MARCONI WIRELESS TELEGRAPHY

A Short History of its Invention, Evolution & Commercial Development

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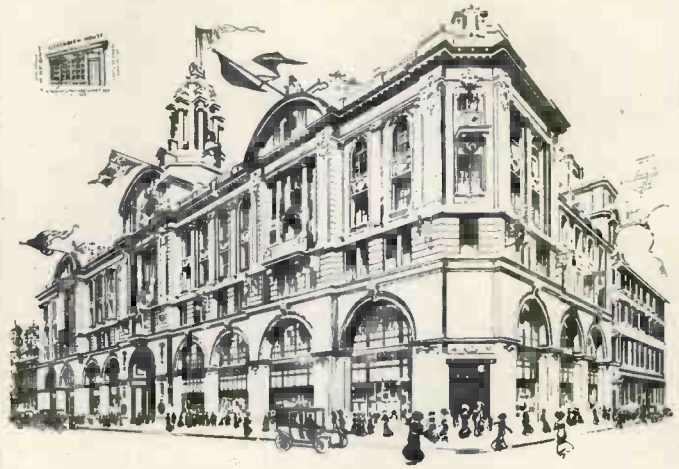

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MARCONI TELEGRAPHY

A Short History of its Invention, Evolution and Commercial Development.

The Marconi International Marine Communication Co., Ltd.
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G. MARCONI, ESQ., LL.D., D.Sc. *Photo by Biograph Co., London.*

Marconi's Wireless Telegraphy

HEMISPHERES.

"No familiarity with the subject removes the feeling of vague wonder with which one sees a telegraphic instrument, merely connected with a length of 150 feet of copper wire run up the side of a flagstaff, begin to draw its message out of space and print down in dot and dash on the paper tape the intelligence ferried across 30 miles of water by the mysterious ether."

THESE words were written in 1899 by Dr. J. A. Fleming, of University College, London, to whom electrical phenomena are a matter of everyday study.

The Marconigraph

If the wonder of wireless telegraphy remains with the skilled experimenter, the fascination which signalling across space holds for the world at large need not be a matter for surprise.

The absence of visible connection between the sending instrument and the receiving instrument strikes the imagination at once. Nothing could be more marvellous, to all appearances, than the response of mechanism on board a ship in mid-Atlantic to etheric vibrations set up hundreds of miles away.

Yet there is nothing essentially more mysterious in wireless telegraphy than the response of the eye to sunlight. The sun sets up waves in the ether, millions of miles away from the eye, which is sensitive to the light vibrations. A wireless telegraphic transmitter sets up waves of a similar sort in the ether, and these waves are recorded by an instrument designed to be sensitive to them. For that reason Lord Kelvin described a wireless telegraphic receiver as an "electric eye"—a simile which is a great deal more accurate than most.

The Marconigraph

Wireless telegraphy as we know it to-day is the outcome of a chain of effort formed by the mathematician, the labora-

PROF. H. R. HERTZ.

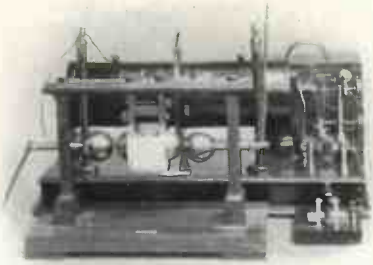
tory experimenter, the inventor, and the capitalist. In 1864, Clark Maxwell, working on purely theoretical lines, reached the conclusion that an electric spark or

" disruptive discharge," would set up oscillations in the ether. In 1887, Hertz proved by experiments that Clark Maxwell's theory was correct. He demonstrated that an electric spark brings about the radiation of etheric waves which may be reflected, refracted, and polarised like those of light. In 1895, Mr. Marconi began his attempts to utilise these waves for signalling purposes. In 1896, he took out the first of the patents which were later acquired by Marconi's Wireless Telegraph Company, and utilised in the development of a world-wide system of wireless telegraphy by land and sea.

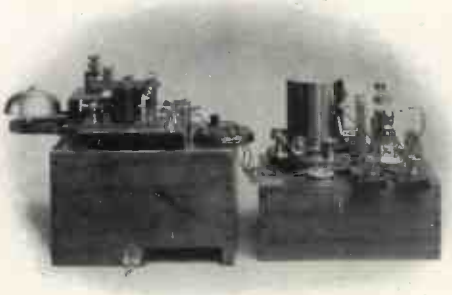
The story of these early experiments is peculiarly interesting. Guglielmo Marconi was only twenty-one years of age when he began the attempt to put Hertz's laboratory experiments to practical use. His first efforts were made at his father's villa in Pontecchio, near Bologna, across distances of only a few yards, from room to room. The next step was to try longer distances in the garden; and after numerous experiments the inventor was able to receive signals the length of the garden.

The Marconigraph

The apparatus employed in these experiments was very simple, and all the



EARLY TYPE OF TRANSMITTER.



EARLY TYPE OF RECEIVER.

Marconi apparatus in use is a direct evolution from it. In the transmitter, Marconi used an induction coil to produce

a spark between two balls, one of which was connected to a metal can hoisted on a mast, and the other to a metal plate in the earth. In the receiver he used an improved form of coherer, which will be

THE MARCONI COHERER.

explained later, connected to a similar "aerial" and a similar "earth." This arrangement of aerial wires and earth connections was found by Mr. Marconi to give the maximum of reliable effect with the minimum of energy. It was an entirely novel arrangement of conductors, and it made wireless telegraphy really practical for the first time.

The coherer is the part to which the description "electric eye" was applied. It consists of a small tube containing metal filings, which have the peculiar property of allowing a current of electricity to pass through them only when they are under the influence of an electric wave. When an electric wave, such as is set up by a thunderclap or an electrical discharge artificially produced, strikes the filings, they "cohere," in a molecular sense, and allow the current to pass. The passage of the current constitutes a signal, as it can be used to make a click in a telephone or to work a telegraphic tape-machine or other recorder.

Latterly, of course, the distances of transmission have grown, wireless installations have become more complicated, and various refinements have been introduced. But the garden experiments at Pontecchio supplied the germ which was destined to grow, twelve years later, into the realisation of Transatlantic wireless telegraphy.

In 1896, Mr. Marconi came to England, took out his first patent for wireless telegraphy, and brought his apparatus under

the notice of Sir William Preece, then Engineer-in-Chief to the General Post Office. Sir William was keenly interested in Mr. Marconi's methods, since he himself had experimented, upon quite different lines, in signalling across space. Sir William's method was based on the well-known fact that currents passing in an electric circuit induce currents in a parallel circuit. By stretching wires on opposite sides of narrow channels, Sir William was able to bridge over the gap by means of this electro-magnetic induction. But the scope for that means of wireless telegraphy was extremely limited owing to the length of wire needed on each side to communicate even a short distance; and Sir William was quick to recognise that Mr. Marconi's use of Hertzian waves opened up new and unexpected possibilities.

Early in June, 1897, Sir William lectured before the Royal Institution on "Signalling through space without wires," and spoke of Mr. Marconi's achievements as follows:

> "In July last Mr. Marconi brought to England a new plan. Mr. Marconi utilises electric or Hertzian waves of very high

> frequency. He has invented a new relay which, for sensitiveness and delicacy, exceeds all known electrical apparatus, The peculiarity of Mr. Marconi's system is that, apart from the ordinary connecting wire of the apparatus, conductors of very moderate length only are needed, and even these can be dispensed with if reflectors are used.
>
> "He has not discovered any new rays; his receiver is based on Branly's coherer. Columbus did not invent the egg, but he showed how to make it stand on its end, and Marconi has produced, from known means, a new electric eye more delicate than any known electrical instrument, and a new system of telegraphy that will reach places hitherto inaccessible. . . . Enough has been done to prove and show that for shipping and lighthouse purposes it will be a great and valuable acquisition."

During the twelve months preceding Sir William's lecture, that is to say, between June, 1896, and June, 1897, Mr. Marconi had conducted several experiments under the supervision of the Post Office, the War Office, and the Admiralty. Tests were first made successfully between St. Martin's-le-Grand and the Thames Embankment; but the experiments which first roused the authorities and the public

to the importance of the invention were those carried out on Salisbury Plain, when Mr. Marconi covered a distance of four miles. In May, 1897, a series of demonstrations were made across the Bristol Channel, communication being established between Penarth and Brean Down, a distance of nearly nine miles.

As a matter of course, the interest taken in these demonstrations was nowhere keener than in Germany. Among those who witnessed the Bristol Channel experiments was Professor Slaby, of the famous Charlottenberg School. He, himself, had been attempting to utilise Hertzian waves for signalling purposes, and the result of his visit to England is recorded in the following historic passage from an article he wrote for the "Century Magazine":—

> "In January, 1897, when the news of Marconi's first successes ran through the newspapers, I myself was earnestly occupied with similar problems. I had not been able to telegraph more than one hundred metres through the air. It was at once clear to me that Marconi must have added something else—something new—to what was already known,

whereby he had been able to attain to lengths measured by kilometres. Quickly making up my mind, I travelled to England, where the Bureau of Telegraphs was undertaking experiments on a large scale. Mr. Preece, the celebrated Engineer-in-Chief of the General Post Office, in the most courteous and hospitable way, permitted me to take part in these; and in truth, what I there saw was something quite new. Marconi had made a discovery. He was working with means, the entire meaning of which no one before him had recognised. Only in that way can we explain the secret of his success. In the English professional journals an attempt has been made to deny novelty to the method of Marconi. It was urged that the production of Hertz rays, their radiation through space, the construction of his electrical eye—all this was known before. True; all this had been known to me also, and yet I never was able to exceed one hundred metres.

"In the first place, Marconi has worked out a clever arrangement for the apparatus, which, by the use of the simplest means, produces a sure technical result. Then he has shown that such telegraphy (writing from afar) was to be made possible only through, on the one hand, earth connection between the apparatus, and, on the other, the use of long extended

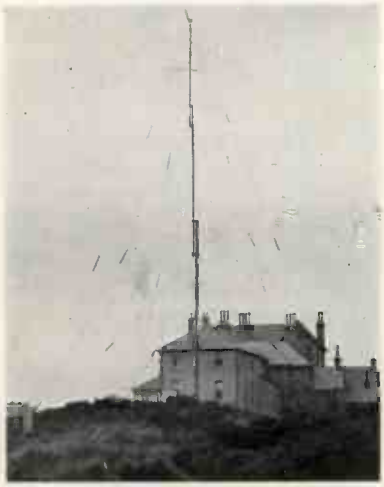
> upright wires. By this simple, but extraordinarily effective method, he raised the power of radiation in the electric forces a hundredfold."

Professor Slaby afterwards became one of Mr. Marconi's competitors, being a partner in the Slaby-Arco system which was adopted by the German Government, but he has probably never ceased to appreciate the debt he owed to the demonstration of Mr. Marconi's success in a field where he, himself, had been baffled.

Continuing his experiments, Mr. Marconi, in July, 1897, under the auspices of the Italian Government, transmitted messages between warships at Spezia, twelve miles apart. Shortly afterwards he erected stations at Alum Bay in the Isle of Wight, and at Bournemouth (subsequently removed to Poole), fourteen miles distant from Alum Bay, over sea. Many important experiments were made between these two stations, which were visited by several notable people, including Lord Tennyson and Lord Kelvin, the latter signifying his appreciation of the commercial possibilities of the service by paying for wireless telegraphic messages

sent by him to Sir William Preece at the General Post Office, and others.

By this time the system had reached the stage at which the fourth link in the chain of development was required. Capital was, of course, necessary to realise



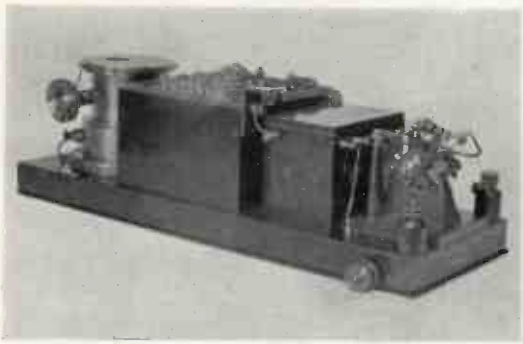
MARCONI STATION, POOLE HARBOUR.

the commercial benefits of wireless telegraphy on a large scale—to manufacture the instruments and develop the business generally, and in July, 1897, the Wireless Telegraph and Signal Company, Limited,

was formed, with a nominal capital of £100,000, to acquire Mr. Marconi's patents in all countries except Italy and her Dependencies. Mr. Marconi made a special arrangement with Italy in return for the substantial and enthusiastic assistance rendered to him by the Italian Government. Subsequently the name of the Company was altered to Marconi's Wireless Telegraph Company, Limited, and in April, 1905, the capital was increased to £500,000 in £1 Ordinary Shares. So rapid was the growth of the business that the capital was again increased—in April, 1908,—when it was raised to £750,000 by the creation of 250,000 Seven per cent. Cumulative Participating Preference Shares of £1 each.

For some time, of course, the Company had to continue the laborious pioneering work undertaken by Mr. Marconi. But it is interesting to survey the advance that had already been made since Mr. Marconi sent his first signals over distances of a few yards. The range had been increased from yards to miles; the receiving apparatus was much more reliable and under much better

control; that is to say, it was less likely to respond to stray electrical disturbances in the atmosphere and more likely to respond solely to the impulses intended to operate it. Mr. Marconi had proved that wireless telegraphy could be worked



PRESENT TYPE COHERER RECEIVER.

as well by night as by day, in fogs and storms as in fair weather, and that high hills or other obstructions did not prevent communication. It had also been shown that the apparatus was not costly and could be set up and handled by the ordinary telegraphist.

Very early in his experiments Mr. Marconi discovered that wireless signalling

was most easily carried out across stretches of sea. As it was precisely in such circumstances that ordinary telegraphic communication was least adequate, the sea was clearly the natural sphere of wireless telegraphy. The earliest demonstrations of its real practicability were, therefore, made around the shores of the British Isles.

In May, 1898, at the request of Lloyd's Corporation, who thus early realised the great possibilities of wireless telegraphy, Marconi apparatus was installed at Ballycastle and Rathlin Island, in the North of Ireland. The distance between the stations was $7\frac{1}{2}$ miles, of which 4 were over land and the remainder across the sea, a high cliff intervening between the two positions. Uninterrupted communication between these two stations was maintained for some considerable time. The apparatus was worked part of the time by Lloyd's lighthouse keepers, who were not long in learning how to use the instruments.

In July of the same year the Marconi Company was requested by a Dublin paper (the "Daily Express") to report,

from the high seas, the result and incidents of the Kingstown Regatta. For this purpose a land station was erected in the grounds of the Harbour Master at Kingstown, and the steamer "Flying Huntress" was chartered, the Marconi instruments being placed in the cabin. A telephone was fixed from the land station at Kingstown to the "Express" office in Dublin, and as the messages came from the vessel they were telephoned to Dublin and published in succeeding editions of the evening paper. The system was in use for several days and over 700 messages were sent and received between the "Flying Huntress" and the land station, none requiring to be repeated.

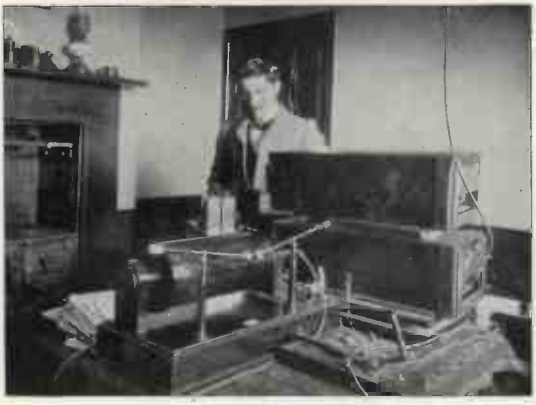
On the 3rd of August, 1898, wireless telegraphic communication was established between the Royal Yacht "Osborne" and Osborne House, Isle of Wight, in order that Her late Majesty Queen Victoria might communicate with His Royal Highness the Prince of Wales (now King Edward VII.) suffering from the results of an accident to his knee. Constant and uninterrupted communication was maintained between the Royal

Yacht and Osborne House during the sixteen days the system was in use. One hundred and fifty messages were sent, being chiefly private communications between the Queen and the Prince. Many of these messages contained over 150 words, and the average speed of transmission was about fifteen words per minute.

ROYAL YACHT "OSBORNE."

In December, 1898, the Marconi Company considered it desirable to demonstrate the practicability of the system for communication between lightships and the shore, and the opportunity was offered to the Company by the officials of Trinity House. They gave permission for connection to be made between the South Foreland Lighthouse and either the "Gull," the "South Sandhead," or the

"East Goodwin" Lightship. The vessel chosen was the most distant one, viz., the "East Goodwin," which is twelve miles from the South Foreland Lighthouse. The apparatus was taken out to the Lightship in an open boat, rigged up in



MARCONI APPARATUS AT THE SOUTH FORELAND LIGHTHOUSE.

one afternoon, and set to work immediately without the slightest difficulty. The system continued to work admirably through the whole time it remained in use—over two years—and it was the means of saving several vessels and a number of lives. In the case of one steamer which went ashore on the Goodwins, evidence in the Admiralty Court

proved that by means of one short wireless message, property to the value of £52,588 was saved.

During a heavy gale in January, 1899, when a part of the bulwarks of the "East Goodwin" Lightship was carried away, a report of the mishap was promptly telegraphed to the Superintendent of Trinity House with all details of the damage sustained. On the 3rd of March the same year, the lightship was run into by the sailing ship "R.M. Matthews." The incident was reported by wireless to the South Foreland Lighthouse, lifeboats were promptly launched, and the lightship was towed out of danger.

Dr. Fleming, after spending some time in examining the appliances and working, wrote a letter to the "Times" on the 3rd April, 1899, which gives a very graphic account of the achievements of wireless telegraphy at this period. The following are some extracts:—

> "During the last few days, I have been permitted to make a close examination of the apparatus and methods employed by Signor Marconi in his remarkable tele-

graphic experiments between South Foreland and Boulogne, and at the South Foreland Lighthouse have been allowed by the inventor to make experiments and transmit messages from the station there established, both to France and to the Lightship on the Goodwin Sands, which is equipped for sending and receiving ether wave signals. Throughout the period of my visit, messages, signals, congratulations, and jokes were freely exchanged between the operators sitting on either side of the Channel, and automatically printed down in telegraphic code signals on the ordinary paper slip at the rate of twelve or eighteen words a minute. Not once was there the slightest difficulty or delay in obtaining an instant reply to the signal sent."

"The apparatus, moreover, is ridiculously simple and not costly. With the exception of the flagstaff and 150 feet of vertical wire at each end, he can place on a small kitchen table the appliances, costing not more than £100 in all, for communicating across thirty or even a hundred miles of channel. With the same simple means he has placed a Lightship on the Goodwins in instant communication, day and night, with the South Foreland Lighthouse. A touch on a key on board the Lightship suffices to ring an electric bell in the room at the South Foreland, twelve

miles away, with the same ease and certainty with which one can summon the servant to one's bedroom at an hotel. An attendant now sleeps hard by the instruments at South Foreland. If at any moment he is awakened by the bell rung from the Lightship, he is able to ring up in return the Ramsgate lifeboat, and, if need be, direct it to the spot where its services are required, within a few seconds of the arrival of the call for help. In the presence of the enormous practical importance of this feat alone, and of the certainty with which communication can now be established between ship and shore without costly cable or wire, the scientific criticisms which have been launched by other inventors against Signor Marconi's methods have failed altogether in their appreciation of the practical significance of the results he has brought about."

"Up to the present time none of the other systems of wireless telegraphy employing electric or magnetic agencies has been able to accomplish the same results over equal distances. Without denying that much remains yet to be attained, or that the same may not be effected in other ways, it is impossible for anyone to witness the South Foreland and Boulogne experiments without coming to the conclusion that neither captious criticism nor official lethargy should stand in the way

of additional opportunities being afforded for a further extension of practical experiments. Wireless Telegraphy will not take the place of telegraphy with wires. Each has a special field of operations of its own, but the public have a right to ask that the fullest advantage shall be taken of that particular service which ether wave

telegraphy can now render in promoting the greater safety of those at sea, and that, in view of our enormous maritime interests, this country shall not permit itself to be outraced by others in the peaceful contest to apply the outcome of scientific

> investigations and discoveries in every possible direction to the service of those who are obliged to face the perils of the sea. If scientific research has forged a fresh weapon with which in turn to fight Nature, "red in tooth and claw," all other questions fade into insignificance in comparison with the inquiry how we can take the utmost advantage of this addition to our resources."

The Marconi apparatus was eventually removed from the lightship, as the Board of Trade was not at that time prepared to enter into a contract with the Company.

Cross-Channel Communication.

Naturally enough, most of Mr. Marconi's attention was directed to increasing the range of transmission. He found that by raising his aerial masts he could send his messages further, but there was a limit to the practicable height of masts on land as well as on sea. Accordingly he devised, about this time, an improvement which made the receiver very much more sensitive than it had been. This improvement enabled the receiver to record messages much further away from the source of the waves. The results

obtained with it encouraged Mr. Marconi to attempt to communicate across the English Channel. Success was achieved in 1899, between the South Foreland and Boulogne stations referred to by Professor

MARCONI STATION, WIMEREUX (FRANCE).

Fleming in the letter quoted above, the distance between these two stations being thirty-two miles.

Nothing in the previous history of wireless telegraphy roused such keen

interest as the bridging of the Channel. It set the scientific world talking and filled the newspapers with descriptions, comments, and prophecies. In August, 1899, the British Association held its

INTERIOR OF MARCONI CABIN ON "TONGUE" LIGHTSHIP.

meeting at Dover; and during a lecture to the Association on "The Centenary of the Electric Current" (Volta had made his famous discovery of the Voltaic Cell in 1799), Professor Fleming exchanged messages between a temporary station in

the lecture hall and the South Foreland, Wimereux (Boulogne), and the East Goodwin Lightship—4, 33, and 12 miles distant respectively.

The next step was the transmission of messages between Wimereux and

INTERIOR OF MARCONI STATION, CHELMSFORD.

Chelmsford, a distance of 85 miles, 30 over sea and 55 over land.

The feasibility of wireless telegraphy over land was also demonstrated by experiments between the Chelmsford Station and the one at Harwich, forty miles distant.

The Marconigraph

In November, 1899, a number of Marconi installations were despatched to South Africa at the request of the War Office, but owing to the difficulties of procuring suitable masts at the front, it was decided to transfer them to the Navy Squadron in Delagoa Bay, where they were used to such advantage that the Admiralty decided to make its first purchase of 32 sets from the Company.

Early Naval Experiments.

The Admiralty from the outset had been watching the progress of the experiments with interest. In August, 1899, the first attempt was made to use the new method of signalling during naval manœuvres. Three ships of the "B" fleet—the flagship "Alexandra" and the cruisers "Juno" and "Europa"—were fitted with wireless apparatus. Attached to the "Juno" was a small squadron of cruisers; and the method adopted was that messages sent to the "Juno" from the flagship by wireless telegraphy were repeated to the cruisers by the usual flag signalling. This arrangement enabled the flagship to control the movements of the squadron

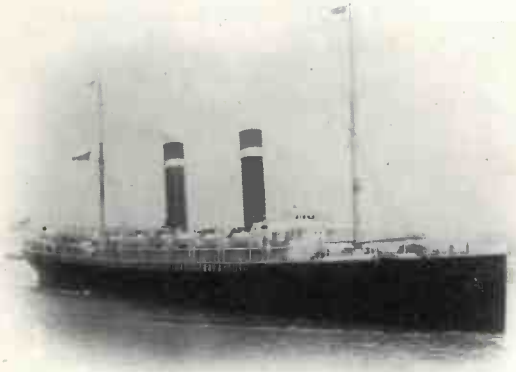
even when out of sight. The wireless installations were kept going night and day with results which convinced the Admiralty that wireless telegraphy was invaluable as an aid to manœuvres on a large scale. The greatest distance covered during these trials was 74 nautical miles —equivalent to 85 land miles.

Other Marine Experiments.

In October of the same year the Marconi system was used to report from the high seas the progress of the yachts "Shamrock" and "Columbia" in the International Yacht Race. Over 4,000 words were transmitted in the space of less than five hours spread over several days. After the conclusion of this race some tests were carried out by the United States Government, the apparatus being fitted on the battleship "Massachusetts" and the cruiser "New York."

A beginning was also made during this eventful year with the "ocean newspapers" which are now familiar to travellers by the great liners. Shortly after the outbreak of the South African War, Mr. Marconi was returning from the United

States on board the American liner "St. Paul" and as he had a set of apparatus with him, it was suggested that it should be fitted up in the ship in an attempt to establish communication with Mr. Marconi's installation at the Needles, Isle of

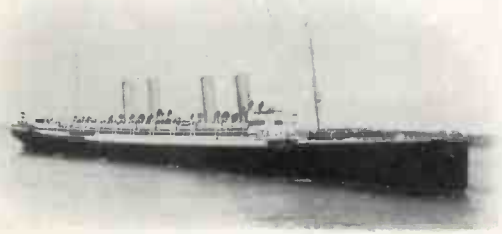


S.S. "ST. PAUL."

Wight, and obtain the latest war news before the arrival of the "St. Paul" at Southampton. This was accordingly done and the "St. Paul" succeeded in calling up the Needles station at a distance of 66 nautical miles. All the important news was transmitted to the "St. Paul" while she was steaming 20 knots, and messages were also despatched to several places by passengers on board. The news was col-

lected and printed in a small paper called the "Trans-Atlantic Times" several hours before the vessel arrived at Southampton.

In March, 1900, the Marconi system was adopted by the Norddeutscher Lloyd



S.S. "KAISER WILHELM DER GROSSE."

Steamship Company, and by agreement with that Company the Marconi apparatus was installed on the "Kaiser Wilhelm der Grosse," on the "Borkum Riff" Lightship and at the Borkum Lighthouse. According to the official report of the Imperial Postal Authorities at Oldenburg, the total number of commercial wireless telegrams transmitted from and to the "Borkum" Lightship between the 15th May and the end of October, 1900, amounted to 565. Of these, 515 came from ships at sea, and 47 were for transmission to ships. There are now 17 vessels of the Norddeutscher Lloyd equipped with Marconi apparatus.

The Marconigraph

In November, 1900, the Belgian Royal Mail Steam Packet "Princesse Clementine," plying between Ostend and Dover, was equipped with wireless telegraphy, and a Marconi station was installed at La Panne, near Ostend, on the Belgian Coast. These installations have frequently proved of great value in saving life and property. On New Year's Day, 1901, the barque "Medora" was stranded, waterlogged, on the Ratel Bank. The "Princesse Clementine" which happened to pass near, at once sent a message to Ostend through the La Panne Station, and before leaving was able to tell the shipwrecked sailors that assistance was on the way.

Shortly afterwards, upon coming into signalling distance of the Roytengen Lightship, about 15½ miles from Dunkirk, the captain of the "Princesse Clementine" observed that he was being signalled. It appeared that the lighting apparatus of the lightship was out of order. The captain of the mail packet at once despatched a message *via* the La Panne station, to the Lighthouse Department at Dunkirk, which immediately sent out to the lightship and effected the necessary

repairs. The great inconvenience and danger of the lightship not being able to have its lights exhibited was thus avoided.

MARCONI STATION AT LA PANNE.

Considerable use was also made of the Marconi System in the British cruisers attached to the "Ophir" during the voyage of the Duke and Duchess of Cornwall to Australia in 1901.

Thus ends what we may term the early history of the Marconi System of Wireless Telegraphy.

The Growth of the Maritime Service.

The pre-eminent position held by the Marconi Company in wireless telegraphy is primarily due to the remarkable skill and inventiveness of Mr. Marconi, but it is also due, in no inconsiderable degree, to the exceptional commercial policy adopted by the Company.

This is a point not adequately understood by many of the people who took part in the controversies which once raged round the rival systems of wireless telegraphy.

The distinguishing point about the Marconi Company is that it was the first —and for many years the only company in the world—to organise A PUBLIC BUSINESS IN THE TRANSMISSION OF MESSAGES BY WIRELESS TELEGRAPHY. This is a very important point. The Marconi Company began—as other wireless telegraph companies began and continued — by simply manufacturing wireless apparatus and selling it outright to shipowners and

others who wanted to use it. This was done, for instance, in the case of the installations supplied to the "Kaiser Wilhelm der Grosse," and to the Dover-Ostend packet boats. It soon became clear to the Marconi Company, however, that no satisfactory or extensive business could be done by asking shipowners to purchase apparatus outright and to organise a public service. The Company accordingly decided to adopt the bold policy of organising the service on its own account.

Three things were necessary to the efficiency of such a service. First, the provision of land stations adjacent to the chief trade routes; second, the equipment of vessels with wireless apparatus and, third, but by no means least, the working of both ship and shore stations by operators trained to obey the same rules and regulations. These are the lines upon which the Marconi Company rapidly built up a most useful and successful service on the high seas. In each case the apparatus installed on the ships remained the property of the Company and was worked by the Company's own operators.

With uniform control confusion was prevented and the service brought to the highest pitch of usefulness.

MARCONI STATION, NORTH FORELAND.

In order to carry out this pioneering work the Marconi International Marine Communication Company, Limited, was formed (in 1900) with a capital of £350,000. It is empowered to work the Marconi system for maritime purposes

everywhere except in the United States and its Colonies, Hawaii and Chili. In Great Britain and Italy the license does not extend to naval vessels.

At this period it was open to anyone to erect a wireless telegraph station any-

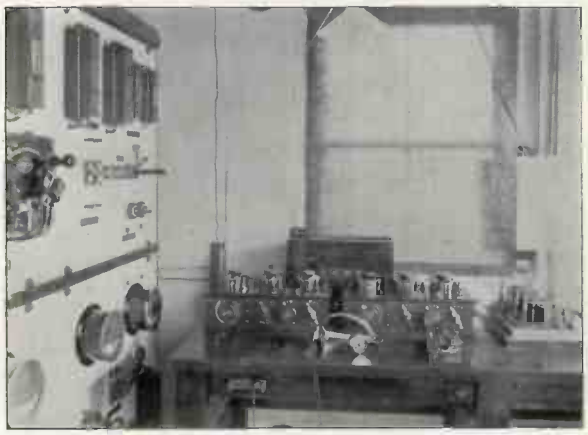
MARCONI STATION, MALIN HEAD.

where in the British Isles to communicate with a ship outside the three-mile limit reserved by the Postmaster-General under his power of monopoly. No license of any kind was then required for this class of enterprise. The Marconi Company at once proceeded to erect stations, and in May, 1901, the following were open for

commercial telegraphic communication with ships at sea :—

In Ireland :—Crookhaven, Malin Head, and Rosslare.

In England: – Holyhead, Withernsea, Caister, Lizard, Niton (Isle of Wight), and the North Foreland.



BOLT HEAD STATION, INTERIOR.

The first British ship to be fitted with wireless telegraphy under this system was the Beaver Line steamship "Lake Champlain," in May, 1901. The organisation was soon widely extended by agreement with the Italian, Canadian, Belgian and Newfoundland Governments. In 1901, a fourteen years' contract was entered into

with the Corporation of Lloyds, providing for the installation of Marconi apparatus in ten of Lloyd's signal stations. The result was that Marconi Telegraphy soon established itself over a large portion of the globe, and is now an important factor in civilisation. Installations have been set up, not piecemeal, but on a comprehensive system, which resembles very nearly a telephone system, of which the ships are the subscribers and the shore stations the exchanges.

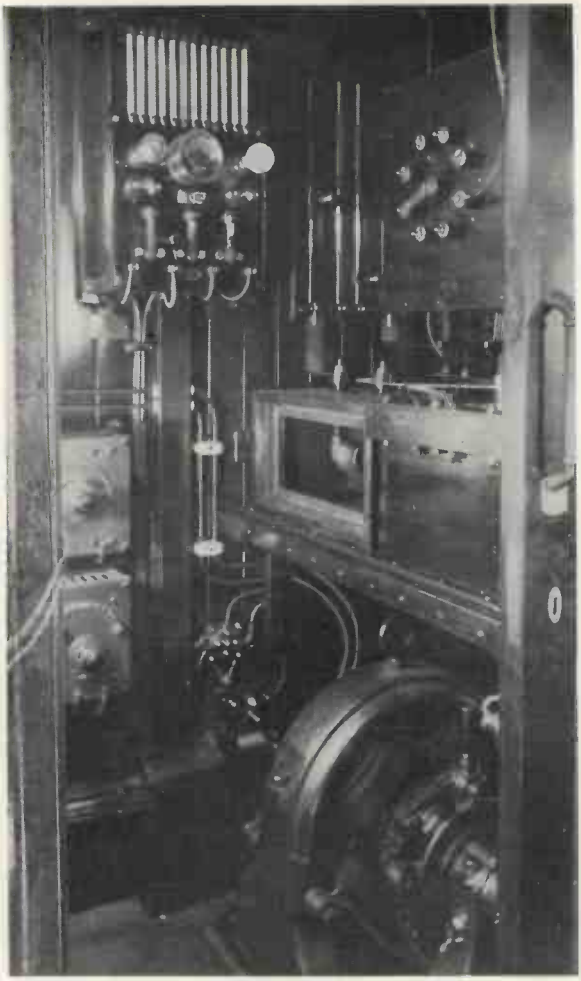
It was not long before other shipowners took advantage of the wireless exchange offered to them. The Cunard Company, as befitted one of the oldest, and at the same time most enterprising Shipping Companies, was amongst the first to adopt the system in their largest Atlantic liners; and early in 1902, an agreement was made with the Belgian Government for the installation of the apparatus on all the Ostend-Dover Royal Mail Steam Packets.

While this growth in organisation was proceeding, Mr. Marconi was rapidly improving the range and certainty of transmission. The distance over which messages could be sent at sea rose from

tens to hundreds of miles, and later—when the long distance stations at Poldhu and Cape Cod were established—to over 1,000 miles. The isolation of ocean voyages on the great liners thus became a thing of the past. Messages could be received at any time from the stations on one side or other of the Atlantic, and from any of the vessels passing within a hundred or two hundred miles.

This development led to the establishment, in June, 1904, of a regular news service on board the Atlantic liners—following the plan adopted on the "St. Paul," at the outbreak of the South African War. The Cunard liner "Campania" was the first vessel to be equipped with long-distance receiving apparatus, which enabled messages to be recorded over 1,000 miles, from the sending station. Other liners soon followed suit; and the regular items of news transmitted from the English, American, and Canadian long-distance stations were published day by day in the "Cunard Bulletin."

There are now 194 ships of the Mercantile Marine and 89 shore stations equipped with Marconi apparatus.

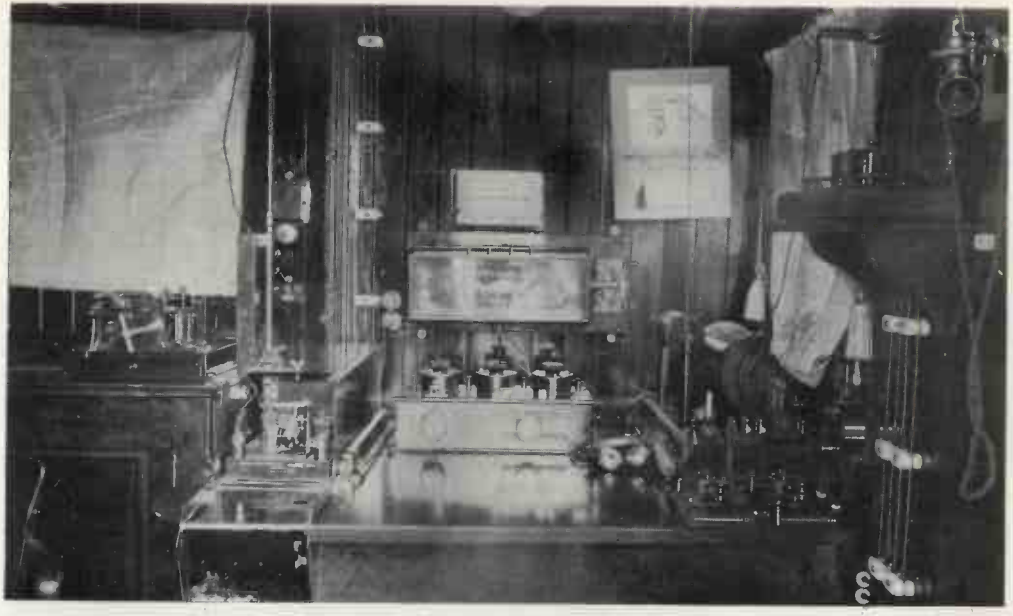


INTERIOR OF MARCONI CABIN ON S.S. "LUSITANIA."

Transatlantic Wireless Telegraphy.

In 1900—that is to say, five years after he had made his first experiments in the garden at Pontecchio—Mr. Marconi had raised the range of transmission by wireless telegraphy to over 200 miles. It was inevitable, therefore, that he should expect to increase the range still further and to bridge the Atlantic as he had bridged the Channel.

Pessimistic prophets were not slow to declare such a feat to be impossible. They confidently predicted that the curvature of the earth would prevent the electric wave from England being detected in America, unless the aerials from which the waves were despatched exceeded several miles in height. They also declared that the tremendously powerful waves from the long-distance station would swamp the feebler waves from the ordinary ship and shore stations, just as thunder drowns the noises of every-day life.



INTERIOR OF MARCONI CABIN ON S.S. "LUSITANIA."

Taking the latter point first, Mr. Marconi had good reason for believing that the prophets were mistaken. He had already developed his "tuning" or syntonic system so far that he felt sure the traffic between ships and shore stations would not be disturbed by the thunders of his long-distance stations. His earliest receiving instruments had been sensitive to practically every kind of electric wave; but his later instruments were designed to respond only to waves of a certain amplitude. A tuning fork will start vibrating if an exactly similar tuning fork in its vicinity is struck, but it will not resonate even to a thunderclap unless the note of the clap is of the proper pitch. A similar power of selection is enjoyed by the tuned or syntonic wireless apparatus. Mr. Marconi proved that the long-distance station at Poldhu could send messages to a Cunard liner several hundreds of miles out at sea without affecting the messages sent from a neighbouring station to a ship approaching Southampton Water.

As regards the obstacle presented by the curvature of the earth, that proved to be a bogey, like Professor Airy's famous

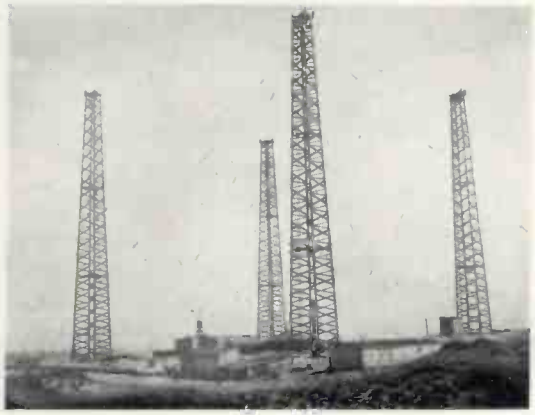
pronouncement, fifty years ago, that an Atlantic cable could never be laid, and, if laid, could never be used for the transmission of electric signals.

Mr. Marconi convinced himself, by tests made between two stations two hundred miles distant, that the electric waves he was employing were able to make their way round the curvature of the earth. He concluded that the curvature of the earth was not likely to constitute a barrier to the transmission of the waves over great distances. In 1900, therefore, experiments in transatlantic transmission were begun in earnest at Poldhu. Shortly afterwards the erection of a similar transatlantic station was begun at Cape Cod in the United States of America.

Towards the end of 1901 the station at Poldhu was far enough advanced to try the experiment of transmitting signals right across the ocean.

The completion of the arrangements was, however, delayed owing to a storm which wrecked the masts and aerial at Poldhu on 18th September, 1901.

Nevertheless by the end of November the aerial was sufficiently restored to enable Mr. Marconi to complete the preliminary tests which he considered necessary prior to making the first experiment across the Atlantic.



MARCONI STATION, CAPE COD, U.S.A.

Another accident—in this instance to the masts at Cape Cod on the 24th November, 1901,—seemed likely to postpone the tests for several months more. Mr. Marconi therefore decided that in the meantime he would use a purely temporary receiving

installation in Newfoundland for the purpose of testing how far the arrangements in Cornwall had been conducted on right lines. He accordingly left for Newfoundland on 27th November, 1901, with two assistants. As it was impossible at that time of the year to set up a permanent installation with poles, Mr. Marconi de-

ELEVATING AERIAL AT ST. JOHN'S (N.F.) FOR FIRST TRANSATLANTIC EXPERIMENTS.

cided to carry out the experiments by means of receivers connected to elevated wires supported by balloons or kites—a system which had been previously used by him when conducting tests across the British Channel for the Post Office in 1897. He also employed a telephonic receiver which registered the messages by means of a series of clicks.

The Marconigraph

Mr. Marconi's assistants at Poldhu had received instructions to send on and after the 11th of December, during certain hours every day, a succession of "S's," followed by a short message. In the Morse code the letter "S" is represented by three successive dots.

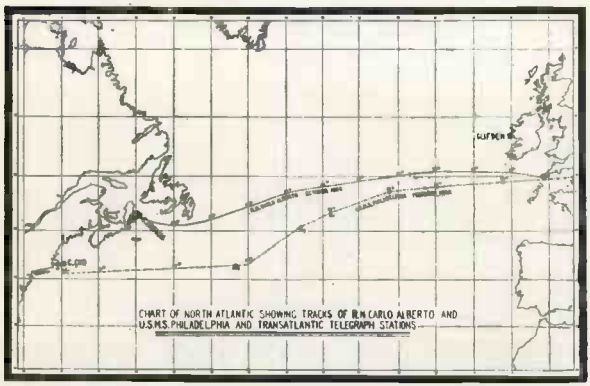
On December 12th the signals transmitted from Cornwall were clearly received at the pre-arranged times, in many cases a succession of "S's" being heard distinctly, although probably in consequence of the weakness of the signals and the constant variations in the height of the receiving aerial no actual message could be deciphered.

The result obtained, although achieved with very imperfect temporary apparatus, was sufficient to convince Mr. Marconi that by means of permanent stations (that is, stations not dependent on kites or balloons for sustaining the elevated conductor) and by the employment of more power in the transmitters it would be possible to send messages across the Atlantic Ocean with the same facility with which they were being sent over much shorter distances.

The Marconigraph

In February, 1902, further tests were carried out between Poldhu and a receiving station on board the American liner "Philadelphia" en route from Southampton to New York.

Readable messages were received from Poldhu up to a distance of 1,551 miles;



"S's" and other test letters were detected as far as 2,099 miles.

The distances at which the messages were received are all verified and countersigned by the Captain and Chief Officer of the ship, who were present during the tests.

The Marconigraph

Early in 1902 modifications and improvements were carried out at Poldhu, wooden towers being erected to replace

TOWERS AT MARCONI STATION, POLDHU.

the masts, and at the same time a high-power station was commenced at Cape Breton (Nova Scotia) to enable Mr. Marconi to carry out further tests. These tests were greatly facilitated by the subsidy of

£16,000 granted by the Canadian Government to support Mr. Marconi's experiments.

MARCONI STATION, CAPE BRETON.

During the time that constructional work was in progress at Glace Bay, Cape Breton, tests from Poldhu were carried out over considerable distances, the Italian Government very kindly placing the cruiser "Carlo Alberto" at Mr. Marconi's disposal for this purpose.

During these tests messages were received direct from Cornwall by the "Carlo Alberto" in the Baltic, the North Sea, the Bay of Biscay; also at Ferrol, Kiel, Cadiz, Gibraltar and Spezia.

THE ITALIAN CRUISER "CARLO ALBERTO."
(Placed at the disposal of Mr. Marconi for experimental purposes.)

After these experiments the "Carlo Alberto" was sent back from the Mediterranean to Plymouth and thence conveyed Mr. Marconi to Canada in October, 1902. Signals from Poldhu were received

throughout the voyage up to a distance of 2,300 miles. In December, 1902, messages were for the first time exchanged at night between the stations at Poldhu and Glace Bay. Transatlantic wireless telegraphy was then a definitely accomplished fact. It was found, however, that communi-

cation was exceedingly difficult and unreliable from England to Canada, whilst it was good in the opposite direction. The reason for this is that the Glace Bay station was equipped with more powerful and more expensive machinery, a condition rendered possible by the subsidy granted by the Canadian Government.

As, however, communication had been established by wireless telegraphy from Canada to England, inaugural messages were despatched to the Sovereigns of England and Italy, both of whom had previously given Mr. Marconi much assistance and encouragement in his work. Their replies attested their appreciation of the results which had been achieved. Other messages were also sent to England by the Government of Canada. Officers delegated by the Italian Government and a representative of the London "Times" were present at the transmission of these messages.

Further tests were shortly afterwards carried out with the other long-distance station at Cape Cod in the United States of America. A message from President Roosevelt was transmitted from that station to His Majesty the King in London.

In the spring of 1903 the transmission of news messages from America to the London "Times" was attempted in order to demonstrate that messages could be sent from America by means of the new method; and for a time these messages were correctly received and published. A break-

down in the insulation of the apparatus at Glace Bay made it necessary, however, to suspend the service; and unfortunately further accidents made the transmission of messages uncertain and unreliable. In consequence it was decided not to attempt, for the time being, the transmission of any more public messages until a reliable service could be maintained in both directions under all ordinary conditions.

As Mr. Marconi found that many improvements evolved during the course of the numerous tests and experiments could not be readily applied to the plants at Poldhu and Cape Breton, it was decided to erect a completely new long-distance station in Ireland, and to transport the one at Glace Bay to a different site in the vicinity, where sufficient land was available for experimenting with aerials of much larger dimensions than had been previously employed.

Experiments were, however, continued at Poldhu. In October, 1903, it became possible to supply the Cunard steamship "Lucania" with news transmitted direct from the shore during the entire crossing from New York to Liverpool.

In November of the same year tests, similar to those carried out with the Italian cruiser, took place on behalf of the British Admiralty between Poldhu and H.M.S. "Duncan." Communication with Poldhu was maintained during the entire cruise of this battleship from Portsmouth to Gibraltar, and further communication was established between Poldhu and the Admiralty station situated on the Rock of Gibraltar. The distance between Cornwall and Gibraltar is 1,000 miles—500 over land and 500 over water.

Early in 1905 the construction of the new station at Glace Bay was sufficiently advanced to allow of preliminary tests being carried out. Signals and messages from this station were received at Poldhu by day as well as by night, but no commercial use of the station was made at that time, because the corresponding station on the same plan had not yet been erected in Ireland. In October, 1905, however, preparations were made for the construction of a transatlantic station near Clifden, in Galway. Considerable delays were experienced in the course of the work, and it was not until the end of May, 1907, that the

station was ready for experiments with Glace Bay.

Good signals were obtained at Glace Bay from the very commencement of the tests, but some difficulty was encountered

GLACE BAY STATION.

in consequence of the effects of atmospheric electricity, due to the prevalence of thunderstorms in the eastern part of Canada during the first few days of the tests.

Simultaneously with these tests others were carried out from Poldhu to Glace Bay with a new system of transmitting

apparatus. The signals from Poldhu were so much better than those from Clifden that Mr. Marconi decided to at once adopt this new method of transmission at Clifden and Glace Bay. A few tests with this apparatus were carried out between Glace

RECEIVING ROOM, CLIFDEN STATION.

Bay and Clifden, and on October 17th, 1907, a limited service for press messages was commenced between Great Britain and America. On February 3rd, 1908, this service was extended to ordinary messages between London and Montreal.

The stations at Clifden and Glace Bay are not complete and the necessary duplication of the running machinery has not

yet been executed, but nevertheless communication across the Atlantic has never been interrupted for more than a few hours since the commencement of commercial working on the 17th October, 1907.

Considering the novelty and the peculiar difficulties of such an enterprise, the time

LIGHT RAILWAY AT THE CLIFDEN STATION.

occupied in establishing a wireless telegraph service across the Atlantic was by no means excessive. It was, indeed, remarkable that success was achieved in so short a time. Numerous problems had to be solved "by-the-way" as it were, and many entirely new devices had to be erected at considerable expense before the efficacy

could be determined. An important novelty introduced at both Glace Bay and Clifden was the "directional aerial." By arranging the aerial wires in a particular way Mr. Marconi was able to concentrate the electric waves mainly along the direct path between the two stations.

This arrangement secured more certain transmission with a smaller expenditure of power, while limiting the area of possible disturbances with or by other wireless stations.

The Future of Wireless Telegraphy.

Considering that wireless telegraphy is only thirteen years old, the remarkable advance which it has made during that short period will discourage any attempt to fix limits to its application. Already it has become a vital aid to the safety of shipping and an instrument of ever-increasing value to commercial and social life. It has provided a new factor in offensive and defensive warfare; and it has, generally, opened up the prospect that communication between nations will become much more cheap and easy than at present.

As time goes on, more and more ships of the mercantile marine will be equipped with wireless telegraphy until such installations become recognised as necessary to the safety and up-to-date working of a ship. Parallel with this development there is certain to be an increase in the number

PORTABLE TRANSMITTING AND RECEIVING APPARATUS.

of installations on land and on lightships, lighthouses and other points of importance to the safety of shipping.

In the British Navy every battleship and cruiser is fitted with Marconi apparatus, and the service has recently been extended to destroyers. The rapid and carefully planned evolutions over an extended area—characteristic of modern naval warfare—would hardly be possible without the power of communication by wireless telegraphy. In military operations also wireless telegraphy is being more largely used. The Marconi Company has designed portable apparatus for this purpose, capable of being carried on horseback or in carts, which can be set up in from ten minutes to half an hour after arrival at the site.

For inland telegraph work wireless telegraphy has already been used to a considerable extent by the Italian Government, and in the case of two sets of experimental stations by the British Post Office. Marconi apparatus was installed at Tobermory and Loch Boisdale for the handling of ordinary telegraphic business,

and the results have been so satisfactory that a station has recently been erected

AN ITALIAN AUTOMOBILE STATION.

at Bolt Head in Devonshire, which is considered to be one of the best equipped small power stations in existence. It has a range of 300 miles, and has been

opened by the British Post Office for a public telegraph service with ships at sea. Wireless stations will probably be used a great deal in situations where the hills, deep channels or the prevalence of storms make the use of land lines difficult.

Commercial transatlantic communication having been established with so much success, it is bound to develop rapidly in usefulness. As to how far the wireless service will compete with the cable service views greatly differ, but the general trend of independent opinion seems to be that the wireless service will create much more new traffic for social and press purposes than it will take from the cables. In other words, wireless and cable telegraphy will be co-operative rather than competitive.

In 1903, when the immense importance of wireless telegraphy in maritime and general international affairs began to be realised, the Emperor of Germany invited the other great powers to a preliminary conference to consider the question of international control. Great Britain sent delegates to that conference, but it was

unable to subscribe to the resolutions for supervising wireless telegraphy, since at that time the Government had not assumed powers to control wireless telegraphy within its own territory. In 1904, however, the Wireless Telegraphy Act was passed, making it compulsory upon anyone desiring to erect and work a wireless station in the British Isles to apply to the Postmaster-General for a license. When, in 1906, a second international conference was held, Great Britain agreed with all the other great Powers, with the exception of Italy, that wireless telegraph stations on land and on sea should be subject to certain international regulations, and that each station must receive and transmit all messages irrespective of the system adopted by the station which is sending the messages to it or is intended to receive the messages. The Select Committee of the House of Commons, which was appointed to consider the advisability of Great Britain ratifying this Convention, reported in favour of it, and recommended that, in recognition of the valuable work already done by the Marconi Company as the pioneers of practical wireless telegraphy, the Company should be compen-

sated in the event of its business being injuriously affected by the operation of the Radiotelegraphic Convention.

The establishment of Government supervision is perhaps the highest compliment which could be paid to wireless telegraphy —and, incidentally, to the Marconi Company. It represents the desire of other nations to secure for their own benefit the results of enterprise conducted by Mr. Marconi with the cordial support of the Italian, Canadian and British Governments.

The Business of the Marconi Companies

It may be convenient to summarise, in the briefest possible way, the enterprise now conducted by the Marconi Companies.

The business may be divided into three principal departments :—

1. Transatlantic Wireless Telegraphy.
2. Maritime or Ship-to-Ship and Ship-to-Shore Service.
3. Manufacture of Apparatus.

The first two of which have been already dealt with fully. In addition to the main departments the Company undertakes, at its Liverpool station, the training of operators. This work was organised in pursuance of the policy of uniform control which the Company adopted at the outset of its commercial career. No small amount of skill and intelligence is required to

work wireless telegraphic apparatus on the high seas, but the conditions are favourable enough to attract a good class of operator and there is no difficulty in securing a sufficient number of recruits.

INTERIOR LIVERPOOL SCHOOL.

Manufacture of Apparatus.

In 1898 the Company acquired a spacious factory at Chelmsford, in Essex, for the manufacture of the apparatus covered by Mr. Marconi's patents, and in addition large quantities of ordinary telegraph and general electrical apparatus are turned out every year.

MACHINE SHOP, CHELMSFORD WORKS.

MOUNTING SHOP, CHELMSFORD WORKS.

The Marconigraph

Over 500 wireless stations have been equipped by the Company and the number is constantly being added to. Considerable orders are received each year from the British Admiralty and Foreign Governments for wireless telegraph apparatus and accessories, and these, coupled with the demand arising from the Company's own shore and ship-stations, keep the works well employed.

Important contracts have already been executed for, and apparatus supplied to the following Governments:—

BRITISH (Admiralty, Post Office, Board of Trade and Trinity House).

CANADIAN.	BELGIAN.
NEWFOUNDLAND.	DUTCH.
ITALIAN.	CHILIAN.
UNITED STATES.	BRAZILIAN.
RUSSIAN.	CHINESE.

SIAMESE.

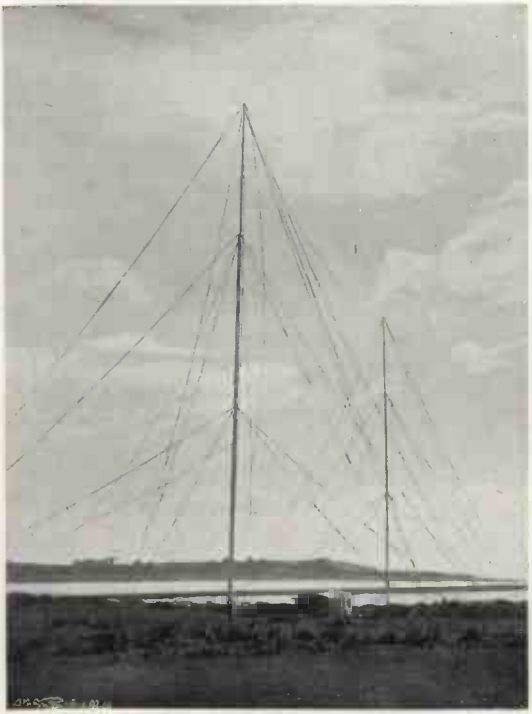
Affiliated Companies

The scope of the Company's operations is not confined to any particular country. In the most obvious application of wireless telegraphy, viz., for ship-to shore communication, the Telegraph System

MARCONI STATION, SEAGATE, U.S.A.

comprises coast stations in many different countries, and stations on ships of many different nationalities. Ships voyaging, for example, from Germany to the United States require to communicate with stations in the United Kingdom, on the Continent of Europe, and on the coast of North America. Also communication takes

place between the different liners at sea. It follows, therefore, that there must be uniformity, not merely of apparatus, but



MARCONI STATION, DEVONPORT, TASMANIA.

of method of working at all these stations. It was, therefore, considered advisable to have a number of Companies associated together, which would constitute a world-

wide organisation for wireless telegraph purposes, and with this view, certain Affiliated Companies have been established in other countries with which the parent Company has intimate working relations. Besides the Marconi International Marine Communication Co. Ltd., which was formed in April, 1900, Companies have been incorporated in the following countries:—

BELGIUM.	Incorporated 26th October, 1901. Capital, Frs. 600,000.
UNITED STATES.	Incor. 16th April, 1902. Capital, $6,650,000.
CANADA.	Incorporated 1st November, 1902. Capital, $5,000,000.
FRANCE.	Incorporated 24th April, 1903. Capital, Frs. 100,000.
ARGENTINE.	Incorporated 4th August, 1906. Capital, $6,750,000.

These Companies are not only engaged in carrying on the application of the Marconi system in the countries for which they have respectively acquired the patents, but they all co-operate for international purposes.

Agencies have also been established in:
ITALY (Rome). RUSSIA (St. Petersburg).
CHILI (Valparaiso). DENMARK (Copenhagen)
NORWAY (Christiania).

MARCONIGRAMS.

GENERAL INFORMATION.

Extension of Inland Telegraph Service to Ships at Sea.

The Transatlantic and other liners listed herein are, for several hours after sailing and before arrival, in direct telegraphic communication with one or other of the shore-stations of THE MARCONI INTERNATIONAL MARINE COMMUNICATION COMPANY, LIMITED, at Crookhaven, Rossiare, Malin Head, Liverpool, Lizard, Niton (I.O.W.) and Caister, shown in the diagram map, and thence with the land Telegraphs and International Cable Systems of the World.

Marconigrams Accepted at all Postal-Telegraph Offices.

Telegrams for transmission to ships at sea are accepted at all Postal Telegraph Offices in the United Kingdom, and at the Head Offices of the Marconi International Marine Communication Company, Limited, Watergate House, York Buildings, Adelphi, London, W.C.

Ordinary Charge for Transmission.

The charge for transmission of telegrams between any Postal Telegraph Office in the United Kingdom and ships at sea through the above-mentioned shore-stations is 10½d. a word, without minimum.

Deposit Accounts.

For the convenience of customers and to avoid the necessity of sending a remittance with each

Marconigram, as in the case, for example, of Long-distance messages sent by telegraph to the Company's Head Office (see p. 84), sums will be received on deposit and applied to the payment of Marconigrams.

When a Marconigram is received from a customer having a Deposit Account, the Account is debited with the charge for its transmission.

A Statement of the Account of a customer will be rendered periodically.

The Account may be closed at any time and the balance repaid to the customer.

Deposit Accounts may be opened at any time.

Addressing Telegrams.

Telegrams should be addressed: name of passenger, name of ship, name of shore-station through which it is desired that the telegram should be sent:

Example:—Brown,
Mauretania,
Crookhaven-Wireless-Station.

In the address the name of the shore-station is charged as one word only.

Special Service.

General or Special News will be supplied by the Company to individual passengers throughout a transatlantic voyage if so desired.

The Company will obtain and forward direct to passengers, by telegraph, such information as the results of sporting events, closing Stock Exchange Quotations, and the like, without charge other than the regular rate for the transmission of the messages, which is 10½d. a word for ordinary, and 3/- a word for Long-distance transmission.

Passengers desiring this service should notify the Company as early as possible before sailing.

The Marconigraph

Times of Ship and Shore Communication.

Sailing Lists of all ships having Marconi Telegraph Offices on board, showing the latest time after departure and the earliest time before arrival at which they are in communication with the various shore-stations are compiled, and supplied by the Marconi International Marine Communication Company to all Postal Telegraph Offices in the United Kingdom, to the leading Hotels in London, Liverpool, Southampton, Glasgow, and to the Steamship Companies and their agents, and may be seen at any time. Copies of these lists may be obtained free of charge on application at the Company's Head Office.

Approximate times that telegrams should reach the undermentioned shore-stations for direct transmission to the ships listed herein are given below:

Marconi Shore-Station.	Number of hours out from	Port of arrival or departure.
Liverpool	3	Liverpool
Rosslare	10	Liverpool
Crookhaven	29	Liverpool
Crookhaven	24	Southampton
Crookhaven	34	London
Crookhaven	22	Le Havre
Lizard	12	Le Havre
Lizard	13	Southampton
Lizard	24	London
Niton	13	London
Niton	6	Southampton
Niton	30	Rotterdam
Niton	30	Hamburg
Niton	30	Bremerhaven
Malin Head	18	Liverpool
Malin Head	9	Glasgow
Caister	4	London
Caister	13	Hamburg
Caister	12	Bremerhaven
Caister	8	Rotterdam

Re-Transmission of Telegrams.

Ships beyond the direct range of shore-stations can often be reached by re-transmission through other ships. For particulars of this service enquiry should be made of the Company at Watergate House.

Long-Distance Marconigrams.

All ships on the North Atlantic route marked with an asterisk, being fitted with special long-distance receivers, can be reached at any time during the voyage.

Telegrams destined for these ships must be forwarded through the Head Office of the Company. They may be either handed in direct by the sender or telegraphed from any part of the United Kingdom. When telegraphed, in addition to the name of the addressee and the ship for which they may be destined, telegrams must be addressed "care Expanse, London," and accompanied by a telegraphic Money Order (except when a customer has a Deposit Account), covering the transmission charge, which is 3/- a word, made payable to Cashier, Expanse.

The words "care Expanse, London," will not form part of the oversea telegram and therefore will neither be transmitted from the shore to the ship, nor charged for in respect of the oversea transmission.

The ordinary inland charge for the transmission of the telegram over the Post Office lines to the Company's Head Office must be prepaid by the sender.

North American Service of Affiliated Marconi Companies.

In the United States and Canada telegrams for transmission to ships at sea are accepted at

all offices of the Western Union Telegraph Company and Postal Telegraph-Cable Company, and at the Head Offices of the Marconi Wireless Telegraph Company of America, 27 William Street, New York, and Marconi Wireless Telegraph Company of Canada, 1724 Notre Dame Street, Montreal.

Coast Stations and Times of Communication.

The following list gives, approximately, the times at which telegrams may be sent through the principal shore stations of the American and Canadian Marconi Companies.

Marconi Shore-Station.	Number of hours out from.	Port of arrival or departure.
Seagate, L.I.	4	New York
Sagaponack, L.I.	8	New York
Siasconset, Mass.	14	New York
Cape Sable	28	New York
Sable Island	36	New York
South Wellfleet	6	Boston
Cape Sable	24	Boston
Sable Island	30	Boston
Sable Island	14	Halifax
Camperdown	6	Halifax

Ships sailing out of or destined for the ports of Montreal or Quebec communicate with the Gulf Shore Stations of the Canadian Marconi Company shown in the diagram map at times varying from 8 hours for Grosse Isle to 56 hours for Belle Isle. Intermediate times may be ascertained on enquiry at the Head Offices of the Canadian Company in Montreal, or the American Company in New York, or at any Postal or Western Union Telegraph Office.

Mediterranean Service.

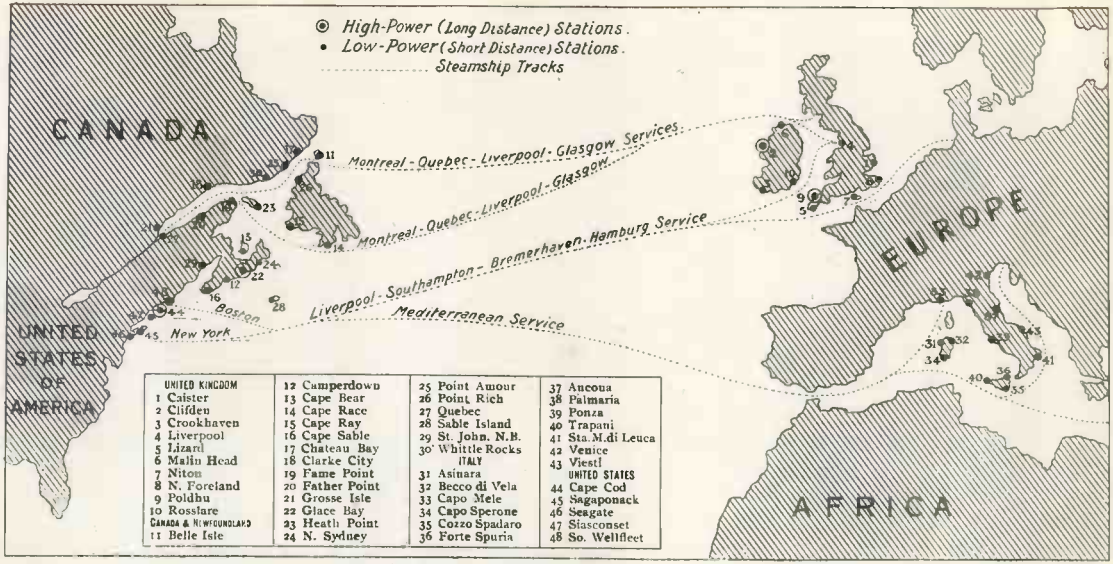
Telegrams destined for transmission through Marconi-Shore stations in the Mediterranean to passengers on ships in the Mediterranean Service, should be handed in at the Company's Head Office in London, or its Agency at Corso Vittorio Emanuele, 315, Rome.

Marconi Telegraph Offices on Shipboard.

Telegrams are accepted on board ship for transmission to all parts of the world through such ship or shore-stations as the vessel may pass.

Notices of expected communications will be found in prominent places on board.

Through rates can be obtained from the Pursers and Marconi operators on the ships.



Location of Shore Stations serving ships in the North Atlantic Trade.

List of MARCONI TELEGRAPH OFFICES on SHIPBOARD.

Ships marked with an Asterisk (*) are fitted with Special Long Distance Receivers.

Aberdeen Line—
- *Inanda
- *Inkosi

Allan Line—
- Corsican
- Grampian
- Hesperian
- Tunisian
- *Victorian
- *Virginian

American Line—
- New York
- Philadelphia
- St. Louis
- St. Paul

Anchor Line—
- Caledonia
- California
- Columbia
- Furnessia

Anglo-American Oil Company—
- Iroquois
- Narragansett
- Navahoe
- Tamarac

Atlantic Transport Line—
- Minneapolis
- Minnehaha
- Minnetonka
- Minnewaska

Austrian Lloyd—
- Thalia

Austro-American Line—
- Alice
- Argentina
- Francesca
- Laura
- Martha Washington
- Oceania
- Sofia Hohenberg

Batavier Line—
- Batavier II.
- Batavier III.
- Batavier IV.
- Batavier V.

Belgian Mail Packet—
- La Flandre
- La Rapide
- Leopold II.
- Marie Henriette
- Prince Albert
- Princesse Clementine
- Princesse Elizabeth
- Princesse Henriette
- Princesse Josephine
- Ville de Douvres

Booth Line—
- *Antony

Bowring Line—
- Florizel
- Rosalind

Canadian Pacific Railway—
- *Empress of Britain
- Empress of China
- Empress of India
- *Empress of Ireland
- Empress of Japan
- Lake Champlain
- Lake Erie
- Lake Manitoba
- Lake Michigan
- Milwaukee
- Monmouth
- Montcalm
- Montezuma
- Montfort
- Montreal
- Montrose
- Mount Royal
- Mount Temple

Cie Generale Transatlantique
- *Chicago
- La Bretagne
- La Gascogne
- *La Lorraine
- *La Provence
- *La Savoie
- La Touraine

Compagnie Cyprien Fabre—
- Germania
- Madonna
- Roma
- Venezia

Cunard Line—

*Campania
*Carmania
*Caronia
Carpathia
*Etruria
Ivernia
*Lucania
*Lusitania
*Mauretania
Pannonia
Saxonia
Slavonia
Ultonia
*Umbria

Dominion Line—

Canada
Dominion

Hamburg-American Line—

*Amerika
*Batavia
*Bluecher
*Bulgaria
*Cincinati
*Cleveland
*Deutschland
*Graf Waldersee
*Hamburg
*Kaiserin-Auguste-Victoria
*Moltke
*Patricia
*Pennsylvania
*President Grant
*President Lincoln
*Pretoria
*Prinz Adalbert
*Prinz Oskar

Holland-Amerika Line—

*Nieuw Amsterdam
*Noordam
*Potsdam
*Rotterdam
*Ryndam
*Statendam

Isle of Man Steam Packet Co.—

Ben My Chree
Empress Queen
Viking

Koninklijke Hollandsche Lloyd—

Frisia
Hollandia

La Veloce Line—

Amerika
Argentina
Brasile
Europa
Nord Amerika

Lloyd Italiano—

Cordova
Florida
Indiana
Lusiania
Mendoza
Principessa Mafalda
Virginia

Lloyd Sabaudo—

Principe di Piemonte
Re d'Italia
Regina d'Italia
Tomaso di Savoia

Navigazione-Generale-Italiana

Campania
Duca degli Abruzzi
Duca di Genova
Lazio
Liguria
Lombardia
Principe Umberto
Regina Elena
Re Vittorio
Sannio
Sardegna
Sicilia
Umbria

North German Lloyd—

Barbarossa
Berlin
Friedrich der Grosse
George Washington
Grosser Kurfurst
*Kaiser Wilhelm II.
*Kaiser Wilhelm der Grosse
Konig Albert
Konigin Luise
*Kronprinzessin Cecilie
*Kronprinz Wilhelm
Main
Neckar
Princessin Alice
Princessin Irene
Prinz Friedrich Wilhelm
Rhein

Peninsular and Oriental Steam Navigation Co.—

Malwa
Mantua
Morea

Red Star Line—

Finland
Kroonland
Lapland
Vaderland
Zeeland

Royal Mail Steam Packet Co.—

Amazon
Aragon
Araguaya
Asturias
Avon

SiculaAmericana—

San Giorgio
San Giovanni
San Guglielmo
San Guiseppi

Societa Di Navigazione Italia—

Ancona
Bologna
Siena
Taormina
Toscana
Verona

White Star Line

Adriatic
Arabic
Baltic
Canopic
Cedric
Celtic
Cretic
Cymric
Laurentic
Majestic
Megantic
Oceanic
Olympic
Romanic
Teutonic
Titanic

Wilson Line—

Aaro
Oslo

A List of the Vessels fitted with the Marconi System of Wireless Telegraphy since the above was compiled will be found on page 92.

By Royal Warrant.

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Supplementary List of Marconi Telegraph Offices on Shipboard.

Allan Line—

Carthaginian
Corinthian
Ioanian
Mongolian
Numidian
Parisian
Pretorian
Sardinian
Sicilian

American Line -

Haverford
Merion

Atlantic Transport Line—

Manitou
Marquette
Menominee
Mesaba

Cie Generale Transatlantique

Charles Roux
Guadeloupe
*La Champagne
*La Navarre
Perou

Donaldson Line--

Cassandra
Athenia
Saturnia

Hellenic Transatlantic Steam Navigation Co.—

Themistocles
Athinai

La Veloce Line—

Italia
Oceana
Savoia

Leyland Line—

National Steam Navigation Company Limited, of Greece—

*Patris

Navigazione Generale Italiana

Duca D'Aosta

Peninsular and Oriental Steam Navigation Co.—

China
Egypt
Salsette

Red Star Line—

Gothland
Samland

Rotterdamsche Lloyd—

Goentor
Karoi
Ophir
Rynjani
Sindoro
Tabanau
Tambora
Wilis

Societa Di Navigazione Italia—

Ravenna

Stoomvaart Maatschappy "Nederland"—

Grotius
Konig Willem II.
Konig Willem III.
Orange
Prinses Juliana
Rembrandt
Vondel

Thompson Line—

Tortona

White Star Line—

Afric
Athenic
Corinthic
Ionic
Medic
Persic
Runic
Suevic

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Passenger's Notes

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per le Communicazioni Marittime,
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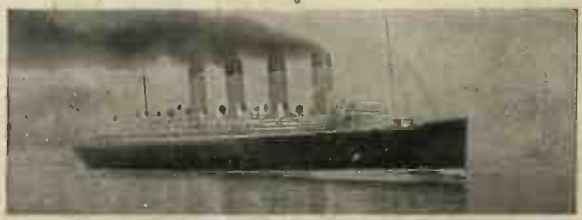

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