THE MARCONIGRAPH

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Science and Literature.

THERE is a belief, which is shared to no small extent by the general public, that engineering is not a matter calling for the exercise of any intellectual faculties. That oft-repeated statement recalls the long-standing dispute between the literary man and the scientists, wherein literary extremists refuse to rank the labours of the physicist and mathematician with the poet and novelist. Mr. A. Campbell Swinton claimed in his interesting address to the Röntgen Society some time ago that literary men have the ear of the world, and constitute the best organised and most successful mutual admiration society on record. The prominent position taken by the literary guild, and their often prejudicial influence on public opinion, lies in part, no doubt, in the fact that relatively little labour or application is required to enable a man to appreciate good literature. It is thus easy to understand the fact that university extension lectures, devoted to culture studies, are very much more popular than those dealing with science. Everyone has views on literature, history and sociology, and, with little or no training, can speak and argue on such subjects with absolute self-confidence.

Not so with the exact sciences, however. Each man's opinion is, in his own view, as good as another, and statistics can always be found which, in their unanalysed state, appear to support the most contradictory of views. The effective force in moulding humanity has been the scientific imagination. As Mr. Campbell Swinton pointed out, no historical character has affected the destinies of the race to more than an infinitesimal extent when his influence is compared with that of the unnamed savage who first had the intelligence to see the uses of fire and the courage to attempt to control it. Some other unknown engineer first saw the possibilities of flint weapons, and once his individual intellect opened the path, the whole tribe of men were able to follow it. Herodotus avowed as a reason for undertaking his history a reluctance to let fade into oblivion the great and admirable deeds of either the Greeks or the Barbarians. Yet, immortal as is the work of the Greek historian, it is a moot point whether it has wielded so potent an influence upon the destinies of the race as the imperishable work of Mr. Marconi seems destined to do. The underrating of intellect in its practical applications is in some measure due to the defective state of secondary education in this country, the trend of which has for too long been in the direction of the "humanities" and away from science. Such work as that of Mr. Marconi represents the triumph of patient and intelligent perseverance over great inherent difficulties, and thus commands an appreciation of the meaning of such work upon human progress.

M. J DAL PAZ

M. J. dal Piaz

Director of the Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil

THE career of a man who has made some definite mark in his own particular centre of activity is a subject of more than average interest to the public. And for this reason: there are so many ways of attaining success (all of them slippery and difficult), there are, too, so many varieties or combinations of natural faculty, that the story of how success was attained in every individual case must always fascinate. Malvolio (and incidentally Shakespeare) divided Life's prize-winners, roughly, into three groups. "... *Some are born great, some achieve greatness, others have greatness thrust upon them.*" The feather-pated steward of the fair Olivia was only concerned with the last-mentioned group. We are more interested in the others; and that the definition is obviously correct cannot be gainsaid. No two writers, for instance, have ever attained popularity by the same means or gifts. Pope declared he "wrote in numbers, for the numbers came," while Horace tells us he required years of study and patient toil, and evolved an elaborate system of weeding out his material and polishing his sentences before he achieved success as a man of letters. The same practices are to be observed in business careers. One man is born with a marvellous business capacity, is equipped from the outset of his career with the means necessary for making his way along the appointed road, and is only required to add certain personal qualifications, such as self-discipline, concentration of purpose, and a trained judgment, to assure his progress on the path "that leads to sovereign power."

Another—and this, fortunately for commerce, is no rare type—is he who makes his way step by step up the difficult ladder of business enterprise, reaping as he goes a rich harvest of experience, which ripens into expert knowledge, and finally attains an unassailable position in his sphere of work and the esteem of his fellow-workers.

To this group belongs M. J. dal Piaz, the brilliant director of La Compagnie Générale Transatlantique and of the Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil. He was born in Paris in 1865, and went through the ordinary curriculum of French education, serving his schoolboy apprenticeship in *l'external*, and later taking up the greater responsibilities of *le lycée*. Not content with merely completing the usual educational course, M. dal Piaz applied himself to the study of the law, and to such good purpose that he early qualified as a solicitor, or, as French legal phraseology has it, *était licencié en droit*. Shortly afterwards—in 1888—he entered the service of the Compagnie Générale Transatlantique, and from this time forward he has been identified with the ever-increasing scope of this important organisation. He has a complete understanding of every branch in the important organisation over which he presides, and, furthermore, has the affairs of every department in the business at his finger-tips; for at different periods of his connection with the company he has filled all its more important posts, with the result that he is now the master-key of this complex machine. Such, in a few words, is the personality of the man who is head of this important company, and among those who control the Marconi interests in France and the French possessions. M. dal Piaz is besides a member of the Upper Council on Navigation, a director and member of the acting committee for La Société des Chantiers et Ateliers de St. Nazaire, and a director of La Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil.

His countrymen have recognised his indefatigable zeal and his services to the State by appointing him an officer of the Legion of Honour.

The Production of Electrical Oscillations by Spark-Gaps Immersed in Running Liquids

By W. H. Eccles, D.Sc., and A. J. Makower, M.A.*

IN the sending apparatus for wireless telegraphy the spark is an important feature. The spark usually takes place in air, and when a large amount of energy is to be transformed, special means have to be adopted to prevent the spark from degenerating into an arc between the electrodes. One mode of preventing the formation of an arc consists in moving the electrodes at such a high speed that a spark can only bridge the gap between them during the very brief period when they are in close proximity. The rapid separation

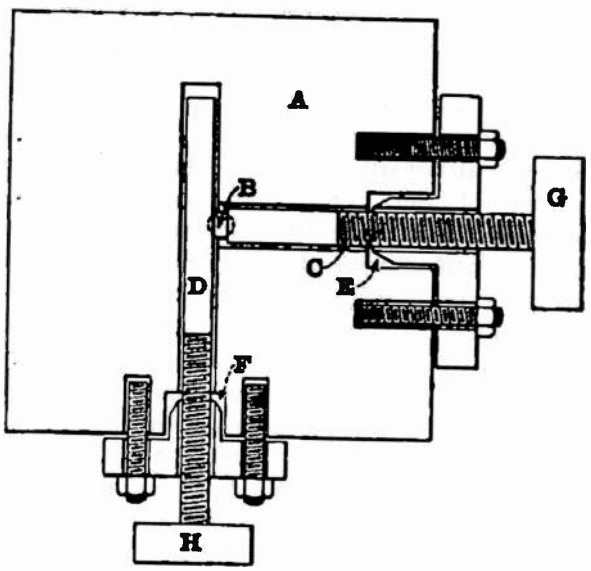


Fig. 1

of the electrodes from each other effectually prevents the formation of an arc.

It occurred to us that another method of achieving the required result might be arrived at by causing the spark to be formed between stationary electrodes immersed in a rapidly flowing stream of liquid. With this end in view we have experimented with various liquids and various forms of spark-gaps, and from the facts set out below it will be seen that very good results are attainable by these means. Not only can very efficient extinction be produced with sparks of considerable energy in simple apparatus of small dimensions, but also the enclosing of the spark has the effect of eliminating practically all the noise which accompanies the discharges across the customary open spark-gaps.

The first apparatus tried consisted of an ebonite tube, through the walls of which the two electrodes were passed. The electrodes were brass or iron screws projecting into the tube from opposite sides with their axes in line. The ends of the screws thus confronted each other, the gap between being adjustable. The tube was made out of an ebonite rod about 4 in. long by drilling axially a ¼-in. hole, and it was mounted vertically so that water from the mains could be led into it at the top and be allowed to fall out at the bottom end of the tube. The spark-gap was connected in the position usually occupied by an air-spark in wireless telegraph apparatus. It was found after using a variety of transformers and transformer ratios that for large or small gaps, within the range allowed by the bore of the tube, much lower voltages were required to produce the spark in water than were required for an equal length of spark in air. In fact, every attempt to use the high voltages usually applied to air-sparks failed. Thus the most appropriate type of transformer was not the induction coil, but rather one of the ordinary power type. Perhaps the best results obtained with the transformers at our disposal were those in which a Swinburne transformer was used. This transformer was of the hedgehog type with open magnetic circuit which supplied about 1,000 volts at the gap at a frequency of 50 cycles a second. The results obtained with this apparatus were very encouraging as regards the constancy and intensity of the oscillations generated, but not as regards the efficiency of transformation ; it appeared that much energy was dissipated in ohmic losses and in electrolysis in the water.

In order to gauge the performance of the apparatus under something like practical conditions, a secondary capacity-inductance circuit was coupled to the primary oscillating circuit energised by the spark. A number of damping curves were taken with various degrees of

* Read before the British Association Meeting at Dundee, 1912.

coupling with a view to finding an optimum coupling. Three of these are given in Figs. 2, 3, and 4, which relate to couplings of 25, 23, and 20 per cent. respectively, the other circumstances being unchanged. In these figures the

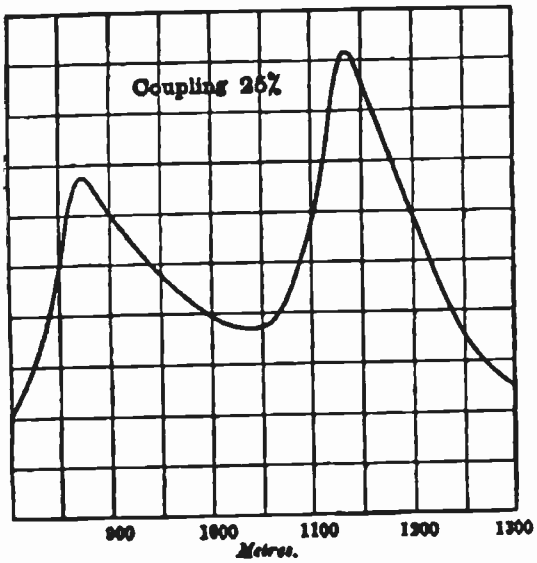


Fig. 2

abscissæ are wave-lengths, and the ordinates are effective currents in arbitrary units.

The primary circuit contained a capacity of 4.550 cm. and an inductance of 53,700 cm. as a shunt to the water-spark, and the secondary contained a capacity of 1,380 cm. and an inductance of 188,000 cm. The tertiary circuit comprised a fixed inductance, a variable capacity and a thermo-ammeter, and was, of course, very loosely coupled to the secondary circuit. In Fig. 2 the coupling between primary and secondary was 25 per cent., and the decrement of the higher frequency component was 0·4 per whole period, and that of the lower frequency component 0·09.

There are certain obvious advantages in an oscillatory circuit that produces oscillations of a single frequency under conditions of close coupling. The curves show that a coupling of 23 per cent. was best from this point of view.

As an example of the effects that can be obtained with a very close coupling we give Fig. 5. Here the coupling was estimated at 63 per cent. For this case the primary circuit contained a capacity of 2,640 cm., and an inductance of 73,200 cm., and the secondary circuit a capacity of 1,120 cm. and an inductance of 171,000 cm.

After this an attempt was made to decide whether the efficiency would be increased by maintaining a considerable pressure in the water in the tube instead of allowing it to escape freely at atmospheric pressure; but the type of tube used up to the present proved to be too fragile, and we were compelled to adopt a stronger design. Several dischargers were made, and it was found that ebonite was unsuitable owing to the fact that it was liable to soften through the heating obtained in continuous runs, and glass was liable to crack if the discharge was not regulated with great care. Finally, marble was employed, but experience showed that unless ample thicknesses of this material were used, the pressures produced in the interior of the discharger during the passage of the sparks were sufficient to burst it. The most satisfactory design reached by us consisted of a cube of marble with a side of about 4 in. provided with a vertical channel of ¼-in. bore through which the liquids could be caused to flow, entering at the bottom and flowing away at the top so as to sweep away all the gases formed by the passage of the discharge through the liquid. The electrodes consisted of two horizontal metal rods with axes at right angles forming a spark-gap in the middle of the liquid column. This arrangement of the electrodes was adopted to ensure that the discharge should take place inside and not outside the liquid column. By making the section of the electrodes slightly larger than that of the liquid column it was made certain that the discharge should take place only between the end of one electrode and the side of the other. In order to prevent the liquid being forced out by the high pressures developed it was found necessary to provide

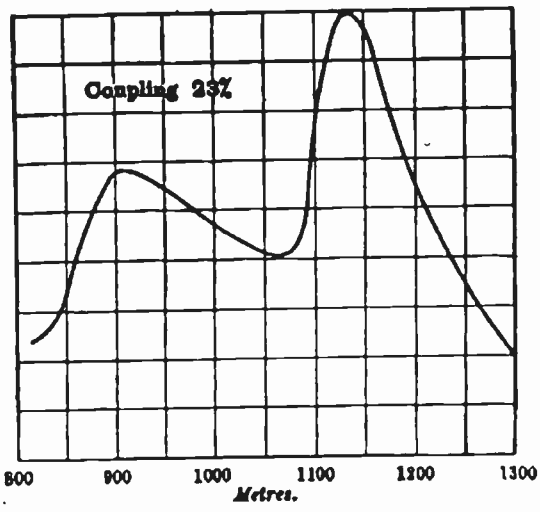


Fig. 3

stuffing boxes at the points where the electrodes entered the marble.

Fig. 1 is a horizontal section of the discharger through the plane of the electrodes, and shows the marble cube, A, with the liquid column.

B, in the centre, and the electrodes, C and D, entering at right angles through the stuffing boxes, E and F, and provided with ebonite handles, G and H, for adjusting the gap. The length of the gap was adjusted by rotating the handle, G, and when the side of the electrode, D, became pitted a new surface could be brought into action by rotating the handle, H.

The first experiments were made with water, and it was found that with a given voltage and length of gap there was a rate of flow of the water that gave the best oscillation in a capacity-inductance circuit connected across the gap. If the water flowed too quickly no sparking took place, and if the water flowed too slowly arcing was produced instead of sparking. Even with the flow adjusted so as to give the best possible results it was found that much energy was wasted owing to the losses arising from the conductivity of the water between the electrodes; this makes the water-gap less efficient than an air-gap; in fact, on the whole there was no improvement exhibited by the apparatus designed for high-water pressures over the old apparatus, in which the water was allowed to escape directly into the atmosphere. On this account we were led to make fresh trials, using transformer oil instead of water. This change made the apparatus more efficient; in fact, the efficiencies attained were about the same as those attainable with the discharge in air between

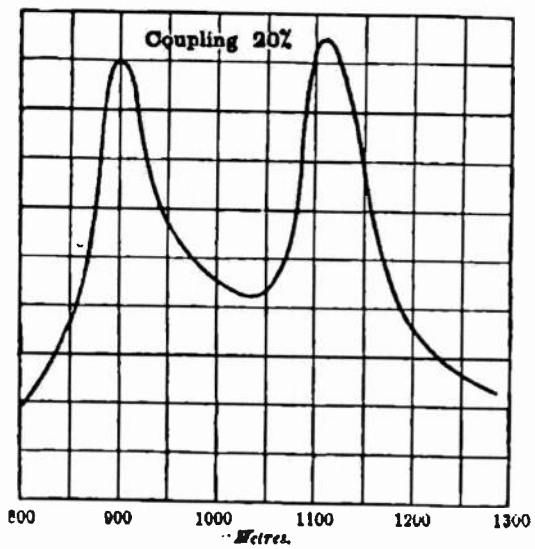


Fig. 4

metal balls. The discharge enclosed as above described is remarkably silent and remains steady for protracted periods, so that it is useful for laboratory experiments.

Experiments made with oil in a discharger with glass sides showed that vapour is freely formed as soon as the discharge passes, and that unless the oil is caused to flow quickly the vapour displaces the liquid from the space between the electrodes and arcing ensues.

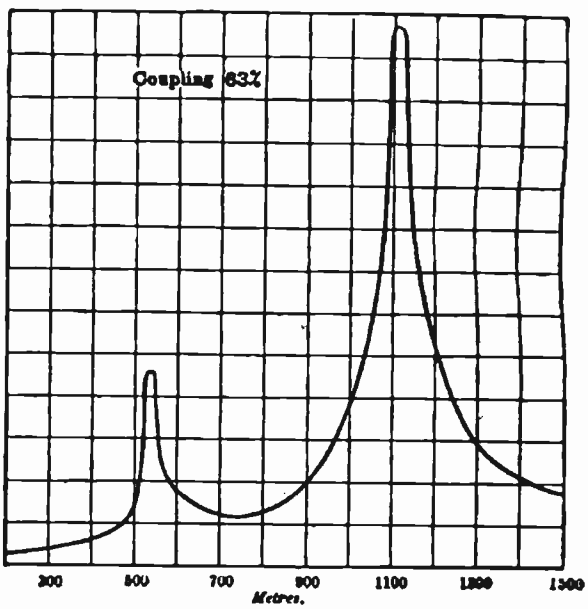


Fig. 5

The oil in all our experiments was contained in a small tank, and forced round the circuit by means of a pump. Although the same oil could be used for several days it ultimately became too conductive by getting loaded with finely divided particles of carbon, and then it required filtering before further use.

The above experiments having indicated a satisfactory working of the form of discharger shown in Fig. 1, a number of tests were made, using it in conjunction with a standard wireless telegraph outfit of Marconi's Wireless Telegraph Company. Owing to the fact that we intended to carry out tests with couplings ranging up to values far in excess of those attainable with this apparatus, the secondary of the high-frequency transformer was replaced by a flat coil, which enabled very tight couplings to be reached.

It was soon found that when the oil-spark was used, with almost any degree of coupling, some impulse excitation was taking place. For example, when the coupling was 12 per cent. a single wave-length of 620 metres was observed in the primary and secondary circuits, and no other wave-length was detected; whereas when the spark occurred in air the same circumstances gave two distinct wave-lengths of 570 and 640 metres. On another occasion, with slightly different circuits and

with a coupling exceeding 60 per cent., the air-spark gave two wave-lengths again, namely, 170 and 680 metres, while the oil-spark gave a main wave-length of 640 metres with two subsidiary waves of 157 and 670 metres, 640 metres being the measured wave-length of each of the circuits taken separately. The predominance of the natural frequency in this case showed that very good shock-excitation was attained with the discharge in oil.

Turning now to the question of the efficiency of the apparatus when using sparks in flowing liquids, it was found easiest to make measurements of the input from the alternator and of the current produced in the aerial, both for sparks in liquids and for sparks between metal balls in air. A comparison of the results gives a fair notion of the relative efficiencies of the methods.

Factors of Efficiency.

The first point to notice is that the efficiency depends very greatly on the rate of flow of the liquid and on the voltage applied to the gap, but not very greatly on the length of the gap. As a general rule the efficiency is best when the voltage used on a given gap is taken as low as possible for regular sparking. As regards alterations in the rate of flow of liquid the effect is more striking with water than with oil. With water the efficiency rises greatly as the rate of flow is decreased, the lower limit of speed being determined by the overheating of the electrodes.

With water flowing slowly an aerial current of 9·2 amperes was obtained with an input of 525 watts; while an air-spark gave with the same apparatus an aerial current of 5·5 amperes with an input of 450 watts, the efficiencies being in these cases in the ratio of 3 to 2. This high efficiency obtained here with water could, however, not be maintained without constant feeding of the electrodes.

With oil it was easy to maintain the gap working so as to give 4·6 amperes in the aerial with an input of 375 watts, which works out to exactly the same efficiency as was obtained above with the same apparatus with an air-spark.

The principal fruit of our experience with these dischargers is that, as regards water, a very convenient, simple and noiseless oscillation generator can be made which gives steady oscillations for long periods if the flow of water is rapid enough to keep the electrodes cool, but the efficiency under these circumstances is low. As regards oil, its use presents the advantage of giving better quenching than the air-spark and of eliminating the deafening noise associated with the latter, while the efficiencies of the two forms of apparatus are the same.

Discussion.

Captain H. Riall Sankey asked for information regarding the power used in the experiments described in the paper and the effect of the inflammable gas when working with 50-kw. or less in the spark. Prof. G. W. O. Howe wanted to know if the same oil was used many times and whether it carbonised. He thought it would be interesting to know how the very modest figures of efficiency were obtained. Prof. J. T. Morris asked Dr. Eccles if he had tried any other liquid than that described. He, Prof. Morris, had made some simple experiments with both oil and amyl-acetate, and had found that the latter obviated the difficulties of carbonisation which were encountered with oil; moreover, there was no risk of explosion with this and it also seemed to give a sharper "kick" in the signals. It is necessary to explain that Dr. Morris conducted his experiments on a very small apparatus.

Dr. Eccles, in reply to the discussion, said the power used in the experiments was only 5 kw., but there was no danger from the inflammable gas, as precautions were taken to prevent any accumulation. There seemed to be no deterioration of the oil, although, after a while, it got rather thick through carbonisation, and it could then be filtered. What carbon was formed on the electrodes the jet of oil removed very rapidly, this jet working at something like 4 ft. per second. The figures of efficiency were not absolute measurements, but merely comparative with the spark gap. The absolute efficiency was not known. He agreed that the use of amyl-acetate would give better results than oil, but it was very expensive.

Wireless from the Sun

In a certain sense every shining star in the heavens is constantly sending out spherical electro-magnetic waves within the range of visual perception, besides probably many longer waves outside of that range. In this particular sense we are constantly receiving wireless telegraph waves from every visible orb, and the message received is not news but light. Moreover, since all animal energy is derived from plants, and all plants build up their substance from the energy contained in the sunlight they receive, it follows that all our muscular energy is derived indirectly from wireless telegraphy waves received from the sun.—*Dr. A. E. Kennelly.*

Automatic High-Speed Working

A Notable Wireless Development

"MARVELLOUS, isn't it? There's nothing we shan't be able to do in ten years."

When a character in one of Mr. Rudyard Kipling's stories ventured forth this opinion and prophecy concerning wireless telegraphy, there were probably few of the author's vast public who realised that the prediction was so near fulfilment.

"How I want to live and see it develop." It is less than ten years since these words were written, and within that time there have been developments before which even the most optimistic prophecies pale. This is not the moment to make a survey of the marvellous development in the wireless world; what we propose to do is simply to refer to one which is the necessary outcome of the progress referred to.

The great acceleration in the speed of wireless working over long distances has exceeded the power of human agency to receive and transcribe messages in the ordinary way, and there is a demand for some reliable and efficient means of automatic reception. The question of automatic transmission and reception has been carefully thought out by Mr. Marconi and his assistants, and as a result of prolonged investigations and experiment, means have been found which furnish a satisfactory solution thereto. It is proposed to use the system in the Imperial scheme, which is now under the consideration of the Select Committee of the House of Commons, and in order to satisfy the authorities that the apparatus has now reached a stage of perfection, a demonstration of high-speed automatic transmission was recently given at the Marconi Works at Chelmsford to representatives of the British Post Office, the Admiralty, the War Office, Colonial Office, and the Crown Agents for the Colonies. The speed signals were transmitted from Poldhu, Cornwall, where other representatives of the Government were present, and these were received and recorded at Chelmsford both by means of a recorder on the principle of a gramophone, and printed on tape. It was demonstrated that by this means signals could be received at a high rate of speed on a recording cylinder—the cylinder being afterwards caused to repeat the messages at a rate of speed sufficiently slow to enable the operators to read them; while by the other method a printed tape left the receiver, recording the messages as they were received.

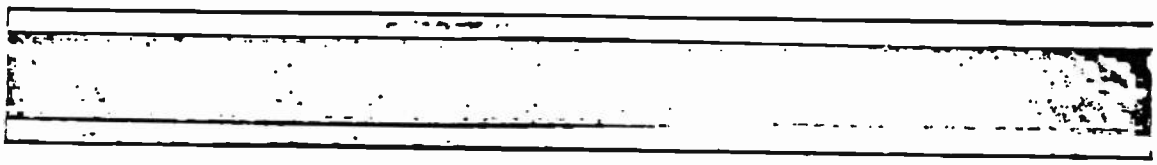


Fig. 1.—Photographic Tape. Signals given by Deflections

Transmitting was done at Poldhu with the new synchronous disc discharger, which was worked from the Wheatstone automatic transmitter through a special relay. No troubles were found in working the transmitter at speeds of over 50 words per minute. At Chelmsford, where a single wire aerial was used for receiving, the maximum signals were very strong on ordinary wireless receivers, but for the purpose of the demonstration they were reduced to medium signals.

Fig. 2.—Photographic Tape. Ordinary Morse Signals

The photographic reproducing apparatus, which the Government representatives care-

fully inspected, consists of a string galvanometer, and an optional arrangement for projecting the shadow of the string on to a narrow slit behind which sensitised paper is passed at a speed which is determined by the rate of working required. The effect of the signals on the galvanometer is to move the string, and throw a shadow more or less to one side while the signals are actually coming through. A white line is produced on the dark ground of the sensitised paper, and the deflection of this line shows the signals. An example of this type of tape is shown in Fig. 1. Another type of tape was obtained by screening the slit from all light, with the exception of the place normally occupied by the shadow of the string. The effect of the signals is to move this shadow and allow a small point of light to fall on the sensitised paper, which brings out the Morse signals as black dots and dashes on a white ground—an example of which is shown in Fig. 2. The string galvanometer can be operated direct from the receiving circuits, but it is preferable to operate the galvanometer through a special relay, which gives steadier signals and a better speed. On emerging from the slit the sensitised paper passes through a series of developing, fixing, and washing baths, and is delivered outside the machine one minute after being exposed, when working at a speed of 50 words per minute. The sensitised paper is put in the machine on spools of 1,000 feet each, which is sufficient for 5,000 words. At the demonstration perfect signals were shown with both kinds of tape at a speed of 55 words per minute.

Another method of recording signals received, which was inspected by the Government representatives, was based upon the gramophone principle. For recording by this method the signals are magnified and caused to act on a loud-speaking telephone. The effect of this is that signals which are only of medium strength on the usual wireless circuits are heard with ease on the special telephone at a distance of 50 feet away, and on the occasion of the demonstration the signals were heard by everybody in the room. The signals were recorded on a cylinder at the rate of 55 words per minute. When the cylinder is full, all that is necessary is to place it on another machine, which can be set to run at a slower speed, so that the signals can be read with ease. This method of recording has many advantages, chief amongst which may be mentioned that of retaining the natural distinction between the note of the signals and the sound of the atmospherics. When the cylinder is run slow so as to enable the signals to be read easily, the note is naturally lowered in proportion, but the tone of the atmospherics is also lowered, and the difference between them is therefore maintained.

News from Spain

AT the central observatory of the Meteorological Office of Madrid there has been installed a wireless station. Apparatus has been furnished by the Compañia Nacional de Telegrafia Sin Hilos, and by this means the observatory will be able to receive daily reports of atmospheric and weather conditions in different parts of the world. The value of wireless telegraphy to meteorological research is becoming more generally recognised, and the Spanish authorities are to be congratulated upon having installed a wireless equipment at their central observatory.

* * *

The Ministry of the Interior have decided upon a praiseworthy step in their decision to establish a school for the training of wireless operators. We understand that the school will be one of the most complete of its kind in existence, and therefore it should be in a position to satisfy what is becoming a pressing want, not merely in Spain, but in all countries possessing a maritime fleet. The school will be equipped with a 1½-k.w. Marconi set and emergency gear, whilst there will also be installed a short range set and several practice buzzers, the latter being of the type which has already been described in THE MARCONIGRAPH, and which has proved to be an invaluable instrument for practice in receiving signals. The Compañia Nacional have already a fine school in Madrid, which is well filled with learners, and which is doing very useful work. This school will form the basis of an article which we hope to publish in an early issue, intended to illustrate the decidedly practical steps which the Marconi companies have taken to train suitable candidates to become efficient operators.

Coming Events

FRIDAY, DECEMBER 6TH.

Wolverhampton & District Engineering Society.—Dr. J. D. Coales on "Wireless Telegraphy" at the Technical School, Wolverhampton.

MONDAY, DECEMBER 9TH.

Institution of Post Office Electrical Engineers.—Meeting at the Institution of Electrical Engineers, Victoria Embankment, London, W.C., 6 p.m.

TUESDAY, DECEMBER 17TH.

Physical Society.—Annual Exhibition of Scientific Instruments at Royal College of Science, South Kensington.

THURSDAY, DECEMBER 19TH.

Institution of Electrical Engineers.—Ordinary General Meeting, Victoria Embankment, 8 p.m.

Further Details of the New Compass

IN the September number of this magazine we described a new wireless compass which is admittedly an important advance in the provision of means for enabling ships at sea to locate their position in foggy weather. It is not only when a ship is near land that its proximity becomes a matter of urgency; the necessity of ascertaining the direction of an approaching or overtaking ship is equally urgent. A further extended series of trials has made it evident that the wireless compass developed at the Marconi works will make it possible for a vessel to navigate the whole coast of a country during a fog, and to take bearings without recourse to any visible method.

If, in a fog, a ship is able to determine the

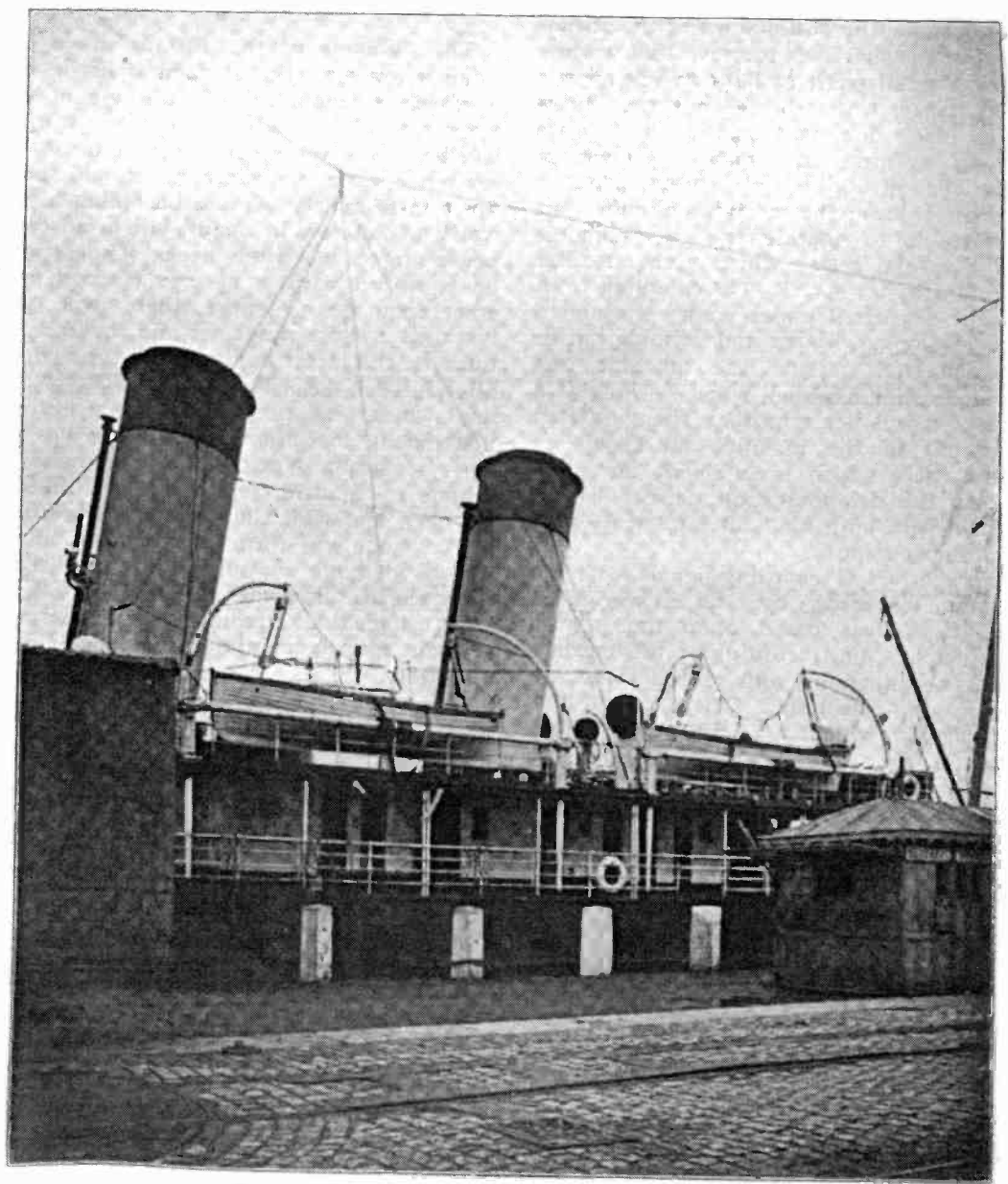


Fig. 1.—The Wireless Compass on the s.s. "Onward"

positions of known ports or places with a fair degree of accuracy, it can readily deduce its own position by simple calculation. This is

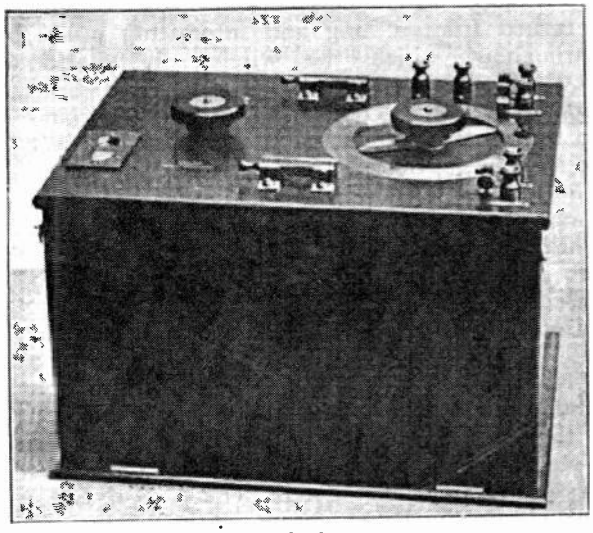


Fig. 2.—Radiogoniometer

exactly what becomes possible by means of the wireless compass. Its application has been simplified in a high degree by the invention of the radiogoniometer, a compact regulating instrument, by the adjustment of which an operator can discover the direction of the oscillations.

There are, of course, various devices for determining with more or less exactness the situation of a radiotelegraphic station from which signals are being received. Many of the aerials or antennæ now in use have a certain amount of directional effect, and it is easy so to dispose them as to render the effect still more marked. But some disadvantages are involved. In the ordinary way, for instance, a ship at sea is usually anxious to pick up messages from all ships within its possible radius of interception, but if the receiving apparatus be directional, it can intercept signals only from ships lying within a specific area. Any directional arrangement of aerials should therefore be adjustable, so as to bring within focus, so to speak, the various sections of the horizon one after the other. The drawback to many schemes for accomplishing this object is that the arrangement required is unwieldy and complicated: the advantage of the Marconi system is that two special forms of triangular aerials are fixed permanently, and the moving part responsible for the "searching" is quite small and readily handled.

Some idea of the apparatus can be obtained from the accompanying illustrations. From the outside of the roof of the "wireless" room on the topmost deck runs a system of triangular wire stay aerials. This, as shown in Fig. 1, may be suspended between the two masts, or it may be fixed to one mast, in which case a special bracket is provided for its support. There are two complete triangles at right angles to each other, and each is fitted with two wires leading from the bases of the triangles into a small wooden box, Fig. 2, inside the "wireless" room. In this box is fitted a small hollow cylinder of vulcanite wound up and down with rows of naked copper wire, each row about a sixth of an inch apart. Outside this movable cylinder, at a distance of an eighth of an inch away, are four sets of about forty insulated wires attached to the four wires coming down from the two triangles outside. The hollow cylinder turns by the means of a hand-screw on a compass dial above. When signals are being received, instead of the message coming from "somewhere" as hitherto, the ship can now up to forty miles' distance tell from which direction the signals are coming, for as soon as the operator hears the signals, he turns the handle to the right until he reaches a position beyond which it is not possible to receive signals When he has reached that position he turns

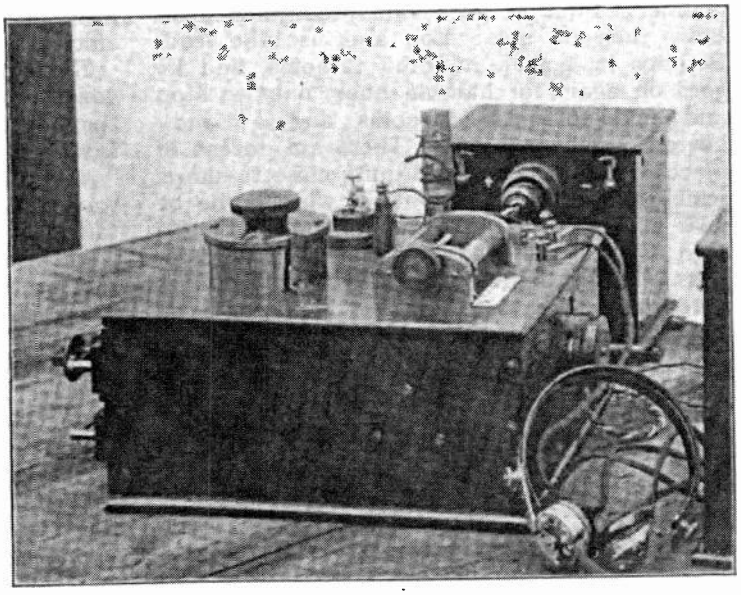


Fig. 3.—Receiving Apparatus

the handle in the opposite direction, and finds a corresponding position on the left; the mean between the two points at which the signals

become inaudible is the direction of the sending station.

As to the possible uses of this new invention, two examples suggest themselves. A liner or a cargo ship may be broken down in mid-ocean and drifting, and because for two or three days it has not been possible to obtain a sight of sun, moon, or stars owing to mists, fogs, or cloudy weather, the captain does not know exactly where he is, and he cannot tell his would-be rescuer exactly in which direction he is to steam, for though dead reckoning is good enough for ordinary purposes on straight courses when everything is in order, after having drifted even for a few hours exact accuracy as to position becomes impossible, especially if there be wind and current, both of them variable in strength and direction. But now comes along a vessel fitted with the Marconi compass, and because she can find out where the other ship is in relation to herself she can race to her rescue so long as the vessel in distress can send signals.

Yet another instance. One of the most dangerous operations in navigation is when approaching a rocky coast in a fog, or when approaching unlighted promontories after a day or two of dead reckoning. Though the propellers have turned so many thousand revolutions, and though the captain knows that at such a speed and in such a time his ship should be in such a position, it is largely a matter of luck and guesswork. The result is that when he approaches the shore under such conditions he usually does so in a hesitating manner. First he goes half-speed, then dead slow, then he must stop and use the lead. Perhaps he gets a hundred fathoms, and he goes on again for half an hour, only to stop and find forty-five fathoms and a sandy bottom. Where is he? There are dozens of places on the chart, some quite close to shore, which answer this description, whether he be near Daunt's Rock or Fishguard or the Land's End or the Needles. Then comes in the compass. If the lightship or the shore station is fitted with wireless telegraphy the captain can tell whether he is in his right course or not. Crookhaven may be N.N.E., or the Lizard due west, or whatever may be the compass bearing, and thus fog notwithstanding and despite snow, mist and blinding rain-storms, but always barring risks of other traffic, the vessel can go full speed ahead.

The report of the governors of the Leith Nautical College refers to the importance of teaching wireless telegraphy at the college, and adds that the governors will keep the matter carefully before them.

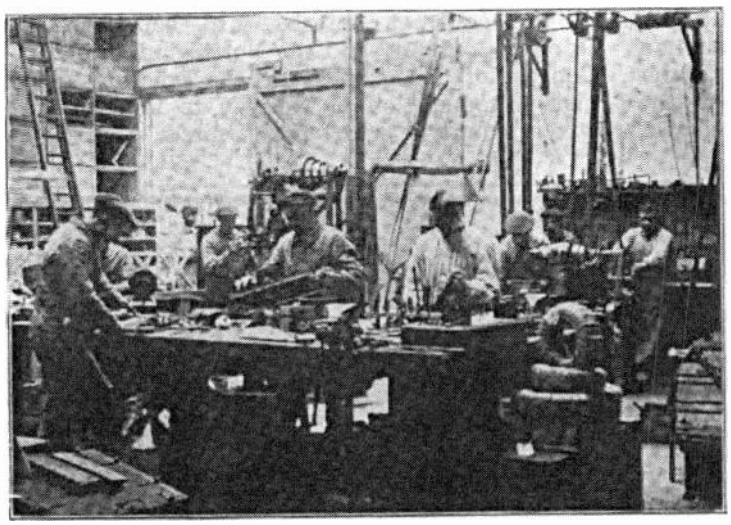
The "Matatua's" Record

A 1½-kw. Marconi standard ship set and emergency gear has been installed on the s.s. "Matatua," belonging to Messrs. Shaw, Saville & Albion, Ltd. This vessel has recently returned from a long and interesting cruise, throughout which the wireless installation gave excellent results. She proceeded from London via the Tyne and North of Scotland to Montreal; thence via South Africa, direct to Melbourne, Sydney, and New Zealand ports. The return journey was made via the Suez Canal to Dunkirk, Liverpool, and London. The voyage lasted just 26 weeks, and one of the most interesting vessels passed was the ex-convict ship "Success," whose own adventurous journey across the Atlantic was described in the September MARCONIGRAPH by the operator in charge of the Marconi station on that vessel. The "Matatua" communicated with the "Success" for several hours at a distance of 170 miles, the signals of the latter vessel being very good. The "Matatua" also obtained excellent results with the stations at Swakopmund and Luderetzbucht in South-West Africa, both being in touch for a week, and opening communications at over 1,000 miles at night. She also communicated with these stations when at a distance of 398 miles, communication taking place at mid-day in full sunshine. The success of these communications led to the operator at Swakopmund remarking to his colleagues on the "Matatua": "You have a big station, which is clear and strong at over 1,000 miles." This incident furnishes a further demonstration of the extreme efficiency of the Marconi standard ship sets.

Durban and Capetown stations gave equally good results. It is of special interest to note that during the run in the southern ocean from July 16th to August 4th, where the "Matatua" made down to 47.00 s., on the way to Melbourne, communication was maintained and positions exchanged daily with the "Anchises" of the Blue Funnel Line, when the former vessel was at times over 600 miles south of the latter. The "Demosthenes" was also within range several days up to a distance of 800 miles, and communication was also established with the sister ship "Miltiades" at a distance north of 1,000 miles, bound for Durban. Thanks to the efficiency of the wireless apparatus the "Matatua" was never for any appreciable length of time out of touch with the world's affairs. On October 10th strong signals were received from the Antipodes at 2,700 miles. Communication was opened with Niton Station from near Malta, the coast station responding to a general call made from the ship on October 29th, and easy communication was made between the two at 900 miles on several occasions prior to passing Gibraltar.

The New Works of the French Marconi Company

A SHORT time ago the French Chamber of Deputies passed a Bill requiring that all material required for the installation of wireless apparatus on board French vessels was to be manufactured in France, and the immediate result of this Act was to make the existing workshops of the French Marconi Company—the Compagnie Française Maritime et Coloniale de Télégraphie sans Fil—entirely inadequate to the demands placed upon it.



Machine Shop.

For some time past the increasing output of material had made it evident that, sooner or later, new premises would have to be sought for or built, and the Company had already taken steps to alleviate the rush of work by the occupation of a larger factory and by increasing the staff when the demands of the Government made the necessity not only imperative, but urgent.

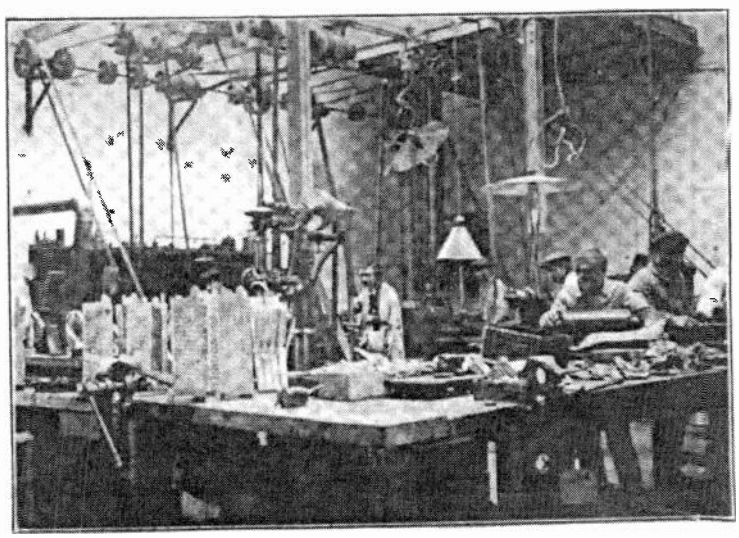
The new workshops are situated in the Rue Farcot at Saint Ouen, only a few minutes outside Paris, and are quite easy of access owing to the numerous tramway services which traverse this neighbourhood, so that for all purposes of business it is as conveniently situated as if it stood in the heart of the French metropolis.

The workshops comprise a vast machinery room, 60 ft. long, 50 ft. wide, and 25 ft. high. There is besides a special room, measuring 15 ft. by 20 ft., which is reserved for the manufacture of induction coils; and attached to this is a testing room, where every instrument, even the most insignificant, which has been manufactured by the Marconi Company is weighed in the balances, nor passed out thence until it has been found perfect, down to the very smallest particular. Here have been installed two transformers, one of 2 k.w., the other of ½ k.w., 150 periods, 100 volts, as well as a battery for charging accumulators. Here also are tested stations of various sizes, and all the special Marconi apparatus. A room is reserved for testing transmission condensers, and measuring the capacity of oil condensers and Leyden jars by means of the cymometer.

The motive power for the machines is supplied by the Great Central of Saint Denis, which has an alternating current of 110 or 220 volts, but which, by means of a transformer, can be raised to a maximum of 2,000 volts.

Last of all, adjoining the workshops, is a yard of about 1,200 sq. ft., which is surrounded with numerous sheds erected for the purpose of storing material.

The French Marconi Company are to be congratulated upon their possession of such an up-to-date and spacious factory, but we have a shrewd suspicion that they will not long be content with even these large workshops, for their constantly increasing business tends to the belief that before long the *ateliers* in the Rue Farcot will require to be enlarged to meet the necessary demands.



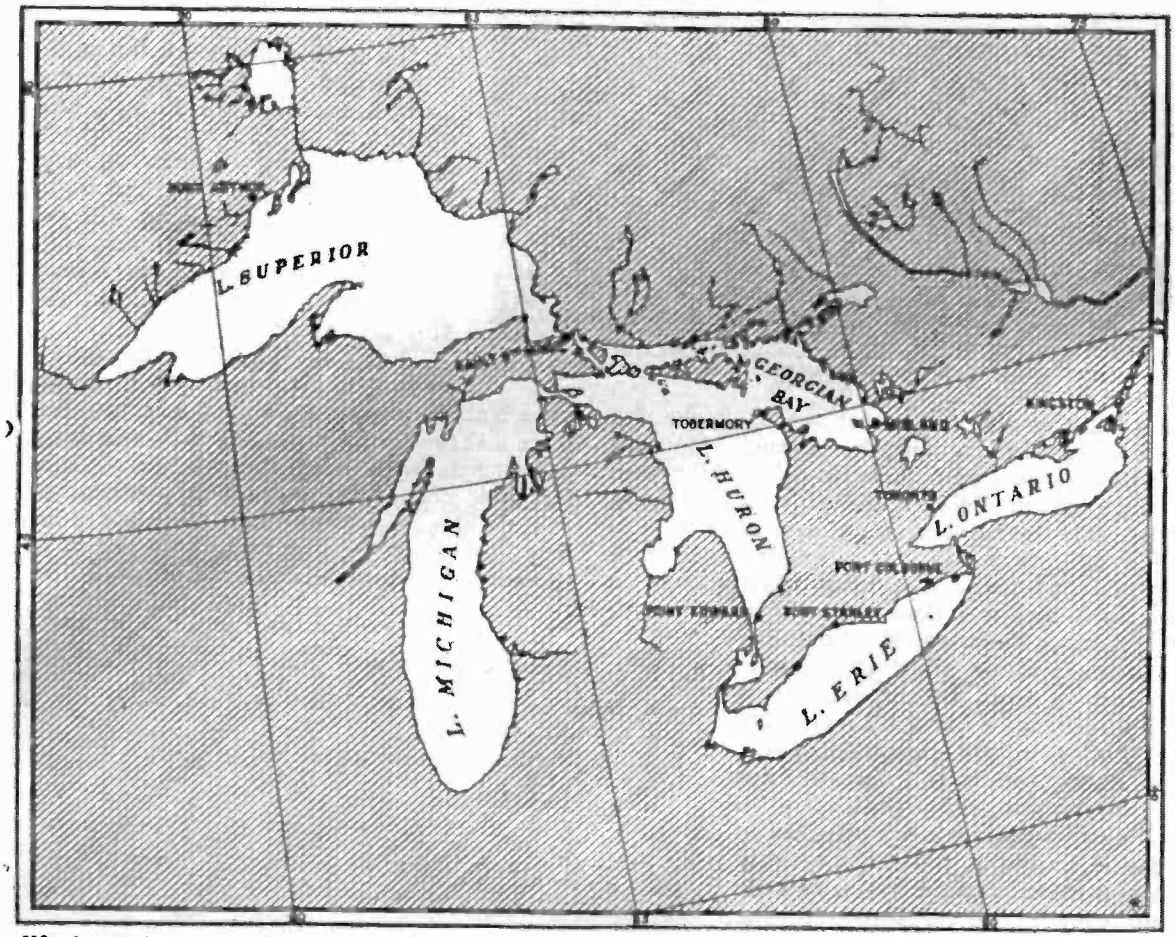
Mounting Shop.

Wireless Stations on the Canadian Lakes

IN the early days of November the following announcement appeared in the Press :

Marconi's Wireless Telegraph Co., Ltd., is advised that the contract with the Canadian Government for the operation and maintenance of nine additional stations on the Great Lakes of Canada has been signed.

the above possesses a special significance. It was made a few days before the announcement of the approval by the Norwegian Government of the contract entered into between the Marconi Company and the Norwegian Director-General of Telegraphs for the erection of a high-power station in Norway to link up the latter country with the United States of



Wireless Stations erected and to be erected by the Marconi Co. on the Great Lakes for the Canadian Government

When these stations are completed the Canadian Company will receive an additional subsidy from the Canadian Government of $31,500 per annum, The Agreement is for a period of nineteen years.

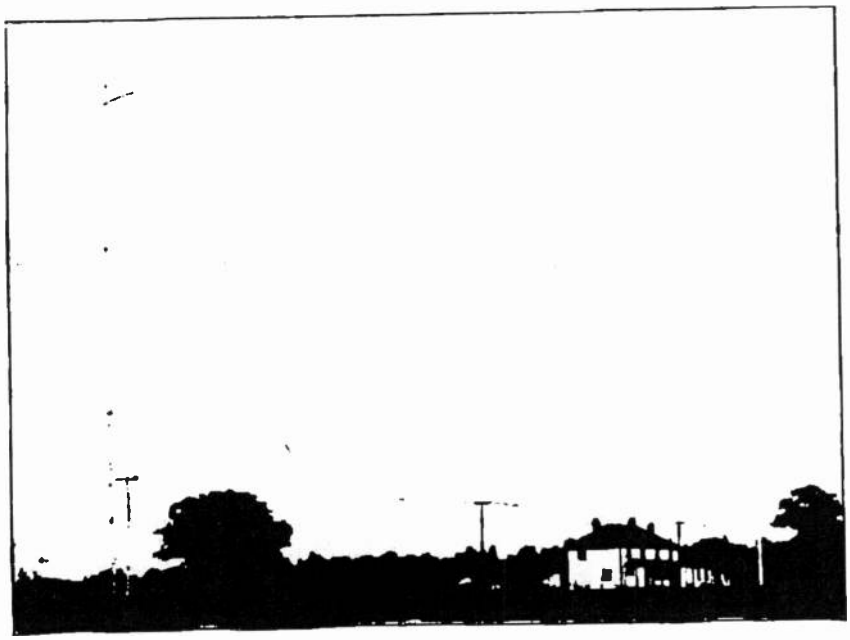
Following upon the important contract with the Canadian Government, which we were able to announce in these columns some months ago,

America, and it should help the public to obtain a clear perception of the true state of affairs in the wireless world.

Canada has for long been alive to the full significance of wireless communications, and her attitude has been consistent with what might be expected from a country whose remarkable development is likely to con-

stitute one of the most striking historical facts connected with the economic progress of the present century. At the time when Mr. Marconi was making notable experiments in Transatlantic wireless telegraphy the Canadian Government came to the assistance of the company with a subsidy of $80,000 towards the equipment of a high-power station at Glace Bay. The Government of to-day are no less zealous than were their predecessors for the maintenance of wireless communications by the most reliable and efficient system available.

The Company has completed the erection of three stations for the Canadian Government at Midland, Tobermory and Sault Ste. Marie. These stations will work in conjunction with the station at Port Arthur, erected in December, 1910, by the Marconi Company, and now to be taken over by the Dominion Government. A station at Sarnia is now in course of construction, and other stations are to be built at Port Stanley, Port Colborne, Toronto and Kingston, which will also work in connection with the existing stations.



Marconi Station at Sault Ste. Marie.

The erection of these stations on the Great Lakes is a continuation of the system of wireless telegraph stations in connection with the great waterways of Canada which was commenced in 1904 in the Straits of Belle Isle and at Cape Race, Newfoundland, and has been completed as far as Montreal. The Great Lakes branch when completed will also connect with Montreal.

The main uses for which this system of stations is intended are :

1. To aid navigation by enabling the masters of steamers to communicate with the shore, their owners, or agents, and the ports which they have left, or to which they are destined.

2. To provide similar facilities for passengers.

3. To provide direct communication between the points where shipping interests are centred without necessitating the use of the more circuitous routes of the land-line telegraph for communication between these points.

The points that have been chosen on the Great Lakes will show at once how these interests have been considered. By the opening of navigation in 1913 all the main shipping points in the Western Lakes will be in direct communication with one another by wireless ; these points are : Midland and Victoria Harbour, Sarnia, Sault Ste. Marie, and Port Arthur.

The necessity for stations on the Great Lakes might be questioned by those unacquainted with the conditions. Steamers probably find the greatest usefulness in wireless telegraphy when they are in close proximity to shore, leaving it, making a port, entering canals or narrow straits, and under other similar circumstances which occur very frequently with Great Lakes vessels. It must also be remembered that the larger of the Great Lakes are at certain seasons subject to exceedingly stormy weather, fogs, ice and cold, just as much as the oceans, and at such seasons constant communication with land or passing steamers is very acceptable.

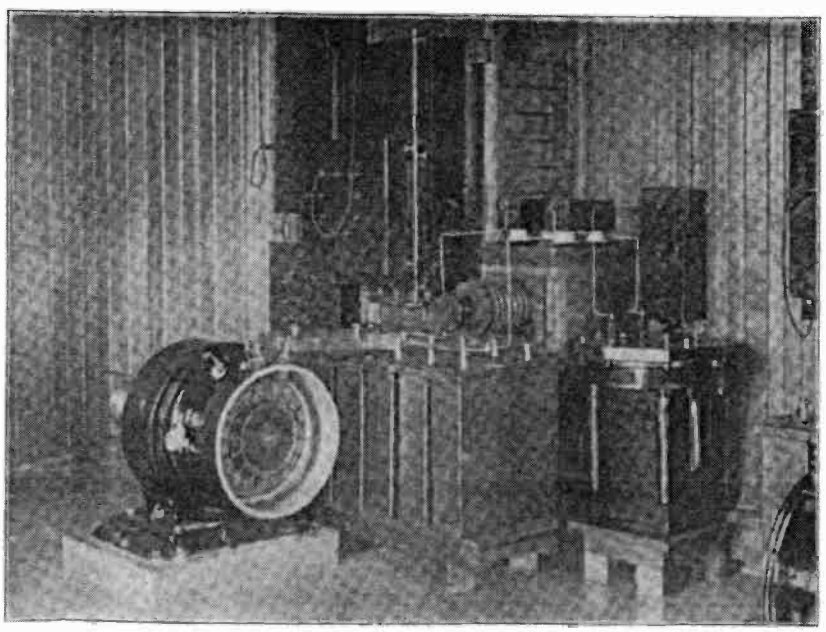
The site of each station will cover an area of about 650 ft. by 150 ft. There are erected two wooden masts, 450 ft. apart, each 185 ft. high ; the masts are built in three sections, supported by steel guys, and are 22 ins. in diameter at the bottom and 9 ins. at the top.

Each station is provided with two houses, one double dwelling house containing two dwellings, and one station house separated from the dwelling house by about 50 ft. The

Receiving Apparatus and Switchboard at Sault Ste. Marie.

dwelling houses provide accommodation for three men, and have been made very comfortable. The station house is divided into engine and transmitting room, operating room and office. All buildings are of wood with concrete foundations.

A standard type of transmitter is being installed at all the Great Lakes stations; it consists of a 10 h.p. 3 phase 550 volt standard induction motor worked by public power supply. The motor is directly connected through a flexible coupling to a special A.C. generator, generating A.C. at 440 volts and 240 cycles, and a spark discharger is attached to the A.C. generator: this consists of an insulating disc attached to the generator shaft, and rotating inside a muffler. Fixed in the muffler and insulated from it are two fixed electrodes, adjustable radially, and coming opposite to any two adjacent rotating disc studs. These fixed electrodes form the terminals of the sparkgap, and it is between their inner extremities and the points of the rotating studs that the spark occurs each time the latter come into a position exactly opposite the fixed electrodes. The fixed electrodes can also be adjusted in an angular direction. This adjustment allows their position to be fixed so that the spark always occurs in a certain position relative to the A.C. generator pole pieces, and therefore relative to the curve of the E.M.F. of the generator. It is arranged that this point shall be that point in each alternation at which the condenser has been charged to maximum voltage. All these complications in the design are necessary to enable the spark to be obtained absolutely free from arcing, and giving a pure musical note. The vibration per second of the musical note is twice the A.C. generator frequency, in this case equal to 480 per second. The note is about equal to middle C on the piano. The remainder of the transmitter is of regular design, consisting of a transformer for 240 cycle A.C., and specially constructed with regard to transformation ratio and magnetic leakage, various high and low-tension adjusting and protective chokers, and glass plate condenser capable of withstanding a voltage of 50,000 volts, and of a capacity of .06 M.F. high-frequency primary and secondary inductances and oscillation transformer. The transmitter is capable of emitting oscillations of any wave-



Transmitting Machinery at Tobermory

length between 600 and 1,700 metres, but is specially adjusted for wave-lengths of 600 metres and 1,600 metres, the former being the standard wave-length for ship communication, and the latter being solely for communication with the Great Lakes stations.

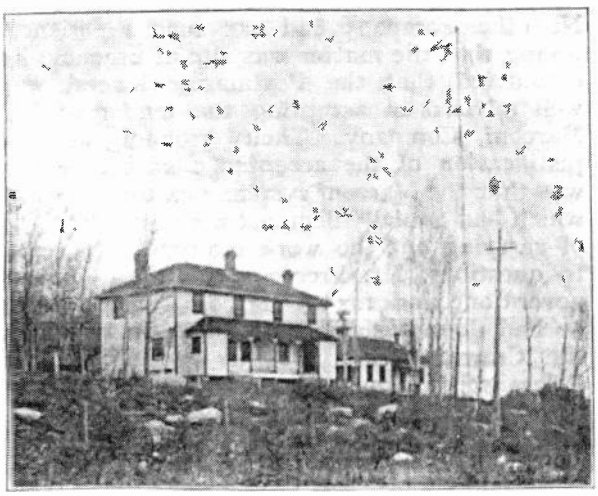
The aerial wires are stretched between the two masts, and are supported by four strain insulators designed for a mechanical load of 1,500 lbs., and to withstand an electrical voltage of 100,000 volts wet or dry.

The transmitting apparatus is completely duplicated at all stations. Where a public power supply is used, one 8 h.p. gas engine set is installed to provide motive power in case of breakdown of the electric power supply. Where no public power supply is used, and the engine is the main motive power, the engine is duplicated with the remainder of the transmitting gear. The only station of this latter type to be erected is at Tobermory.

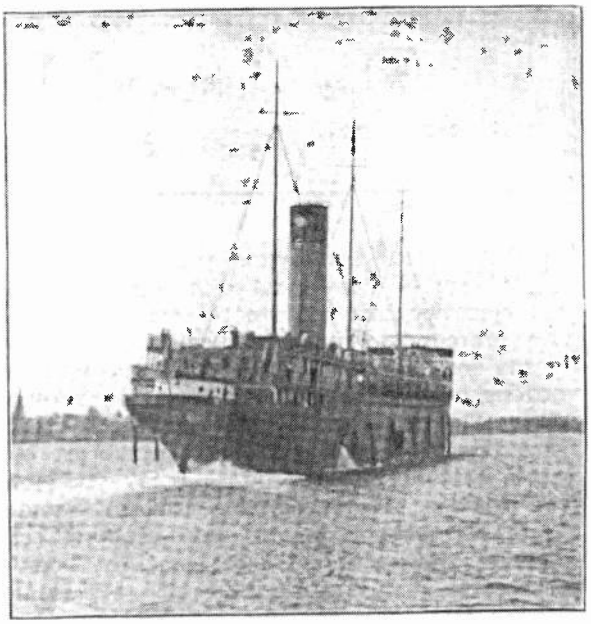
The receiving apparatus is contained in a room entirely separate from the transmitters, and consists of the Marconi type of valve receiver, with tuning apparatus capable of receiving similar wave-lengths to those transmitted by each station, and also the Marconi magnetic receiver is installed as an emergency or duplicate. The photograph of the receiving room shows the operator's chair with the receiving apparatus on the table; the switchboard completely controls the transmitting apparatus, and can be manipulated by the operator without rising from his chair.

At the Port Arthur station preliminary preparations for converting this station into a standard station have been commenced.

As is well known, different climates offer conditions favourable or adverse to wireless telegraphy, and these conditions influence the design of the station. Present experience



Midland Station showing only one Mast



The S.S. Assiniboia of the C.P.R. Great Lakes Fleet leaving Sault Ste. Marie.

shows the climate of the Great Lakes of Canada to be particularly favourable to wireless telegraphy in the winter time, but somewhat adverse to it during the summer. During the summer season electrical disturbances are frequent, and these are always accompanied by disturbances to wireless telegraph receivers. In telephonic reception these disturbances evidence themselves by scratching and dull-toned noises in the telephone, and it is when these electrical disturbances exist that the pure-toned note of the transmitters installed on the Great Lakes is particularly advantageous.

Now that the land facilities are being provided Canadian steamship owners on the Great Lakes have commenced to equip their vessels with wireless telegraphy. Up to the present eleven Canadian steamers are operating. These are:—Canadian Pacific Railway (Great Lakes) steamships, " Alberta," " Keewatin," " Assiniboia," " Athabasca," " Manitoba," the Northern Navigation Company steamers " Huronic," " Hamonic," and " Saronic," and the Canadian Towing & Wrecking Company vessels: barges " Imperial," " Empire," and " Provence."

It is expected that during the winter of 1912-13 there will be considerable activity in the fitting with wireless telegraphy of Canadian Great Lakes steamers. A large number of these steamers trade with United States ports, and recent United States legislation makes equipment with wireless telegraphy compulsory with all vessels trading in United States ports. This legislation for the Great Lakes comes into effect on April 1st, 1913.

The Imperial Wireless Scheme

Proceedings before the Select Committee

THE Select Committee appointed by the House of Commons to inquire into the contract entered into by the Post Office with Marconi's Wireless Telegraph Company for the erection of a chain of Imperial wireless stations, held its first public meeting on October 29th. The chairman of this Committee is Sir Albert Spicer, and the other members are Mr. James Falconer, Mr. Gordon Harvey, the Hon. Neil Primrose, Sir Herbert Roberts, Mr. Handel Booth, Mr. Leopold Amery, Lord Robert Cecil, K.C., Mr. George Faber, C.B., D.L., Mr. Donald Macmaster, K.C., Mr. Harold Smith, Mr. Henry Terrell, Mr. John Mooney, Mr. William Redmond, and Mr. J. Parker.

The first ten sittings were occupied in receiving evidence from, and examining, four witnesses, seven days being devoted to the examination of Sir Alexander King, the Secretary of the Post Office. Sir Alexander, who opened the case for the contract, gave an outline of the history of the negotiations which led up to the signing of the contract with the Marconi Company. He explained what other courses there were to choose, and why they were rejected, the main reason being that the Marconi Company were the only people who had had the enterprise to undertake long-distance working, and had shown that they could do it. In reply to questions put to him by members of the Committee, he expressed his opinion that the Post Office had made an exceedingly good bargain. Further questions, prompted by the idea that his department had not given sufficient attention to the offer of the Poulsen Syndicate, elicited from Sir Alexander the statement that the Government would have been very much to blame if they had speculated on a system which had not been proved; for if after twelve months the suggested demonstration had failed, they would have been in a worse position to negotiate than before, and if a war had broken out in the meantime they would have had no defence for their action. He emphasised the importance of Britain to be first in the field with wireless. He believed that international regulation of wireless telegraphy would ultimately extend to long-distance stations, and he assumed that property in wireless would be recognised in any regulations made. The first definite suggestion that the Marconi Company should have the contract came, not from the Post Office, but from the Imperial Defence Committee, who based their recommendation upon strategic considerations, and also on the ground that there should be no avoidable delay. The Post Office had not given the Marconi Company the monopoly; the Marconi Company were already in possession, and had themselves created the monopoly because no other company had shown its efficiency for world service in the same degree. Replying to further questions, Sir Alexander King said he believed the German Government had given a contract to the Telefunken Company for the installation of long-distance wireless telegraphy between the Caroline Islands, the Solomons, and Samoa, but in no case was the distance two thousand miles.

Mr. Llewellyn Preece, a civil and electrical engineer, and a partner in the firm of Preece, Cardew & Company, consulting engineers to the Crown Agents for the Colonies, and to the High Commissioners for New Zealand and South Africa, next gave evidence. He said that during the last thirteen years he had been largely responsible for the wireless telegraph work in connection with the Crown Colonies, which had been placed in the hands of his firm. He had carefully studied the agreement between the Postmaster-General and the Marconi Company, and the approved specifications submitted by the company. The Marconi Company was the only one which had had continuous experience of long-distance commercial working, some of their stations having worked over distances exceeding 2,000 miles. No other company had had such experience. Seeing that the matter was one of urgency, he considered that the Postmaster-General was well advised in accepting the tender of the Marconi Company. Their ground for the justification of the acceptance of the tender was that the Marconi system was the only one which had actually demonstrated its capability of carrying out the work required. In reply to questions, Mr. Preece stated that he had never done work for the Marconi Company, but he had done business with them on behalf of the Crown Agents, and in every case the orders were placed with the Marconi Company because their tender was much more satisfactory and cheaper than the tender of other companies. The Poulsen people claimed that they could work satisfactorily with less area than the Marconi Company, but they had not

proved that they could do so, and he was inclined to doubt the claim. Asked whether he considered it fair that in certain eventualities the Marconi Company should be allowed to see what other companies were doing, he replied in the affirmative. The Marconi Company—as everybody acknowledged, he said—held the master patents for wireless, and the probability was that any new invention might infringe one of these master patents.

Mr. Beach Thompson, president of the Federal Wireless Telegraph Company of the United States, occupied the witness-chair on November 14th. In his evidence before the Committee he said that his company were working the Poulsen system, and the longest distance over which they were working the system both day and night was about 950 miles, between San Francisco and El Paso. They were now working all night and for a portion of the day—that was to say, until 10.30 a.m.—from San Francisco to Honolulu, a distance of about 2,400 miles. In reply to Mr. W. Redmond he said that he was informed that there was a company recently formed in England which owned and controlled the rights for the British Empire for the Poulsen system. Asked whether the Poulsen system communicated freely between San Francisco and Honolulu in the daytime, he replied that they had not got the equipment that they wanted to give them—what he would call a first-class commercial service all day long. He had no doubt that it could be done, but it had not been done commercially. He thought that the system had been proved, but, asked for evidence, of the proof, he replied that it depended altogether on what one meant by proof.

In reply to further questions, he admitted that he had not yet been able to get messages from San Francisco to Honolulu in the daytime. He further admitted that the United States Government had guaranteed him nothing, and had made no contract with him, and that his future relations with the Government of the United States depended entirely on whether they were satisfied with the working of his stations once they were equipped. Asked why, if he could send long-distance messages by night he could not do it in the daytime, he admitted that he could not tell. Pressed to state definitely the longest distance over which his company had been able to work a regular service, the reply was 1,150 miles as the crow flies, between San Francisco and El Paso. As a result of measurements made on the map by members of the Committee, it was found, however, that the distance between these two places was less than 1,000 miles. In reply to further questions as to whether there was any difference in the perfected system which he had been describing to the Committee as working in America, and the system offered to the British Government on behalf of the Poulsen Syndicate, witness said he was not able to answer because he did not know what was offered to the British Government on behalf of the Poulsen Company. There was nothing in the correspondence with the United States Government to show that they were more anxious to secure his company's inventions than those of any other company. On some occasions the most surprising results in long-distance telegraphy had been obtained with his company's system which it had not been found possible to repeat afterwards.

Sir H. Roberts pointed out that what the Committee had to consider was the position of witness's system at the time the British Government made its contract with the Marconi Company, and he asked witness whether it was clear that the ultimate distance he had worked for over a continuous service was the distance from San Francisco to El Paso. Mr. Thompson replied: "I refuse to answer that question definitely; I do not think so. I refuse to take for granted that the only thing done is the only thing that can be done." The Hon. Neil Primrose asked witness why, if he had such confidence in his system working continuously over a long distance of 2,000 miles, he did not put up stations, and the reply was: "When I took this up I told the United States Government it was worth investigation, and that it was worth spending three or four hundred thousand dollars to investigate it. I said: 'If you will come in with me I will carry on the investigations. It will take a year or two.' A year ago I said to them: 'I have proved certain things, but before I am willing to say it is absolutely reliable it must go into the public service and stand the test.' That has been going on ever since." Mr. Primrose remarked that he thought it proved that witness could not do continuous commercial work at all times over 2,000 miles. Mr. Beach Thompson explained that he had come to London to negotiate an agreement with the British Poulsen Company, and partly for vacation; but when he found that the patent rights had been sold to a company whilst he was actually on his voyage from America, "the interview closed very shortly." His company had not sold any of their patent rights to anybody in this country, and had no intention of doing so.

The chairman pointed out that the witness was called on the suggestion of the Universal Radio Syndicate, Ltd., who desired it to be understood, however, that Mr. Thompson was not directly interested in their company.

On November 20th the chairman stated that

he had received a letter from Mr. Beach Thompson dated November 18th, in which the writer said :

" It may be of interest to your Committee to know that I have received information from home concerning our work between San Francisco and Honolulu on the dates beginning November 7th and continuing November 15th, including the two days I was testifying before your Committee. . . . My information now shows that at the time my testimony was given we were in continuous communication between San Francisco and Honolulu at all times of the day, and had been since November 7th, using 40 kilowatts of power, and the new design of Poulsen generator."

The chairman remarked that he had also received a communication from the Post Office containing the following message on November 15th :

" The Under-Secretary of State for Foreign Affairs presents his compliments to the Secretary of the Post Office, and by direction of the Secretary of State transmits herewith copy of the undermentioned paper :

" ' Paraphrase of telegram from Consul General Ross, San Francisco, November 15th, 1912. Poulsen wireless communication to Honolulu.

" ' In reply to your despatch of October 24th, I am informed by the Poulsen Wireless Telegraph Company that they have not yet succeeded in establishing communication with Honolulu by day.' "

This direct contradiction on a matter of fact was subsequently severely commented upon by several members of the Committee, who questioned Sir A. King upon them, and drew from him the remark : " I would sooner take the word of the British Consul."

Sir David de Villiers Graaff, Bart., the Minister of Public Works and Posts and Telegraphs of the Union of South Africa, gave evidence on Monday, November 18th. He said that during the Imperial Conference in June, 1911, he was fully informed of the reasons which had led the British Government to decide that a chain of wireless stations, owned and worked by the State, should be constructed to link up the various parts of the Empire. The Government of the Union of South Africa was then, and still was, in complete accord with the Imperial Government in regard to the great importance of the scheme, both from a strategic and commercial point of view. Through their High Commissioner his Government had kept in close touch with the deliberations which followed in respect of the best method of giving effect to the purpose with negotiations for the station, also of the terms of the proposed contract with the Marconi Company. In July last his Government expressed its cordial approval of the arrangements which had been made. In coming to this conclusion, the Union Government attached great weight to the fact that the Marconi Company, alone of all wireless companies, so far as his Government was aware, was actually carrying on a long-distance wireless service both day and night. His Government always held, and still held, the view that the delay and expense that would be involved in making experiments to ascertain whether another system could carry out an effective and continuous service, could not be justified—especially seeing that it was possible that the trial might fail—when time and money would have been wasted. Sir David Graaff said his Government felt so strongly on this point that they would not have adhered to the Imperial scheme if the system adopted had not been one which had been proved by continuous long-distance service. He further said that his Government would withdraw from the scheme if the Imperial Government were to adopt a system which would involve expense and delay before it would be declared to be of proved capacity for the work. His Government gave great weight to the fact that, under the agreement with the Marconi Company, there was the definite guarantee that payment for the work to be undertaken by the company was only to be made upon the satisfactory erection of the installations, and definite approval as to the capacity of the installations for carrying long-distance messages.

He was quite satisfied with the arrangements that had been made by the Post Office, and, in his opinion, the best arrangement had been made to serve the best interests. The present scheme was, in his opinion, an improvement upon the earlier schemes submitted. Sir David Graaff added that in South Africa the Government had a technical staff, who had obtained particulars from another company, and had arrived unanimously at the conclusion that the Marconi Company, and the Marconi Company only, was the proper company to give the contract to if they wanted to ensure success.

The chairman then finally intimated to Sir David that he wished to ask him two questions. " You heard Mr. Beach Thompson give his evidence last week ? "—" Yes."

" If you had to make a contract again, having heard his evidence, would you still join in giving it to the Marconi Company ? "—" Absolutely, and all the more so after having heard his evidence—much more so."

Mr. Falconer asked why, and the answer was :

" Because I think he admitted he was simply in the experimental stage—that his schemes were still in the air. We have a good deal of that sort of thing out our way, and we do not take notice of such people."

Parliamentary Notes

OPERATORS ON LINERS.—The President of the Board of Trade was asked about the number of wireless operators carried on board the P. & O. liners; also whether the Board would issue regulations that every ocean-going steamer fitted with the Marconi apparatus should carry at least two operators.

Mr. Buxton agreed that only one Marconi operator was carried on certain of the P. & O. vessels. The Board of Trade had no power to issue regulations as to the number of operators to be carried, but, as he had already stated to the House, a Bill requiring certain ships to be provided with wireless telegraphy apparatus had been prepared, and the question of operators would be dealt with in it.

* * *

PATENTS.—Mr. F. Hall wanted to know on what grounds the letters patent in respect of certain improvements in wireless telegraphy granted to Mr. Ettone Bellini were revoked; and whether any of such improvements had been or were proposed to be embodied in the Marconi system.

Mr. Buxton assumed that the patent referred to was No. 11339 of 1911. This patent was revoked by the Comptroller-General of Patents on September 28th last in consequence of an offer made by the patentee to surrender the patent under the provisions of section 26 (3) of the Patents and Designs Act, 1907. The reason given by the patentee for making this offer was as follows: "That the invention is found to be wanting in novelty." Mr. Buxton had no official information as to the last part of the question.

* * *

THE WIRELESS CHAIN.—The Postmaster-General was asked by Sir R. Adkins whether the first Marconi tender was signed in January last; whether none of the Dominions had entered into a contract with the Marconi Company; and whether he had himself given currency to either or both of these statements.

Mr. Samuel replied that these statements were totally false, like much else that had been written about the contract. No agreement of any kind had been made with the Marconi Company with respect to these stations until March 7th, 1912, when their tender in general terms had been accepted, while the contract itself was signed on July 19th. He repeated that he had made no reference to any tender having been signed in January. The South African Government was participating in the contract, and the statement alleged to have been made with respect to the Dominions was a mere invention.

* * *

WIRELESS TELEGRAPHY ON BRITISH SHIPS.—Mr. Peto asked the Secretary to the Admiralty whether, in respect to the Board of Trade notice to masters and owners of British merchant vessels which had been issued at the request of the Lords Commissioners of the Admiralty, directing their attention to the necessity for arranging for periodical practices in wireless telegraph communication between His Majesty's ships of war and ships of the British mercantile marine for the purpose of ensuring efficient and reliable communication when required, he was aware of the fact that there were aliens commanding and officering ships of the British mercantile marine.

Mr. Lambert replied that the notice in question had been issued with the object of ensuring that any communications which might be considered desirable between the Royal Navy and the mercantile marine might be efficient and reliable when the occasion arose. No inference was to be drawn from this as to the distribution of confidential information.

* * *

WIRELESS IN THE ARMY.—The Committee recently appointed by the Secretary of State for War to consider Wireless Telegraphy in the Army have commenced their proceedings, the first meetings being held at the War Office.

The members are Sir Henry Norman, M.P. (Chairman), Colonel R. D. Whigham, D.S.O., of the General Staff; Commander A. E. Silverton, R.N., of H.M.S. "Vernon"; Major R. H. H. Boys, D.S.O., R.E., of the Department of Fortifications and Works; Lieutenant-Colonel Hippisley, of the Territorial Force; Mr. E. Russell Clarke, of the Inner Temple; and Captain A. M. Henley, of the General Staff, secretary. The proceedings of the Committee are confidential.

* * *

It is understood that the New Zealand Government have under consideration legislative action compelling all steamers trading with the islands for passenger traffic to carry wireless equipment.

The International Radiotelegraphic Convention

Results of the London Conference

THE third International Radiotelegraphic Convention, which met in London on June 4th, and concluded its deliberations on July 5th, came to an agreement as regards several important features which the Berlin Convention of 1906 left undecided.

Thirty-seven countries were officially represented by 149 delegates, in addition to the companies, whose representatives were entitled to speak, but not to vote. The meetings were not open to the public. Sir Henry Babington Smith presided. French was the official language. We will give a brief *résumé* of the results of the conferences.

The Convention, which requires ratification, is divided into two parts—the Convention proper, with an additional final protocol, and the Règlement de Service. The Convention consists of twenty-three articles. The definition of coast stations and of board stations (not comprising permanently anchored ships) remains as before. Article 3 enacts an exchange of messages, irrespective of the system, between coast and board stations, and between board stations. It does not force coast stations to a like exchange with other coast stations; but that point may be left to the next Convention, which is to assemble at Washington in 1917. There is also a clause added to this article which provides that systems which cannot enter into communication with other systems may be used, provided that this incapability be inherent in the system, and not due to arrangements especially made with the object of preventing intercommunication. The following articles, referring to the transmission of the received messages by the telegraph and cable lines, to exchange of information on the service, and to the maintenance of a service such as not to disturb other stations (Article 8), do not differ from those of 1906. Article 9 demands absolute priority for distress signals, no matter of what origin—that is to say, whether they come direct from a ship or indirectly from coast stations. Article 21 of the Règlement adds that the transmission of such signals, and its continuation and stoppage, must take place in accordance with the desire expressed by the ship in distress. The distress signal is . . . – – – . . . (S.O.S.).

Right to Vote

The fees to be paid for a radiotelegram comprise a sum payable to the coast station and a board tax, in addition to the further sums due for forwarding the telegram on and to special transit charges. All further questions, so far not in the competency of the Bureau International de l'Union Télégraphique, are to be settled by additional conferences of delegates. At these conferences each country has one vote only, but colonies count as separate countries, with the restriction that the number of votes for any nation must not exceed six. Thus Great Britain has one vote, and additional votes for South Africa, Australia, Canada, East India, and New Zealand. Disputes between different States as to the interpretation of the Convention and to any modifications, are to be decided by arbitration.

Article 21 is important. It prescribes that the Governments may erect military and naval stations, and special stations for service between fixed points, which are not subject to the general rules; but such stations must take up distress signals, and must not disturb other stations. When these stations also accept public messages across the sea, they are bound by the ordinary regulations; the regulations for the service between fixed stations are left to the respective country. The Convention is to enter into force on July 1st, 1913. The final Protocol adds that the United States decline to sign any rule as to the tariff, since their telegraphic service is mainly private, and that Canada reserves its right to impose a total maritime tax for messages coming from the United States and intended for ships.

Service Regulations

The service regulations demand (Article 2) that each coast station shall be equipped with apparatus for working with two wave-lengths, 300 m. and 600 m. Other wave-lengths may only be used with the sanction of the respective Governments, but no wave-lengths intermediate between 600 m. and 1,600 m. are to be used in public service. Stations which exclusively enable ships to fix their position are to work with waves of 150 m. For most ships the 600-m. wave-length is to be regarded as the normal one, and every ship must be able to receive with that wave-length during service hours. So far as possible messages should be replied to with the same wave-length as received. The International Bureau will publish at intervals lists of all the stations, with their full "nomenclatures," comprising posi-

tion, name, range, etc., of station, wave-length, hours of service, and tariffs. This nomenclature distinguishes private stations, P; public stations, P G; restricted public stations, P R; official stations, O; permanent service stations, N; stations working with indefinite interruptions, X (Articles 4 and 5). The exchange of superfluous signals is interdicted, and experiments should be conducted only when not interfering with other messages, and then with special wave-lengths and with the smallest possible expenditure of energy (6). The waves should be pure, and direct antenna-sparks not be used, except by stations not commanding more than 50 watts of primary energy. Apparatus should be able to maintain a minimum speed of twenty words of five letters per minute. New stations should be equipped so as to be able to work at several ranges smaller than their normal range, the minimum being 15 nautical miles, whilst special stations for enabling ships to take their bearings (radiophares) should be limited to a range of 30 miles.

Operators' Certificates

The power of the special generator for the instrument should not exceed 1 kilowatt, measured at the binding screws, except when a ship is at least 200 miles from any coast and anxious to send long-distance messages. No coast station may be erected or worked without permission of the respective Government, and the licence must be shown to the proper authorities in foreign ports if called for. The Government (Article 10) has also to license the operator, and two kinds of certificates are distinguished. A first-class certificate is given to a man possessing sufficient practical and theoretical knowledge of the apparatus and of the service regulations, and sufficient experience to maintain the regulation rate of transmission. A second-class certificate is to be granted to operators who cannot maintain full speed; they may be employed as assistants or as operators on vessels which merely wish to telegraph in their own interest—*e.g.* fishing craft. The operators are subject to the orders of the commander of the ship. All stations classified for permanent service (*a*) or for service for certain hours (*b*) must be equipped with an auxiliary radiotelegraph outfit, comprising an independent source of power capable of maintaining transmission for six hours over a range of 80 or 50 miles (permanent (*a*) or limited (*b*) services). Cases of complaints have to be examined by the authorities, and the licences of the operator or of the station to be withdrawn after repeated offences.

Most of the remaining articles are of smaller general interest. As regards the service hours (Article 13) the important coast stations (*a*) should be open day and night, and ship stations be open likewise, or during their special hours (*b*); vessels of the third category (*c*), having no definite hours or service, are not subject to any definite rules. Articles 14 to 19 deal with the charges, Articles 20 to 35 with transmission, Articles 36 and 37 with the forwarding, Articles 35 to 40 with special messages (prepaid replies, urgent messages, etc., are now permitted).

Weather Telegrams

A few special features should be mentioned. According to Article 24 the customary call sent by any ship to a coast station which it is approaching should be omitted in waters which, like the English Channel, are much frequented. Such a call should not be made before the apparatus is well adjusted and before the station is within the normal range of the ship and within 75 per cent. of the range of the coast station. In making the call the ship should wait for a pause. If that be impossible, the ship should in general stop sending when a protest of interference comes from some quarter. A powerful station (Article 27) first should send in all cases the signal — — . . — — three times with the smallest possible amount of energy at least 30 seconds before putting on full power. Various restrictions are made with regard to more or less unnecessary matter which should not be telegraphed under ordinary conditions. Article 45 regulates the transmission of weather and time signals.

Weather telegrams should not exceed a length of twenty words, and time signals and weather signals (to be sent in the order just stated) should not take up more than ten minutes together. During this period other messages should temporarily cease.

"We are informed by a trustworthy correspondent that the Marconi Company has no intention at present of undertaking the manufacture of gas fittings."—*The Electrician.*

Marconi's Wireless Telegraph Co., Ltd., gave a donation of £10 10s. towards the Lord Mayor's fund for the relief of sufferers by the recent floods in Huntingdonshire.

Professor J. Wertheimer, D.Sc., delivered a lecture on "Wireless Telegraphy" in the great hall of the Merchant Venturers' Technical College, Bristol, on October 25th. Dr. Wertheimer said that when he gave the first lecture in the West of England on the subject of wireless telegraphy, fourteen years ago, many of his friends asked him whether the discoveries had any commercial value; nowadays no one doubted that this was the case.

The Post Office and Safety at Sea

THE inquiry which has recently been held at the Board of Trade by the Derelicts Committee regarding the steps taken to report the position of bergs and derelicts, as well as meteorological conditions, has elicited much interesting information. While there was a marked difference of opinion amongst witnesses regarding the prevalence of these dangers, all were agreed on the best course to be pursued in dealing with the trouble, the unanimous verdict being that it is the duty of every ship-master, if he come in contact with a derelict or iceberg, or if he experience severe weather, which is likely to be dangerous to other vessels, to report the fact to the authorities, and for this purpose wireless telegraphy is the only possible means of communication. That this would be the verdict of anyone competent to judge on these matters was a foregone conclusion; but the chief interest of the inquiry lies in the evidence given as to the resources available for the adequate dissemination of such information. The outcome is that the efforts of the Post Office in this connection do not appear in a very favourable light; but not, we must believe, from any intentional desire on the part of the authorities to evade this important duty, nor from any want of consideration on the subject.

A Change of System

One of the most important witnesses at the inquiry was Captain Mathias, who gave testimony on behalf of the Liverpool Steam Ship Owners' Association and the Mercantile Marine Service Association. He alleges that since the Marconi wireless stations have been taken over by the Post Office a complete change in system has been introduced with reference to charging for "danger" telegrams. When the stations were in private hands there was a give-and-take arrangement between the parties, and messages obviously in the public interest regarding derelicts, vessels in distress, dangerous ice and other obstructions, as well as bad weather, were accepted without charge, the obvious result being to put a premium upon these reports, and to prevent captains, in making them, from being in any way influenced by considerations of economy. With the change in management, however, the officials strictly carry out the rules and tax every word transmitted.

It may turn out that to some extent Captain Mathias may be mistaken in his estimate of the attitude of the Post Office officials, but his statement was both categorical and circumstantial, and the actual instance he gave will take a good deal of contradiction to explain away. On one of his recent voyages he desired to know from a station near Liverpool what was the nature of the weather outside the river, and was met with the curt answer that he could have the information if he chose to pay for it. This was not a case of reporting a derelict, it is true; but the witness was not less emphatic in his declaration that every word had now to be paid for. At the same time Captain Mathias laid stress on the difference in this respect between the officials in this country and the United States and Canada, the "wireless" people in America being only too anxious to afford captains of ships every possible information likely to assist in safe navigation.

The United States and Derelicts

In support of his contention, he stated that the United States employed three vessels to destroy derelicts off the coast, and these vessels operated as far as 400 miles off the coast. A certain number of derelicts escaped and drifted into the trade routes. The derelict destroyers searched for derelicts all winter. They were fitted with wireless telegraphy, and were in constant touch with the wireless stations on the coast. They were of about 1,500 tons each, and carried large and efficient crews. At the same time, he added, that the American coast was extremely dangerous, and there was nothing like it round the United Kingdom.

Captain Mathias's evidence was to some extent corroborated by the Postmaster-General, who, on October 30th, in the House of Commons, replied to a question put by Mr. Pretyman as to whether a charge of 5s. was made for radio-telegrams furnishing local weather reports to vessels at sea.

Mr. Samuel stated in his reply that the charge referred to was made to cover the cost of the radio-telegram conveying a weather report to a ship, as well as the radio-telegram asking for information, and was below the ordinary rates. The Marconi Company, when they owned the shore stations, supplied reports of this kind free of charge. On the other hand, the International Conference on Wireless Telegraphy, which recently sat in London, resolved that this service ought not to be gratuitous. Radio-telegrams relating to the position of derelicts and other objects dangerous to navigation were transmitted to ships gratuitously from the Post Office stations. As at present advised, he saw no reason why the

same privilege should be granted in the case of weather reports at the cost of the taxpayer.

The Charge for Meteorological Information

A little later an interesting correspondence (dealing more particularly with the meteorological side of the question) took place between the President of the Board of Trade and Mr. J. Smith Park. In one of his letters Mr. Buxton, after quoting—practically verbatim—the above-mentioned report of Mr. Samuel, adds that "operators at coast stations under the charge of the General Post Office have been instructed to give information as to weather conditions without raising any discussion as to charges, which are subsequently collected from the owners of the ships concerned."

In reply, Mr. J. Smith Park asks the President of the Board of Trade whether it does not strike him "as incredibly mean that the British Government, representing as it does the greatest maritime nation in the world, should make any charge whatever for informing ships arriving off our coasts as to the state of the weather." He points to the pressure put upon shipowners to fit their vessels with wireless telegraphy, and to the British Meteorological Office's invitation to the masters of ships fitted with wireless telegraphy to transmit to them by wireless information as to weather at sea, a request which is freely complied with.

Derelict Statistics

Coming back again, however, to the subject of the derelicts, some remarkable statistics were afforded at the inquiry by Rear-Admiral E. F. Inglefield, secretary of Lloyd's, regarding the limited services of the Post Office. He declared that during 1911 Lloyd's received reports of seventy derelicts, all over the world, and sixty-one during the present year up to October 19th. These were from masters, who were all under an obligation to report derelicts and wreckage to the agent or sub-agent at the nearest port of call. Reports were also received from the Board of Trade, Trinity House, the Customs, and the Receiver of Wrecks, and some of these reports were of derelicts which had not been reported by masters. The information was published broadcast by Lloyd's. There were 1,705 British and foreign steamers fitted with wireless telegraphy apparatus, and reports were now also received by that means.

In 1911 twenty-four such reports of derelicts and dangers to navigation were received, and twelve in the present year up to October 21st. Practically all these reports were received from ships in the Atlantic. Reports were also found in the British and foreign Press. The Post Office had taken over Lloyd's wireless stations, and they distributed a limited amount of information which they received. If the Post Office received a wireless message from a ship they would retransmit to Lloyd's on payment of the ship's station charge, and on Lloyd's paying the overland charge. The Post Office gave practically no assistance at all to Lloyd's. In the United States and Canada the reporting of derelicts was regarded as a national duty, and here it was laid upon individual shoulders or upon Lloyd's. The committee of Lloyd's believed that reports of derelicts reported by a ship at sea and received at the wireless stations should be transmitted by the Post Office absolutely free.

Several vessels struck the masts of the sunken ship "Oceana" off Eastbourne, although the wreck was well marked, and they signalled every ship going up the Channel until the wreck was dispersed. It was very difficult to destroy a derelict even after it had been found. The number of floating derelicts was decreasing year by year, as the number of wooden vessels was becoming less. Derelicts were generally wooden ships. It would be an advantage to mariners if one authority, instead of several, were charged with the duty of disseminating information as to derelicts. At present the Meteorological Office, the Board of Trade, the Admiralty, the Post Office and Lloyd's distributed the information, and he suggested that Lloyd's was the best agency to distribute such news.

Conclusions

With such evidence as this before them there can be little doubt as to the attitude which the committee will adopt in their report. There is proof enough and to spare that there are serious faults in the present system of assisting navigation by wireless reports, but at the same time it is equally evident that these faults are easily rectified. It is manifestly to the interest of everyone that masters of vessels should be possessed of every item of news calculated to enable them to avoid ocean and river dangers, and the State owes it to the community to see that no hindrance is placed in the way of the acquirement of such knowledge. There are thousands of smaller vessels which, if they were fitted with "wireless," would certainly to some extent be influenced by the fact that even a mere query as to the weather would entail charges on their masters, and it does not seem right that shipmasters should be placed in this position.

At the same time the attention of those authorities should be drawn to the suggestion of Captain R. Deane, a representative of the Commissioners of Irish Lights, who in the course of his evidence before the committee pointed out that it would be an advantage if some of the lighthouses and light vessels were equipped with wireless telegraphy for promptly reporting derelicts and wreckage.

War Notes

THE attention of the public and of the Press the world over is so deeply obsessed by the rapid development of military events in the Balkans, and, at the moment of writing, by the extreme delicacy of the diplomatic situation in the Near East, that there has been no time to think of certain details of military equipment which are decisive factors in warfare. The *role* played by wireless telegraphy in the present war may seem, to the casual observer, a relatively small one; the close student of the Press, however, cannot fail to notice that the various wireless stations in the vicinity are performing services of immense value. The nature of the work of these stations is such that their operations do not come much within the limelight, and, even if they did, it is doubtful whether they would be able to divert attention from the startling events that are occurring with breathless rapidity at the seat of war.

* * *

But when the clash of battle has subsided and the sword is replaced in its scabbard, the historian who sits down to record facts and to draw deductions for the benefit of students of military tactics will be able to shed an illuminating ray upon the part played by wireless telegraphy in the war. It will then appear how much depended upon the rapid means of communication made possible by the genius of Mr. Marconi and those who, with him, have brought such renown to Marconi apparatus, and made the term synonomous with wireless telegraphy. For it is well known that several of the combatants possess numerous Marconi portable stations of various types and ranges, and that in Bulgaria, Turkey and Greece there are high-power Marconi stations, each of them performing valuable work.

* * *

The *Matin* on November 12th, in a despatch from Constantinople, published the interesting item of information that the French Admiral Dartige du Fournet had some difficulty in getting into touch with the Eiffel Tower by means of his wireless installation, and he had to make use of the "Jules Ferry" as a relaying station. The British cruiser "Weymouth," on the other hand, was daily in direct communication from the Aegean Sea with England. The maintenance of direct communication in spite of the disturbance caused by the various warships endeavouring at the same moment to communicate with their respective Governments, and the failure of the "Leon Gambetta" to get through to Paris, is an incident fraught with great significance.

The chief stations are Varna on the Black Sea, owned by the Bulgarian Government, Constantinople and Athens. All these stations were built by the Marconi Company, and are worked by their respective Governments. None of them have so far been used for the transmission of commercial messages, and it is unlikely that they will be permitted to transmit ordinary Press or other telegrams. Notwithstanding this, some important communications have been received in London by wireless. Thus on November 12th Mr. M. H. Donohoe, the famous war correspondent of the *Daily Chronicle*, sent a message by wireless from the s.s. "Dacia," in the Black Sea, to the effect that Turkey was prepared to open negotiations with the allies for peace. The *Daily News & Leader* correspondent marconigraphed on November 15th from the "Principesa Maria" a rumour concerning a mysterious loan.

* * *

Some days ago there was a report that the Turkish authorities in Constantinople entertained grave fears with regard to the safety of Adrianople as wireless communications between the fortress and the capital ceased. This leads to the belief that one of the Marconi portable stations, supplied to the Turkish Government some time ago, was used for communicating between Adrianople and the capital, as there is no other station at the first-named city. Apart from this, there is nothing in the Press reports to indicate to what extent the portable sets supplied to the various countries engaged in the war have been used. Nevertheless, it is safe to assume that considerable use was made of these stations; otherwise it is difficult to see how the vast armies, stretching as they did along hundreds of miles, could have worked together so smoothly. Thanks to wireless telegraphy the commander of the forces would have less difficulty in keeping in touch with his various units than had Wellington at Waterloo, though the latter's line was to be measured in yards instead of in miles.

The United States Naval station erected at Fort Meyer, Arlington, Va., was recently tested. The feature of this station is the three steel towers connected at their tops by a series of 23 wires by which messages will be radiated and received. The towers are ranged 400 feet apart at the corners of a triangle foundation around a central receiving and sending station. The equipment comprises a 100 k.w. motor-generator set, on the shaft of which is a synchronous rotating spark

TROUBLES WITH THE CAVALRY WIRELESS STATION

THE MARCONIGRAPH

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

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The Share Market

London: November 25th.

Dealings in the share market have been very restricted since our last issue owing to the grave fears that have been entertained as to the general international situation. The shares of the various Marconi issues have been little influenced by the general depression, no doubt owing to the fact that they are very strongly held, and also that the favourable course of the Inquiry has brought in a good many buyers.

The prices as we go to press are: Ordinary, 5 1/16; Preference, 4½; Canadian, 21s.; Spanish, 1⅛; American, 1⅜.

The shares of Marconi's Wireless Telegraph Company are now quoted on the Milan Exchange, and the shares of the Marconi Wireless Telegraph Company of America are quoted on the Amsterdam Bourse.

The Patent Situation

Two statements have appeared in the newspapers during the past month. The first, which was published on November 4th, was to the following effect:

> "In view of the position assumed by the Commonwealth Government in connection with wireless matters, and particularly having regard to the building of stations on a system which is declared by experts to be an infringement of patents now existing, the two companies principally interested—viz., Marconi's Wireless Telegraph Company and the Australian Wireless Co., Ltd. (Telefunken system), have agreed to sink their differences and take joint action to secure their rights and future protection of their patents."

This was followed on November 13th by the announcement that:

> "Messrs. Siemens Brothers, acting in England for the Telefunken Company, have admitted the validity of the Marconi patent No. 7777 of 1900, and arrangements have been come to by which the actions brought by each company are now at an end."

Patents in the United States.

The United States Patent Office at Washington has recently decided to award priority of invention to Mr. Marconi over the wireless inventions of Prof. Reginald A. Fessenden. The inventions specified involved a transmitting apparatus for wireless, which Prof. Fessenden contended contained features substantially the same as those in the Marconi patent, while application for a patent had been filed by him as early as 1906, whereas Mr. Marconi's patent was only issued on September 28th, 1909. The Patent Office, however, found that none of the subject-matter of the

Marconi invention were to be found in the apparatus of Prof. Fessenden, and decided the award must be to Mr. Marconi.

The Fessenden wireless patents are owned by the National Electric Signalling Co., of Pittsburg, who entered an appeal in the United States Circuit Court of Appeal against the judgment of the Patent Office, but the case was dismissed.

Two suits for injunctions and damages for the infringement of wireless telegraph patents have been brought in the United States District Court of California by the Marconi Wireless Telegraph Co. of America against the Federal Telegraph Co., which operates the Poulsen system of wireless telegraphy in a small way.

The patents involved cover basic inventions of Guglielmo Marconi and Sir Oliver Lodge. Two of the patents have already been adjudged valid and held to have been infringed by the United States District of New York.

The bills of complaint in these suits allege that the Federal Telegraph Co. is making and using the apparatus and system of these wireless telegraph patents, and claim that the Marconi Company is entitled to an injunction restraining the Federal Company and its associates from the infringement of the patents, and that the Marconi Company is entitled to a large amount of damages and profits which it has sustained by reason of the Federal Company's infringement.

Transpacific Wireless

Some correspondence on the above subject appeared in the *Electrician* of November 1st. Mr. Elwell, the chief engineer of the Federal Telegraph Company, in a letter to the editor, took exception to the word "claim," which appeared in the Marconi Company's note published in the *Electrician* of September 6th. The use of the word "claim," he said, gave an entirely erroneous idea as to the present status of the San Francisco-Honolulu service of the Federal Company, and he asserted that the stations in question were opened "for regular commercial service" on September 5th, 1912. Mr. Elwell added that at his company's San Francisco station they were using only 30 kw., whereas, "according to their announced plans, the Marconi Company will use 500 h.p. in their proposed stations at the same points."

The letter, of which the foregoing is a summary, was courteously communicated by the editor of the *Electrician* to Marconi's Wireless Telegraph Company, whose managing director, Mr. Godfrey C. Isaacs, sent the following reply:

> "When we speak of a commercial service, we understand it to be a continuous service; one which works not only in the night time, and when atmospheric conditions are favourable, but which is able to work at all times during the day and night in all weather conditions. The Federal Telegraph Company are only able to communicate between Honolulu and San Francisco in the night time with their 30-kw. stations, and this not without interruptions. We are also able to, and do, communicate with Honolulu from both San Francisco and Seattle, which is farther, with 10-kw. Marconi stations, but we do not claim a commercial service. The long experience which we have had, and the knowledge of the necessities of the conduct of such a service, calls for a station of a very different construction, and one of which the Federal Company has neither knowledge nor experience."

"The Marconigraph" and its Subsidiaries

Contemporaneously with the world-wide extension of wireless telegraphy has grown a public demand for information concerning wireless telegraphy. It was to satisfy this demand that THE MARCONIGRAPH was established in April, 1911, and the thousands of readers who have followed its career from the beginning have been able to note the remarkable progress which it has achieved. Combining the best features of magazine, review, and newspaper, it has acquired a unique place in journalism, and has been the means of conveying information to almost every country in the world, appealing alike to the scientist, the engineer, the business man, and that elusive personality, the general reader. To supplement its usefulness abroad foreign editions have been founded. The first of these was the *Telegrafia sin Hilos*, published in Madrid. This has now reached its fourteenth monthly issue, and continues to show signs of increasing importance and prosperity in Spain and Spanish-speaking countries.

An American edition, bearing the same title as its parent publication, has just made a successful first appearance in New York. That number contains many interesting articles and much up-to-date information, and the general appearance of the magazine is deserving of the warmest praise. We heartily wish it the success which it merits.

The *Messenger of Wireless Telegraphy*—a Russian edition, to be published in St. Petersburg—will appear in a few days, and, in addition thereto, we hope shortly to welcome another ally in wireless journalism. So important has this enterprise now become that, in spite of the establishment of foreign editions, the parent MARCONIGRAPH continues to make immense increases in circulation, which now amounts to many thousands per month.

Monthly Miscellany

THE scheme for the establishment of a trans-Atlantic wireless service between Norway and Sweden, outlined in the October issue of THE MARCONIGRAPH, has been carried a stage further. It was reported on November 15th that the Norwegian Government had approved the contract entered into between the Marconi Company and the Norwegian Director-General of Telegraphs for the erection of a high-power station in Norway. The other station will be erected in the vicinity of New York.

* * * *

A libel action brought by Mr. G. Marconi, chairman, and Mr. Godfrey C. Isaacs, managing director of the Marconi Company, against the responsible editor of the newspaper *Die Wel am Montag*, which is a paper of a sensational character published on Monday mornings, began on October 30th. This paper asserted that two marconigrams were sent from an American land station to the "Carpathia" with orders to the operator on board that ship to keep back all news about the accident; the inference being that Mr. Marconi withheld the news in order to sell it to an American newspaper for a large sum.

The defendant, whose name is Alfred Scholz, was brought from Tegel Prison, where he is serving a sentence for blasphemy.

The wireless operator, Mr. H. S. Bride, is a witness in the case. The hearing on October 29th was postponed in order to enable the production of the Senate Commission's report. It was further decided to examine the chief telegraphist of the "Carpathia," Mr. Cottam, either personally or by commission, and to find out the name of the American coast station operator in order to obtain his evidence also.

* * * *

The selection of a subject for a presidential address is never an easy one, and there is a great temptation to devote such an address to the discussion of general matters rather than to those of which the new occupant of the chair has special knowledge and experience.

In his inaugural address before the Institution of Electrical Engineers the new president, Mr. W. Duddell, F.R.S., touched upon a great variety of subjects, upon all of which, however, his familiarity with the details enabled him to illustrate and to refresh his remarks by examples. He spoke as a physicist and as an electrician rather than as engineer, and rightly deplored the tendency to confine the subjects discussed before the Institution—mainly the generation, distribution, and the cost of electrical energy. He put in a plea for more papers being read on other subjects, and, taking as a particular instance telegraphy and telephony, he pointed out that during the last ten years only twelve papers dealing with these subjects had been read out of a total of four hundred. Before leaving the subject of telegraphy, Mr. Duddell reviewed the progress that was being made in the art of wireless telegraphy, and he recalled to the minds of the members the great interest that was awakened when, in 1899, Mr. Marconi read his paper before the Institution. Since that date there have been a number of papers dealing with different parts of the apparatus, but he complained that a general review of the subject had not been laid before the Institution. We will deal fully with Mr. Duddell's remarks in this section of his address on another occasion.

* * * *

The necessities with regard to what is now loosely called science have so changed since the establishment of the British Association for its advance, that it has become incumbent upon that body to overhaul its proceedings in relation to what may be the requirements of such an association. In pursuance of this it has been decided to appoint a committee to carry out radiotelegraphic investigations. The gentlemen invited to form the committee are: Capt. H. R. Sankey, Mr. S. G. Brown, Prof. J. A. Fleming, Prof. G. W. O. Howe, Prof. H. M. Macdonald, Mr. F. Maclean, Prof. Sylvanus P. Thomson and Dr. Erskine Murray, with Dr. W. H. Eccles as secretary. The appointment of this committee is the outcome of a suggestion made by Dr. Fleming in the course of his admirable paper before the Dundee meeting of the association. It will be remembered that at this meeting Capt. Sankey made it clear that unless such a committee could command the use of apparatus for long-distance transmission, and practically had unlimited capital, they could not obtain data to answer the many questions with which they would be confronted in the course of their investigations. To what extent the committee will be able to surmount the difficulties outlined by Capt. Sankey remains to be seen.

* * * *

Some eighty delegates representing sixteen different nations were present at the International Time Conference which was recently

held at Paris. As a result of their deliberations a report comprising the resolutions adopted has recently been published. Among these resolutions is one which provides that the expenses necessitated by a complete system for the transmission of the exact time by wireless telegraphy should be defrayed by the various nations in proportion to the number of their inhabitants; these expenses will probably only amount to something between £16 and £80 a year for each nation. An international "Bureau de l'Heure," which is to be, as it were, the time centre of the whole world, will be established at Paris. The time signals transmitted by all wireless stations are to be identical on and after July 1st, 1913. By this date it is hoped that there will be thirteen great wireless stations in Europe, Africa and America, which will be capable of transmitting time signals over more than half the globe.

The Conference also advises that the transmission of meteorological and other scientific reports of value to agriculture, navigation, aviation, and the like should be widely extended. It further suggests that the telegraphic departments should endeavour to establish time centres in a large number of their offices, and should consider the means of giving the exact time to private persons. Finally, a provisional committee has been appointed to draft and submit for the approval of the various Governments the resolutions voted by the Conference. Until this approval has been obtained the Paris Observatory will act as the central time office.

* * * *

Dr. F. W. Dyson, the Astronomer Royal, who was the guest at the Authors' Club dinner held on November 11th, made reference to the same subject in his reply to the chairman's speech, and forecasted the possibility of wireless telegraphy superseding chronometers at sea. The Eiffel Tower, he said, daily sent out the time as far abroad as Gibraltar and the Shetlands, so that ships, if they could pick up Greenwich time in that way, really had no need for chronometers. The great map of the skies, upon which the Greenwich and other observatories of the world were engaged, was nearing completion. This great work would give the positions of millions of stars, and data which would help to solve the problem of whether or not there was a limit to the stellar universe as we saw it. Mr. H. Krauss Nield, referring to the presence of coronium in the sun, said that it would be very interesting if it could be collected on the earth. The problems of aviation would be seen in a very different aspect, for they had good reason to suppose that coronium was so light that its lifting capacity would be vastly superior to anything of which they had any knowledge. Future visits to our neighbours in the solar system, or even farther, he did not regard as an absolute impossibility. Such a prediction seemed to him no more wonderful than would have been the statement three hundred years ago that it would be possible to throw a message across the Atlantic without the guidance even of an intervening wire.

* * * *

To return to the subject of the Conference. Aviation should be greatly benefited by the clause in its report which lays particular emphasis on the urgent need for extension in the wireless transmission of meteorological reports.

For the last two years a vigorous campaign has been carried on by such aeronautical authorities as Professor Berget, Major Renard and M. Louis Capazza in favour of providing all military aerodromes with direct wireless communication with the Eiffel Tower in order that the latest weather reports might be always at the disposal of aviators and aeronauts. M. Capazza has insistently drawn the attention of aeronautical experts and the military authorities to the results of the experiments conducted by him at the International Kite Competition at Spa: a complete wireless service had been fitted up, and with the aid of an antenna carried up by a kite it proved possible to receive messages from Canada. Thanks to the weather reports received M. Capazza was able on five or six occasions to foretell the arrival of a storm and prevent the inflation and departure of a free balloon. A first step has been taken by the decision of the Minister of War that the Meteorological Office should transmit all its weather reports by telegraph to all the military aerodromes, and the Congres de la Sécurité en Aéroplane concluded its labours by voting a motion calling on the authorities to provide every aviation centre with a wireless station.

Now that the International Time Conference has also taken up the matter we may hope to see a great advance in this direction, for it is one of the utmost importance not only from the point of view of efficiency in military tactics, but for the greater safety of those engaged in an occupation which has already cost us many lives.

The death was recorded at the beginning of last month of Mr. Victor Popp, who was for many years connected with the electricity supply of Paris, and who was interested in wireless telegraphy.

Correspondence

DAYLIGHT EFFECT ON RADIO-TELEGRAPHIC WAVES.

SIR,—In connection with the daylight effect on radio-telegraph signals and atmospherics, I conducted an observation at this station during the partial solar eclipse of October 10th last.

Arrangements were made with the s.s. "Kildonan Castle," lying at Port Elizabeth at a distance of approximately 380 miles direct, to send V's for three minutes each quarter of an hour from 4.15 p.m. till 6.30 p.m., whilst during the intervals we made a lengthy call to the ship.

At 4.15 p.m. low continuous atmospherics were present, there being no break or intermission in them. They continued without any apparent change in character or strength until 5.40 p.m., when a slight increase in strength was noticed, and a gradual increase from thence onward until after dark, when they were fairly strong, and continued so for the rest of the evening. This, however, is the usual effect observed, atmospherics being very prevalent at this station.

No signals from the "Kildonan Castle" were received, and the ship reported hearing nothing from us until 6.25 p.m. The sun set with the shadow still upon it at 6.1 p.m.

The result, in my opinion, was distinctly negative, the more so as the low continuous atmospherics provided a most advantageous means of observing any variation that might have occurred.

Yours, etc.,
CHAS. NEATE.

Radio-Telegraph Station,
Durban,
October 27th.

MARY SOMERVILLE.

SIR,—Just as the artist on viewing a picture can trace the influence of an old master, so in science we note where an inventor obtained his initiative. Thus in reading the admirable article on "Clerk Maxwell" in the November number of THE MARCONIGRAPH we find him taking up Michael Faraday's work. Then, going still further back, we find that prince of experimenters working very hard to demonstrate the identity of light with electricity; the keynote of which was struck by Mary Somerville in her paper on the magnetic properties of the violet ray in the solar spectrum given before the Royal Society in 1826. Indeed, wireless telegraphy owes another debt to that remarkable Scotch woman, for it was she that induced Adams to work out mathematically the perturbations of the planet Uranus, which led to him being the co-discoverer of Neptune. This was the direct cause of the Adams Prize Essay on the constitution of Saturn's rings, won by Clerk Maxwell in 1857. From the preparation of this essay Maxwell evolved his electro-magnetic theory of light, and laid the foundations of his mathematical deductions upon which Hertz founded his famous experiments resulting in the demonstration not only of the identity of light with electricity, but the Hertzian waves which give us wireless telegraphy.

Yours, etc.,
EDINBURGH.

Mr. Marconi.

AT the time of writing Mr. Marconi is staying at Venice with Mrs. Marconi, his secretary (Mr. M'Ewen), and some friends. The object of his visit to Venice was to have an artificial eye made and set. In the clinique at Turin, where he had his damaged eye removed, an artificial one was temporarily set. Inquiry was then made in different cities for a skilful maker and setter of artificial eyes, and the choice fell on Professor Luigo Rubbi, of Venice. A correspondent from Venice, writing in the *Scotsman* on November 19th, states that Professor Rubbi is a man of upwards of seventy years of age, who has a modest house and laboratory in a calle off Via XXII. Marzo. But he has remarkable ability in judging eye colour and in reproducing facsimiles of the eyes of patients. He produces not only the colour, but the minutest veins or streaks of colour in the eye. At first Professor Rubbi was asked to go to Turin, but he telegraphed that this was impossible, as at his age and in this weather he could not travel, nor could he guarantee any really good work to be done out of his laboratory, and so Mr. Marconi came here and put himself into his care. The artificial eye, of course, is not a globe, but only a thin convex sphere that is removable, just as false teeth are, and is removed every night. The proper adjustment of it is both a difficult and delicate work, and takes usually five or six days.

Mr. Marconi was on the way to America when the accident happened at Foce, near Spezzia. His automobile was going at a moderate speed, but the other that ran into his was going very fast. One cause of these motor-car accidents in Italy is that the drivers are very careless about keeping the rule of the road. They run all over the place. Indeed, both coachmen and chauffeurs act as if no rule of the road existed. Mr. Marconi says he did

not suffer much pain at any time, and he always slept well.

Mr. Marconi is in the best of health and spirits, and says the marvel is that they were not all killed when the other machine mounted on the top of theirs. His cheerfulness is also explained by one fact that his left eye, the undamaged one, is in a perfectly sound condition, and there is no likelihood of its sight being at all affected by the removal of the right eye. Oculists state, according to the correspondent from whom we have quoted, that people can get on very well with one eye, so far as sight is concerned, and that the chief drawback of an artificial one is the contrast it must present with the living one (however much it may resemble it) in its lack of expression and its immovability.

On November 14th Mr. Marconi was present at the Rossini Theatre. As soon as his presence was observed the whole of those present rose and cheered, the ladies waving their handkerchiefs. Three times Mr. Marconi, who was greatly touched by the ovation, rose and bowed to the assembly. The Chamber of Commerce and the city authorities have sent him condolences and, at the same time, congratulations on the security of the sight of the left eye. They are naturally proud, too, that Mr. Marconi has been able to find a specialist in the making and setting of artificial eyes without going out of Italy, or away from Venice, with which city he has not a few associations.

The Training of Operators.

THE scheme outlined in our November number for the establishment of evening classes at Marconi House, London, for training wireless operators has been carried a stage further, and the arrangements are so well advanced that applications will now be considered from suitable candidates. Applicants must be between the ages of 19 and 24 years, and need not have had any previous telegraphic experience, but it is essential that they should be good penmen. Young men desirous of undergoing a course of training which will prepare them for positions as wireless operators in the Marconi service on board ship should write to the Traffic Manager, Marconi House, Strand, London. Letters should be endorsed "Application Evening Classes," and should give particulars of previous business experience.

The committee of the Municipal School of Technology, Manchester, have under consideration the provision at the school of a commercial wireless telegraphy installation. Meanwhile it has been decided to organise a preliminary course in the subjects essential for those who wish to become wireless telegraphists. These subjects are: (1) Electricity as applied to wireless telegraphy; and (2) a knowledge of the Morse Code. To meet these requirements it is proposed to arrange suitable classes, meeting on two evenings during the session 1912–13. One evening will be devoted to a lecture, with tutorial work (from 7 to 8.30), and the second evening (from 7 to 9) to practical work. The latter will be arranged so that students will have the opportunity of practice in sending messages by the Morse key, and receiving by the use of the sounder or telephone. The inclusive fee for the course, including both classes, will be 30s.

The Phillips Memorial.

THE committee appointed to make arrangements for the erection of a fitting memorial at Godalming to John George Phillips, the wireless operator on the "Titanic," have submitted their proposal to the Godalming Town Council. The scheme, which was drawn up by Miss Jekyll (the honorary secretary to the committee) in collaboration with Mr. Thackeray Turner, and which has been approved by the committee, takes the form of a rectangular cloister, with the further wall arcaded to lead out into a meadow beyond, and to bear a wide central panel where the memorial tablet will be placed. It is proposed also to utilise a site belonging to the town council for this purpose, and the authorities have given their full consent to the suggestion.

The cost of the scheme is estimated at about £700, and of this the actual sum received in subscriptions is £420, which includes about £100 collected by THE MARCONIGRAPH. As soon as plans showing the elevation of the building will be ready, the committee propose to issue a small sketch in the hopes that admiration of this beautiful structure will induce others to become subscribers. At the same time it should be pointed out that the scheme must not be regarded as a merely local affair; it is a national memorial to a national hero, and as such should command world-wide sympathy and support.

The Postal Telegraph Clerks' Association have intimated to the committee that they have raised a sum of £30, which they are prepared to add to the fund on condition that some small portion of the memorial can be identified with their association. To this the committee have already agreed, and a detail of the construction will be set apart to represent this special contribution. Further, at the next meeting of the town council a proposal will be brought forward that £100 be voted towards the fund, and it is not expected that there will be any opposition.

Unpublished Chapters from "The Sleeper Awakes."

FOOTSTEPS, at quiet, evenly-measured tread, could be heard approaching the room in which Graham sat, and almost as soon as he became aware of the sound the curtain slowly lifted. A tall, white-haired man, clad in garments of cream-coloured silk, appeared, regarding Graham from under his raised arm.

For a moment the white form remained holding the curtain, then dropped it and stood before it. Graham's first impression was of a very broad forehead, very pale-blue eyes, deep-sunken under white brows, an aquiline nose, and a heavily-lined resolute mouth. The folds of flesh over the eyes, the dropping of the corners of the mouth contradicted the upright bearing, and said the man was old.

Ostrog

It was Ostrog, the prime mover of this great social upheaval which had shattered the power of the White Council, and had made of the spacious council hall a mass of crumbling, blackened masonry. Even now, as the two men faced each other, the noises of tumult could be heard coming up from the thronged streets. There were cries for the Sleeper, the Master, which kept rising and falling in waves of popular enthusiasm, and reached this lofty room in the Windvane Offices in a dull—almost imperceptible—hum.

Ostrog turned to Graham. "We thought you were killed," he said quietly, "and were preparing your 'double' so that the successful outcome of our enterprise might not have been altogether in vain. You are, you understand, our figurehead, for although your power is limited to a certain extent, all material wealth is yours. The capital that was invested for you three hundred years ago has accumulated to itself the entire resources of the world. You, therefore, stand as a symbol of all power and order. For over two centuries the people have been waiting for you to awake. You are to them the reincarnation of Barbaressa and King Arthur, and they see in your awakenment the commencement of a new era of emancipation—a Millennium, if you will. The Council looked forward with apprehension to this moment. They have cherished a hope that the occurrence which would undermine their authority and destroy their prestige was impossible. When, therefore, your long sleep was ended they were taken unawares, and there is no doubt that, had they been able to keep the secret of your awakenment dark, you would have been anæsthetised, and once more have been laid out on the marble slab in order that the old order of things might continue uninterrupted. But we had news of your approaching awakenment, and all our forces were drawn up, and our plans arranged against the event. We have won. To-night has been a night of victory. Everywhere your star has blazed. A day ago the White Council ruled, as it has ruled for a century and a half of years, and then, well, only a little whispering, a covered army here and there, suddenly—So!——" He broke off abruptly.

The Camera Obscura

They listened to the noise without, then Ostrog stepped across the room, something clicked, and the place was in darkness save for an oval glow in the ceiling. As Graham watched it gradually cleared until at last he saw passing over the mirrored surface swarms and swarms of people travelling by the moving ways in every part of the city. They seemed to be concentrating in the squares, markets and theatres, which were already densely crowded. Gallery after gallery was packed with people. One particular space, in which a stage had been erected, was surrounded with a vast auditorium, and the black figures of the audience showed tier upon tier of densely-packed humanity. Graham realised that he was watching the events taking place in the city in a species of *camera obscura*, developed far beyond the limitations of such an instrument of his day. Soon Ostrog interrupted his reflections. "But there is work to be done, the people must be satisfied. They are clamouring to see you. And abroad they want to see you. Paris, New York, Chicago, Denver, Capri—thousands of cities are up in a tumult, undecided, and clamouring to see you. They have clamoured that you should be awakened for years, and now it is done they will scarcely believe——"

"But surely I can go?"

Ostrog answered from the other side of the room, and the picture on the oval disc paled and vanished as the light jerked back again. "There are kineto-telephotographs," he said. "As you bow to the people here, all over the world myriads of myriads of people, packed and still in darkened halls, will see you also.

In black and white, of course—not like this. And you will hear their shouts reinforcing the shouting in the hall.

"And there is an optical contrivance we shall use," he added, "used by some of the posturers and women dancers. It may be novel to you. You stand in a very bright light, and they see not you but a magnified image of you thrown on a screen, so that even the furtherest man in the remotest gallery can, if he chooses, count your eyelashes."

Ostrog pulled back the curtain and motioned Graham to the door. As soon as they were outside he led the way and they entered a silently-gliding lift, and were swept down a fathomless distance, as it seemed to the unaccustomed occupant. Then a series of corridors and galleries were passed through until Graham, clothed in Imperial black, made his way into the vast arena he had seen in the oval mirror of the Windvane Offices. Together he and Ostrog mounted the stage, and were flooded with the brilliant light. For the minute he was dazed and troubled by the unaccustomed procedure, and then, remembering that he had a part to play in this drama, he made a violent effort to control himself. With all the composure which he could assume, he bowed on every side to the applauding multitude. Suddenly an idea struck him, and he reached out for Ostrog's hand and drew him forward a pace or two. The applause redoubled as they stood together—rescued and rescuer, the clear-headed Statesman and the bewildered Ruler of Mankind.

How little Graham at that moment suspected that within a short time Ostrog and he would be at death grips.

* * *

The Beginning of the End

The end was in sight. But who would be victor in this titanic struggle? Certainly the odds lay with Ostrog—possessed of all the power of the latter-day knowledge, and able to direct the outcome of events by one touch on the complex keyboard of government. In his control were also the monoplanes, while to his keen insight and cold-blooded statescraft Graham's limited twentieth-century conceptions were as thistledown to the wind.

On the other hand, Graham was backed up by two great assets—fixity of purpose and the loyalty of the multitude, and, as he looked down from the aerial stage which surrounded his apartment in the Windvane Offices, and could see the multitudes engaged in vast preparations against the attack of the Ostrogites, he realised that this was no empty power.

His discovery of Ostrog's schemes and the consequent misery of the masses had come through Helen Wotton. She had urged him to use his eyes, and not be the puppet of his Ministers, and the earnestness of her tone had roused him to action. He half-wished that he had never followed her advice, for he scarcely dared to dwell on the scenes which he had witnessed in the underground factories of the metropolis—the sweated workers, the disease, and the terror, while his soul was sickened with the empty frivolity of the pleasure cities, and the perfumed strumpery which ended in euthanasia. He realised now that the rebellion against the White Council had been the popular expression of revolt against this system, and that his crafty Minister, Ostrog, had used this discontent to compass the downfall of the Government, and assume office by a clever *coup d'état*. But Ostrog had no wish to see the order of things changed. He could only countenance rebellion when it served his own ends; and once these had been gained the rebellion had to be ruthlessly crushed. But the storm once aroused could not be so easily dispelled. It had as its source the concentrated discontent of centuries, and the city, the nation, the world was seething with revolution. Poor, blinded, ignorant humanity! They scarcely knew what they were doing, or what they wanted. But he knew, Helen Wotton knew, a little band of chosen councillors also knew. They were the eyes and the ears and the brains of the populace. These blue-garmented myriads had hoped blindly in the awakenment of the Sleeper. The Sleeper was awake now. Their hope was near fulfilment. Already Ostrog had suffered severe losses. Many of the mechanics and military engineers had deserted from his ranks, and all he had to depend on were the hired black army and the combined fleet of aeroplanes. Nevertheless, unused as he was to modern tactics, Graham realised he was in a tight corner. Nothing could replace the want of aeroplanes. The deserters from Ostrog's army were hastily building others; but, despite the numbers of hands pressed into the service of construction, it would be many days before any could be completed, and as it was every moment was of importance. Already the black army, the hired assassins of Ostrog, were mobilised at Paris, New York and India, and the aeroplanes were speeding to headquarters from all parts of the world. Two aeroplanes constituted the whole of Graham's fleet; one had got out of the control of an unskilful aeronaut and had fallen in Hyde Park: it was badly damaged, but it was possible that within a few hours it could be repaired. The other was the special service 'plane which had been forgotten in the hasty flight of the Ostrogites, and was still standing ready for use on its aerial stage.

Graham was glad he had been an aeronaut in the pre-somnian days, for he knew that the forthcoming battle would be fought, if not by aeroplanes, at least through their agency, for all the success or failure of tactical manœuvres would depend on aeroplane observation. He realised how important was this single car, and resolved to control it himself. So bent was he on his purpose that he had risen with an idea of inspecting the machine before he was aware of anyone in the room.

Phryths

It was the Windvane keeper, to report that the entire telegraphic staff had declared for his service. Already the wireless operators were tapping the communications of the enemy, and had been able to hamper the organisation of their forces by sending false messages. "Phryths, the commandant of the wireless corps," he concluded, "was waiting outside; would The Master be pleased to see him, as he had important plans to discuss?"

Graham signed to him to enter, and was confronted with a little man who bore unmistakable signs of Japanese descent. He was clean shaven, and his face was bloodless and scarred, the skin was wrinkled round the eyes and stretched tight across the nose and the high cheek-bones. His wiry, iron-grey hair was plastered down on either side of a high but narrow forehead. As he waited for a word from Graham he nervously fidgetted the quicks of his finger nails, and his action showed square, sinewy and capable hands.

"You want to see me about some plans?"

"Yes, sire."

"Can you give me the main details now? There is much to do, and even as it is we cannot help the enemy finding us unprepared."

At these words Phryths came closer and began in a slow, hushed tone to unfold a plan for the discomfiture of Ostrog's host. As his discourse proceeded he spoke faster and faster, until it ended in a hurricane of excited words.

"The detonators have already been manufactured, and to them we have fixed a kind of tuning-fork, the whole apparatus weighing scarcely two pounds. If only a 'plane can be perfected before the fleet starts from Paris, we are certain of success. Our only hope is that Ostrog will remain in hiding in the city some little time longer. Once he joins the fleet in Paris the whole invading force will be put in motion, and we are doomed. All depends on our securing an aeroplane—and an aeronaut—first."

The Game's Afoot!

Graham motioned him to the window, and showed him the special service aeroplane on its stage. "Go," he said to Phryths, "and bring me the bombs. If it is possible they shall be placed to-night." He rang a bell on the table, and demanded an organicist. When that functionary appeared he asked him if there were any means of anestheticising an adversary; he wanted something that would take effect instantaneously; something that could be sprayed into the atmosphere, but at the same time he desired immunity from its effects for himself. The organicist was doubtful, but he would see what could be done; and with a deep obeisance he hurried out, and was lost to sight on a moving way.

Graham saw his way more clearly now. Only the destruction of that aerial fleet stationed at Paris could save his people. He would be the destroyer, or at any rate make this attempt to emancipate them. He rang the bell again.

He told the attendant to bring Helen Wotton to him, and while he waited he looked out from his window in this Teufelsdochel Tower. The sun was just sinking, already the seven larger units of Ursa Major were visible in the blue expanse, deep as lapis lazuli. The last glow of light fell on the distant Surrey hills, over Richmond way a thick mist was rising, and just beneath him was the great glowing globe of the hemispherical roof which shut in the eight and twaindy myriads of his subjects . . .

The curtain rose and fell—Helen Wotton was in the room. He advanced to her, and immediately she ran forward and grasped his hands. "Sire," she whispered in a voice strained with excitement, "the South-West Wards are marching to help in the defence of the city. The volunteers have mounted every available gun, and each point of vantage is defended."

Graham smiled at her enthusiasm. It was all so splendidly illogical. A few bombs dropped by a score or so of invading 'planists and all this work would be wasted. Yet at this moment there was a fleet a thousand strong ready to swarm down on the insecure capital: 300 lying ready to sail at Paris, 400 at New York, and another 400 mobilising at Delhi. But no nature is proof against the glow of zeal; his excitement grew as the story of defence preparations proceeded, and soon he found himself incoherently explaining his plan of action to her.

"But, sire," she cried, "where is the aeronaut?"

"Here."

"And the wireless operators?"

"They are on our side; one must come with me." He rang the bell.

"Tell them to put the special service aeroplane on the guides." The attendant had

scarcely disappeared before Phryths entered to report that the bombs were ready.

Graham and Helen followed him into his special wireless cabin in the round tower where he had caused the bombs to be stored. In curt phrases he explained the mechanism of the apparatus attached to them, and suggested a way of secreting them in the cabin of the 'planes. Graham grasped the necessary details with a keenness which was intensified by mental excitement. Every step of his proposed action was clearly defined in his mind. He recollected he still wanted some means for subduing the sentinels, and inquired again for the organicist.

Within a few minutes he appeared carrying in his hand a small puff-ball. He explained that the instrument was used in extreme cases in the Euthanasia. A pressure on the indiarubber ball would release a fine glittering powder which would produce instant insensibility and ultimate death; at the same time he handed him a mask of the appearance of gold-beater skin which would cover the nostrils and mouth, and filter the air of the noxious atoms.

Graham took the instrument, and the organicist disappeared; then he directed Phryths to have the bombs conveyed to the 'plane's cabin. The commandant hurried away to make the necessary arrangements, the door banged, and he and Helen were left alone.

At that moment Graham felt as if they were isolated from the current of events. In a world of activity they had stumbled on a dream. Outside was the tumult, the stupendous realisation of a world struggle between Ostrog and himself, and then this confined, quiet little room with its brass keys and blank white indicators and knobs and wires! They were no longer persons, but mere spectators, mere impressions of a tremendous convulsion. They became unreal even to themselves, miniatures of personality indescribably small; and the two antagonistic realities, the only realities in being, were first the city, that throbbed and roared yonder in a belated frenzy of defence; and secondly, the aeroplanes waiting to whirr up like a covey of partridges and appear over the round shoulder of the world.

Graham Sets Out

There came sounds of a louder commotion from outside, a running to and fro, and cries. A clock thrumming in Graham's brain told him it was time for him to take his departure. He grasped Helen almost roughly by the shoulders, then let her go and turned to open the door. Immediately as he did so Helen cried out:

"What do you mean to do?"

"This special service 'plane—it is a chance——"

"You don't mean——"

"To try—yes. To break up the fleet. I have thought it out. We have only one aeroplane, but there is the wireless to be used. A resolute man! I see now something to do. I see now why I am here!"

Helen made a step towards Graham. Her face was white. "But, sire! How can you succeed? You will be killed."

"Perhaps. Yet not to do it, or let someone else attempt it——"

"You will be killed," she repeated.

"I've said my word. Do you not see? It may save—London!"

He stopped, he could say no more; he swept the alternative aside by a gesture, and they stood looking at one another.

They were both clear that he must go. There was no step back from these towering heroisms.

Her eyes brimmed with tears. She came towards him with a curious movement of her hands, as though she felt her way and could not see; she seized his hand and kissed it.

"To wake," she cried, "for this!"

He held her clumsily for a moment, and kissed the hair of her bowed head, then thrust her away. Then he stepped out into the blinding light.

He could not speak to the attendant who was waiting for him; but the gesture of his arm said, "Onward."

As an instance of the great value of wireless telegraphy to the cargo steamer, we quote you the following extract from a letter received by the owners from the captain of the s.s. "Drumcraig," which left Liverpool on September 28th, and arrived in Galveston on October 16th. The captain writes as follows:

> "During the passage I have had more than one inquiry from other vessels as to the state of the weather at my point, the others, of course, giving me their own present conditions, which it is often very useful to learn. But by far the most useful were the reports which I received from the American coast stations during the last few days, and you will understand the relief it was to learn definitely by that means that the hurricane (whose course I was striving to determine without, perhaps needlessly, delaying my voyage) was inclining just sufficiently to the westward to carry its dangerous centre about clear of us."

Obviously, as more ships become fitted the more information will be available, and in times like the present, where delay means such serious loss of profit, wireless telegraphy might often be of the greatest value.

Technical Notes

SPARK-GAP OSCILLATIONS.—In the interesting paper from Dr. W. H. Eccles and Mr. A. J. Makower, which we reproduce on pages 368-70, the authors do not appear to claim that the results so far obtained are of much practical value with regard, at any rate, to commercial wireless. With water, the low efficiency, when the flow is rapid, would seem to put the method described out of the running, except as a laboratory method for obtaining steady oscillations for quantitative experiments. On the other hand, when the efficiency is improved by decreasing the rate of flow, the method would apparently have to be complicated by the introduction of automatic means of "feeding" the electrodes, a process which is rendered the more difficult by the fact that these have to pass through stuffing-boxes.

Turning to the experiments in which oil is substituted for water, one advantage suggested over the ordinary air-gap is that the oil-gap, being enclosed, eliminates the "deafening noise" associated with the air-gap. We think that the authors are over-estimating the importance of this point. There are many ways in which the noise of a half-kilowatt spark (which is the greatest power mentioned in these experiments) can be reduced to a negligible sound, simpler than a method necessitating a constant stream of oil, which requires filtering from time to time.

But experiments like these, conducted in such a scientific manner and spirit, are (to use a word constantly applied to Mr. H. G. Wells' works) "provocative," and the more of them that are carried out, and the more they are made public, the better for the progress of the science. It would be interesting to know how these methods would behave when applied to higher powers, where so many excellent laboratory results behave in an unreasonable and disappointing manner.

* * *

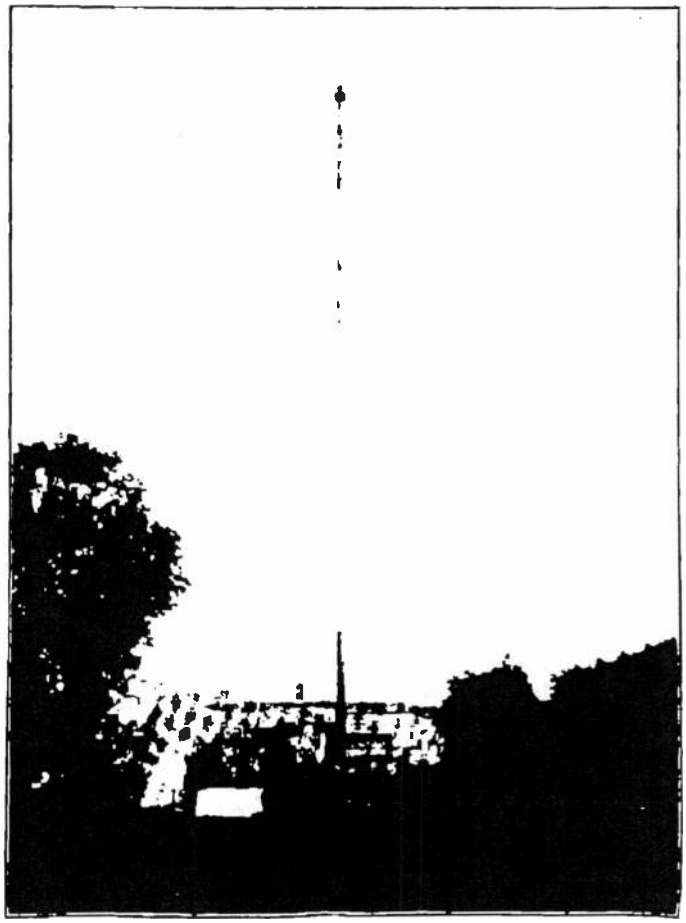
CONDENSERS FOR WIRELESS TELEGRAPHY.—In a study of the various type of condensers used in wireless telegraphy which recently appeared in the *Electrician*, Mr. W. Torikata and Mr. E. Yokoyama deduce the following general conclusions: The surface, as well as the edges of the metal coating of the condensers, must be very smooth; the smoothness is far more important than the nature of the metal itself in decreasing the total losses of the condenser; the total length of the edges of the metal coating must be as short as possible (from this point of view it is concluded that the Leyden jar type of condenser is better than the plate type); the enamel process is very efficient, and practically annuls brush discharges; also it shows no difference between the various types of condensers in regard to brush discharge.

* * *

ELECTROMAGNETIC AND LIGHT-WAVES.—The radiation in wireless telegraphy is similar to light; therefore it is of interest to refer to a comparison of the human receiver of this radiation—namely, the eye, with the receiver of a wireless station, made by Mr. W. Duddell before the Institution of Electrical Engineers. According to some recent experiments by Messrs. Paterson and Dudding a light of $\frac{1}{10}$ of a candle at a distance of a kilometre is near the limit of visibility. Assuming the square law this corresponds to a candle-power of 2,560 at 100 miles. With our present incandescent lamps this would require 2½ kw. In wireless, to cover the same distance, it is usual to instal what is nominally a 1½-kw. station. Taking, however, Drysdale's figures for the rate of radiation of energy in the visible spectrum (about 0·1 watt per candle-power), our source of light is radiating energy at the rate of about 250 watts. Assuming the overall efficiency of wireless antenna at 20 per cent., the radiation of the wireless antenna is 300 watts. It would seem, therefore, that there is a remarkable similarity between the sensibility of our eye to radiation of the short wave-length which constitutes light, and the sensibility of our wireless receiving apparatus for the long wave-length radiation used in telegraphy. According to Lord Rayleigh's experiments, if a tuning-fork is producing sound at the rate of 42 ergs per second it will just be audible at a distance of 30 yards. This corresponds to a source of sound giving out 0·0056 watts being audible at 1 km., or assuming no absorption or bending of the sound waves 143 watts at 100 miles. We, therefore, have the curious result that if it were possible to radiate energy at a given rate, either as sound-waves or as light-waves or as long Hertzian waves, we should be able to detect them at approximately the same distance by means of our ear or our eye or the receiving apparatus of a wireless station. Wireless time signals are regularly sent out each day for the use of the ships at sea. In view of the fact that wireless signals are received practically simultaneously everywhere on the globe, they form in conjunction with transit observations a ready means for the determination of differences of longitude to a high degree of accuracy. It is claimed that in recent tests differences of time were determined to an accuracy of $\frac{1}{1000}$ of a second, which corresponds to an uncertainty in position of only 5 yards at the Equator. The surveying of difficult country may be expected to be greatly facilitated by this new means of determining the difference of time.

The Physiological Effect of Hertzian Waves.

THE physician in the French Navy whose investigations have led him to conclude that Hertzian waves as used in wireless telegraphy do definite physical injuries to those who come into their vicinity has against him the main current of experience and science. No protection of any special kind, either for the eye or the exposed parts of the body, is provided for, or demanded by, wireless operators. The notion that a wireless telegraph operator can have his health injured by the use of the electrical apparatus is based on some confusion between Hertzian waves and Röntgen rays. Now, it must be clearly and primarily understood that Röntgen rays, X rays, and so on, have nothing whatever in common with Hertzian waves. Röntgen and X rays do have a powerful physiological effect, and they are utilised on that very account. But Hertzian waves cannot be legitimately supposed to have any effect on the organism at all.



One of the 450 feet Masts erected at the Marconi Works, Chelmsford.

The idea that ultra-violet or other troublesome rays come from the arc used in wireless telegraphy is quite absurd, for the simple reason that the arc is enclosed. Thus the wireless operator is not affected by the arc in any degree, and so he is no more affected by the Hertzian waves than other persons in different parts of the body of the ship. Unfortunately everything electrical has to run the gauntlet of prejudice, and this attack on the hygienic properties of wireless telegraphy is easily paralleled by other attacks. Wherever the source of some conflagration is doubtful the fusion of electric light wires is given the discredit. Again, electric incandescent light is accused of injuring the eyesight, whereas it gives practically the same kind of light as incandescent gas burners. Generally speaking, the comparative novelty and apparent mystery of things electrical call out the instincts of opposition and scaremongering. We suppose that the electrical industry will be open to this kind of opposition until something newer and more astounding and more useful to man is discovered.

Exploring the Earth's Interior.

SOME months ago we referred to some experiments which were made towards exploring the interior of the earth by means of electric waves. The matter has since occupied a good deal of attention, notably from Mr. E. Kilburn Scott. In the course of a paper before a London meeting of the Association of Mining Electrical Engineers, Mr. Scott referred to the future possibilities of firing mine and quarry explosives by "wireless" methods, thus making for the greater safety of those who are conducting the operation. Shot-firing is a risky business at the best of times, and the farther one can get from the actual centre of the explosion the better one is situated to avoid accident. The adoption of wireless principles for this duty would, of course, extend the possible range of the firing point almost indefinitely. "He would be an unwise man," remarked Mr. Scott, "who said this would never be done"; but, of course, lots of things are possible which are not commercial.

Reviews of Books

"WIRELESS TELEGRAPHY, AND HOW TO MAKE THE APPARATUS." ("Work" Handbooks, 1s. net.)

The "electrical amateur" to whom this up-to-date and practical little book is addressed should have no difficulty, if he has a very average collection of tools and the power to borrow the occasional use of a lathe, in obtaining the results indicated. Indeed, we think that at times the author is even inclined to overestimate difficulties; as, for instance, when he states that with an ignition coil giving an eighth of an inch spark the signalling distance, using the receivers described, would only be a few yards. The least satisfactory chapter is perhaps the first, where the author deals with theory rather than with practice. In striving, for instance, to give a clear idea of the functions of the ether, he states that it conducts light, heat and *sound* by means of etheric waves (page 2). We were about to commend the wise warning on page 13 against the uses of gas-pipes as transmitting earth-leads, when we noticed that on page 59 it is very inconsistently stated that a gas-pipe may be used for this very purpose. In the matter of a wave-meter, whose use adds so much to the instructiveness of "tuning" experiments, it seems a pity to risk deterring the amateur from its manufacture by saying that it must of necessity be calibrated in a laboratory. It should be possible, by using "plain aerials" of various known lengths, to calibrate the home-made wave-meter at home in a way instructive and sufficiently accurate. These are small defects which might be remedied in a further edition, which would seem likely to be called for.

"UNIVERSITIES AND NATIONAL LIFE," by Viscount Haldane. (John Murray, 2s. 6d. net.)

The fact that this volume of Lord Haldane's addresses has now reached a 4th edition is ample testimony to the wide appreciation it has received. But these essays are not light reading. They probe too deeply into the great "How's" and "Why's" of our existence, both as individuals and as citizens, to be easy of understanding. But they are earnest reading, fascinating reading, if you will, for they make a direct appeal to the intelligence and sympathy of the reader by their ingenuousness and sincerity of tone.

The four addresses are severally entitled: (1) The Soul of a People; (2) The Calling of a Preacher; (3) The Dedicated Life; (4) Great Britain and Germany; a Study in National Characteristics.

In the first three Lord Haldane shows himself a "practical idealist"—that is to say, he is a man who appreciates a practical nature, but is not blind to the fact that such a nature, to be completely developed, must have a certain amount of idealism as a component part. What is perhaps even better, he preaches the need for idealism as the motive force of all action, and points out that, without it, the loftiness of purpose which distinguishes the work of any truly great citizen will be wanting.

From time to time in his discourse Lord Haldane illustrates his remarks with a graphic word-sketch of some notable man, and notable amongst these is his portrait in "The Soul of the People" of Hermann Lotze, the man and the philosopher. But perhaps the most interesting is the address delivered at Oxford in August, 1911, on "Great Britain and Germany." In it a difficult subject is handled in a masterly way, and it shows an intimate knowledge of German literature and social life. Lord Haldane briefly reviews the evolution of German philosophy in order to show how it is that the Germans became possessed of "habits of thinking in abstract terms, even when dealing with the most immediate and practical affairs, and of looking for principles everywhere, which make things at times trying for those who have not this useful if difficult habit of mind in the same degree." Later, he sums up the English characteristics in an equally admirable phrase: "What we have actually done, we have done—not as the outcome of any pre-conceived and thought-out policy, but because . . . at the moment it was the obvious thing to do . . ." and so he drives home his point—"What is wanted then is education in mutual understanding." But it is impossible to do full justice to the book in a short review. "Universities and National Life" is a book to be read, and re-read, and pondered over.

We have received a copy of the paper presented before the Institution of Electrical Engineers by Dr. J. A. Fleming, F.R.S., and Mr. G. B. Dyke, B.Sc., on "The Power Factor and Conductivity of Dielectrics when Tested with Alternating Electric Currents of Telephonic Frequency at Various Temperatures." This paper, which is reprinted from the *Journal* of the Institution, is a valuable addition to the literature dealing with the subject. The authors concern themselves with only one department—viz., the power factor and conductance of dielectrics under alternating electromotive force of low voltage, pure sine wave-form, and of frequencies of 900 and 5,000 p.p.s., as this has a close connection with practical telephony.

Recent Marconi Orders

Nine 3-kw. motor-car stations have recently been ordered by the Italian Government from Marconi's Wireless Telegraph Co., Ltd.

The following steam yachts have been equipped with Marconi apparatus :

The " Valiant," the property of Lord Pirrie.

The " Doris," the property of S. Joel, Esq.

Orders have been received to equip the following vessels :

Fifty vessels of the Ellerman Line.

Three submarines of the Brazilian Government.

Six White Star Line vessels.

Five Dominion Line vessels.

The following vessels have been equipped with Marconi installations during the past month :

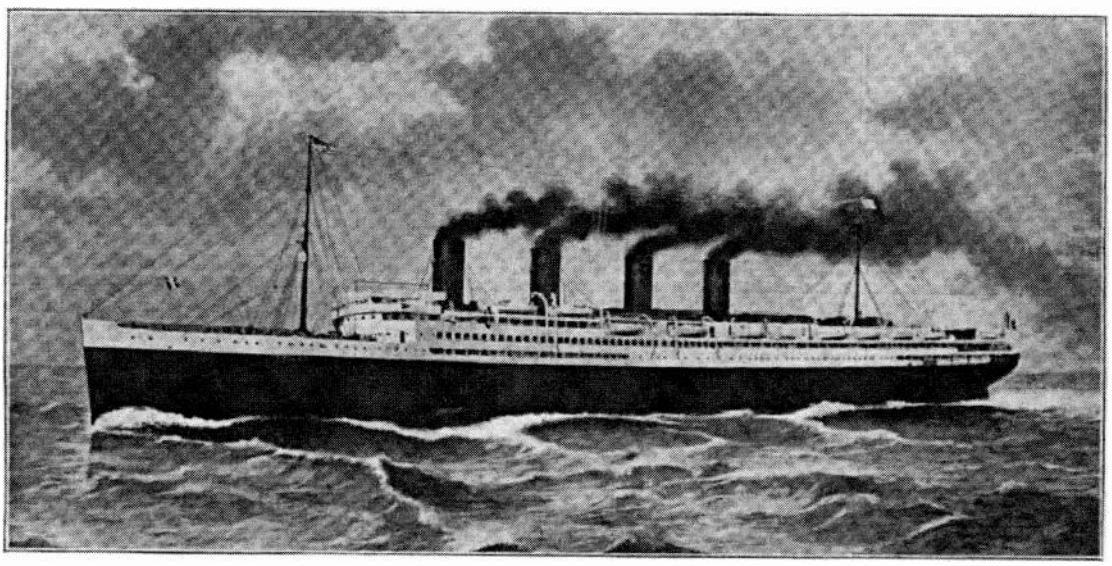
Owners.	Name of Vessel.	Installation.	Service.
Andrew Weir & Co. ...	s.s. " Luceric " ...	1½ kw.	Cargo transport between Savannah and Liverpool
" " " ...	s.s. " Poleric " ...	1½ kw.	Cargo transport between Africa and India
Bucknall Steamship Co. ...	s.s. " Johannesburg "	1½ kw.	Cargo vessel with world-wide service
" " " ...	s.s. " Kentucky " ...	1½ kw. and emergency set	Cargo vessel
J. Chadwick & Sons ...	s.s. " Drumcree " ...	1½ kw.	Cargo vessel between Liverpool and Buenos Ayres
" " " ...	s.s. " Drumlanrig "	1½ kw.	Cargo vessel between Liverpool and Buenos Aires.
Cunard Mail Steamship Co.	s.s. " Ultonia " ...	1½ kw.	Passenger between New York and Mediterranean
T. and J. Harrison	s.s. " Wayfarer " ...	1½ kw.	Passenger, cargo between Liverpool and New Orleans
" " " ...	s.s. " Custodian " ...	1½ kw.	Passenger, cargo between Liverpool and New Orleans
Messrs. Lage...	s.s. " Itapuhy " ...	1½ kw.	Cargo vessel in South American waters
Lamport & Holt	s.s. " Veronese " ...	1½ kw.	Cargo vessel
P. & O. Steam Navigation Co.	s.s. " Sicilia " ...	1½ kw.	Passenger between London and Japan
" " "	s.s. " Palawan " ...	1½ kw.	Passenger between London and Calcutta
" " "	s.s. " Sunda " ...	1½ kw.	Passenger between London and Japan
" " "	s.s. " Nubia " ...	1½ kw.	Passenger between London and Calcutta
" " "	s.s. " Sardinia " ...	1½ kw.	Passenger between London and Japan
Royal Mail Steam Packet Co.	s.s. " Magdalena "...	Emergency apparatus	Passenger, Southampton to New York via West Indies
" " "	s.s. " Tagus " ...	Emergency apparatus	Passenger, Southampton to New York via West Indies
Union Castle Steamship Co.	s.s. " Berwick Castle "	1½ kw.	Passenger between London and Mauritius
" " "	s.s. " Cawdor Castle "	1½ kw.	Passenger between London and Mauritius
White Star Line	s.s. " Delphic " ...	1½ kw.	Passenger, destination uncertain
Yeoward Bros.	s.s. " Aguila " ...	1½ kw.	Passenger between Liverpool and Canary Islands

Orders have been received by the Marconi Co., Ltd., to equip the following vessels with wireless installations :

Owners.	Name of Vessel.	Service.
Andrew, Weir & Co. ...	s.s. " Suveric "	Cargo, transport between Africa and India
" " " ...	s.s. " Kumeric "	Cargo, transport between Africa and India
" " " ...	s.s. " Orteric "	Cargo, transport between Africa and India
" " " ...	s.s. " Salamis "	Cargo, transport between Africa and India
" " " ...	s.s. " Roseric "	Cargo, transport, destination uncertain
" " " ...	s.s. " Naueric "	Cargo transport between Africa and India
Burns, Philip & Co. ...	s.s. " Matunga "	Building
Lulea Ofoten	s.s. " Murjek "	Building in Thompson's yard, Sunderland
Fraissinet et Cie	s.s. " Corte II."	—
" "	s.s. " Golo "	—
" "	s.s. " Liamone "	—
" "	s.s. " Iberia "	—
" "	s.s. " Corsica "	—
" "	s.s. " Numidia "	—
" "	s.s. " Italia "	—
R. Paquet et Cie	s.s. " Doukkala "	—
S. Pearson & Sons	s.s. " San Bernardo "	Passenger, destination uncertain
P. & O. Steam Navigation Co.	s.s. " Borneo "	Passenger between London and Calcutta

Maritime Wireless Telegraphy

THE accompanying illustration is that of one of the leading French mail steamers—"France"—which has recently been added to the fleet of the Compagnie Générale Transatlantique. This superb vessel compares favourably with the modern leviathans which cross the Atlantic, and it is a tribute to the progress which the Marconi system has made in France that the vessels of this great maritime company should be equipped with the Marconi apparatus. The



The s.s. "France"

installation is a standard 1½-kw. set, and it has been carried out by the Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil à Paris. It is capable of receiving long-distance messages from Poldhu (England) and Cape Cod (United States), and by that means the "France" is capable of publishing a daily newspaper on board—the *Journal de l'Atlantique*. The "France" is 220 metres in length and has accommodation on board for 1,925 passengers and a ship's company of 560.

The s.s. "Pontianak," a cargo boat of the Rotterdam Lloyd, after having left Makasar for Soerabaja, ran on a rock near the Kangean Isles on the following day, and sprang a leak, by which the fore-holds became full of water. The "Pontianak" informed the station at Sitobondo of the accident by means of wireless. Before aid came the ship had come off again without assistance, and continued the voyage to Soerabaja, where she arrived the day after.

The Canadian Northern liner "Royal George," bound from Avonmouth to Quebec, ran ashore in a dangerous position on the Beaumont Shoal at the western end of the Isle of Orleans, about 10 miles due east of Quebec on November 7th. No lives were lost.

Wireless messages were despatched to Quebec, and tugs and other river craft were quickly on the way to the rescue, but the fog began to thicken, and it being low tide, it was some time before the rescuers could get near the liner. However, the transhipment of the passengers was proceeded with quickly, but in orderly manner, and 420 were transferred to a ferry boat by midnight. In the darkness the craft was very nearly wrecked on the same ridge, but good seamanship prevailed, and the rescued people were safely conveyed to Quebec.

A severe hurricane almost destroyed the seaport of Acapulco, Mexico, recently, and information concerning the disaster was made known through the medium of wireless telegraphy.

The announcement in the *Daily Telegraph* that six men were dying of hunger in the lighthouse on the Island of Loveira is an unwelcome reminder of the extraordinarily large field there is still open for wireless. The poor men were without any communication with the mainland for thirty days, and naturally great anxiety prevailed regarding their terrible situation. Loveira is an islet off the coast of Corcubion in Spain, and is not very far from Cape Finisterre, near which the "Delhi" came to grief some time ago. Although a number of lighthouses are already equipped with wireless apparatus, it cannot be said that the number is by any means adequate, and we hope that the authorities controlling lighthouses in different parts of the world will give the matter their serious attention. In this way they will be increasing the efficiency of the lighthouses and, at the same time, render their occupants more immune from the dangers of the ocean.

Upon arrival of the Union Steamship Company's s.s. "Tofua" at Levuka it was learned that cable communication between Levuka and Suva had been interrupted by storms and floods for several days. Consequently business men at Levuka suffered great inconvenience and probable loss through being isolated from other parts of the world.

When the postmaster at Levuka learned that the "Tofua" was equipped with Marconi apparatus, he requested the Marconi operator on board to communicate with the Marconi station at Suva, and to transmit and receive from Suva by wireless the large number of cablegrams which had accumulated, and were being delayed at both ends of the broken cable.

Throughout the "Tofua's" stay in the port, the Marconi operator was kept busy with messages to and from Levuka and the outside world. All messages dealt with by this means were received quickly and accurately. Although the "Tofua" could stay but a few hours in the port, her Marconi installation during that time proved of great service and value to the traders on the island.

The s.s. "Huanchaco" arrived at Punta Arenas on November 21st with a number of the passengers of the Pacific Steam Navigation Company's steamer "Oravia," which was wrecked off the Falkland Islands on November 12th. It appears that the vessel struck a rock half a mile from the lighthouse at the entrance to Port Stanley at ten o'clock at night. Blinding snow and intense darkness made it impossible to see anything. The wireless apparatus proved the salvation of those on board, for in response to the signals of distress five whale boats arrived three hours after the ship struck. The mails and baggage were also saved, but the cargo was lost, as the "Oravia" broke in two and sank. There was no loss of life.

The new rates for wireless telegraph messages off the Canadian coast become effective on December 1st.

The Telegraph Master, Karachi, notifies that the new Karachi Wireless Telegraph Office has now been opened, and is available for the transmission of public wireless telegrams to all ships fitted with wireless installations.

The regulations which are to govern the free import of shipbuilding materials have at length been drawn up by Mr. McVeagh, Secretary to the Treasury of the United States, and will shortly be promulgated. They provide for the free entry of wireless telegraphy apparatus, and of sails and rigging as part of the equipment of a ship.

A Spanish Royal decree has lately been promulgated making obligatory the installation of wireless telegraph apparatus on Spanish passenger steamers. Following is a summary of the decree:

1. From August 1st, 1912, all Spanish merchant vessels which carry passengers or mails shall be fitted with wireless apparatus.

2. The apparatus must be in accordance with the requirements of the Ministry of the Interior and of the General Direction of Posts and Telegraphs.

3. Shipping companies shall, as soon as the installation has been completed, communicate this fact to the competent authorities in order that such installation may be submitted to official tests.

A further Bill is also before the Cortes dealing with the same subject. This reads:

> "Commencing from January 1st, 1913, no passenger shall embark in Spanish ports on any ship which has not been provided with wireless apparatus, the marine authorities only granting the necessary authorisation after ascertaining that the apparatus in question is in good working order."

It will be observed that, although the decree deals with Spanish shipping only, the Bill seeks to make obligatory the installation of wireless telegraphy on the vessels of all nationalities embarking passengers in Spanish ports.

Two Centuries Ago.

THE following curiosity of literature extracted from the *Spectator* of two hundred years ago—viz., December 6th, 1711,—heralds the idea of wireless telegraphy:—

"Strada, in one of his prolusions, gives an account of a chimerical correspondence between two friends by the help of a certain loadstone, which had such virtue in it that if it touched two several needles, when one of the needles so touched began to move, the other, though at never so great a distance, moved at the same time, and in the same manner. He tells us that the two friends, each of them possessed of one of these needles, made a kind of a dial-plate, inscribing it with the four-and-twenty letters, in the same manner as the hours of the day are marked upon our ordinary dial-plate. They then fixed one of the needles on each of these plates in such a manner that it could move round without impediment, so as to touch any of the four-and-twenty letters.

"Upon their separating from one another into distant countries they agreed to withdraw themselves punctually into their closets at a certain hour of the day, and to converse with one another by means of this their invention. Accordingly, when they were some hundred miles asunder, each of them shut himself up in his closet at the time appointed, and immediately cast his eye upon his dial-plate. If he had a mind to write anything to his friend, he directed his needle to every letter that formed the words which he had occasion for, making a little pause at the end of every word or sentence, to avoid confusion. The friend, in the meanwhile, saw his own sympathetic needle moving of itself to every letter which that of his correspondent pointed at.

"By this means they talked together across a whole continent, and conveyed their thoughts to one another in an instant over cities or mountains, seas, or deserts."

Falkland Islands.

Six thousand five hundred square miles, chiefly of bog-land, pasture, and morass, cut through by brownish tarns; a bleak climate like most of the outer Hebrides, rain on 250 days in the year, leaden skies nearly always, a little capital called Stanley with some 600 inhabitants and three places of worship, these are the lot of the electrical engineering staff who man the new 5-kw. Marconi station at the Falkland Islands, described in a recent issue of this journal. The Crown Agents for the Colonies gave out the order, and some importance attaches to this new move, as the radius will cover a distance in which navigation was much at a loss for means of communication. We hope to say more about this on a future occasion.

A New Limb of the Law.

A sensational use of wireless telegraphy has been made in tracing the whereabouts of Nestor Wilmart. Wilmart is a Belgian millionaire, who, after leading a life of affluence and good repute and making a name for himself on the racecourse as owner of a magnificent stud, was suddenly seen no more either amongst his wide circle of friends or in his accustomed resorts. His disappearance elicited inquiries, with the result that he is alleged to have forged railway share certificates to the tune of over two million pounds which he had deposited at various banks as security for substantial loans. Upon this discovery followed an easily understood desire to find the whereabouts of Nestor Wilmart. Detectives searched, but in vain. Paris and London were vigorously scoured, but all to no purpose, and the authorities were nonplussed. One evening, however, a wireless message was received by the judicial authorities at Brussels from the captain of the "Etoile Belge," a steamer belonging to the General Atlantic Company, then on its way to New York, stating that Nestor Wilmart was on board the vessel. A wireless reply was immediately forwarded to the "Etoile Belge" ordering a special watch to be kept on Wilmart, and at the same time an order for his arrest was sent to the authorities at New York. Nestor Wilmart is now on his way back to Belgium. We should rather like to know his opinion of wireless telegraphy.

* * *

Another arrest was recently effected by means of wireless telegraphy. Rode Ballagon was "wanted" by the authorities at Harrisburg, and it was believed he had booked a passage on the steamship "Haverford," which was due to start for England from Philadelphia. Detectives were immediately dispatched, but failed to find their man on the ship. They, however, learned that the steamer "Graf Waldersee" had just started from Philadelphia, and would probably have Ballagon aboard. They therefore communicated through the "Haverford" with Detective Cameron as to the best course to pursue. The reply came back: "Charter tug, endeavour overtake 'Graf Waldersee.'" The advice was acted upon, and the liner was overtaken at League Island. The detective's surmise was found to be correct, but definite orders were necessary before they could carry out the arrest.

Following the captain's suggestion, a message was quickly transmitted to a wireless receiving station on top of a building near City Hall and delivered to Captain Cameron, who, in replying, instructed the detectives to arrest Ballagon.

A Cruise in Troubled Waters

FOR a man who has not yet completed a third part of man's allotted period on this planet, Mr. Ernest R. Sprice, the wireless operator on board the s.s. "Montevideo," has had a life singularly full of incident. He was educated at Battersea Grammar School, and received his wireless training at the Clapham School of Telegraphy. From there he entered the service of the Compagnie de Télégraphie sans Fil, and later was transferred into the Compagnia Transatlantica Español.

His latest experience has been the Mexican Rebellion in Vera Cruz, and he has written home a graphic account of the incidents of the bombardment of Vera Cruz, and of the service which wireless rendered in enabling his ship to go to the rescue of many starving refugees.

When the "Montevideo" arrived at Habana from New York, news was received from the agent that trouble was brewing at Vera Cruz, and after many telegrams had been exchanged with the authorities regarding the best course to pursue, it was at last decided that the vessel should go to Porto Mexico, and not risk the dangers of attempting a landing in the danger zone. Accordingly, the "Montevideo" started from Habana on October 19th, and on the following day information was obtained that the rebels held Vera Cruz, all communication with the capital had been cut off, and business was at a standstill. This news was reported to the captain, who was immediately anxious to have information regarding the state of affairs at Porto Mexico, for if the position of affairs were the same at this port it might be impossible to effect a landing. Such information was, however, not forthcoming, the only definite news being received from the wireless station at Campeche. And this was news of a negative description, for the operator told the "Montevideo" that communication had been cut off for five days, and he had heard nothing further. The captain decided to proceed and take his chances, and on the morning of the 22nd the "Montevideo" arrived at Porto Mexico and found all quiet. But a message was awaiting her from the Spanish Consul giving instructions to the captain to proceed at once to Vera Cruz, and take off all Spanish residents, as an official intimation had been given by the rebels that the town was shortly to be bombarded.

Mr. E. R. Sprice.

The captain immediately informed the passengers that, as the "Montevideo" had been commissioned for Vera Cruz on special service, disembarkation was to take place without a moment's delay. The unhappy travellers were not a little disturbed at these orders. Scarcely one of them was ready to leave the ship, and many were panic-stricken lest they should be left stranded at Porto Mexico, with no means of reaching Mexico City. Their fears were allayed somewhat by the news that the railway company had agreed to put a special train at their service; although it hardly compensated for the inconvenience to which this hasty landing subjected them. Their plight was ludicrous. Trunks were carried ashore half packed, their contents a desperate medley of crumpled garments. Bundles of every description were deposited on the quay, many insecurely fastened and gaping wide to show their heterogeneous contents.

A little after one o'clock in the afternoon the "Montevideo" put out again to sea, and as it turned out not a moment too soon, for an hour later an urgent message was received from the

American cruiser stationed at Vera Cruz, bidding the "Montevideo" make all speed possible, as the town was to be bombarded at six in the morning of the 23rd. The vessel was therefore placed under its utmost steam, with the result that she made Vera Cruz before ten o'clock, and anchored just outside the harbour. All this time she had been in constant communication with the cruiser, and at last was able to inform the American captain that the "Montevideo" had arrived and was awaiting orders from the Spanish Consul. All night Sprice was on the *qui vive*, hoping every minute that these instructions would come, but all to no purpose. Not a whisper from the Spanish Consul reached them.

Within Range of Fire.

At half-past six the bombardment began. Sprice, with the captain and other officers, watched proceedings from the bridge. The whole of the line of battle was visible to them from this point of vantage. There was a continual movement among the soldiers, some placing cannon in position just outside the city; others, cavalrymen, galloping from point to point, and presently the guns began to fire in quick succession. The deep booming of the cannon completely drowned the intermittent noise of the quick firing guns. But at this juncture the captain deemed it advisable to stand further away from the shore in order to escape misdirected shots, and gave orders to weigh anchor. Almost as soon as this had been done a message was received from the American steamer, reporting many Spanish subjects on board. To this the captain of the "Montevideo" replied that if they wished he would take them off at once. An answer came, the acceptance of the offer by twenty of the passengers, and the further information that on Sacrifice Island, just a little way out from Vera Cruz, were several hundred persons, with hardly any food and no shelter, who would be very grateful for help. To this Sprice was ordered to telegraph back: "Am sending boats." At once the boats were got ready; one was sent off to the American steamer, and one to the island. The boat from the ship came back with sixteen refugees, and reported that thirty-two more were anxious to be transferred. To accede to the wishes of these self-appointed guests was no easy task, for the distance between the two steamers was about half a mile, and there was a heavy sea running. However, Sprice, as he was able to interpret for the passengers, was told off to captain a second boat going to the help of the steamer. He returned to the "Montevideo," to find that the boat sent to the island had come back with twenty refugees, and the officer reported that there were one thousand five hundred persons occupying the island, many were completely destitute, and some almost starving.

While the "Montevideo" was engaged in these good services, the battle on shore had been fought to a finish, and in the afternoon a report came through by wireless, stating that all was quiet, and an entry into the harbour could be effected without danger. The captain gladly availed himself of the opportunity to anchor in a less exposed position, but he was warned that none of those on board were to be allowed on shore that evening, a prohibition which, it is needless to add, was faithfully observed.

The next morning, however, the ban was removed and the passengers were able to visit the city. Evidences of the conflict were only too visible. Some of the houses and shops were riddled with bullets, while the stained and slippery state of the pavements bore witness of the fact that the victory had been far from bloodless. One building, the offices of a Vera Cruz paper, entitled *Blanco y Negro*, in the Calle 5 de Mayo, was a most conspicuous ruin. It was peppered with holes, and its façade was horribly blood-stained. Indeed, these gruesome evidences pointed to such promiscuous firing that one might suppose both sides to have shut their eyes when they pulled the triggers of their rifles.

Sea Episodes.

The adventures of this voyage, however, were not entirely over. On October 31st the "Montevideo" arrived at Habana, and left the same day for New York. Sprice reported the weather as insufferably hot, but expected a change would set in soon. He had not long to wait, for on the following day it was so cold that although he was clad in his very warmest rig, he could not keep warm. Shortly after a storm began to rise, and by six o'clock that evening the sea was running high and tossing the "Montevideo" about like a cork. Towards seven o'clock news came through that a collision between a sailing ship and a steamship had just taken place. The steamer was fitted with wireless, and was sending out for aid. The "Montevideo" answered her call, and received the reply that a revenue cutter and battleships were racing to her aid. Communication, however, was kept up between the two vessels, and we learnt later that the vessel, a Norwegian steamer, was gradually sinking, but was being towed into port by the cutter. Shortly after communication ceased; possibly the water had invaded her wireless cabin.

On the following day the "Montevideo" arrived in New York.

Football

It is doubtful whether any match in the fixture lists of the two Marconi clubs surpass in interest the annual encounters between the London Office and Chelmsford elevens. The keenest rivalry exists between the two clubs; but it is rivalry of the most wholesome character, limited to the arena. The supporters of each club are staunch believers in the merits of their respective favourites, yet in spite of the excitement engendered among them when the two clubs meet their fine sportsmanship enables them to meet in friendly intercourse after the matches.

The first of the two encounters of the present season took place on Saturday, November 16th, when a large party from the London office accompanied the team to Chelmsford. Both have been very successful in their league matches this season, and there was a quiet confidence of victory on each side. The game opened fairly evenly, but the downfall of the visitors' goal during the first ten minutes seemed to dishearten the London club, whose play suffered in consequence. Chelmsford played with fine dash and combination, and simply "walked round" their opponents, who were two goals down when the interval arrived. When the teams lined up again after a brief refresher it was noticed that the visitors had re-arranged their side. But that expedient availed them nought. The homesters continued to play in masterly style, and added three more goals before the final whistle was blown, leaving them well-deserved victors by five goals to nil. The condition of the ground after the heavy rains militated somewhat against good playing, but that, if anything, made the victory of Chelmsford all the more creditable. If they maintain their present form, we predict a very successful season for them, and nothing would please us better at the end of the season than to record their capture of the various trophies for which they have entered.

As to the London club, they need not feel disheartened because of their defeat, albeit it is the most severe trouncing which they have received this season. They were decidedly the inferior of the two teams on the day's play, the only redeeming feature of which, from their point of view, being a gallant revival during the closing stages, and the fine play by Cadman at left back and Lord at right half. The playing members have shown themselves in previous matches to be a first-rate team, and when the return match is played they are determined to show their Chelmsford friends that the latter caught them on an "off" day.

The following were the teams: Works, Waller; Greenaway and Love; Bedford, Fowler and Camenoil; Weldon, Rashbrook, Pemberton, Leggett and Hughes. London Office: Wagstaff; Mason and Cadman; Lord, Wedlake and Underhill; Noakes, Dodson, Menear, Littaur and Badder.

After the match both sides and their supporters met in the splendid new club house as the guests at tea of the Works club. In the evening a concert was held, over which Mr. C. Mitchell, the works manager, presided, supported by Mr. C. E. Turnbull, Mr. A. Gray, Mr. T. E. Hobbs and Mr. W. R. Cross from the London office. A feature of the excellent concert provided was the playing of the Marconi orchestra. Responding to the toast of the visitors, proposed by the chairman, Mr. Hobbs expressed thanks for the generous hospitality of their hosts, and, after complimenting the victors on the result of the game, he predicted that the return match would produce an entirely different result. Mr. Gray proposed and Mr. Turnbull supported a vote of thanks to the chairman, and with this an enjoyable evening was brought to a close.

The previous league matches of the London club this season resulted as follows: *v.* Talbot, won 1—0; *v.* Aster, draw 4—4; *v.* Maple Leaf, won 3—0.

Movements of the Engineers

J. J. Leary, who is in charge of the work of erecting two high-power and several smaller stations in Chili, in connection with the Marconi Company's contract with the Chilian Government, sailed on R.M.S. "Oronsa" for Valparaiso, accompanied by H. Nicholls and B. S. Benning, who will assist in the work.

P. Croaker, assisted by H. Richmond, is at Carnarvon, Wales, engaged in preliminary work in connection with the erection of a high-power station.

S. L. Dashwood has returned to London from Poldhu.

D. H. and L. S. Payne have been temporarily transferred from Broomfield to Poldhu for experience in high-power work.

R. F. Pitcairn, who has been to Poldhu and Clifden stations for experience, is now at the Head Office, temporarily attached to the drawing office.

P. E. Privett, from Clifden high-power station, has been transferred temporarily to Broomfield.

F. E. Robinson and J. H. Shannon have been transferred from Broomfield to Poldhu, where they are temporarily attached for experience in high-power work.

A. G. Savill has returned to London from abroad, and is now temporarily attached to the drawing office.

Movements of Operators

L. W. G. Alford, from the "Agadir" to the "Montezuma."

W. F. Atkinson, from the "Cestrian" to the "Kenuta."

A. R. Akerman, from the "Highland Piper" to the "Tagus."

E. D. Bagot, from the "Olympic" to the "Orama."

G. Balding, from the "Galician" to the "German."

G. W. Balfour, from the "Lusitania" to the "Celtic."

V. W. Ball, from the "Corinthian" to the "Minnetonka."

C. H. Bartlett, from the "Pardo" to the "Kenilworth Castle."

T. Beamon, from the "Mongolian" to the "Durham Castle."

J. Biggins, from the "Vandyck" to the "Minneapolis."

A. G. Blow, from the "Armadale Castle" to the "Egypt."

A. B. Bower, from the "Goorkha" to the "Demosthenes."

H. S. Bride, from the "Medina" to the "German."

A. C. Brown, from the "Canadian" to the "Devonian."

A. F. T. Burgess, from the London School to the "Amazon."

A. E. R. Ballard, from the London School to the "Athenia."

T. S. Brosman, from the London School to the "Vandyck."

C. H. Brett, from the London School to the "Asturias."

A. C. Caldwell, from the "Braemar Castle" to the "Athenic."

F. N. Calver, from the "Antony" to the "Mandingo."

J. Camfield, from the "Celtic" to the "Haverford."

W. Condon, from the "Ascania" to the "Ausonia."

H. T. Cottam, from the "Athenic" to the "Goorkha."

K. S. Cawhey, from the "Empress of Britain" to the "Elmina."

R. Cox, from the "Durham Castle" to the "John Pender."

J. A. Craigie, from the "Cymric" to the "Lake Champlain."

B. A. Carter, from the "Ionian" to the "Hydaspes."

A. N. Clarke, from the "Navara" to the "Highland Laddie."

D. R. Cormack, from the London School to the "Numidian."

J. W. A. Clark, from the London School to the "Oceanic."
D. Cohen, from the London School to the "Scotian."
H. E. Cuthbush, from the London School to the "Caledonia" (Anchor).
F. Campbell, from the London School to the "Minneapolis."
J. E. Davies, from the "Stephen" to the "Canadian."
H. R. Dennis, from the "Ultonia" to the "Magdalena."
E. W. Dexter, from the "Caesarea" to the "Braemar Castle."
L. A. Dods, from the "Minneapolis" to the "Campania."
D. Donelly, from the "Victorian" to the "Haverford."
H. Donisthorpe, from the London School to the "Darro."
J. J. Donegan, from the Liverpool School to the "Carthaginian."
H. E. Earl, from the "Danube" to the "Vandyck."
B. F. Emery, from the "Oriana" to the "Delphic."
V. F. Evans, from the "Burutu" to the "Custodian."
P. S. Firth, from the "Minnehaha" to the "Idaho."
W. C. Gadd, from the "Grantully Castle" to the "Ruapehu."
F. L. Garraway, from the "Sardinian" to the "La Correntina."
B. A. Gillet, from the "Kildonan Castle" to the "Armadale Castle."
F. N. J. Gowlett, from the "Mooltan" to the "Grantully Castle."
R. A. Gascoigne, from the "Montezuma" to the "Highland Glen."
P. Greenstreet, from the "Ultonia" to the "Nubia."
D. Graves, from the London School to the "Arlanza."
A. J. Gregson, from the London School to the "Ionian."
H. Hayes, from the "Scandinavian" to the "Sardinian."
A. L. Henri, from the "Lanfranc" to the "Lake Manitoba."
H. Herd, from the "Letitia" to the "Scandinavian."
C. A. Hill, from the "Demosthenes" to the "Indarra."
T. Horne, from the "Highland Rover" to the "Ionian."
E. G. Hutton, from the "Vechis" to the "Arcadia."
J. A. Hempson, from the "Highland Glen" to the "Highland Rover."
B. J. Hibberd, from the "Caledonia" (Anchor) to the "Pretorian."
E. N. Hewitt, from the "Devonian" to the "Junin."
C. W. Herbert, from the Liverpool School to the "Andorinha."
W. Inder, from the Liverpool School to the "Maure tania."
F. V. Kinder, from the "Beltana" to the "Mooltan."
W. Lee, from the "Minnetonka" to the "Malwa."
S. A. Leith, from the "Dominion" to the "Pancras."
J. D. Lovelock, from the "Haverford" to the "Drumlanrig."
G. H. Lambert, from the London School to the "Ultonia."
C. F. Mackenzie, from the "Saturnia" to the "Itapuhy."
J. MacLeod, from the "Mamari" to the "Trent."
P. B. Maltby, from the "Elysia" to the "Empress of Britain."
J. Mather, from the "Maloja" to the "Asturias."
A. N. Matthews, from the "Athenia" to the "Carthaginian."
P. Mattock, from the "Teutonic" to the "Orcoma."
P. B. May, from the "Egypt" to the "Kildonan Castle."
W. J. McCutcheon, from the "Andorinha" to the "City of Dunkirk."
E. McKelvey, from the "Corinthian" to the "Ultonia."
A. H. Millard, from the "Cheyenne" to the "Waipara."
J. Moody, from the "Clifden" to the "Majestic."
F. H. Mawe, from the "Aquila" to the "Ardeola."
W. S. Morse, from the "Clyde" to the "Sumatra."
W. Murphy, from the "Franconia" to the "Darro."
P. R. Norwood, from the "Bohemian" to the "Celtic."
W. H. Nixon, from the "Highland Laddie" to the "Highland Brae."
H. Oliver, from the "Arlanza" to the "Highland Piper."
J. E. Osborne, from the "Sicilian" to the "Lake Erie."
D. O'Sullivan, from the "Cedric" to the "Adriatic."
C. W. Pain, from the "Victorian" to the "Burutu."
H. M. Palmer, from the "Lake Erie" to the "Hantonia."
W. Pettingell, from the "Arcadia" to the "Medina."
G. Plummer, from the "Minnewaska" to the "Agadir."
P. Plummer, from the "Minnewaska" to the "Navaro."
H. Roffey, from the "Turakina" to the "Minnehaha."
T. Rookes, from the "Sardinian" to the "Parisian."
H. Rowlands, from the "Montfort" to the "Palawan."
W. C. Ryan, from the "Iroquois" to the "Orontes."
T. Robb, from the London School to the "Saturnia."
T. H. Sadler, from the "Lake Manitoba" to the "Lanfranc."
C. Searl, from the "Montcalm" to the "Dominion."
A. Schofield, from the "Ionian" to the "Berwick Castle."
P. S. Smith, from the "Cedric" to the "Empress of Ireland."
D. M. Sproat, from the "Hydaspes" to the "Mendi."
W. P. Spurgeon, from the "Corinthic" to the "Cawdor Castle."
W. K. Schneider, from the "Highland Scot" to the "Galician."
A. F. Smith, from the "Ionian" to the "Mamari."
W. E. Sandon, from the London School to the "Royal George."
G. W. Smythe, from the Liverpool School to the "Franconia."
C. E. Stannard, from the London School to the "Tagus."
W. Smith, from the London School to the "Minnewaska."
E. Sharples, from the Liverpool School to the "Victorian" (Allan).
W. H. Thomas, from the "Canopic" to the "Winifredian."
E. J. Trail, from the "Makrini" to the "Navara."
G. R. Tyler, from the "Mendi" to the "Cymric."
A. Thomson, from the "Letitia" to the "Sardinian."
G. Tilford, from the "Mauretania" to the "Franconia."
W. Taylor, from the London School to the "Grampian."
T. R. Walker, from the "Teutonic" to the "Victorian."
J. N. Ward, from the "Adriatic" to the "Caronia."
G. J. Wright, from the "Goth" to the "Makarini."
L. A. Walters, from the "Ascania" to the "Ausonia."
F. M. Wright, from the London School to the "Lake Erie."
W. J. Wing, from the "Runic" to the "Parisian."
G. V. Williams, from the "Hesperian" to the "Columbia."
G. O. Whitaker, from the London School to the "Vauban."
A. L. Yates, from the "Arlanza" to the "Italia."
W. P. Yelland, from the "Inkosi" to the "Galeka."
A. T. Yelding, from the London School to the "Oruba."
F. E. Young, from the London School to the "Asturias."