review at Spithead at 5 o'clock on the morning of July 30th, was recalled by wireless and ordered not to disperse for manœuvre leave as had been previously arranged. On the Sunday the *London Gazette* issued a special notice to the following effect:—

"*In pursuance of Regulation 5 of the Wireless Telegraphy (Foreign Ships) Regulations, 1908, I, the Right Honourable Charles Edward Henry Hobhouse, his Majesty's Postmaster-General, do hereby give notice that in the opinion of the Right Honourable Reginald McKenna, one of his Majesty's Principal Secretaries of State, an emergency has arisen in which it is expedient for the public service that his Majesty's Government should have control over the transmission of messages by wireless telegraphy, and that the use of wireless telegraphy on board foreign ships whilst in the territorial waters of the British Isles will be subject to such rules as may be made by the Admiralty.*"

This was followed by a notification issued from the Admiralty on August 3rd:—

"*With reference to the notification published by the Postmaster-General on the 2nd inst., the following regulations have been made by the Lords Commissioners of the Admiralty, prohibiting the use of wireless telegraphy by merchant vessels in the territorial waters of the United Kingdom and Channel Islands:—*

"1. *The use of wireless telegraphy is prohibited in the harbours and territorial waters of the United Kingdom and Channel Islands.*

"2. *On entering any port or harbour, or on directions being given to that effect by any naval, military, examination service,*

Customs, or police officer, the aerial wire or antenna is to be at once lowered, disconnected from its halliards and from the operating-room, and is not to be rehoisted while the ship remains in British territorial waters.

"3. *Any breach of these regulations renders the masters of offending ships liable to penalties, and to the confiscation of the wireless apparatus of their ships.*

"NOTE.—*These regulations do not apply to ships owned (not chartered) by the Admiralty, whether they fly the Blue or the Red Ensign.*

"*By command of their Lordships.*

"(*Signed*) W. GRAHAM GREENE."

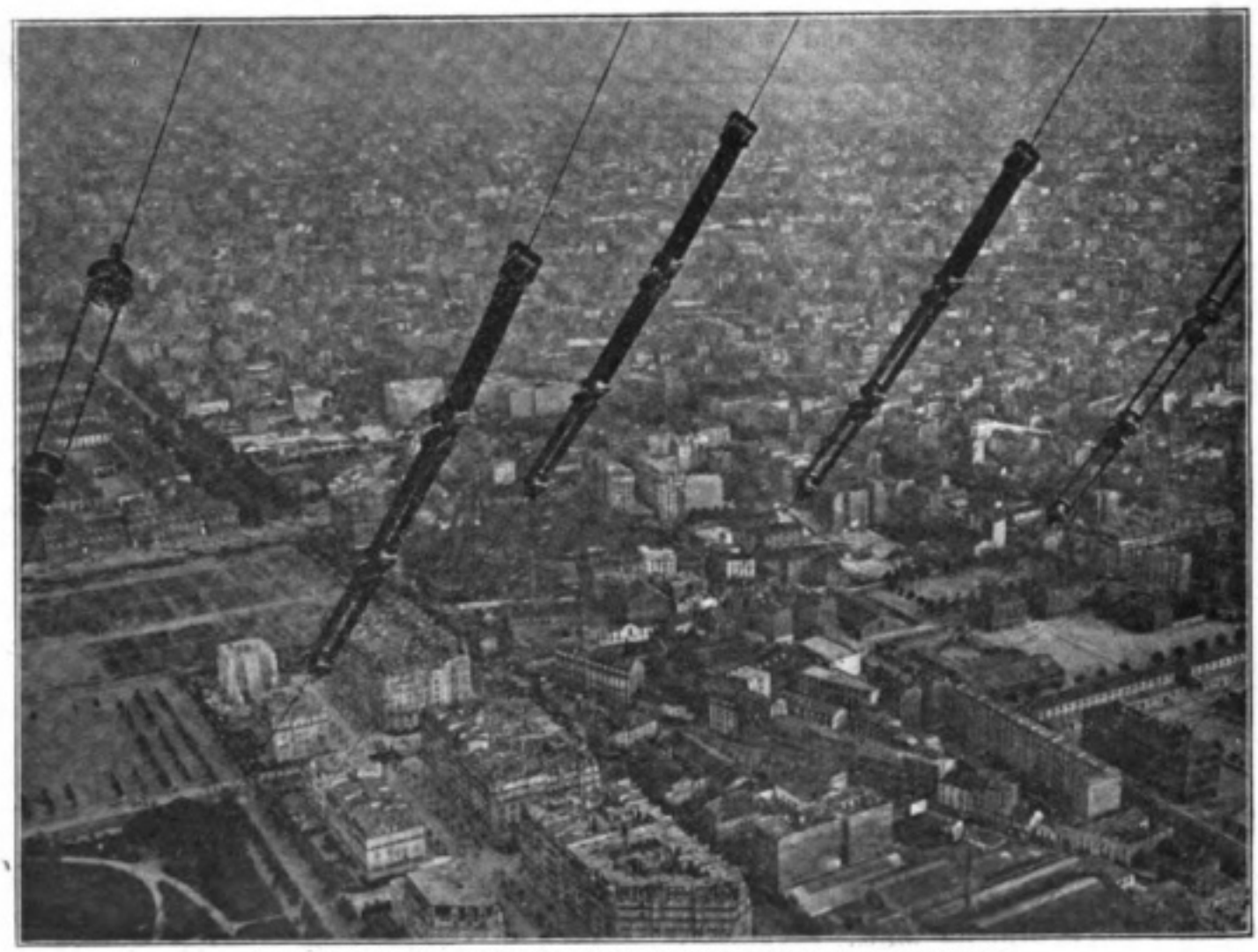
That same evening a further official communication was published to the effect that:—

"*The Postmaster-General has issued instructions for the closing of all experimental wireless telegraph stations in this country.*

"*He will be glad to receive from any quarter information of any wireless station which may be observed to be kept up in contravention of his orders.*

"*The instructions do not apply to wireless stations doing public business, such as the coast stations which carry on wireless communicatio with ships at sea.*

"*Ordinary telegrams for places abroad and radio-telegrams, however addressed, can only be accepted if written in plain English or French, and at sender's risk. They will be subject to censorship, and must bear the sender's name at the end of the text, otherwise they are liable to be stopped until the name is notified by paid telegram. Registered abbreviated addresses will not be accepted either as addresses or names of senders.*"



A VIEW OF PARIS FROM THE EIFFEL TOWER.
This station has been working at full pressure throughout the War. Note the suspended wires of the antennæ.

This was a precautionary measure to reduce to a minimum the leakage of such official information as might be transmitted by wireless telegraphy. It also would be a further security for official wireless stations from risk of interruption. As a matter of fact, in issuing a licence to experiment in

wireless telegraphy, one of the conditions of such a licence is that "The Postmaster-General may take possession of any licensed apparatus in time of emergency, and may use it, if he thinks fit, for the King's service." Licensed stations may therefore be entered by any authorised person with a view to carrying these conditions into effect. But, besides this negative use of the new invention, the Admiralty instantly took steps to secure the services of wireless operators for all branches of the service, and all operators belonging to the recently formed corps of Royal Naval Volunteer Reserves; and Captain Rupert Guinness, commander of the Reserves, issued the following appeal:—

"The Royal Naval Volunteer Reserve requires recruits. Men with knowledge of Morse and semaphore telegraph or wireless especially useful. Apply Headquarters, R.N.V.R., Commercial Road, London."

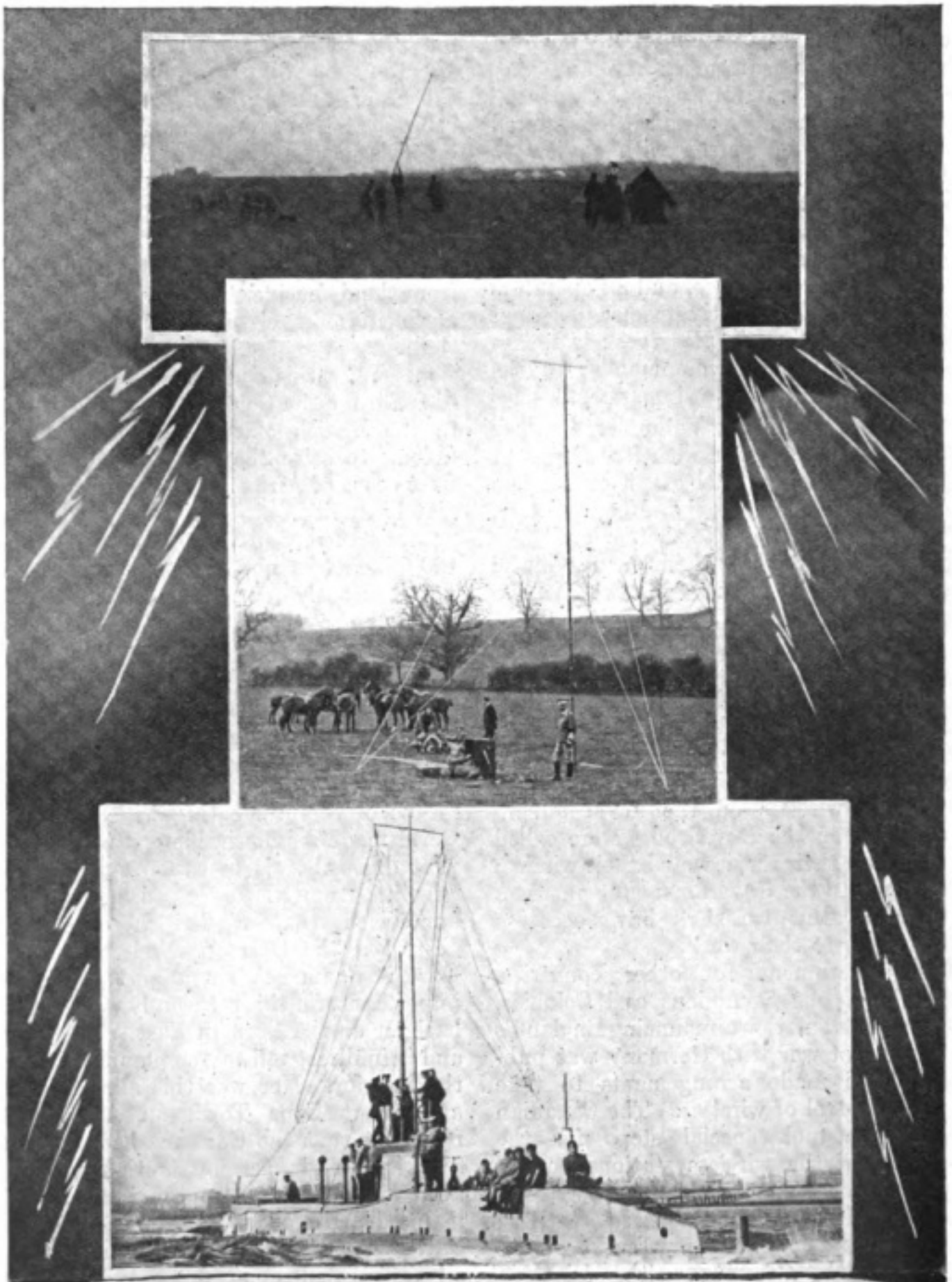
It is believed that these men will be drafted off to the prize vessels which have already been captured by the British Fleet and brought into English ports, where they will be transferred to the service of the Navy and equipped with wireless telegraphy which will be controlled by operators drawn from the Naval Reserve Wireless Corps.

Another appeal was issued for volunteers to operate wireless on the naval airship fleet, and even the Boy Scouts were called upon to give their services and their wireless equipments to the Government for purposes of defence. But we shall have occasion later to refer to their work.

The Governments of other countries, especially of our Dominions and Colonies, since the proclamation announcing England's declaration of war with Germany was published, have made arrangements to take over the control of wireless. The Canadian Government took special steps for the protection of the wireless stations on the Atlantic coast. The Amalgamated Wireless Company of Australia placed its stations, apparatus, and complete organisation at the disposal of the Commonwealth. In Cape Town a proclamation was published, establishing a wireless telegraph censorship and prohibiting all code messages and registered addresses. In the United States President Wilson issued an order prohibiting all wireless stations, foreign and otherwise, from transmitting or receiving for delivery messages of a non-neutral nature, and in any way rendering any of the belligerents any non-neutral service. The Secretary of the United States Navy was appointed to enforce the order, and naval officers are acting as censors at the various stations. Following on this censorship, the Customs officers sealed up the wireless apparatus of all vessels in New York harbour flying the flags of the belligerent Powers.

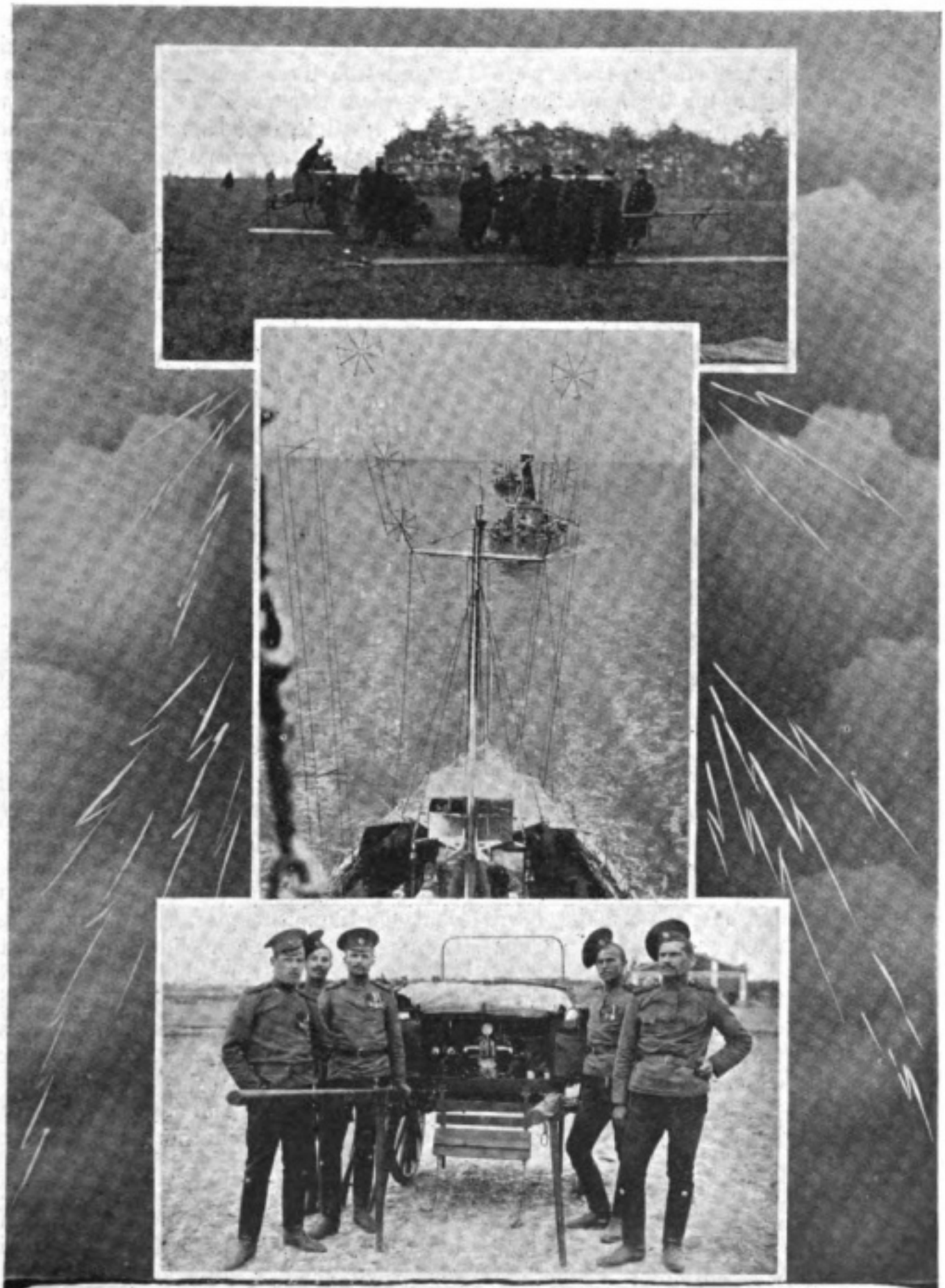
The above facts deal chiefly with wireless from the defensive standpoint, but the War authorities have taken steps to cripple Germany's use of such means of communication. With this end in view, the Secretary of State for the Colonies issued instructions to the British officers in the Gold Coast Colony to seize the town of Lome on the west coast of Africa. His order was immediately carried out. The invaders met with no resistance, and South Togoland, up to 120 kilometres north from the coast, was simultaneously surrendered. Togoland is situated between the Gold Coast and Dahomey, the French colony, and has belonged to the German Empire for some thirty years. Except for the fact that it possesses a large wireless telegraph station, it is a colony of little importance; but its value to the German Government as a means of communicating with the outside world made it a desirable capture. On the next day—that is to say, August 10th—a telegram from Nairobi, British East Africa, announced that a British cruiser had destroyed the German wireless station at Dar-es-Salaam. Again a post of strategic importance, for this is the only well-sheltered harbour on the German East African coast, and is in direct railway communication with the interior. Nor was this all. A coaster arrived at Cape Town on August 11th reporting that the Germans had evacuated Swakopmund in German South-West Africa, after having blown up the jetty and dismantled and sunk the tugs in the harbour. Warehouses and shops had been closed and all provisions removed to Windhuk, the capital. Luderitzbucht had suffered similar treatment. Both these towns are wireless telegraph land stations, each with a range of 500 nautical miles by day and 900 by night. Windhuk has a more powerful station.

A sidelight has been thrown on the useful-



WAR PICTURES

1. Belgian soldiers hoisting wireless mast of a Marconi Cart Set.
2. Carrying out wireless manœuvres in England.
3 Wireless on an English submarine.



WAR PICTURES

1. *Belgian officers carrying out experiments with a Marconi Cart Station.*
2. *Leaving Portsmouth in battle array.*
3. *Russian soldiers with a Marconi Cart Set.*

ness of such outlying stations of the German Empire by a discovery in Bombay. In that port every effort had been made to ensure the comfort of about 80 Germans who were detained in harbour owing to the outbreak of war between England and Germany. All would have gone well had not the authorities found that their wireless apparatus had been disturbed and ascertained that the disturbance originated with the Hansa liner *Rheinfels*, one of the vessels which had been detained. As a result, the installation on board was immediately destroyed and the captain and crew of 13 imprisoned. There is no doubt that the aim of the Hansa crew was to forward, if possible, information through one of these colonial stations to Berlin. As a matter of fact, their efforts, even if unchallenged, would have been doomed to failure, as the following extract from an article on this subject goes to prove. In it the writer remarks that, notwithstanding persistent efforts of German operators to interfere with wireless messages which have been proceeding incessantly between Whitehall, Paris and the Fleet, not one of these attempts has proved successful. Endeavours to "jam" wireless messages have failed entirely, and the Cabinet, no less than the Admiralty and War Office, have been kept in uninterrupted touch with the entire theatre of war. Numbers of misleading messages have been received with the obvious intention of deceiving the responsible officials, but these have been detected and dealt with accordingly. Thus, while the danger of interference from Wilhelmshafen with our wireless system has long been recognised, the system adopted for circumventing any such action has stood successfully the severest tests.

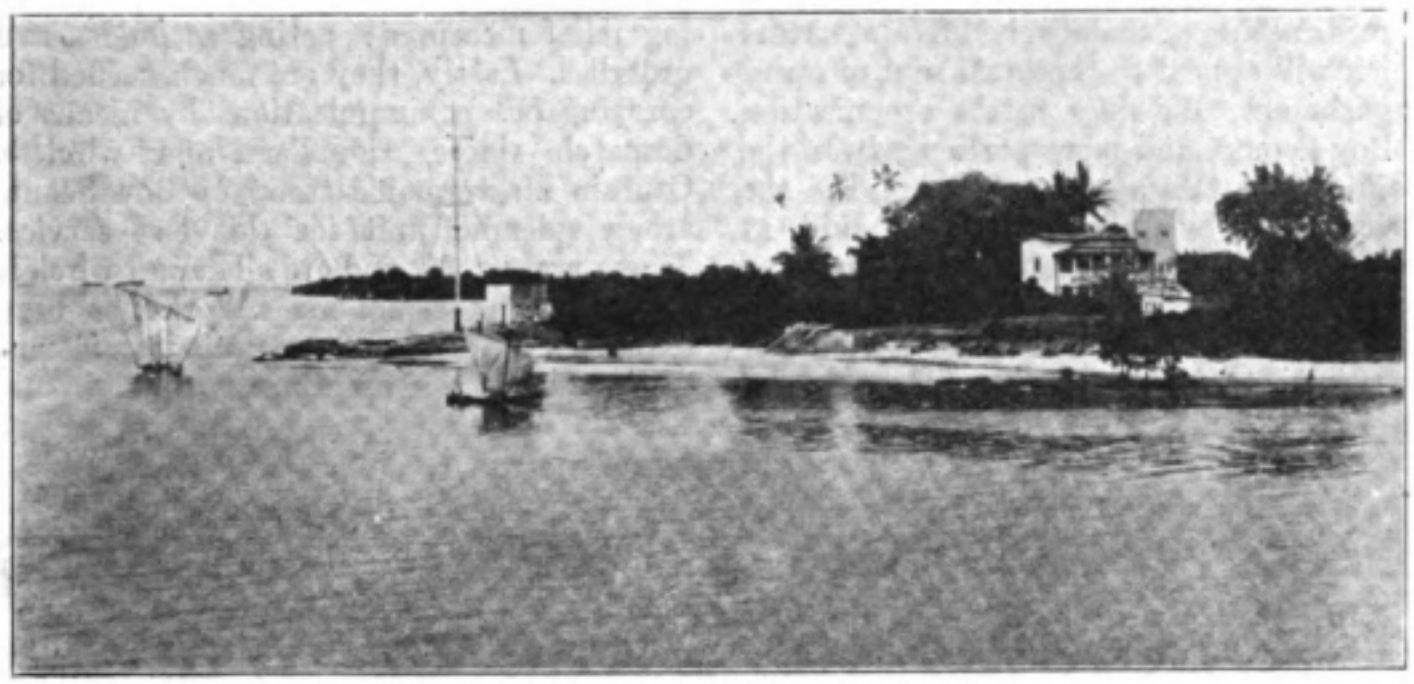
As regards the influence of wireless telegraphy on military operations it is interesting to notice that long-distance communication for this purpose is being kept up almost entirely by means of the wireless system, and the results so far obtained justify the retention of this method of maintaining touch with our Allies on the Continent and with our armed forces on the East Coast and at sea. It has been particularly fortunate that weather conditions have recently been favourable to the working of wireless telegraphy by day as well as by night, and this has materially facilitated the work of those who are carrying on the responsible duties of transmitting the incessant communications whch have been passing to and fro. But there is another phase in the present war which has confirmed the use of wireless telegraphy as a safeguard under the most abnormal conditions. We refer to the use made of it in rescuing English liners from the clutches of German prowlers. One of the most dramatic voyages across the Atlantic in the history of ocean-going liners has recently been accomplished by the *Mauretania*. She was bound for New York, but at 11.30 on Thursday night, August 8th, she was warned by a wireless message from the British cruiser *Essex* to change her course without delay. She did so immediately and with such suddenness that the passengers, unaware of the order, believed that the vessel was turning turtle; then, at the highest possible pressure of her turbines she set off for Halifax, her portholes blanketed and her lights extinguished. A similar experience was undergone by the White Star liner *Cedric*, which also received timely warning by wireless from the *Essex*. Another vessel to be warned by wireless was the *Calgarian*, which was sailing the high seas at the time of the declaration of war. Some anxiety was felt on her account, but this was allayed when she reported herself at 11 p.m. on August 7th as out of danger and in touch with Cape Race. In the case of the adventure of the Norddeutsche-Lloyd Steamer, the *Kronprinzessin Cecilie*, the boot was on the other leg, for the English were this time the pursuers and the liner the fugitive. There were two million pounds of specie on board and she was anxious to reach Germany. For this purpose her entire appearance was changed by blanketing her prow and stern with a shroud of canvas and her four funnels were tipped with black paint in order to completely conceal her identity. Furthermore, the passengers were refused permission to use her wireless apparatus for fear of betraying her whereabouts. But all her efforts of subterfuge were of no avail. She was forced to return to America before she had driven very far from the coast.

How the War Affects the Amateur.

Mention has already been made of the command of the Postmaster-General that all experimental wireless stations should be

dismantled. The private owner was informed of this decision by the following communication: "*Dear Sir,—In accordance with your wireless licence, the Postmaster-General requires you to remove at once your aerial wires and dismantle your apparatus. One of his officers will call upon you.*"

Of the large number of amateur wireless telegraph stations in this country the majority are equipped as receiving stations only, and the Postmaster-General's order was cheerfully accepted. Numerous stories have been told of the service which certain amateur stations have rendered to espionage, though these are probably exaggerated. The *Standard* reports that many agents of the German Secret Service who were in England before the war broke out were possessors of amateur stations on or near the East Coast, by means of which they hoped to be able to get into communication with German cruisers on the North Sea. Prompt action by the Government forestalled their plans, and although one or two instances of discoveries of concealed apparatus have come to light, they are nothing to be compared with the organisation of the German Secret Service which is said to have existed in France and Belgium to establish wireless communication with Berlin, or to overhear messages. A German at Versailles was arrested on suspicion and a search in his rooms revealed a most cunningly contrived wireless apparatus concealed along the sides of the chimney. A similar case was reported from a shop in Antwerp, where this time the apparatus was hidden on the roof of a large German bazaar, and concealed behind a statue draped with flags. But the case of a German hotel proprietor in the Champs Elysees is perhaps the most noteworthy. As soon as war had been declared by Germany, French plain-clothes detectives drove up to the hotel in a taxicab. They crossed the spacious hall to the manager's office. He was seated at his mahogany desk, spruce, self-possessed, a model of urbanity. "You have been using a secret wireless apparatus on the roof of your hotel for the purpose of confiding messages to the enemy. You are arrested as a spy." A moment later some of the detectives drove away with their prisoner. The rest stayed behind to make arrangements for the immediate closing of the hotel. What was the end of the story? Rumour tells of a barracks, a court-martial, a ditch and a firing squad. Possibly! War is War!



DAR-ES-SALAAM.

Showing the German wireless station which has been destroyed by gun-fire from a British cruiser

Mr. William le Queux, the novelist, who is well known to be one of the leading exponents of amateur wireless telegraphy in England, had some valuable remarks to make on this subject. "I certainly think," he writes, "that the police should have authority to enter houses where suspected aliens are living; at present they have to

be armed with a search warrant. The police should also be empowered to enter any house suspected of containing a wireless apparatus with an indoor aerial.

"Although the Government have dismantled the aerials of all private wireless stations, many receiving stations may still exist, as wireless messages could easily be received even upon gas pipes, or upon a wire mattress, or upon wires insulated from the interior of the roof."

That is one phase of amateur wireless which it is not particularly pleasant to dwell upon. Here is another of an entirely different nature which will appeal to the loyal soul of every Englishman. We refer to the organisation of Boy Scouts, and more particularly to the useful work they are performing for the Government by means of their skill as operators and the use they are now making of their wireless equipment. The recent competitions in wireless efficiency, organised by the Marconi Company, and the offer by them of apparatus to the squads of the winning competitors provided a great encouragement and has resulted in augmenting the number of young experts very considerably, as well as supplying them with the necessary initiative for the troops to make amateur apparatus for themselves. Their work is now reaping its reward. The Government has recognised their uniform as that of a public body. They have been largely in request for non-military work, such as patrolling and guarding bridges from individual spies, collecting information as to supplies, transports, etc., available; organising relief measures; acting as guides and orderlies. Lastly, they are much needed for carrying out communications by means of despatch riders, signallers and wireless. Captain Masterman's troop of Boy Scouts are a splendid unit for this last service. They number 160, and are all expert wireless operators and signallers. Work has been found for all of them, and that is sufficient testimony of their usefulness.

The Work of a Naval Wireless Operator in Time of War

WAR! Martial law has been proclaimed, the fleets have been mobilised, and the battle manœuvres are now being "practised" in deadly earnest. It is one thing to repel a friendly enemy; it is quite another when the opposing naval forces are, next to our own, the finest in the world.

Let us suppose we are reconnoitering in hostile waters. The cruisers are ordered to spread themselves out in the vanguard of the fleet on look-out duty; they steam along without lights of any description. These great vessels, invisible as the night can make them, are brooding on the troubled waters. Yet they are very alive. Ceaselessly they communicate one with another, for in each vessel, hidden as far as possible from external view, is the soundless and padded wireless room. Here the operator is at work, the electric lamp glowing brilliantly above him; but a messenger enters with an order from the Commander; immediately, as the handle of the door is touched and pulled open by the entrant, the lights go out and pitch darkness prevails until once again the door is closed behind him, and automatically the lights are switched on—that is part of the secrecy which prevails on a battleship in time of war. The men on look-out duties are stationed in various parts throughout the cruiser; their duty is to keep their eyes open, as there is always a chance that one of the enemy's destroyers may come rushing along at a speed of some 30 knots an hour, shoot a torpedo into the ship and get away unscathed. At the best of times it takes a cunning gunnery to strike a vessel going at this speed, but in the darkness possibilities of the marauder's escape are increased ten-fold, and only the eyes of the crew and watchers can, as far as possible, safeguard mishap. As soon as anything is sighted it is reported to the battle fleet. This is done by the wireless, and the operator is compelled to work at high pressure, for he has to read every message a cruiser sends,

inform his captain, and himself get in touch with the fleet if his officer should desire to send a reply. Then there is the Admiral of a fleet to be considered. The operator must keep a good look-out in case some battle order should be transmitted from this important quarter.

All this time, remember, the ship is cruising at imminent risk not only from the actual attacks of a secret enemy, but from the danger of floating mines and even aerial attack. It requires no little personal courage, therefore, for the operator to remain in that closed wireless cabin whence, should disaster occur, there is no chance of escape, and all the time he must keep his head and send and receive messages with as much nonchalance as though he were seated at home in the security of his own little den. But quiet heroism is one of the traditions of wireless service; never yet has an operator been found wanting.

Very few people realise the great importance of wireless telegraphy, especially in time of war or strained relations. We will take, for instance, a fleet of battleships at sea while their country is at war with another Power. Each ship in that fleet has its wireless installation, adjusted so that they can send and receive signals and messages to other squadrons at sea or in harbour and to stations ashore. One ship of that fleet is always in direct touch with the Admiralty. The chance of interference from an enemy's ship is reduced so as to be almost not worth counting. Each ship in a battle fleet is responsible for some station ashore, or for a cruiser squadron or flotilla of torpedo boat destroyers.

The importance of having one ship in a fleet always looking out for messages from the Admiralty can be easily seen. All foreign intelligence and the movements of foreign ships go to the capital by telegraph, cablegram, and wireless from different parts of the world, and from thence it is transmitted to the admiral in charge of the fleet, who directs his ships accordingly. The whole safety of a battle fleet depends on wireless telegraphy in time of war. When a number of battleships are steaming along, perhaps looking for the enemy, it would not do for them to run into a superior number of the enemy's battleships

To guard against this, a great number of cruisers are sent out ahead and spread a number of miles across. The duty of these ships is to keep a thorough look-out and report to the ship in the battle fleet looking out on their particular tune. This ship, in turn, reports by semaphore or morse-lamp to the admiral of the battle fleet. The cruisers are sometimes assisted by torpedo-boat destroyers. Now, if 30 of these ships are used it will be readily seen that the area of their vision is enormous, and it would be almost impossible for a fleet to pass unobserved. Immediately any of the ships sight the enemy's squadron they would report at once by wireless, stating the number of ships sighted, with their speed, latitude and longitude, etc. The Admiral would then give his orders, also by wireless. If the Admiral determines to attack, he directs the cruisers to steam at full speed and take refuge behind the battle fleet.

Among the other effects of the great European war will be the holding up for the time being of the wireless telegraph schemes which some of the intending nations had planned. One of these schemes is that which had been prepared, and was in course of execution, to establish a chain of high-power wireless telegraph stations to connect Paris with the French colonies. Capt. Brenot has published in *La Lumiere Electrique* maps of the location of these stations, which show that one main line will proceed *via* Tunis, Djibouti, Pondichery, Saigon, to Noumea, in the Hebrides. Another will go across Africa to Tananarive, Madagascar, and a third *via* Tombouctou, Martinique, across the Panama Canal to Marquises Island, thence to Tahiti, completing the chain to Noumea. The ranges vary from 1,680 kilometres to 4,000 for most of the stations, but between the Saigon and Noumea stations is about 7,500 kilometres, and between Martinique and Marquises Island 8,500. Several of the stations are at work, the largest being at Saigon, requiring 450 horse-power, which is supplied from the town electricity. The aerial is horizontally carried on eight steel masts, 120 metres high, isolated from the ground and spreading ten horizontal wires, spaced 180 metres and 870 metres long. There are also a large number of smaller stations described. Their power varies from 5 to 15 kilowatts, and the leading particulars of them are given.

The Wireless Direction-Finder

ON the opposite page we are able to publish a chart of the tests carried out with the Marconi-Bellini-Tosi wireless direction-finder during a voyage of the *Royal George* from Canada to England. The chart was prepared by the commander of the vessel, Captain F. J. Thompson, who, in the course of a communication from which we published an extract in the August number of THE WIRELESS WORLD, stated that the instrument was wonderfully accurate in determining the compass direction both of shore stations and stations on other vessels.

The position of the *Royal George* was determined on the chart by the crossing of the course of the ship and the compass bearing of Small's Lighthouse. When, in the case of fog, the light could not be seen, the position was determined by the crossing of the course with the wireless bearing of Land's End—a distance of about 90 miles.

The chart also shows some of the tests for locating a ship on the high seas. The bearings generally differed by one or two degrees from those shown in the chart, and this is explained by the fact that the course of a ship is never perfectly steady and that for some hours after having taken the point the position of a ship on the high seas is only approximately known.

The value of this instrument lies in finding the position of a vessel in heavy weather and in materially assisting the prevention of collisions.

The aerial system required for the direction-finder consists essentially of loops of wire of equal size suspended vertically and crossing each other at right angles. The loops ordinarily take the form of triangles of wire suspended by their top corners through insulators from a triatic or other fore and aft stay, or from a sprit, gaff, or bracket on one of the masts. Their horizontal base wires cross the ship at an angle of 45 degrees on either side of its centre line, and at right-angles to each other, the two bottom corners of each triangle being ordinarily made fast through insulators to stanchions at the side of the ship. Connecting wires are taken to the instrument from the centres of the horizontal base wires of the triangular aerials, which are split by an insulator at their point of intersection. The range of the installation suffers to some extent if these connecting wires are very long, in addition to which the possibility of injury to the wires decreases the reliability of the installation, and it is therefore advisable to keep the distance between the instrument and the centre of the aerial system as short as possible.

The instrument indicates the angle which the direction of the station makes with the centre line of the ship; that is to say, it shows the line on which the wireless transmitting station lies, but it does not show in what direction along that line. For example, it may indicate the direction 20 degrees off the port bow, but it does not distinguish between this direction and that which is diametrically opposite to it, namely 20 degrees off the starboard quarter. There is, however, hardly ever any doubt as to whether a ship is approaching or receding from a land station, and, indeed, in most cases there is only one possible way of interpreting the indications of the instrument, as by the reverse interpretation the ship would be found to be somewhere inland. If, however, there is any ambiguity two successive bearings taken of the same station while keeping the ship on a fixed course will place the matter beyond doubt, and will at the same time give the ship's distance from the station by the method ordinarily in use for that purpose. In the same way, the ship's position may be found by taking simultaneous bearings of two fixed stations. The useful application of the direction-finder is to determine whether the ship is on a course which will take it inside or outside a lightship or isolated lighthouse. A few signals from the lightship or lighthouse will settle the question as certainly as if the light were visible. Similarly, when making a harbour, a few signals from a station in the harbour

will show immediately if the ship has drifted to one side of the entrance. When trying to locate another ship while going slow in a fog, an indication of the direction-finder would show by a steadily increasing strength of signal if another ship were approaching, but would leave doubt whether it was approaching, say, on the port bow or overhauling on the starboard quarter, though a wireless inquiry as to her course addressed to the other ship would relieve the doubt at once.

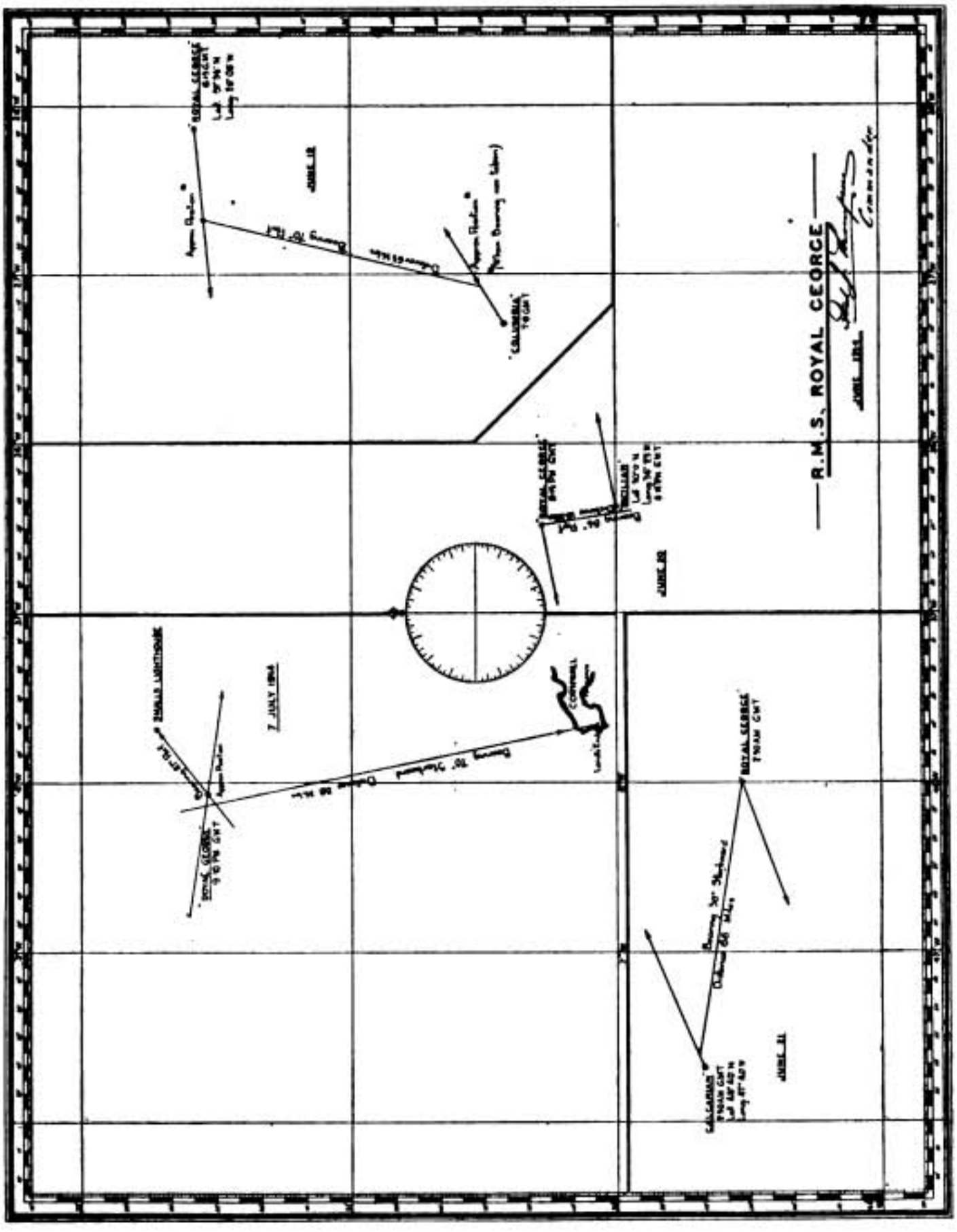
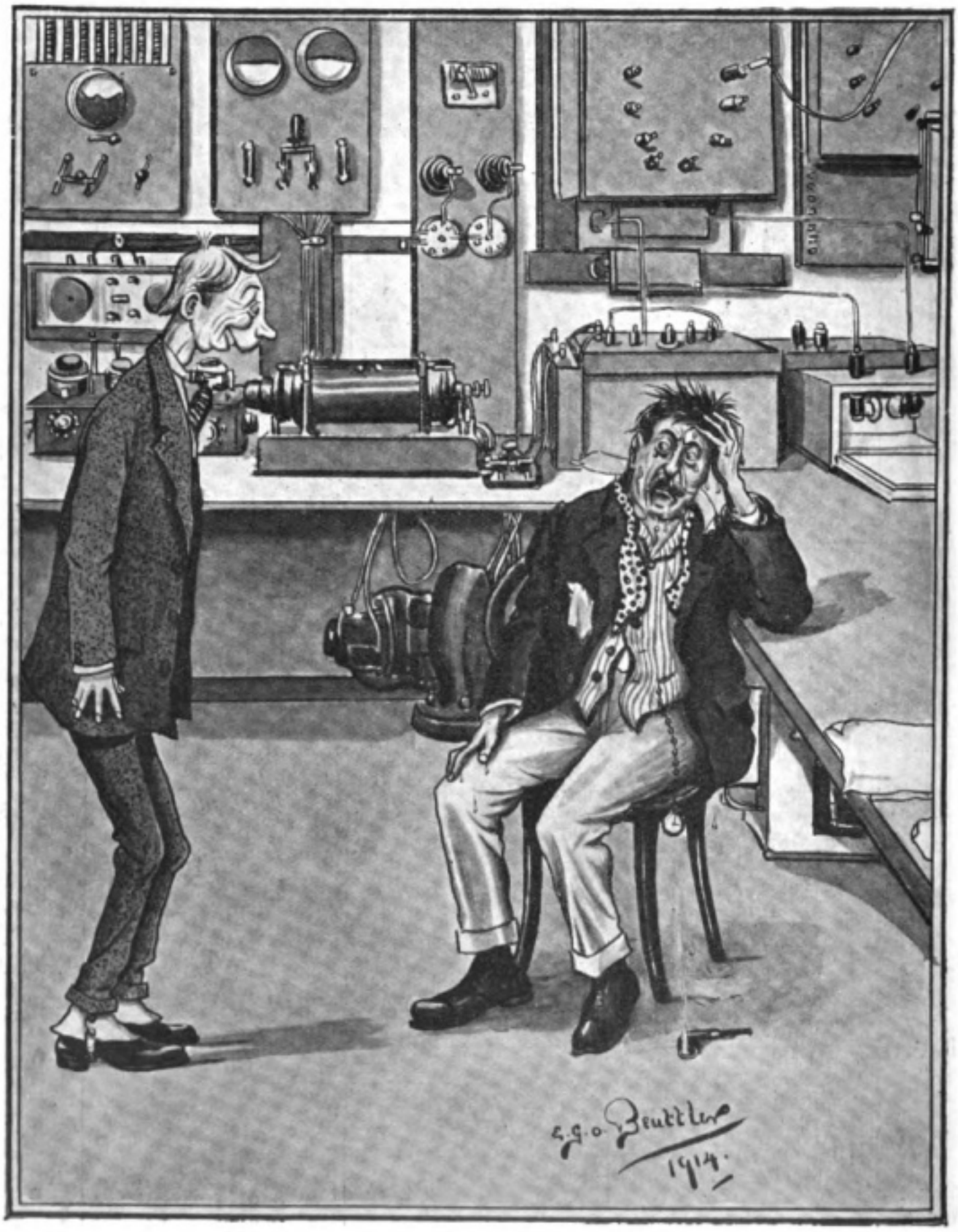


Chart of Tests with Direction-Finder on "Royal George."

CARTOON OF THE MONTH



Wireless Worries

The Examiner's point of view, and how the Candidate sometimes appears to him.

Wireless on a Sailing Ship.

An Account of a Voyage round the World in the training vessel "Mersey."

By LIEUTENANT FREDERICK CROSS, R.N.R.

(*In charge of the Boys and Wireless Instructor*).

TO those who go to sea on a ship fitted with wireless the idea of being without seems an absolute impossibility; indeed, we on our sailing ship cannot understand how we ever did without it. I am speaking, not only from a "news" point of view, but also from the standpoint of utility in the navigation of the ship.

On our last trip home from Sydney, New South Wales, which port was left on February 21st, 1914, we were no sooner outside the "Heads" when in came an urgent telegram, and certain matters were thus adjusted without undue delay—and delay in a sailing ship is no mere ordinary delay, but one of three or four months; likewise after the telegram came the weather report for the day, this being sent free of charge by the Australian Government—our own Government, of course, charges 5s. for weather reports—these weather reports came regularly from Sydney every day until we were over 1,000 miles away, after which we picked them up from the Bluff, New Zealand or Hobart, until we were well clear of the land.

When we were well on our own and had started the long run down to the Horn, although we only actually spoke two ships, yet the whole way across we were receiving detailed weather reports from ships both ahead and astern of us.

Here is one typical evening's report:—

March 14th, 1914—*Mersey* in 49° 45′ S., 147° 1′ W., following weather reports.

Memphis 56° 20′ S., 99° 2′ W., mod. sea, fine clear weather.

Ruapehu—52° 50′ S., 129° 59′ W., wind fresh N.W., heavy S.W. swell, sea mod., clear and fine.

Carpentaria—49° 43′ S., 158° 7′ W., mod. to S.W. gale, frequent heavy squalls, hail, snow and rain, very heavy, confused sea; barometer 28.85, falling.

These reports handed to the captain enable him to obtain a general idea of the weather ahead and astern, and by comparing barometer readings, etc., he can form a very useful idea of what weather is coming his way. Further, we knew exactly where all the ice was lurking, and everyone knows how the poor sailing ship would fare if she encountered an iceberg in that lonely southern ocean. It is worse even than the North Atlantic.

Every sailing ship man, too, will know exactly what I mean when I say that wireless takes away that absolute feeling of being cut off from the whole world which is so acutely felt on that loneliest of all runs, Australia to Cape Horn, on a sailing ship. The small ship, the huge seas, the grey skies, the horrible weather, the frequent fog, and the ever-present fear of ice in these gloomiest latitudes, all combine to make it not only lonely and miserable, but also a period of unceasing anxiety for the harassed master of the vessel.

Mr. Marconi's gift to the world, however, in our particular case has done much to rob the journey of its unseen terrors, and to give the man responsible for the safety of the ship and the lives she carries many helps in the way of weather knowledge, locality of ice, etc., to help him in his task.

Another and interesting side to wireless is a study of the relation between "statics" and weather.

We kept two-hourly regular observations for a period of about 10 months, noting all the details, such as barometer readings, thermometer, hygrometer, wind direction

and force, character of "atmospherics," etc., and in the course of time were able to trace a certain connection between "statics" and weather; we could almost invariably let the officer of the watch know whether or no he was to expect a sudden shift of wind from the N.W. to S.W. whilst running the "Easting" down. Of course, this only applied to those high latitudes.

And now *the* great benefit from the navigator's point of view—the checking of chronometers.

No matter how good one's chronometers may be, at the end of 120 days at sea they are apt to be out somewhat, and so give the poor master one more worry, which increases a thousandfold if the weather is dull or foggy. But the sailing ship with wireless has rated her chronometers daily for days before the land fall is made by comparing signals made from the Eiffel Tower morning and night, so all is well.

On the outward voyage we generally find a steamer between Cape Town and Cape Leewain who compares chronometer times with us, so we are as well off as the steamer who is able to rate hers in port every few days. One more example of general utility.

A few weeks ago the *Mersey* approaching the Fastnet—having been told by wireless that a tug was on her way to meet and tow the ship up to Liverpool—suddenly runs into a fogbank with light winds. Puzzle—find the tug. However, a kindly operator, hearing our voice, drops a hurried remark to the effect that he has just sighted—off the Stags—a tug who was inquiring for the *Mersey*. Our ship was immediately headed for the Stags, with the result that the tug was met an hour later on her way back to Queenstown, despairing of ever finding us in the fog. So again wireless proved our friend, and probably saved us several more weary days in Channel.

In conclusion, I should like to ask all the operators whose duty takes them to the run between Cape Town and Australia about November, also the run between Australia and Cape Horn next March–April, to keep a good look out for MWJ, and give us all the ice and weather reports, etc., they can, for accurate weather reports mean so much more to us who have to use the weather as motive power, than to those on the steamers, who use weather reports principally as a guide to keeping their ventilators trimmed to the wind.

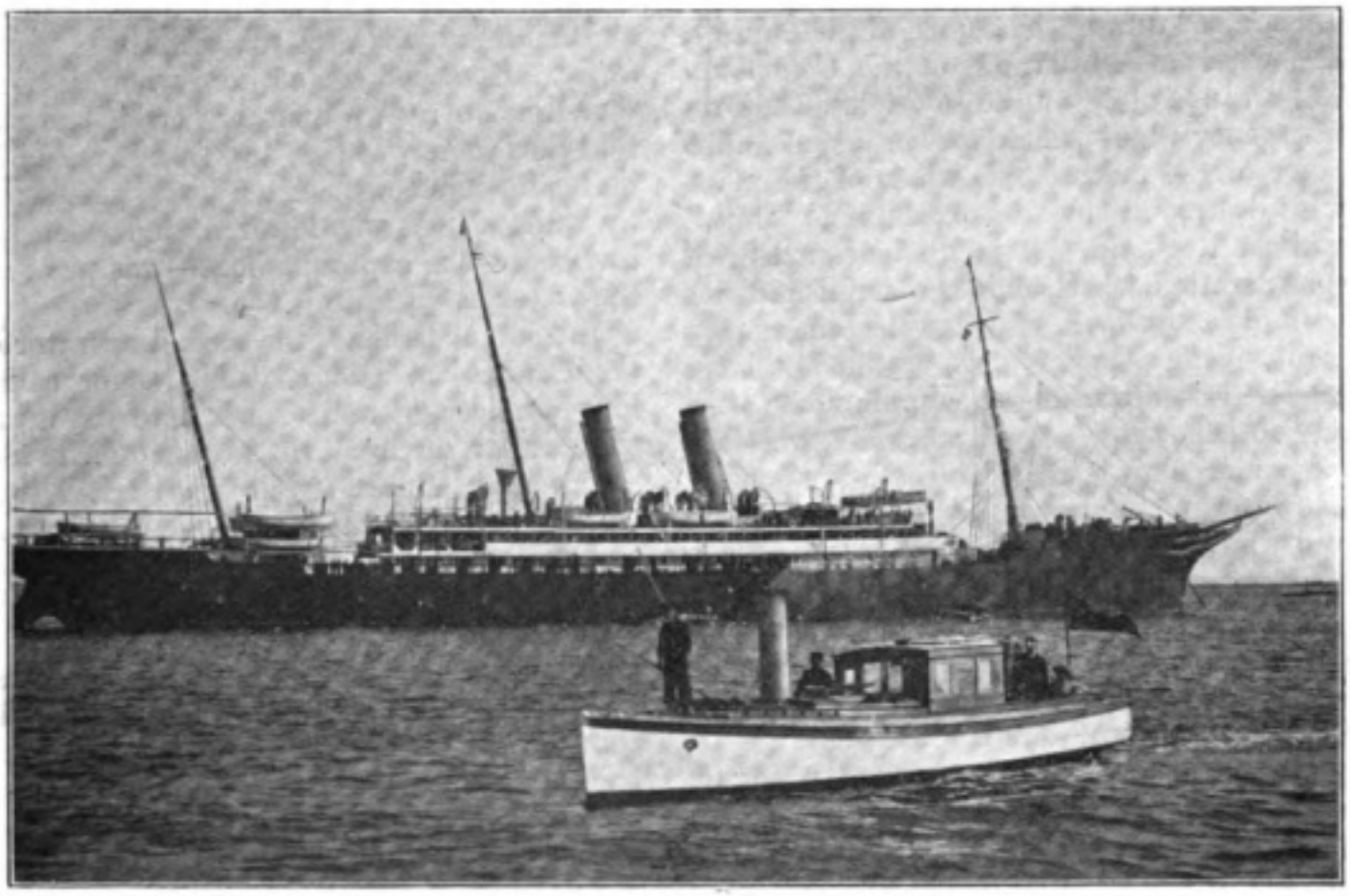
"Speech Unto Speech"

STEERING for home through the darkness, under a changing sky,
Her aerial swings in the smoke-drift, turning the night wind's sigh,
Wires fore and aft from the spreaders stretching from mast to mast,
Spliced and guyed and steadied with the down leads taut and fast;
Rimed by frosts of the Arctic, blackened by suns of the South.
By this ye shall know that the liner is fitted with ears and mouth,
Ears to hear when her sister shall call for a sister's aid,
A voice to return an answer, "Sister, be not afraid!"
"Aye, but the storm is rising, the rudder and masts are gone!"
"Yet shall we never leave thee, sister, to fight alone,
"For we are racing to thee, nor shall the engines tire!"—
And the doomed ship hearkens the message, syllabled out in fire.
They that were dumb can speak now; they that were deaf can hear;
Gone is the shadow of silence, gone is the lonely fear;
Praise be to Him who giveth thus to His sons who seek
Making the deaf to listen, making the dumb to speak!

PENROSE-WHITE.

Maritime Notes

JUST when it had been decided that at this tourist season a short article on the S.Y. *Viking* and its cruises in Norway would be of interest news came to hand that the vessel was destined for service of an entirely different nature—such are the fortunes of war—and the *Viking*, which was in readiness to make the beautiful trip through the country of the Fjords under ideal holiday conditions, has now been chartered by the American community to carry some of the stranded visitors in London back to the States. It is a good move on the part of our unfortunate visitors, for both as regards safety and comfort the *Viking* is a first-class vessel. It has a displacement of over 8,500 tons, its length over all is 455 feet, with a beam of 50 feet. The vessel has been fitted with a Marconi 5-k.w. wireless apparatus and arrangements have been made on board whereby passengers can, if they like, transmit any message to shore or, if occasion should arise, they can get in touch with the *Viking* central office in London and have their messages posted to their friends in London. As is the case with the majority of passenger vessels equipped with wireless, a daily bulletin of news is available. In the present instance this is a most important consideration, for the suspense of any who have been subject to the ordeal of the last few days and who, as far as private citizens can, know only too well the meaning of international strife, would otherwise be intolerable. No space is here available to give a complete description of the engines and machinery in use on the *Viking*—sufficient it is to say that she is a fast runner and quite well equipped for the Atlantic voyage, and her wireless apparatus, which will keep her in touch with any passing vessel, is sufficient guarantee of a safe voyage.



The "VIKING."
This beautifully appointed Steamship of the Viking Cruising Company is fitted with a Marconi installation.

The "Columbian" Inquiry

An informal inquiry into the circumstances attending the fire which broke out on board the S.S. *Columbian*, in or near latitude 41° 30′ north, longitude 59° west, north Atlantic, on May 4th last, was opened in London on July 24th. In the course of his opening address Sir Reginald Acland, K.C., who appeared on behalf of the Board of Trade, outlined several questions that might have to be raised during the course of the inquiry. The wireless installation on the *Columbian* had a range of 180 miles in daylight and an emergency plant which was provided had a range of 130 miles. The whole of the plant was destroyed by an explosion, "but," said Sir Reginald, "it might be a matter of consideration whether, if the aerial had not been destroyed as it was, the emergency plant, being where it was, would not have rendered it impossible to communicate with any other ship." It appeared that the particular ship with which the *Columbian* had been in communication during the day, and which was not far off, did not receive the message which was sent out before the explosion began. The examination of the operators was directed, in part, to the elucidation as to how it was that the message seemed to have been sent but not received.

Mr. M. M. Burke, the senior operator on the *Columbian*, said the emergency plant was in the Marconi cabin. About midnight on May 3rd he was told by the captain to call the *Winifredian* and ask her to stand by as the ship was on fire. The *Winifredian* was bound in the same direction as the *Columbian* and he had been speaking to her earlier in the day. Judging from the strength of her signals she seemed near. He had not communicated with the *Winifredian* from 8 p.m. up to the time of leaving the watch at 2 a.m. the following morning. About 9 p.m. he had been in communication with the *Oceanic*, whose signals were very clear.

Just after calling the *Winifredian* he had tuned his instrument up to the Cape Cod wave. Between 8 o'clock and the time of the fire he had kept on the ship's wave. He was inside the Marconi cabin when the explosion took place in the engine room; the side of the cabin joining the engine room was partly blown in and the wireless receiving gear, which was fixed up on that side of the cabin, was thrown on to the floor. The whole of the side of the cabin adjoining the engine room was destroyed. He got out of the cabin and met the captain on deck, who asked him: "What about the wireless?" and his reply was that the aerial was blown away. He asked the captain whether there was time to rig up another aerial, but was told that there was not, and that it would be better for him to get into a boat. He stood by while a boat was lowered, and when the last boat—the captain's boat—was put into the water he got into it too.

Mr. James Drohan, the second operator of the *Columbian*, said that his senior called him at midnight and told him to get up as the ship was on fire. He dressed quickly and stood near Burke while the latter was working. He heard him call the *Winifredian* and was then told to go outside the cabin and see if the aerial was all right. Burke was sending out messages about the *Columbian* being on fire when the explosion happened. The first thing that he saw was that the communication chart hanging on the back of the cabin had crumpled up and fallen; then some of the instruments attached to that part of the cabin fell in too.

Mr. G. E. Turnbull, assistant manager to the Marconi Company, said in his evidence that the *Columbian* was classified as a first-class ship because she carried two first-class operators, but she was not obliged to be fitted with wireless at all. However, her owners decided to fit her with wireless, and having agreed with the Marconi Company that it was best to have two first-class operators she was listed as such at the General Post Office. The distinction between a first and second-class ship was that the former was required to keep continuous watch. It was pointed out to Mr. Turnbull that Mr. Burke changed his wave length when he got no answer from the *Winifredian*, and changed it so that he could hear

the station (Cape Cod), which was sending out Press messages. That, said witness, was a very good thing for the operator to do. It only occupied a second or two, and thereby tested his receiving apparatus, which would convince him that his receiving gear was in good working order. He switched back immediately, a task which could be performed with certainty in about two seconds. Mr. Turnbull stated that since the Marconi Company heard of the loss of the *Columbian* they were naturally interested to see to what extent the wireless service had been of use, and they appointed one of their officers to examine all the telegraphic returns which came from the ships and to report his findings. The first thing the company really had to do was to find out, as far as they could, what ships were within speaking range of the *Columbian*. They started out on this basis; that the *Columbian* having an effective range of 180 miles, they should select all such ships as would be within 200 miles of her. This narrowed down to about four ships, the *Oceanic*, the *Winifredian*, the *Armenian* and the *Vaderland*. It was difficult to ascertain exactly, or even fairly approximately, the positions of these steamships, and the only systematic thing to do was to examine the telegraphic records of these ships for the two or three days preceding May 3rd to see when telegrams had been exchanged between the different commanders notifying their relative positions and verifying, as far as possible, the difference between the ship's time and the New York time. It finally came down to this, that the *Winifredian* was approximately 25 miles away, the *Oceanic* 110 miles away, the *Armenian* 120 miles, and the *Vaderland* 165. The problem then was that the operator of the *Columbian* had issued a call, and the operator of the *Winifredian*, 25 miles away, had not received it. Examination of the different logs of the various steamers had shown that the *Oceanic*, during that time, was receiving Press messages, and the *Winifredian* was talking to the *Armenian* and the *Quernmore*—he could not say the time exactly, but it would be about midnight. Sable Island records showed that at 10.50 p.m. the station heard shipping remark "Hurry up K K K, we are on fire," but owing to atmospherics it was unable to get the ship's call. 10.50 p.m. American time was about midnight ship's time, which showed that the transmission was correct. The *Columbian* was then about 205 miles distant from Sable Island. The log of the Sable Island station confirmed that the *Winifredian* was working some other station at the time the *Columbian* sent out its call, so that the inference to be drawn was that, at the moment the *Columbian* sent out its call, the *Winifredian* sent out its call to the *Armenian* or to the *Quernmore*.

Captain McDonald had remarked that he did not immediately instruct the operator to send out the S.O.S., but by the time it was necessary to do so the operating room had been blown away. Asked whether the sending of the S.O.S. would have helped matters, Mr. Turnbull replied: "If the *Winifredian* had been working the *Armenian* or the *Quernmore* as we suppose, and as seems to be proved by Sable Island, the possibility is that the S.O.S. might have been jumbled up too; but the S.O.S. is such a distinguishing call. It is like a fire bell going down the Strand; you must pay attention to it, and all operators are so much on the *qui vive* for S.O.S. that I hardly think it could have escaped notice; but I cannot say it would, because of the stations working. The International Convention foresees the possibility of a call not being answered by having provided that, if a call is sent out three consecutive times and not replied to, that station calling shall cease for a quarter of an hour in order not to interfere with other correspondence. You may say, as a rule, a wireless call at sea is replied to immediately, but if the station called happens to be working on the limits of its range with another station both stations have to be very attentive to themselves, and may be so attentive to themselves that they may not be able to catch the S.O.S. that was going. The trouble of it is that these stations are movable. If they were all fixed and maintained a constant strength there would not be any difficulty whatever." After the fire the *Seydlitz* notified Sable Island that she had sighted a burning hulk. The land station sent a message to the Agent of Marine and Fisheries in Halifax and to all other ships within range, with the result that the *Franconia* heard it and was able to alter her course and pick up one of the *Columbian's* boats.

D

Wireless Telegraph Patents

Judgment in Marconi v. Helsby Action

JUDGMENT was delivered on July 24th in the action brought by Commendatore G. Marconi and Marconi's Wireless Telegraph Co., Ltd., against the Helsby Wireless Telegraph Co., Ltd., for infringement of Patent 7777 of 1900 by the installation of wireless apparatus on board four London and North-Western Railway steamers. The action came on for trial on June 24th in the Chancery Division, before Mr. Justice Eve, with Professor Bertram Hopkinson, F.R.S., sitting as assessor at the request of the defendants. After a hearing extending over several days Mr. Justice Eve delivered the following judgment :—

This action was commenced on October 18th, 1912. At that date, and down to their expiry on the 25th day of April last, the plaintiffs were the owners of Letters Patent No. 7777 of 1900 for an invention of "improvements in apparatus for wireless telegraphy." They allege that the defendants infringed the said letters patent in 1911 by the construction and installation of an apparatus on board four steamships belonging to the London and North-Western Railway Company. The defendants deny that they have infringed; and they allege that the letters patent are invalid by reason of certain prior publications; and on these two issues the case has been tried.

The area of conflict has been considerably curtailed, and the points in conflict greatly reduced, by the fact that in 1911 the letters patent upon which the plaintiffs are suing were construed; and many of the objections raised by the defendants in their pleadings here were dealt with by Lord Parker (then Mr. Justice Parker) in an action brought by the plaintiffs against other defendants. The apparatus used by the defendants in that action was held to be an infringement of the plaintiffs' patent, and it is admitted that the apparatus complained of in this action is for electrical purposes identical with the apparatus so held to be an infringement, except for the introduction into the primary circuit of two additional spark gaps and a through charging coil—but as the presence of the coil is consequent on the introduction of the two spark gaps, there is nothing substantial in that. (See Questions and Answers Nos. 2457 to 2461.)

The short point, therefore, on the issue of infringement which I have to decide is whether, by the introduction of the two spark gaps, the defendants have produced an apparatus which does not come within the scope of the plaintiffs' patent. The object of the two additional spark gaps is the reduction of the length of the primary wave train; and that they do bring about some reduction is, in my opinion, established by the evidence. Indeed, that such is the case is not disputed by the plaintiffs; it is mainly a question of degree. The defendants put forward and rely on the exhibit J.S. 9 as demonstrating diagrammatically the reduced length of the primary wave train consequent on the introduction of the spark gaps; and they insist that optical experiments go to confirm the accuracy of the photographic material which forms the basis of that diagram. In estimating the credibility to be attached to J.S. 9—that is to say, in considering how nearly it approaches to an exact representation of facts—one has to give weight not only to the obvious physical difficulties of accurately reproducing by photography phenomena, the duration of the existence of which is measured by millionths of a second, and the agencies employed in the reproduction—that is to say, such things as the sensitiveness of the photographic plate, and the actinic value of the metal constituting the spark gaps, but also the following facts admitted or proved in the course of the trial: (1) That the defendants' installation works satisfactorily over the requisite distances; (2) that it is not wasteful of energy; (3) that the coupling of the two circuits is a loose one in the neighbourhood of 2 per cent., and certainly not exceeding 5 per cent.; (4) that with loose coupling the transfer of energy must be in small doses, something like 3 per cent. per oscillation; and (5) that substantially the whole of the energy in the primary has been in fact transferred to the secondary in the defendants' apparatus when the primary has ceased to oscillate. The conclusion to which a consideration of these matters has led me is that J.S. 9 cannot be accepted as quantitatively reliable. The alternative of accepting it as accurate leaves one face to face with more than one problem, to which I cannot find a satisfactory answer in the defendants' evidence. For example: (1) How can a large proportion of the energy be transferred from primary to secondary in $3\frac{1}{2}$ oscillations with a coupling of less than 5 per cent.? (2) If only that percentage of the energy which corresponds to this coupling is transferred, how can the defendants' apparatus be either efficient or non-wasteful? and (3) If the whole of the energy is not transferred, what becomes of it? But as I have already stated, I am satisfied that the presence of the spark gaps does substantially reduce the length of the primary wave train; and that after the primary has ceased oscillating the secondary continues to oscillate for a number of periods, and to radiate the pure wave of the aerial. The defendants claim that the result of this is to improve the working of the installation, in that the cutting off or shutting down of the primary eliminates what has been called the double

humped curve produced when surplus energy is returned from the secondary to the primary, as it can be when the primary is persistently oscillating while the secondary is radiating.

I think this may be the case; but I do not think it affects the real question which I have to answer. I think that question may be thus stated: Is it an essential feature of Marconi's invention that the primary should oscillate so that as energy is radiated by the aerial the primary will persistently replenish the secondary with at least an equivalent amount of energy, and thereby maintain the radiating secondary? I do not think it is. In both the plaintiffs' and the defendants' installations the primary oscillations die down before the secondary oscillations are finished; and in this sense the question resolves itself into one of degree, dependent largely on the character of the radiation employed. With a good radiator radiating in a single swing, a very large percentage of the energy transferred, the oscillations of the secondary must die down very quickly after those of the primary have died down; and in such an installation the primary may well be said not only to build up oscillations in the secondary, but thereafter to maintain them, and to be in the true sense the reservoir on which the secondary is persistently drawing for energy to replace that which is being contemporaneously radiated.

But with radiators of, what I may perhaps call, more conservative capacities, the necessity for persistent maintenance is proportionately reduced; and although when such radiators are employed the function of the primary is perhaps rather to build up than to maintain the secondary oscillations, it nevertheless does in fact both build them up and maintain them.

The defendants rely greatly on those passages in Lord Parker's judgment wherein they claim that he expressly treats the maintenance of the secondary oscillations by the persistent primary oscillations as of the essence of the invention; but these passages must be read in relation to the particular infringement with which the Court was then dealing; and in my opinion they are not equivalent to a construction of the patent which would have precluded the patentee from claiming protection for installations embodying radiators in which the oscillations could be built up and maintained without the necessity of keeping the primary persistently oscillating.

I think, notwithstanding the great ability which has been displayed in endeavouring to lead me to a different conclusion, that the defendants have in substance appropriated the invention described in the plaintiffs' letters patent, and that in the construction of their apparatus they have only introduced such modifications as are within Marconi's specification and covered by his claim. I hold, therefore, that their apparatus was an infringement of the plaintiffs' patent.

This conclusion disposes of the defendants' suggestion that their apparatus is Fig. 4 of Lodge's specification of 1897; but with regard to that figure, and the working of the apparatus there depicted, I am advised by the assessor—whose valuable assistance throughout I take this opportunity of acknowledging—that Mr. Swinburne's evidence (illustrated in J.S. 16) is to be preferred to that of Dr. Erskine Murray. It is possible that Lodge made an invention when he suggested, in connection with Fig. 4, that he would charge the aerial, and would then cut it off from the charging agent as rapidly as possible, leaving it free to swing independently; and the defendants may have taken this invention; but, even so, that does not mean that they have not also taken Marconi's invention, which relates to the nature of the charging agent, and can quite well be combined with Lodge's invention.

I do not think it is necessary to dwell at length on that part of the case which is concerned with the alleged prior publications. In my opinion, no evidence has been adduced in this case which qualifies in any way the conclusions at which Lord Parker arrived upon the question of Tesla's alleged anticipations, and which are to be found at lines 36 to 49 on page 213 of 28 Reports of Patent Cases. Nor, as a matter of construction, do I think that the passage on page 45 of the documents referred to in the Particulars of Objections, where the use by Ducretet of the Oudin resonator is dealt with, refers to anything else than a user for the purpose of tuning transmitter and receiver; and, as Dr. Erskine Murray admits, the passage on page 51 covers the same ground only. His evidence on this alleged anticipation is well summed up on page 243 of the Notes, where, at Question 2947, he is asked: "Aye or No. Do you suggest this taught the world the Marconi invention." And he replies: "I say it might teach the world—but there is always the teacher and the taught." That is not the sort of evidence on which I should be justified in holding that these passages relied on by the defendants disclose an anticipation; and I decline so to do.

In my opinion, the plaintiffs are right. They are entitled to a declaration that the defendants' apparatus was, at the date of the writ, and thereafter down to April 25th last continued, an infringement of the Letters Patent No. 7777 of the year 1900; to an inquiry as to the damages sustained by them in consequence of such infringement; and to the costs of the action down to and including this judgment, to be taxed as between solicitor and client. The subsequent costs will be reserved; and there will be liberty to apply.

PATENT RECORD

(July-August, 1914).

16659. July 13th. Erforschung des Erdinnern G.m.b.H. Process for transmission of electric waves in the interior of the earth. (*Convention date, July 11th, 1913, Germany.*) (*Complete.*)

16660. Process for directly exciting a Marconi antenna. (*Convention date, July 11th, Germany.*) (*Complete.*)

16988. July 17th. Attila Pedery, Fritz Forbath and Desider Varsanyi. Wireless telegraphy systems. (*Complete.*)

17131. July 20th. Simon Kahan. Methods for producing devices consisting of substances liable to changes in their ohmic resistance under the action of light, especially electric light-sensitive preparations and the like. (*Nicolas S. Yapolsky, Russia.*) (*Provisional.*)

Marconi's Wireless Telegraph Company

Annual Meeting.

THE Seventeenth Ordinary General Meeting of Marconi's Wireless Telegraph Company, Ltd., was held at the Hotel Cecil, London, W.C., on July 21st, 1914, Commendatore G. Marconi, LL.D., D.Sc., Chairman of the Company, presiding.

The following is a report of the Chairman's speech:

I am afraid that the Report and figures before you have been somewhat disappointing to you, but, judging from some of the criticisms which I have heard and read, I do not think that the full meaning of what is said in the Report or the figures which it contains have been altogether appreciated. After the few remarks which I propose to make upon them you will regard them perhaps with a little less pessimism. But I would like to preface what I am going to say about these matters by drawing your attention to the following facts:

1. Although we have existed as a Company for quite a number of years, the wireless industry is a very young one; even now, I think I may say, it is only in its infancy.
2. Our business cannot be compared with any other; we do not trade in bales of wool or sacks of flour in which there is an almost unlimited market; our market is a somewhat limited one, and our revenue is derived from three sources:
   (1) Sales made mainly to Governments and contracts entered into with them.
   (2) Dividends from our holdings in subsidiary companies, and
   (3) Receipts from telegraph services which we conduct or in which we are interested.

With regard to the first, so long as we do a good proportion of all the business which Governments offer we cannot complain; we cannot do much in the way of creating business when the financial conditions of the world are unfavourable and every Government is aiming at reducing its expenditure by avoiding any outlay which is not immediately essential.

In the second case we can give all the assistance in our power to our subsidiary companies, but we cannot make them and do not try to induce them to pay bigger dividends than their directors think prudent. These companies are all subject to much the same conditions which influence our Company, and they, too, are in the course of development and expansion. They take time to build up; as they improve so do our revenues.

Thirdly, the telegraph service; we do a great deal of work, and last year we did a great deal of work from which the profits are to be derived in the future. (Hear, hear.)

Principal Source of Revenue

We have more than once expressed to you our opinion that the principal revenue to be derived from Wireless lies in the creation and working of telegraph services. And we have told you that the policy of the Company was to build telegraph stations as far as possible for our own account under concessions or licenses, and in cases where these could not be obtained we would build them for others, we remaining interested in one form or another in the receipts. Whichever of these courses is adopted the stations have to be built and the telegraph services created, and both take time. Neither produce profits during the course of construction or creation, but they will, we trust, insure to us sure and regular revenues in the future. To this we attach the greatest importance; but we recognise that our profits may vary considerably according to demand as regards that section of our business which relates to contracts and sales; but when we shall have reached the stage of developed telegraph services at which we aim, we hope to be quite independent of the contract and sales section as regards profits, without neglecting that part of our business.

In the meantime it must be recognised that a considerable proportion of our work does not give us any immediate profit unless we elected to sell outright or in substantial part. But that is not our policy. We prefer to build up a sound future even though we have an occasional year with a Profit and Loss Account less favourable than we would all like to see it.

As an example of what I mean, we have been engaged during the past year in the construction of our Welsh Transatlantic stations. They constitute the most important work ever carried out by the Company. We look to them, in conjunction with those constructed simultaneously in America, to produce large and regular revenues both to our Company and to the American Company, in which, of course, we participate through our large shareholding in that Company. Those stations are very nearly ready to start a direct telegraph service to New York.

The Trans-oceanic Wireless Telegraph Company, Ltd., will conduct that business. We hold all the shares in that company; we could have sold them very easily, we think, if we had wanted to, and so reimbursed the money we have expended and made a substantial profit besides. This

would have materially improved our Profit and Loss Account for last year, but it would have been bad business indeed if, as we hope, the Company will earn *yearly* and for many years to come as much as, or more in each year than, the single profit we could have derived by an outright sale.

For such reasons as these our actual profits for the year are less than they otherwise might have been, but our assets are materially improved by the addition of these securities, and at their par value, which we hope and believe they are worth, they show a substantial profit, but that profit not having been realised it is not carried to Profit and Loss Account. If we realised, or whenever we might decide to realise, whatever sum might be produced above cost becomes available for distribution and would be included in the Profit and Loss Account of the year, but not before; meantime it remains an asset and is treated in our accounts accordingly.

Shares in Associated Companies

In the Balance Sheet, the amount representing the cost of shares in associated companies and patents, which is a very important asset, increased during last year to £1,298,743 13s. 6d., which is £442,624 5s. 2d. more than appeared in the accounts of the preceding year; the par value, however, represented by that increase is £826,636 12s. 4d., and we hope and believe that the additional interests acquired are worth at least par. If they are they would represent a profit of £384,012 7s. 2d. when realised, but at present there has been no attempt to turn them into cash.

We are subjected to some criticism, and some of our shareholders would seem to be dissatisfied because we do not again set out particulars of shares in associated companies. I can assure you that your directors themselves regret to have had to come to that decision, and in doing so it was not that they had any wish to keep information from you, but solely because they are all convinced it is not in your interests that the information should be made public.

There are few, if any, important holding companies which publish such information, and we are not creating any precedent in adopting the course we do. We are merely doing what others do, and they no doubt have the same reasons.

Much the same remarks apply in the Profit and Loss Account under the item "By Balance of Contracts, Sales and Trading Account."

We do not give more information respecting that item because we are satisfied it would be against your interests to do so, and for no other reason.

With superior knowledge of the Company's affairs, that is our opinion and that is our advice. Your directors have no personal interests to serve and no desire to keep anything from you, and if, notwithstanding our advice, a majority of the shareholders wish all the details under both or either of these heads published it shall be done in the future. (Hear, hear.)

But we recommend reflection before you take such a decision.

I can, however, inform you that the list published last year is practically unchanged. We have not sold any of our shares, and I would like it known that we never deal in the market in any shares in any of our subsidiary companies. We have never bought any such shares, and, except on some few occasions when we have received advantageous offers for blocks of shares which we have considered it wise to accept, we have had no transactions of any kind.

I make this statement because I frequently hear it stated that the Company is buying or selling, as the case may be, in the market, which accounts for the rise or fall in shares. Whenever you hear such statements as these you can deny them with my authority—for I repeat the Company never deals in any of its shares in any way whatsoever other than that which I have described. (Hear, hear.)

Having decided we ought not to publish the particulars of our holdings, it did seem to us important that you should have some idea as to whether the value of our shares, representing so important an item in the balance sheet, were worth their cost at which they were taken into account.

We therefore proceeded to make a careful valuation of them, taking the price at June 30th last for all the shares quoted on the Stock Exchange, and on that day the prices were perhaps lower than they have ever been before, and forming our best judgment upon those unquoted, and we have told you that that valuation exceeds the amount at which it stands in the accounts, and according to our valuation the amount in excess is considerable.

If our shares are worth the figure at which the shareholdings and patents together stand in the balance sheet, our patents are not represented by any sum whatsoever.

Turning to other figures in the balance sheet of this year, I think you must agree the comparison is a favourable one. Sundry debtors showed an increase of £115,000. Stock at cost was nearly doubled, namely £151,141, as compared with £81,206, which is an indication of increased business in hand. When all these things are taken into consideration, although the actual realised profit for the year is disappointing, I think you will agree that the results of the year as a whole are good and the Company's position shows a marked improvement.

The Balance Sheet

Reverting for a moment to the profits for the year and the recommendation of a final dividend of 10 per cent., I would like to explain to you the reason why the directors recommend this distribution.

At the end of 1912 a sum of £146,726 5s. 11d. was carried forward, after placing £100,000 to General Reserve Account. The object of carrying forward so large an amount instead of distributing it was admittedly for the purpose of averaging dividends. In those circumstances your directors were of opinion that unless they could say that it was essential at this moment for the purpose of the Company's business that they should refrain from distributing the profits earned, the shareholders would have just cause of complaint if the directors did not use a part of the monies earned in the previous year for the purpose of averaging for which it was carried forward.

In September, 1913, a circular was issued informing you of an arrangement which had been made for the acquisition by this Company of the

majority of the shares of the Compagnie Universelle de Telegraphie et de Telephonie sans Fil of France, which Company not only commanded a valuable influence in certain foreign countries, but also owned the world-wide rights, other than those of Germany, of Professor Goldschmidt's inventions, including his high frequency alternator, and in order to fulfil the Company's programme we issued 250,000 new shares at the price of £3 5s., which was below the market value at the time, and at this price we were able to get the whole issue guaranteed. We did contemplate that the profit and loss account for the year would have shown a bigger realised profit, and we certainly did not expect to see our shares depreciate on the market as they have done lately, but for these fluctuations we are no more responsible to-day than we were some time back when movements were in the other direction.

I think I have now dealt fully with all matters concerning the report and accounts, and will refer to some of the more important work we have now in hand. Speaking in a general way our business has suffered, and our whole programme has become somewhat dislocated and retarded by the non-ratification of the contract we entered into with the Government in March, 1912. A long-drawn-out Parliamentary Committee followed, and a hearing and world-wide publication given to any witness who had something to say against our Company and in favour of other systems and foreign interests; and notwithstanding our applications to be heard and the promises given to us that we should be given an opportunity to reply fully upon all matters before the Committee closed, our managing director was never heard at all upon anything which related to the merits of the contract.

Work in Hand

And when a contract was eventually ratified, the construction of the Imperial stations, as we have told you, has not progressed at the rate we had hoped and expected. We had every reason to believe that we should have been allowed to get to work on all the six stations simultaneously and had made all our preparations accordingly.

We also expected to erect them with all speed possible, and contemplated that the whole might have been completed within eighteen months of the ratification of the agreement, which is what is contemplated in the contract.

Besides being occasioned a great deal of additional expense, we are affected in other ways, not the least important of which is the non-receipt of our royalties and the effect the delay has upon our royalty period. These are matters which are receiving the most serious consideration of the Board.

I observe that the Postmaster-General has stated that some delay has been caused by reason of our suggesting an improvement. I cannot admit that there was any reason whatsoever for delay on this account. Approval could and should have been given, in my opinion, within forty-eight hours. If the erection of the stations is delayed a few more years there might be more improvements suggested, but we must not be told on that account that we are responsible for delay. I cannot say more on this subject at this moment.

I have referred already to the new Transatlantic stations. We hope to have these opened very soon now; the stations would have been completed ere this but for some imperfections in manufacture of material which are being remedied.

When this new means of direct communication with New York is established, we think the true value of wireless telegraphy will be recognised, and so also the profits to be derived from it.

Another important telegraph service about to be started is that between this country and Spain and the Canary Islands, which will, of course, also embrace a service to and from Spain and the Canary Islands and the United States of America and Canada. This service should make a material difference to the Spanish Company, in which we are largely interested.

By reason of legal and other proceedings our managing director was prevented from visiting America and Canada, as was his intention ever since the beginning of last year, and the progress of our companies in both countries has been hindered in consequence. It was responsible for the delay in the appointment of a manager in New York and for matters equally important as regards Canada. It is hoped that his visit may not have to be much longer deferred.

We continue to maintain good relations with a number of foreign countries, for whom we are engaged in carrying out important contracts, and our works are kept well occupied.

Early this year our 7777 patent expired in this country, but we own nevertheless a number of very important patents, and to these we added very considerably during the last year; some of these new patents may, and we think will, prove to be of very great value indeed. Shareholders probably know, but I wish to emphasise the fact, that at the present time whatever new patents the Company becomes possessed of, if they are my inventions or those of members of the staff, they do not cost the Company anything at all beyond the expense of our research department and the cost of the fees for the patents themselves.

One of the branches of our work which has made great progress during recent times is that of wireless telephony. I was enabled, with the valuable assistance afforded me by the Italian Government, to carry out some very important experiments and tests, which have assisted materially in our being now able to produce a practical standard set for wireless telephony over moderate distances. This is a first tangible step, and will lead to further developments.

Wireless Telephony Progress

I am now occupied in making the necessary arrangements to carry out tests between this country and America, from which I hope to get some practical results before the end of the year.

This is a new branch of our work which should be productive of a new and additional source of revenue, not only to the parent Company, but to all the subsidiaries who, at present, have the advantage of all our inventions and work.

I must now deal with a matter which affects you and the whole Board—a matter, too, which reflects more particularly upon the honour of your managing director. Unhappily I am not at liberty without risking the charge that I am showing a want of respect to the Court to speak with that freedom

which I desire, and it is for that reason that I can only tell you in language which must necessarily be somewhat guarded about the action which Mr. Locker-Lampson, a Member of Parliament, and a Mr. P. E. Wright have instituted against the Board of this Company and other persons. So far as the Board other than the managing director are concerned the claim is of comparatively small importance. It depends upon what may fairly be regarded as technicalities which can have but comparatively small interest for you. But with regard to your managing director a very different charge is made. It is alleged against him that he has been a party to frauds upon your Company with the object and result of putting large sums into his own pocket. Defences have been delivered, and these, I need hardly tell you, contain a categorical denial of all the charges. (Hear, hear.)

I may add a word as to the interest in your Company of the two gentlemen who are bringing this action and preferring these charges.

Mr. Lampson at the commencement of the proceedings was the registered holder of two shares, one Preference and one Ordinary. A few weeks afterwards he tempted fortune by acquiring a further twenty shares, and is thus to-day the holder of twenty-two shares. (A laugh.)

Mr. Wright is the registered holder of one share only. He was not, as a matter of fact, registered in respect of this cherished possession until after the writ was issued.

But seriously, gentlemen, the fact remains that these two gentlemen have a combined interest of twenty-three shares in the capital of this great Company, which, as you know, is a million and a-half sterling. Possibly they are merely stalking horses for gentlemen with larger interests but less courage—gentlemen who, for reasons at which you may guess, preferring discretion to valour, remain in obscurity. I am told that Mr. Locker-Lampson and Mr. Wright have been and are industriously busying themselves in an endeavour to obtain the support of other shareholders. To what extent if at all their efforts have been successful is a point upon which I desire complete enlightenment, and my method of obtaining it is by retiring from the Board and offering myself for re-election. Your managing director will do the same. It is not my turn to retire, and as for the managing director, he has waived his privileges, for he is never under an obligation to retire.

I ought to mention that the plaintiffs, through their counsel, have openly declared in the Courts that expense in this action is not a matter of any consequence. Your Board entirely dissent from this view. But what more nearly concerns the Board and you is the inevitable dislocation and interruption of the steady work of the Company which must result when its officers are compelled to employ so considerable a part of their time and energies in resisting legal proceedings. The damage to your interests by the continuance of the proceedings by no means rests here, for the seeds of suspicion which have been sown bear fruit not only in this country but throughout the civilised globe. An opportunity is thus afforded to those who are antagonistic to your company of damaging its reputation and prestige with its chief customers—the various Governments of the world.

Gentlemen, I have now dealt with this action in relation to yourselves. I now propose to touch on a different aspect—its relation to the managing director and myself.

Wireless Telegraphy a British Industry

It will be within the recollection of many of you that when your managing director came to this company its affairs were far from satisfactory and its chances of reaching a dividend-paying stage seemed remote. It is, I hope, hardly necessary for me to remind you of the great results which your managing director has achieved for you—it is his loyal devotion which you must thank for the commercial prosperity of the company and its great industrial position in the wireless world. Mainly upon his shoulders have fallen the great and complicated problems which almost daily present themselves in a new industry. Scarcely a year ago you acknowledged his services in a worthy and generous spirit; I cannot think your feelings towards him have altered. Do not permit yourselves to be influenced by statements in the Press or by those whose interests are not your interests. Rest assured that all charges will be investigated by the Courts at the earliest moment possible—the fullest enquiry is courted, and in the meantime I recommend you in your own interest to remain staunch to those who have guided the fortunes of this company through manifold difficulties. (Hear, hear.) At this time domestic dissension is dangerous. Undisguised enmity is displayed in more than one quarter, and a united front is essential if your company is to enjoy that prosperity for which so stern a struggle is being fought.

I was also reminded that it is due to your managing director that wireless telegraphy has become an important British industry, a matter which may be vital to the whole nation. (Hear, hear.) It would otherwise have been entirely in foreign hands.

He brought this position about by the aid of foreign capital at a time when no money could be found for the purpose in this country. It is he who is responsible for the great Imperial scheme of placing all the Dominions across the seas into wireless communication with each other, and it is due to him that a British company is able to carry out this work, and that this country will possess the biggest and most powerful wireless stations in the world. Their great value may one day be put to a great practical and critical test; then perhaps there will be a true appreciation of the greatness of the work. (Hear, hear.)

Not only has our managing director turned our own work to account, but he obtained the control for this British industry of an important foreign invention, and by so doing he has given it in the face of contrary opinion the opportunity of practical development which it otherwise had very little prospect of receiving.

And, finally, allow me to say a few words about myself, an invidious enough task since it compels me to refer to my own services to the Company.

I cannot refrain from telling you how bitterly I have felt the association of my name with those political quarrels with which you are all familiar, and to all of which I am fortunately a stranger. (Hear, hear.)

Many times have I been tempted to return to Italy, where the pleasures of my native land await me, and where I can continue my scientific pursuits under ideal conditions and with the enthusiastic co-operation of the authorities, whether scientific, civil, or military, and with the full and unstinted appreciation of my countrymen, independent of any party politics or political opinions. (Hear, hear.)

I have always had large interests in Italy derived from sources wholly unconnected at any time with this company, and if I were only to consider my personal interests I should return permanently to my country to-morrow, and I can assure you that it would be to my advantage in every way to do so. ("Not for us.") I would return immediately were it not for a sense of duty and loyalty to my colleagues on this Board and the whole-hearted and sympathetic support which I have hitherto received from you all, and which I expect you will extend to me and to the managing director to-day.

I now beg to move: "That the Report of the Directors submitted, together with the annexed statement of the company's accounts at December 31st, 1913, duly audited, be received and adopted," and I will call upon Mr. Godfrey C. Isaacs to second the motion. (Applause.)

Mr. GODFREY ISAACS: Ladies and Gentlemen,—I have pleasure in seconding the motion which has just been put by our chairman. There is nothing which I can usefully add to the long and thorough statement which he has given you respecting the company's affairs. There are but a few words which I wish to say personally, and which concern me personally, and which I may venture to say to some extent also concern you. I do not want to refer too much to the time, to the work, and to the energy which I have devoted to the company's affairs ever since I joined it. The chairman has told you something of the position in which I found the affairs of the company when I came to it, and I have done my very utmost, independently of my own interests, to further the interests of your company. I am aware, ladies and gentlemen, that when I joined the company the shares of the company were practically unsaleable at a price somewhere in the neighbourhood of 10s. or 12s., and no dividend had ever been paid upon them. I am aware that we had then a big body of shareholders who enthusiastically cheered me in the work which I was then doing, and their shares, of course, with the development of the company's business, improved materially in value—improved so excessively, I may say, through no fault of anyone associated with the company—that a very large number of our original shareholders—perhaps the greatest number who were then on our register—sold their shares, and others took their places. And those others took their place at a very high price, and I am consequently perhaps in a somewhat unfavourable position to-day, because I am probably in front of a large body of shareholders who, unfortunately, have bought shares at high prices and who are consequently facing a position of loss instead of the position in which I should have liked to see them of a body of shareholders who were shareholders at the time I joined the company, and whose property had been materially increased in value in consequence of the work which I have done. I think, ladies and gentlemen, you will all appreciate that there is a changed position in so far as the managing director of this company is concerned, and one which is not of small importance to himself. As regards the remarks which the chairman has made with regard to the action which is pending against the company, he has referred to me in terms loyal and appreciative, of which I am deeply sensible. I have decided, and I think that you will all agree that that is a proper course to take in view of the extraordinarily false rumours which are constantly circulated, and the poisoned atmosphere with which I have been recently surrounded—that it behoves me to continue in this company only provided that I have the complete confidence of the shareholders for whom I am working. (Hear, hear.) Unless, ladies and gentlemen, I were perfectly confident that I did carry their complete confidence, I assure you that it would be utterly impossible for a man in my position to carry out efficiently the work which has to be done, and I equally assure you that unless I have that confidence I have not the smallest desire to continue to conduct your work for you. For that reason, ladies and gentlemen, I tender my resignation. I waive all my privileges as managing director, and I leave it to you to say whether it is your wish or not that I shall continue to direct your affairs. (Applause.)

The Position of the Company

THE CHAIRMAN then invited questions.

MR. STUART COLE moved an amendment adjourning the consideration of the Report and Accounts "until a proper and detailed Balance Sheet and Trading and Profit and Loss Account are submitted to the shareholders." His reasons, he continued, for proposing the amendment were the lack of detail in the accounts and the lack of candour shown by the directors in their Report. The shareholders wanted to be assured that their dividends would be regular and payable out of commercial trading profits and not out of the profits of sporadic company promotion. He asked the chairman to state the exact fees and emoluments received by each director from the company and its subsidiaries and what had been the dealings and profits of the directors in the shares of this company and its subsidiaries since 1910. In whose hands were the shares referred to in the Auditors' certificate, and what security did the company hold for the good faith of those who held them? Why were not all the certificates in the possession of the company? The company possessed wonderful patents, but to be successful it must have good management.

The amendment was not seconded.

The managing director asked if Mr. Cole would hand up a list of the questions which he had put. He found that Mr. Cole registered five Bearer shares in the company on Saturday. ("Oh, oh!" and a voice: "It's a dirty trick.")

MR. COLE said he was unaware that it was necessary to register all one's Bearer shares on coming to a meeting.

MR. JOHN WEBB, who said he held 300 shares, remarked that after the very candid statements they had heard from the chairman, he considered it very foolish for the shareholders to find fault with the directors.

MR. HARVEY BRAIN inquired whether the American Company's Balance Sheet was correct in saying that the call of 5s. per share due by the English company to the American company on 119,000 shares had not been paid; if not, when was it going to be paid? Having referred to the advance in the price of the company's shares in 1912 to £10 each and pointed out that they were now about £2, he remarked that what was wanted was not a sudden rise and then a sudden fall in their shares, but steady and continuous progress in their business.

Mr. ARNOLD STATHAM strongly deprecated the attack which had been made on the directors, and expressed his conviction—which he maintained would be held by every fair-minded man—that they had no reason to doubt the supreme integrity of Mr. Godfrey Isaacs. All that they had heard from some of the previous speakers simply meant a conspiracy to bolster up the actions to which reference had been made—actions which, he contended, had been brought about for ulterior and improper motives. After referring to the chairman's great invention, he urged the shareholders "to stand by their commander-in-chief and his aide-de-camp."

Other shareholders having spoken, the chairman said that he would ask the managing director to reply to the questions, as Mr. Godfrey Isaacs was much more in touch with the business side of the company than he himself was. At the same time, he must say that he greatly regretted that so much matter foreign to the company had been introduced into the remarks of some of the speakers.

Mr. GODFREY ISAACS (Managing Director), who was received with applause said: One gentleman has asked a very pertinent question which I think it would be fair to answer and which I think I rather like having the opportunity of being able to answer. He said he would like to know how much money the managing director has made out of the buying and selling of shares. Now, ladies and gentlemen, let me tell you that when I joined this company, and having confidence in what I might be able to do with it, I did not hesitate to buy as many shares in the company at that time as I could afford, and I bought them with the intention of holding them so long as I should be associated with the company. I did hold them. I saw them go to the price of £9 15s., which I deplored, but I did not sell one of those shares. (Applause.) I should have held the whole of those shares to-day had it not been that it was made quite clear to me by what was then taking place that I was laying myself open to all sorts of suggestions—sinister suggestions—by being largely interested in the company. Therefore, when the market fell, and when it had fallen in the autumn of 1912, I determined not to have the large holding in the company so it could not again be suggested that my interests were in any way swayed by my personal holding, and I therefore then sold my shares. I think it was somewhere in the neighbourhood of £4, and I have never bought or sold a share in that company or in any other from that day to this. (Applause.) Mr. Cole asked for some information with regard to the premium account. There is an item of commission paid for the underwriting of the new capital which was issued last year which has been debited, as has always been our custom to debit those commissions, to premium account. The deficiency he sees is the premium which we announced in our circular when we informed you that we were issuing that capital, that it had been guaranteed, and that a commission was being paid, and we told you what that commission was. As regards company promotions, we have made no money out of company promotions whatsoever. All these things, gentlemen, are merely that class of rumour which is put about to damage the company when there are certain individuals who desire to damage it. They are passed from one to another and they very soon assume an importance which they really never had because they never had an atom of foundation behind them. (Hear, hear.) With regard to the question put by Mr. Harvey Brain *re* the American shares, it is perfectly true that we had, according to the American balance sheet, 119,000 shares which stood to our debit in their balance sheet at the end of 1913; but, ladies and gentlemen, although it was a perfectly correct entry in the American company's balance sheet it was not quite a representation of the fact, because we had a large sum to our credit in the American company. The two accounts had not at that time been squared, but if they had been that item of 119,000 shares would not have appeared to our debit. (Hear, hear.) As regards the reference to a circular which it was alleged I issued, and which contained improper or misleading information, let me tell you that no circular is issued by the managing director of the Marconi Company. Whenever a circular is issued it is issued by the company with the full accord of the whole Board, and I do not know why any individual circular is attempted to be put upon my shoulders. In any case that circular expresses what we believed to be the plain truth, and all that it was thought desirable to tell our shareholders, and we hold that opinion to-day. There was nothing in the circular which was in any sense misleading. As regards the auditors' report, Mr. Pears, of Messrs. Cooper Brothers & Co., is here, and I propose to leave him to answer the questions which have been raised. With regard to the progress of the six months in regard to which Mr. Eves asked, and his references to the Chinese contract, I will say this: It is never our habit, and for reasons which I am perfectly sure you will all appreciate, to make any reference to any business which is in course of negotiation. Unfortunately, and by some means which I have never been able to fathom, a good deal of information got into the Press respecting the Chinese contract which we are negotiating. I was immediately asked whether there was any truth in that statement, and I was bound at once to say that there was truth in the statement that there were negotiations, but that there was no truth in the statement that the contract had been actually signed. I informed the Press, as I felt bound to do in the circumstances, that contracts had been sent forward to Pekin, and that they might be signed at any moment so far as I knew, but I had no news that they had been actually signed. Since that time, unfortunately, these and other statements which were incorrect—statements which were

Reply to Critics

Negotiations in China

alleged to have been made by our chairman—went to Pekin and appeared in the Pekin papers, and in consequence thereof there were some possibilities of damaging the negotiations which were then pending, and for reasons which it would not do for me to explain in detail we felt it was necessary to make some official statement to the Press. That statement we made, and I should think most of you have seen it. It was to this effect: that we are in negotiation with the Chinese Government and that we have received an official letter agreeing to authorise the Marconi Company to make an issue of Five per Cent. Gold Bonds to the value of £2,000,000 for the erection of a number of wireless stations for internal and external communication in China, and in that service the company is to be interested to the extent of 15 per cent. of the gross receipts. That contract, gentlemen, has not yet, so far as I know, been signed by the Chinese Government, but we have every hope and belief that it will be. It is premature to be obliged to speak of it; it may even be to some extent troublesome to our negotiations that it has been made public, but in the circumstances it is best to give you the facts as they are and leave you to judge. There are other negotiations pending which are also very important, but I must ask you not to press me to give you any information until the moment is ripe for doing so. I have already told you on many occasions that directly there is anything of any importance which our shareholders ought to know it will be immediately published in the Press, and you will be at once given all the information by circular. We cannot do more than that. I have also always told you that if any shareholder at any time desires any information or has any doubt upon any question whatsoever with regard to the conduct of the business or anything else that affects him, I invite him to come and see anybody he likes and he will get all the information he can possibly require. I believe all those shareholders who have taken the trouble to come to the office, and who have had the opportunity of making the acquaintance of their managing director, do not carry away the opinions which have been expressed by some of those who are here to-day. I should like to go one step further and say that there is no person with whom your managing director has ever had any business throughout the whole thirty-five years during which he has worked, and that there is no person to-day who is associated with him in this immense enterprise—whether in respect of any members of the staff, of the company, or of the associated companies, or any of the people with whom he does business—I have not heard that there is a single person among them who would echo one word of the sinister suggestions and innuendoes which have been made here to-day.

MR. MARSHALL: Can the managing director tell us what the trading profit apart from the transactions in shares was in 1912 and also in 1913?

MR. GODFREY ISAACS: So far as 1913 is concerned the trading profits amounted to the whole sum which you see in the balance sheet; there has been no trading in shares. The chairman told you so in his opening speech. With regard to 1912, I cannot tell you the exact amount, but I do not hesitate to tell you what we have already told you at the end of 1912, at the meeting last year, that a very large sum was derived from the sale of a certain number of shares, very profitably. We told you so, and there was no secret about it. We had an opportunity to sell a certain number of shares very advantageously and we availed ourselves of the opportunity. We told you that it was an exceptional year in consequence, and because it was an exceptional year and because the profits had been so derived, we recommended that £100,000 should be carried to special reserve account. There is one thing more. There is a certain confusion which is likely to be created in the minds of some shareholders when we say that we derived profits from shares. I want you to understand—we took great trouble to set them out clearly in one of our preceding reports—that we do sometimes receive payment in shares for work which we do during a year, and in that particular year we received considerable sums in shares for work done, and during that same year we had an opportunity of selling a portion of those shares and so converting a share payment into cash payment, a very large proportion of that representing payment for work done. It is for such reasons as that that it is extremely difficult, with any accuracy at all, to divide the sums realised from shares and those derived from work done. I hope I have made that clear.

MR. MARSHALL: Quite.

THE CHAIRMAN: I now ask Mr. Pears, of the auditors, to say a word in regard to the auditors' certificate.

MR. PEARS (who was received with applause) said: I was rather surprised to hear one of the shareholders state that our certificate to these accounts was a scandal. The form of this certificate is the same as that used in previous years. My firm have been auditors of this company ever since its incorporation in 1897, and I personally have attended to the company's accounts for many years. I may say that there is no company whose accounts I have audited in which I take more interest. I do what I can on behalf of the shareholders whom we represent. The certificate has given to shareholders, in our opinion, the information which they should know. A suggestion has been made that we should see all the shares the company possesses, but it is stated distinctly that some of the shares are abroad, in various countries, and we cannot see them. There is no reason why we should see them. We have seen letters or certificates regarding them, and we are satisfied that they are properly held on behalf of this company. This is a form adopted by my firm and other accountants where similar circumstances exist.

THE CHAIRMAN: It remains for me to put the motion to the meeting in regard to the adoption of the Directors' Report and Balance Sheet.

The resolution was carried unanimously.

THE CHAIRMAN: I have now to move:—

> "That a final dividend of 10 per cent., equal to two shillings per share, less income tax, upon the 250,000 Cumulative Participating Preference Shares, be and the same is hereby declared for the year ended December 31st, 1913; that the said dividend be payable on August 31st, 1914, to the shareholders registered on the books of the company at July 21st, 1914; and to holders of share warrants to bearer.

"That a final dividend of 10 per cent., equal to two shillings per share, less income tax, upon the 750,000 Ordinary shares numbered 1 to 500,000 and 750,001 to 1,000,000, be and the same is hereby declared for the year ended December 31st, 1913; that the said dividend be payable on August 31st, 1914, to the shareholders registered on the books of the company at July 21st, 1914, and to holders of Share Warrants to Bearer."

CAPT. H. RIALL SANKEY seconded the motion, which was carried unanimously.

MR. STATHAM: I have much pleasure in moving that Mr. Marconi should be re-elected. The greatest tribute to him would be to put the resolution to you without further comment, for his merits are so well known. I recommend that you unanimously re-elect him.

MR. EVES seconded the resolution, which was carried with applause.

THE CHAIRMAN: Thank you very much.

ALDERMAN J. C. FORDE (of Cork): I have very great pleasure in proposing the re-election of Mr. Godfrey Isaacs. I think that his statement to us to-day has imparted confidence among the shareholders. Mr. Isaacs has brought this company to a great measure of success. When he started first with it the company was in a very bad financial condition, but to-day it is able to show a balance sheet with hundreds of thousands of pounds in hand.

A SHAREHOLDER: I second the motion, and I hope that these attacks will now cease.

The resolution was carried with one dissentient.

MR. GODFREY ISAACS (who was received with applause) said: Allow me to thank you for my practically unanimous re-election to this Board. You may rely upon it that I shall continue to do the work which I have endeavoured to do in the past, and to do it even more efficiently if I can in the future. I beg of you all to believe that so far as the Board is concerned, and so far as the managing director of the company is concerned, nothing whatsoever in the ordinary conduct of this business has had or should have any effect whatsoever over the fluctuations of markets. We have suffered very badly—I have suffered particularly—in consequence of fluctuations of the market, but I assure you that these fluctuations have resulted largely from excessive speculation in all parts of the world in what has proved an industry which is so attractive and so alluring and far-reaching as wireless telegraphy. It appeals not only to the home markets but to every market in every country. Everybody desires, at certain moments, when something excites him, to invest in Marconi shares, and in consequence there are times—and may be so in the future, but I hope not to the same extent—of excited speculation in the shares, which must necessarily cause them to go to a price which everybody must know is unjustified, and that whatever the success of the company the shares should not stand at such a figure.

SIR JOHN HENNIKER-HEATON: I wish to bring forward an uncontested motion. I have known Mr. Marconi for many years, and as my total dividends from this company amount to 6s. a year I am not likely to be accused of selfish motives. I desire you to join with me in a hearty, cordial vote of thanks to Mr. Marconi. To quote some well-known words, he is "the most marvellous inventor of the age." Millions of people now go to sea with a greater feeling of safety and protection. He is one of the most marvellous men in the country, and he is also noted for the fact that he could not possibly be connected with anything that is dishonourable. (Hear, hear!) I propose a hearty vote of thanks to our dear friend, Mr. Marconi. (Applause.)

ALDERMAN J. C. FORDE: I should like to second that. I am very glad that this meeting has turned out so well. There has been a little breeze but that is all over. You have presided, sir, with wonderful self-control, and a source of satisfaction is that there is no "SOS" signal going forth from this meeting. (Applause.)

The resolution was carried unanimously.

THE CHAIRMAN: I thank Sir John Henniker-Heaton for his very kind remarks. He has always taken a very great interest in my work. There is one more formal matter. I wish some shareholder would move the appointment of the auditors.

The auditors, Messrs. Cooper Bros. & Co., were unanimously re-elected.

THE CHAIRMAN: The next business is that of the Extraordinary General Meeting, the notice of which has already been read. I have to move the following extraordinary resolution:—

"That the provisions of the Memorandum of Association of the company be altered with respect to the objects of the company by the insertion of the following provision in Clause 3 of the said Memorandum and that the objects of the company be extended accordingly, that is to say: Between sub-section (*x*) and the sub-section at present lettered (*y*) the following additional sub-section—namely, '(*y*) To establish and support or to aid in the establishment and support of associations, institutions, trusts, funds or conveniences calculated to benefit employees or ex-employees of the company, or the dependents or connections of such persons, and to grant pensions and allowances, and to make payments towards insurance, and to subscribe or guarantee money for charitable or benevolent objects, or for any exhibition, or for any public, general or useful object.' And that the sub-sections of Clause 3 of the said memorandum at present lettered (*y*) and (*z*) be lettered (*z*) and (*za*) respectively."

MR. ISAACS seconded the motion, which was carried unanimously.

Replying to a request for information as to future prospects, the Charman said: The prospects of the future is a very big question. We have already touched upon the business of wireless telephony. Perhaps that will also be applicable between distant countries. Progress is continuous in every department of the transmission of messages through space, perhaps even greater progress than persons outside realise. I have a great number of assistants here who are doing very good work and with whom I am very satisfied. If I wished to go into an explanation and to forecast the future of wireless I should have to keep you a very long time, but I certainly think that the future looks as good as ever. (Applause.)

The proceedings then terminated.

YOUNG EXPERTS—Boy Scouts on a "Field Day" with their wireless.

Light Portable Wireless Apparatus

IF "patriotism is dead," as the pessimist has declared, how then is it that movements among youths and young men which can only flourish upon the existence of this instinct, added to that of manliness, are in such a healthy condition? The response by the young to undergo some form of training and organisation which will make them better and more useful citizens has contributed in no small degree to the success of the Boys' Brigade, the Church Lads' Brigade, the Boy Scouts' Association, and, among the seniors, the Cadet Corps and the Territorial Force. Those who direct the energies of all the organisations just named have realised, as have many of the individual members, that a knowledge of wireless telegraphy is an important factor of efficiency, and that such knowledge might also be turned to useful account.

But we cannot have competent operators of light portable wireless telegraph stations suitable for such organisations unless there is available sound and reliable apparatus at a price that will bring it within the range of the purses of those by whom it will be employed. The Marconi Company having encouraged the study of the principles of wireless telegraphy by the award of valuable prizes in connection with the recent examination, have gone a step further and have designed special apparatus for the Territorial Forces, Cadet Corps, the Boys' Brigade, the Church Lads' Brigade, the Boy Scouts' Association, etc.

Many a troop or company has been unable to obtain a first-class equipment on account of the expense, and has hesitated to make the heavy claim upon the generosity of its benefactors which the provision of the equipment would mean, whilst to the private individual the initial outlay has been prohibitive. This difficulty has now been overcome not only by producing an inexpensive set, but also by so designing it that it is unnecessary to purchase a complete station at the outset.

The Marconi Company have devised the apparatus with a view to enable the purchaser to procure, at first, merely the essential parts for a receiving station, so that in time a complete and in every way first-class installation can be built up. They have issued an illustrated catalogue of such parts, and everything

No. 3 Transmitting Set.

which appears therein will be found on trial to be the best that is available.

In this catalogue some particularly interesting items are illustrated. For instance, on pages 11 to 14 prices are given for sufficient apparatus to enable the beginner to set up a receiving station. For this he will require an aerial and earth, a large two-slide inductance, crystal detector, and telephones. With this combination, and using zincite-bornite or other low-resistance crystals, he will be able to receive clear signals from large stations, notably the Eiffel Tower and its time signals. If he wishes to increase the sensitiveness of his receiving instruments, he has only to turn to page 13, where he will find several items relating to this subject. Possibly, indeed probably, he will desire to purchase a potentiometer and battery. It is surprising how much the sensitiveness of even the low-resistance crystals, such as zincite-bornite, and especially zincite-tellurium, can be increased by means of a battery.

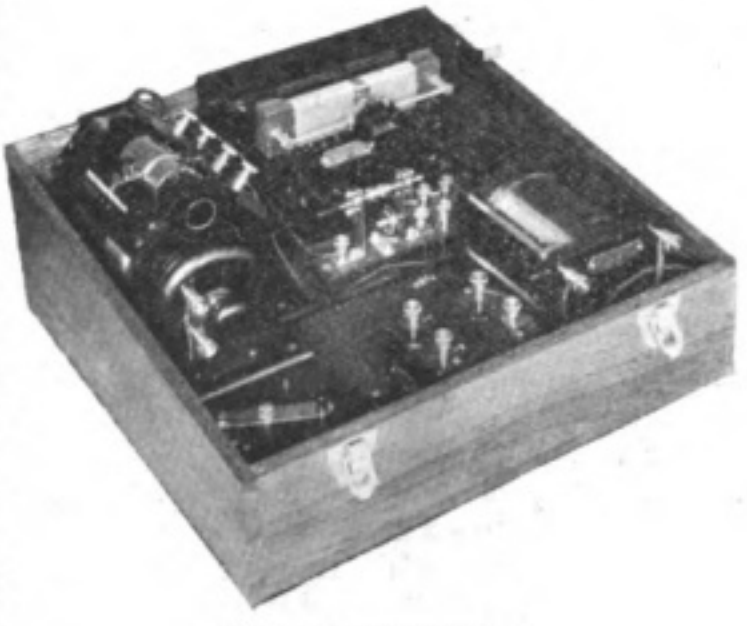
For receiving on short wave-lengths and for exceptionally sharply tuned receivers the Marconi Company have designed a special jigger which can be supplied with the secondaries wound either in two sections connected to two terminals and giving a range of about 150–650 metres, or in one section giving 1,200–3,000 metres.

There is also a convenient buzzer, which will be found to work effectively in conjunction with a tuning curve supplied with each instrument. By this means the aerial circuit can be made to oscillate and so quickly tuned to any wave-length.

Then there is an aerial-tuning condenser to enable short waves to be received on a long aerial. Another piece of apparatus which the amateur should take special note of is the telephone transformer, with which he will be able to obtain results comparing very favourably with the work of the high-resistance telephones, which are quite beyond the means of many amateurs.

A "Scout" Wireless Troup ready for marching with a complete transmitting and receiving set.

The Astronomer Royal to the Board of Visitors of the Royal Observatory, Greenwich, has just issued his annual report. In it attention is drawn to the fact that the sending of wireless time-signals has proved of great value to navigators, and is likely to be of importance in the determination of the longitude of land.



No. 3 Receiving Set.

E

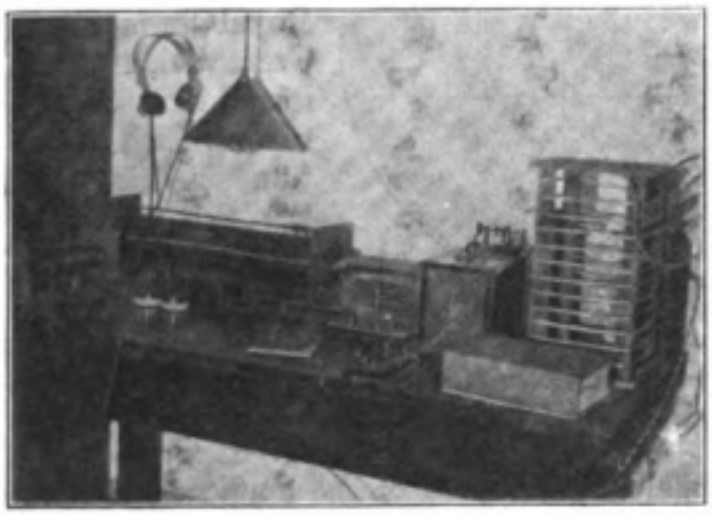
Practical Hints for Amateurs.

A Small-Power Amateur Wireless Station.

By ERIC E. HART.

THE apparatus used in the station described below is practically all home-made. The aerial consists of two parallel copper wires, No. 16 S.W.G., on spreaders 4 feet long — ordinary broom handles. The high end is 60 feet high, on a mast at the far end of the garden, and the lower end is 35 feet high, on a chimney pot. The operating room is at the lower end, and the leading-in wire comes straight down, making an inverted L aerial. The length of the aerial including the lead-in is 150 feet.

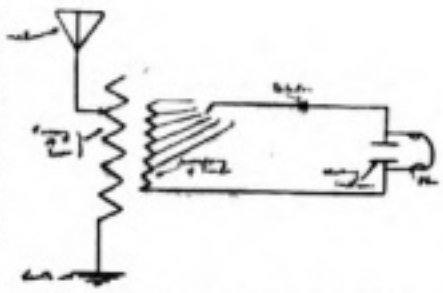
Another aerial is also fitted up, but only as an experiment. This is in the loft over the operating room; it consists of two wires (No. 14 S.W.G. aluminium), 1 foot apart and 25 feet long; these are just slung across



from one beam to another, about 25 feet from the ground. Good results have been obtained with this aerial, both in receiving and sending.

The receiving instruments consist of a loose-coupled tuner, detector, blocking condenser, and 'phones. The primary of the tuner is No. 18 S.W.G. enamelled copper wire, wound on a cardboard cylinder, 22 inches long, and 4½ inches diameter. The secondary is No. 28 S.W.G. enamelled copper wire, wound on a cylinder 15 inches long, which just slides inside the primary. It is tapped off in six sections; the tappings coming to a switch at the end of the coil.

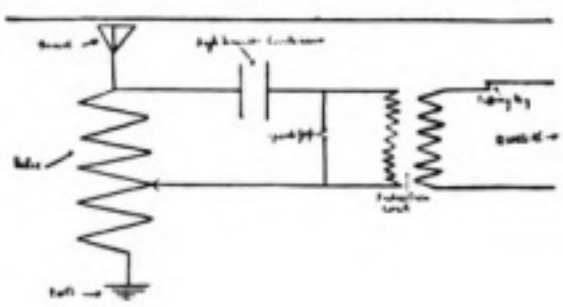
The detector is of the usual type, consisting of two brass cups, one containing a point of copper pyrites, the other a surface of zincite. Various crystals have been tried, but these two have been found to give the best results. The blocking condenser simply consists of 15 glass plates, 4¼ by 3¼ inches—in fact, photographic negatives—interleaved with sheets of tinfoil. The 'phones are of 1,000 ohms resistance each.



The secondary of tuner, detector, and blocking condenser are all connected in series; and the 'phones are in parallel with the condenser as shown in Fig. 1. A buzzer, to adjust the detector, is also used; this is simply an electric bell with the gong and hammer removed.

The transmitting instruments are a 1½-inch induction coil, high-tension condenser, helix and tapping key. The coil and key are not home-made, so will not be described. The condenser is made of 14 glass plates 10 by 8 inches, interleaved with tinfoil. The helix is 24 feet of No. 8 S.W.G. aluminium wire wound on a mahogany frame.

Power.—A 12 volts alternating current is obtained from the lighting mains by means of a small transformer. This voltage is put through the coil and its hammer break. With alternating current, of course, it is usual to short the break of a coil, and use the latter as a high-tension transformer; but in this case it has been found that a much larger and thicker spark is obtained when the break is working. The break is not in synchronism with the cycles of the current (60 per sec.), but is simply left to work in the ordinary way.



EXPERIENCES WITH A KITE AERIAL.

By K. K. J.

TO enable me to hear the more important stations I decided to use a kite aerial. An ordinary kite was obtained, and the first aerial consisted of about 100 yards of 36-gauge copper wire—flimsy, it is true, but it was sufficient for the first experiment.

The receiving apparatus on this occasion was a small direct-coupled set which just fitted on the cycle carrier. The "earth" consisted of two bicycles laid on the ground.

The kite was got up without difficulty, the aerial being suspended from a small insulator fixed to the string near the kite. The aerial wire was connected directly to the "set." No sooner was the 'phone put on than our old friends ECX and MHX were heard like trombones in a small room.

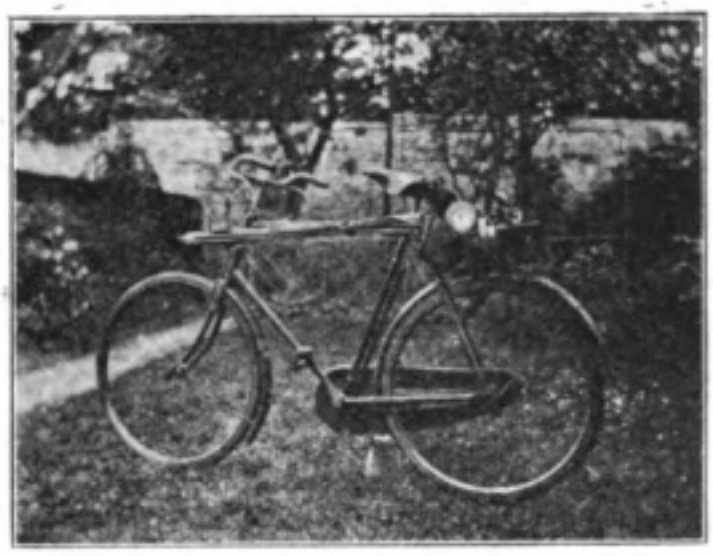
It was then found that the strengths of signals were wonderfully improved by supplementing the bicycle earth by a few "stair rods" stuck in the ground.

The kite was raised to a still better angle so that the aerial should be vertical, and so about 300 feet high.

Not satisfied with the result, a much larger aerial was tried—a single wire, but some 600–700 feet long. This was raised so that it subtended an angle of about 60–70 degrees. We tried for Clifden and "got him OK" and quite loud. Two days later we tried this aerial again, but no sooner had we got it into the air than we discovered—by physical phenomena—that X's were pretty abundant, considering that no one had the pluck to put his hand within an inch or so of the aerial.

A heavy thunder cloud was passing, but we succeeded in putting a spark gap in series with the aerial and earth, opened it a full three-quarters of an inch, and left it. Then followed a remarkable fire of oscillation sparks from the aerial. Everything sparked!

We found that when the height of the aerial varied while signals were coming through, the difference in tuning on direct-coupled circuit due to the variation in capacity was not sufficient to put the signals out appreciably. A good earth was obtained by sticking a few metal rods in the ground or laying them in a wet ditch. When iron



railings were near we made a connection with a scraped portion of the metal and obtained excellent results.

A silicon detector worked admirably and was found to be convenient owing to its reliability and ease of adjustment.

For ordinary experiments a small "tapped off" directly coupled set, measuring but a few inches each way, is very convenient for the roaming amateur. All one needs, then, is this set, with self-contained detector, a 'phone of some kind (quite ordinary 'phones give remarkably good results on these lofty aerials), a stair rod or two, a few hundred yards of wire (almost any size), and lastly the kite, which should be of the tailless variety and not more than four feet high. We found that a two-foot kite would take with ease a 36-gauge 600-foot aerial in a normal wind and keep it there without any trouble. A stouter aerial is somewhat better, but has the disadvantage of requiring a larger kite, and should a gust of wind raise the kite suddenly there is a danger of its soaring off with the receiving set.

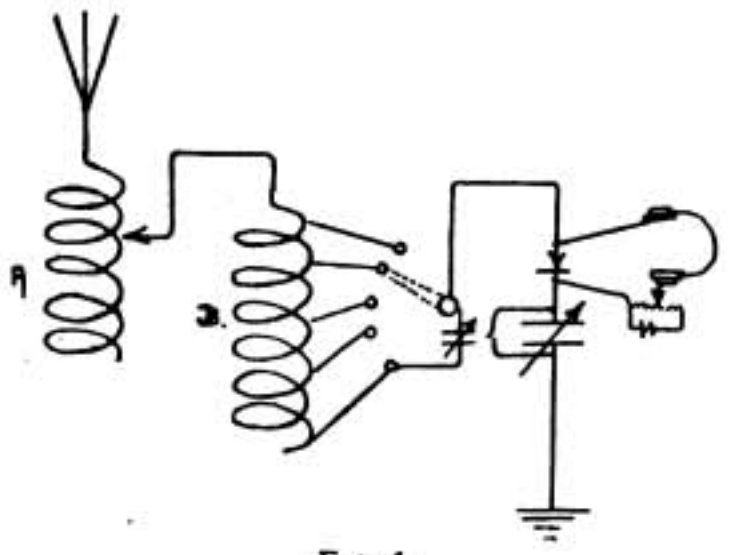


Fig. 1.

AN AMATEUR STATION.

By COLIN GRANT.

A GOOD deal has been written at various times about the height of the aerial; the average height of my aerial is about 26 feet, the highest point is only 32 feet above ground, and length 160 feet; the situation is not particularly open. On this I get all the usual stations—Paris, Norddeitch, Nauen, and further on favourable occasions; my transmitting range is about 8 or 10 miles.

My receiving connections (I have two receiving sets) are as shown in Figs. 1 and 2. I have tried various connections for reception, but find that it takes a lot to beat that shown in Fig. 2, while with that shown in Fig. 1 I get very good results indeed, and am rarely troubled with jamming.

In the set shown in Fig. 1 the coil, A, consists of 300 feet 22 dcc. on a 4 in. millboard tube, and coil B consists of 250 yards 28 enamelled copper, tapped in 18 sections; coil A has a sliding contact. From the tubing coils connection is made to potentiometer (300 ohms wound with 36 scc. G.S.), variable condensers, two detectors and switches, all mounted on one base. The variable condenser consists of 9 fixed and 8 movable plates (zinc), with a di-electric of $\frac{1}{32}$ in. ebonite sheet. A good way of fixing the ebonite to the plates is to use Mendine, an adhesive which I have found useful. The detectors are silicon and zincite-pyrites, and there is also a stand-by—carborundum with battery and potentiometer. Earth is made to the water main in two places with a $\frac{3}{16}$ in. bare cable. The head 'phones are ordinary watch receivers, re-wound to 2,000 ohms each, and they give excellent results. It is quite a simple matter re-winding a 'phone with 49 scc., and the ordinary diaphragms will do quite well; I find no difference whatever in the strength of signals using one of the special thin diaphragms used in wireless 'phones.

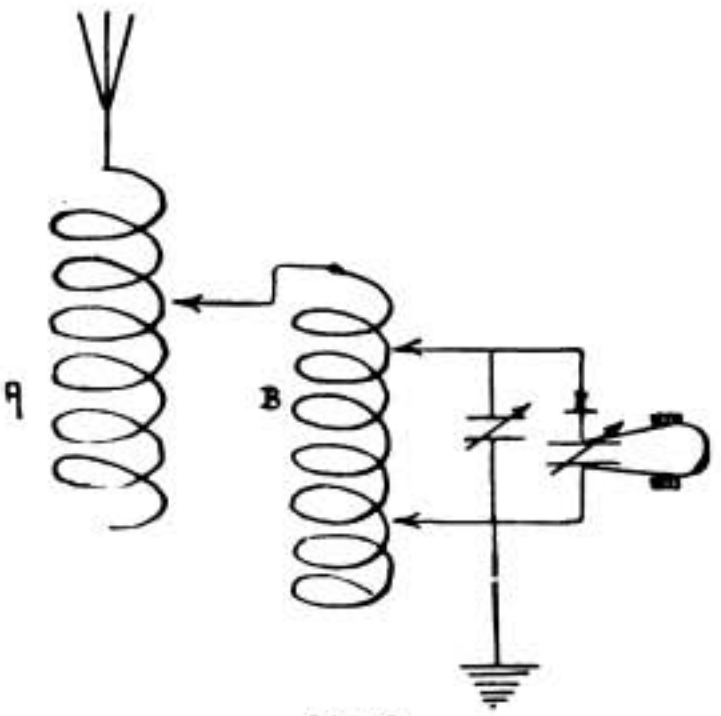


Fig. 2.

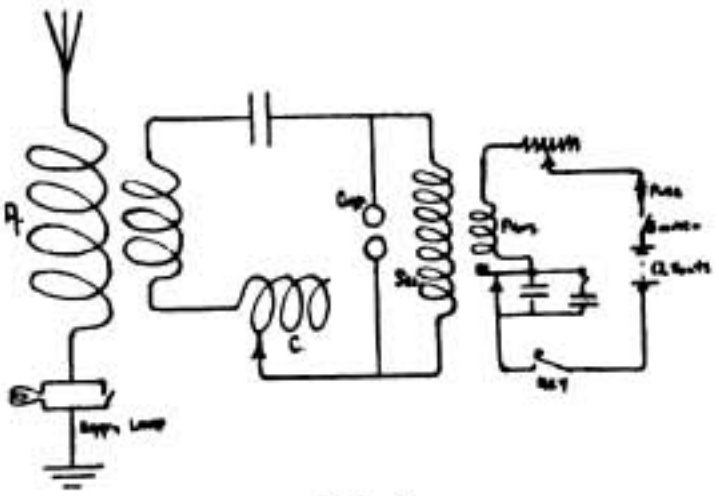


Fig. 3.

In receiving set as shown in Fig. 2, coil A consists of 200 yards 26 enamelled copper on a 5 in. tube with a sliding contact, and the two-slide coil, B, is wound with 150 yards of 26 enamelled copper on 5 in. tube; the variable condenser is made up out of old quarter-plate negative glasses with tinfoil on one side, and the sliding plates are the usual zinc; distance pieces separating the glass plates are made of waxed millboard strips.

TRANSMITTER.

I first made a 1 in. spark coil, and use with it an oscillation transformer and glass plate condenser; in this set the transformer, A, is made as follows:—

Primary: 8 turns 70 40 rubber-covered flex, wound on a 2 in. or 3 in. cardboard or wood cylinder. Secondary: 24 turns 20 dcc. slipped over primary and separated by about $\frac{1}{16}$ in. with strips of rubber or ebonite; the whole is put in a glass jar and filled up with paraffin wax.

The break on coil used with an attachment of mine gives a good musical spark; it is constructed as follows (Fig. 3):—near the soft iron disc there is another but smaller pillar with screw and lock-nut; this screw regulates a strip of brass $\frac{1}{16}$ in. thick, which presses against spring on contact breaker; between this brass strip and the contact spring is interposed a disc of rubber, which almost completely deadens the note of the break.

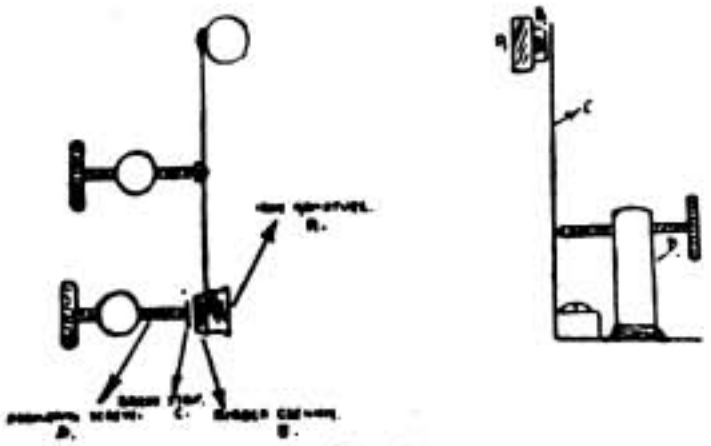


Fig. 4.

The coil, C, consists of 35 feet 12 tinned copper, and the condenser consists of 11 sheets of copper foil, $3\frac{1}{2}$ in. by $2\frac{1}{2}$ in., between the usual glass plates, size $4\frac{1}{4}$ in. by $3\frac{1}{4}$ in.; this is fixed underneath the baseboard containing the transformer and spark gap.

Perhaps the following hints will be of use to amateurs. In the first place, I would advise anyone to fit up the attachment for giving a high note to the spark; by the use of this one can put extra voltage on to the coil. I designed my coil for 6 volts, but always use 10, which makes a great improvement, and the insulation of secondary stands it all right. If the higher voltage is adopted, an extra condenser of at least twice the capacity of the condenser fitted in base of coil should be fitted on to the primary. A small rheostat should also be kept in series with coil, as current can be regulated to nicety with it—this makes another improvement; if resistance were not used, you would most likely get a shorter spark—this happened on my coil.

A zinc gap is much superior to any brass ball. I first fitted my coil with a brass ball gap, but discarded it a few days afterwards in favour of a zinc gap; the ball gap is still fitted to coil, although it is not now used.

THE AMATEUR HANDYMAN.

A Protected Detector.

BY P. DENISON.

ALTHOUGH many good and well-designed detectors have appeared in these pages at different times, one seldom sees one that would be capable of use close to a high-power transmitter, that is now becoming the lot of many amateurs to possess.

Short-circuiting the detector when sending almost certainly leads to destruction of its sensitiveness, as an oscillation circuit is so formed which picks up a good deal of current from the surrounding apparatus, burning the crystals at their contact with one another.

In experimenting with that most excellent combination zincite-copper pyrites I noticed with what ease a sensitive place was found on the crystals; in fact, on even moderately good crystals it is only necessary to put them together and signals are good without any adjustment whatever of their pressure.

Another obvious phenomenon is that of maximum sensitiveness immediately after contact has been completed and before any other adjustment has taken place.

Working upon these facts, I have invented the crystal holder represented in the accompanying diagram, and it has been in constant use every day for over two years, with not the slightest trouble that so often attends a "short-circuiting protector."

I can thoroughly recommend it to those who have hitherto stirred the ether with complaints of burnt-out crystals and the inevitable unreceived message!

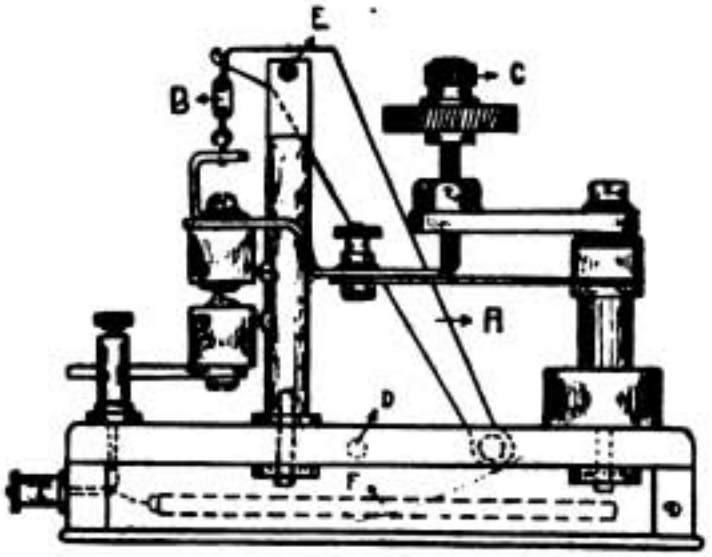
It will be seen by reference to the diagram that the stand is almost similar to those in

use in the majority of stations, except that it has the addition of a pivoted lifting lever, A, turning upon a screw, E, and separating the two crystals on moving the arm forward (shown to the left in the diagram) by means of the two small links and a small ebonite insulator, B.

Except in one or two small details, the diagram is self-explanatory. The blocking condenser in the base is used as shunt to the telephones, and may be of suitable dimensions to give crisp signals with the pair of 'phones in use, two short leads being taken from it to two of the terminals screwed to the end of the base. Two more terminals are connected to the fixed crystal cup and the base of the pillar supporting the spring and adjusting screw.

The adjusting screw embodies rather a unique feature in the small knurled thumb-nut, C. Being of small diameter, it allows of rapid adjustment, or removing the screw for oiling, etc., leaving the larger diameter head for finer working.

The insulator, B, simply serves to prevent leakage from the moving cup to earth by means of the lever and base.



A round-headed brass upholstery tack is driven into the side of the base in the position shown at D in the diagram, and this forms a catch over which to hang the arm when crystals are separated, eliminating the necessity of holding back the lever during transmission.

A small wooden or ebonite knob may be fixed to the end of the lever for use as handle, or a cord and pulley arranged to work it in conjunction with the aerial switch, if one is used, may be devised to suit each case.

The rapidity with which this detector may be operated, and how effective this method really is, can only be judged after a fair trial.

It works excellently with zincite-copper pyrites crystals, but several others may be experimented with with more or less satisfactory results.

In returning the lever to its receiving position, care should be exercised not to allow it to spring back, or the crystals will be chipped and spoiled.

AMONG THE WIRELESS SOCIETIES.

North Middlesex.—A meeting of the North Middlesex Wireless Club was held on August 10th, at Shaftesbury Hall, Bowes Park. The question was raised as to whether it would be advisable, in view of the unsettled conditions consequent upon the outbreak of war, to postpone future meetings. After a short discussion it was unanimously decided to hold a further meeting on Monday, September 7th. It was agreed that by holding meetings at intervals of a month there would be less chance of members getting out of touch with each other. The stations of all members have been closed by the Government during the war and the aerials have been taken down. It is pleasant to be able to record that the officials who undertook the work did so with great courtesy and consideration and, in some cases, promised to give every assistance in restoring the apparatus to its former condition.

At the July meeting of the Club a letter was read from Mr. Penn, who is at present in India, in which he claimed that he had carried on some successful experiments with wireless telephones, having been able to communicate 900 miles using only 24 volts and 3½ amps., the masts supporting the aerials being no more than 30 ft. high.

* * *

Liverpool.—At a meeting of the Liverpool Wireless Association, held on July 23rd, it was agreed to take steps to control as far as possible the operations of amateurs, with a view to minimising interference with commercial and other amateur stations. A further meeting was held on July 30th to consider a programme of future meetings.

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 to Mr. H. Dobell, 21 Maltese Road, Chelmsford. Such questions must be accompanied by the name and address of the writer, otherwise they will remain unanswered.

V. G. M. (Bexley Heath) sends us a diagram of a two-slider tuning-coil, in which the earth goes to the bottom end of coil, the aerial to one slider, the second slider and the earth-lead to the two sides of a variable condenser, while the detector (crystal) with telephone in series goes across this condenser. He asks whether the station being received should be tuned in roughly with the first slider, and then finely tuned by the second slider, or whether both sliders should be moved simultaneously. In his diagram he has got the first slider right at the top of the coil, which looks as if he were receiving long waves. In this case, we have no high opinion of this circuit; if a single-circuit receiver is to be used, we prefer to make it a truly single circuit—just the aerial-earth circuit tuned to the incoming wave and the detector taken off from the top of the tuning inductance included in that circuit. The introduction of a variable condenser in this case only decreases the potential across the detector, and introduces a pseudo-tuned secondary circuit which adds complications in adjustment, without any compensating advantage in selectivity such as is given by a double circuit receiver. As for tuning-in a station, if the latter cannot be heard at all the first slider should be moved in steps, and at each step the second should be swept up and down; when weak signals are obtained, the second slider and condenser should be adjusted to maximum and then the first slider altered till its best position is obtained. If the station is strong enough and near enough to "impulse" the aerial, however, the second slider will give a maximum when it is in tune with the aerial-circuit, whatever this may be tuned to, in which case the first should be altered in steps and the second altered to suit each step.

V. G. M. also asks if a single telephone receiver of 150 ohms res., which gives distinct clicks when the leads are placed simultaneously on his tongue, will be sensitive enough for use with carborundum or zincite bornite. This "click" test is no indication of sufficient sensitiveness, and the telephone would be of little use unless helped by a telephone transformer (see numerous past Answers).

E. W. J. (Brussels) has made a wireless set, but does not know how to connect up the various parts to get the best results. He has got a certain diagram of connections from a book, but rightly doubts its correctness, since it shows the aerial and earth permanently connected to the ends of the tuning-inductance, so that the aerial-earth circuit cannot be tuned. He says, "If I place the tuning inductance and condenser in series, as in the November, 1913, instructional article, I can tune to all wave-lengths within the limits of the apparatus, but where shall the detector and telephones be connected? In the article they are shown across the inductance, but this is no good when the latter is shorted for short wave-lengths." Quite right, but the article goes on to explain that such a "single-circuit receiver" is of very little good except when receiving long waves on a short aerial, under which conditions there must always be a considerable amount of inductance added to the aerial circuit. With E. J. W.'s aerial, even the comparatively short ship-waves of 600 metres would require a fair amount of inductance, and would give pretty good signals on the single-circuit receiver, though for these waves—and certainly for the 300 metres ship-waves—we should prefer the coupled circuits described in the same article. E. J. W. suggests putting the detector across both inductance and condenser; but is held up by the difficulty "how can he connect the potentiometer in this case, since the condenser would break the circuit for the continuous current from the battery?" He might use this connection with a crystal which does not require a battery and potentiometer; but even so, it would not be using it to the best advantage, as the article explains (see par. 449 of the "Elementary Principles," by R. W. Bungay). He suggests an ingenious way of using the potentiometer in spite of the intervening condenser, by putting a large inductance across it, which would conduct the continuous current and, incidentally, prevent accumulation of static charge. We think this would be all right so far as it goes, though he certainly should not use an electro-magnet for the purpose, but a very long single-layer coil of fine wire; but this plan will not overcome the difficulty that when receiving such short waves that all the inductance is shorted, the crystal will not be in its best position to get the full potential difference of the signals. However, he might try this, also he might try an auto-jigger connection for the short waves instead of changing over to coupled circuits. Finally, we think there is no need to lower his aerial in thunderstorms if it is well earthed *outside* the house—*i.e.*, with a direct circuit to a good earth without having to enter and leave the house.

R. C. C. (Ongar) asks whether he would get better results with his aerial pointing straight in the direction of the other station or *not* pointing straight in that direction. Unless his aerial is long in comparison with its height, the direction of it will not matter much; but if it is sufficiently long to possess the properties of the Marconi directional aerial, it should point straight *away* from the other aerial, and the other aerial should point straight away from it—that is to say the leading-in ends should be nearest each other, and the free ends furthest from each other. As he draws them they are just wrong. Apparently the transmitter he proposes is "plain aerial;" he had better take care, for unless the power he uses is very small, he may have trouble in getting his licence.

G. N. W. (Uppingham).—I intend making a small wirelessly controlled motor-boat, which will be propelled by a ¼ B.H.P. petrol motor with electric ignition; this boat will also have two brushes, one running against a two-section commutator, the other running against a six-section commutator. How can I prevent the spark at the sparking plug, which will give an ½ in. good spark, and also the sparking at the commutators, from affecting the coherer, which will be about three feet from the spark plug.

Answer.—Your only chance of arranging that the ignition-spark shall not affect the coherer will be to use a Lodge double-electrode plug, using twin or concentric leads to this so as to render the ignition-circuit as non-inductive as possible. With the ordinary single-electrode plug the metal of the engine forms part of the ignition-circuit, and it would be impossible under those conditions to protect the coherer from the effects of the spark. With regard to the commutators, you must shunt the breaks of these with non-inductive shunts; you may have to employ condensers as well—little "Mansbridge" type, 1 mfd. paper condensers are suitable, and are not expensive.

TRAINING COLLEGES.

THE managers of the Royal Technical College, Glasgow, find that the demand for instruction in wireless telegraphy has increased to such an extent that it cannot be met by the present arrangements at their School of Navigation. The demand is coming largely from students of navigation, who cannot remain on shore for a time sufficiently long to enable them to complete the courses. In these circumstances the managers of a number of local lines of steamers have intimated that they will make special arrangements for giving the apprentices who sail on their ships every possible opportunity of attending the classes. They are of the opinion that, while all ships fitted with an installation must have one wireless operator, the manipulation of the apparatus, on cargo ships, at any rate, might be entrusted to a junior officer, and that on long-distance passenger ships one exclusive operator might be carried, and there might also be, for relieving purposes, one qualified member of the crew.

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In October the colleges of England enter upon a new session, and all who are intending to take up engineering will be required to decide, and to decide forthwith, what their curriculum is to be. Future success in life depends to a large extent on the care with which both the college and future course of study are selected. Too many—and this is especially true of those whose parents are engaged in an occupation entirely different from that which their sons intend to take up—make a haphazard choice. Sometimes it is that they do not know what they want or else they are unable to gauge their abilities and qualifications, with the result that, after a course of expensive study, they find they could have done so much better if they had entered for this or that course; but now the time available for their education is drawing to an end, they cannot afford to "put back the dial," and they are perforce obliged to start their careers only half equipped.

For such, therefore, who intend to take up engineering with a view to making wireless telegraphy a special part of their study, we would advise a glance at the prospectus which is issued by the University of London for the faculty of Engineering of University College. The prestige of this faculty is well known. It would be invidious to say that it ranks higher than any other similar faculty in the United Kingdom, but at least it ranks as high, and inasmuch as it is situated in the very heart of London, within a short railway journey from the majority of the suburbs, it should prove a very desirable opportunity to many. On pages 33 and 40 of the prospectus will be found the particulars dealing with electrical engineering. It will be seen that their plant and apparatus is particularly efficient, and amongst their desiderata the department holds a licence from the Postmaster-General for a wireless telegraph plant and antennæ, and practical instruction is given as well as courses of post-graduate lectures. In the advanced lecture course wireless telegraphy is among the subjects put down for study in the third term. The fees will compare favourably with those of any other similar institution.

The Manchester School of Technology aims at instruction for a somewhat different class of student, the commercial engineer, if we may use the term without offence. For the two classes are entirely distinct, though both in their sphere are indispensable. This is where the necessity for making a definite choice comes in, for the student who takes up the theoretical—or shall we say professional?—side of the profession is at a loss to adapt himself to the commercial side when the necessity arises. Therefore when the ultimate aim is to be commercial rather than professional, this second prospectus will be found the more useful. The Manchester School of Technology fits its students to get at results most useful to future employers, whether on the practical side or theoretical. For experience has proved that a manufacturer values an apprentice who can take his place at once on a "dynamo test" and earn money without making mistakes about the "constant of the instrument." On the theoretical side such a man values the young designer who can not only apply his mathematics to the problem in hand and obtain a correct result, but who has also a knowledge of shop processes and costs and the importance of standardisation.

The position of this school is most admirably adapted for this kind of work, for it is situated in the heart of a manufacturing district and is in close touch with the manufacturing firms of its neighbourhood. Many of the staff of these firms take part in the teaching and give lectures on general subjects outside the usual curriculum of an engineer's training. Furthermore, many of these firms have made arrangements to take over students for a vacation course, so that they are enabled to judge of their qualifications before enrolling them for a two-year apprenticeship on the conclusion of their college work.

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In a letter to the Press, the Irish School of Wireless deny the rumour that their school in Dublin is closed and the apparatus dismantled by the order of the Government. The actual state of affairs is said to be as follows:

"The Government have insisted on taking down the aerial, so that no message can be sent or received, but they have in no way dismantled the apparatus, only reserving the right to use it themselves when necessary. In the meanwhile the apparatus is in perfect order for working and instructional purposes, and the school is open as usual, although many of the students are taking their summer holidays."