THE MARCONIGRAPH

Vol. II.—No. 17. August, 1912. Subscription, 3/6 per annum, post free. Price 2d. Post Free 3½d.

The Imperial Wireless Scheme

ON July 23rd the Treasury issued, as a White Paper, the text of the agreement between Marconi's Wireless Telegraph Co., Ltd., and the Postmaster-General with regard to the establishment of a chain of Imperial wireless stations, together with a Treasury minute explanatory of the reasons which have actuated the Government, and of the negotiations which led up to the adoption of the scheme.

After a series of prolonged conferences, in which the representatives of the Dominions, of the Government of India, and of the various departments concerned took part, the scheme embodied in the agreement was finally settled. While the accepted principle was that the Governments concerned must own and work the stations on their territories, it was recognised as essential to secure the co-operation and assistance of one of the existing wireless telegraphy companies, both on account of their possession of patents and in order to have the benefit of actual experience in transmitting long-distance wireless messages; and in experience of such long-distance working as was required by this scheme the Marconi Company far surpassed any other.

It was not considered necessary to adopt at the outset such a wide scheme as that proposed in 1910 by the Marconi Company, and it was eventually decided that a chain of stations connecting the United Kingdom with Australia (*viâ* India) and with South Africa should be established in the first instance—the installations to be erected in England, Egypt, the East African Protectorate, South Africa, India, and Singapore. The Australian Government finally decided not to take part in the agreement, but to proceed independently with the erection of a station in connection with the Imperial wireless chain. It is intended that this station shall be constructed without delay, and that it shall communicate direct with the Imperial station at Singapore.

Under the agreement the sites are to be provided by the Postmaster-General, while the company will provide the installations (including apparatus, power plant, and machinery), in accordance with specifications to be approved by the Postmaster-General—who is to act in this matter, as in others, on behalf of the Governments concerned. Should other commercial stations capable of continuous communication over a range of not less than 2,000 miles be required to be erected during a period of five years by any Government which is a party to the agreement, the company will have the exclusive right of providing them. After the expiration of that period they may further be required by the Postmaster General to provide such installations at any stations in the British Empire which he may specify. The price of each installation will be £60,000.

The Postmaster-General will have the right to use in the stations during the "royalty" period any future patents of which the Marconi Company has the use, and both the company and Mr. Marconi, and also any person whose patents, etc., they acquire, are bound to give the Government information and advice.

If the Government adopts a system which makes no use of valid and still unexpired patents owned exclusively by the company, and ceases to use the Marconi patents, it may terminate the "royalty period" at any time. Subject to this exception, the agreement and royalty period are only terminable at the expiration of eighteen years, subject to six months' notice. If not terminated in either of these two ways the royalty period runs for twenty-eight years.

CAPT. CECIL NORTON, M.P.

Capt. Cecil Norton, M.P.,

Assistant Postmaster-General

WITH the termination of the International Radiotelegraphic Conference it is fitting to reflect upon some of the features which have distinguished one of the most notable gatherings ever held in this country. Of the results achieved we need say nothing here, for they are dealt with in another part of this issue. One feature which stands out prominently is the warmth of the hospitality which has been extended towards the representatives of foreign nations who visited this country in connection with the conference. The success of the social side of the gathering is due in the main to the well-planned and representative list of entertainments provided for the visitors, and a meed of praise is due to the Reception Committee of the Post Office for the admirable manner in which the arrangements were carried out. Courteous and tactful to a degree, every member of the committee was unsparing in his efforts to ensure the success of the gathering, and the appreciation of the distinguished visitors was expressed in no unmeasured terms in the course of private conversation. His work on the Reception Committee is a striking testimony to the ability of Capt. Cecil Norton. But it required no such occasion to demonstrate the indomitable energy and organising skill of the subject of our present sketch, who, as second in command of that vast organisation—the Post Office—has already made his mark in the administrative affairs of this country.

Capt. Norton is possessed of wide knowledge of men and affairs, as a brief survey of his career will show. He was born in Ireland, being the eldest son of the late Rev. William Norton, rector of Baltinglass, co. Wicklow. His earlier education was obtained abroad, but he returned to his native country, and obtained the distinction of being double prizeman in modern languages at Trinity College, Dublin. He similarly distinguished himself on leaving Dublin at the Royal Military College, Sandhurst, and after this successful scholastic career he entered the Fifth Royal Irish Lancers. With this regiment he spent some years in India, and during this time he obtained considerable knowledge of Hindustani, and when he later passed through the Staff College at Sandhurst he distinguished himself once more by his linguistic ability in that language as well as in German, French and Italian.

He was next selected by the government of that day to report upon the Italian cavalry, and on his return he became Brigade-Major of Cavalry at Aldershot. This concluded his military career. It is worthy of note that throughout his career in the Army he passed the whole of his leave in travelling, studying the languages, the customs, and the administrations of other nations.

Capt. Norton next turned his attention and devoted his time to politics—his earliest entry into the political arena being two unsuccessful attempts to capture Great Yarmouth in the Liberal interest in 1885 and 1886. In the following year, in response to the invitation of the Liberals of West Newington, London, he became candidate for that constituency, which, at the election in 1892, he won by a large majority, and which he still represents. Since that time his energies have been usefully employed in many directions, but he has always shown his greatest interest in the improvement of the conditions of the lower-paid workers of the State. It seemed obvious to him that any general improvement in the conditions of labour in this country must of necessity be preluded by the conversion of the Government into a model employer. With this end in view he has on three separate occasions been instrumental in improving the conditions of the Police force, while he has always given his best endeavours in the service, and has earned the sincere gratitude, of the postal employees of the nation. It would be quite impossible to mention all the classes which have benefited by his labours, or to estimate the debt which they owe him.

In Mr. Asquith's first ministry he was a Junior Lord of the Treasury, and he afterwards succeeded Sir Henry Norman as Assistant Postmaster-General. In that position his knowledge of the customs and administrations of other countries has been conducive to the smooth running of the international postal and telegraphic services, and it is in this position that he was brought in contact with the International Radiotelegraphic Conference, for the successful organisation of which he is so largely responsible.

The International Radiotelegraphic Conference

Summary of the Decisions

THOSE who followed the proceedings of the International Radiotelegraphic Conference, held in London from June 4th to July 2nd, could not fail to be impressed by the important position which wireless telegraphy has taken in the short period of less than two decades as a means of communicating intelligence from place to place over the face of the globe. The youngest yet most vigorous " child of telegraphy " has touched all nations, and of this we had ample evidence in the representative gathering held in London.

At the previous Conference in Berlin the general plans for the regulation of wireless communications were fairly well formulated, but since that time there have been improvements in the art, and a vast amount of valuable experience has been gathered to serve as a guide for future action. The most important regulations established at the Berlin Conference in 1906 were those governing the sending of wave-lengths over different classes of service and interchange of maritime messages. Thus the main object of securing easy communication between ships and the shore with a minimum of interference and difficulty was in a measure attained, but experience has shown that much still remains to be done before the difficulties of the situation can be cleared away.

Compulsory Wireless

Until the report of the Conference recently closed is available, we shall not be in a position to learn how far the revised Convention will meet the existing situation. Judging from a brief report published, it appears that the Conference has taken the opportunity to revise and amend the regulations for the exchange of messages between ships and the shore by means of wireless telegraphy, and it has passed a resolution to the effect that upon certain classes of ships there should be imposed a regulation to carry radiotelegraphic equipments. In addition it recommended that every maritime country should establish a number of coast stations with a permanent wireless telegraph service. These resolutions were carried unanimously, and now await ratification by the governments whose representatives have agreed to them. An increased demand for instruments, plants, and operators is likely to follow as the result of the ratification of these resolutions.

It was at the request of the British Government that the Conference gave special consideration to the question of the use of wireless telegraphy for the prevention of disasters at sea. The text of the resolution was as follows :

" The International Radiotelegraphic Conference having examined the measures taken with a view of preventing disasters at sea and of rendering assistance in such cases, expresses the opinion that in the general interests of navigation there should be imposed on certain classes of ships the obligation to carry a radiotelegraphic installation. As the Conference has no power to impose this obligation, it expresses the wish that the measures necessary to this end should be instituted by the governments. The Conference finds it important, moreover, to ensure as far as possible uniformity in the arrangements to be adopted in the various countries to impose this obligation, and suggests to the Governments the desirability of an agreement between themselves with a view to the adoption of a uniform basis for legislation. Lastly, the Conference recommends to the Governments the desirability of establishing in each maritime country a number of coast stations with a permanent service adequate for the needs of navigation."

Ensuring Public Safety at Sea

The new regulations contain several proposals intended to render more effective the service of wireless telegraphy in the case of distress at sea. Ships will in future be required to provide an auxiliary source of power able to work the wireless apparatus for at least six hours. This emergency installation must be placed in as secure a position as possible, and must be entirely self-contained, so that an accident to the ship which stops the working of the ship's engines need not affect the wireless apparatus.

Other resolutions which have been passed show that the Conference was influenced by the circumstances attending the recent shipping disaster, and evidences a desire of the delegates to take prompt action upon a matter at issue concerning public safety. Thus steps have been taken to lessen the danger of distress signals going unheard by laying down rules as to attendance of the wireless operators on

various classes of ships. On ships of the first class a permanent watch will be required, and in this case two fully qualified operators at least must be carried. On ships of the second class, where a permanent watch is not considered practicable, the operator must listen during the first ten minutes of every hour. This does not require the regular operator to attend to the instrument during the periods stated; the effect of the resolution is that a junior officer or some member of the crew will be trained to listen to the distress call, and that he will stand by the apparatus during the first ten minutes of every hour, thus ensuring that no distress call goes unheard during the time that the regular operator is off duty. There should be no difficulty in training the junior officers or members of the crew for this duty, especially when it is borne in mind that instruction in wireless telegraphy is given on board training ships. In the smallest ships, such as fishing boats, etc., no regular periods of watch is prescribed. Each Government in giving a licence to a ship to carry wireless telegraph apparatus is to determine in which of these classes the vessel is to be placed.

Rules have also been made for both ship and shore stations to suspend work, and to listen at the end of each quarter of an hour in cases where it is likely that distress calls may otherwise not be heard. To prevent confusion, the ship in distress will in future have control over the wireless working of all stations in its vicinity, while the operators on every ship are now specifically placed under the authority of the captain.

Prevention of Confusion

Provision has also been made for giving priority of transmission of weather reports from ships and for keeping coast stations supplied with weather forecasts for communication to ships on demand.

In order to prevent confusion in working, the regulations adopted at the Berlin Conference required ships to communicate with the nearest shore station, various proposals being made so as to allow communication between a ship and a station which is not the nearest. These proposals gave rise to considerable discussion, and a regulation was finally adopted which permits such communications provided that a special specified wave-length is used for the apparatus, but which at the same time limits this exceptional arrangement to the case of communications exchanged between a ship and a shore station in the country to which the ship belongs.

The transmission of radiotelegrams from a ship to the shore, and *vice versa* by means of one or more intermediate ships, is becoming frequent. Regulations were adopted as regards charges, accounting, etc., which it is expected will facilitate this service.

Numerous other changes, mainly of a technical character, were made in the regulations with the object of promoting the smooth and expeditious working of the service. In this connection it may be mentioned that, as already published in the July issue of THE MARCONIGRAPH, all the countries concerned have now agreed that all ships should be under the obligation of inter-communication with one another, irrespective of the system of raido-telegraphy employed.

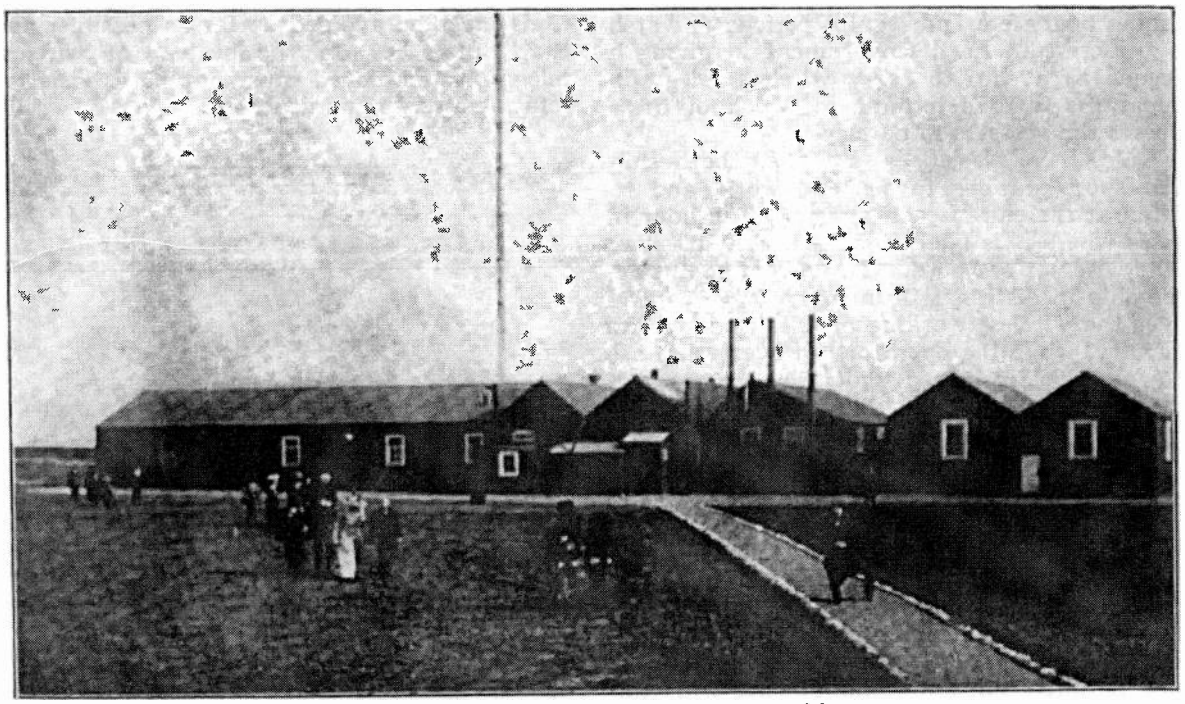
It was decided that it would be premature to attempt to lay down regulations for the long-distance service between land stations, and it was expressly laid down that each country remains free to organise a service of its own as it thinks best, the only principle laid down being that interference between different stations must be avoided as far as possible, and that differences on the system of wireless telegraphy employed must not be a basis for refusing any communication.

Dr. Frederic Chevalier Wagner de Jauregg, Chief of the Austrian Delegation.

The Cradle of Transatlantic Wireless

Po'dhu Re-Visited. An Historic Station. Important New Developments.

A MORE fitting termination to the round of visits paid by the delegates to the International Radiotelegraphic Conference than a week-end trip to Cornwall, it would be most difficult to imagine. Nowhere around Great Britain is there such sailing among fairy lands of romance, for the lofty poles at Poldhu—which proclaim to the world the fact that Cornwall is still playing an important part in the developments of science, as it did in the far-off days of Richard Trevithick and Humphry Davy—are as stimulating to the imagination as was the weird Arthurian legend. Everything combined to make the visit a memorable one. Fickle June conceded breezy, sunny days, and the visitors were able to enjoy " the softest, sweetest air in the world, air which takes from the Atlantic gales all their refinement and none of their blustering roughness." Two hundred guests made the journey of 292 miles from Paddington to Falmouth in record time in a special train provided by the Great Western Railway Company. The British Post Office, who were the hosts on this occasion, displayed a warmth of hospitality which is only to be compared with the unremitting labours of the Members of the Reception Committee, whose arrangements were carried out to perfection. The party arrived at Falmouth at 4 p.m. on Friday, June 29th. On the following morning they visited the Marconi station at Poldhu at the invitation of Marconi's Wireless Telegraph Company, returning to Falmouth in the evening. On Sunday afternoon the guests were taken for a trip up the charming River Fal as far as Truro, where they boarded the special train which was to convey them to London.

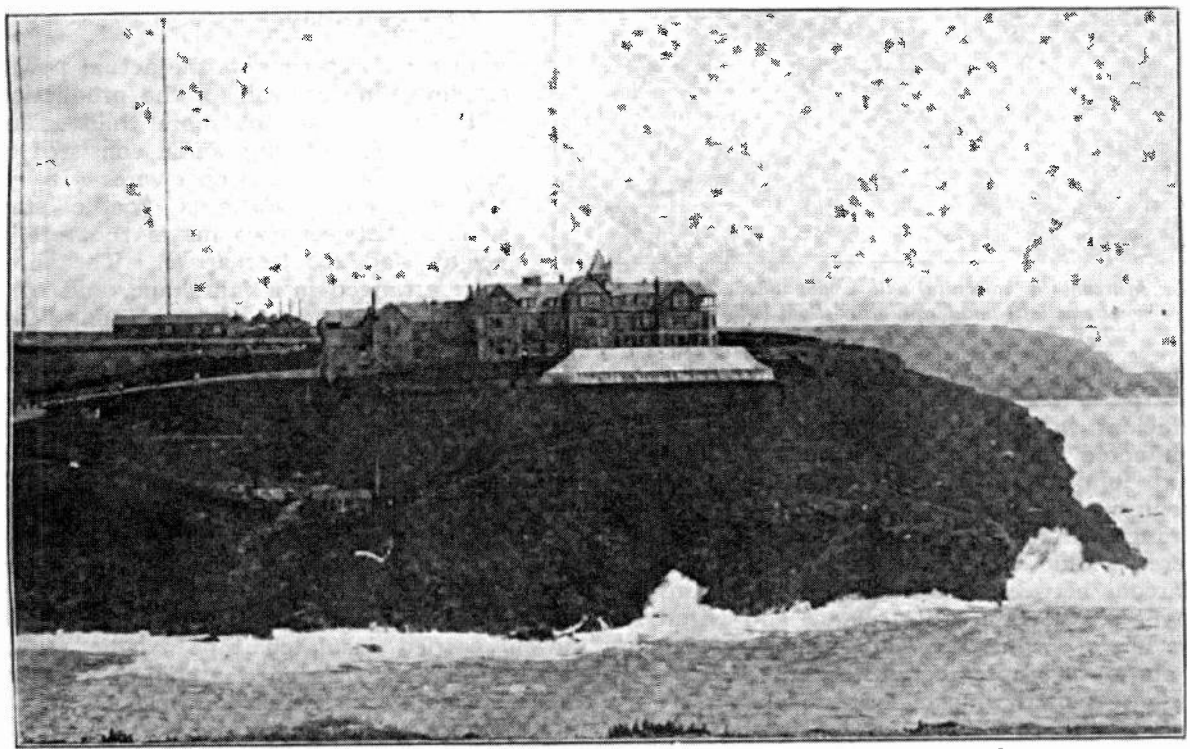


The Station Buildings and one of the New Masts.

The *raison d'être* for the excursion was the visit to Poldhu, which was made in ideal weather. On arrival the guests were entertained to luncheon by the directors of Marconi's Wireless Telegraph Company—a happy luncheon at which there were next to no speeches. Mr.

Marconi in the single sentence which he uttered in response to the plaudits of the guests said he would say, "*Una cosa sola: Grazie*"—a word which was echoed to all who had conspired to make the visit memorable. After luncheon came the inspection of the station itself. Here we may make a slight digression to recall some incidents in the history of that famous station.

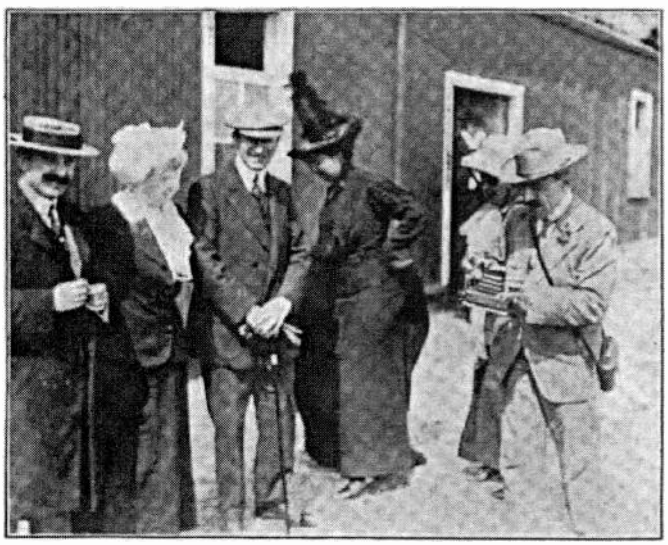
In January, 1901, Mr. Marconi established wireless communication between St. Catherine's in the Isle of Wight and the Lizard in Cornwall, a distance of 200 miles. Previously to this, however, in June, 1900, when Mr. Marconi returned from the United States after having achieved the feat of sending wireless messages over 100 miles, he had arrived at the decision to make a serious attempt to send an electric wave across the Atlantic and detect it on the other side. He had long held in view the application of his system of wireless telegraphy to Transatlantic working, not merely as an experimental feat, but with the object of making it a means for commercial communication. It was obvious, however, that if such a purpose was to be brought to fruition it would necessitate the employment of more powerful electro-magnetic waves than those previously used, and it was above all things necessary to be perfectly certain that the production of these waves would not prevent or cripple the already established wireless communication between ships and the shore. Moreover, the nature of the plant to be employed required careful consideration. After many experiments the construction of plant was commenced. A convenient site at Poldhu, near Mullion, on the coast of Cornwall, was leased in August, 1900, for the erection of the first electric wave power station, and the construction of appropriate buildings was commenced in October, 1900, by Marconi's Wireless Telegraph Company. In the interests of scientific history it may be well just to mention briefly the facts and dates connected with the first serious attempt at Transatlantic wireless telegraphy.



The Marconi Station and Poldhu Hotel. The tent in the foreground is where the Delegates were entertained to Luncheon.

The machinery began to be erected at Poldhu in November, 1900, and at the same time the nature of the aerial that it was proposed to employ was decided. The aerial was to consist of a ring of twenty masts, each 200 feet high, arranged in a circle 200 feet in diameter, the group of masts supporting a conical arrangement of wires insulated at the top and gathered together at the lower point in the shape of a funnel. In December, 1900, the building work was so far advanced that drawings were prepared showing the arrangement proposed for the electric plant in the station; this being delivered, experiments were carried out at

Poldhu in January, 1901, for the purpose of ascertaining how far it would be efficient for the purpose in view. At Easter, 1901, by means of a short temporary aerial, experiments



Mr. Marconi (in the centre) with Commandeur Pullino (on the extreme left) and Capt. Bardelloni (with Camera).

were conducted between Poldhu and the Lizard, a distance of six miles, which were sufficient to show that the work was being conducted on the right lines. During the next four months much work was done in modifying and perfecting the wave generating arrangements, and numerous telegraphic tests were conducted during the period by Mr. Marconi between Poldhu in Cornwall, Crookhaven in the South of Ireland, and Niton in the Isle of Wight. A delay occurred owing to a storm on September 18th, 1901, wrecking a number of the masts, but sufficient restoration of the aerial was made by the end of November, 1901, to enable Mr. Marconi to contemplate making an experiment across the Atlantic. He left England on November 27th, 1901, in the s.s. "Sardinian" for Newfoundland, having with him two assistants, Messrs. Kemp and Paget, and also a number of balloons and kites. He arrived at St. John's, in Newfoundland, about December 5th, and made arrangements for sending up a balloon and an attached aerial wire, having previously instructed his assistants in Poldhu to send from 3 p.m. to 6 p.m. each day a programme consisting of the letter "S" (which in the Morse code consists of three successive dots) at short intervals. Signals began to be sent out in this way from Poldhu on Wednesday, December 11th, and after some difficulty in elevating the aerial wire in Newfoundland by means of a kite, Mr. Marconi received the "S" signals at Newfoundland on Thursday, December 12th, 1901. On Friday, December 13th, he confirmed this result, and on Saturday, December 14th, 1901, he was able to send a message to Major Flood-Page, one of the directors of Marconi's Wireless Telegraph Company in London, to this effect:

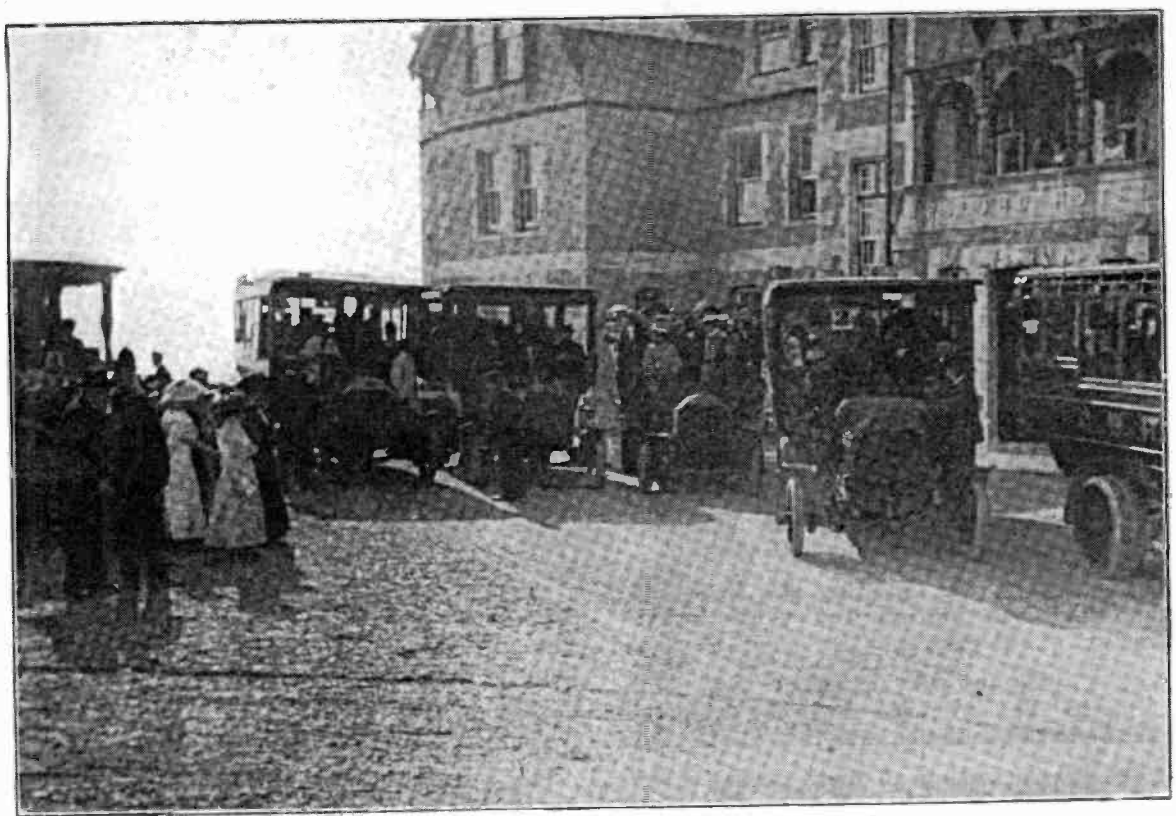
> "St. John's, Newfoundland, December 14th, 1901. Signals are being received, weather makes continuous tests very difficult, one balloon carried away yesterday."

In these experiments the actual power employed in Cornwall for the production of the waves was not more than 10 or 12 kw. The sending aerial consisted of fifty bare stranded copper wires 7/20 in size, suspended from a triadic stay strained between two masts 160 feet in height, and 200 feet apart. The wires were arranged in a fan shape, and connected together at the bottom. With this arrangement, however, electro-magnetic waves were produced which crossed the Atlantic and retained sufficient energy at a distance of 2,200 miles to influence the receivers employed by Mr. Marconi. In February, 1902, Mr. Marconi made arrangements for the erection at Poldhu of a permanent structure for carrying a large aerial. This consisted of four wooden lattice towers, each 210 feet high, placed at the corners of a square 200 feet in size. The towers carried insulated rope triadic stays, from which was suspended a conical arrangement of 400 copper wires forming the aerial, put up in sections so that more or less could be

A group of Delegates and their friends outside Poldhu Station.

employed. The buildings for the generating plant were placed in the middle of the area, additional machinery was obtained, and improvements carried out which were indicated by experience. At the same time similar towers were erected in Cape Cod in Massachusetts, U.S.A., and Cape Breton in Nova Scotia.

We have only to glance backwards at the early history of any great electrical work to see that when there is substantial scientific achievement on which to work, technical skill and commercial enterprise have a foundation on which a superstructure of commercial success may be subsequently erected, even though great initial difficulties have to be faced. The facts that were established beyond question by the end of 1902 were that telegraphic messages could be sent 3,000 miles across the Atlantic by electro-magnetic waves with great speed and certainty. It is unnecessary to recall the recent achievements in long-distance wireless telegraphy, for these are sufficiently familiar to everybody. One important matter, however, was completely settled as far back as 1903—namely, that the power station working could be conducted without any interference with the ship to shore or ship to ship wireless telegraphy. Statements having been made at that time to the effect that the establishment of power stations for the production of electro-magnetic radiation suitable for long-distance telegraphy would render it impossible to conduct the highly necessary ship to shore communication, arrangements were immediately made for putting this contention to the crucial test. There was at Poldhu in those days a mast and aerial 100 yards or so away from the aerial of the power station. Six miles away, at the Lizard, there was a Marconi station for communication with vessels proceeding up and down the Channel.



Delegates leaving Poldhu for Falmouth after the visit to the Station.

It was arranged that at a certain time wireless messages should be sent off simultaneously from the power station and from an ordinary ship equipment in connection with the isolated mast at Poldhu, and received on two Marconi receivers connected to the aerial at the Lizard. These experiments took place in March, 1903, and different messages were handed in to the sending operators at the power station and neighbouring small or ship station, the operators not knowing a moment before the message which would be given to them. Some of these messages were in cipher, and some of a commercial character. For example, the following

Delegates leaving the Steamer at Truro on the return journey.

cipher message was dispatched in Morse code from the power station :

" Bulfish, London Streamlet Solstice Turtle Worthily, John Brown, Captain."

Simultaneously, the following was dispatched from the small station 100 yards away—namely :

" A thick fog prevails here. S.S. ' Mignonette ' has been run down by a foreign ship, send tugs immediately."

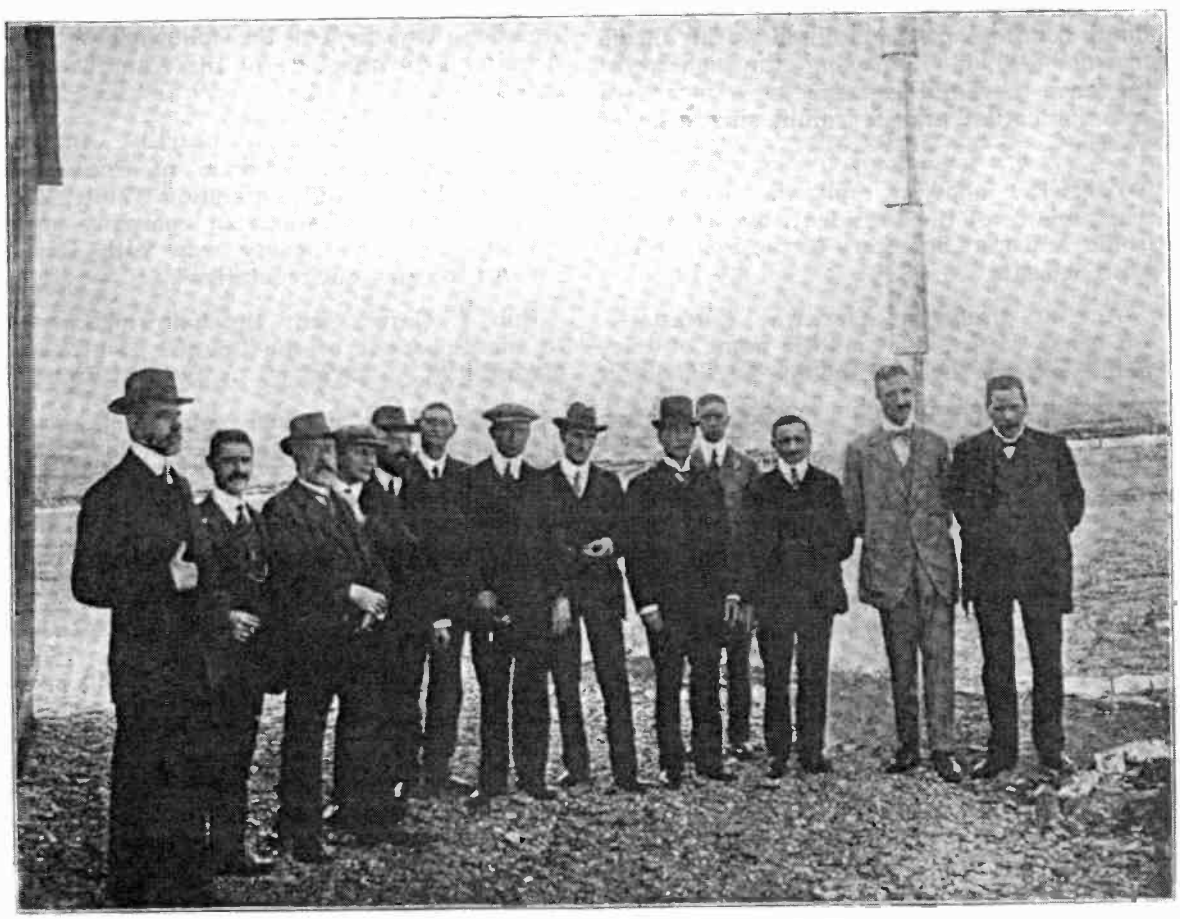
At the Lizard station all these messages were received by Mr. Marconi and printed on Morse slips, pair and pair simultaneously, on two independent Marconi receivers attached to the same aerial. In no case was any mistake made. To be sure that the power station was sending out waves much more powerful than the small station, other receivers were placed at Poole, 200 miles away, and the messages from the power station alone were recorded there. These were telegraphed back for verification by postal telegraph immediately on arrival.

During the intervening years the Poldhu station has been in active operation, and press messages intended for newspapers and bulletins published on Atlantic liners have been sent through this station. The old plant consists of a tandem compound horizontal steam engine and a 75-kw. belt-driven alternator, which supplies single-phase current, 25 periods, to a bank of 400 Poldhu condensers through static transformers. This has been supplemented by a turbine of 110 horse-power, and direct-coupled to a 200-cycle alternator of 75 kw. The turbine makes 20,000 revolutions per minute, but the speed of the alternator shaft is only 2,000 revolutions, the reduction being effected by helical gearing with forced lubrication. Another new turbine of 15 horse-power drives a 10-kw. dynamo for lighting and charging the battery. The speed of this turbine is 24,000 revolutions, reduced by gearing to 2,400, while a third turbine of 5 horse-power has been installed for pumping the condenser water. Formerly, water for condensing purposes was pumped from the foot of the hill, but in order to overcome the possibility of a breakdown through the failure of the pumps, a reservoir has been erected for the supply of condensing water.

The new alternator charges a bank of 144 condensers, constructed of zinc plates suspended in oil ; a smaller number is required than with the old alternator, because of the higher frequency of the current with which they are supplied. The result is a considerable economy

of space. The discharger in the old plant is of the Marconi disc type, and is driven by a separate motor, whereas in the new plant it is carried on the same shaft as the new alternator, and is thus driven direct by the large turbine. In the latter case the apparatus takes the form of a rimless wheel with a number of copper spokes which rotate in close proximity to a pair of electrodes. Each of the latter consists of a brass disc which is slowly rotated by worm gearing so as continuously to present a fresh surface for the passage of the spark, and the whole apparatus is enclosed in a brick chamber through which a current of air is passed. In this way trains of oscillations are produced at the rate of 400 a second, which are heard in a telephone at the receiving station as a musical note of definite pitch.

The four wooden lattice columns have been demolished, and six masts, two of steel and four of wood, now support the aerial, which is of the L directional type, containing some 20,000 feet of wire. The two steel masts, which are tubular, stand at the end nearest the sea, and are 264½ feet high to the extreme top. At a height of 250 feet they carry a triadic stay, from which the wires of the aerial run back in two groups of eight to stays supported by the wooden poles, which are somewhat lower. In erecting the steel masts an ingenious arrangement is employed which does away with the need for scaffolding. They are composed of semi-cylindrical sections, 10 feet long, and having longitudinal flanges by which they are bolted together to form complete cylinders, and which are placed alternately at right angles to each other; and they also have flanges at each end by which they can be bolted to their neighbours above and below. When one section has been put together a wooden pole is inserted in it and secured by a pin passing diametrically through the steel. The pole is then used as a derrick by which the next pair of segments is hoisted up, and when these



An International Marconi Group at Poldhu.

Left to Right: M. Asensio (Spain); Mr. T. E. Hobbs, Engineering Dept.; Conde U. de Albiz (Spain); Mr. W. W. Bradfield, Manager; M. Travailleur (Belgium); Capt. Sankey, Director; Mr. G. Marconi, Mr. Godfrey C. Isaacs, Managing Director; Baron de la Chevrelliere (France); Mr. Tegelberg (Holland);

have been bolted together in position round it it is raised and secured by a pin passing through the top of the completed section. The same operation is repeated for each succeeding section, and thus the work of erection can be effected very rapidly, the masts at Poldhu having been put up in four days.

Poldhu was formerly a sending station only, but now it has been adapted for the reception of messages also, and it will be able to communicate direct with Vigo and Aranjuez (Madrid), the newly-opened stations in Spain. Its capacity was severely tried on June 29th, when greetings were exchanged with other countries. Below are some of the messages sent from and received at Poldhu on that day :

From the Acting Premier of Canada, Mr. G. H. Penley, to the president of the Radiotelegraphic Conference, Poldhu :

" The Canadian Government present greetings to the President and members of the International Riadotelegraphic Conference, and feel sure that a conference between so many countries of the civilised world will be instrumental in increasing the sphere of influence of radiotelegraphy as a means of communication and of minimising disaster at sea."

To this the following reply was dispatched, in the absence of the President, by Mr. E. W. Farnall, Assistant Secretary of the Post Office, British delegate :

ACTING PREMIER, OTTAWA, CANADA.—On behalf of President, and in name of delegates, express hearty thanks to Canadian Government for message of encouragement and goodwill."

From Mr. J. L. Hazen, Canadian Minister of Naval Affairs, aboard the steamship " Royal George," to the manager at Poldhu.

" Please convey my heartiest greetings to International Radiotelegraphic Conference, and best wishes for successful conclusion of deliberations."

To this the following message was sent in reply :

" Mr. Marconi thanks Minister of Naval Affairs for his considerate and encouraging message.—G. MARCONI."

Mr. Charles Nagel, Secretary of Commerce and Labour, Washington, sent this message to the American delegates :

" On behalf of the President of the United States extend to you and your colleagues best wishes for the success of the conference in promoting the regulated use and orderly progress of radio-communication."

The following reply was sent by Dr. A. G. Webster :

" American delegation appreciates good wishes. By courtesy Marconi Company, expresses to President Taft great success of Radio Conference in promoting international good feeling.—WEBSTER."

From Mr. Beekman Withrop, Acting Secretary United States Navy, the following was received :

" To the American delegates, Poldhu.
" Through courtesy Marconi, by agency his genius has given world, Navy Department sends greetings to delegates London Radio Conference. America confident that regulation of radio will be wisely advanced by this conference."

Mr. John Bottomley, Vice-President of the Marconi Wireless Telegraph Company of America, transmitted the following to Rear-Admiral Edwards, one of the American delegates :

" Congratulate most heartily American delegation on work done in Convention, especially splendid suggestion Willis Moore duly accepted. American company stands ready co-operate every way with Department to carry out regulations."

Col. J. Garcia sent the following message to the President of the Council of Ministers, Madrid :

" Delegados Espana conferencia radiotelegrafica desde estacion de Poldhu Saludan respectuos amente V. E. rogandole eleve S. M. testimonio adhesion."

Mr. Marconi to the Minister of Marine, Rome :

" Sono lieto alla presenza delegati internazionali e rappresentanti Marina Italiana di rivolgere mio saluto V. E. Questo giorno ove opera Italia e specialmente marina per radiotelegrafia Viene da tutti riconoscinta prego gradire miei sentimenti riconoscenti inrieme a ministro guerra e Poste Telegrafi."

To General Brusati, at the Quirinale, Rome, Mr. Marconi dispatched a message as follows :

" Prega in Questo Giorno riunione delegati internazionali presso prima stazione ultapotente trasmettere a S. M. il re miei devoti omaggi."

The New Marconi Works at Chelmsford

Description of the Equipment

THE structural features of the new Marconi works at Chelmsford have already been described in THE MARCONIGRAPH, but no reference has yet been made to their equipment. All who have visited these works, who have assured on this point. The technical press have evinced considerable interest in the new Marconi works, and have published articles concerning them. In the *Times Engineering Supplement* there appeared an excellent account

Conference De'egates in the Machine Shop at Chelmsford on June 22nd.

witnessed the various operations carried on there, and have observed the conditions under which the employees perform their daily tasks, have been struck with admiration for the hygienic and cheerful atmosphere which pervades the spacious building, and for the modern features of the equipment. No pains have been spared to provide and equip such works as would guarantee the excellence and efficiency of the apparatus produced, and no one who has inspected them has failed to be of some of the features of these works, of which we present the following extracts.

Equipment of the Shops

Commencing our tour with the mounting shop, the visitor will note the neat and orderly arrangement of a large number of benches in continuous rows, and a few small machines driven through a line shaft by a 4-h.p. motor. This shop communicates with the finished-part stores by a window and has a door-

way to the finished stores, while opening out of it is a special mounting shop for secret work, with its own benches, machines, and motor-driven shaft. In the condenser and winding shop there is a vacuum cleaner driven by a 6-h.p. motor for use in connection with a vacuum drying plant, from which pipes are run to all parts of the shops and offices with sockets for flexible suction hose. This equipment was supplied by the British Vacuum Cleaner Company. The equipment includes power is derived from three 15-h.p. Crompton motors. Counter-shafts on ball bearings are used for stopping and starting, with ball-bearing loose pulleys. A motor-driven Sturtevant exhauster is installed with an underground suction duct to a metal saw and two grinders.

The carpenters' shop contains the usual machines, which are driven through an underground shaft by a 15-h.p. Crompton motor. A Sturtevant exhauster is connected to three

The Mounting Shop.

a number of small winding machines driven through two line shafts by 4-h.p. and 2-h.p. motors respectively, and there are three ovens by Messrs. Fletcher Russell & Co., heated by town gas, for enamelling and baking windings of various kinds.

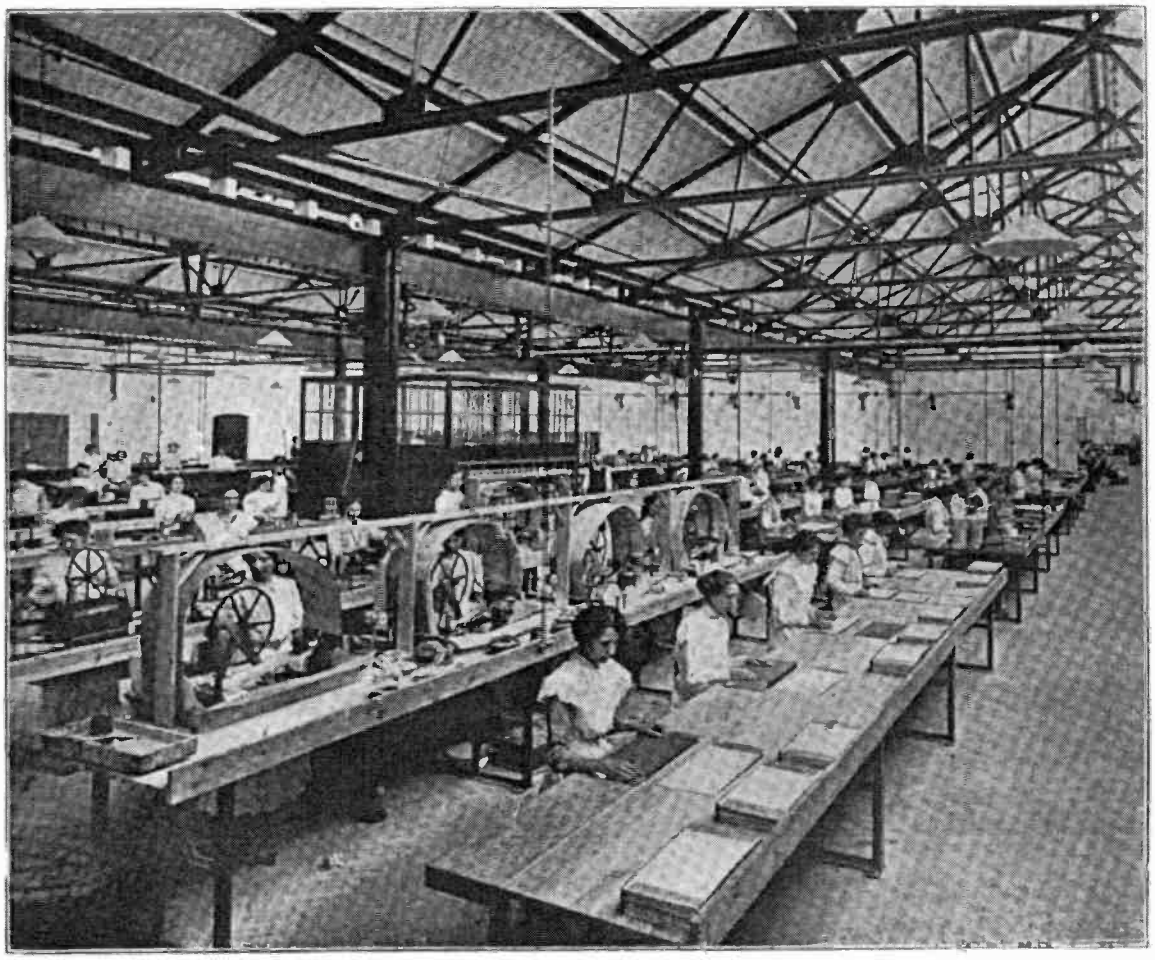
Alternate lines of machines and benches are to be found in the machine shop, a large number of lathes, drills, and grinding wheels being installed, including seven Ward capstan lathes. The machines are driven by three line shafts extending from end to end of the shop, for which sand-papering machines. Opening out of this shop are rooms for tinsmiths and riggers. Two coke-fired heating boilers by the National Radiation Company are installed, and there are six separate low-pressure hot-water circuits, in which circulation is ensured by motor-driven pumps in duplicate.

The stores throughout are fitted with racks, having wooden frames and shelves resting in loose angle irons at each end, these angle irons being provided with dowell pins for insertion into holes in the uprights.

Several iron bins made by Messrs. Estler Brothers are provided for the storage of bolts, castings, etc.

The Power House

In the power house steam is supplied at 200-lb. pressure by two Davey Paxman Economic boilers with superheaters which give an extra 200° F. The two feed pumps, by Messrs. J. P. Hall, of Peterborough, are of the direct acting type, and a Boby water softener is installed with a reagent mixer driven by a 2-h.p. Crompton motor. The engine-room contains two 150-kw. dynamos at 220 volts driven at 1,000 r.p.m. through 10 to 1 helical reduction gear by De Laval steam turbines, flexible couplings of the stud and rubber bush type being used between the dynamo and slow-speed shaft. The Körting multiple jet ejector condensers are fixed below the floor, circulating water for them being supplied by centrifugal pumps in duplicate direct coupled to 7½-h.p. motors. A 10-kw. turbo-generator driven through 10 to 1 gearing at 2,400 r.p.m. of a similar type, but exhausting to atmosphere, is provided for emergency lighting and for supplying current to the circulating pump motors before the large sets are started up. The whole of this equipment was supplied by Messrs. Greenwood & Batley. The main switchboard is of enamelled slate by Messrs. Ferranti, and is fitted with aluminium busbars. In addition to the machine and circuit panels containing the usual fittings (including meters to the circuits), there is a panel for running both large machines in series to give 440 volts and a ground-leakage detector panel. There is also an alternating current panel for connection to the town mains. A distribution board by Messrs. Whipp & Bourne, containing fittings for four d.c. motor circuits, six lighting circuits, three a.c. motor circuits, and a circuit breaker for external arc lighting, is situated

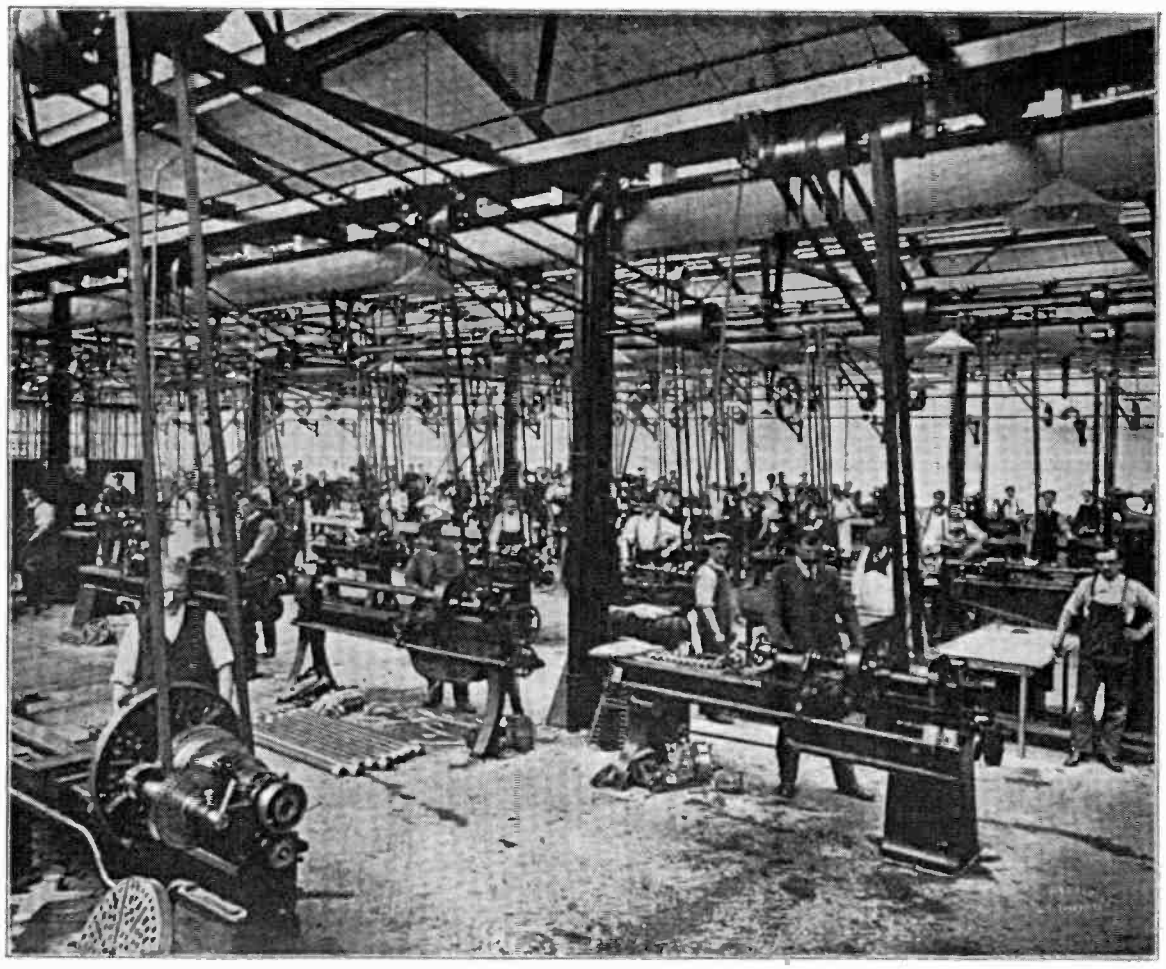


The Condenser and Winding Shop.

in the raw stores, the supply cables being brought from the power house under the railway siding in 3-in. pipes.

The deep well-pumping machinery consists of a bucket pump having its working barrel 150 ft. below ground level and with the weight of the rods balanced. The pump belt is driven by a 7-h.p. motor through one intermediate shaft, from which the crank-shaft is driven by gearing. The whole of this plant was supplied by Messrs. C. Isler & Co.

while wrought-iron split pulleys are used with Hendry belts. Artificial lighting is by 100-c.p. metallic filament lamps on separate overhead circuits carried in steel tubing, the power mains being paper-insulated, lead-covered cables run underground in 2 in. gas barrel. The doorways and stores' serving windows throughout the works are protected by fireproof doors of the sliding type, but hung upon overhead rollers running on inclined rails, the inclination having a tendency to close the



The Machine Shop, View from the West End.

The benches used throughout have wooden tops about 2 ft. 6 in. wide supported by cast-iron standards, the front planks being of hard wood 3 in. thick, while the back planks, although at the same level, are only 1 in. with a batten 3 in. deep fixed on edge at the back. A lock-up drawer with a special key is provided for each man, and there is a master key which fits all locks. All the line shafts are mounted on Hoffmann ball bearings with patent hangers,

doors. This tendency is overcome by weights hung upon ropes which pass over sheaves to the ends of the doors, where a connection is made by a fuse with a melting temperature of 150° F.; hence, if a fire should occur the weights would drop off and allow the doors to run home down their inclines. These doors, together with the Grinnell sprinkler equipment, were supplied by Messrs. Mather & Platt. A synchronome electric clock is provided in each shop.

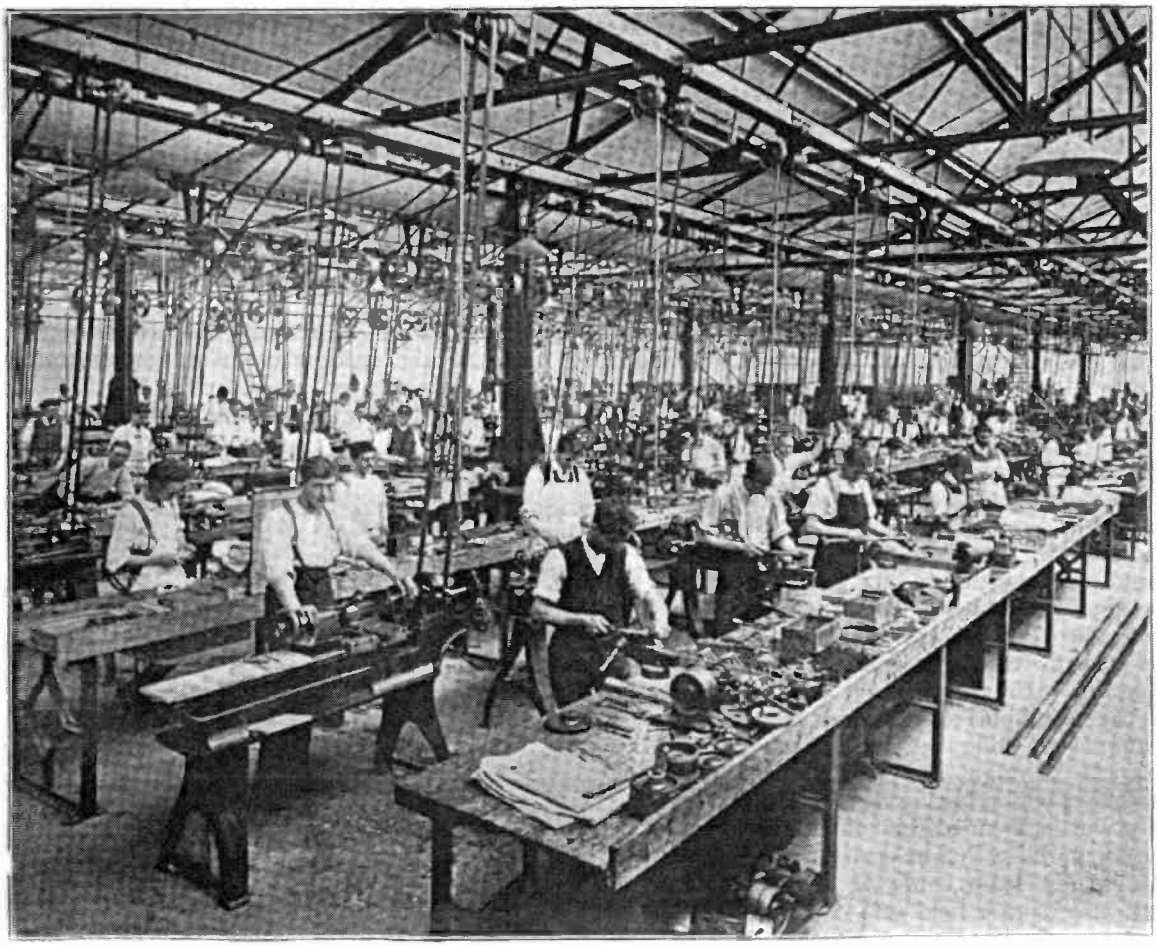
Engineers at Chelmsford

MEMBERS of the Junior Institution of Engineers, of which Mr. G. Marconi is this year's president, paid a visit to the Marconi works at Chelmsford on July 12th.

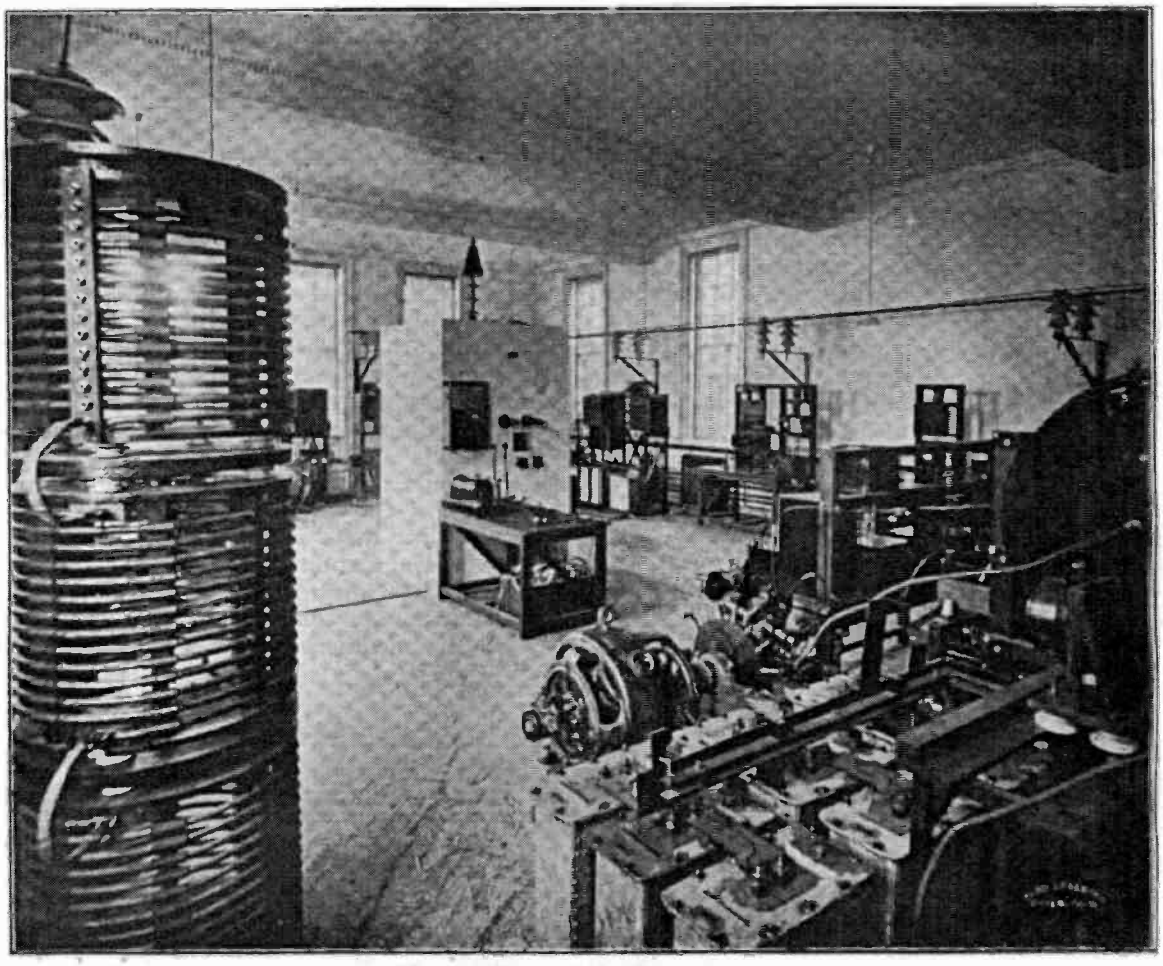
The visitors arrived at noon, and were taken in parties over the works. At half-past one luncheon was served in the dining-room, Capt. H. Riall Sankey occupying the chair. The Chairman expressed regret at the unavoidable absence of Mr. Marconi, who was in Ireland. He welcomed the members of the Junior Institution of Engineers to the works.

Mr. W. T. Dunn said it was his privilege, on behalf of the Institution, to express their thanks to the company for allowing them to visit the works. It was a matter for intense regret that their president was not with them, and he was sure that that regret was also felt by Mr. Marconi. He proceeded to refer to the increasing usefulness of wireless telegraphy, and said, after the experiences in connection with the foundering of the "Titanic," the human race were deeply indebted to Mr. Marconi for his invention. In some people's minds, he continued, there was a doubt as to who was the inventor of wireless telegraphy. It was true that others had worked in the field, but Mr. Marconi could be regarded as the inventor of the wireless telegraph system. Some of them who saw the magnificent fleet at Spithead had their hearts stirred. It was necessary that the Navy should be upheld in order to maintain the integrity of the Empire, but it was also important that there should be ready means of inter-communication between the different parts of the Empire. He would like to send the following Marconigram to their president:

"The members of the Junior Institution



Another View of the Machine Shop.



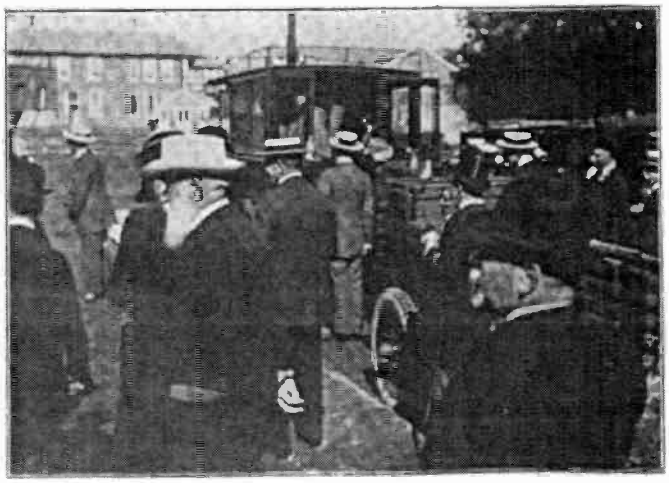
General View of the Show Room.

of Engineers desire to offer you their respectful and hearty congratulations on visiting the new Marconi works, and wish you continued and increasing success."

In concluding, he proposed the health of the chairman.

Capt. Sankey, in replying, said he would convey their good wishes to Mr. Marconi, and he also thought their Marconigram could be forwarded to him. They were not on speaking terms with Clifden, but they were with Poldhu, and the message would be transmitted from that station to Mr. Marconi. He then gave a brief account of the principles of wireless telegraphy, which was followed with ease by his hearers through the clear mechanical analogies which he described. The visitors afterwards resumed their inspection of the works, and saw demonstrations in wireless telegraphy from some of the large sets and also from a field set. Messages were exchanged with Poldhu and Mr. Marconi at Clifden.

Tea was served during the afternoon, and a pleasant and instructive visit terminated with votes of thanks to Capt. Sankey, Mr. C. Mitchell, the works manager, and Mr. Dowsett.



Witnessing a Field Station Demonstration at Chelmsford.

An Impression of the Marconi Works

By a Lady Visitor

DURING the visit of the Junior Institution of Engineers to the works of the Marconi Company, the statement was made that one of the ladies present was willing to record her impressions. This was a rather liberal interpretation of a desire not to be disobliging, when persuaded that a few lines from a feminine pen were really wished for. To inflict probably quite uninteresting thoughts upon unwary readers was not a thing one felt desirous of doing. Having sounded this note of warning, it may be said that the chief impression was, perhaps, that the Marconi Company was to be congratulated upon the ability to dispense, to both mind and body, hospitality of such quality as was enjoyed by those present on that occasion. One could not but reflect, whilst enjoying the "rare and refreshing fruit" at luncheon, that the fare provided for our mental digestion was of even daintier description, embodying as it did one of the most wonderful fruits of man's endeavour.

There could be but one impression made on all minds by the airy, light, and roomy workshops, and by the refinement of the dining and recreation rooms. Obviously, the lines of the employees of the Marconi Company had fallen in pleasant places, and one could but wish that all workers in factories could earn their bread under similar conditions.

Captain Sankey speedily dispelled the disappointment felt at the unavoidable absence of the President, Mr. Marconi, and the explanation he gave of the principle of wireless telegraphy was, even to the lay mind, quite lucid. But, to eyes unaccustomed to workshops, the multitude of detail and the patient, perfect workmanship that go to make up the complete apparatus, were things to marvel at and to admire unreservedly.

It was felt that, should women ever enter the field of electrical engineering, which to the best of the writer's knowledge they have not yet done, it would take many years for them to become accustomed to thinking in coils and wheels, as it were. However, with women chauffeurs and aviators already with us, very probably time will show this impression to have been quite erroneous.

Personally, one felt that it was preferable not to have to deal in daily work with anything so weird and impalpable as electricity. It was a relief to watch the spark gaps and feel that here was something visible and audible, though far from tangible.

Women are credited, as a rule, with greater faith and imagination than men; but to one at least it seemed almost unbelievable that the solitary and bare-looking mast erected in the grounds represented an actuality of great commercial value, and of such importance to the lives of men as was proved to be the case in the late unforgettable tragedy of the sea.

This may have been due to the fact that the writer, owing to her connection with electric telegraphy, to which reference was made during the day, had used, as toys in childhood, sections of the very solidly realistic shore-end of the first Atlantic cable. It was perhaps but natural that it should add to the pleasure of an entirely delightful visit to know that one's forebears had, by their pioneer work in compelling electricity to the service and uniting of mankind, laid the foundation of the great achievement upon which Mr. Marconi's wonderful inventions have set the coping stone.

In the House of Representatives, Melbourne, on July 17th, Mr. Tudor moved the second reading of the Navigation Bill passed by the Senate last year. The new provisions include compulsory boat drill, wireless installation, etc.

* * * *

The Conference report on the new wireless telegraph law requiring that operators shall be provided for constant duty has been adopted by the House of Representatives at Washington. The Bill now only requires President Taft's signature.

* * * *

A list of wireless telegraph stations of the world has been published by the United States Government. This publication runs into 165 pages, and contains the names of ships, location of stations, call letters, range in nautical miles, power in kilowatts, wave-length in metres, and character of station. There is also an alphabetical list of call letters. Copies of the publication can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C., at a cost of 15 cents each.

THE MARCONIGRAPH

An Illustrated Magazine for all interested in WIRELESS TELEGRAPHY, published monthly by MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, Marconi House, Strand, London, W.C.

Telegraphic Address ....." Expanse, London."
Telephone No. .....City 8710 (Ten Lines).
Codes used .....Marconi, A.B.C. (4th edition), Western Union.

Subscription rate.....3s. 6d. per annum, post free.
Single Copies.....2d. each, by post 3½d.

Subscription Rate in the United States and Canada..... $1 per annum, post free.
Europe .....fr. 4.80 per annum, post free.

All communications relating to Subscriptions, Advertisements and other business matters, to be addressed to "The Publisher, 'The Marconigraph,' Marconi House, Strand, London, W.C."

All Editorial communications to be addressed to "The Editor, The Marconigraph,' Marconi House, Strand, London, W.C."

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

CONTENTS

PORTRAIT OF MR. PHILLIPS. The Publisher begs to announce that he has arranged to supply portraits of the heroic Marconi Officer who lost his life as a result of the "Titanic" disaster at the following prices: Cabinet size, 1/9 each; Enlargements, 10 in. by 8 in., 13/-; 12 in. by 10 in., 14/-; 15 in. by 12 in., 17/6 post free. The portrait is by Miss J. Stedman of Farncombe, and is the same as that from which the illustration in the May number of THE MARCONIGRAPH was made.

The Share Market

The market in the various issues continues a fairly active one, although the prices have suffered from the general industrial depression of the past month. The share markets are generally idle for the holiday season, but the investment interest in the Marconi issues is maintained, and inquiries continue from all parts of the world.

The prices as we go to press, on July 24th, are; Ordinary, 5 7/8; Preference, 4 1/8; Canadian, 24s. 6d.; Spanish, 1 7/8; American, 1¾.

Share Warrants to Bearer

Marconi's Wireless Telegraph Co., Ltd., give notice that the following dividends will be payable on and after August 1st, 1912:

On the 7 per cent. Cumulative Participating Preference Shares—A final dividend for the year 1911 of 10 per cent., being 2s. per share, less income tax at 1s. 2d. in the £. Coupon No. 5. An interim dividend for the year 1912 of 7 per cent., being 1s. 4¾d. per share, less income tax at 1s. 2d. in the £. Coupon No. 6.

On the Ordinary Shares—A final dividend for the year 1911 of 10 per cent., being 2s. per share, less income tax at 1s. 2d. in the £. Coupon No. 3. An interim dividend for the year 1912 of 10 per cent., being 2s. per share, less income tax at 1s. 2d. in the £. Coupon No. 4.

Coupons may be lodged at the head office of the company, Marconi House, Strand, London, W.C., and must be left four clear days for the purpose of examination and preparation of dividend warrants.

Coupons will also be payable at the following places, at the exchange of the day:

Banca Commerciale Italiana, Milan, Rome, Genoa, Turin, Venice, Leghorn, Naples, Bologna, Florence, and Palermo.

Banque d'Outremer, 48, Rue de Namur, Brussels.

Hanover National Bank, New York.

Mendl & Co., 383, Bartolome Mitre, Buenos Aires.

The necessary forms for lodging coupons may be obtained from any of the above addresses, or from the office of the company: Piazza San Silvestro 74, Rome; Cie. Française Maritime et Coloniale de Telegraphie sans Fil, 35, Boulevard des Capuçines, Paris; The Marconi Wireless Telegraph Co. of Canada, Ltd., 86 Notre Dame Street, Montreal.

"E 5," the largest submarine yet put in the water, was launched for the British Navy at Barrow. She has all the latest improvements, including wireless telegraphy.

Portuguese Contract Ratified

The provisional contract entered into between the Government of the Portuguese Republic and Marconi's Wireless Telegraph Co., Ltd., for the erection of wireless telegraph stations in Portugal and Portuguese possessions has now been ratified by the Parliament, and considerable extensions made therein. Particulars of the provisional contract were published in the April issue of THE MARCONIGRAPH, and it will be remembered that the contract provided for the erection and installation of five radio-telegraph stations. Efforts were made to delay the ratification of this agreement, and several inspired attacks appeared in some of the newspapers. A discussion on the question took place in the Portuguese Parliament early in June, when the Prime Minister made a full reply to the unfounded attacks which had been levelled against the Government and the Marconi Company. The Prime Minister stated that the decision to adopt the Marconi system was only arrived at after the whole question concerning wireless telegraphy had been most carefully studied. The choice of a system was guided by scientific, technical, and commercial considerations. A member of the Portuguese Parliament who had shown some opposition to the ratification of the contract thereupon stated in the House that the explanation given by the Prime Minister was satisfactory, and all opposition was withdrawn. The range of some of the stations is to be increased and additional stations are contemplated.

Further Developments in America

Following the absorption by the American Marconi Company of the United Wireless Company comes the interesting information of the acquisition by the same company of the property of the Massie Wireless Telegraph Company. In accordance with this arrangement certain ship and shore stations pass into the possession of the Marconi Wireless Telegraph Company of America. These stations include two on Cape Cod—namely, Cape Cod (which must not be confused with the well-known Marconi station at South Wellfleet, Cape Cod) and Chatham—Block Island, at the mouth of the Long Island Sound, Point Judith (Rhode Island), Narragansett (near Newport), New London (Connecticut), and Wilson Point. These stations are available for reporting purposes and communication with vessels using the Long Island Sound.

The installations on three ships owned by the Montauk Steamship Company and the installation on the "Tasco" owned by the Scott Towing Company, together with certain apparatus constructed by the Massie Company, have also passed into the possession of the American Marconi Company. These developments are calculated to still further advance the Marconi interests in the United States.

Lantern Lectures on Wireless

Wireless telegraphy is likely to be a very attractive subject for lectures during the coming season, and in order to help technical institutions, colleges, literary and other societies, as well as lecturers, we have prepared a wide range of lantern slides covering all aspects of wireless telegraphy: the scientific, the engineering, and the popular. There has been a great demand for these slides during past years, and on every occasion where they have been used they have been very highly appreciated. We have considerably increased the number of slides available for the coming season and we are prepared to supplement these by furnishing appropriate readings to accompany the slides. Further information respecting these slides will be published in the next issue of THE MARCONIGRAPH. In the meantime we shall be pleased to receive applications for the loan of any number of slides, which we shall be happy to supply free of charge.

The Phillips' Memorial Fund

The appeal made in last month's MARCONIGRAPH for donations towards the fund which has been opened for the establishment of a memorial to the late Mr. J. G. Phillips has met with a gratifying response. We have received amounts reaching a total of £38 5s., the donations coming from several countries. Since then a sum of £20 has been received from the Compagnie de Télégraphie sans Fils, Brussels, and 200 francs from the Compagnie Française Maritime et Coloniale de Télégraphie sans Fil, Paris. The memorial is to consist of a drinking fountain, to be erected in the borough of Godalming—Mr. Phillips' native town. The amount required is £500. The fund was inaugurated by the public authorities of the Borough of Godalming and the County of Surrey, and all sums received by us will help to increase that fund. Although the response to the appeal has been generous, a considerable sum is still required to enable the committee to carry out their schemes and we make this further appeal to our readers to send in donations. The memorial is in no sense a local one, as is testified by the fact that donations have already been received from all parts of the world.

The O'Driscoll Fund.

We have received a gratifying response to the appeal for the above fund, which now amounts to £33 5s. 6d. Amongst the subscriptions received this month is one for £6 7s. 6d. collected at the Liverpool school. A cheque has been sent to Mrs. O'Driscoll, who has expressed her gratitude at the way in which her husband's memory has been honoured by his late colleagues. The fund is, however, not closed, and we shall be glad to receive any further subscriptions.

Wireless Company's Annual Meeting

A Successful Year. Future Prospects Outlined

A Verbatim Report of the Proceedings at the Annual Meeting of the Company will be sent on application.

THERE was a large attendance of shareholders at the annual meeting of Marconi's Wireless Telegraph Co., Ltd., at the Whitehall Rooms on July 9th, who had gathered in anticipation of a favourable statement from the Chairman. Nor were they disappointed, for from start to finish of the very detailed analysis of the position submitted by Mr. Marconi there was not one note of pessimism; on the contrary, his tone became more and more buoyant as he proceeded and as he enumerated the particular points to which the directors attach importance. In the first place, Mr. Marconi stated that while wireless telegraphy, and the Company's business in particular, made great strides during 1911 as compared with 1910, "the increase of business for 1912 promises far and away to exceed the ratio of increase of 1911 over 1910."

Success of the Subsidiary Companies

It was natural, he added, that with the universal recognition of the great value and utility of wireless telegraphy the success of the associated companies should follow closely on the heels of the parent company. There was, for instance, the Marconi International Marine Communication Co., Ltd., in which the wireless company held over 200,000 fully-paid shares out of a total issued capital of about £204,000, of which the receipts from ships' telegrams, news service, traffics, ships' subsidies, etc., increased from some £40,000 in 1910 to £64,000 in 1911, an increase approximately of 60 per cent. The profits for the year showed an equally satisfactory improvement. The business, however, of 1912 promised even a greater proportionate advance, and that company's organisation had so extended that its business could not help showing substantial and rapid further development. The dividend which that company would pay for 1911 should indicate the progress over the preceding year. Mr. Marconi said he regarded the shares held in the Marconi International Marine Communication Co., Ltd., as one of the most valuable assets to-day, and one which would surely materially improve year by year. The business of the Belgian Company, the French Company, and the German Company for last year had been satisfactory. All had paid dividends, and they look for substantial development in each of them in the ordinary course of things. The Spanish Company was now doing a big business, both in ship and shore telegraph service, and also as a telegraph company conducting a regular telegraph service between the Canary Islands and Spain. Arrangements were in course for substantial extension of that telegraph service to other countries, and he hoped that the day was not far distant when the public would be able to send telegrams to both Spain and the Canary Islands, via Marconi, from every British post office throughout the United Kingdom. The Russian Company was doing a very substantial and satisfactory business. It had already obtained orders from the Russian Government for considerably over one million roubles, and was negotiating for further business of a very extensive and important nature. He contemplated that St. Petersburg, where there were extensive freehold works, would become a very important centre for the development of wireless telegraphy over the vast territory to the East, where very little in the shape of telegraphic communication yet existed.

Transatlantic Wireless

Mr. Marconi went on to state that the Canadian Company was making good progress, and the directors were informed that "a further agreement of importance has been come to with the Canadian Government, which awaits the return of the Ministers, who are now visiting this country, to be completed and signed." The Transatlantic service had shown considerable improvement during the past year, and traffics showed a marked increase. He reminded shareholders that they were now able to send a telegram from any of H.M. telegraph offices throughout the United Kingdom to any part of Canada and the United States, via Marconi, at 4d. per word less than cable rates, and deferred messages could be dispatched equally from any offices at half this rate.

There had been delay in the progress of the Argentine Company, but a very able representative was visiting Buenos Aires at the present moment with the object of straightening out many matters, and he was glad to say that

highly satisfactory reports had been received from him, and they could now look forward to substantial progress and development in that part of the world. He hoped to be able to give some further interesting information in this connection at not too distant a date.

American Company's Prospects

Mr. Marconi devoted a considerable amount of time to a statement regarding the American Company, and it at once became evident that this enterprise is likely, in the near future, to play an important part in the forwarding of the Marconi interests on the other side of the Atlantic. Important and profitable as was the marine telegraph business carried on by the American Company, it was, said Mr. Marconi, dwarfed by the impending developments of the telegraph business which had been taken in hand, and to which the seven million dollars of new capital would be devoted. Everybody was acquainted with the immense commerce of the United States and the free use which was there made of the telegraph. They were satisfied that an excellent service would be furnished which would put the United States of America in communication by wireless telegraphy with this country, across the Pacific with the East, and south to many of the South American States, which he hoped in time would be extended to all of them. This service would be one of the most extensive, if not the most extensive, telegraph service in the world, and he left it to shareholders to form their own appreciation as to what was likely to be its worth. By reason of the agreement which the Marconi Company entered into with the Western Union Telegraph Company, and also the Great North-Western Telegraph Company, their service would be fed by the 25,000 telegraph offices which those companies possessed.

The Imperial Scheme

Another point referred to by the chairman was that of the Marconi patents, and he was able to show in this connection that the Company had little to fear from the advent of fresh discoveries in connection with wireless telegraphy, for, in the first place, the Company itself was showing great energy and enterprise regarding this matter, and was always on the look out for fresh ideas. Even supposing, however, that a valuable invention were brought out by independent interests, it was highly improbable that one single patent would affect the position of the companies already established. Reference was made to the contract entered into with the British Government in respect of the Imperial wireless scheme, which provides for the construction of a number of high-power, long-distance stations, communicating over a range each of about 2,000 miles, in places which have been already defined, and at all such other places as may subsequently be required and agreed upon. A speed of 20 words a minute duplex, with ordinary working, or 50 simplex with automatic working is guaranteed. During the duration of this agreement the Marconi Company will receive 10 per cent. of the gross receipts derived from the service.

Mr. Marconi mentioned that the United States Government had decided to adhere to the Berlin Radiotelegraphic Convention, which would bring America into line with Europe in all matters relating to wireless telegraphy. Naturally, a reference was made to the Conference which had been sitting in London since the commencement of June, and had just completed its labours, and to the delegates who attended that important gathering Mr. Marconi tendered his congratulations on the results achieved.

A Welcome Surprise

Mr. Godfrey C. Isaacs (the Managing Director), who seconded the report, announced that the Company has just received a telegram from Portugal advising them that the Portuguese Parliament had approved the provisional contract which they had entered into (THE MARCONIGRAPH, April, page 9), and had ratified it with considerable extensions. He further announced that the Company's representative in Bolivia had furnished them with the information that the Bolivian Government had accepted the Marconi Company's terms for the erection of some seven stations in Bolivia, and on conditions which were very satisfactory to the Company. Those two additional contracts would add very materially to the figures which the Chairman indicated in his speech.

There was a very brief discussion before the unanimous adoption of the report, and in the course of which Mrs. Henry Lee asked whether there was any possibility of a dividend being paid by the American Company in the near future. To this the Managing-Director, Mr. Godfrey Isaacs, replied that he anticipated " a very reasonable dividend " when the business recently owned by the United Wireless Company had been worked for twelve months. This concern, we may mention, was acquired as from March 31st last.

The Dividends

The following motion was then unanimously carried : " That a final dividend for the year ended December 31st, 1911, of £10 per centum on the 250,000 cumulative participating preference shares be paid on August 1st, 1912, to

the members who are on the register as present holders thereof; that a final dividend for the year ended December 31st, 1911, of £10 per centum on the capital now paid up on the ordinary shares be paid on August 1st, 1912, to the members who are on the register as present holders thereof."

The retiring directors (Major S. Flood Page, Mr. Henry S. Saunders, and Mr. Samuel Geoghegan) were re-elected, after which the chairman formally declared "That an interim dividend in respect of the year 1912 of £7 per centum on the 250,000 cumulative participating preference shares will be paid on August 1st, 1912, to the members who are on the register as the present holders thereof; that an interim dividend in respect of the year 1912 of £10 per centum on the capital paid up on the ordinary shares at this date will be paid to the members who are on the register as the present holders thereof."

The shareholders sanctioned the appropriation of a sum of money to divide among the staff as a bonus, and another sum to start a pension fund, after which the meeting, which was enthusiastic in character from the commencement, terminated with a hearty vote of thanks to the Chairman.

The Marconi International Marine Communication Company, Limited.

THE annual report of the directors of this company, and the balance sheet and profit and loss account for the year ending December 31st, 1911, indicate the very satisfactory progress of the company's business during the year under review, the net profit for the year amounting to £15,027 15s. 7d., after deducting £7,600 for depreciation and allowing for debenture interest, as compared with £10,765 9s. 9d. in the preceding year. The revenue from ships' telegrams, traffic, subsidies, etc., amounted to £64,165 16s. 8d., showing a substantial increase over the sum of £40,535 15s. 8d. for 1910. The progress of the company is further indicated by the number of telegraph stations owned and worked by the company on board ships on the high seas, which has increased from 250 at the end of 1910 to 350 on December 31st, 1911, and stands at some 406 at this date. A list of the ships, exclusive of warships, which are equipped or are on order for equipment, is annexed to the report.

In order to meet the large and increasing demand for the installation of telegraph stations on board ships, 6,250 5½ per cent. First Mortgage Debentures of £20 each were created during the year, and the eighty 7 per cent. First Mortgage Debentures of £500 each were paid off.

The directors now recommend the payment of a dividend for the year 1911 at the rate of 7 per cent., which will absorb the sum of £14,283 18s. 5d., and to allocate the sum of £1,750 to the repayment of debenture account, leaving the sum of £2,612 2s. 10d. to be carried forward. The retiring directors are Captain H. Riall Sankey and Mr. Henry Spearman Saunders, who, being eligible, offer themselves for re-election.

The annual meeting of the company was held on July 31st.

The transfer books of the company were closed on July 29th, and will remain closed until August 11th inclusive.

The Spanish Company.

The annual report of La Compania Nacional de Telegraphia sin Hilos opens with an historical account of the formation of the company. Reference is made to some of the events of the past year, including the inauguration of the central station at Aranjuez, near Madrid, in which the King and Queen of Spain took part, and which was attended by the Princess of Battenberg, members of the Government, the English and Italian ambassadors and many diplomats, naval and military officers, representatives of the Civil Service, and of the Spanish and foreign Press. Another important occurrence was the wreck of the "Delhi" on the coast of Africa, and the saving of its passengers and crew, in which the newly-opened station at Cadiz took a prominent part. Mention is also made of the considerable and valuable assistance which the Cadiz, Teneriffe and Las Palmas stations rendered on the occasion of the breakdown of the cable between the Peninsula and the Canary Islands. It has been decided to establish a school for the training of operators, and a site has been acquired in the vicinity of Cuatro Camison. Mr. Rodriganez, the president of the company and a member of the board, resigned his post on being appointed Minister of the Crown. The board agreed that Mr. Comyn should be appointed managing director of the company, and that the presidency should remain vacant for a certain time. General D. Jose de Bascaran and D. Jaime Macnaughton were elected members of the board.

The Effect of Daylight upon Radiotelegraphic Waves

By J. A. Fleming, M.A., D.Sc., F.R.S.

ONE of the unsolved problems on the theoretical side of radiotelegraphy is the full reason for the diminished range of it by day as compared with night. It is now well known, even to the general public, that a given transmitting and receiving apparatus has a considerably greater range of action during the dark hours of the night than during the full daylight. This phenomenon, discovered by Mr. Marconi in 1902, has been attributed both to an action of daylight on the sending antenna and also to a certain degree of absorption of the electric waves by the atmosphere when illuminated by sunshine. Neither of these explanations is entirely satisfactory. It was discovered by Hertz in 1887 that ultra-violet light which is present in the light from the electric spark or electric arc when falling on another spark gap facilitated the discharge so that the spark across that gap will take place at a slightly lower voltage. Subsequent investigations showed that ultra-violet light has a particularly strong discharging action when such light falls on a zinc surface negatively charged.

The Lesson of the Solar Eclipse

Certain other metals, such as potassium, sodium, and rubidium, also lose an electric charge under the influence of ordinary light. Hence it was at least a permissible hypothesis to assume that the antenna, when charged, would during daylight lose some of its charge, and hence be raised to a less voltage than during the night. Another supposition made was that the action of daylight is due to the ionizing effect of daylight on the atmosphere by which it becomes to a certain small extent conductive, and therefore absorbs some of the energy of the electric waves passing through it. The recent occurrence of a solar eclipse, which was total at or near Paris, seemed, therefore, to offer an interesting opportunity to gain some further knowledge on this subject.

Since the darkness of a solar eclipse is localised to a small area, which is the cross-section of the conical shadow of the moon at or near its apex, then if this shadow should sweep across a radiotelegraphic station it is evident it will for a few seconds put the antenna in darkness, whereas the rest of the large area over which signals can be received is in full daylight. During a recent visit to Paris I obtained from the French authorities permission to visit the Eiffel Tower radiotelegraphic station, and asked M. Ferrié, the eminent radiotelegraphist in charge of the station, what effect on the signals was produced by the eclipse. He told me that a slight increase in strength of the signals had been noted at the time of totality. This result agrees with certain observations of Dr. Eccles in England. One would need to be able to command the services of a good many prolonged total solar eclipses to make all the control experiments necessary to settle how far the effect is due to an action on the antenna itself and how far it is due to an action on the surrounding air.

Conductivity of Air

We can, however, make measurements of the conductivity of the air near the earth's surface and at higher levels. Nevertheless, the results are not altogether such as enable us to definitely settle the question of the influence of ionic conductivity in the air.

To take a simple case: suppose a plane electromagnetic wave to be advancing through the air with its plane vertical to the earth's surface. Let s be the conductivity of the air in electrostatic units per centimetre cube, and let r be the corresponding resistance in ohms per centimetre cube. Let K be the dielectric constant. Then, starting from the fundamental equations of the electromagnetic field, it is not difficult to prove that at a certain distance the waves will be reduced in amplitude in virtue of energy absorption to an extent which will reduce it to 36·8 per cent. of its value at the sending station. The reason for taking this particular percentage is because the fraction ·368 is equal to $1/e$ where e is the base of the Napierian system of logarithms, and it facilitates calculation.

Now, it is not difficult to prove that when the conductivity of the medium is small such plane waves are reduced to $1/e = 36{\cdot}8$ per cent. of their initial strength in travelling a distance in centimetres equal to $r\sqrt{K}$ divided by 188·5, where r is the specific resistance in ohms of the medium per centimetre cube and K is the dielectric constant. Let us take the case of air for which $K = 1$, and in the first place investigate the absorption if we assume the air to have a specific resistance of 10,000 megohms per centimetre cube. Then $r = 10^{10}$.

ohms, and the critical distance is $10^{10}/188{\cdot}5$ centimetres, or nearly 500 kilometres. In this distance, then, the plane wave would be reduced in amplitude by absorption to nearly one-third of its initial value, apart altogether from any other causes of weakening, such as diffusion, or by the earth's surface. As a matter of fact, such measurements as have been made of the atmospheric conductivity near the earth's surface do not give anything like so small a value. Professor Zenneck has given, as the result of H. von Gerdien's measurements, a value nearly 100,000 times greater—viz., about 1,000 million megohms. If the conductivity of the air during the day at or near the earth's surface has anything like the latter value, then it is clear that ionic conductivity will not account for the daylight effect. Again, there is clearly an influence of wave-length upon the phenomenon, since certain wave-lengths at certain times are found to be more penetrating than others.

The Analogy of Sounds

It is, however, quite possible to frame a third hypothesis which may be found to have a basis of fact.

It is well known that sounds are better heard when the wind blows with the direction of the sound than when against it. The true explanation of this was given many years ago by the late Sir George Stokes. When wind is blowing along the surface of the earth the wind velocity is generally less close to the earth than at higher levels. Hence, if a plane sound wave is travelling against the wind, the upper parts of the wave front travel more slowly than the lower. Hence the wave front is tilted backwards, and the direction in which the sound travels, being normal to the wave front, is tilted upwards. Hence the greater part of the sound wave passes right over the head of the observer, and he hears less sound. I have applied the same kind of reasoning to electro-magnetic waves. If we imagine a plane vertical wave advancing through the air, all parts would travel at the same speed, and the direction of the ray would be horizontal. If, however, any cause, such as ultra-violet light, ionizes the upper portion and condenses on the ions atmospheric moisture, then it is quite possible the dielectric constant of the upper region may be greater than that of the air near the surface. If this is the case, the upper part of the wave front will travel more slowly than the lower, and it will be tilted backward, and the direction of the ray or normal will be tilted upward. Hence at a distant receiving station the greater part of the wave may pass right above the receiving antenna and so weaken the signals.

Accordingly the loss of range in daylight may not be due to conductivity produced by ionization, but to increased dielectric constant in the upper atmosphere.

It has been pointed out by Sir J. J. Thomson that air exposed to ultra-violet light may be regarded as filled with minute water particles condensed on the ions. This suggests that perhaps even the blue of the sky, generally now attributed, on the authority of Tyndall and Lord Rayleigh, to dispersal from small particles, may not, at least, in part be due to such molecular groups.

Daylight Effects

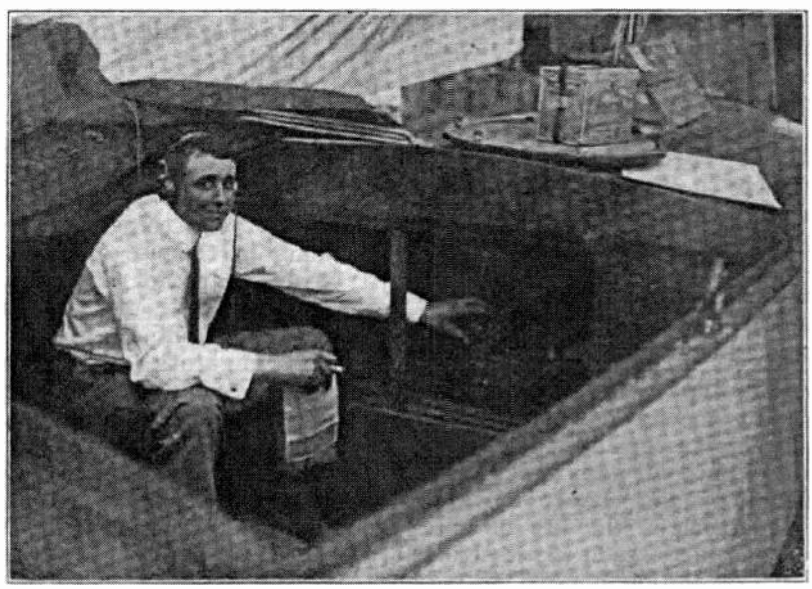
Professor Zenneck states that he has not found that air filled with water cloud has a higher dielectric constant than pure air. I am at present engaged on experiments which have for their object to investigate this question more closely. If it should turn out that the action of ultra-violet light upon air containing moisture is to increase its dielectric constant by even one or two parts in a thousand, it would provide a basis for the above hypothesis, which would enable us to explain the effect of daylight on long-distance radiotelegraphy without assuming any increase in conductivity. One of the notable peculiarities which call for explanation by any valid hypothesis is the well-known depression in the signalling-intensity curve at or about dawn. If a diagram is drawn, showing the disposition of the earth's shadow with regard to air antenna at the boundary, it will be seen that we have just the arrangement which is most favourable to such an uptilting of the transmitted waves, provided that the part of the wave front travelling in sunlit air moves more slowly than the part travelling in darkness. Before, however, we can safely theorise on this matter we require far more extensive measurements than have yet been made of the atmospheric conductivity at various levels and times of the day, and also of the dielectric constant of air under the influence of ultra-violet light.

Some of these matters are at the present under investigation in the radiotelegraphic laboratory at University College, London.

The master of a village school in Northamptonshire has erected a small wireless set at the school. This was referred to in a letter by a youthful pupil, who states that the wires have been fixed to the summit of the tallest elm tree on the school close, some 80 ft. high. Most of the children know the Morse code; and the youthful writer hopes that "one day some Bugbrooke boys will become Marconi operators, and will rival the gallant operators who have saved so many hundreds of people from drowning."

Atlantic Airship Explosion

IN the November issue of THE MARCONIGRAPH there appeared an article by Mr. Jack Irwin, who was operator on the airship "America," which was the first air vessel to attempt to cross the Atlantic. The story of the "America" and its ill-fated voyage was described by Mr. Irwin, who mentioned that he was offered the position of Marconi operator on Vaniman's new airship, the "Akron," in which another attempt would be made to reach Europe by dirigible balloon. The "Akron" was completed in September last, and had a maximum length of 258 feet, while its capacity was 400,000 cubic feet, the gas being contained in two small balloons, one forward and one aft. Under the car, 185 feet long, was a tank capable of carrying 8,000 gallons of petrol, and beneath this again was a lifeboat. The weight of the car was 6,000 lbs. The airship carried two motors, one of 110 H.P. and one of 80 H.P., as well as an auxiliary of 17 H.P. There were six propellers, three on either side. It was also intended to carry a 3-kw. Marconi set of special construction.



Mr. Jack Irwin, the Wireless Operator on the Transatlantic Airship.

In full view of thousands of spectators on the beach at Atlantic City on the morning of July 2nd the "Akron" exploded, burst into flame, then fell into the sea with its car and crew of five, including Mr. Melvin Vaniman and his brother Calvin. All were killed. Mr. Irwin was not on the airship at the time of the disaster. The precise cause of the accident possibly never will be known. It was believed that no spark from the engine-room, which was encased in asbestos, could reach the gas envelope, which had been specially constructed, and could hold its contents without any material leakage for thirty days. Spectators say that the "Akron," which at first seemed to be under perfect control, suddenly shot upward at a terrific speed as the sun's rays expanded the gas, and the explosion followed. The huge airship was launched at 6.15 a.m. on July 2nd, and this was to have been the final trial before she attempted a flight across the ocean. Her first trouble was experienced when attempts to take water on board for ballast proved a failure. The airship started to mount steadily. It appeared that Mr. Vaniman and his men were fighting hard to bring her down, but she failed to respond. The disaster occurred at about 6.30 at an altitude of from 1,000 to 2,000 feet, and half a mile from the shore.

Several determinations of longitude have of late been made by means of wireless messages, but the most ambitious attempt of this nature has just taken place between Paris and Tunis, wireless signals connecting two clocks, one at the Eiffel Tower and the other at Bizerta, Tunis, the comparison of which decided the longitude. The signals travelled the whole distance in 0.007 second, which works out at nearly 200,000 miles a second. When Sir George Airy (Astronomer-Royal) determined the longitude of Valentia, the little island off the coast of Kerry, he had no fewer than thirty chronometers carried backwards and forwards between Valentia and Greenwich Observatory twenty-two times before he was satisfied.

An Indivisible Navy

The following extracts from an article in the "Times of India" will be read with interest, in view of the completion of the Imperial scheme of wireless telegraphy. Some of the claims made have been satisfied since the article was written, but this does not detract from its interest.

THE Eastern waters are most inadequately provided with wireless stations, although two years ago Mr. Asquith, replying to the Indian Delegation at the Imperial Press Conference, who pressed this point, gave the assurance that the question should receive early attention. Then not only are the stations in Eastern waters too few, but they are of inadequate power. In establishing them the standard accepted has been the maximum distance over which shipboard installations can be secure of transmitting messages—namely, three hundred miles. The gap between Bombay and Aden may be taken to illustrate this point. The shore stations at Bombay and Aden have a guaranteed radius of three hundred miles. That is to say, if there are not ships equipped with wireless scattered over this route, the shore stations are useless till such ships come within range and complete the chain.

An Eastern Link

Not only then have the stations in the East to be numerically increased, but their range has to be improved until all gaps are bridged without dependence on the chance of intervening ships. Nevertheless, the use of wireless in the Navy has made such giant strides that it has effected a revolution in naval strategy not inferior to that wrought by the universal adoption of steam.

Before Mr. Marconi made his discovery one of the great problems of naval strategy was the maintenance of communication between the Fleet commander and the units of his command. The invention of smokeless powder and the advance of visual signalling were only palliatives. Until wireless telegraphy became general in the Navy it is not exaggerating to say Fleet commanders realised that once action became general, they could not hope to maintain control over fleet units. But wireless telegraphy solved the problem at a step. Its merits were at once appreciated by the Admiralty, and although we are accused of being a conservative people, the British Navy is years ahead of any of its rivals in the utilisation of this great engine of war. A unity of control and purpose in British Fleets has been attained undreamt of a decade ago.

From Fleet unity to unity between Fleets was a longer step. Through the increasing efficiency of wireless installations and the establishment of a powerful installation at the Admiralty buildings in Whitehall, all the squadrons operating in Home and adjacent waters were brought into direct harmony with the directing brain. The process of extension, until these conditions become world-wide, has now been commenced. The incalculable influence of this development on grand strategy is

A Strategical Centre

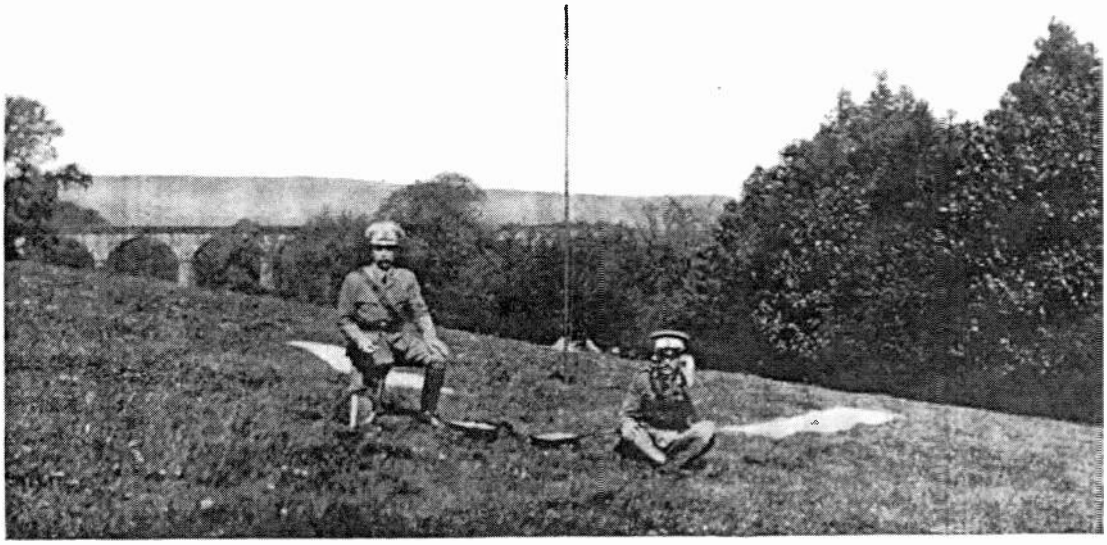
at once apparent. The whole naval force of the Empire will be capable of being directed on the strategical centre, and no important units ought to be for an hour out of touch with the progress of the war. Indeed, it is not saying too much to assert that a degree of unity will be secured throughout the naval forces of the Empire, whether they be in Home waters, the Atlantic, or the Pacific, far transcending that obtaining in a huge land force. From this development the British Empire benefits in a special degree, for its dominions are far-flung, the strategical area embraces the globe, whilst the enemy will usually operate on interior lines. For one thing, it secures an enormous economy in the use of ships. No longer will it be necessary for the commander to utilise the greater part of his cruiser strength in maintaining communications. For another, it renders nugatory all the plans of possible enemies to cut cables and seize landing-places in the hope of isolating detached units, and inducing uncertainty and confusion. Yet again, it strikes the death knell of the *guerre de course*. The great predatory cruiser, on its mission of destruction, will be followed day by day, hour by hour.

We can deduce, from experience on a small scale, the immense value of the system. During the Russo-Japanese war Admiral Togo was able to keep his main battle fleet in secure anchorage in its island harbour, whilst his cruisers flashed immediate intelligence of any movement by the Russian Fleet. The success of the naval measures against the gun-runners from the coast of Oman has been largely the fruit of the skilful employment of wireless telegraphy. At present the weakest links in the chain are in the East. We look for the immediate completion of the shore stations, and the raising of them to such a pitch that they will be capable of bridging all gaps like those between Bombay, Karachi, Colombo and Aden, and Aden and Singapore, without the necessity of relying on intervening ships. Then we want to see wireless on every British passenger ship, for all these will be invaluable scouts in war time. When these two ends are secured, Great Britain will have at last attained its ideal, an Imperial Fleet, one and indivisible

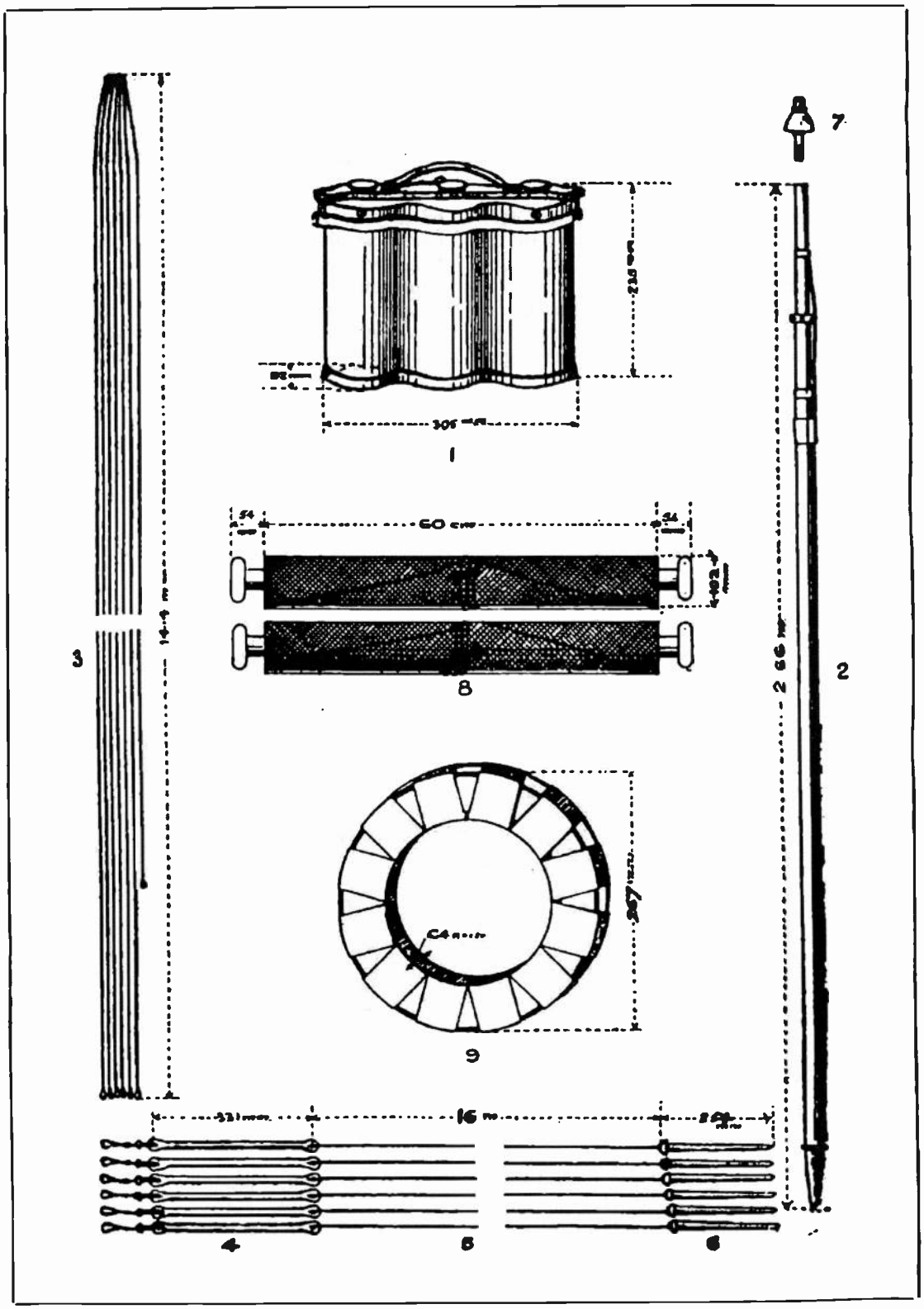
Portable Wireless Telegraphy.

A New "Knapsack" Station.

IT is a truism to declare that wireless telegraphy will play an important part in the future of the art of war; the only question worth considering is to what extent it will be developed for Army purposes. The absence of rapid means of communication in the campaigns of the past was sorely felt. What the bearing on the South African campaign would have been if Ladysmith, Kimberley, and Mafeking possessed installations before they were besieged is a problem which may be left to military strategists to decide. It is safe to suggest that neither contemporary public opinion nor history would show any leniency towards those who, indifferent to the lessons of previous campaigns, entered upon future wars without equipment of this necessary adjunct to attack or defence. The only possible excuse that could be advanced for placing an army in the field without making provision for wireless communications would be the absence of reliable apparatus, or neglect to develop the application of wireless telegraphy to meet progressive military requirements. No such excuse can be sustained, however, for the Marconi portable stations as they stand are already well on the road to perfection; and as new conditions arise, and new developments in other branches of the Army take place, the Marconi system has been developed to meet these new conditions. For instance, it will have been noticed in the Press that successful equipments have recently been made by Marconi's Wireless Telegraph Company in



Officers of the Westmorland and Cumberland Yeomanry Working Knapsack Station in Cumberland, 1912.

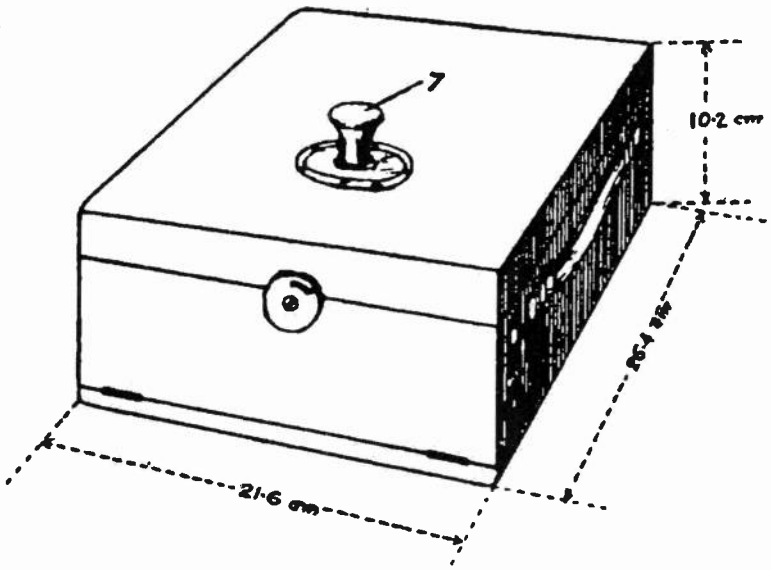


(1) Battery. (2) Telescopic Mast (30 feet). (3) Aerial. (4) Aerial Tension Insulators. (5) Aerial Stays. (6) Anchor Pegs. (7) Mast Insulator. (8) Earth Nets. (9) Aerial Drum.

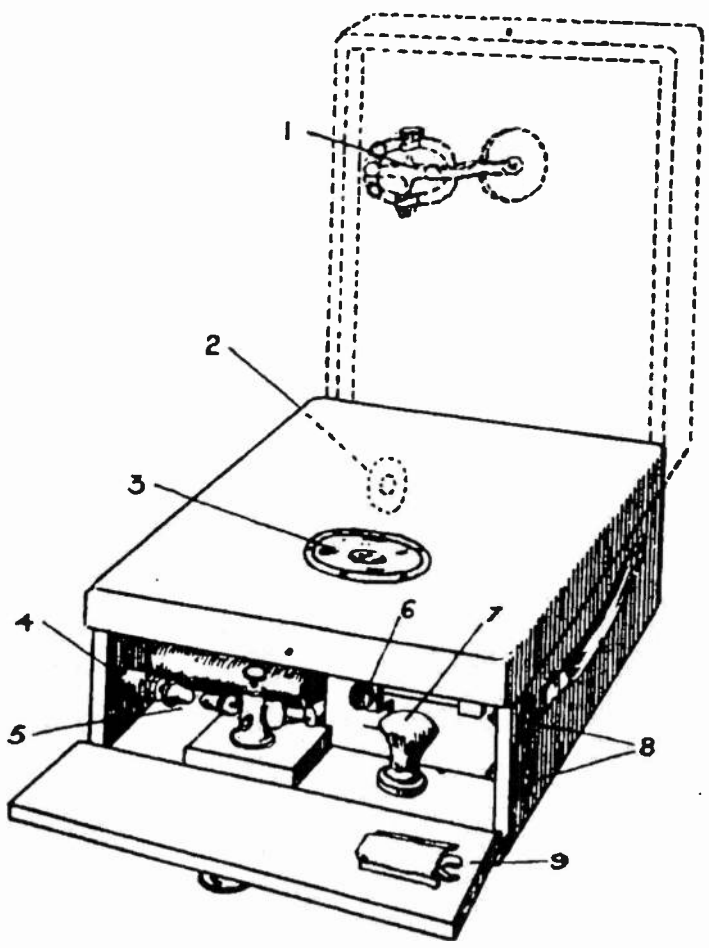
Aerial Gear, etc.

connection with wireless installations on aeroplanes. These experiments have already led to results from which it can safely be said that before very long there will be placed on the market a station capable of communicating from and to an aeroplane over a distance of anything from thirty to fifty miles. Such an installation would increase to a great extent the value of an aeroplane in time of war. Closely akin to this type of apparatus is another which is known as the "K" type knapsack station.

It is not so long since the knapsack station has been on the market, but it has been there long enough to demonstrate its usefulness. This is a type of apparatus which is well calculated to bring home to everybody the simplicity and ease of application of wireless telegraphy. Devoid of complications, extremely portable and easy to manipulate, the importance of the knapsack station cannot possibly be exaggerated. It is one of the short range stations manufactured by Marconi's Wireless Telegraph Company to meet the demand for an extremely light station intended for use by scouts, and to replace to a large extent visual signalling and mounted orderlies. There are many purposes for which this station can be used, including direction of gun fire. The knapsack station has a range of about ten miles, and is carried in knapsacks strapped to the backs of soldiers. Four men, each carrying a load of between 20 lb. and 30 lb., are necessary to carry a complete installation. Some idea of the portability of the knapsack station can be gathered from the accompanying illustration. The first man is seen carrying the mast and battery, the second man is carrying the earth nets, the transmitter and receiver are carried by the third man, while in the knapsack strapped to the back of the fourth man is the aerial gear. The mast is about 30 feet in height. It is of extremely light though rigid construction, made chiefly of aluminium tube, and is used to support an umbrella



A—Open.

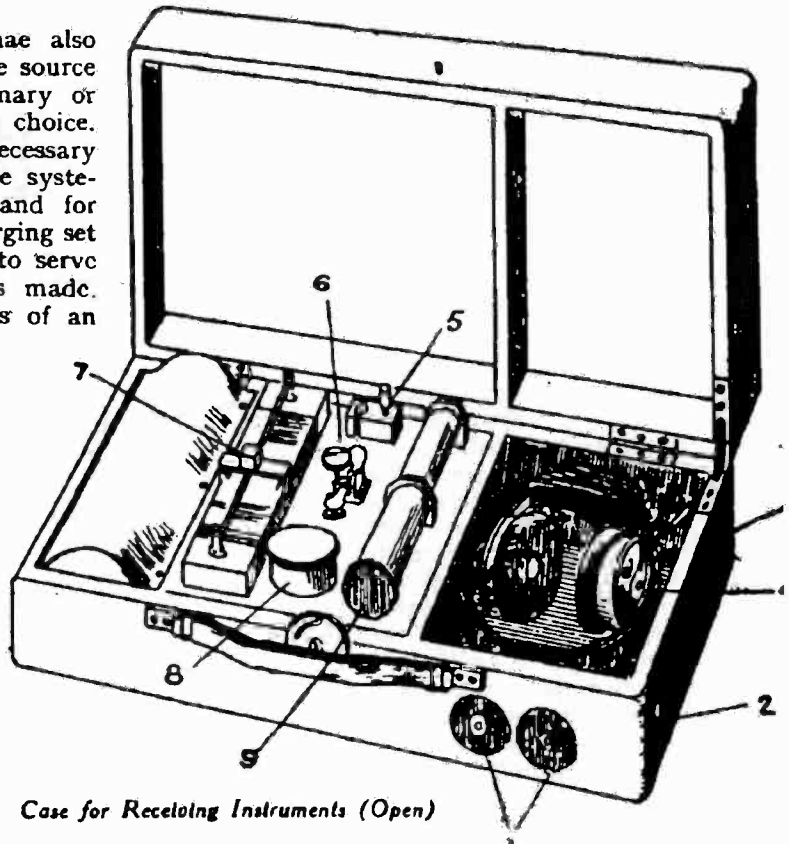


B—Closed.

A—Open. B—Closed. (1) Manipulating Key. (2) Aerial Socket. (3) Leather Diaphragm. (4) Earth Socket. (5) Spark Electrodes. (6) Adjusting Screw of Coil. (7) Manipulating Key Handle. (8) Battery Terminals. (9) Adjusting Spanner.

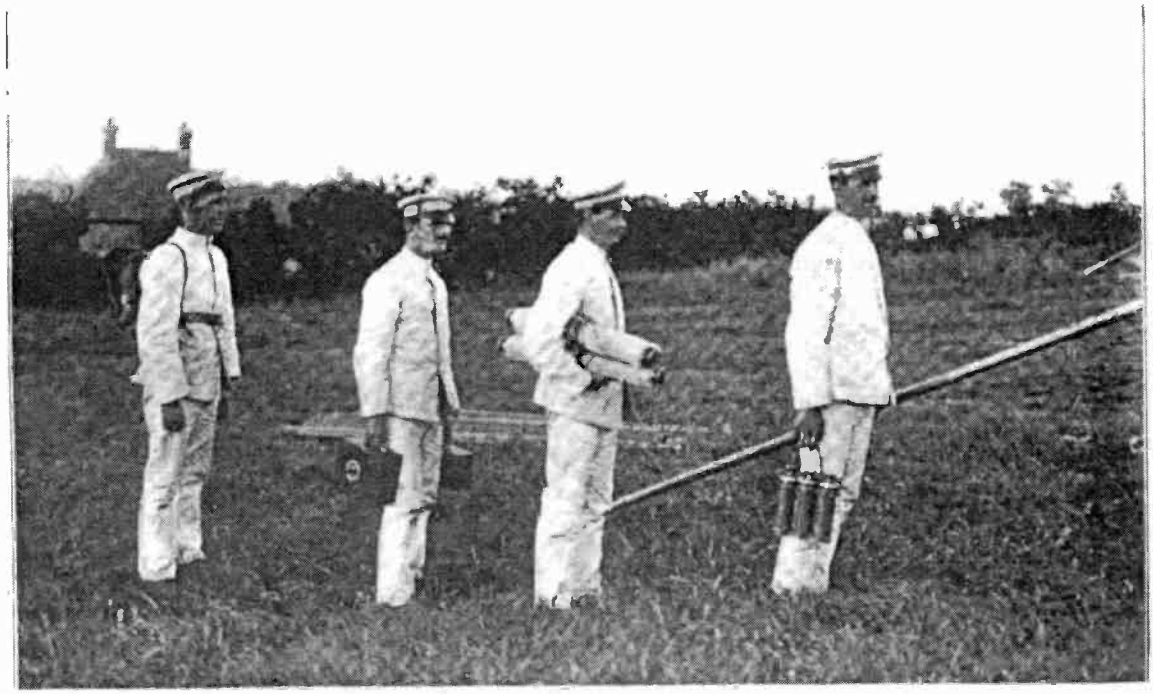
Transmitting Case for Knapsack Station.

form of antennae, the antennae also acting as stays to the mast. The source of energy may be either a primary or a secondary battery according to choice. If the latter be employed, it is necessary that the accumulators should be systematically charged as required, and for this purpose a special field charging set which has a sufficient output to serve ten or twenty such stations is made. The transmitter, which consists of an ordinary ignition coil requiring a pressure of only six volts, is contained in a square wooden box weighing 11 lb. The receiver consists of the ordinary carborundum receiving circuit with jigger, tuning condenser, and four dry cells, which may be switched on and off as required. This is also contained in a box which weighs 6 lb. No elaborate system of syntonisation is provided, this being unnecessary owing to the short wave-length employed, which is so widely different to that in ordinary use as to make these stations practically immune from interference. A buzzer for testing the wave length is also part of the equipment.



Case for Receiving Instruments (Open)

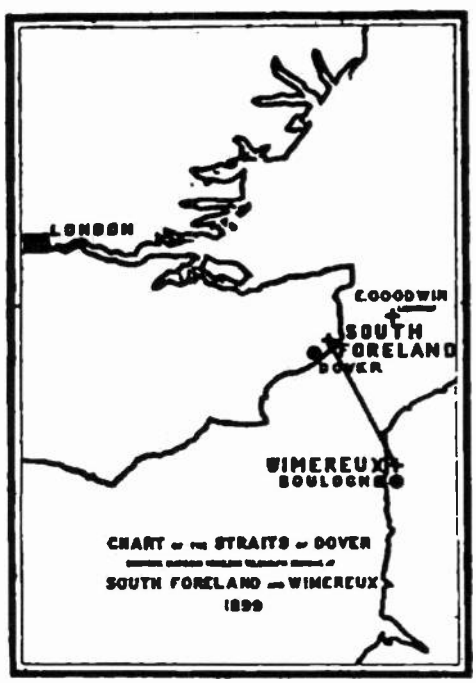
(1) Telephone Sockets. (2) Earth Sockets. (3) Aerial Socket. (4) Telephones. (5) Plug Switch. (6) Crystal Holder. (7) Potentiometer. (8) Box of Spare Crystals. (9) Adjustable Tuning Condenser.



A Knapsack Station. First Man carrying Mast and Battery; Second, Earth Nets; Third, Transmitter and Receiver: Fourth, Aerial Gear.

Wireless on the Cross Channel Steamers

THE crossing of the Channel has always exercised a powerful fascination over enterprising minds. To go back to the early days of English history, the first well-authenticated item that we have is that Julius Cæsar crossed the Channel, thereby setting a fashion which has ever since had an ever-increasing band of followers. The second important fact in history that every child knows is that William the Conqueror crossed the Channel in 1066, and history seems continually to be occupied with that stretch of water which separates the British Isles from the remainder of Europe. It would seem as

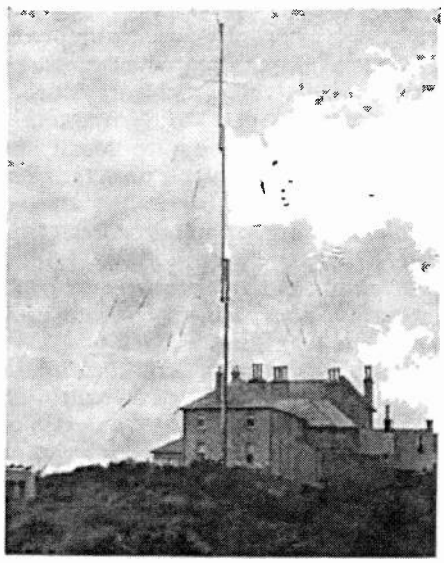


though the narrow stretch of water was a stimulus to devise means of circumventing the difficulties of communication which its presence causes. With every means of communication, from submarine tunnels to aeroplanes, Dover and Calais seem to be the ordained beginning and end of enterprising attempts. Those who are familiar with " The Toilers of the Sea " will remember that the earliest steam vessel made its first voyages in the Channel, and it is within everyone's memory that the first aviation prize was for a flight across the Channel. Confirmation of this unwritten law of human enterprise may be found in the fact that wireless telegraphy was accepted as a real commercial possibility when messages had been transmitted over some thirty-three miles of water from Dover to Wimereux, near Boulogne. It is refreshing to recall some of the early trials which were undergone in the Channel and contrast them with the smooth and reliable working of wireless telegraphy on the Dover-Ostend, Dover-Calais, Folkestone-Boulogne and Southampton-Havre routes—to name only four of the steamship lines which span the English Channel.

When Mr. Marconi first commenced experimenting in England he had already demonstrated the possibility of transmission by means of radiant emanations, and was chiefly interested in the increase of the distance of transmission. It was a somewhat cumbrous operation to experiment with two land stations, and it seemed obvious that the best method of procedure was to have a land station on the coast, and a movable station on board of a vessel which could easily move to any suitable distance. With this object a station was erected at Alum Bay, on the north-west coast of the Isle of Wight, close to the Needles. By continual experiment and alteration the distance of the vessel from shore was increased until communication was established between Alum Bay and Bournemouth, a distance of fourteen miles. Shortly afterwards a station was erected at Poole, eighteen miles from Alum Bay, and satisfactory communication was established.

In December of the same year the Marconi Company obtained permission from the officials of Trinity House to demonstrate the practicability of communication between lightships and the shore, and a station was installed at the South Foreland lighthouse, and another on the East Goodwin lightship, twelve miles distant. This installation was extremely satisfactory, and worked for over two years, during which time many vessels and lives were saved by its use. It was proved in the Admiralty Court that property worth over £50,000 was saved by means of wireless in the case of one steamer which went ashore on the Goodwins. Twice during this period accidents occurred to the East Goodwin lightship—once when in a heavy gale part of the bulwarks were carried away, and once when a sailing vessel ran into it—and on both occasions aid was summoned by wireless, and arrived—as it could not otherwise have done—in time to be of great service.

Experiments were next made to determine the influence of intervening land masses. Accordingly permission was obtained to instal a wireless set at Dover Town Hall, on the top



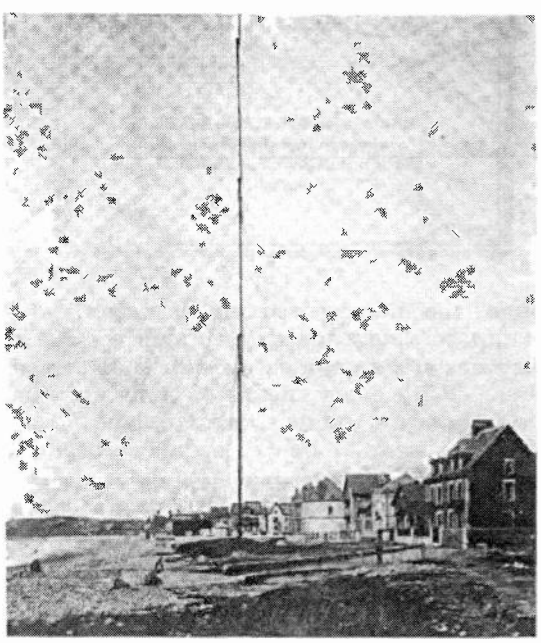
Haven Station, Poole Harbour.

of the tower of which is a flagstaff, forty-five feet high, giving a total height of one hundred and ten feet above sea level. Between this and the South Foreland is the Castle Cliff, over four hundred feet high, and therefore as effectual a barrier as could be desired. It was found, however, that messages were received with the utmost ease, and it was therefore concluded that no trouble need be feared from intervening mountains or from the curvature of the earth. During these trials a few stray dots and dashes were recorded on the Morse tape, and it was thought that these might be signals from an experimental station which had been erected at Wimereux, near Boulogne, thirty-three miles away. Accordingly the aerial was raised another thirty-six feet, giving a total height of one hundred and fifty feet above sea level. With this, satisfactory communication was established, and maintained, across Channel.

The following week the British Association held its annual gathering, and by a lucky chance the meeting was at Dover. Mr. Marconi was unable to be present, as he had arranged to leave for America to investigate the possibility of trans-Atlantic communication, and, *inter alia*, to report the America Cup races by wireless.

It was then nearly one hundred years since Volta had communicated to Sir Joseph Banks, then president of the Royal Society of London, in a letter dated March 20th, 1800, describing his electric-current generating apparatus, since known as the voltaic pile, or cell. The British Association were commemorating this discovery, as also were at the same time the French Association (Pour l'Avancement des Sciences) at Boulogne, and an Italian Electrical Congress at Como. Dr. Fleming delivered a lecture at Dover on "The Centenary of the Electric Current," the last half of which he devoted to the development of wireless telegraphy. Before him, as he lectured, were the transmitter and the receiver connected to the aerial at the Town Hall, and he there transmitted in the presence of the foremost scientists of the country, a message to M. Brouardel, president of the French Association (Pour l'Avancement des Sciences), a message conveying greetings and good wishes. This message was received at Wimereux and telephoned to M. Brouardel at Boulogne. Before the conclusion of the lecture a reply was received saying that M. Brouardel was "Very much touched by the proof of friendship which the wireless telegraph transmits to us," and sending congratulations and good wishes. The total time of transmission was thirty minutes, mainly taken up in getting from the Wimereux station to the nearest telephone. After the lecture a message was received from Como, which had been telegraphed from Como to Wimereux, and thence by wireless. In this way it was demonstrated to the foremost scientists of the world that wireless telegraphy was a practical success.

Since it had been proved that communi-



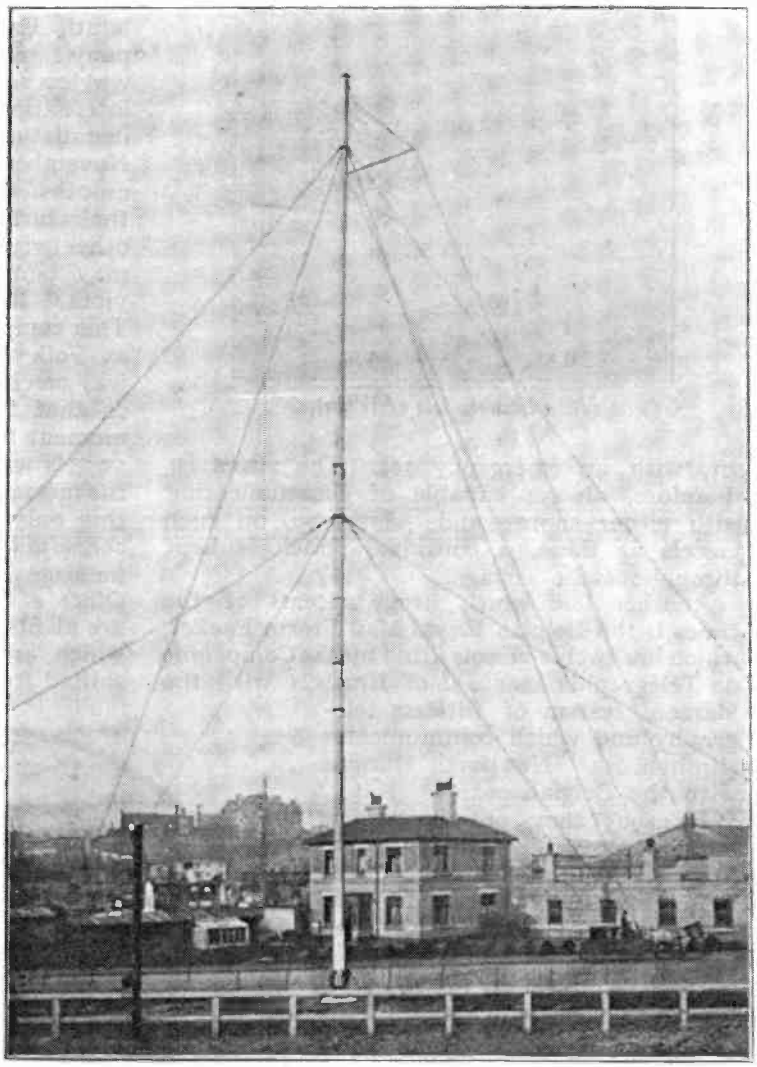
Wimereux Station, near Boulogne, Spa.

cation across Channel was possible, it was obvious that communication with any intermediate point was likewise possible, and one would have expected that almost at once the cross-Channel boats would have been fitted with an appliance of such manifest value. The whole of the boats would obviously have been always under complete control, and whether in fog or storm or calm they could instantly have been in touch with the shore in any emergency. Some years elapsed before these vessels were fitted. However, just as in course of time we passed from the ignorance of the dark ages to the comparative enlightenment of the present day, and just as the coracle of the ancient Briton has given place to the modern turbine steamer, so, with time, the obstacles in the path of progress disappeared. To-day, wireless telegraphy is regarded as indispensable for the comfort and safety of passengers, and for convenience of management of the boats.

The jaded worker in search of health and vigour can be recommended to make a trip on one of the numerous cross-Channel steamers with the assurance that he can keep in direct touch with land on both sides of him through the instrumentality of wireless telegraphy. At a trifling cost the pleasure seeker can administer an agreeable surprise to those left behind by sending a "marconigram." All that it is necessary for him to do is to hand to the purser on the vessel the text of the message, which is then sent pulsating through the ether and delivered to its destination through one of the stations on the south coast of England or the coast of France, Belgium or Holland.

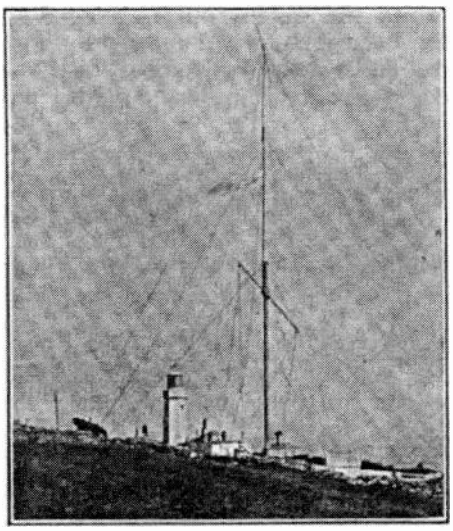
There should be no difficulty in making one of these trips, which possess the double benefit of invigorating the body and stimulating the mind with memories of the victories gained by the intellect of man from the hidden mechanism of Nature. If the tourist desires to make an entry upon the Continent through one of the French ports, he is admirably catered for by three well-equipped lines of steamers; if Ostend is intended to be the point of embarquation he will be able to make the journey with equal speed, comfort and safety.

The London and South Western Railway have on their Southampton-Havre route four vessels fitted with wireless telegraphy—the "Cæsaria," the "Sarnia," the "Hantonia" and the "Normannia"—this vessel and its sister ship, the "Hantonia," have only this summer been put in commission. They are both driven by geared turbines which maintain a speed of twenty knots, and which ensure a smoothness of running and an absence of that vibration so distressing in its effects upon those who desire to sleep in comfort. In each of these vessels there are five state cabins, placed amidships on the promenade deck, which are ordinary bedrooms afloat, being fitted with brass bedsteads and armchairs, and all the comforts one can desire. It may be mentioned that this line makes a speciality of the convenience of sleeping on the night crossing to



Folkestone Station.

avoid waste of valuable time. All the latest life-saving appliances are to be found. The wireless operator's room is just aft of the boat deck, and the installation is a 1½-kilowatt ship



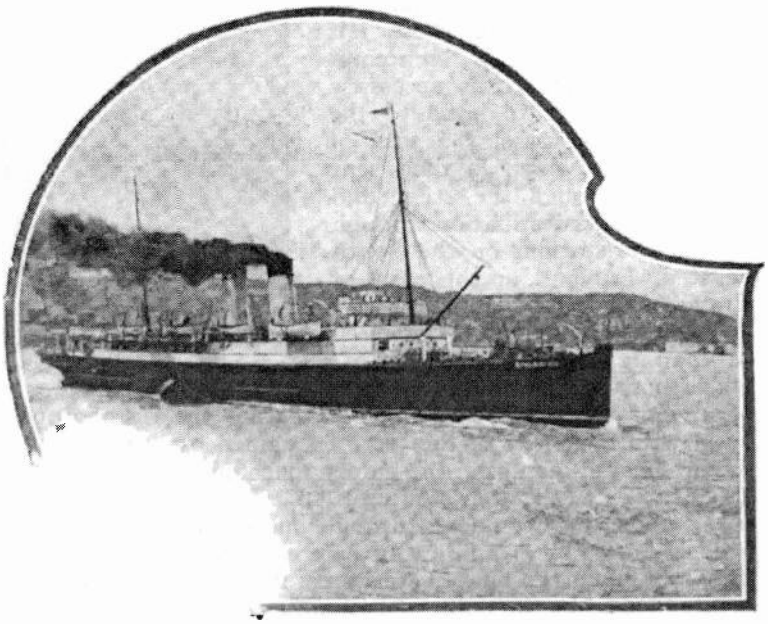
Niton Station, Isle of Wight.

set, with an emergency set. The vessel is, therefore, always capable of communicating with either shore; and, of course, on such vessels as these, a continual watch is kept throughout the voyage.

Another line which keeps abreast of the times is the Belgian Royal Mail Steam Packet, which has twelve vessels fitted by the Compagnie de Télégraphie sans Fil of Brussels with the Marconi system of wireless telegraphy and which communicates through the Newport stations with the Belgian coast.

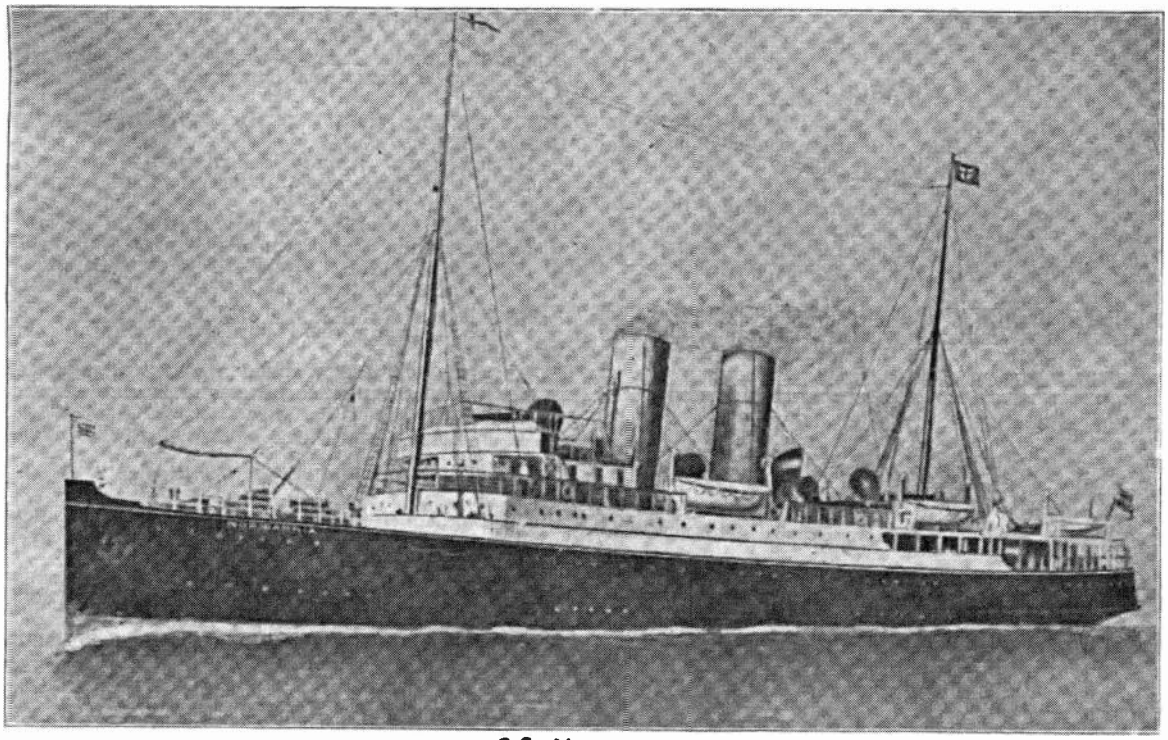
In 1905 they put in service on the Dover-Ostend route the first turbine mail packet boat built on the Continent — the "Princess Elizabeth," which had a speed of twenty-four knots. In 1910, to celebrate the seventy-fifth anniversary of the opening of the first Belgian state railway, two further turbine vessels, the "Jan Breydel" and the "Pieter de Coninck," were built. These vessels have a length of 361 feet, a breadth of 40 feet, and a draught of 10 feet. We cannot describe in detail the luxury and comfort of these vessels, but a point deserving of mention is that the restaurant of the "Jan Breydel" is decorated by twelve magnificent panels painted by Henri Baes, each one reproducing a famous picture of the Flemish school—works of Van Eyck, Memling, Metsys, Porbus, Rubens, Van Dyck, Corneille de Vos, Snyders, Jordaens—with a portrait of the painter, reproduced from authentic sources, given in the top corner of each. The popularity of this line may be gathered from the fact that it carries nearly a quarter of a million passengers a year.

A company which has seen the advantages of wireless telegraphy from the very first is the South Eastern and Chatham Railway Company; and this company would have installed wireless sets many years ago had it not been for international restrictions. They had their first installation—on board the "Onward"—on November 12th, 1909, and in the next six months they installed four other sets. All their turbine boats are now fitted. Amongst other vessels which are fitted with wireless may be mentioned the "Queen," the "Invicta," the "Empress," and the "Victoria." This company possesses a private land station at Folkestone—which, it may be mentioned, was erected in the short space of two days—so that they are sure of being able at any moment to communicate with any one of their vessels without the delay which would arise if the message could not be sent direct. Of course, this only applies to administrative messages concerning the company's affairs; ordinary messages to passengers are sent via the Post Office station at North Foreland. The boats are all fitted with accumulator 10-inch coil sets, which are easily moved, and are frequently shifted from one vessel to another.



SS. Engadine (South Eastern and Chatham Railway.)

It might be said that with such vessels wireless telegraphy is of greater use in life-saving than lifeboats themselves. It is very rare that one of these vessels could not be reached within an hour, and with modern devices such as watertight bulkheads, these vessels could easily remain afloat for that time in the worst weather after the most severe accident that is likely to occur. In bad weather the task of taking to the boats would be one of considerable risk, and to reach the shore would need hours of the hardest toil. Aid summoned by wireless could arrive quickly, all the passengers could be removed with little risk and brought to shore with ease and safety. Such accidents as would necessitate the abandonment of a vessel in the Channel are very rare, but they are not impossible, and it is satisfactory to know that the danger to human life is reduced to a negligible quantity.



S.S. Normannia.

THE Austrian Ministry of Commerce have published a decree concerning the establishment of a wireless telegraph office of control in Trieste. This is a sub-department of the Ministry of Commerce, and is concerned with the control of ships' operators on Austrian vessels. It further exercises State control over private ship stations on Austrian vessels, and on foreign ships in Austrian waters. The decree came into effect on April 1st of this year. Application for a ship telegraph office on board an Austrian vessel must be made to the Ministry of Commerce. The equipment of the office and accessories is provided for and maintained by the State, who also supply one or two telegraphists, but the shipowner must furnish the material for the establishment and working of a wireless telegraph office on board, and the accommodation of the office staff. The shipowner pays to the State for the ship telegraph office an annual sum in the case of ships which come under the regulations of the Ministry of Commerce dated November 10th, 1910, which amounts to Kr. 2,500 or Kr. 2,200, according to whether the type of apparatus used is first or second class. Ship stations transmit free of coast tax general service telegrams relating to navigation, or telegrams which are addressed by the captain of the ship to the shipowner or to his representative or agent. Collection of coast and land taxes for service telegrams is effected on the basis of the receipts kept by the wireless station.

H.M.S. "Leda," which has been appointed to the Moray Firth Control, is the first fishery service cruiser fitted with wireless telegraphy to arrive in the port of Aberdeen.

Chelmsford Works Outing.

For the annual outing of the employees of the Marconi Works, Chelmsford, a party of about 150 journeyed to Yarmouth by special train on July 13th. The party split into various sections, and some visited the Post Office wireless station at Caister and the Yarmouth lighting station. Mr. J. P. G. Aylett acted as hon. sec., and Mr. W. N. Ball as hon. treas. Donations towards the expenses were liberally contributed by the directors and several heads of departments. A number of the girl employees visited Southend, the secretarial and other work for the trip being carried out by Miss K. Carlton.

Athletics

On June 29th the Marconi Athletic Club met and were defeated by Catford Excelsior to the tune of 44 runs, the scores being 71—27. On July 6th North Middlesex were encountered and beaten by 97 runs, the scores being 168—71 (Bates contributing a fine 60 for the Marconi Club); and on the 20th the club, in a return match with Fulham Palace, gained a victory by 52 runs, the final scores being 117—65 (Wheeler, 37; Burden, 17; Smith, 14).

For the forthcoming football season the club has been admitted to the Western Suburban League and Alliance, Division I., and it is hoped that practice will be in full swing in the course of a week or so. Needless to say, the club are looking forward to a highly successful season in this section.

Movements of Engineers

T. Williams has returned from Brazil, and is now at Broomfield.

H. Richmond and A. J. Sherborne have recently joined as probationer engineers, and are now at Broomfield instructional station.

S. T. Dockray has been transferred from Broomfield to Poldhu to relieve Mr. Pontifex, who is now in London.

N. C. Rackstraw returned to London from Glasgow and is now on annual leave.

C. James left London for the Gold Coast, West Africa, to supervise the erection of stations there.

G. J. Boome has been transferred from the London office to Chelmsford temporarily.

J. Corner has resigned from the company.

H. J. Round has returned from the Amazon district, and is now in London.

Messrs. Rau, Slaughter, Chadbourne, Hudson, Hart, and Hallborg, engineers in the employ of the American Company, are in England for instructional purposes on behalf of the American Company.

Movements of Operators

L. A. Hancock, from the "Californian" to the "Armenian."

W. Raw, from the "Cedric" to the "Burutu."

P. S. Smith, from the "Burutu" to the "Cedric."

P. Norwood, from the School to the "Cedric."

R. F. Osborne, from the "Cedric" to the "Ben-my-Chree."

A. R. Beynon, from the "Viking" to the "Franconia."

D. M. Sproat, from the "Franconia" to the "Hydaspes."

F. Arnott, from the School to the "Ivernia."

J. R. Kingsford, from the "La Marguerite" to the "Kelvinbank."

S. W. Lewis, from the "Lanfranc" to the "Oravia."

J. Camfield, from the School to the "Viking."

G. A. Beardmore, from the "Empress of Ireland" to the "Appalachee."

J. Vincent, from the School to the "Bohemian."

A. V. Jones, from the School to the "Carpathia."

R. Ferguson, from the "Tarquah" to the "Cymric."

J. Camfield, from the "Viking" to the "Cymric."

P. Connolly, from the "Karina" to the "Esmeraldas."

H. Miller, from the "La Marguerite" to the "Empress of Ireland."

H. E. Wright, from the "Victorian" to the "Francis."

A. Julius, from the "Scandinavian" to the "La Marguerite."

A. L. Henri, from the "Cymric" to the "Lanfranc."

A. H. Jefferies, from the "Ulster" to the "Munster."

F. James, from the "Oronsa" to the "Tarquah."

W. C. Obey, from the School to the "Victorian."

A. Crofts, from the "Appalachee" to the "Viking."

F. E. Garlick, from the "Campania" to the "Ben-my-Chree."

R. F. Osborne, from the "Ben-my-Chree" to the "Californian."

J. M. Butterworth, from the School to the "Deseado."

T. W. Murray, from the "Merion" to the "Empress Queen."

F. R. Collier, from the "Warilda" to the "Oronsa."

J. B. Stone, from the "Campania" to the "Merion."

P. Mattock, from the "Virginian" to the "Caronia."

R. H. Mauntain, from the "Mauretania" to the "Clement."

T. J. O'Donnell, from the "Dominion" to the "Devonian."

S. A. Leith, from the "Vauban" to the "Dominion."

A. E. Jones, from the School to the "Dominion."

G. Kemp, from the "Potomac" to the "Galicia."

C. H. Whitaker, from the "Ambrose" to the "Vauban."

W. P. Greaves, from the "Winifredian" to the "Hypatia."

A. Cottingham, from the "Cymric" to the "Mauretania."

E. Wilkinson, from the School to the "Merion."

A. J. Osborn, from the "Denis" to the "Tunisian."

G. M. Burgham, from the School to the "Tunisian."

A. G. Dicks, from the "Caronia" to the "Virginian."

A. Bolster, from the "Dominion" to the "Scandinavian."

C. H. Bartlett, from the "Volturno" to the "Pardo."

N. A. Boon, from the "Lake Erie" to the "Pardo."

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

H. M. Palmer, from the "Balmoral Castle" to the "Lake Erie."

E. C. Rumford, from the "Montfort" to the "Mount Royal."

A. J. Thompson, from the "Stephano" to the "Majestic."

A. E. Bright, from the "Oceanic" to the "Majestic."

W. Yelland, from the School to the "Inkosi."

H. Roffey, from the "Corinthian" to the "Turakina."

H. Anderson, from the "Marathon" to the "Orania."

C. A. Hill, from the "Orania" to the "Demosthenes."

R. E. Greatbatch, from the "Arabia" to the "Persia."

G. Balding, from the "Minneapolis" to the "Galway Castle."

W. Merryweather, from the "Sicilian" to the "Corinthian."

A. Schofield, from the "Sicilian" to the "Corinthian."

P. F. Rice, from the "Minnetonka" to the "Montfort."

F. V. Kinder, from the "Gothic" to the "Beltana."

J. E. Marriott, from the School to the "Oceanic."

A. G. Dunn, from the School to the "Gothic."

A. C. Baker, from the "Corinthic" to the "Mantua."

A. Beattie, from the School to the "Araguaya."