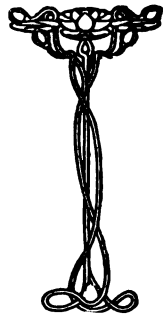
THE WIRELESS AGE



AUGUST, 1914

THE RADIO REVIEW

GODFREY ISAACS, Managing Director of the English Marconi Company, is quoted in London dispatches as saying that Mr. Marconi expects to be able to telephone from Carnarvon, Wales, to New York, before the end of the present year. This statement was made while testifying before the Dominions Royal Commission on Imperial Communications, and was followed by a query from Sir Rider Haggard as to whether it could be expected that the time would come when a subscriber could have a telephone in his house by which he could telephone all over the world. Mr. Isaacs answered that he would not like to go as far as this, for many difficulties would first have to be overcome; but it might be possible to go to a particular station in London and telephone to New York.

Telephony Predictions near Realization

Thus it is not only possible but probable that the feat of telephoning from Wales to New York will be accomplished before many months have passed. For some little time tests have been conducted between London and Chelmsford, twenty-nine miles apart, and, according to the dispatches, Mr. Marconi is authority for the statement that the telephone apparatus to be used in trans-Atlantic communication will soon be ready. Mr. Marconi does not make statements haphazardly, so it looks as if we shall soon see the fulfillment of the long-expected wireless telephoning between two countries, the wonder of which baffles ordinary intelligence.

WITH experiments so far advanced and unusual confidence in success expressed, one's thoughts naturally turn to the commercial possibilities of the wireless telephone, and first—in these days when we all stand in the shadow of the bugaboo of the high cost of living—is what will it cost to talk from New York to London? If it is to be compared to present-day cable telephone, it will be somewhat expensive. It now costs nearly one dollar a minute to telephone between London and Paris. The wireless telephone may have competition there. But it is rather well understood that a cable telephone between London and New York is an impossibility. There are now sixteen cables across the Atlantic, but not one spoken word can be heard. In attempting to telephone by cable

Cost and Type of Service

the sounds are distorted as the distance increases; with wireless the sounds of course become weaker, but the voice is not distorted.

The forthcoming wireless telephone service is not expected to be a public one, but full confidence is expressed that it will be possible for privileged persons. Nor is it likely that apparatus will be installed in private homes, although there could hardly be any physical objection to a millionaire having a private installation between his home and his office. The logical arrangement, and the one which will eventually be adopted no doubt, will consist of wire connections from offices direct into instruments located at the stations in London and New York.

The Globe Girdling Aerial Flight

WITH his ever-increasing activities Mr. Marconi has not neglected aviation, according to the reports of his recent conference with the Commissioner of Aeronautics of the Panama-Pacific Exposition.

The Commissioner, Mr. Arnold Kruckman, had a long conference with Mr. Marconi, who is enthusiastic over the prospects of the around-the-world flight. The inventor not only promised to help with wireless on the seas, but offered to place the entire world's wireless system at the disposal of competitors in the race. He has studied carefully the question of wireless assistance to overseas flyers with Hamel, when the distinguished English aviator was planning a cross-Atlantic flight. Hamel's disappearance while flying the English Channel put an untimely end to those plans. But the result of these calculations will be placed at the disposal of the commission.

Wireless Employment for Unfortunates

A LEPER in a colony on an island near New Bedford, Mass., has applied for a wireless license, and it is said he will have no difficulty in securing it. He has pursued his wireless studies with poor equipment during the five years he has been a member of the colony. Why does not this open the way to a possible use for the leper, now an outcast and a drone? There are government activities which require no communication with the outside world of a nature which threatens infection and yet do not leave the sufferer out of the processes of society. For example, many wireless stations on bleak coasts where settlements are impossible would be well cared for in the hands of those afflicted with the dread disease. A leper settlement with a physician in charge and telephone equipment to relay messages could give splendid service, several

inmates serving at the receiving and sending stations for a short period during the day or night.

Then there is that cable station in the Pacific where a dozen persons are on an island far from every inhabited region. Christmas Island's phosphate industry might offer similar opportunities. It would seem worthy of strenuous effort to find means of making happy the lives of these unfortunates; and no way promises greater possibilities in the discovery of some means of employment under government supervision which assures productivity, without the chance of infection and without the absolute isolation which is so fatal to human kind.

THE EDITOR.

Lawrence Prudhont

An Appreciation

Monument Erected in California to the Memory of an Unsung Hero of the Wireless Key

ON the first anniversary of the Rosecrans sea disaster, a monument to the memory of Marconi operator Lawrence A. Prudhont was unveiled at Venice, Cal. The granite shaft stands in the Rosedale Cemetery, but there is no grave. The body has never been recovered.

Behind this brief news item lies a story of noble self-sacrifice that others might live, and wonderful devotion to duty in the face of certain death. A blue-eyed boy of eighteen years had stood alone by his crackling wireless key and with the hungry waves clutching at his feet sent forth the plaintive appeal that brought succor to the vessel's storm-stricken crew. When the rescuers arrived, hours later and after a heartbreaking battle with the sea, Lawrence Prudhont could not be found.

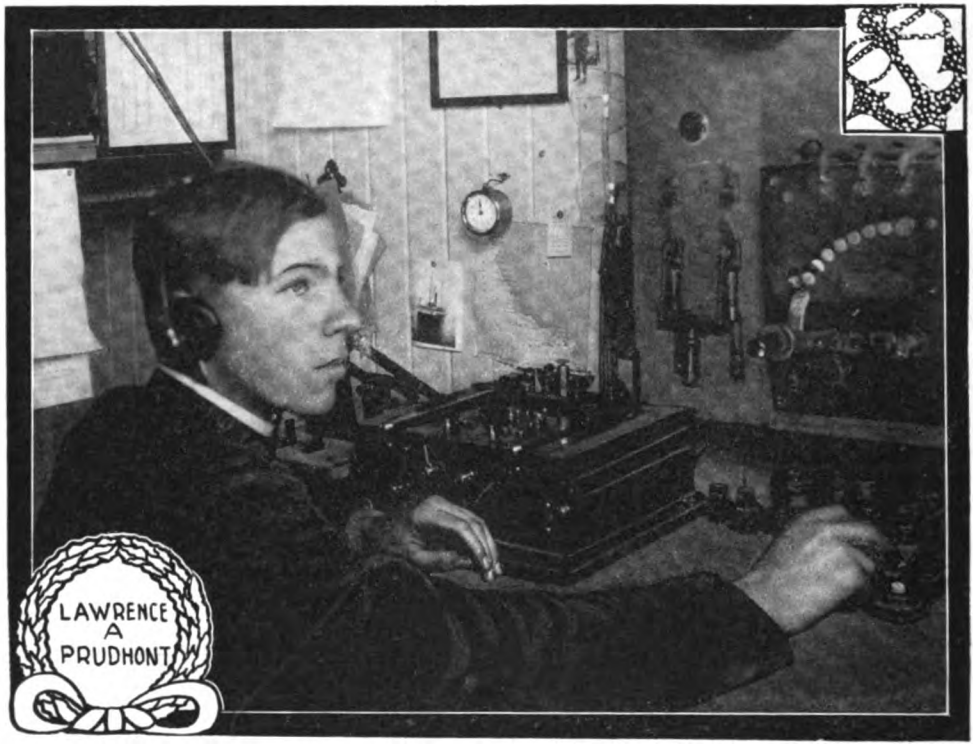
According to the survivors this hero of heroes, duty done, had been pinned between the wrecked pilot house and the vessel's rail, and when the ill-starred Rosecrans broke up, he was washed away and drowned. An immortal hero sleeps; unsung, almost unknown, but leaving behind a glorious memory of supreme devotion and undaunted courage. All men must feel an expansion of soul in the presence of calm courage such as this; and his example will ever prove a source of inspiration to his fellow wireless workers.

Little is known of the Rosecrans disaster. It was not a national tragedy with thousands of hearts pulsating and enormous crowds gathering about bulletin boards, searching through blinding tears for the names of loved ones, lost or saved. Thirty-three lives were lost. Thirty-three good seamen, snatched into oblivion on the morning of January 7, 1913, and a pitiful remainder of three brought safely ashore. None of them were well known; many left no family; so the

ocean tragedy was soon forgotten. A few public spirited citizens of California cherished the memory of Lawrence Prudhont, though, and a movement was started to secure funds for a memorial by popular subscription. It was also arranged to have his name inscribed on the wireless operators' memorial fountain to be erected in New York; and this will be done.

Far too little is known of this boy; not much about him can be told. But the one thing that invariably stands out when each new hero is made upholding the Marconi tradition, is particularly noticeable in the case of young Prudhont. That is, a perfect record. This is best shown by extracts from the reports of his superiors. One says: "The young man was single and of exceptional ability as a wireless operator; he was studious, honest, and in the very best of standing in the community." Another says: "Lawrence was a fine boy, a good, conscientious worker. I had a very high regard for Lawrence." The general superintendent of his division reported that "Operator Prudhont was a young, industrious and ambition operator; a credit to his profession."

Young Prudhont was a wireless operator from choice, and secured his position through determination and conscientious effort. A glimpse of his boyhood days will throw some light on how inevitable was his following of the sea and reveal interesting indications of strength of character manifested unusually early.



His father was a merchant on the ocean front at Venice, Cal., and the limitless spaces and mysterious tides of the sea drew Lawrence to the beach from childhood. The strength and restfulness which the great solitudes habitually impart to those who commune with them had taught him life's true perspective when, at seventeen, he combined another elemental love, electricity. Thus it was that his experiments with wireless quickly fostered a definite aim and purpose—to become a man-of-warsman in the United States Navy.

He had learned something of that branch of the service from embracing every opportunity to go on short voyages and while aboard permitted nothing of an electrical nature to escape his keen observation. He tried several times to enter the navy, but failed for lack of parental consent. Finally this was given, his father and mother deciding there was no other way to relieve him of his constant longing to enter the marine wireless field.

Passing his examination at Los Angeles, he left for San Francisco expecting to be stationed on a training ship at that port and to be later assigned to a warship. To his great surprise the exacting medicos at the Golden Gate turned him down. Rear Admiral Moore later advised his father that the boy had been rejected on account of valvular heart disease. Greatly disappointed, but not discouraged, Prudhont started back home. He stopped off at San Pedro en route, however, embraced the opportunity there given him to ship on the merchant steamer Yosemite and commenced the wireless career that was brought to such an untimely end.

Aside from the instruction gathered by questioning the mechanics of Venice, young Prudhont attended the Belden School in Los Angeles and the Marconi School in San Francisco. In January, 1913, he had gained the position of chief operator on the steamship Yale, running from San Diego to San Francisco. The vessel was put in dry dock for twelve days and the boy planned to go home on a vacation. He gave up this project when he was asked to make one trip on the Rosecrans as an accommodation to the company. When the Rosecrans went ashore only three of the thirty-six members of the crew were saved, and the boy who loved the sea was the last to leave the doomed vessel.

One of the most touching incidents connected with the preservation of the memory of Lawrence Prudhont's noble performance of duty occurred on the Memorial Day following his death. Five torpedo boats were stationed outside the breakwater at Venice and ushered in the day with a cannon salute. Services were held in the auditorium and at their conclusion the civic bodies and the school children formed in line and marched to the ocean front. A salute was fired from the naval militia and the torpedo boats and the children and adults tossed thousands of white carnations on the ocean in memory of Lawrence Prudhont, whose name will remain emblazoned throughout eternity among those who have gone to death in the sanctified cause of manliness and self-sacrifice.

SERVICE ITEMS

Henry F. Litaud, who has been employed in the traffic department of the Marconi Wireless Telegraph Company of America for the last fourteen months, has accepted a position in the traffic department of the English Marconi Company. He left New York for England on July 21 on the SS. Aquitania.

H. E. Jensen, an apprentice wireless operator of the Marconi Company, died at sea on the SS. United States on May 23. He had been in the service only twelve days.

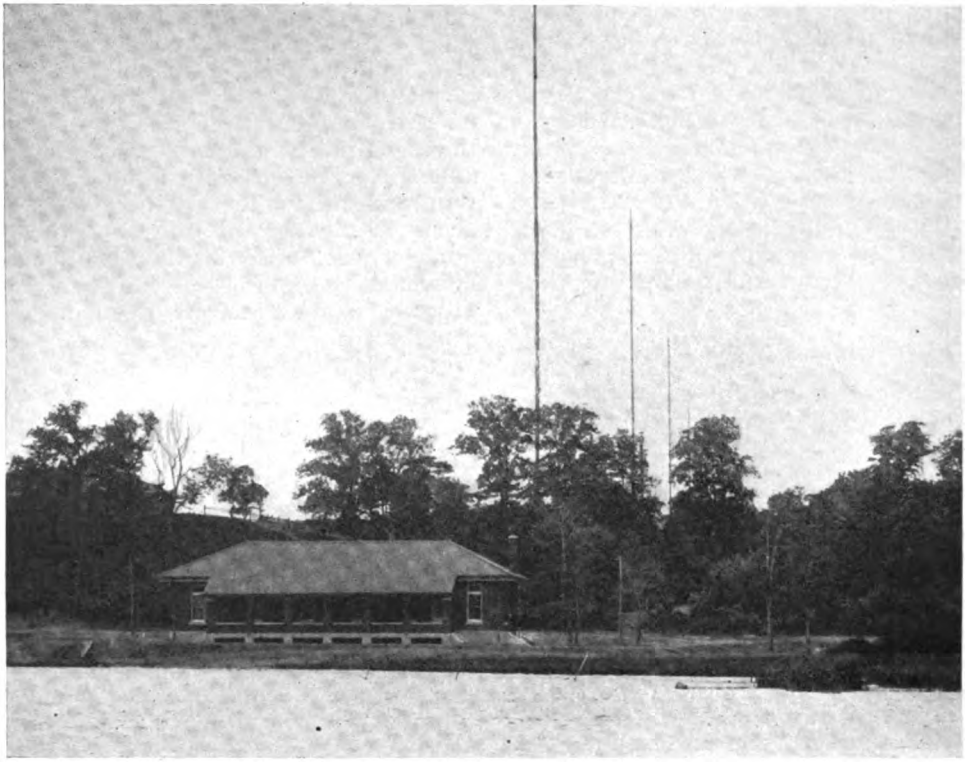
R. T. Jenssen, junior Marconi operator on the SS. Kristianiafjord, died in the Norwegian Hospital, New York City, on June 15.

The Austrian license of E. C. Werner, wireless operator, who deserted from the Patris at New York last October, has been cancelled.

S. de Winter has been appointed Pacific Coast representative of the Marconi Wireless Telegraph Company of Canada. He has opened an office at 651 Howe Office Building, 318 Richard street, Vancouver, B. C.

Charles Banta, junior operator on the City of Montgomery of the Savannah line, died from appendicitis on June 15 in Irvington, N. Y.

Among the July visitors to New York was W. H. Eccles, the English scientist whose investigations into static causes have won him the position of honorary secretary of the Committee for Radiotelegraphic Investigation, British Association for the Advancement of Science.

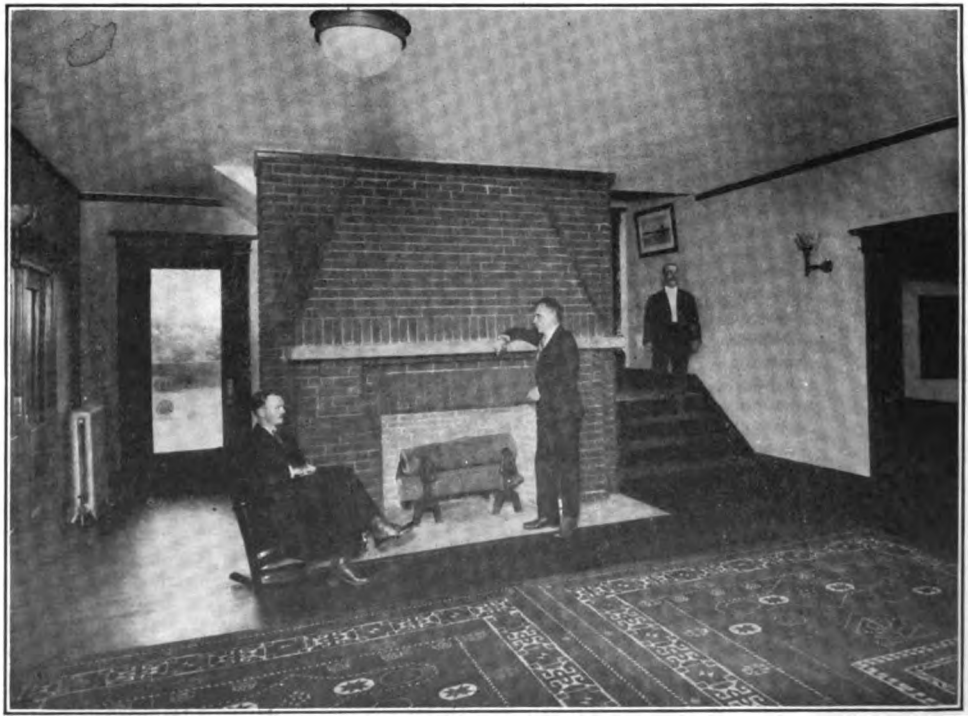


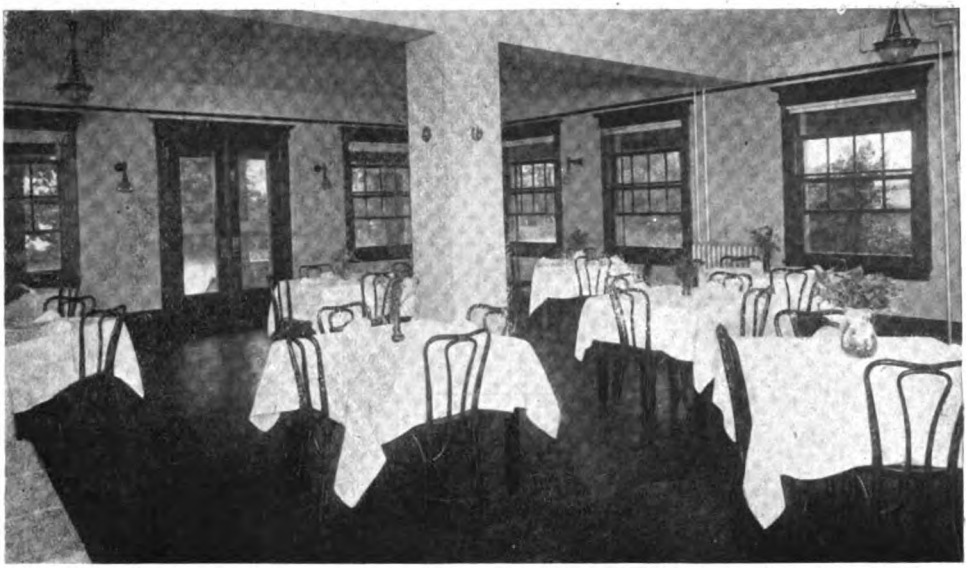
The Belmar Station

The illustration at the top of this page shows the operating building located at the water's edge at Belmar, N. J. The masts of this gigantic Marconi station, which appear in the background, are 300 feet high and the aerials carried on them stretch westward for almost a mile. It is here that the wireless messages which are soon to wing their way across the Atlantic from Wales will be received. The Belmar plant is one of the largest in the world and perhaps the most important link in the Marconi world-wide wireless chain. It has an equipment second to none, as the photographs on the pages following will testify. The operating building necessarily appears small in the illustration, but is over 82 feet long. It contains a generously proportioned office for the manager, a similar one for the engineer in charge; also a large store room and a coat room. The room containing the tuning apparatus runs the full depth of the building and is connected by a message chute with the receiving room adjoining. Nearby is the charging room for small accumulators and the main operating room with five large tables, which, when fully manned, will require thirty operators. All messages received and transmitted from this station will be handled automatically, most of them being received at the Broad Street and Madison Square offices of the Marconi Company. Similar arrangements have been made for filing Wales station messages in London, thus placing the two greatest cities in the world in direct communication by trans-Atlantic wireless.

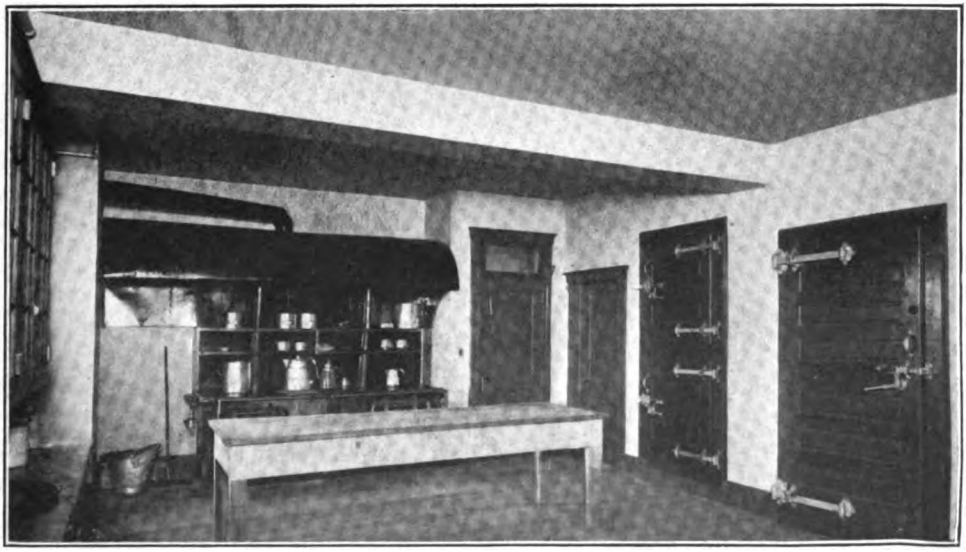
For the comfort and convenience of the large staff of operators and engineers necessary to maintain the twenty-four-hour service at Belmar the Marconi Company has erected the hotel shown in the above illustration. Built of dark red ornamental brick, with a lighter red tile roof, this fireproof structure is as handsome as any of the palatial summer resort hotels in the vicinity. It is a city block long and contains 45 bedrooms.

The photograph above gives a partial view of the hotel lounge, where the Belmar operators will congregate in the evening for relaxation and entertainment. Below, the foyer hall leading in from the porch.

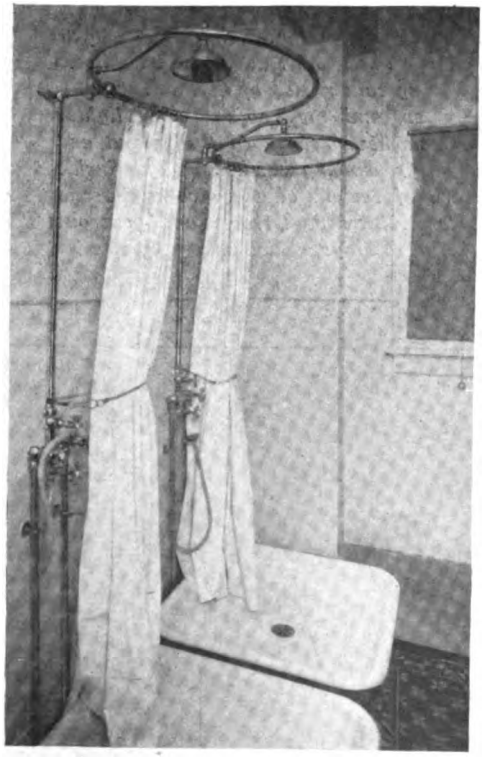




The dining-room in the hotel is a cheery apartment and is arranged so that each diner will have a pleasant outlook and plenty of room. From the windows may be seen the wide, sweeping shore lines of the Shark River and the breakers of the Atlantic. There are seating accommodations for 50 persons and many more can be taken care of whenever necessary. The kitchen, a portion of which is shown in the lower photograph, is equipped with every modern aid to the culinary art, in charge of a French chef. To the right of the illustration may be seen the heavy vault doors leading to the cold storage plant, eighteen feet square. The refrigerating plant, operated in conjunction, has a capacity of 600 pounds of ice per day.



A typical bedroom in the hotel and a private sitting room.

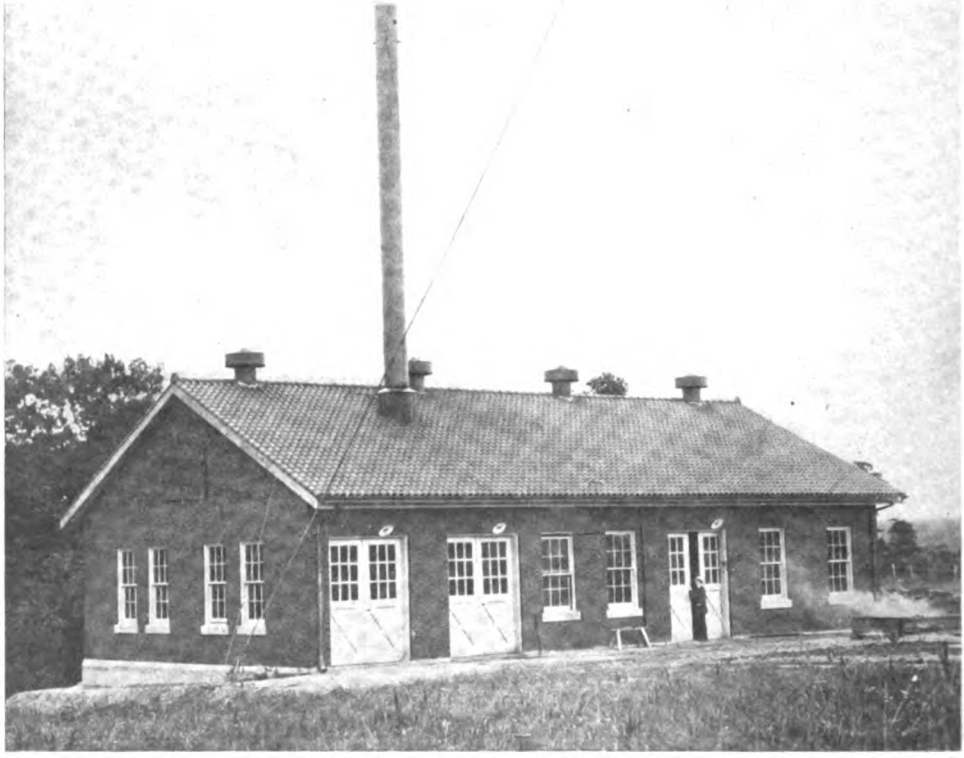


Some indication of the luxury afforded the operators fortunate enough to secure an assignment to the Marconi station at Belmar is given in the two illustrations on this page. The upper photograph shows a portion of the land set aside for the raising of fresh vegetables for the table. Twelve acres of the 600-acre tract are planted with garden truck for all seasons and experienced farm hands give this feature undivided attention. The photograph on the lower left hand shows part of the shower room in the hotel, an additional comfort to the sixteen bathrooms provided for the men. Outdoor sports play a large part in the life of the section and while the shower baths are not meant to be competitive with the sea and still water bathing, they will undoubtedly be greatly enjoyed by those coming off duty on a summer's day or returning from a hard set of tennis on the courts provided for the staff.

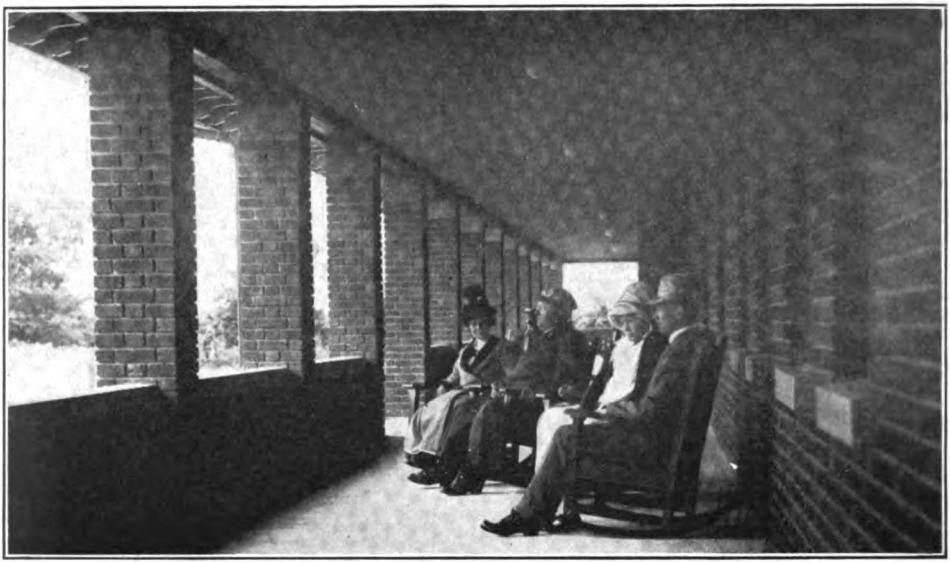
The cottages for the manager and engineer in charge at Belmar are shown respectively in the upper and lower illustrations. These most attractive bungalows architecturally conform to the hotel building, being constructed of dark red tapestry brick, laid with raked joint and black mortar, and the roofs are of lighter red Spanish tile. The best of building materials have been used throughout and structural details comprise the most modern fireproofing methods. The inside partitions are of hollow tile, the plaster work of cement on terra cotta tile and the inside wood flooring is laid on concrete. Attractive terraces and generous verandas are an additional attraction of these buildings, which are 50 feet wide and 40 feet deep.

The progress in wireless telegraphy is well illustrated by these photographs taken in the quarters provided for the management, for they clearly indicate the change to ideal living conditions, as contrasted with the cramped quarters in bleak localities which until recently were the land station operators' portion. The smaller picture on this page shows the dining-room of the manager's cottage at Belmar. The cottages, of which this is typical, have been furnished throughout by the Marconi Company; handsome electric fixtures, high grade rugs in Oriental patterns, pictures, chairs, tables, buffets and the various items of furniture, were selected by a special committee with a view toward tasteful harmony with the surroundings. The lower view is of the living room, the feature of which is the tapestry brick fireplace. Easy chairs upholstered in leather, rocking and straight chairs, settees and dining-room chairs, too, are all upholstered in leather. Bookcases and library tables are further aids to comfort. The bedrooms, of which there are four to a cottage, are finished in mahogany, with two rugs, straight and rocking chairs, enameled beds, chiffonier or dresser and appropriate pictures. The bathrooms are fitted with the very best of fixtures and the kitchen equipment includes a large range and hot water boiler. The cottages are steam heated from the power plant.

A glimpse of the manager's office and the power and electric lighting plant.



The natural beauties of the high bluff on which the Belmar station is located have been further enhanced by care in laying out the grounds under the direction of a landscape artist. The walk seen in the picture above is typical of the efforts in this direction. In the illustration below an impression of the heavily-wooded shores of the Shark River is given; here the balancing line towers are located. One may be seen in the foreground of the illustration; others may be traced by the fainter reproductions in the middle distance and background.



The piazza of the hotel is nearly a city block long and has already become a favored resting place for automobile tourists who visit the station. Situated on a high bluff at the westward end of the Shark River, a broad and navigable stream dotted here and there with sailboats, canoes and motor boats, the Belmar hotel commands a vista unsurpassed for miles around. An endless profusion of laurel, birch, oak, maple and pine trees cover the hills, and the spoils of wild grape vines and huckleberries, mulberries and blackberries are there for the wireless men and visitors. Off to the eastward may be seen the broad expanse of the Atlantic and the edge of the pine belt, and the resultant pungent blend of piney aroma and salty tang of the sea holds great attractions. A landing dock for motor boats is under construction and the wooded slopes of the Marconi property will soon become the headquarters of the numerous picnickers from the seashore cottages.

The Completion of the Carnarvon Station

ANOTHER crowning triumph for Guglielmo Marconi will have arrived when the trans-oceanic wireless stations are opened. It is only a few years ago since he announced that he had sent a wireless signal across the Atlantic ocean. A cry went up that deception had been practiced; that the reading was an error. However, it is known that the signal was actually sent and received, and to-day the trans-oceanic scheme of communication by wireless has shown that the earlier success of the inventor of the art was but a harbinger of greater things to come.

It was in 1900 that Mr. Marconi, encouraged by the success of his cross-Channel and other experiments over varying distances, 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 trans-Atlantic 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.

The Birthplace of Trans-Atlantic Wireless

After many experiments the construction of the plant was commenced. Poldhu, on the Cornish coast, was the locality chosen for the site, and that name will go down in history as the birthplace of transatlantic wireless telegraphy. The construction of appropriate buildings was commenced in October, 1900, by Marconi's Wireless Telegraph Company. In the following month the machinery began to be erected. 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 points in the shape of a funnel. In December, 1900, the building 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 on at Poldhu in January, 1901, for the purpose of ascertaining how far it would be efficient for the objective in view. At Easter, 1901, by means of a short temporary aerial, experiments were conducted between Poldhu and the Lizard, a distance of six miles, which was sufficeint to show that the work was being conducted on the right lines.

Communication Between Poldhu and Newfoundland

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 18, 1901, which wrecked a number of masts, but sufficient restoration of the aerial was made by the end of November, 1901, to enable him to contemplate making an experiment across the Atlantic. He left England on November 27, 1901, in the steamship 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, Newfoundland, about December 5, and made arrangements for sending up a balloon and an attached aerial wire,

having previously instructed his assistants at Poldhu to send from three to six o'clock in the afternoon of 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 11, 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 12, 1901. On Friday, December 13, he confirmed this result, and on Saturday, December 14, 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 14, 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 K.W. In February, 1902, Mr. Marconi made arrangements for the erection at Poldhu of a permanent structure.

Opening of the Clifden Station

The plant and equipment at Poldhu have since been modified to adapt the design of the station to the requirements of modern radio-telegraphic practice, but it ceased to be employed for trans-Atlantic work in 1907, when a new station was opened at Clifden, on the west coast of Ireland, to communicate direct with another station at Glace Bay in Nova Scotia. These two large stations began to exchange radio-telegraphic messages across the Atlantic on October 7, 1907, and millions of words in press and private messages have since been transmitted. The long history of this great achievement was related by Mr. Marconi in a lecture at the Royal Institution of Great Britain, delivered on March 13, 1908, in which he recounted the various stages of the work and the steps by which success had been finally attained. After an interval of interruption due to a fire which destroyed part of the Glace Bay Station in August, 1909, commercial communication was re-established across the Atlantic at the end of April, 1910.

Now to the Clifden-Glace Bay service is about to be added another, which is calculated to more effectively bring together the two continents and to cope with the enormously increasing use of trans-Atlantic telegraphic communication which the cheapness and efficiency of the Marconi system has made possible.

Carnarvon's History Interesting

The stations are situated in New Jersey and North Wales. The British station is located in the neighborhood of Carnarvon, the whole surroundings of which are full of interest. The history of the neighborhood goes back many centuries. but the enlightened research of trained scholarship within recent years has somewhat dispelled the mists that envelop its early history. For instance, the fact has been revealed that long before Cæsar set foot on the shores of the "White Island" its every headland along the North Wales coast was occupied by what, to the military engineer of that day, must have been impregnable cities. These were so systematically grouped that the appearance of an invader at Chester could be signalled to Carnarvon, and thence along the western coast, with a promptness that, in a sense, anticipated the wireless telegraphy of to-day.

Until far into the Middle Ages, Carnarvon was the richest and busiest city in Wales. Since then, however, it has fallen on evil days, commercially. For generations its local industries have been a diminishing quantity. The riveter's hammer on the iron and steel ships of the Clyde and Tyne sounded the knell of about the last of its flourishing trades.

The station in North Wales, although familiarly known as Carnarvon Station, is not actually within the confines of that city. The transmitting section is situated, as told in a previous issue of THE WIRELESS AGE, a few miles east of Carnarvon, on the Cefn-du Mountain. The receiving section is at Towyn, one of the most pleasant seaside resorts in North Wales, about three-quarters of a mile from the village, and a distance of about sixty-two miles by road from the transmitting section.

The transmitting and receiving sections are separate to enable duplex wireless telegraphy to be effected—that is to say, to make possible the simultaneous reception from, and transmission to, America. It is not usual to have so large a distance separating the two sections, but it was necessary to do so in this case owing to certain geographical features. In duplex working the receiving section must be placed in a certain definite direction with respect to the transmitting section, and here the correct angle could not be obtained with a suitable site at a nearer distance owing to the configuration of the country.

There are four wires connecting the two stations, these being carried on the same poles as the Post Office telegraph lines.

The transmitting station consists of one large building measuring approximately 100 feet by 83 feet, which is divided into three sections, known as the main machinery hall, the annex, and the extension.

In the main machinery hall are located the transmitting sets, switchboard, transformer room, stores, offices and emergency operating room. The auxiliary plant, consisting essentially of electrically driven blowers, D. C. generators, ventilating fans, and some small motor generator sets used in connection with the signalling circuit, is placed in the annex, which also provides an office for the shift engineers and accommodation for the fitting shop. The extension is devoted entirely to experimental apparatus.

On the two upper floors of the north end of the building are arranged most of the actual wireless apparatus, consisting of condensers, bus-bars, jigger, and inductances.

Duplicate Transmitting Sets

The main transmitting sets are in duplicate, each set comprising a 300 K. V. A., single-phase alternator, generating at 1750 volts directly coupled to, and driven by, a 500 B. H. P. three-phase self-starting motor, suitable for 440 volts and 50 frequency; this in its turn is directly coupled to a shunt-wound exciter giving 300 amperes at 40 volts.

The alternator is directly coupled to the discharger, which is of the rotating disc type, the coupling being an insulated one. Lubrication throughout the entire set is forced. The disc discharger is enclosed in a sound-proof room.

An insulated foundation is provided for the disc, and should it be required at any time to run this asynchronously, an independent 50-horse-power 110-volt shunt motor having a quickly removable insulated coupling is provided for the purpose.

The Transformer Room and Main Switchboard

The main switchboard consists of ten panels, each 2 feet wide and 8 feet high, upon which are mounted the necessary instruments and circuit breakers and switches for the control of the various parts of the plant. The mains and main motor panels are provided with time limit relays; the cables from the switchboard to the various machines are all lead covered, and are suspended on racks on the sides of the trenches.

The transformer room is worthy of note. Here are transformers each having a capacity of 75 K. V. A., as well as low-frequency inductances. There is an electrically operated safety switch in the transformer primary circuit which is controlled by a master switch. Each transformer is provided with isolating switches in both primary and secondary circuits, and these are carried by an iron framework immediately over the transformers. The low-frequency inductances are arranged to facilitate adjustment of the amount of inductance required.

In the emergency operating room is all the apparatus necessary for transmission and reception from the transmitting station instead of from the distant operating station. In addition there is here a master switch, under the control of the operator, which automatically operates the safety switch in the transformer room, the receiving aerial isolating switch, the receiving crystal protecting switch, an illuminated sign, "Ready to Transmit," situated in the shift engineer's office, and a disconnecting switch in the main earth lead, to unearth the aerial when required for receiving, thus

completely avoiding any possibility of damage to the receivers when the aerial is required for transmitting.

The auxiliary plant is, as previously stated, situated in the annex. Here are motor generator sets in duplicate, each consisting of a three-phase induction motor directly coupled to a 50-K.W., 110-volt, shunt wound, D. C. generator, in connection with which is used an automatic pressure regulator. The blowers are also in duplicate,, each set consisting of a positive rotary blower of the out-board bearing type, driven through spur gearing by a motor suitable for 440 volts, three-phase, and 50 frequency. Air is conducted to a reservoir, thence distributed where required. The disc discharger chambers are ventilated by means of exhaust fans, each driven by a three-phase induction motor. Duplicate signalling circuit motor generators are provided, each consisting of a three-phase induction motor running at 1,460 revolutions per minute, directly coupled on either side to a D. C. shunt wound protected type generator. Liquid starters for use in connection with the auxiliary disc motors are, like the other machinery installed here, supplied in duplicate, to guard against any possible temporary interference of the service.

From the shift engineer's office, which is partitioned off from the annex, an uninterrupted view is obtained of the machinery hall, main switchboard and the auxiliary plant.

The small but well arranged repair shop is capable of dealing with almost any class of repair work likely to be required, and it is equipped with modern power-driven tools.

Condensers of the Latest Type

The latest type condensers are installed, the banks being arranged systematically on two floors. The pots are used three in series.

The bus-bars are of copper-sheet, stiffened by Duralumin angle plates. They are supported on standards and separated by means of porcelain insulators. The main bus-bar is extended beyond the condenser banks, and divides immediately over the disc chambers, the ceiling of which is provided with specially insulated glands, through which pass the main connectors conducting the current from the condenser bus-bars to the side disc. Each branch of the main bus-bar is connected up to one transmitter by means of quickly removable change-over links.

The jigger, of the usual independent primary and secondary type, consists of a suitable number of turns of special H. F. cable wound on insulated frames, which are supported so that their axis lie along the axis of the windings. Provision is made for one of these frames to be easily movable in a line along its axis for the purpose of varying the couplings between the primary and secondary.

Three Aerial Tuning Inductances

The aerial tuning inductances are three in number, and are provided with the necessary tappings for tuning purposes. The aerial is of the directional type, and extends from the building in an easterly direction up the mountain side. It is approximately 3,600 feet long and averages 500 feet in width. Ten tubular masts support the aerial, and these are arranged in four rows of three, two, two and three, each row being 900 feet apart. The aerial diverges from the leading insulator to a line of rod insulators supported by the triatics between the tops of the first row of three masts, thence to the triatic supported by the other rows in succession, the plane of the wires following roughly the contour of the mountain at a height of just under 400 feet. Even tension is kept in every wire by means of a balance weight, thus minimizing the possibility of breakage of wire due to wind pressure.

The earth system is briefly as follows: a ring of metal plates is buried in a circle, with the building as center. This is connected by means of radial wires with another ring of larger radius. From the outer ring wires are run to the end of the aerial, whilst from the first circles of plates wires are brought overhead to the common earth wire. On two opposite sides of the building are earth terminals, passing through the wall to which the common wire is connected.

There are ten tubular steel masts, each 400 feet in height, the lower half being

3 feet 6 inches in diameter, and the upper half being 2 feet 6 inches. The lower half is built of quarter sections, or quadrants, each 15 feet in length, and the upper half is built of semi-circular sections each 10 feet in length. All the sections have outside flanges, by means of which they are bolted together. Each mast is provided with a gallery at the top, which can be reached by a ladder running up inside, access to the ladder being by means of a manhole. The triatics are attached to a halyard passing through a block at the top of the mast, and another at the bottom, and are made fast to bollards. A winch with warping drums is placed between each two masts. The foundation plate for each mast stands on a block of concrete measuring approximately 12 feet by 12 feet by 6 feet, and weighing approximately 48 tons.

Four sets of seven stays of 3-inch steel wire rope with solid core are used for each mast. A stay is insulated about every hundred feet of its length. The stay anchors consist of concrete blocks measuring about 12 feet by 12 feet by 12 feet, and weigh approximately 97 tons. The intermediate pairs of masts are provided with back stays in order to lessen the strain on the mast-head caused by the greater length of triatic which they support.

Power is supplied to the station by means of an overhead transmission line which provides a three-phase supply at 10,000 volts.

The Power Station At Cwn Dyli

The power station is situated at Cwn Dyli, about 11½ miles distant. The prime movers are high pressure water turbines, the water being obtained from a lake very near Snowdon. There is a transformer station adjacent to the wireless station, where the voltage is reduced from 10,000 to 440 volts, at which pressure it appears on the main switchboard.

At the Towyn station the receiving aerial is supported by five masts, each 300 feet high; these masts are erected on a range of hills at the back of the town, the last mast being about 1,400 feet above sea level. A balancing aerial is also erected carried on 80-foot poles, the purpose of the balancing aerial being to balance out the effect of signals, transmitted from the stations at Cefn-du, so that the signals received across the Atlantic are not in any way affected by the signals from the transmitting station at Carnarvon.

Prepared to Handle 100 Words a Minute

The station is equipped with all the latest types of receiving apparatus, and the operating building has been designed to accommodate sufficient operators to deal with a traffic of 100 words per minute duplex. The operators for both stations are all located in the various operating rooms at the Towyn station, as are also the operators for working the land lines.

The signalling switches at the transmitting station are controlled from Towyn, where the punched tape from the Creed instrument is put through a Wheatstone transmitter, which, by means of relays at the Carnarvon station, actuates the signalling switches, making and breaking 300 K.W.

The large and continuously increasing volume of traffic with which the Marconi service has had to cope is proof of its popularity. The latest inventions have been introduced to facilitate its rapid disposal, and with a view to eliminating to the greatest extent human agency.

The Marconi Company have opened large new premises at No. 1 Fenchurch street, London, E. C., which serves as a main telegraph office. The new premises are connected by direct land lines with the company's offices at Marconi House, Strand, London, W. C. The public office has a commanding position, facing as it does the banking center of the world, Lombard street, and Gracechurch and Fenchurch streets, the home of shipping and produce. The office is fitted with panelling, doors and counter of Cuban mahogany, the walls above the panelling and the ceiling being covered with lincrusta of rich and elegant design. In the basement are to be found the compressor for the Lamson tubes, and several busy motor generators vie with one another to supply power to mechanism of most recent invention in the operating room. Here also is ample accommoda-

tion for the rapidly accumulating and vast records which it is the duty of a telegraph company to keep, according to the provisions of the International Telegraph and Radio-telegraphic conventions.

To ensure an uninterrupted public service and to provide against the risk of fire, the land lines connected to both the Welsh and Irish stations can be worked from the office in the Strand or from the main office in Fenchurch street.

Let us follow the handling of a telegram from the time of its acceptance at the counter of the telegraph office. Immediately it is handed in it is dispatched by a special tube leading from the public office to the instrument room, where it is transferred to punchers. The rapid tapping will convince any onlooker that an expert is transferring the message onto the tape. Then it is passed to the man in charge of the Creed transmitter on the next table, which automatically reproduces punched tape at the high-power wireless station at Towyn. There another operator transfers the tape to the wireless transmitter by means of which the dots and dashes are flashed into space and received at the station in New Jersey. Here again expert telegraphists transcribe and hand the messages to the land line system connecting with all the important cities and towns in the United States and Canada. The same operation is repeated when a message is transmitted in the other direction —that is, from the United States to England—the only difference being that in London the signals, by means of the Creed printer, are recorded in letters on tape, which is automatically gummed, and handled by the scrutineer, who separates the tape and affixes it on the company's forms for delivery to the addressees.

The apparatus being in duplicate, there is, therefore, every assurance of an uninterrupted service, and to ensure the greatest speed the lines are worked duplex.

All kinds of telegrams are dealt with, communications in cipher being handled as easily as those of the ordinary class. The rates have been reduced so that telegraphy has been placed within the reach of a far wider public, and a saving effected of thirty-three and a third per cent. as compared with the charges for transmission by other means.

THE CHINESE CONTRACT

In view of statements in the newspapers to the effect that a contract with the Chinese government had actually been signed, the Marconi Company recently made the following announcement in London:

Negotiations have been pending between the Chinese government and this company for some time past for the erection of a number of wireless stations in China for the internal and external telegraph services.

On April 8 the Chinese government sent an official letter agreeing to authorize the Marconi Company to issue £2,000,000 (approximately $10,000,000) of five per cent. Chinese bonds in payment of the proposed stations. This document was filed at the British Legation in Peking and a formal contract has been sent forward for approval and signature.

The company has every confidence that in due course the agreement will be signed and all mutual obligations fulfilled.

MARCONI DIVIDENDS

A dispatch from London, dated July 9, says: It was announced to-night that a final dividend of ten per cent. had been declared on both the preference and the ordinary Marconi shares, making the total seventeen per cent. on the preference and twenty on the ordinary shares for the year. These rates are the same as were paid in the two preceding years.

The gross profits in the last year are £245,583 (approximately $1,227,915) and the net profit, £122,323 (approximately $611,615). After allowing for dividend payments the sum of £76,549 (approximately $382,745) was carried forward to the next year's account.

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION

It isn't sufficient in speaking of the career of Charles H. Taylor to simply say that he is assistant chief engineer of the Marconi Company with headquarters in New York. There is considerable more of interest to relate. Take, for instance, that war experience and—but it's better to start at the beginning.

He was born in Hayes, Middlesex County, England, in 1875, and obtained his early education at Cranleigh School in Surrey. Afterward he entered upon an engineering course in Herilt Watt Technical School in Edinburgh. He was graduated from that school in 1895 and began an apprenticeship training in engineering work which lasted three years. Then he entered the employ of the Sturtevant Engineering Company, being assigned to a place in the draughting office of that concern in London.

It was in 1898 that Mr. Taylor took up his duties with the Sturtevant Company; a year afterward he heard the call of wireless and joined the service of the Wireless Telegraph and Signal Company (the old Marconi Company) as an engineer. Dr. Erskine-Murray was carrying on wireless investigations at the Haven station, near Bournemouth, and Taylor was detailed to assist him. Mr. Marconi was also conducting experimental work at the station and the task of aiding in the development of the receiving jigger for the old coherer sets devolved on Mr. Taylor and his associates.

After a few months' service at the Haven he was transferred to the Needles station on the Isle of Wight; then he went to the East Goodwin Lightship station. One night, while the weather was thick, a British war vessel bore down on the lightship. The commander of the latter, in order to avoid a collision, was compelled to slip his cable and float with the tide. The excitement resulting was accompanied by considerable racket, but Taylor remained asleep, unconscious of his peril, until the next morning, when he was informed of the occurrence.

He was assisting in the test room of the wireless works at Chelmsford just prior to the breaking out of the Boer War in South Africa. When this event occurred he was sent to the scene of activities with wireless sets which were installed on British warships blockading Delagoa Bay.

After eight months spent in South Africa he returned to Chelmsford, where he took charge of the test room. In 1910 he went to Brazil to superintend the construction of stations and came pretty close to getting in the way of a small revolution which was disturbing that country.

Mr. Taylor has great confidence in the trans-oceanic wireless service.

"What difficulties there are to overcome," he said, "will be small and it will be only a matter of engineering to overcome them."

"Only a matter of engineering" is an everyday affair to Taylor. The evening of the day he made the remark he left for Honolulu to supervise "only a matter of engineering" in connection with the work of preparation for connecting the continents by wireless.

On Waves and Wave Motion*

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

THE principal difficulty which persons who are not trained physicists find in obtaining any clear ideas of the *modus operandi* of wireless telegraphy arises from the imperfect conceptions they are able to form of the nature of an electric wave. They hear that wireless telegraphy is conducted by means of electric waves, but the words convey no definite meaning to their minds. Hence many people, otherwise very highly educated, frequently declare that wireless telegraphy and everything connected with it is to them an unspeakable mystery, even in spite of much popular discussion of it.

This difficulty arises from two causes. First, because the only things we are able to visualize very clearly are the *motions, forms,* or *relative positions* of material substances, added to which we can recover by recollection such special sensations as colors, smells, or tastes. Secondly, because the word *wave* conveys to the ordinary mind the notion of an effect which is not strictly speaking a wave at all, and hence forms a wrong starting point for a correct idea of the nature of an electric wave. The ordinary non-technical person hearing the word "wave" pictures to himself the water curling over and breaking on the rocks or beach at the seaside, or else the irregular splashing foam-crested water in a sea or channel. Properly speaking, the water which dashes up at the edge of the sea is no more a true "wave' than a house in the act of tumbling down can be called a good residential property.

How to Form a Correct Impression

The best place to form right notions is to look at the surface of the sea at some distance from the coast on a bright, breezy day when the wind is blowing towards the coast or up an estuary or long bay. We then see rounded ridges or hummocks of water chasing each other over the surface. At first sight it appears as if the surface water itself is moving. If, however, we fasten attention upon a floating buoy or patch of seaweed we shall notice that as each wave passes over it the floating object is merely lifted up and let down again, or at most has a small forward and backward motion as well.

What a Wave Length Is

If we look at two such objects not too close together we shall see that they perform the same small oscillatory motions successively and not simultaneously. A little careful scrutiny will thus convince us that the true motion of each part of the water is merely a small motion in a circle, being moved up, forward, downwards, and backward, and that each part performs this cycle of operations in its turns, and over and over again. The speed with which this cyclical motion is handed on from point to point is called the velocity of the wave. We might, for instance, imagine a seagull to fly along always keeping himself above one particular hummock of water. His speed would then be the speed of the wave. The distance from one hump to the next one, measured crossways or at right angles to the line of the crest, is called the *wave length.* The waves are said to be long when the distance is great from crest to crest, not when the ridges themselves are long.

Such waves on water are called surface waves; and the effect of them extends a very little way down into the sea. The same class of surface wave is produced when we throw a stone into still water in a pond or lake and notice the expanding rings of ripples which are thereby produced. This latter is a typical case of wave motion in two dimensions.

Again, if we give a jerk to the end of a long stretched cord a hump or kink travels along it, which is likewise a wave motion. Each part of the cord is lifted up and then let down successively,

*From "The Year Book of Wireless Telegraphy and Telephony," 1914.

and the motion is handed on from point to point with a certain speed.

A large number of models of various kinds have been constructed to illustrate various forms of wave propagation. In the case of the water surface waves or the wave motion of a kink along a rope the displacement of each part of the medium, whether water or rope, is at right angles to the direction in which the wave is moving. On the other hand, we have forms of wave motion in which the displacement is in the direction of that motion. Thus, for instance, if a brass or steel wire is coiled into a spiral and the spiral suspended by threads attached to it at regular intervals, so as to support it in a horizontal direction, we have a medium in which we can propagate what are called longitudinal waves. If we give to one end of the spiral a smart blow with a piece of wood, striking the spiral end-on and not sideways, we shall thereby suddenly compress the end, and the turns of the spiral at that end will be squeezed closer together, but they immediately expand again, and therefore compress the next or adjacent turns. The result is that a wave of compression runs through the spiral. We see each part of the spiral in turn slightly compressed and then relaxed.

A Longitudinal Wave

The same kind of longitudinal wave of compression and rarefaction takes place in air when a sound or aërial wave is produced. Suppose an explosion to take place at any point in the air. We can picture to ourselves the air round that point as arranged in concentric shells or layers like the coats of an onion. When the explosion happens it compresses the layer of air next to it, but owing to the inertia of the air the compression does not make itself felt instantaneously at all distances. The innermost layer is first compressed; then it expands back and compresses the next outer layer, and so on, the state of compression being handed on from layer to layer, and travelling outwards with a speed of about 1,200 feet a second at ordinary temperatures. The motion of each particle of air as the wave passes over it is to and fro in the line of propagation of the wave. Hence the wave is called a longitudinal wave.

Interchangeable Forms of Energy

A little consideration will make it evident that to produce a self-propagating wave in a medium, as contrasted with a mere wave motion or successive performance of some periodic motion by a line of particles, there must be a connection between the different elements of the medium. Moreover, the medium must have two qualities, one of *elastic resistance* to some change imposed upon it, and the other of *persistence* in doing what it is set doing. In other words, it must have elasticity and inertia. Thus in the case of air the air molecules resist being compressed, and when the compressing force is removed they fly apart. But on being set in motion they continue to move and expend their energy in compressing other layers of air. The air, therefore, can store up energy in two forms—viz., as kinetic energy, or energy of motion, and potential energy, or energy of compression. These forms of energy are interchangeable, and are continually being transformed into one another. The total energy in any volume occupied by pure wave motion is at any instant half potential and half kinetic.

If we analyze in the same manner the case of the wave on a water surface we find that the water being a heavy body not only possesses inertia, in virtue of which it stores up kinetic energy, and when set moving continues to move until it is deprived of this energy, but also the water surface resists being made unlevel. Hence when the water is heaped up in one place or depressed it tends to move so as to restore the level surface. Accordingly the water surface when made unlevel stores up potential energy. It has an elastic resistance to change of level. Similar ideas present themselves in all other cases of visible wave motion.

As long as we are dealing with the case of waves on water, or in air, or on strings, we can picture to ourselves or actually see the motions of which we speak.

The moment we pass beyond this region of eyesight, or the result of eye-

sight, and concern ourselves with a super-material medium like the ether, the difficulties of framing adequate mental images corresponding to the words used become very great.

All the phenomena in wireless telegraphy by Hertzian waves on the system initiated by Mr. Marconi point indubitably to the conclusion that we have here to deal with a wave effect, and that these waves are not created in air as a medium and not entirely in the soil or crust of the earth, but are produced in some medium which interpenetrates matter and co-exists with the air in the space above the earth. In spite of the efforts which have been made by a certain school of thinkers of late years to render the assumption of the ether unnecessary or to throw doubts on its physical existence, it still remains the most probable hypothetical basis for certain indisputable observed effects. Hence we find much to support the assumption of some form of energy-transmitting medium which is of a more fundamental nature than tangible gravitative matter. This ether is inappreciable directly by our senses, unless we admit that the impact of certain very short waves in it called light is such direct appreciation. Nevertheless, we cannot feel it, weigh it, or confine it like gas in any vessel, and its properties have to be inferred from observed effects.

Maxwell's View of Ether

Before the date of publication of James Clerk Maxwell's great contributions to the theory of electricity it was generally assumed that this hypothetical ether must possess an elasticity resembling that of an incompressible elastic jelly-like solid, in that it can resist a shear or distortion or change of shape. Also it was assumed that it possessed inertia and therefore could store up energy as energy of motion. It followed that the only kind of waves possible in it were waves of transverse displacement—that is to say, each part of this elastic substance could be displaced a little way from its normal position by shearing, but that when released it sprang back. Hence the only type of wave motion it could transmit would be identical with that wave of distortion producible in a mass of indiarubber or jelly. If we picture to ourselves such a jelly made up in concentric layers, like the coats of an onion, and suppose that the innermost shell makes a small movement of rotation to and fro round some axis, and that each shell in turn repeats this motion round the same axis, then a wave of transverse displacement would be propagated through the medium. Such a conception affords us, however, no explanation of electrical phenomena, and when Maxwell addressed himself to the consideration of the actions at a distance with which we are familiar in electrical work it was, in his view, essential to make such assumptions as to the possible structure of the ether that it could be used to explain electrical as well as optical effects.

A Theory to Explain Optical Phenomena

Nevertheless, he realized that we know nothing about the mechanical structure of the ether, and therefore he propounded a theory which enabled him to explain optical phenomena in terms of known electrical facts, and discarded any attempt to invent hypotheses as to the mechanical structure of the ether which would permit both optical and electrical facts to be interpreted in terms of possible mechanical motions of the ether. It is perfectly certain, however, that the only actions we can visualize clearly are mechanical movements. We cannot think of the ether at all or use it as an hypothesis to explain observed effects unless we are able to make a *working model* of the ether structure in terms of the concepts of mechanics. Hence innumerable attempts have been made to represent the ether in imagination by structures made up of inter-connected cog-wheels and idle wheels or gyrostats, or fluid vortices, or in a dozen other ways, to imagine a mechanism which would act under mechanical forces as we find the actual ether does under electrical and magnetic forces. It does not follow, however, that, because we can imagine a mechanism that would produce the effects we find in Nature, the effects are actually produced in this way.

Hence a scientific hypothesis cannot at any time be regarded as giving us

absolute and final truth on any matter. It is at most merely a shadow of the truth. It provides a language in which we can describe and connect phenomena, or it gives us a suggestion and incentive for further experimental work. Whatever hypothesis for the time holds the field as regards the structure of the ether, it must certainly enable us consistently to explain wave motion through it. The characteristics of wave motion are that the energy entirely leaves the radiating body and exists for some time, long or short, in the medium before reaching the receiving agent. Also that energy exists in two forms which alternate periodically both in space and in time along the line of propagation.

Maxwell employed the purposely vague term *electric displacement* to denote the change produced in the ether near an electrified body, and he showed that when the electric displacement at any point was changing there was produced around it all along an embracing line another state called *magnetic flux,* similar to the condition of space near a magnetic pole. Working from this starting point, he was able to show that a sudden application of electric force or its sudden removal resulted in the propagation through the ether of waves of electric displacement and magnetic flux. These two effects correspond in the case of ether waves with the state of compression and with the velocity of the air partitcles in the case of wave motion through the air, or with the state of elevation or depression and with the velocity of the water particles in the case of a surface-water wave.

The Velocity of a Wave

Maxwell was able to show, and abundant confirmatory proof has since been obtained, that the velocity of such an electro-magnetic wave through the ether would be identical with that of light—viz., about 300,000 kilometres per second.

The term electric displacement, as used by Maxwell, is perfectly definite in a mathematical sense, and we are therefore able to express in exact mathematical form the relation between the change of electric displacement and the resulting magnetic flux, and also the corresponding inter-connection between change in magnetic flux and electric displacement; but these terms do not of themselves raise in the mind any definite mechanical images. In one sense it is better that they should not do so. Strange as it may appear, the more definite we try to make our conceptions of Nature's machinery in this respect, the less likely are they to be true. The actuating machinery of Nature is hidden from us. We are like spectators at a play. We see the changes of scene and effects produced upon the stage, but the exact means by which it is all brought about is concealed from us. The first question which presents itself to us in considering wave motion through this ether is—What is the nature of the elasticity of the ether? What kind of change in it does it resist?

Suggested Structure For Ether

The elasticity is certainly not a resistance to compression or extension or even shearing, like that of a gas or solid. Many converging lines of thought indicate as likely that the ether elasticity is an elastic resistance to the twisting or rotation of certain ultimate elements of it. Just as a gyrostat or heavy top in rapid rotation resists being twisted owing to its gyrostatic stiffness, so Lord Kelvin, Sir Joseph Larmor, and others have suggested a structure for the ether on this basis.

Corresponding to this, we must assume that these elements of the ether can move over each other without friction, so that we have possible in it frictionless flow accompanied with resistance to absolute rotation in each particle. We must also postulate that ether flow or motion involves friction energy associated with it. We have, then, a possible storage in it of potential energy, or energy of twist, as in a coiled spring, and energy of motion. At the same time there must be some linkage or connection between the particles of the ether whereby rotation of a line of particles, or twist round any line, is accompanied by a flow of ether round the line.

Another view of the nature of an electric wave has recently come to the front which is founded upon a suggestion of Faraday's, developed in detail by Sir J. J. Thomson more recently. We

now know that what we call electricity is atomic in structure. That means to say that electricity is made up of particles which cannot be divided without destroying it. The ultimate atom of negative electricity is called an *electron,* and is as much smaller than an atom of hydrogen gas as the latter is smaller than a very, very small pin's head. From the electron proceed in all directions lines of ether twist, which are called lines of electric force. We may picture it to ourselves as like a golf ball, having long, straight wires stuck into it. All conducting bodies have free electrons mingled with their chemical atoms, and in their ordinary unelectrified condition these electrons move hither and thither in all directions. If, however, a high frequency electro-motive force acts on the body, these electrons are caused to swing to and fro in an identical manner. When an electron is suddenly started into motion or suddenly stopped, the attached lines of force lurch backwards or forwards like passengers in a motor-'bus which is suddenly set going or arrested.

The Processes in an Aerial

The result is to produce a kink or bend in the lines, and the effort of these lines to straighten themselves causes this kink to run outwards along the line. If a number of electrons in a wire perform these oscillations simultaneously the result is to form a series of loops of ether twist or electric displacement which are transverse or lie across the radiating lines of force. These loops are shot outwards with the velocity of light. Hence in a wireless ærial or antenna the physical processes at work are as follows: The transmitter, whatever may be its nature, causes the free electrons in the ærial wire to oscillate to and fro with great rapidity all at the same time. The vibrations produced thereby on the radiating lines of force starting from each electron combine to produce one single vigorous etheric oscillation, which consists in the emission from the ærial wire of these loops of electric displacement. This process constitutes what we call electric radiation less. It is essentially of the same nature as visible light, but differs from it only in wave length.

When an Aerial Wire is "Earthed"

In the case of an ærial wire which is "earthed," or connected to the earth at the lower end, there is in addition to this space wave or wave in the ether an "earth" electric wave propagated through the crust of the earth. This is proved by the fact that a high collecting ærial is not absolutely necessary for reception in wireless telegraphy. The signals from the Eiffel Tower Wireless Station in Paris can be detected in London merely by using as collector any metallic mass, such as a galvanized iron dustbin, which is insulated from the earth, the receiver being connected between this mass and the earth.

In the case of long distance wireless telegraphy we are probably concerned with electro-magnetic waves of both types—viz., true electro-magnetic waves propagated through the ether around the earth, partly arriving directly and partly after reflection or refraction by masses of conducting air in the upper atmosphere. Also the effect reaches the distant station as an electro-magnetic wave which is propagated along the surface of the earth, in the same manner that it travels along a wire.

The terrestrial atmosphere is therefore the seat of waves of many kinds. We have not only long ærial waves in the air itself, produced by winds or explosions, but the co-existing ether waves of short wave length, about one fifty-thousandth of an inch in wave length, which constitute light. Then there are in addition frequent natural but irregular vagrant electric waves of great wave length, produced by atmospheric electric discharges, such as lightning, or created, it may be, by extra terrestrial causes, such as explosions in the sun. Lastly, there are the countless long electric waves now intentionally made in telegraphic work, which cause a turmoil in the former comparative ætherial calm.

The mysterious ether transmits all these waves with the same velocity of 300,000 kilometres per second. In order that it may do this the ratio of its elasticity to its density must be a least 3,600 million times greater than that of steel. It would occupy too much space to attempt to sketch in merest outline how such qualities can be combined with

perfect non-resistance to the motion of material substances through it.

Suffice it to say that the electronic theory of matter provides a clue to the explanation of this mystery and to the relation of matter to ether generally. The properties of this basal medium, the ether, have occupied the thoughts of some of the greatest of modern thinkers, and the problems raised by the achievements of long distance wireless telegraphy have brought forward many other more intricate questions for consideration.

TIME SIGNAL MODIFICATIONS

THE Superintendent of the U. S. Naval Radio Service, under date of June 10, 1914, announces certain changes of wave lengths used in sending time signals. These signals will hereafter be sent by the Naval radio stations as follows:

Station.	Wave length, meters.	When sent.
Arlington, Va.	2,500	Daily at 11.55 a. m. to noon and 9.55 to 10 p. m., Standard Time, 75th meridian.
Key West, Fla.	1,500	Same as Arlington.
New Orleans, La.	1,000	Daily, 11.55 a. m. to noon, Standard Time, 75th meridian.
North Head, Wash.	2,000	Daily, except Sundays and holidays, at 11.55 a. m. to noon, Standard Time, 120th meridian.
Eureka, Cal.*	1,600	Same as North Head.
Point Arguello, Cal.	750	Do.
San Diego, Cal	2,000	Do.
Mare Island, Cal.	1,600	Every day at 11.55 a. m. to noon and 9.55 to 10 p. m., Standard Time, 120th meridian.

If for any reason the Arlington station is out of commission, the time signals will be sent daily at noon, Sundays and holidays excepted, by the Naval radio stations at Newport, New York, Norfolk, and Charleston.

The time is sent from the Naval Observatory, Washington, for the Atlantic coast and from the observatory at Mare Island Navy Yard for the Pacific coast.

This modifies the information relating to this service published on the Pilot Chart of the North Atlantic Ocean for August, 1913.

OPERATOR'S STORY OF TAMPICO'S FOURTH

James A. Daggett, of Pascogula, Miss., a wireless operator on the steamship Horley, which left Tampico, Mexico, July 4, reported recently at the office of the Marconi Wireless Company, in The American Building, Baltimore, Md. In discussing the Fourth of July as celebrated in Tampico, Daggett said:

"It was a real Fourth of July at Tampico. The Stars and Stripes floated over the Imperial Hotel, the American Consulate and other places. The hotel was all decorated for the occasion and the American warships in the harbor fired a salute.

"While we were at Tampico one of the aeroplanes made an ascent for Carranza; they have two aeroplanes there."

DIRECTION FINDER ON THE COMUS

The Comus of the Southern Pacific line has been equipped with the Marconi-Bellini-Tosi direction finder. Captain Maxson, commander of the Comus, who has had considerable experience in wireless telegraphy, is making tests with the apparatus.

WEATHER SERVICE ANNIVERSARY

Just one year ago from Wednesday, July 15, the United States Navy Department put in operation a daily weather service by wireless. The earlier success of the service giving the ships at sea correct Naval Observatory time, and also special notice of storms, warranted the establishment of the daily weather service, which is said to have proven entirely satisfactory during the year's trial.

Location of New Marconi Commercial Office Showing the New York Stock Exchange in the Foreground

The First Wireless Receiving Office *for* Continent-to-Continent Messages

WHILE the eyes of the world have been interestedly watching the completion of the trans-oceanic stations by the engineers of the Marconi Wireless Telegraph Company of America, another important branch of the service —the commercial department—has not been idle. Quarters have been engaged at 42 Broad street, New York City, where the Marconi Company will establish its main commercial office, and a branch office will be located at 44 East Twenty-third street. Other offices will be opened later.

The Broad street office has a location well suited to the needs of the Marconi Company and its trans-oceanic service. Situated on the first floor of the Wall Street Journal building, its windows look out on busy Broad street. It is in the heart of the financial district and was selected with a view to its proximity to the various exchanges, bankers, brokers, coffee and cotton merchants and representatives of foreign firms. They will be able to send Marconigrams from the Broad street office by direct automatic and multiple wire circuits to the trans-oceanic stations in New Jersey, connecting with those in Towyn and Carnarvon, Wales, from which messages will be sent to London by land lines. The high-power stations on Cape Cod are also nearing completion and these will open up wireless circuits to Norway, radiating to Sweden, Denmark and Russia. Land lines will connect this service with the Marconi offices in New York and Boston. The Marconi Company is building its own land lines to connect Belmar with the transmitting

station at New Brunswick and with New York.

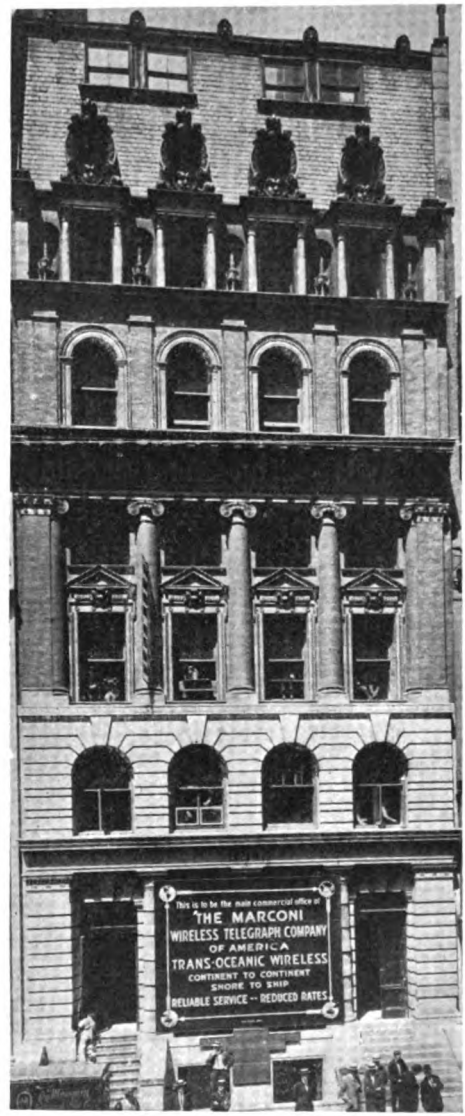
The interior of the office, which has space of about 3,000 square feet, will be finished in mahogany. It has entrances from both Broad and New streets. A counter with marble base will extend almost the entire width of the office. Behind this counter will be a force of clerks who will receive the Marconigrams. Desks and message blanks will be provided for patrons. Space will be set aside for the men who will make their headquarters in the office. These will include Lee Lemon, superintendent of the commercial and operating departments; W. A. Winterbottom, commercial manager; Harry Chadwick, manager of the office, and Paul Kast, cashier. Messrs. Lemon and Winterbottom will have desk room in a space set off by a railing in the front of the office. Mr. Chadwick will have a desk behind the counter, and Mr. Kast will occupy desk room in a space set off from the office by a partition. Near Mr. Kast's desk will be installed a telephone and an operator. The duties of the latter will not be unimportant, for he will receive Marconigrams over the wire. Every precaution will be taken to insure the accurate reception and transmission of messages.

Tables will be placed in the office for the accommodation of the operators and their instruments. Nine operators, including three supervising operators, will be employed. Their hours will be so arranged that the public will have service at any time during the twenty-four hours. Walter E. Wood, G. Jamieson and C. J. Weaver will act as supervisors. The counter will be in charge of two clerks.

In order to insure prompt delivery of messages the delivery department will be directed by an experienced chief delivery clerk. He will have two assistants and ten uniformed messenger boys. The latter will be selected with regard to their knowledge of the financial district of the city. They will wear a uniform of gray with red stripes on their trousers.

From the viewpoint of the uptown business men, the Twenty-third street office is almost as advantageously situated as the Broad street quarters. The Twenty-third street office will cater particularly to the patrons of the Marconi Company in the dry goods, automobile and theatrical districts. Five messengers will be detailed to duty in this office. It will be connected with the Broad street office by a direct wire.

E. B. Pillsbury, assistant traffic manager, is in charge of the staff organization and office arrangements.



The Main Commercial Office is in the Heart of the Financial District, Occupying the First Floor of the Wall Street Journal Building on Broad Street

CHAPTER IX *(Continued)*

FIG. 1 is a detailed drawing of the antenna construction to be found on the standard Marconi ship installation. The spreaders for supporting the wires are of spruce, giving great strength combined with lightness. It will be observed that each wire composing the aerial is insulated by a 24-inch hard rubber rod insulator. In addition, the birdles are insulated from the ship's masts and supporting halyards by spe-

means of hot sulphur which hardens, making the rope impervious to moisture. This extra precaution is necessary on account of high potentials employed when the auxiliary, or emergency, set is in use.

The spreaders are prevented from side-sway by means of two hemp guys on each spreader, which are made fast either to the ship's stays or the top mast. These guys are also insulated by hard rubber rods to prevent leakage through

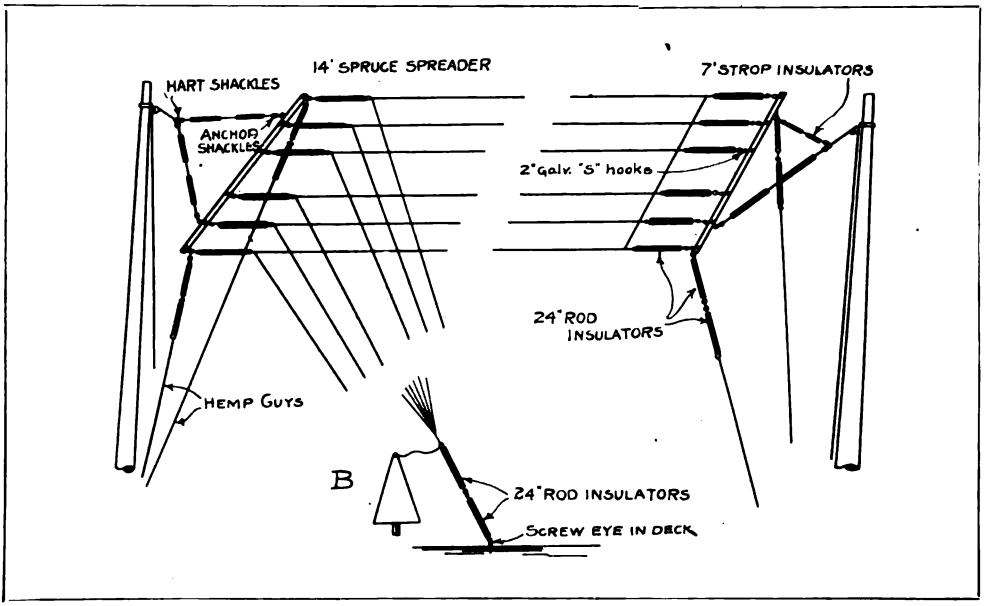
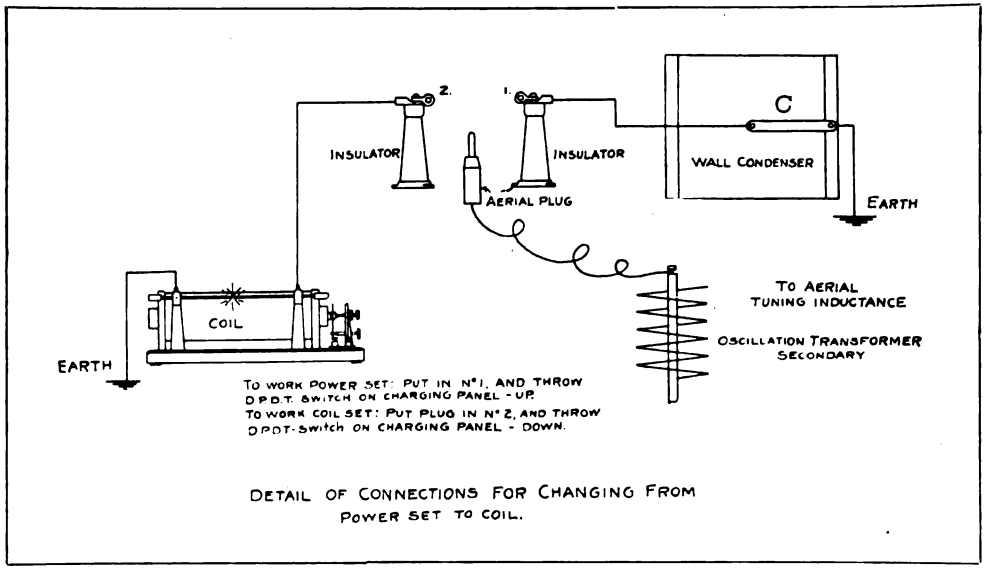


Fig. 1

cial 7-foot strop insulators. These bridles are made of rigging rope covered for several feet with hard rubber tubing. The rope is then thoroughly sealed by the ship's rigging to earth. The entire aerial is supported by steel halyard ropes at either mast, allowing it to be lowered to the deck for repairs with little dif-



DETAIL OF CONNECTIONS FOR CHANGING FROM POWER SET TO COIL.

Fig. 2

ficulty. The Bradfield insulator is shown at B; it is placed through the deck of the wireless cabin or through the bulkheads. The lead-ins from the flat top are "back-stayed" by means of two 34-inch rod insulators, which take the strain which otherwise might exist from the Bradfield insulator, B.

All insulators in use should be greased monthly with a special compound furnished by the Marconi Company. This grease makes the insulators impervious to moisture and prevents leakage in wet weather. It is of course understood that while being greased, the aerial must be lowered to the deck and because of the fact that the derrick booms may be working or for other reasons this cannot always be conveniently done when the ship is in port. Therefore a time for this work should be selected at a less busy port, when more aid can be secured from the seamen aboard the vessel.

Efforts should be made at all times to keep the aerial wires sufficiently taut to prevent side-sway, for operators should know that, owing to the high potentials employed, it is not necessary for the aerial wires or the lead-ins to actually touch the mast stays in order to effect a short circuit. If the aerial wires swing within 6 or 8 inches of any stays which are connected to the hull of the ship, sparking will ensue, effectively weakening the strength of transmitter signals.

The supporting halyards should be inspected from time to time to ascertain whether they are in a weakened condition. Such wear is first noticeable in the pulley block at the top of the mast, where, owing to the swaying of the aerial, considerable chafing takes place.

Insulation

The insulation of an aerial may readily be tested by the auxiliary set. If the spark gap of this set is placed in series with the aerial and it does not function even when the points are separated by ⅛ of an inch, it is a sure indication that the aerial insulators are carbonized. They will therefore require scraping with a knife, or cleaning with sandpaper, to be followed by a new coat of grease.

While temporary repairs may be made without the use of solder, if the aerial wires should become broken at sea, it is imperative that the joint be cleaned and soldered at the earliest possible moment. The effects of a loose joint are not so noticeable in transmitting as in receiving, where it may cause a swinging in and out of the received signals.

Auxiliary Set to Power

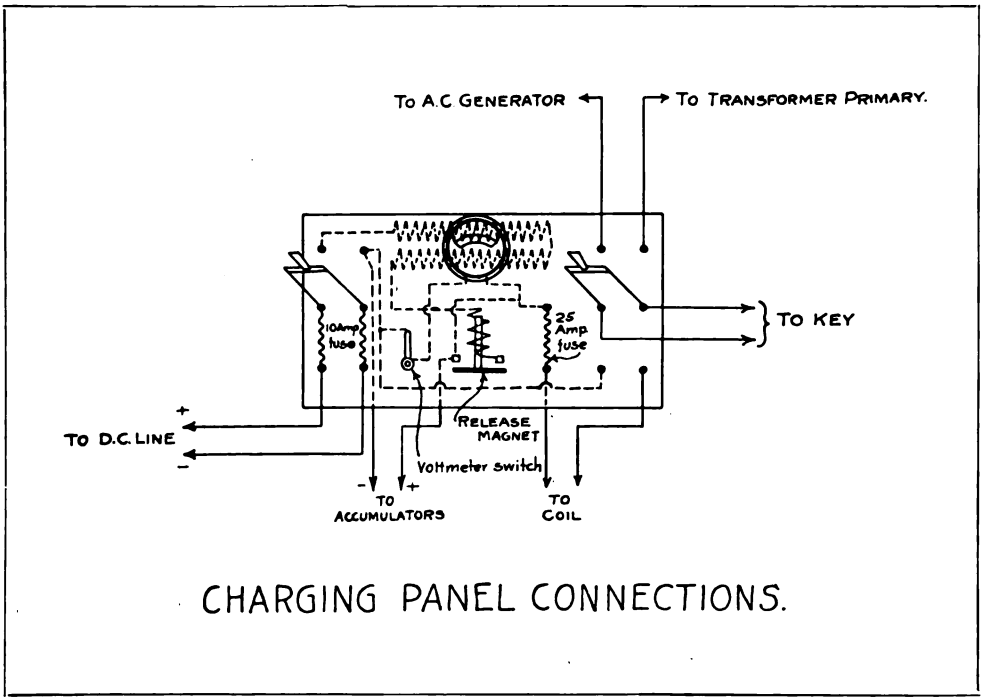
Fig. 2 is important and shows the actual connections made aboard a ship in changing from the auxiliary set to

the power set. Auxiliary sets are now required by the United States regulations to be operated on a wave-length of 600 meters, and since the open circuit of the power set is already set at that wave-length, it is only necessary to connect the spark gap of the induction coil in series with this circuit. Referring to the drawing (Fig. 2) the plug connector is connected at the end to a brass upright supporting the secondary winding of the oscillation transformer of the power set. This plug, when placed in the retainer at B, connects the power set to earth through the short wave condenser; the latter may be short-circuited by the strap, C. When the plug is connected to B the D. P. D. T. switch on the charging panel is thrown upward. This places the transmitting key in series with the primary circuit of the power transformer.

When it is desired to transmit on the auxiliary set, the D. P. D. T. switch is thrown downward, which connects the transmitting key in series with the primary circuit of the induction coil. The plug is then removed from the retainer, B, and placed in retainer A. This places the spark gap of the auxiliary coil in series with the open oscillatory circuit.

Auxiliary Set Connections

Fig. 3 is a detailed wiring diagram showing the actual connections of the charging panel employed with the auxiliary sets. Since the fundamental circuits have been given in previous articles on "Operators' Instruction," it is not necessary to go into the details with the exception that it might be remarked that to charge the storage cells, the 2-pole switch on the left is closed. The plunger of the underload circuit breaker (release magnet) must then be pushed upward in order to close the circuit to the batteries. When the battery circuit is closed, the plunger is held in an upward position, allowing the batteries to charge. If the plunger does not remain in this position, it may be taken as an indication that the fuses on the main D. C. switch are "blown" or that the connections to the storage cells are broken. A small strap key (voltmeter switch) is mounted on the board and, when depressed, al-



CHARGING PANEL CONNECTIONS.

Fig. 3

lows readings of the combined cell voltages to be taken.

The 25 amp. fuse to the right of the switchboard is in series with the primary

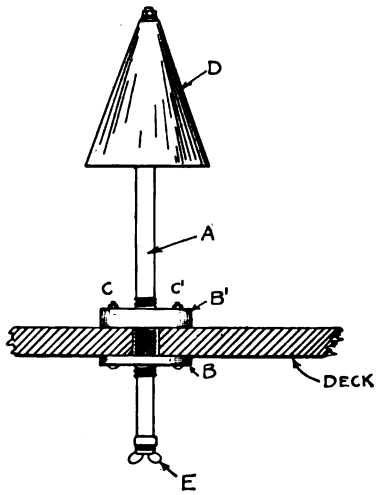


Fig. 4

circuit of the induction coil. Operators should thoroughly study this circuit diagram, having a clear picture of it in mind in case of emergency.

Fig. 4 is a more detailed view of one type of deck insulator used by the Marconi Wireless Telegraph Company of America. The hard rubber tube, A, is threaded and held in place by the disc, B and B'. These discs are clamped together by the bolts, C and C'. The space underneath the discs is covered with white lead, making a watertight joint.

The hood, D, is of metal and serves to protect the rubber from moisture during rain or that due to heavy seas. The electrical connections are made at either end of the brass rod E. This insulator is being replaced by one of new design, the details of which will be given in a later issue.

(To be continued.)

COMPLAINTS OF INTERFERENCE

The following statement has been issued by the United States Department of Commerce:

It has been brought to the attention of the Department that considerable interference is being caused, especially in the vicinities of New York and San Francisco, by stations conducting tests without due regard to traffic which is being conducted simultaneously. Stations desiring to conduct tests should communicate with the radio inspector by letter or telephone, stating the probable length of time that will be required. Stations conducting such tests or temporary experiments should "listen in," to determine that no interference is being caused and during the test should "listen in" frequently for the interference signal, Q R M. Stations conducting tests should transmit their official call signal frequently.

Attention is invited to the Act of August 13, 1912, section five:

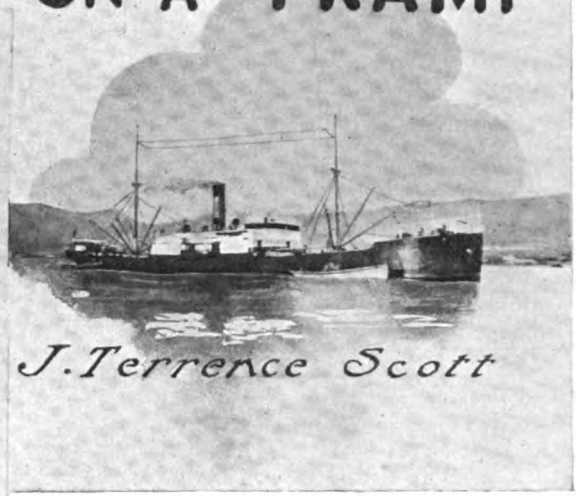
> That every license granted under the provisions of this Act for the operation or use of apparatus for radio communication shall prescribe that the operator thereof shall not wilfully or maliciously interfere with any other radio communication. Such interference shall be deemed a misdemeanor, and upon a conviction thereof the owner or operator, or both, shall be punishable by a fine of not to exceed five hundred dollars or imprisonment for not to exceed one year, or both.

The Department holds that interference caused by tests of the character described is "wilful" when no "listening in" precautions are taken and the call signal of the station sending is not repeated at intervals.

PRAISE FOR MARCONI MEN

The following tribute to two Marconi men is contained in this extract from a newspaper article concerning the investigation by the Commission of Inquiry into the collision between the Empress of Ireland and the Storstadt in the St. Lawrence River: Ronald Ferguson, chief Marconi operator of the Empress of Ireland, and his assistant, Edward Bamford, were called after the luncheon interval. They told the story of the night from their point of view in clear-cut phrases. When they had finished, Lord Mersey said: "You spoke well, you young gentlemen. You are a credit to the service you are in."

A YEAR ON A TRAMP



by J. Terrence Scott

An interesting account of an operator's voyage to South American, North American and European ports.

IT was not without misgivings that a little over a year ago, I took the Oakland ferry to join the Norwegian tramp steamer Cuzco. I had been Marconi operator aboard steam schooners, oil tankers, and passenger boats, big and little; but a tramp—especially a Norwegian—was an unknown quantity.

What was she like? Where was she bound? And, above all, how were the "eats"? These are but a few of the many questions which passed through my mind on the fifteen minute trip across San Francisco Bay.

And then I was surprised, agreeably surprised; and all my questions were answered. At a glance I found a seven thousand ton cargo boat, shining from bow to stern in a new coat of paint, clearing her decks of the rubbish incidental to repair work and making ready for sea. Her commodious upper deck and the awning overhead made her look more comfortable than some of the passenger ships I had been on!

The uniformed chief officer was giving orders in the Norwegian tongue to some sailors on the foredeck, and while I was debating as to the best manner of approaching him he noticed me and came over to where I was standing. Holding out his hand and smiling pleasantly, he said: "I suppose you're the new sparkie?"

I told him of my pleasure in being the same, and Mr. Olsen soon introduced me to the other officers. About fifty per cent. of the load was lifted from my mind when I learned that they all spoke English and welcomed me with that friendliness and openheartedness which seems to be a characteristic of the Norwegian.

The remainder of my worries were dispelled when I answered the dinner bell.

We sailed the next day, March eleventh, for Puget Sound, where the ship discharged its remaining cargo of nitrate of soda and copper ore. Here I was lucky enough to see the whole process of smelting copper ore, from the time the ore and coke went into the enormous blast furnaces until the

copper had been refined and cast into ingots ready to be drawn out into wire.

I was not as fortunate, however, at the Dupont Powder Company's works, for that company's rules are necessarily very strict, and woe to the employee who breaks them by admitting visitors! About all that I learned of powder and dynamite making was that it required many large red signs, announcing, "No Admittance" and "No Smoking." These were posted on every building, gate, and fence-post.

After a week of discharging, we commenced to load. First, the general cargo; then lumber and lumber, and more lumber, for the Panama Canal. I watched go down into her holds what seemed to me to be enough lumber to fill several ships the size of the Cuzco; and then they commenced to pile on the deck load. They piled on lumber until it was eighteen feet above the deck. Finally the loading stopped, just as I was beginning to wonder if the ship was not ready to capsize. Then we loaded dynamite and blasting powder, and I gasped and wondered "what next?"

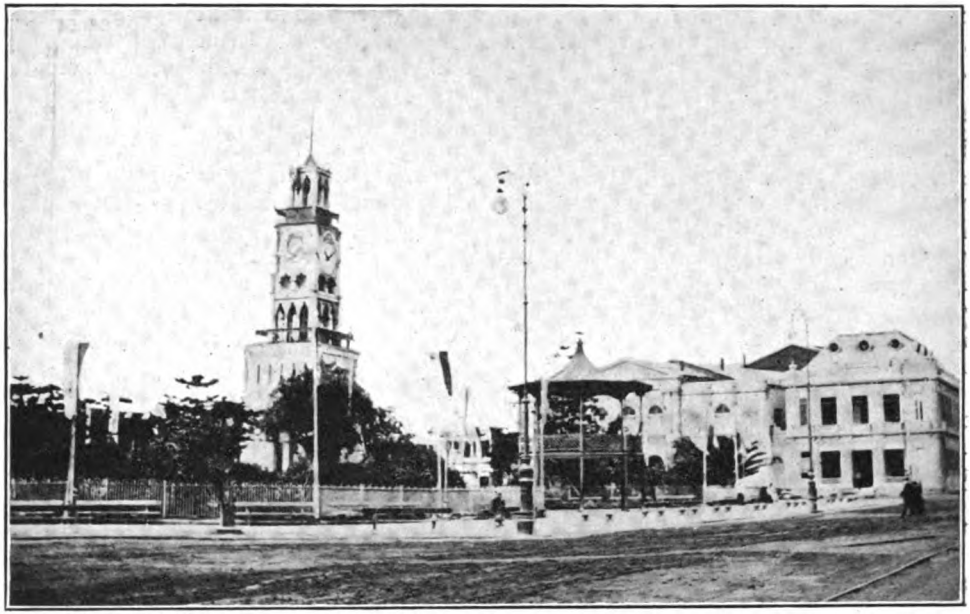
The ship returned to San Francisco on the fifth of April, and after spending a day and a half loading still more cargo, passed out of the Golden Gate and started south.

On the thirteen-day voyage to Punta Arenas, Costa Rica, I had ample time to become better acquainted with my shipmates. They had apparently decided that my lot was rather a lonesome one and did everything possible to make me feel at home. I soon noticed that whenever I came within hearing distance the officers would stop using Norwegian and continue their conversation in English. This may seem but an act of common politeness; but when one stops to consider that some of them used English with difficulty, and that at times they were at a loss for English words in which to express their meaning, it was really as great a courtesy as they could possibly show a lonesome American. This, and their many other kindnesses, soon caused me to be heartily sorry for having ever used the term "squareheads" in speaking of Scandinavians.

We arrived in Punta Arenas on Sunday afternoon. After being ashore for several hours, I did not wonder that Costa Rica is called "The Happy Little Republic." The whole populace promenaded around in their best, whitest, and lightest finery, laughing and chatting in Spanish, with apparently not a care or worry in the world. Punta Arenas, of course, had a *plaza* and a municipal band. Every Central and South American town must have these. Otherwise it would not be a town.

In the evening, everyone, even we *gringos,* marched and countermarched around the *plaza* to the tune of the latest rag. Later we attended the cinematograph—and I will say right here that a designer of Turkish baths could learn something new about perspiration producers by attendance at a Central American movie show. I was a guest of the Governor, so there was

One of the principal sights of Huacho was an old Spanish church, dating back to the Inquisition



Iiquique, Chile, has a population of about forty-five thousand, good hotels, a street car system, moving picture shows, an English club, and a plaza. No Central or South American town can call itself civilized unless it has a plaza

nothing for me to do but sit and perspire for two long hours to the tune of "You Great Big Beautiful Doll," played over and over again on a squeaky phonograph.

The following day we commenced discharging our cargo of dynamite. The natives handled it as though it were sawdust and ignored the supercargo's advice that if they weren't careful with the cases they would all be blown to—er—blazes. Finally one of the stevedores dropped a case with an unusually loud slam, and, looking up at the supercargo with a grin, nonchalantly remarked: "Lots more men ashore!"

Captain Miller had invited me to go on shore with him to look at some pets which he wished to take home, and after watching the unloading I gladly accepted. In fact, I was downright anxious to go. The Governor met us at the *muelle* and went through the markets with us. I believe that I enjoyed the captain's bargaining with the pretty *senoritas* and their *mamitas* even more than the captain himself did, although I did not understand a word of Spanish. We returned aboard ship in the evening with a five weeks' old leopard cub, two squirrels, two parrots, and three noisy parakeets. No monkeys were for sale, otherwise we would have had one.

The next port was Balboa. A ten-day stop here gave me a fine opportunity of seeing the Panama Canal, and I made the most of it. I made the trip across the isthmus one Sunday, stopping two hours at Culebra, Gatun, and Colon. This allowed me to see the big cut and the great locks, as well as the thirty kilowatt NAX station. Here I was received and entertained in the usual American style, and what with swimming in the warm waters of the Caribbean Sea, and talking shop, the time passed so quickly that I almost missed the train.

Before leaving Panama I had even a better chance of seeing the actual work on the canal. I had made the acquaintance of the conductor of a work train, and one day he took me for a trip on his run between Panama and the Pedro Miguel locks, the highest on the Pacific side. The car was at all times crowded with engineers and surveyors moving between the different sections, and their patient answers to my many questions con-

stituted a lesson on canal building which I shall never forget. I learned more about the actual work on the Panama Canal that day than I could have learned from studying all of the books written on the subject. And when I left the train in the evening I envied, admired, and respected one man above all others—the Colonel.

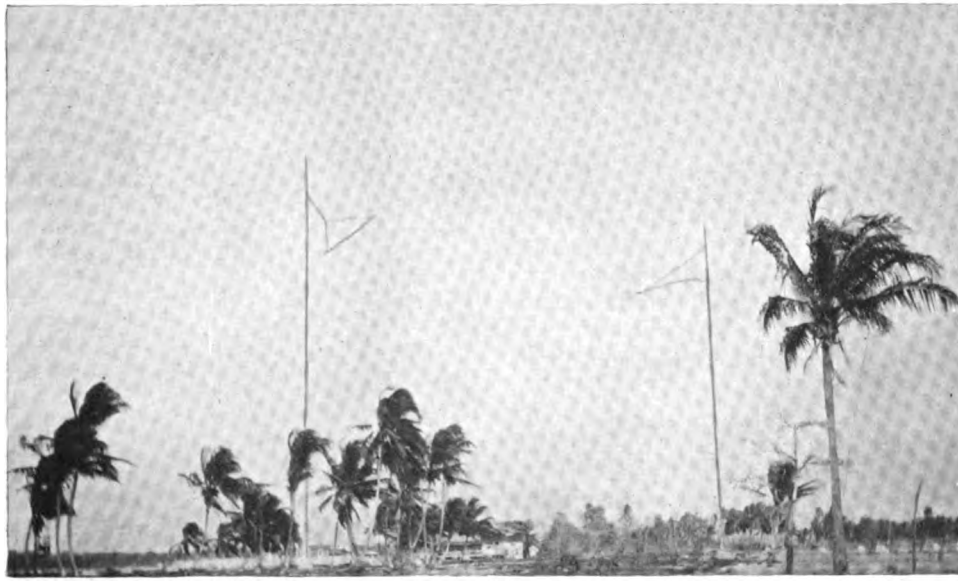
The Cuzco left Balboa on May fourth for Paita, Peru. Paita is the most desolate looking place it has been my misfortune to visit. Several dirty streets with arid sand dunes on one side and the glaring Pacific on the other, was all I could find of the town. The only things of interest were the Panama hats. Dealers in these swarmed aboard on our arrival, offering all grades at prices ranging from one to seventy-five dollars gold. These hats would probably be worth several times their original cost in the States.

From Paita the ship went down the Peruvian coast, visiting Eten, Huacho, Pacasmayo, Chimbote, Supe, and Mollendo; stopping from two hours to a day in each port. At Huacho I was tempted by the sight of what appeared to be a pretty city several miles inland, connected with the wharf by a railroad, and, needing kodak films, I decided to go ashore.

The total passenger equipment of the railroad consisted of one rickety four-wheel car pulled by a team of decrepit mules which, I learned afterwards, had been retired from the Peruvian army for senility. The schedule was regulated by the number of passengers, the conductor blowing a tin horn until the car was loaded. After a half hour wait, the full passenger list of nine was complete, and I jolted up to Huacho.

The principal sights of Huacho were the old Spanish church, dating back to the Inquisition, and the skull road. The highway of the gruesome name is so called because several miles out from the city it runs alongside a fence, the posts of which are decorated with about fifty weather-bleached skulls. I could not secure authoritative information on how their former owners came to their end, but I presume it was from some plague. But I did learn that Huacho, and the citizens of Huacho, are, with one exception, the dirtiest in the universe. The exception is a small town in China.

Our first Chilian port was Arica. What a change! Here there were trees, green grass, and a Marconi station. The town was clean; the people were clean; and the houses were



I made the trip across the isthmus one Sunday, stopping two hours at Culebra, Gatun and Colon. This allowed me to see the thirty-kilowatt NAX station, where I was entertained in the usual American style

houses, not shacks. Yet Arica is uninteresting, except in the fact that it is the site of the Peruvians' last stand against the Chilians in the boundary

The total passenger equipment of the Huacho railroad consisted of one rickety four-wheel car pulled by a team of decrepit mules. The schedule was regulated by the number of passengers

war of 1882-1883, when the town was ceded to Chile.

The next port was Iquique. As we arrived, I remarked that there seemed to be a large number of sailing ships in the harbor. There were perhaps twenty. The old boatswain heard me and smiled. "You should have been here twenty years ago," he said. "Then you would have seen ships! Sometimes there were two hundred of them in here discharging coal from England and Australia, and loading nitrate and ore for Germany and the States." Those twenty ships were the last of that magnificent fleet, and within several years they, too, will be but a memory.

Iquique has a population of about forty-five thousand, good hotels, a street car system, and an English club maintained by the many Englishmen working in the offices of the nitrate companies. There are motion picture shows, and now and then a traveling theatrical company. Then there is also a race track, for horse racing has almost supplanted bull-fighting and cock-fighting in Chile.

I had been told that the street car conductors of Iquique were beautiful young *senoritas,* so, naturally, I was anxious to take a ride. But I saw the conductor-*ess* first. And I walked. Somebody had lied.

From Iquique we went to Tocopilla, a barren looking place hemmed in by high mountains in the back, and by the Pacific in the front. It was the one place where I could find nothing whatever of interest.

Our last stop on the Pacific side was Antofagasta, where we laid for fifteen days discharging the remaining general cargo, and loading a full cargo of nitrate. Antofagasta is beginning to rival Iquique in being the heaviest nitrate shipping port in the world. The ships lay far out in the bay and the cargo was towed out in lighters, or launches, and then carried aboard by the ship winches.

While there I had the opportunity of visiting several of the sailing ships in the harbor. What a contrast between the life on board those ships and that on the wireless equipped tramps! The men on the windjammers leave port and hear nothing from the outside world, and the outside world hears nothing from them, until their arrival at the destination several months later. Wars may be declared, kings may die, and new presidents elected; but the old windjammer goes serenely on her way, or stands still, at the pleasure of the wind. How different it was on board the Cuzco, where the American policy in Mexico and the latest Panama Canal bill were discussed, and the newest court scandal talked over each morning at the breakfast table.

When we left Antofagasta there were many conjectures as to where our cargo was to be delivered. The captain maintained discreet silence in the absence of any definite orders, but some of the officers thought that Germany would be our destination, others Galveston. Only one thing was certain; the ship was going around to the other side. Of course, I was delighted at the prospect of a trip across the Atlantic, as all of my traveling had been confined to the Pacific.

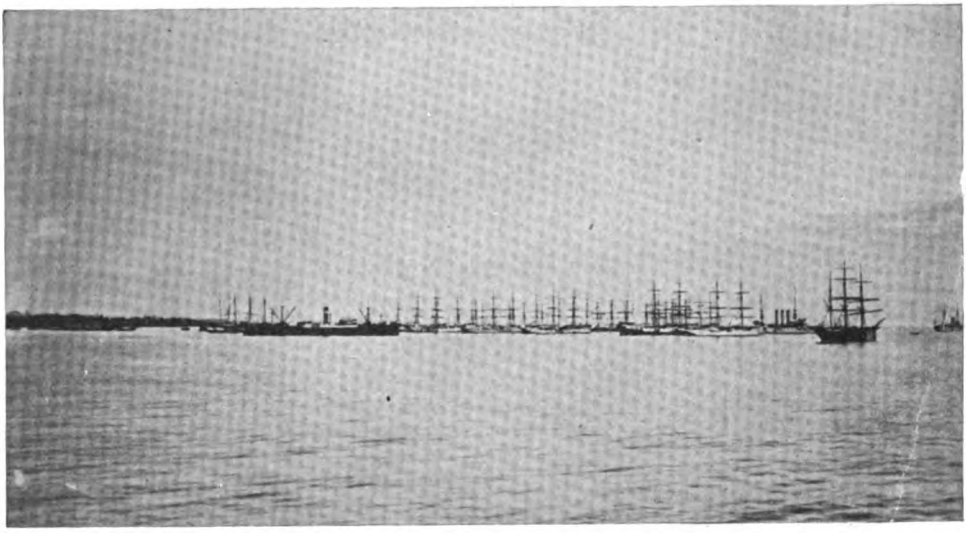
On the night of June sixteenth we arrived off Cape Pillar at the western

entrance of the Straits of Magellan. A cold drizzling rain had added itself to the fog which had been with us for three days, and a strong gale and heavy sea appeared to be doing their utmost to make life miserable for us. I have often heard operators on the regular mail runs describe heavy seas, and I have been in two typhoons myself, but to see the genuine "mountain high" waves one must be off Cape Pillar in a real storm. I went to sleep that night thinking what a fine thing dry land is, and how foolish I had been to ever leave it.

I had been asleep for probably two hours, when I awakened, startled. I leaped from my bunk before my eyes had opened. Woof! I was soaked to the skin with icy salt water, and the room was filled almost to the top of the door sill with the swirling streams. My first thought was of the wireless outfit. No, not to send out the S O S, for I could hear the engine running—but to keep the water from the instruments. My living room and the wireless room were divided by a thin partition, and, luckily, I had closed the door before turning in. I piled my clothes around the crack between the door and the deck, and then investigated.

I had left the door on the hook and opened about four inches for ventilation. Consequently, when the ship was turned to enter the straits, thus putting my room on the weather side, a huge wave swept down the deck, tore the hook from the door, ripped the light screen door from its hinges, and gave me the coldest bath I have ever had.

The Cuzco was well into the straits when I finished breakfast the next morning, so I loaded my kodak and went on deck to attempt some snapshots. The western half of the strait is between almost unbroken ranges of



When I remarked that there seemed to be a large number of sailing ships in Iquique harbor, the old boatswain smiled. "You should have been here twenty years ago," he said. "Then you would have seen ships! Sometimes there were two hundred of them in here"

mountains which rise nearly perpendicular from the water's edge. Their upper halves are covered with snow, and here and there could be seen blue glaciers on the sides. The width of the strait proper varies from ten to fifteen miles; we were never more than five miles from shore, and usually less. Our vessel arrived at one of the narrowest places about eight o'clock in the evening, and as it was a clear moonlight night the captain went on through. At times it seemed as though the ship was bound for certain destruction on the rocks which lined the passage; then a sudden turn would show water still ahead—and another mountain right on our course.

When I got up early the next morn-

ing we had left the mountains behind and were abeam of Punta Arenas, which in English means Sandy Point. The sky was clear and the sun was out all day. The Cuzco passed Cape Virgins at the western end of the straits at eight p. m., and I sent a message from the captain to her owners advising them that she was safely past the most dangerous part of the voyage.

When off Santos, Brazil, our curiosity regarding the ship's destination was satisfied by a message ordering us into Rio de Janeiro for bunkers; thence to Montreal, Canada, to discharge.

At sunrise on the morning of June thirtieth we passed into the harbor at Rio de Janeiro. It is impossible to describe the wonder of this city—especially if one sees it for the first time at sunrise. I can only use the old stereotyped phrase: "beautiful beyond words."

We went to Tocopilla, a nitrate port and a barren looking place hemmed in by high mountains in the back and by the Pacific in the front. It was the one place where I could find nothing whatever of interest

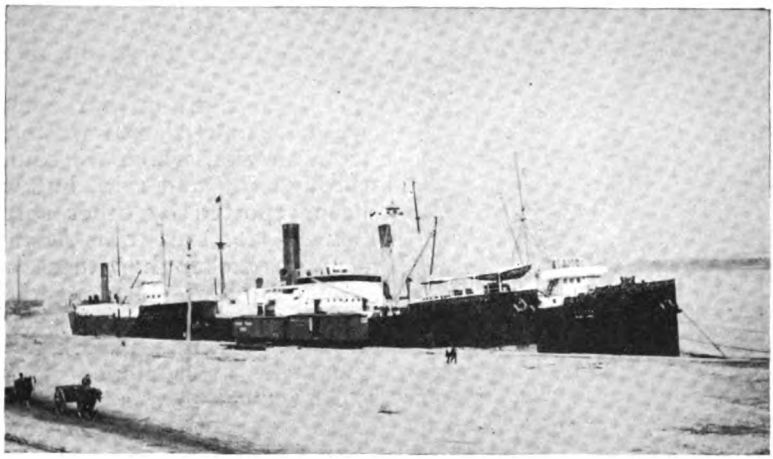
Although the ship stopped at Rio only twenty-four hours, I had time to take a car ride around the bay and a walk through the city. As it was the first real city which I had seen since leaving San Francisco, you may imagine how I enjoyed again walking paved sidewalks, riding on electric cars, and seeing large buildings. Then, too, the Brazilians do not seem to be afflicted with the languid *manana* spirit prevalent on the west coast of South America. The bustle in the streets during the day, and the crowded cafes at night, bear witness that the citizens of Rio believe in the adage that "*manana* never comes," and that it is best to make the most of today.

From Rio de Janeiro the ship went up the Brazilian coast as far as Pernambuco, where we set a course straight for the Gulf of St. Lawrence. Argentine, Uruguay and Brazil maintain an excellent chain of wireless stations, reaching from New Year Island near Cape Horn to Pernambuco, so that a ship is always within wireless range of some coast station. There is also a Marconi station on Falkland Islands which is one of the best stations that I have worked. At a distance of eighteen hundred miles I worked this station with my three-kilowatt outfit, and heard it as far north as Bahia, a distance of about 2,700 miles.

From Pernambuco north was a lonesome trip for a wireless operator. Our course was out of the regular passenger steamer tracks, and the strong atmospherics and tropical lightning every night made long distance work impossible. Finally, early one morning I heard DIT—the Imperator. Then followed the sparks of the other trans-Atlantic liners. At five hundred miles from the North Atlantic track

there was such a babel of sparks that it was amusing to attempt copying any particular one. The many and varied toned sparks, all coming in at nearly equal strength, produced an effect in the 'phones which would have given anyone but a wireless operator "the creeps."

The first land station I picked up after losing Pernambuco was Sable Island. I was quite near this station for one whole day, and during that time I heard finer wireless than I could have believed possible. The swift and systematic handling of traffic without the use of a single unnecessary dot or dash, was a revelation. I know now what good wireless operating really is.



At Montreal our cargo of nitrate was transferred into lake steamers, to be carried on up the river to the Dupont Powder Works. The cargo filled six of these steamers and several large freight cars

On the way up the St. Lawrence I heard more of the working of the Canadian stations, and after being in most places where there is heavy wireless traffic, I have come to the conclusion that, taken as a whole, the Canadian Marconi Company's operators are the best and most courteous in the world. From the time I first heard VCT, until I arrived in Montreal, being a wireless operator was a real pleasure—even with dense fog and lightning storms most of the way.

The Cuzco arrived in Montreal on the morning of July thirtieth, twenty-nine days—to the hour—after leaving Rio de Janeiro. The sudden change from salt to fresh air and the difference in drinking water deranged our stomachs, and for the first week in port every man on board was sick. I suppose the people of Montreal thought we were a wretched representation of humanity; but what we, in return, thought and said about Montreal simply could not be mentioned here. The newspapers came out the day after our arrival with nearly a column about the ship and its "menagerie," and it seemed like at least one-third of the population found time to come aboard and pet Spots or try to make the parrots say "Polly want a cracker?" Montreal was too much. Even Spots' unusually good disposition rebelled and several of the visitors suffered from scratched hands.

Our cargo of nitrate was transferred into lake steamers, to be carried on up the river to the Dupont Powder Works on the Great Lakes. The cargo filled six of these steamers and several large freight cars. After the nitrate had been discharged, the ship was lined throughout with clean new lumber for a cargo of wheat. Ours was a happy crew when they learned that this cargo was designated for England, for it meant they would have an opportunity of visiting home after an absence of three years.

Although it had taken nearly two weeks to load the cargo of nitrate, the ship was full of wheat in less than

At every port we touched I went ashore, enjoying many a refreshing swim in the "Cavancha"

thirty hours after going alongside the elevator. Of course, this is easily explained. The nitrate must be lifted from the lighters, hauled aboard, lowered into the hatches, and then carried to the different parts of the holds; while with the wheat, large iron chutes are put over each hatch and it flows in by gravity.

We said good-bye to Montreal at noon on August twenty-first.

On the way down the St. Lawrence I was given a demonstration of the efficiency of the Canadian Marconi system. The captain was rather doubtful as to whether he would go out by way of Belle Isle or Cape Ray; the former route was much shorter, but dangerous if there was any quantity of ice, while the latter was perfectly safe if it was not foggy. The ship was off Father Point at the time and I asked the Marconi station there for information regarding the conditions at both places. Within twenty minutes I had accurate, down-to-the-minute reports from every station between our position and both Belle Isle and Cape Ray. The reports showed that the Strait of Belle Isle was almost packed with ice and the weather was from hazy to foggy, while the southern route was clear and had no ice. This eliminated all guess-work on the captain's part and he immediately set the course for Cape Ray.

After passing Cape Race I began to receive ice reports from the other ships. For two days there was a continual stream of "msgs," the text in all of them nearly the same: "Sighted large berg lat. 49, long. 51.13; growlers lat....." and so on. We passed within six miles of a large berg which had been right on our course before we had changed, and we felt the cold from several, which we could not see through fog and rain, but which had been reported by other ships. As I listened to the trans-Atlantic liners steadily exchanging these reports, I wondered if the passengers on those floating hotels have any idea of the amount of wireless work that is done for their safety alone.

As the Cuzco was bound around the north of Scotland, then down to the Tyne, she was soon out of the regular steamer track. There was practically no wireless for me to do after the first three days, so I sat back and listened to the other fellows work, and tried to count the number of stations. This pastime was only a degree better than attempting to beat "Old Sol" at cards. One night I counted thirty-three stations in four hours; besides hearing many others I could not copy. I wonder what some of the operators who complain of the interference on the Pacific would think of this jam?

We arrived off Shields on the evening of September sixth and proceeded on up the Tyne to Dunston, where the ship lay for almost two weeks discharging her cargo. From there she went back down the river to Wallsend, five miles below Newcastle, for repairs.

It was expected that the Cuzco would be only six weeks in the ship-

yard, but when this time had elapsed it seemed as if the repair work had been just started. As I had never before seen how ships were built, everything around the shipbuilding plants interested me immensely.

Several hundred feet from where we lay were the ways on which the Mauretania was built; the largest floating crane in the world lifted out our engine; every week a ship was launched somewhere within sight of us. Farther down the river could be seen the largest cranes in the world looming above the surrounding factories. These cranes are capable of lifting the engine from the largest ship afloat, and could easily lift one of the smaller steamers right from the water and place her on land. Up the river could be seen the nearly finished Rio de Janeiro, the largest battleship in the world. And I was actually seeing these wonders!

Two months passed and we were still in the shipyard.

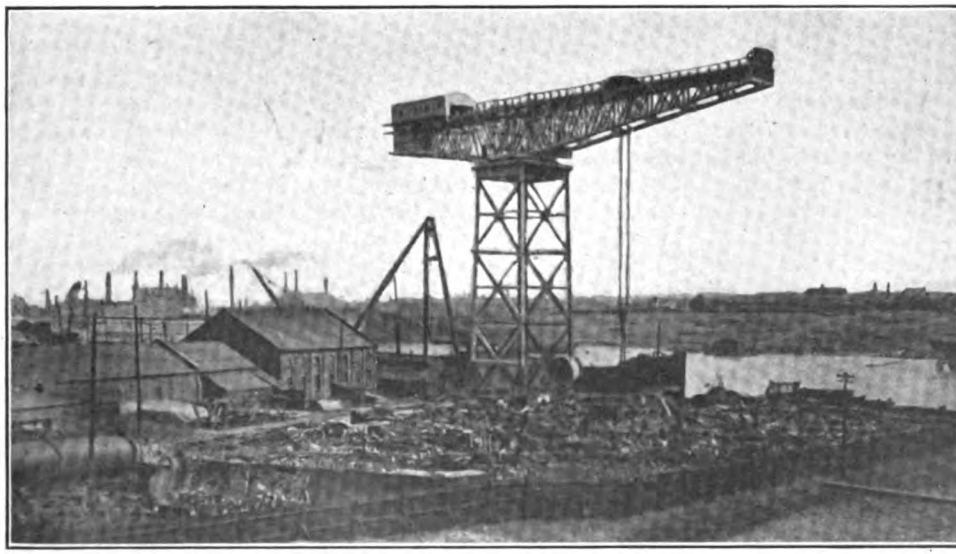
Most of my shipmates were home in Norway, leaving me alone in a foreign land, and if Englishmen were really as snobbish as they like to think they are, I would have had a lonesome time of it. The first real Englishman with whom I became acquainted was Charles J. Close, manager of the Newcastle office of the English Marconi Company. Mr. Close and his staff did everything possible to make my stay in England an enjoyable one. And if there had been more sunshine, and less coal dust and smoke, they would have certainly succeeded.

But I simply could not like England. The crooked streets and the old, low, smoke-blackened buildings were depressing; the filthy barber shops brought on bad dreams about germs and microbes; and dodging street cars and automobiles which run on the wrong side of the street almost gave me nervous prostration. Neither could I accustom myself to women sitting in a "pub" drinking with always smoking, and sometimes swearing, men.

Perhaps I was homesick; I know that I often thought of the land of sunshine and flowers, and of how nice one long look at the sun and a clear blue sky would be.

And how I missed good old American slang! If one casually remarked to an Englishman, "Ain't that rummy a grouchy looking gink?" the Englishman, instead of replying, "I don't getcha," politely requested the definitions of "rummy," "grouchy" and "gink." Which does take the snap out of conversation.

Christmas Eve found us still in the shipyard. The officers had arrived from Norway a week before and we



At Wallsend-on-Tyne the largest floating crane in the world lifted out our engine; every week a ship was launched somewhere within sight of us

made a jolly night of it. At eight o'clock we sat down to a table loaded with all the good things we have at home, besides several Norwegian dishes that I forget the names of. The first toast, of course, was "A Merry Christmas and Happy New Year to all"; the next: "To the place we are all thinking of—Home." The third was: "To the chap that is furthest away from there—'Sparks.'" And I made some kind of a reply; but all I remember is that it had a pretty hard time getting around the lump.

By New Year's I had lost almost all hope of ever leaving England. What had been so interesting at first, now

At Antofagasta the ship lay far out in the bay and the cargo was towed out in lighters and carried aboard by the ship's winches

palled. I had not spent all of the time in Wallsend, of course, but as I intend to only write of the places which I actually visited in the Marconi service, I will just mention that I made trips to the continent and spent a week and a half in wonderful London. Even now I can hardly believe that I really saw those places I had read so much about and which I had always longed to see. And it is even harder to realize that I was being paid to see them!

On the night of January sixteenth —four months after our arrival—we left Wallsend and went down the Tyne to North Shields, where we lay for two days, taking bunkers and a cargo of coke. From there we went to Port Talbot in Wales, where we stopped for three days and loaded general cargo. And then we left the British Isles for good.

Our route was down past the coast of Europe to the Canary Islands, where a course was set for Fernando Noronha, off the northern part of Brazil. On the night that we crossed the equator, Neptune, with his long rope-yarn hair and beard, paid us a visit and initiated those of our crew who had never before crossed the line. The unfortunates were led, dragged, or carried up on deck and forced to sit on a narrow plank laid across the top of a tub filled with cold water. Neptune then approached with a pot of lather —made up chiefly of soot—and with a large paint brush smeared the seaman-elect's face, then proceeded to shave with an enormous wooden razor. Any protests were quickly silenced with another application of the lather—in the mouth! These operations were followed by a ducking, both in the tub and with the fire hose, from which emerged a true son of Neptune.

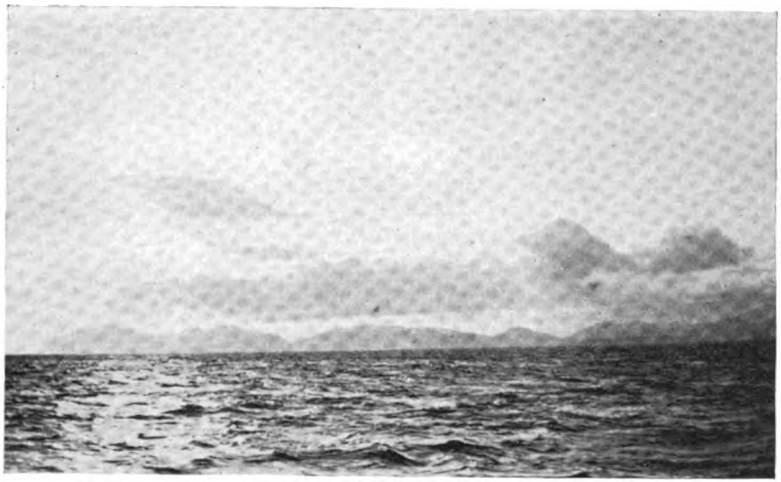
On February eighteenth we arrived in Santos, where the ship lay four days loading coffee. Not so very long ago seamen shuddered, and sometimes mutinied, when their ship was ordered to Santos, as the place was notorious among seafarers as the most unhealthy port in the world. Hundreds, perhaps thousands, of seamen have died there from yellow fever. I have heard of ships lying there for months trying to

get a crew. There is one story about a ship which had seven complete crews and three captains before she finally got away with enough live men to work the ship. Up-to-date sanitary measures have now made the place as healthy as the average South American city.

While the ship was lying here, I visited one of the large plantations and saw how the coffee was grown, picked, dried, and finally sacked ready to be shipped by rail to the seaport.

From Santos we came back to our route of nine months before. On the fourth of March, after a rough, foggy passage through the Straits of Magellan, we passed out by Cape Pillar and I was on the home stretch. The only stops in South America were Coronel and Iquique, Chile. From the latter place we went direct to Punta Arenas, Costa Rica, where we lay for nine days discharging the cargo loaded in Wales, and loading another cargo of rosewood and mahogany for New York, via the Isthmus of Tehuantepec from Salina Cruz, Mexico.

After several days, Punta Arenas began to wear on the nerves of all. The heat was almost unbearable during the day. We tried alligator hunting in the lagoon back of the city, but saw few alligators, and shot none at all. Then we tried fishing, but the fish weren't biting that week. Finally, one morning the chief officer came on deck with an enormous hook and informed all hands that he intended catching a *real* fish. After tying it to a heaving-line, and making the other end of the line fast to the ship's rail, he baited the hook with about five pounds of salt pork and dropped it over the stern—leaving me to stand by and yell if there were any bites. And the bite came! There was a sudden jerk, and I jumped for the rail and yelled at the same time. Several feet below the rail dangled the frayed end of the fish line, and two hundred feet away a large shark was churning the water in agony, trying to rid itself of the hook.



Picture making is difficult in the Straits of Magellan, where the western half is between the almost unbroken ranges of mountains rising from the water's edge

Mr. Shark was evidently not enjoying his meal of salt pork any more than the average sailor does.

Remembering that the Marconi construction men had left some of the old seven-strand bronze wire on board after putting up the new aerial, I offered to lend this if the chief officer would make another hook. He looked rather dubiously at the wire, but finally consented to another try. We had another bite the next evening. This time the line held, although the iron rail was badly bent and almost torn from the ship. After an hour's fight, during which a quartermaster was knocked from the boat and severely bruised, our catch, a monster man-eating shark,

was hauled aboard. It measured slightly over twelve feet in length.

Our only stop between Punta Arenas and Salina Cruz was San Jose de Guatemala, an uninteresting little place except for the gaudy uniforms which the port officials wore. Salina Cruz is of special interest to Americans at present, not so much on account of the recent disturbances in Mexico, as for its relation to the Panama Canal. For many years much of the freight between the east and west coasts of the United States has been shipped down to Coatzacoalcos on the Atlantic side, carried across the 120 mile wide Isthmus of Tehuantepec, and re-shipped at Salina Cruz. Millions of tons of sugar has gone back over the same route to be refined in the East. For this service, the American-Hawaiian SS. Co. maintain a fleet of the finest cargo steamers under the American flag, if not in the world.

As a trans-shipping port, Salina Cruz is probably unexcelled. Fast working electric cranes swing over the ships, lift the cargo out of the holds, then swing back and deposit it direct on the cars. The wharves are made of concrete, and the warehouses the latest in fireproof construction. In the harbor is a dry-dock which will accommodate ships six hundred feet in length. These facilities, which were only completed in 1907, will be practically a dead loss after the opening of the Panama Canal.

From Salina Cruz, the Cuzco went direct to San Diego.

How I worked my tuner, adjusted my detector, and strained my ears for the first buzz from KPJ! Finally, off Cape Corrientes, I heard him; then, several nights later, I picked up KPH sending news from home—God's Country!

After that, each day seemed to be composed of about fifty hours. I spent most of the time on deck, passing uncomplimentary remarks on the Cuzco's speed. I'll admit it: I was then mighty homesick. For, after all, there's only one place for a fellow born and raised in a country where the people know they're alive from their first howl until their last gasp. Where's that? Don't make me laugh. U. S. A. it.

At daybreak one Sunday morning, the chief officer came running into my cabin, yanked off my bed-clothes and ordered me to get up quick. I tumbled out in a hurry, and without stopping to dress went on deck.

And there she was. . . .

The Cuzco was then abeam of Point Loma; within two hours she was made fast to the San Diego wharf, and I was again on American soil. My first purchase was an ice cream soda; my second a decent haircut. An American does not know how good ice cream sodas really are, nor what a treat it is to sit down in a sanitary barber shop, until he has been where there are neither.

Two days later, we proceeded to San Francisco, arriving there on April twenty-third—exactly a year and fifteen days after leaving. There my trip ended.

THE CROP

by George Mabie Todd

BR-R—IPP! Bump!

Manning turned over in his berth uneasily. Why couldn't they let him sleep; he had left the wireless room only a few hours before . . . willing to bet that there was no necessity for him to turn out for a long time yet. If only he could just get a few more winks, a little. . . .

With a sudden lurch of the vessel he was hurled violently out of his berth on to the floor amid a grinding and moaning of timbers. The big vessel quivered and shook, and outside there were muffled shouts and cries. Manning struggled to his feet, dazed. Groping his way across the cabin he had reached for the electric light switch when there then came a violent pounding on his door. He wrenched it open and a figure in dripping oilskins stood before him. It was the first officer.

"We've struck something; there's a hole in the bow as big as a house!" he flung out. And Manning, grabbing what clothes he could pick up in one handful, jumped into his trousers and dashed out of his cabin. Everything was in turmoil. The stewards were making their way from cabin to cabin, arousing the passengers, and already a few panic-stricken men and women were groping their way about the deck.

In the wireless room Harris, the junior operator, was waiting the arrival of his chief. He had already sent out the S O S call and now he surrendered the key to Manning. Again and again the senior operator flashed the appeal over the waters. Then he settled back to await a reply.

It was not long in coming. The Wiltania, steaming on her course seventy-five miles to the east, responded. She wanted to know the exact position of the Sylvester.

The captain had arrived in the wireless room by then and his face was tense with interest as he stood at Manning's back. He had guessed the unspoken request before it reached the operator's lips.

"Tell 'em we've struck a reef in latitude 16 degrees north, longitude 72 degrees west," he directed crisply. Then he added grimly, "And tell 'em to hurry up or they may not find us."

The force of this statement broke suddenly on Manning as he noticed that the floor of the wireless cabin sloped till it was almost impossible for him to retain his position at the key. The cries and shouts outside, faint at first, had redoubled. The wireless signals were growing dimmer. He knew what that meant. The water had reached his dynamos and they had failed him. And there was no storage battery equipment!

He turned to inform the captain of this fact. He had gone. Harris, too, had left, and following the direction of his superior had sought a place near the lifeboats. Manning knew then he was quite alone! His own safety came to his mind; he crawled on his hands and knees out of the door and surveyed the situation.

He was not a little dismayed by the cleared decks that met his eyes. Dawn

was just breaking and in the distance he saw the Sylvester's boats making toward a cloud of smoke which he suspected came from the funnels of the Wiltania. On the Sylvester, however, there was not a person in sight.

He slid across the deck toward the stern. Then he mounted a tackling block and halloed loudly. He waved his coat wildly also, but all to no purpose; the occupants of the boats, apparently unaware that any one had been left on the sinking ship, kept steadily on their way.

The situation was desperate. Manning dimly wondered how it would end. For several long minutes he speculated vaguely on his fate, sitting still and silent, staring out over the sea.

He was aroused by a low moan; it seemed to come from the other side of the deck and he picked his way among the débris in that direction. Again the moan sounded in his ears; this time it seemed to come from directly under his feet. He looked down, but saw no one. A heavy iron ventilator had fallen there, and as he listened the moan was repeated lower and nearer than before. He tugged and strained at the ventilator, but to no purpose. Stepping to one side he managed to separate a heap of overturned deck chairs and discovered the form of a man pinned under the mass of metal. As the unfortunate raised his head, Manning recognized him as a passenger—Flanders by name—whose resemblance to the operator had been commented upon early in the voyage. Now, however, the resemblance was marred by a deep gash in his forehead and his face was contorted with pain.

"It's no use trying to help me," he muttered as Manning bent over him. "I couldn't even get into a boat now. I seem to be hurt all over and weak." A spasm of suffering seized him and he beckoned Manning closer.

"Take this," he gasped, holding out his hand which clutched a letter. "Deliver," he choked; "deliver," he closed his eyes and the wireless operator drew quickly back. Another gasp, then: "Deliver—"

Manning called to the injured man softly, but there was no response. The operator realized suddenly that he was the only living person aboard the Sylvester.

This was followed swiftly by the disconcerting observation that the wind which had been blowing from the northeast had veered around to the north, increasing considerably in force. It brought with it seas which, although of comparatively little strength, at first developed in a surprisingly short time into mountainous waves. The ship rose high up in the air and came down with a crash which made her shake from stem to stern. As the minutes flew by both the wind and seas were increasing and Manning knew that the Sylvester could live only a short time.

The end of the vessel was nearer, in fact, than he thought, for even as there formed in his mind a resolution to find out if by chance a life-boat had been left behind, there came a grinding and a tearing; and, as if by magic, that part of the ship extending from the bow almost to amidship, disappeared into the hungry maw of the sea.

Held spellbound by the extremity of his peril, Manning stood for a moment gazing in terror at the waters swirling over the grave of the hulk. The next instant he hurled himself into the maelstrom.

Down . . . down . . . down, he sank. It seemed as if he must strike the bottom, many fathoms below. His head was bursting and a horrible din sounded in his ears. Instinctively he began to work his arms and legs. Then, almost as quickly as he had gone down, he ascended to the surface of the water. Before he had time even to draw a breath he was rolled over and submerged by a giant wave. Caught on the crest of another he was then propelled a considerable distance from the wreck. His breath was gone and his muscles seemed powerless. He wondered if he would ever come to the surface again; he wondered, but was not concerned. Then the din again sounded in his ears; something bumped his arm. It was a bit of floating wreckage. He reached toward it, and as his hand closed over the end

a strange sense of peace and quiet stole over him; a dark curtain appeared before his eyes.

II

The President of Zoambique had two objects in taking a cruise on his yacht the day that the Sylvester was wrecked. The first reason had to do with hygiene, but the second and more important one was a desire to leave behind for a fleeting moment the cares of state. And it so happened that he was not particularly pleased when his reverie was interrupted. He and the members of his party were basking in the sunshine aft when His Excellency was informed that a man clinging to a bit of wreckage had been sighted. Reluctantly, almost grudgingly, the yacht hove to; . . . and fifteen minutes afterward the limp form of Manning was carried aboard.

The unexpected may happen at any time to a wireless operator, and the unexpected having happened before, Manning did not permit any expression of surprise to escape him when he opened his eyes and found himself tucked in a berth in a well furnished yacht cabin. Although he was somewhat weak as a result of his buffeting from the seas, he quickly recovered his strength and engaged the first passerby in conversation.

An hour after his rescue he was sitting in a deck chair under an awning telling his story to the President and his friends. While he was relating the circumstances concerning the fate of the Sylvester, he found an opportunity to observe His Excellency. The wireless operator set him down as the typical soldier of fortune—quick of wit, ready of courage and willing to risk any hazard to advance his own interests. But the personal charm of the man sufficed to remove any prejudice that might be formed by the calculating glance with which he was wont to appraise those about him, as if searching for some hidden weakness on which to play.

Polite and urbane, he was quite the proper host. Yet all the time that his steady brown eyes were bent upon him Manning felt that he was being probed for secrets, motives and what not; that his every word was being weighed and carefully considered. It gave him a feeling of uneasiness which he put aside as a freak of nerves.

All that day the Marie—that was the name the President had given his craft—cruised about. But as evening approached she was turned about until her nose was pointed toward Boram, the capital of Zoambique, and when Manning awoke in the morning he looked out of the port holes in his cabin upon the sparkling waters of a harbor which was surrounded by hills crowded with a wealth of vegetation.

As he stood on the deck a little later gazing with delight upon the scene which unfolded before his eyes, the President appeared and remarked upon the beauty of the new day. Suddenly he said:

"Do you think you would like to become a citizen of Zoambique, Mr. Manning?"

There was a significance in the tone in which the words were uttered that was not lost upon Manning. It seemed to imply a command rather than a question. His Excellency took Manning's consent for granted, for he nodded and walked away before the latter had an opportunity to reply. Surprised and somewhat discomfited at the unexpected development in his affairs, the wireless man was at first disposed to resent the peremptory way in which the President had made known his wishes; being of a philosophical turn of mind, however, he accepted the situation as gracefully as he could and began to make preparations to go ashore.

One of the President's aides—Captain Hungerford—escorted the operator to a pleasant inn where he found arrangements had been made for his comfort. That evening he and the captain, an agreeable young American of his own age, dined together. From the captain he learned much that was interesting concerning the history of Zoambique. It seemed that the present chief executive had been elected by right of the leadership of a majority of the forces following a revolution three years ago. The President

was a very popular man personally, although he was distrusted by many because of his failure to satisfactorily explain the disappearance of $200,000 in gold from the national treasury. In fact, Baron Weiner, the leader of the opposition, who was in hiding in the foothills, had openly charged that the President knew far more than he had told about the circumstances connected with the loss of the cash.

The mention of the Baron's name brought a cloud to the brow of Manning's companion. He leaned across the table and dropped his voice to a whisper.

"How long do you intend to remain in Zoambique, Mr. Manning?" he inquired.

Manning replied non-committally.

"You seem to be the right sort and I don't want to see you get in trouble," the captain went on, "so I'm going to give you a bit of advice. Don't stay here any longer than you can help and don't walk too closely in the shadows of buildings when you are out late at night."

Manning stared in amazement.

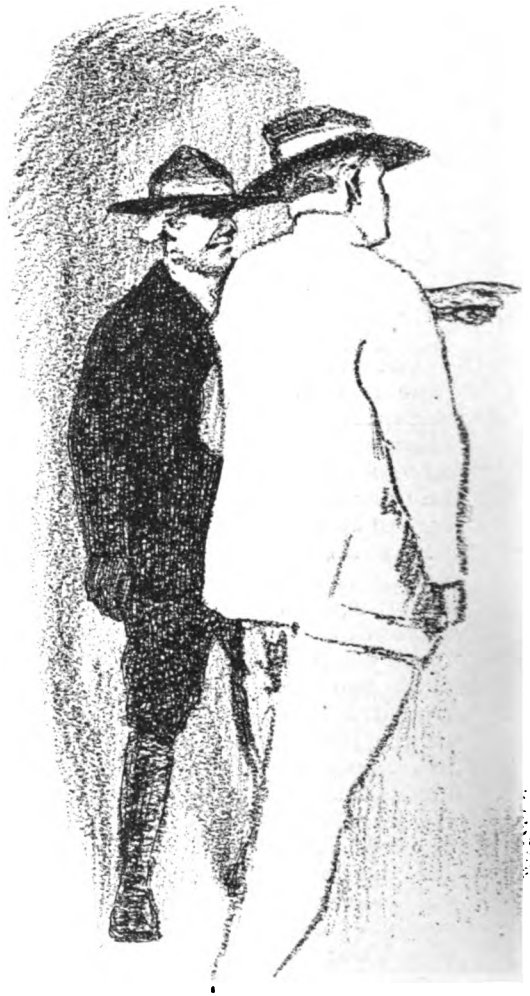
"But——" he began.

"I can't say another word," replied the other. "Only you might need this; better put it in your pocket." And he passed a gleaming object under the table into Manning's hand.

Another engagement called Captain Hungerford away soon afterward. Over his cigar Manning allowed his thoughts to dwell for a time upon what his companion had said. The remarks of the captain did not serve to disquiet him, however. He did not take seriously his companion's warnings, although the weapon which had been handed him was a grim reminder that he had been in earnest.

The name of Baron Weiner had a familiar ring, however. Where had he heard it before? Suddenly he jumped to his feet. It flashed upon him all at once that Weiner was the name written upon the letter which the dying man on the Sylvester had entrusted to him. In the excitement of his rescue and his arrival at Boram the incident had slipped his mind. Hurriedly he took the letter from the rubber bag secured to a cord tied about his neck. Yes, the letter was safe. It was addressed to "Baron Weiner, Borem, Republic of Zoambique."

From the plaza the strains of a waltz floated up to the balcony, summoning Manning to join the crowd below. Strolling aimlessly about, he finally found himself in a quiet thoroughfare on the water front. Over the bay shone the moon, dimly revealing the outlines of the President's yacht as she rode at anchor not a great distance from shore. Impressed by the beauty of the scene, Manning stopped to look and light a fresh cigar.



"I have come to arrest that man, your Excel

As he struck a match a man wearing a dark suit of clothes and a sombrero made his appearance. So un-

expected was his arrival that Manning involuntarily stepped back.

"I crave your pardon," said the stranger, lifting his hat, "but could I beg of you a light?" Manning casually noted that his hair was white.

"Why, certainly," he replied graciously. The match went out and he reached into his pocket for another. "It's a beau——"

He cut short his sentence with a cry of amazement, for the stranger suddenly threw his arms about him and bore him to the ground. So unexpected was the attack that Manning for the moment was unnerved. Quickly recovering himself, he struggled to

ncy," said the detective, pointing at Manning.

free himself from the grasp of his assailant. The stranger had the advantage in weight, but Manning was lithe and active.

Punch! He drove his fist with all his might into the face of the white-haired man. A muffled snarl of rage was the answer. The men clinched, falling to the pavement. Over and over they rolled with the wireless man uppermost at one minute only to lose his advantage the next. Time and again he felt the fingers of his assailant fumbling in his pockets.

Once he caught the gleam of a knife which the white-haired man had snatched from his belt. With a quick movement he seized the wrist of the other; slowly he bent his arm backward until the fellow let the weapon fall from his grasp.

Doggedly, determinedly, the stranger continued the struggle, although Manning rained a shower of blows in his face. The grim resolution of his antagonist filled him with uncertainty as to the result of the encounter. He felt his endurance giving away; an exclamation of triumph escaped his assailant. Manning saw him grope for the knife.

Then came an unexpected interruption. There was a rush of feet on the pavement and Manning's antagonist, muttering imprecations, freed himself from the weakening grasp of the wireless man and darted away. The next instant a squad of men dressed in the uniform of the Zoambique police appeared.

While some went in chase of the fleeing man, the others assisted Manning to his feet. The other policemen returned in a short time with the information that his assailant had vanished. Manning ruefully surveyed his dust-covered clothes. Then he made a discovery which caused him no little perturbation.

The inside pocket of his coat had been neatly cut out, as if by a knife, and the envelope addressed to Baron Weiner was gone.

III

The rays of the sun shining into his windows the next morning aroused Manning from a heavy sleep. Almost simultaneously there came a tapping at the door, and a servant announced that the President wished to see him at the State House. His Excellency was in good humor and greeted him cheerily.

"I've got a job for you, Mr. Manning," he began. "I want you to start

right away getting your wireless station into working order."

A set had been installed in Boram, it appeared, by a sugar company to communicate with a station on Luigi Island, located about 100 miles to the north. When the sugar company ceased its operations the stations were abandoned. On Luigi there was a soldier who had obtained a smattering of wireless from the sugar company's operators. It was the President's plan to have Manning on duty in the Boram station in order to keep in communication with the island.

His Excellency's good humor continued throughout the interview. But just before it ended Manning caught a glimpse of another side of his character.

"Of course," said the President, "I am compelled to rely largely on your discretion, in which I have the utmost confidence. In other words, I don't like men around me who talk."

Manning assured him that he did not gossip about his business. The President nodded his head.

"That's good," he commented. "Good for me—and good for you." The emphasis which he placed upon the last word was accompanied by a significant glance; it was so full of meaning that it was almost a threat.

Somewhat puzzled by the President's attitude on what seemed a comparatively insignificant matter—the appointment of an operator—Manning left to find his way to the wireless station, which was situated on the shore of the harbor. The set was not in the best of condition and he tinkered with it for the greater part of the day. At nightfall he was able to exchange messages with Roberts, the operator at Luigi. The latter had learned that the station at Boram was to be reopened and expressed his surprise.

"There is no one here except the colonel, commanding about fifty soldiers, including myself, and a few old buildings," he flashed. "Why the President wants to keep up communication with this place I can't for the life of me figure out."

Manning was equally at a loss. But it was obvious that His Excellency had an intense interest in Luigi, for the very next day he appeared at the station and sent this message to Colonel Lory, the commandant on the island:

"How is the crop?"

Lory sent a terse reply, merely saying "All right."

It seemed to satisfy the President, however, and he went away from the station smiling. Manning and Roberts discussed the marconigram. "There isn't a thing growing here except weeds," said Roberts.

That night Manning allowed his thoughts to dwell on the mysterious messages until he fell asleep. His interest was aroused again a few days afterward when the President sent another message about the "crop." In fact, it became a habit of His Excellency to call several times a week at the station and communicate with Luigi.

Manning had almost forgotten his encounter with the white-haired man in the interest of his new duties. He had not reported his loss to the police; to do so, he thought, would be indiscreet. One evening the incident was again brought to his mind. He had been given a message for transmission to Luigi late in the afternoon and was compelled to wait more than an hour before he found Roberts "listening in."

It was dark before he left the station. The slight rain which was falling moved him to quicken his pace to a run. As he ran along, head down, he ran full tilt into two men talking on a corner. One of them fell to the pavement as a result of the collision; the other escaped by quickly drawing to one side.

Turning his attention first to the fallen man, Manning was about to assist him to rise when he heard an exclamation from the other; he wheeled about to find his assailant of the water front staring at him. With a cry of anger, Manning sprang toward him. The latter had already started to run; Manning darted after him. Faster and faster ran the fleeing man. But pedestrians were blocking his way, and, although he pushed them aside, he lost ground rapidly and was soon almost

within Manning's grasp. Just then, however, the latter stumbled over a stone and fell headlong. When he got on his feet the white-haired man was not to be seen.

The meeting with his assailant was not the only surprise in store for Manning that night. In a carriage in front of the inn he found the President waiting for him. The latter motioned for him to enter the vehicle, which was driven rapidly back to the wireless station. His Excellency was silent throughout the drive, although Manning saw his hands working nervously from time to time.

"Get Luigi," he ordered shortly, as soon as they had arrived at the station. This was the message he dictated for transmission to Colonel Lory:

"Send crop at eleven to-night."

With expressionless face Manning flashed the words out into the night. The crop! There had come to lie for him a world of mystery in the word. And while he pondered over the many theories that suggested themselves to him as a solution of the problem, the President paced up and down the floor, stopping now and then to look out of the window over the waters. For almost an hour His Excellency continued to walk back and forth.

The nervousness which Manning had noticed before was now more apparent. The wireless man, too, began to feel something of the unrest which was stirring His Excellency. Something untoward was afoot, he felt certain.

A sigh of relief from the President directed Manning's attention to the latter. His Excellency was at the window, intently peering out; the wireless man, stealthily creeping up behind him, followed his glance.

The night had cleared and the little bay and the craft on it were plainly discernible. Alongside the pier just below the station was the President's yacht, smoke pouring out of her funnels in great clouds. She was evidently making ready for a voyage. Near her was a small tug. From the latter several boxes were being unloaded and transferred to the yacht.

While Manning was absorbing the scene the President suddenly wheeled about. The expression of relief in his face instantly gave way to a frown.

"Why don't you keep your eyes where they belong?" he snarled.

"Why, Your Excellency, I——" stammered Manning, overwhelmed by the suddenness of the attack. For a moment the President looked as if he meant to strike the other. But he contented himself with a black glance that was full of meaning, and passed out of the door. From the window Manning saw him go out on the pier.

Here was a new development in the affair. That the boxes had something to do with the messages His Excellency had been sending, Manning was sure. But what did they contain and why was the President so much interested in them?

Deciding to consult Roberts about the matter, he seated himself at the table and called Luigi. The response came immediately; in fact, Roberts told Manning that he had been about to call him.

"Has a tug landed at the pier to-night?" asked the Luigi man. Almost before Manning had flashed back "Yes," the other continued:

"Then the President's going to get away with it all right. There's been a lot going on here ever since that first message came to-night. I saw one of the men loading boxes on a tug, and when it had gone he told me that they were full of gold pieces. One of the boxes fell and burst, so he knows what he's talking about."

Manning was able to piece out Roberts' disconnected story by means of questioning. The Luigi operator had learned from a soldier that the gold had been stored in a cave where it was guarded day and night. The President's messages concerning the "crop" had of course referred to the gold which His Excellency had stolen from the treasury of Zoambique and was now planning to take out of the country.

Roberts signed off and Manning leaned back in his chair, filled with wonder at the bold methods the President had pursued. Then he became aware that someone had entered the room; he felt that he was in peril and

whirled about quickly. Standing before him with a revolver pointed at his head was the President!

"You've been trying to find out about things that you have no business to," he said sharply. It was a guess, but it was a good one. Manning's expression revealed this. His Excellency did not appear to be angry. He was merely coldly resolute. His hand on the trigger, he was apparently considering what to do, when an interruption occurred.

The door was thrown violently open and the figure of a man appeared on the threshold. For a moment he stared with wide eyes at the occupants of the room. In that brief space of time Manning recognized again the white-haired man who had so mysteriously thrust himself into his life.

He halted at sight of the President. Recovering himself, he bowed respectfully.

"I have come to arrest that man, Your Excellency," said the new arrival, pointing at Manning. The President nodded in approval. Manning, at first overcome with surprise at the strange turn affairs had taken, now found his voice.

"On what charge?" he demanded.

"On the charge of planning to train soldiers to foster a rebellion in Zoambique," the white-haired man replied. He stepped forward and drew aside his coat, displaying a badge on which was engraved, "Secret Service Department, Republic of Zoambique."

"But the President knows that this is not true," replied Manning, turning toward the latter. His Excellency looked bored.

"I know nothing about the man, Brader," he said. The Secret Service agent addressed Manning.

"What's the use of trying to deny it?" he asked. "Your name's Flanders." He fumbled in his pocket and drew forth the letter which had been taken from him. "This tells the whole story," the detective went on. "Here's a letter from the Opposition forces' agency in New York—addressed to Baron Weiner."

Manning felt the net of circumstances closing about him.

"I can explain all that," he cried. "I——" The President silenced him with a wave of his hand. "You can do that at the trial—if you have one," he said quietly. "Go on, Brader," he directed.

"Why, this man Flanders is a deserter from the United States Army who came over here to train Weiner's soldiers. I had a description of him from our man in New York before he arrived and I recognized him the minute I saw him. Captain Hungerford had the same information, too, from his friends in America."

Manning gratefully recalled the captain's warning. He realized now that he was a victim of mistaken identity and that Hungerford's words of caution were well founded. He felt that he must do something to extricate himself from the web.

"Then why didn't you arrest me the night of our encounter on the water front?" he demanded.

The detective laughed. "It isn't wise to have too much publicity in these excitable times, and besides, I wanted to find out if you had any confederates with you. If you have, and they are around here, we'll nab them, too, because I'm expecting some of my men any minute."

The President seemed to consider the case as settled. He looked at his watch and, nodding to the detective, walked out of the station.

Brader, apparently relieved that the capture had been effected with so little trouble, was disposed to be talkative.

"You're caught, Flanders," he declared, "and there's no use in kicking about it. If you don't make any fuss, we'll get along together all right. But if you do—he paused and looked significantly at his coat pocket, in which the bulging outlines of a revolver could be seen. Then he settled himself comfortably in a chair to await the arrival of his men.

The operator remained outwardly cool, but his mind was working at high speed. His glance roved uneasily about the room and finally rested on the wireless apparatus. There was a chance that if he sent out a call for aid it would reach him in time to save him.

He allowed his glance to wander out

of the window. Suddenly he started. "The Marie! The President's yacht!" he exclaimed. Brader left his chair and approached the window. As the detective neared Manning he took his revolver from his pocket and pointed it at the latter. But he had given his prisoner the opportunity he wanted. Once within reach of Brader, Manning's fist shot out, striking him on the point of the jaw. At the same time the detective fired his revolver. The bullet went wide of its mark, and Brader sank to the floor. It was but the work of a minute for Manning to bind his hands and feet; then he turned to his set.

"S O S," "S O S" was the call that went flashing over the waters. Two, three, five minutes, he waited. Again the call was sent out, but with no result. Manning was beginning to despair. Then, as he "listened in," he heard the welcome words, "Who is it and where are you?" "An American in danger in Boram, Zoambique," he flashed back. There was a silence lasting for what, it seemed to Manning, was an interminable period. Then came this message:

"This is the United States battleship Alaska. Will reach you in twenty minutes."

In one bound Manning cleared the space between the apparatus and the door and dashed down the path toward the water. He knew that Brader's men had arrived, for behind him he heard a shout to stop and a bullet whizzed past his head. On and on he ran until he came to the pier. A rowboat tied to the structure caught his eye and he jumped into it. Heading toward the mouth of the harbor, he pulled with all his strength. As he cleared the end of the pier he noticed that both the President's yacht and the tug which had arrived from Luigi had steamed away. There was nothing left for his pursuers but another small boat, and into this they tumbled.

Two of the men used the oars while the others sent a fusilade of bullets after the fugitive. The short choppy waves which the wind was stirring up made their aim bad, and none of the shots took effect, although several ploughed up the bottom of the craft at his feet.

The purusing boat came nearer, despite Manning's attempts to widen the distance between the craft. He felt that the race must end soon. His heart was thumping in an alarming manner, and the oars seemed like iron weights. All at once he noticed that the course of the pursuing boat had been changed; now she was being turned about; she was actually heading the other way.

Manning sank forward on the thwart; he was too exhausted to wonder what had caused his pursuers to abandon the chase; too much worn to turn his head about and grasp the fact that it was a man-'o-war's gig, filled with bluejackets, rapidly approaching, which had sent Brader's men scurrying toward the shore to get out of the way; he realized only that for the time being his troubles were at an end; that he could relax. So he dropped the oars and, resting his face between his hands, closed his eyes. It was in this position that the members of the boat's crew from the Alaska found him when they swept alongside the craft in which he had made his escape.

A month afterward the wireless man picked up a copy of the Paris edition of a New York newspaper and glanced idly through its columns. Suddenly he straightened up with interest. This paragraph had attracted his attention:

"The President of Zoambique has arrived in Paris for a lengthy visit. He reports that the finances of Zoambique are in a flourishing condition. This is attested by the fact that he himself has just deposited $200,000 to his personal credit in a Paris bank."

IN THE SERVICE

To devote considerable effort to some tasks without thought of reward in order to acquire fitness in which to earn an additional something has been the plan followed by G. Harold Porter, recently appointed purchasing agent of the Marconi Wireless Telegraph Company of America. He formulated his policy early in life—at the age of twelve, in fact—when it brought him a reward in the shape of a position as telegraph operator in the employ of the Delaware & Hudson Railroad Company in Carbondale, Pa.

The reader will better understand how this came about if he is told some of the circumstances leading up to this period in Mr. Porter's life. He was born in Carbondale in 1871, and when he was nine years old became ambitious to enter the working world. This was about a year after the death of his father. The best opportunity that offered itself was a position as breaker boy in the mining department of the Delaware & Hudson Railroad Company. Young Porter's mother did not know that her son's ambitions had assumed practical form until he was ready to begin his work. Then she objected. An older son, who knew something of the hardships of the employment which the boy had selected, predicted that he would give up his position in half a day. The younger brother overheard the remark and disproved the assertion by remaining a breaker boy for a year and a half.

Porter's ambitions soared above his work, however, and he became in turn newsboy, office boy and messenger, holding the latter position in the telegraph office of the Delaware & Hudson Company. While he was employed as messenger he frequently thought of the telegraph operator's desk as one of the next steps in his climb upward. Therefore he obtained all the knowledge possible of telegraphy from the operator and in return was asked to aid the latter in the routine duties of the office—work which he was not called upon to do in his capacity of messenger. But it gave him training as an operator, and one day he was able to obtain a position at the key in a smaller railroad office not far from Carbondale. In the meantime the operator and his superior in Porter's former place of employment had disagreed and there was a vacancy in the telegrapher's chair. Porter seized this opportunity to apply for the more desirable position. He obtained and held it satisfactorily, although, in the parlance of operators, it was a "roast."

A wider field was beckoning Porter, however, and in January, 1890, he came to New York. Here he found employment as a telegraph operator with the Kings County Elevated Railway Company. Afterward he became telegraph operator for the Central Railroad of New Jersey, and was later invited to join the forces of the Baltimore & Ohio Railroad. He began his commercial career in New York in 1898, when he was appointed chief clerk of the foreign freight department of the Baltimore & Ohio Railroad.

When he left the service of the Baltimore & Ohio in 1906 to become traffic manager of the Tyler Lumber Company he again put into practice his habit of doing just a little more than the duties of his position called for, becoming secretary of the company a year later.

Government Research Work

THE report of the Committee appointed by the British postmaster-general to consider how far and by what means the government should make provision for research work in wireless telegraphy has been made public. The conclusions reached by the Committee were in brief as follows:

It is desirable to establish some body or institution to initiate and control research in matters of general principle which cannot conveniently be investigated in departmental laboratories; to co-ordinate as far as possible the work now undertaken by the Post Office, Admiralty and War Office respectively in connection with experiment and research in wireless telegraphy so as to prevent work undertaken by one department overlapping work undertaken by another, and thus secure economy; and to discuss any difficulties now arising in practice.

The work now being done by the departments should be continued and extended, opportunities also being found by the departmental engineers to carry out such experiments and tests as may be approved by the body or institutions to be established for the purposes referred to.

It is desirable to establish a Research Laboratory (as distinguished from the existing departmental laboratories and service stations), in which research work bearing on the practical needs of the services should be carried out under the guidance of the body or institution in question.

Though the work to be undertaken by the new body or institution and in the new laboratory will principally concern wireless telegraphy, it is undesirable to exclude therefrom the problems of ordinary telegraphy and telephony.

The preliminary work of the Committee consisted of inquiring about what research in connection with wireless telegraphy is now being carried on by the governments in the United States, Great Britain and Germany. It was found that valuable work is being done by the engineering department of the British General Post Office, which, however, is sometimes hampered by insufficient funds, while the questions it investigates are unavoidably such as have an immediate bearing on service problems rather than on the scientific principles underlying wireless telegraphy. The work carried on by the Admiralty is almost entirely restricted to matters bearing on the adaptation of wireless telegraphy to service conditions, and the same is true of the War Office. Both in the United States and in Germany the governments make more liberal and extensive provision for research and experiments in wireless telegraphy than is made by Great Britain.

The work in the United States is undertaken by three departments—the Navy, the Army Signal Corps, and the Bureau of Standards. However, in order to obtain economy and co-operation, all these departments are for the purpose of laboratory research brought together under one roof in the building of the Bureau of Standards.

In Germany the work is carried on by the Post Office in the Kaiserliches Versuchsamt, a building containing 30,000 square feet of floor space. The work in this building is not confined entirely to wireless telegraphy, but covers the entire range of electrical engineering as applied to telegraphy, whether ordinary or wireless, and telephony. It is under the direction of Dr. Strecker, assisted by a large staff; the research work in wireless telegraphy is under the charge of Dr. Kiebitz and Dr. Breisig. Important wireless research work has also been conducted by Dr. Lindemann at the Reichanstaldt in Berlin, and by Dr. Reich in the Naval and Military Radio-Electric Laboratory in Göttingen.

The report recommends that the National Committee should consist of twelve members—two representing the Admiralty, one the War Office, two the Post Office, two (not departmental officers) appointed directly by the Treasury, three appointed by the Treasury on the nomination of the Royal Society,

and one appointed by the Treasury on the nomination of the Institution of Electrical Engineers, together with the director of the National Physical Laboratory. It is planned to have the government departments conduct researches or inquiries arising out of their own administration, and where the results of these independent inquiries are of general interest, they should be communicated to the Committee. The departments should assist in the work by carrying out researches that can be most conveniently made at their respective stations, but the Committee would stand in a purely advisory relation to them as regards their stations and the work done at them. An annual report would be made to Parliament, and such researches published as may be considered useful for the advancement of science generally and are not of a confidential nature.

The annual cost of the Research Laboratory is put at approximately $24,000, including approximate expenditures of $11,275 for staff and $5,500 as honoraria for the members of the National Committee; the initial capital expenditure is estimated at approximately $36,500. Capital expenditure has been considered under three heads:—(*a*) mast, aerial and earth connection; (*b*) buildings; and (*c*) equipment. It is assumed that the National Committee will require the erection of a single wooden mast, 150 feet high, with suitable antennæ and earth connections; a one-story building near the foot of the mast, divided into three parts, one to contain the power plant, one the transmitting, and one the receiving apparatus. One room in this building would need to be metallically screened, to permit of the use of certain types of delicate apparatus. A laboratory building, with a total floor space of 4,000 feet, is also proposed.

A schedule to the report specifies the following subjects for investigation:—

Improvements in methods of measurement of fundamental electrical quantities under high-frequency conditions.

Transmitting Condensers.—Measurement of efficiency of dielectrics used at different voltages, frequencies, and temperatures; quantitative results by which losses can be predetermined.

Insulating Materials.—Behavior at high frequencies and voltages, and best methods of use.

Receiving Condensers.—Efficiency of different types.

Transmitting and Receiving Inductances.—Study of details of design with a view to minimizing energy loss.

Receiving Devices.—Investigation of crystal and valve detectors under different conditions, and best methods of modifying these to obtain desired characteristics. Effect of variation and coupling between detector circuit and the rest of the receiving circuit. Effect of variation of inductance and capacity in receiving circuit. Methods of mounting and preparing crystals. Methods of amplification of received signals, both acoustic and electrical.

Aerial Wires and Earth Connections.—Measurements of losses due to brushing from different types of aerials at high frequencies. Measurement of decrement of aerial and earth system. Conductivity of different kinds of soil at high frequencies. Measurement of losses in steel plate earth connections. Measurements on model aerial to assist in design and to predetermine losses. Investigation of "earth antennæ."

New Systems and Apparatus.—Investigation of new systems of wireless telegraphy and apparatus employed therein, which may be submitted to the Committee and deemed by the Committee worthy of investigation.

Among the subjects the following are mentioned as requiring immediate attention:

Researches into the methods of measuring and standardizing electrical quantities under high-frequency conditions. Among these would be included measurements of voltage, current, power, resistance, inductance, capacity, wave length, and decrement.

Investigations into the methods of standardization and construction of instruments such as condensers, inductances, resistances, wave-meters, etc., and the determination of the losses in such instruments.

A study of receiving circuits in general, including variations in type of inductances, condensers, detectors, telephones, relays and amplifiers.

IN THE SERVICE

SHORE-TO-SHIP DIVISION

Just about this time four out of every four wireless operators are speculating on their chances for assignment to one of those shore station jobs. They wonder how you work it. Looking about for the proper person to drop the all enlightening hint, our choice most naturally rested with Charles J. Weaver as the one best qualified to speak on the subject. So we will let him: "The quickest and surest way for a wireless operator to secure a berth at a shore station is to go to sea!" said the manager of the Marconi Sea Gate station.

Simple, isn't it? If you want to stay ashore, go to sea.

Which might properly be called, paradoxically sage counsel. The paradox is self-evident; the sagacity rests with the fact that Weaver is a permanent fixture at Marconi shore stations. And Weaver went to sea—something like nine years' service on the bounding main is noted in his record. So, adding parenthetically that sea experience alone can qualify a man to deal intelligently with the highly diversified shore traffic problems, let us see how Charles James Weaver of London, of Doncaster, and England in general, became one of the best wireless operators in the universe.

He began early, as all the good ones seem to, and at the age of fourteen demonstrated his ability as a telegrapher to a railway superintendent by getting the news of a train wreck back to headquarters. Up to that time young Weaver had been looked upon solely as a meddlesome boy, who, by virtue of his father being district superintendent, was allowed the run of the forty-five signal towers of the Doncaster yards. In an emergency the knowledge thus gained got an important message through. The praise given the youngster must have influenced his future activities, for on leaving school two years later he entered the British Government telegraph service. Between the ages of seventeen and twenty he served in the military telegraphs, then passed into the reserve for the next twelve years. A demand for good men brought him to the Commercial Cable Company, and while stationed in the Azores he received the news of the eruption of Mount Pelee.

New York called him and the brand-new American Marconi Company, then a very small concern, needed him. His first assignment was to the Babylon station, an experimental plant and school of instruction. A short turn then at Sagaponack was followed by service at Siasconset until the station was demolished. Wireless communication was then becoming more reliable, and Weaver decided to learn the ship end of the business. He arranged a transfer to the American liner Philadelphia and stayed with her for five years. A round-the-world cruise on George Gould's yacht Atalanta was followed by the honeymoon trip on the yacht Noma with the late Colonel Astor. Weaver came ashore then to stay. Two years ago he was given his present position, manager of Sea Gate, about the busiest shore-to-ship station in the United States.

Meeting of the Marconi International Marine Communication Company

AT the Fourteenth Ordinary General Meeting of the Marconi International Marine Communication Company, held in London, June 30, Commendatore Guglielmo Marconi, as chairman, made a particularly interesting address to the shareholders.

"Ladies and gentlemen," he said, "I feel sure that the accounts of the past year will have satisfied you, as they have satisfied your directors, that the company has continued to make sound and substantial progress. Comparing the figures with those of last year, it will be seen that the number of ships which we have fitted with wireless telegraph stations which we operate increased from 580 at the end of 1912 to 788 at the end of 1913, and that the same rate of progress continues, the number having become 873 at the date of the report. The receipts from ships' telegrams, news services, subsidies, rentals, &c., during the past year were £146,316, as compared with £100,322 of the preceding year, showing an increase in round figures of £46,000. On the other hand, the expenses, although necessarily higher, have not increased out of proportion. The principal item of increase is shown under station expenses, which, of course, rise with the number of stations, and likewise the amount of depreciation. Turning to the balance sheet, the only items to which I think I need make any reference are on the debit side, the issued capital, which has been increased to £213,000, which, after making allowance for depreciation, shows an addition of £69,000, which is accounted for, of course, by the additional ships which have been fitted.

Wireless Telegraphy on Ships at Sea

"It is a matter of great satisfaction to your directors—and, if I may be allowed to say so, especially so to me—to see this company now soundly on its feet earning reasonable profits and paying a fair return to its shareholders, for I cannot forget that when this company was registered in the year 1900 it had for its object the introduction of wireless telegraphy upon ships at sea to save life and to save ships, but with very few exceptions we found very little disposition to take advantage of the valuable services which we offered. In these days, when many ships have been saved by means of wireless telegraphy and thousands of people owe their lives to the fact that installations are on board most of the important ships, it will be scarcely believable to those of our shareholders who have not been thoroughly acquainted with the development of the company that we expended something in the neighborhood of £200,000 (about $1,000,000) in creating and popularizing our service before we were ever able to earn a profit. As a result, however, of the great energy of our staff and the hard work of every member of the company, we are able this year, for the fourth successive year, to pay a reasonable dividend.

The Company's "Monopoly": Reply to Critics

"I think I am warranted in saying that the nation at large, if not the whole civilized world, owes respect at least to this company for the untiring and patient work which it has done in causing loss of life at sea to be so much less than it otherwise would have been; yet, notwithstanding, there are members of Parliament who never miss an opportunity of attacking our company and complaining of the monopoly which they allege we possess. I would ask them if they can contend that we have turned that monopoly to an improper account. Does the history of our company suggest anything of the kind? Does the 10 per cent. divi-

dend which we are now able to declare, after nine years without any return at all for the capital invested, savor of extortion? Have they any knowledge or appreciation of our vast organization? Do they know that every young man serving with us as a telegraph operator on board ship—and there are now some 1,500 of them—has been taught by us without charge; that not one of them has ever failed to do heroic duty, even to the sacrifice of his life, when circumstances have called upon him to do so?

"There has never been any evidence that a ship in distress fitted with a Marconi installation has ever yet called for assistance without receiving an answer. In every important port throughout the world there is a Marconi inspector ready to overhaul the wireless apparatus of every ship that calls, and they and the operators must work together under carefully considered rules, which have to be most rigorously adhered to by the company to ensure the magnificent discipline so essential to the public and which prevails throughout the service.

Lord Mersey and the Marconi Operators

"Only a few days ago Lord Mersey, as President of the Court at present inquiring into the disaster which recently overtook the Empress of Ireland, complimented the Marconi operators, and stated that they were a credit to the service to which they belonged; and innumerable are the letters of appreciation which are received by the company from all the important shipping companies throughout the country. I contend that it does not lie in the mouth of anybody to complain of the monopoly which this company possesses—if it possesses one—for it owes it to the inventors, to an organization and a perfect discipline, which is essential and could not exist were the business in many hands, and to the important capital which it has invested, so providing a valuable, well conducted, and reliable service to the whole traveling public, which it is very probable would never have existed at all but for the company's own efforts.

Safety of Life at Sea

"In view of the bill which has been introduced into Parliament to carry into effect the International Convention for the Safety of Life at Sea, under which wireless telegraphy becomes obligatory upon ships carrying fifty passengers or more, including crew, your directors have consented to enter into an agreement with the Board of Trade to supply their installations in a similar way as they have done before wherever they may be called upon to do so. It is proposed that the remuneration which they are to receive shall be left to a referee. Having regard to the very reasonable terms which the company has been in the habit of charging, your directors see no objection to accepting these conditions.

A Superannuation Fund

"As mentioned in the report, the directors have established, subject to the approval of the shareholders, a superannuation fund, of which the North British and Mercantile Insurance Company will act as trustees. This fund is for the purpose of providing pensions for employees of the company when they eventually retire from work. Similar funds have been brought into existence in the other Marconi companies, and it is thought that it is highly desirable, now that this company has been placed on a sound profit-sharing basis, to commence to make provision for employees upon their reaching the age of well-earned rest. The company and its employees will contribute jointly and in equal proportions to the fund, and you directors are of opinion that such a scheme is due to its staff, besides going a long way to encourage them to remain in the company's employ, and materially assisting therefore in maintaining the discipline which is of such pre-eminent importance in the responsible work which your company conducts."

After commending the efficiency of the directors, the Chairman announced the declaration of a "final dividend of 5 per cent., equal to 1s. per share, less income tax, upon the capital now issued and paid up, be and the same is hereby declared for the year ended December 31, 1913; that the said dividend be payable on July 31, 1914, to the shareholders registered on the books of the company on June 30, 1914."

From and For those who help themselves

Experimenters' Experiences.

FIRST PRIZE, TEN DOLLARS

A Hightone Rotary Spark Gap

The following is a description of a rotary gap that gives a tone similar to the one emitted by the Clapp-Eastham "Hytone" rotary quenched gap. This gap will easily stand a 1 k. w. transformer and requires a condenser of very small capacity. I use only 3 plates 8 by 10 inches, with tin-foil, 6 by 7 inches on each side, packed form, with a 1 k. w. set, the rotary running at 4,500 R. P. M. In fact, if a capacity greater than this is used, the tone is not so pure and clear; on this account this gap should appeal to the amateur using the 200-meter wave.

Procure a copper meter plate already trued-up, having a set screw for fastening on shaft. Next divide the edge of the plate into 8 sections and mark each division for the lugs. The disc or plate should be 5 1/4 inches in diameter.

The lugs are made of zinc, 5/16ths of an inch in diameter and 7/8ths of an inch in length. They are slotted at your end the width of the disc to a depth of 5/16ths of an inch and should fit the edge of the disc snugly. They should be firmly soldered in place to avoid the risk of having one fly off when the gap is in rotation. Eight lugs are required for the rotary and 2 for the stationary electrodes of the gap.

Next turn up a shaft as per Fig. 2, 1 3/8 inches long and large enough in diameter to pass through the center of the disc. Then fasten the rotary disc and also a 1-inch grooved pulley to the shaft.

The frame is made of well seasoned and thoroughly dried oak. It should have dimensions as shown in Fig. 1.

Fig. 2 shows the bearings of the gap. These must be at least 1/8th of an inch deep and fit the shaft closely. They are supported by 2 heavy binding posts.

The stationary part of the gap is made of a piece of brass rod 3/8ths of an inch by 1/2 inch by 2 7/8ths inches, bent as

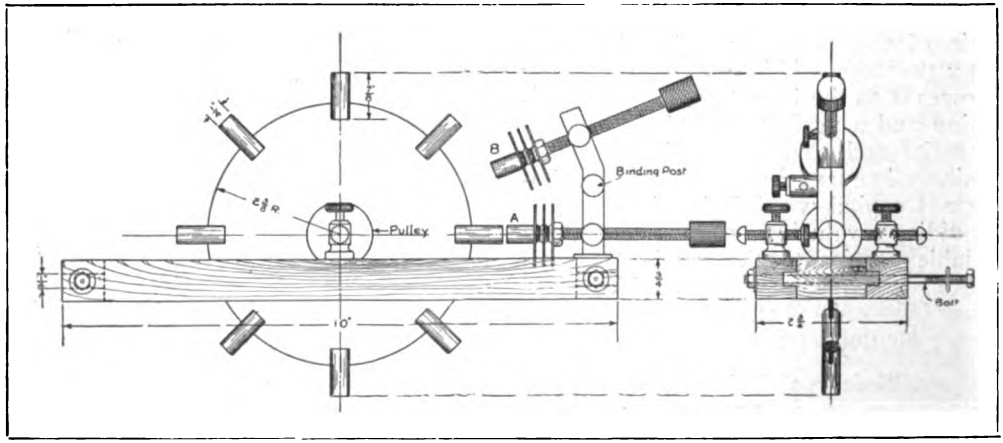


Fig. 1, First Prize Article.

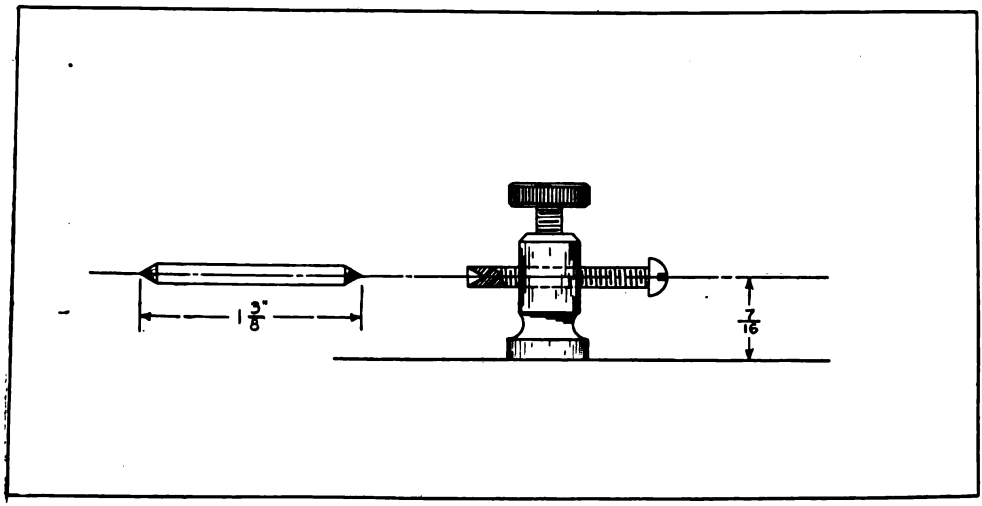


Fig. 2, First Prize Article

shown, having 2 5/32-inch holes drilled in it for the lugs and also 2 others drilled half way through and tapped for 8/32 screws. Another set of holes is drilled and one tapped for an 8/32 screw as were the other two. This is to be used as a binding post and should be placed directly between the other two.

The stationary electrodes require 2 8/32 threaded brass rods 3 inches in length, 2 brass nuts, 6 small brass or copper washers about 1/8th of an inch thick, 2 zinc lugs 5/16th of an inch in diameter and 7/8ths of an inch in length, tapped at one end for an 8/32 screw, 2 hard rubber knobs and 6 copper discs, 1/32nd of an inch thick by 1 1/4th inches in diameter with a 5/32-inch hole in the center. These are to be used as cooling flanges for each gap.

The extra gap added gives the effect of having just twice as many lugs as there are actually on the disc. The lugs should be so fixed that when a spark passes at A, none should pass at B, and when a spark passes at B, the lug A

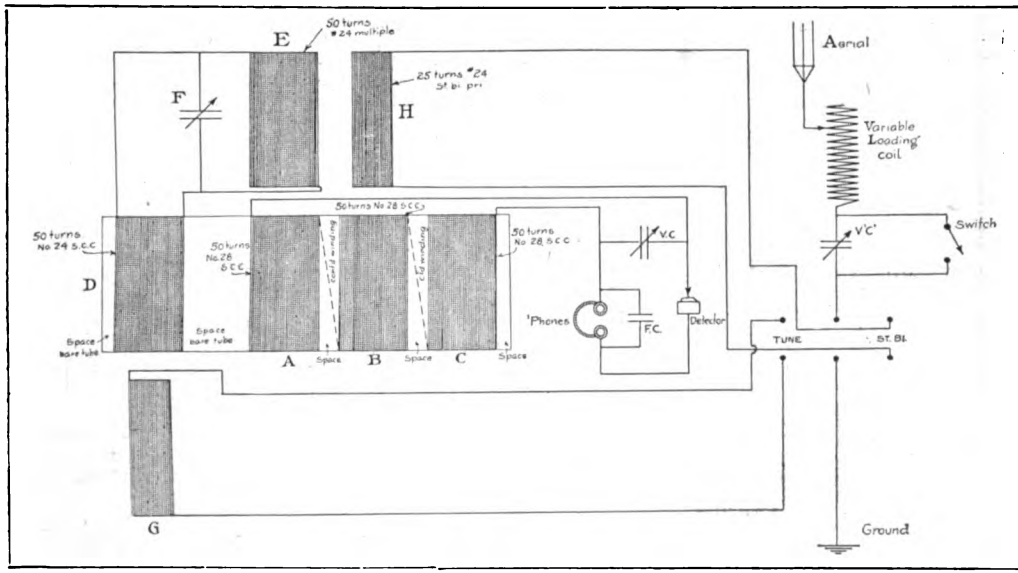


Fig. 1, Second Prize Article.

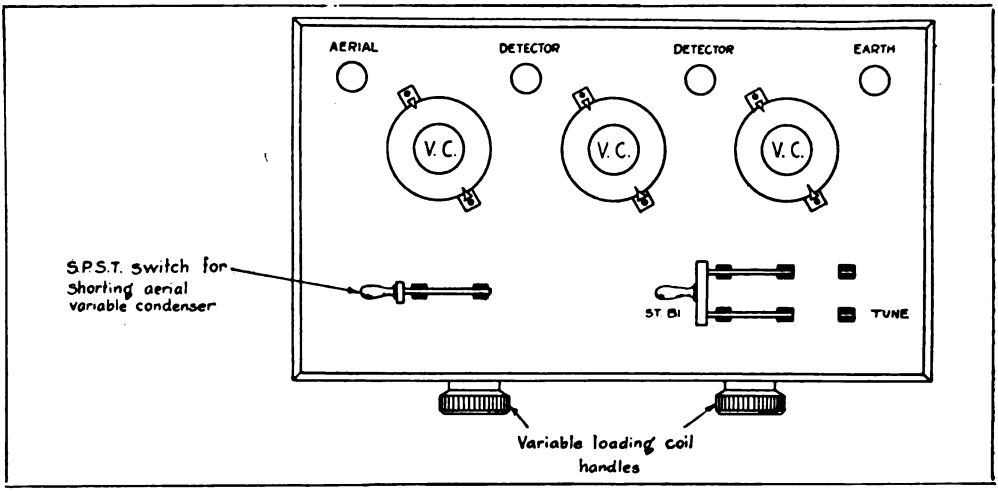


Fig. 2, Second Prize Article.

should be half way between 2 of the lugs on the disc. The whole is fastened to some sort of frame by the 2 small bolts shown in Fig. 1.

This gap is best driven by a small induction motor of about 1/10 or ⅛ h. p., as this type of motor accelerates quickly and is at full speed in 4 or 5 seconds—a very desirable feature in rotary gaps.

I have been using a gap of this design for about four months and operators in this vicinity with stations along this coast thought I was using a Clapp-Eastham "Hytone" set because of the quick start to full speed and the very high tone emitted. The motor should run 1,800 R. P. M. and the pulley on it be 2⅜ inches in diameter.

FRANK O'NEILL, California.

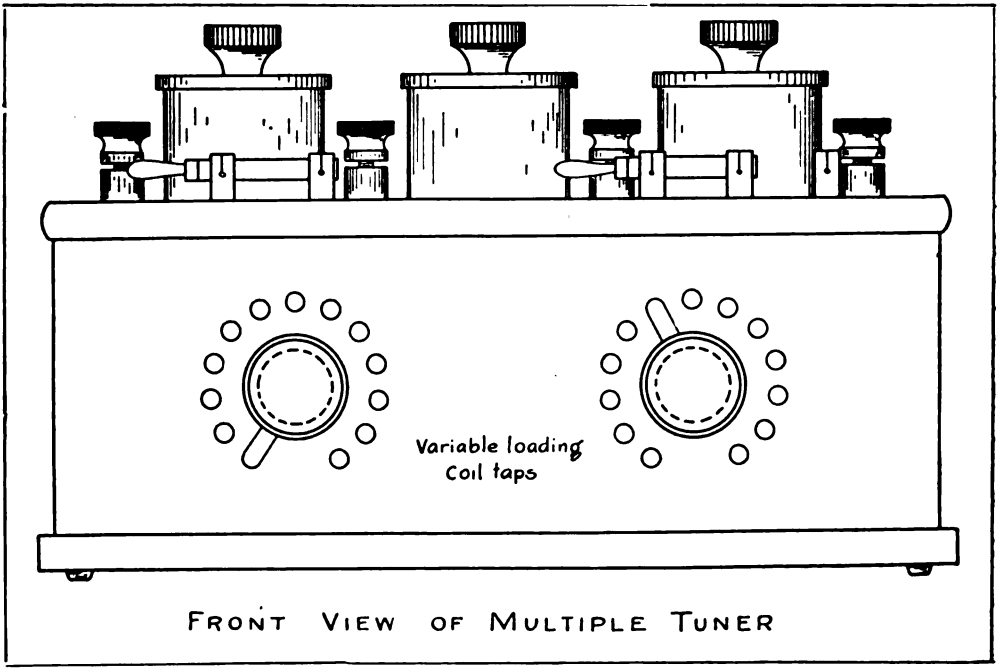


Fig. 3, Second Prize Article.

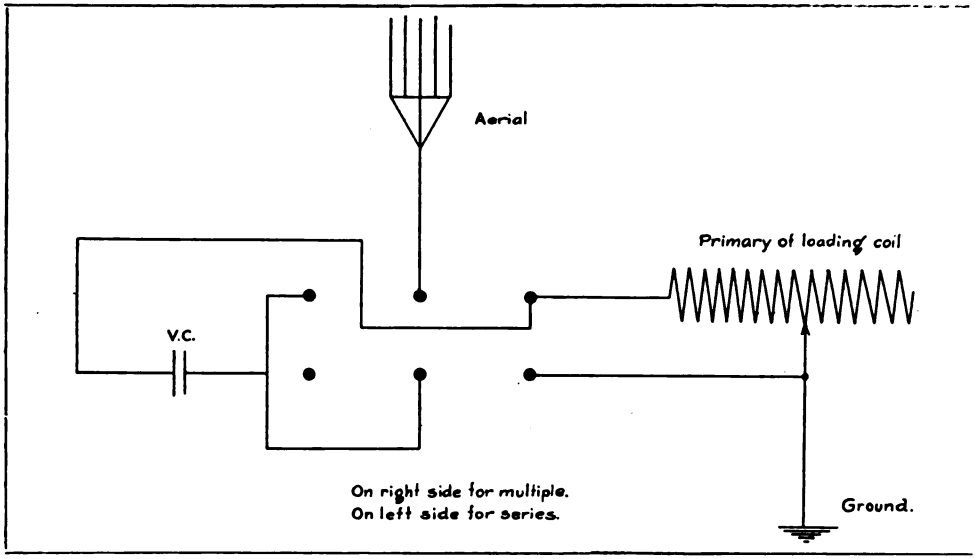
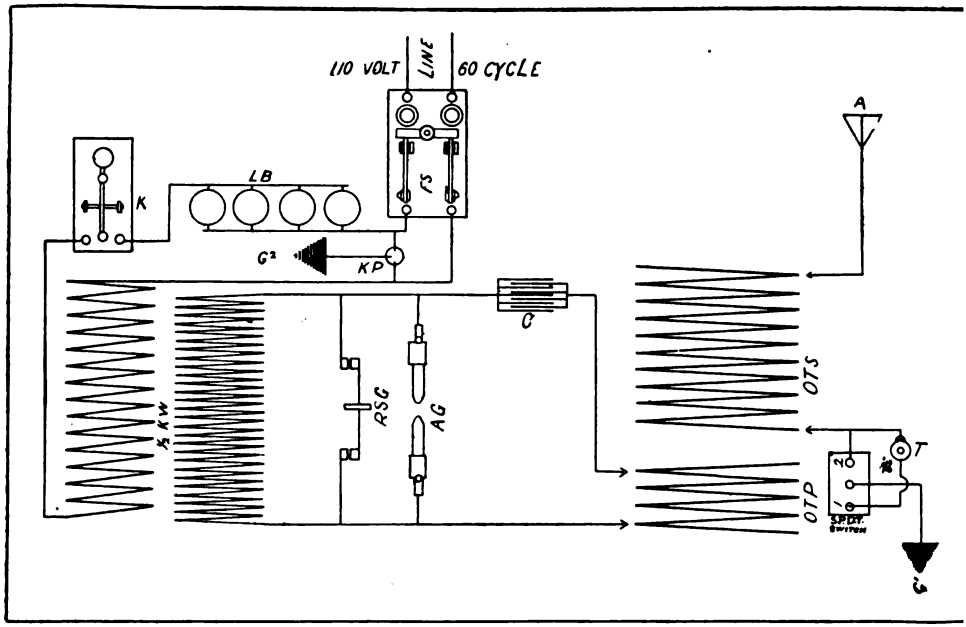


Fig. 4, Second Prize Article.

SECOND PRIZE, FIVE DOLLARS

An Amateur Multiple Tuner

The following is a description of a multiple tuner which I have constructed and found satisfactory for amateur purposes. A general idea of the construction is given in Fig. 1. The secondary windings of the transformer A, B and C, are wound on a cardboard tube about 3½ inches diameter and 9 inches in length. The secondary winding consists of 3 units comprising 50 turns of No. 28 S. C. wire in each. The intermediate circuit consists of the winding, B, having 50 turns of No. 24 S. C. C. wire and winding, E, comprising the same number of turns. The variable con-



Diagram, Third Prize Article.

denser, F, is in shunt to both of these windings.

When the intermediate circuit is used, the primary winding, G, is employed, consisting of 25 turns of No. 24 S. C. C. wire. When the stand-by side is thrown into the circuit by means of the change-over switch, winding H, consisting of 25 turns of No. 24 wire, is connected in series with the antenna. It is also wound closely around the turns of coil B.

It is of course understood that winding D must be at a considerable distance from winding A, and furthermore winding G should be made of a tube of such dimensions that it will slide in and out of D, or may be mounted on a shaft so as to turn at right angles to D. The same statement applies to winding E, which is preferably mounted on a shaft inside of winding A so that it can be turned at right angles. Thus the degree of coupling between windings E and A, D and G may be readily varied. When winding H is employed, the circuit is similar to that of any "loose coupler" with the exception that H is wound tightly around A or B, thus giving at all times a close coupling.

The tuner is readily changed from a stand-by circuit (broad tuning) to a sharp tuning circuit by means of the double pole, double throw switch, as indicated in the drawing. The short wave condenser, V'C', is quite necessary in a circuit of this type, as is also the loading coil, for, owing to the fact that G and H are windings of a fixed value of inductance, variations of wave-length must be made at the loading coil or at the variable condenser.

Fig. 2 is a plan view of the location of the variable condensers, change-over switches, etc., which to some extent has been copied from the Standard Marconi Multiple Tuner. Fig. 3 is a front elevation showing the location of the multiple point switches in use with the loading coil. Fig. 4 indicates a method which I used for placing the short wave condenser either in series with the aerial circuit or in shunt to the primary of the receiving transformer, by simply throwing the D. P. D. T. switch from right to left.

MYRON CHACE, Massachusetts.

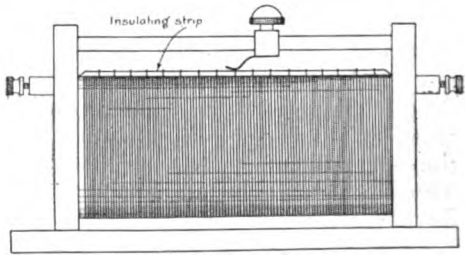
THIRD PRIZE, THREE DOLLARS

Wireless Telephony on a 200-Meter Wireless Telegraph Set

The majority of amateur wireless experimenters using 60-cycle current in connection with both telephony and telegraphy, finds it necessary to install 2 complete transmitting sets to obtain satisfactory results and comply with the government regulations.

In the following arrangement I have obtained good results using a single oscillation transformer and one-half K.W. transformer in connection with both telegraphy and telephony.

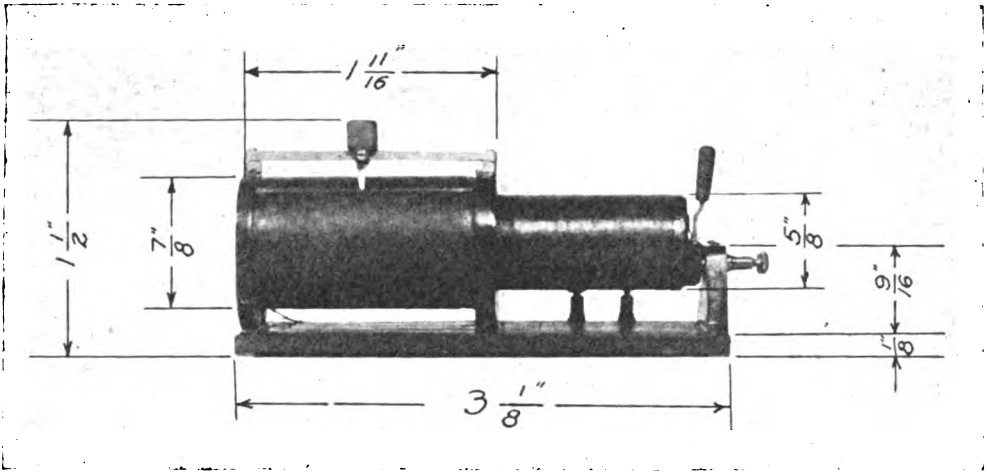
Referring to the accompanying figure, L B is a lamp-bank used for current adjustment; K is the sending key and K P a small gap used as a kick-back preventer. Around the ½ k. w. transformer are shown R S G, the rotary spark gap, and A G, the carbon arc gap used for telephony. Very little condenser being



Figure, Fourth Prize Article.

used, an arc takes place between this gap instead of a spark. C is the adjustable condenser; O T P and O T S the primary and secondary oscillation transformer. T is a carbon-grain telephone transmitter.

The carbons from 2 discarded dry cells are utilized in constructing the arc-gap. When hard carbons are used the arc is blue in color and better results are obtained both in distinctness of voice and distance covered. The carbons should be mounted on standards and so arranged as to be finely adjustable. In adjusting care should be taken that the arc does not burn between the outer edge of the carbons, as it causes the voice when heard at the receiving station to sound irregular and broken. The carbons may be ground smooth or left rough, as suits the experimenter's fancy. Any type of carbon-grain transmitter may be used provided it is in good ad-



Photograph, Honorable Mention Article, F. C. Knochel.

justment, but its sensitiveness may be increased by procuring some small carbon balls and substituting them for the grains in the transmitter.

The condenser should be so arranged that all but 1 or 2 plates may be disconnected readily, as very little capacity is necessary in connection with the wireless telephone. A lamp-bank is connected in the transformer primary circuit for current adjustment.

When the S. P. D. T. switch (around which the telephone transmitter is connected) is thrown to contact 1, and using the carbon arc, the set is in condition to be used for telephony. With this arrangement distances of 15 miles have been covered. With the switch at point 2, using more condenser and the rotary gap, the set works as a wireless telegraph transmitter. Under favorable conditions messages have been sent a distance of 100 miles.

A change-over from telephony to telegraphy can be made in a very short period of time.

HAROLD MCINTOSH, California.

Note.—This article is published without experimental verification and is presented as a matter of general information to the amateur field. It is one of the many articles of similar nature which have been received.

At sight it may appear that the device would be wholly inoperative, but a little consideration will show that some results should be obtained. When the very small value of condenser capacity, as suggested, is used, the spark assumes the nature of an arc and the number of discharges through the closed oscillatory circuit will be considerably greater than the alternations of the primary current (60 cyc.). Hence a sufficient number of discharges are produced to transmit in a crude manner the modulations of the human voice.

It should be understood that at the receiving station a more or less continuous "hum" is produced because the discharges of the transmitter are within the limits of audibility. The voice, however, is heard above the "hum."—Technical Editor.

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

Improvement in Tuning Coils

As is well known, a tuning coil equipped with the ordinary slider arrangement is sometimes very inefficient, owing to the fact that the slider spring contact touches two or more wires at the same time. This being the case, it would seem that the scheme here explained and illustrated should be welcome to those who do not wish to go to the trouble and expense of putting on a switching arrangement.

When preparing to wind a tuning coil, all that is necessary is to provide a piece of wood or other insulating material, say, 1/16 of an inch thick by 1/2 inch wide; and the length of the proposed tuner. Mark a line along the core exactly where the slider spring will come when finished. Now proceed to wind, bringing every second, third or fourth turn, depending on the size of the wire and core, up over the insulating strip, and sliding the other turns under from the end. Remove the insulation from the turns that come up over the strip.

It will be seen that by this method the slider makes perfect contact with but one wire. Also the resistance of the coil is less than where there are many leads taken off for switches, and consequently the inductive effect is increased. Of course, it may be used either on straight or "loose coupled tuners," and while simple to construct, will give practically as good results as the high-priced tuners with multiple point switches.

LESLIE LONG, Oregon.

Note.—The main objection to this construction is the lack of the fineness of adjustment obtainable with the old style of winding. It may, however, be compensated for by the judicious use of a variable condenser.—*Technical Editor.*

HONORABLE MENTION

A Miniature Receiving Tuner

I note in the February, 1914, issue of THE WIRELESS AGE a photograph of the "smallest receiving transformer." The accompanying photograph is approximately the actual size of a tuner which I have recently constructed.

The primary winding is made of No. 30 S.S.C. wire; the secondary winding of No. 36 S.S.C. wire; the sliders of brass and the handles are of hard rubber. The windings of the secondary are equally divided between the contacts of the 5-point switch. The binding posts are ¼ inch in height.

This tuner is made entirely by hand. The cost of the material complete is 75 cents. I estimate the cost of the labor at about $20.

F. C. KNOCHEL, New York.

Note.—This tuner should receive wave lengths up to 175 meters.—*Technical Editor.*

GROWTH OF THE RADIO LEAGUE

Amateurs throughout the country are displaying a great interest in the American Radio Relay League, hundreds of applications to join having been received at its headquarters in Hartford. Hiram Percy Maxim, chairman of the League, has issued a statement calling attention to the fact that it has been impossible to handle all of the communications quickly because of the fact that the work is done by a limited clerical force which is made up of volunteers and by clerks hired with funds provided by the Radio Club of Hartford.

"The enthusiasm which is felt on all sides for this Relay League of Amateurs is pushing the work along," declares Mr. Maxim, "and we will get it well organized before it becomes necessary to call upon its membership for support. It is asked that those who have sent in applications for appointment as a relay station in their locality have patience and they will in due time hear from headquarters in Hartford.

"Over 200 relay stations have already been appointed. These extend from Seattle east to Idaho, and from Maine west to Minneapolis. Some of these are able to bridge surprising distances, especially in the winter time."

Among the questions on the application blanks are the following:

"Do you use an audion detector? What is your approximate receiving range in miles? Are you trobled by interference? What are your usual listening hours and how many evenings a week do you average at your instrument? Have you a telephone connection, or convenient? Do you keep your station practically constantly in running order? Can you copy press news? About how many words a minute can you receive with certainty? What is the nearest commercial or government station to you? Have you a government license and if so what grade?"

The prospective member of the League is requested to "make any remarks or comment which you think will be of help in perfecting a chain of amateur radio relay stations throughout the country." He is also informed that "no money transaction of any kind is considered in connection with this League, the expenses being borne for the present by the Radio Club of Hartford and any voluntary subscriptions which may be made. The object of the League is strictly confined to facilitating the relaying of radio messages among amateurs."

Some of the blanks forwarded to the League came from men many of whom are forty years old; one is sixty-four.

Crossing the Atlantic in a Life-boat

EINAR SIVARD, naval architect and superintendent of the Welin Marine Equipment Company, is about to start across the Atlantic in a Lundin Power life-boat of the type described as non-capsizable, non-smashable and practically unsinkable. His crew of five will include his young wife, Mrs. Signe Holm Sivard, to whom he was recently married, and who, in order to accompany her husband on this trip, will muster in as cook. The other members of the crew will be a navigator, a wireless operator, one engineer and one sailor.

Smallest of all the craft carrying a wireless installation, the life-boat is equipped with Marconi ½ K.W. set with the units all mounted on one panel, conveniently and compactly arranged for installing and operating. One extra break system type hand key is supplied for table mounting. The transmitter consists of 120 cycle, 220 volt motor generator; power 220-8,000 volt transformer, condenser, oscillation transformer, aerial tuning inductance, break system hand key, with reactance, aerial switch, 5-point wave length switch, change-over switch, break system aerial switch, switches for direct current and alternating current lines, generator field and blowers, change-over; a generator field rheostat, automatic starter, direct and alternating current volt meter, alternating current wattmeter, radiation ammeter.

The equipment is the same as those supplied by the Marconi Company to the United States submarine and torpedo boats. With the limited available antenna on the Lundin life-boat it is estimated that the wireless apparatus will have a transmitting radius of from fifty to 100 miles.

The craft was successfully launched on Wednesday, July 15, from the yards of the Welin Marine Equipment Company at Long Island City. While it has been constructed especially for this voyage, it differs only in size from power life-boats designed for actual use on ocean liners. The new boat has a length of thirty-six feet and a beam of twelve feet, while the largest similar craft previously built is thirty feet long and ten feet wide.

It is built of galvanized steel with a water-tight deck six inches above the load water-line. The space between the deck and the bottom is subdivided into numerous water-tight compartments, several of which may become filled with water without in the least endangering the boat. A steel house with water-tight portlights, doors and ventilators encloses all but a small part of the boat fore and aft, where short decks are provided for the helmsman and the outlook. With the house properly closed up, this type of boat has proved to be self-bailing and self-righting. Along the sides of the boat are fitted heavy fenders of Balsa wood

The Lundin Power Life-Boat

(the lightest wood in existence) that have been submitted to a special impregnating process serving at once to preserve the wood and keep it from absorbing water. The fenders constitute an almost perfect guarantee against the smashing of such a craft when lowered from a ship.

The boat is equipped with a 32 horsepower, 4-cylinder Standard engine and gasoline tanks that will enable it to remain at sea for many days.

Mr. Sivard will go by way of Boston and Halifax to St. Johns, Newfoundland. From there he will cross the ocean to Queenstown and will then proceed along the English coast to London. The total trip is expected to take a little more than a month and the open-sea crossing about fifteen to seventeen days.

BOY SCOUTS RECEIVED A MESSAGE

At the Fourth of July celebration, held in Ridgefield, Conn., a newspaper's wireless station contributed its part of the ceremonies incident to the laying of the cornerstone of the new $50,000 school house. In the afternoon, when the athletic meet and baseball game were in progress, there issued from the tent where the Boy Scouts had their small home-made receiving station several youngsters in a state of excitement. One of them bore a congratulory wireless message from a newspaper. The amateur wireless operators among the boys were somewhat chagrined that their station was not equipped so that the message could be acknowledged.

A London dispatch says that at the Isle of Grains naval air station a seaplane accomplished a speed of seventy-eight miles an hour and climbed to a height of 4,000 feet in seven minutes, fifteen seconds. Wireless equipment was carried and communication with the aerodrome was successfully maintained.

INSPECTOR KRUMM IN NEW YORK

Chief Radio Inspector Louis R. Krumm will be in New York during the month of August, while Inspector Terrell is on a vacation.

TEST OF DIRECTION-FINDER A SUCCESS

The Canadian Northern liner Royal George docked in Quebec, Canada, recently after a voyage which has been the occasion for testing the Marconi-Bellini-Tosi direction-finder.

In charge of the apparatus was an engineer connected with the Marconi company, who said that the tests had proved most satisfactory. Both he and Captain Thompson said the instrument was accurate to a degree in determining the compass directions of other stations, whether on shore or on other vessels.

In this way they had been able to ascertain the compass position of Cape Race, Cape Ray, Father Point and the vessels Columbia, Calgarian and Sicilian. The Columbia had been at a distance of sixty-eight miles away, the Calgarian fifty-three and the Sicilian eighteen.

The finder shows the line on which the wireless transmitting station lies. It is very simply manipulated, as the readings are taken by moving an indicator to different positions and noting the point at which the loudest signals are heard in a telephone.

Captain Thompson foresees great possibilities for the system, especially if occasion should arise to determine the location of a ship which is sending out the S O S call. With the ordinary wireless apparatus it is necessary for the ship in distress to give another ship its position in degrees of latitude and longitude, and the navigating officer of the ship going to render assistance must know his own position. With the new apparatus he can head directly to the rescue even when the position of neither ship is known.

IMPROVED SERVICE ON THE GREAT LAKES

A greatly improved service of wireless reports concerning the movements of boats on the Great Lakes has been arranged for. In addition to the stations at Port Arthur, Sault Ste. Marie, Tobermory, and Midland, the Marconi Company has completed the construction of stations at Sarnia, Burwell, Toronto, and Kingston.

Laws for British Ships

A bill to amend the laws relating to British Merchant shipping so as to make effective the International Convention for the Safety of Life at Sea, signed in London on January 20th last, was introduced in the House of Commons recently by John Burns, president of the Board of Trade.

The bill is divided into six parts, containing twenty-nine clauses and five schedules. The first part relates to ice and derelicts, and provides that if the master of a British ship fitted with a wireless telegraphy installation meets with, or is informed of, any dangerous ice or dangerous derelict, or any other imminent and serious danger to navigation on or near his course, he must send out the wireless danger call — — — (TTT), to be followed after an interval of one minute by the message, repeated three times at intervals of ten minutes.

Every wireless telegraphy station under the control of the postmaster-general, or licensed by him, must, on receiving the wireless danger call, refrain from sending messages for a time sufficient to allow other stations to receive the message. Compliance with this provision will be deemed to be a condition of every license granted by the postmaster-general under the Wireless Telegraph Act, 1904. This provision does not interfere with the transmission of the wireless distress call, which will remain . . . — — — . . . (SOS).

Clause 5 places the master of a British ship under an obligation to render speedy assistance on receiving a wireless distress call, and where he does not proceed to the assistance of the persons in distress, he must enter the fact and the reasons justifying his action in the official log book and, if necessary, immediately inform the master of the ship from which the call is received. This section of the bill also specifies the penalties to which a master of a ship, or any person, is liable if he fails to observe the directions set forth in the measure.

The compulsory wireless clauses (15 to 17 inclusive) are in Part III. of the bill, which is as follows:

15.—(1) Subject to the provisions of this Act, every British ship registered in the United Kingdom which carries fifty or more persons shall be provided with a wireless telegraphy installation, and shall maintain a wireless telegraphy service which shall be at least sufficient to comply with the rules made for the purpose under this Act, and shall be provided with certified operators and watchers in accordance with those rules.

(2) In reckoning the number of persons carried on a ship for the purpose of this section, persons shall not be counted who are exceptionally and temporarily carried on a ship—

(*a*) As a result of *force majeure;* or

(*b*) As the result of the necessity of increasing the number of the crew to fill the places of members of the crew who are ill or disabled; or

(*c*) As the result of the obligation on the part of the master to carry shipwrecked persons, or persons in like circumstances; or

(*d*) If so provided by regulations of the Board of Trade, as cargo hands for a part of the voyage not being between one continent and another, and not being, during the time the hands are carried, outside the limits of latitude thirty degrees north and thirty degrees south.

(3) If this section is not complied with in the case of any ship, the master or owner of the ship shall be liable in respect of each offence to a fine not exceeding five hundred pounds (approximately $2,500), and any such offence may be prosecuted summarily, but if the offence is prosecuted summarily the fine shall not exceed one hundred pounds (approximately $500).

16.—(1) The Board of Trade, in consultation with the postmaster-general, may make such rules with respect to wireless telegraphy installations and service on British ships which are registered in the United Kingdom and with respect to the carrying on those ships

of operators and watchers for the purposes of wireless telegraphy as appear to them necessary or expedient to carry into effect the provisions of the Convention mentioned in Part V. of the third schedule of this Act.

(2) The Board of Trade may by rules made under this section exempt from the obligations of this Act as to wireless telegraphy: —

(*a*) Ships while on voyages the course of which does not take the ship more than a hundred and fifty sea miles from the nearest coast, if the Board are satisfied that the route and the conditions of the voyage are such as to render compliance with those obligations unreasonable or unnecessary; and

(*b*) Sailing ships on which, owing to the peculiar or primitive nature of their build, it is impossible to provide a proper wireless telegraphy installation.

(3) The Board of Trade may by rules made under this section provide that any automatic calling apparatus which is certified by them to be efficient and to have been accepted by the parties to the Convention may be substituted for the purposes of the provisions of this Act, and any rules made thereunder relating to wireless telegraphy, for a certified operator or watcher.

17.—The Board of Trade may postpone the operation of the provisions of this Act relating to wireless telegraphy as respects any particular ship for such period as the Board of Trade may determine in each case, if it is shown by the owners of the ship that they have taken all reasonable steps to comply with the provisions of this Act as respects the ship, but that they have been unable to do so owing to difficulties in obtaining delivery of any wireless telegraphy apparatus or of obtaining the services of certificated operators or watchers.

The period of postponement under this section shall not exceed one year in the case of ships which are required in pursuance of the Convention to provide a first-class wireless telegraphy service, and two years in the case of ships which are so required to provide a third-class wireless telegraphy service, and in the case of ships which are so required to provide a second-class wireless telegraphy service shall not exceed one year as respects the provision of the wireless telegraphy installation and two years as respects the provision of a continuous watch.

Clause 19 (Part IV.) proposes to confer upon the Board of Trade power not to grant a safety certificate, unless they are satisfied, on the report of a wireless telegraphy inspector, as respects provisions relating to wireless telegraphy that the certificate can be properly granted.

The postmaster-general (and the Board of Trade, if they desire to do so for any special purpose in connection with wireless telegraphy on board a ship) may appoint officers for the purpose of inspecting ships with a view to ascertaining whether the requirements of the Act relating to wireless telegraphy are complied with on board any ship.

The wireless telegraph inspector may go on board any ship at all reasonable times and do all things necessary for the proper inspection of the installation on the ship; he may also require the master of the ship to supply him with any information which it is in the power of the latter to supply with respect to the provision on the ship of operators or watchers, and require the production of any certificate granted under this Act in respect of the installation, and of the certificates of the operators and watchers on the ship.

Failure on the part of the master of a ship to supply information in accordance with this section will render him liable to a fine not exceeding twenty pounds (approximately $100) and any person impeding an inspector in pursuance of his duties is liable to a similar penalty.

According to statistics made up by the International Bureau of Posts, there were on January 15, 1914, 569 wireless telegraph stations in the world. The United States leads with 178; then come England, 91; Canada, 37; France, 35; Italy, 33; Russia, 29; Brazil, 26; Germany, 23; Norway, 21, and so on down to China and Sweden with two stations each.

New Marconigram Sign Displayed in the Telegraph Offices

LIST OF OFFICIALS

Marconi Wireless Telegraph Company of America

NEW YORK

Woolworth Building, 233 Broadway

JOHN W. GRIGGS, *President*
EDWARD J. NALLY, *Vice-President and General Manager*
JOHN BOTTOMLEY, *Vice-President, Secretary and Treasurer*
FREDERICK M. SAMMIS, *Chief Engineer*
GEORGE S. DE SOUSA, *Traffic Manager*
DAVID SARNOFF, *Contract Manager*
JOHN YOUNG, *Auditor*
WILLIAM B. VANSIZE, *Patent Attorney*
G. HAROLD PORTER, *Purchasing Agent*
J. ANDREW WHITE, *Editor of Publications*

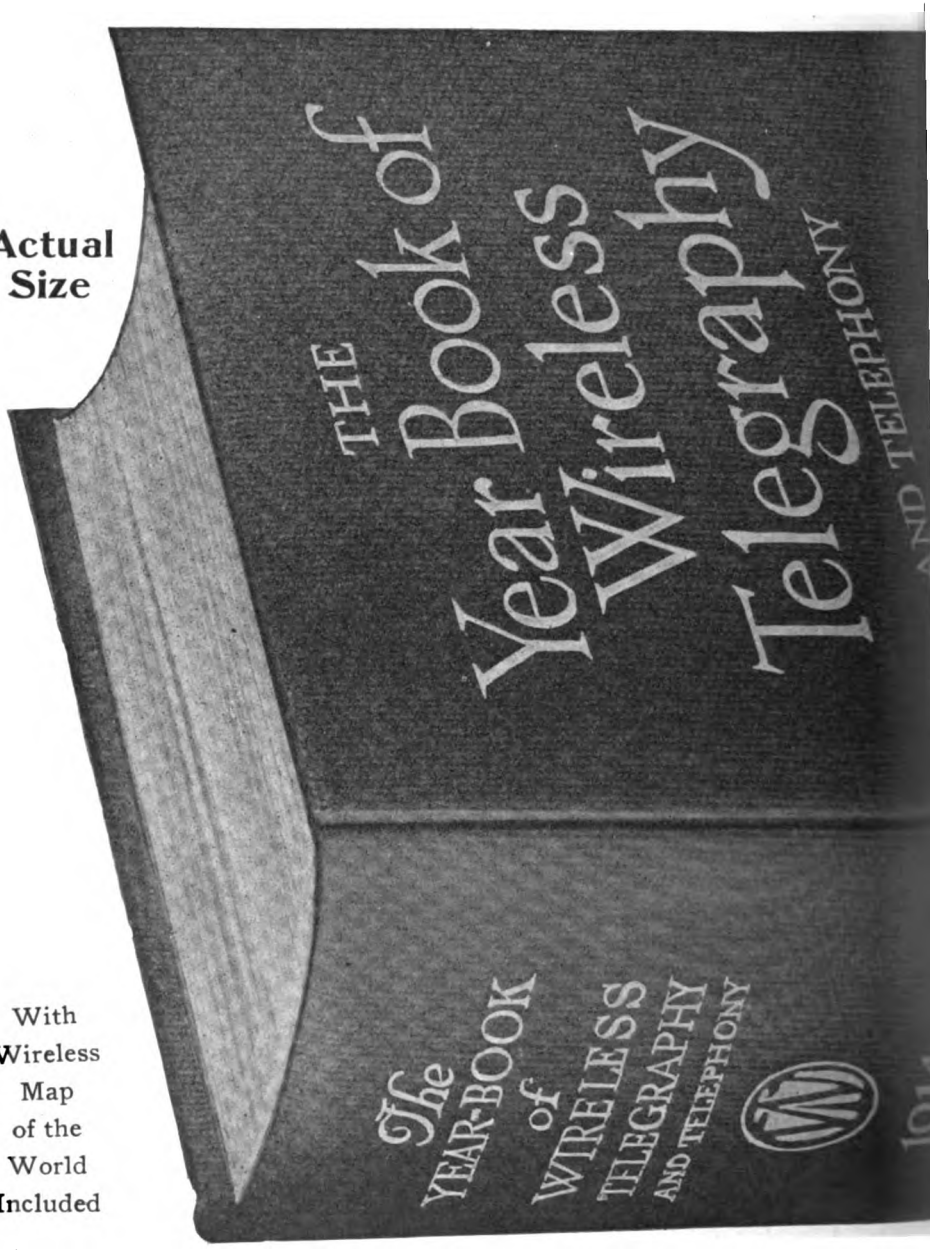
Operating Department - - 29 Cliff Street

E. T. EDWARDS, *Superintendent Eastern Division*

SOUTHERN DIVISION—American Building, Baltimore. Md. C. J. Pannill, *Superintendent*
GULF DIVISION—Metairie Ridge Road, New Orleans, La. - A. Mowat, *Superintendent*
GREAT LAKES DIVISION—Schofield Building, Cleveland, Ohio. E. C. Newton, *Supt.*
PACIFIC COAST DIVISION—Merchants Exchange Building. A. H. Ginman, *Gen'l. Supt.*

THE BOOK

Actual Size



With Wireless Map of the World Included

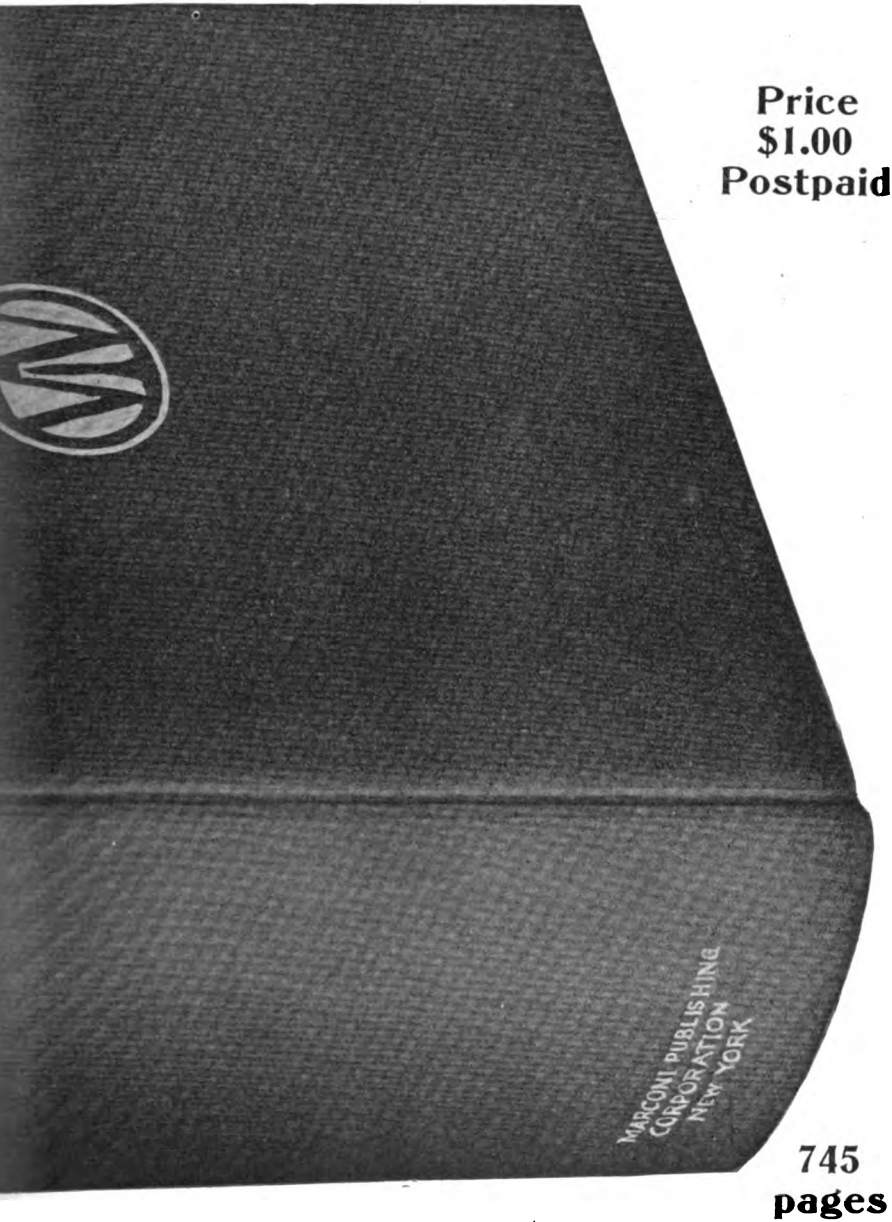
ALMOST TWICE AS LA

THE FIRST EDITION WAS QUICKLY EXHAU

SEND ONE DO

MARCONI PUBLISHING CORPORATION,

YOU NEED!



Price
$1.00
Postpaid

745
pages

RGE AS LAST YEAR'S

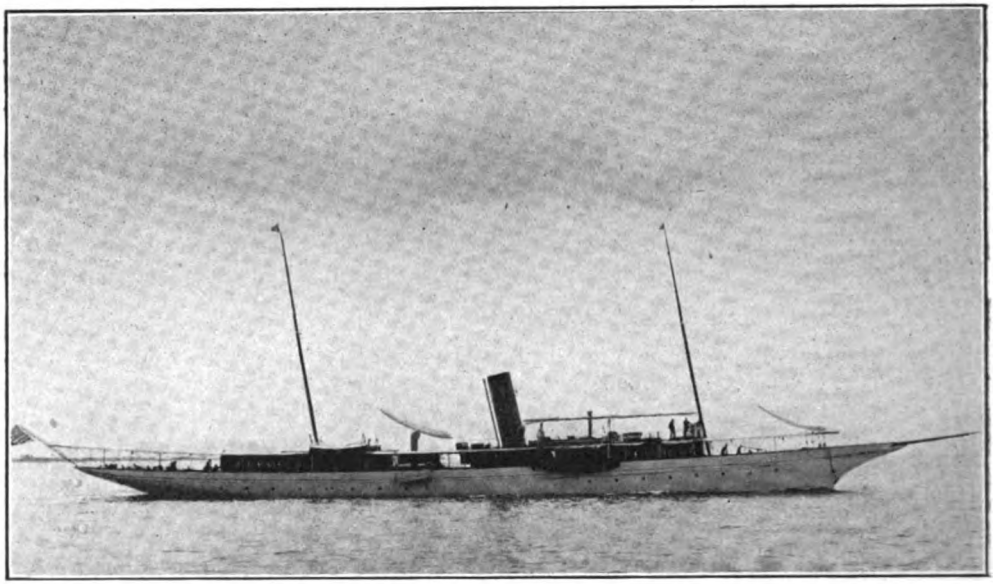
STED; THIS ONE IS SELLING EVEN FASTER.

LLAR TODAY

0 FOURTH AVE., NEW YORK.

Interesting Equipments

THE steam yacht California has recently been equipped with a standard 2-K.W. Marconi set with an independent emergency outfit. She will sail soon for Panama and thence to the Pacific coast. The California combines seaworthiness, comfort and speed. She has cruised extensively on the Atlantic coast and made a winter voyage through the West Indies. She is owned by Mrs. H. H. Stocker.



Mrs. H. H. Stocker's Steam Yacht "California"

She is constructed of steel, being particularly trim and graceful. Her bulwarks are of good height and she has large deck house and a main deck room. There are two galleys, the crew's being below and the owner's on deck. The sailing master's stateroom is on deck. She has ten beds for the accommodation of her owners and guests. She has six officers' staterooms.

Built in 1913, her length over all is 210 feet. Her beam is 23 feet 3 inches, while she has a depth of 11 feet and a draught of 9 feet. Her coal consumption is no greater and, in fact, less than that of other yachts of her size at the speeds at which they are usually driven. She was designed by Gielow & Orr, naval architects.

Her crew consists of twenty-four men. She has a mate, two quartermasters, a bos'n, two launchmen, five sailors, a chief and assistant engineer, two oilers, four firemen, two cooks, two stewards, two messmen and a cabin boy.

Contract News

The Bellona, chartered by the Atlantic Fruit Company, has been equipped with a 2-K.W. standard Marconi outfit. The vessel, which plies between New York City and Jamaica, has a special cabin for the accommodation of its wireless operator and apparatus. She flies the British flag. Her call letters are VEP.

The latest type of Marconi panel equipment has been installed on the United States, owned by the Indiana Transportation Company. Her call letters are WIT.

VESSELS EQUIPPED WITH MARCONI APPARATUS SINCE THE JULY ISSUE

NAME	OWNERS	CALL LETTERS
South American	The Texas Company	KVW
Atlantic City	Atlantic City Steamship Line	KWN

THE SHARE MARKET

New York, July 20.

Instead of responding to the optimistic views expressed by the leading financial authorities, the share market still remains weak. The pressure put upon the market does not come exclusively from the sale of long stock, in the opinion of the brokers. This selling is decidedly in the minority. The activity of the bear traders is mainly in evidence and has its effectiveness where earnings have been impaired in many directions by the decline in trade and other factors.

Liquidation in relatively weak properties is known to have its effect in slower downward movements in other issues. To this condition the brokers attribute the slight decline in American Marconi. English Marconi's were likewise affected by operations connected with the bear faction, but later rallied from the lowest levels, although a decline was shown by both common and preferred shares. Canadian Marconi's also weakened.

The consensus of opinion among the brokers to-day is that the public has lost confidence during a business depression which is unwarranted, and will not come forward to repel the attacks of the professional traders. A generally cheerful attitude is expressed toward Marconi's and the conservative traders urge buying at the present low levels.

Bid and asked prices to-day:

American, 2¾—3; Canadian, 1⅜—1⅝; English, common, 11—14; English, preferred, 9—12½.

DIRECTORS EXPRESS CONFIDENCE IN MR. NALLY

A dispatch from London referring to the annual report of the Marconi Wireless Telegraph Co. for 1913 says:

The report says considerable difficulty was experienced in obtaining the services of a man with the knowledge and ability needed for the direction of the American company. Lack of such a man rendered the business less profitable than it otherwise would have been. The directors believe that Edward J. Nally, who was eventually appointed, will fill the position satisfactorily.

NEW ORLEANS OFFICE MOVED

The New Orleans (La.) office of the Marconi Wireless Telegraph Company of America (call letters WHK) has been removed from the Grunewald Hotel to Metairie Ridge Road, where the quarters of Superintendent Mowat, of the Gulf Division, are now located.

The Boletin Official publishes a decree authorizing the Argentine post office to spend 50,000 pesos paper (approximately $22,000) on the erection of two wireless telegraph stations at Posadas and Puerto Aguirre in the National Territory of Misiones.

According to the Indianman, wireless telegraphy in India is making satisfactory progress. The wireless station at Peshawur is now in working order, while from Rangoon comes the news that the masts for the station there are being set up, and that the installation of machinery will soon begin.

Marconi Men

The Gossip of the Divisions

Eastern Division

Operator J. J. Kaleta, of the Cristobal, has been transferred to the steamer Yaguez.

Operator W. H. Davis, the hero of the Oklahoma, has been transferred to the El Sol. Davis has had designs on the El Sol for some time.

Operators B. J. Harvey and S. Hopkins have been assigned to the Trinidad, which went into commission on July 18.

Operator N. J. Kearney, who has made one trip on the Mexico since the Havana laid up, rejoins the latter vessel when she goes into commission.

Operator E. Bambourakis has been promoted to first operator on the City of Savannah, vice Arthur Cohen, resigned. D. Duffield, formerly of the Arapahoe, is second.

Operator A. Bernhard transferred to the Seguranca, when the Algonquin laid up, relieving operator Cuthbert, who is on sick leave.

M. Z. Bishop, of the Alamo, has been transferred to the City of Montgomery as second operator. O. C. Temple relieved him on the Alamo.

E. J. Quinby, who was dispatched as relief operator to the pilot boat New Jersey, showed a capacity for quick action when the New Jersey sank. Quinby immediately called Sea Gate and continued to sound the distress call until stopped by the rapid rise of the water. The call was promptly received by Sea Gate, which just as promptly notified all concerned.

C. E. Burgess and J. J. Simpson, first and second operators on the American Line steamer St. Paul, have been transferred to Belmar. J. A. Worrall and J. S. Scott have been assigned to the St. Paul.

J. W. Swanson, first operator, and F. J. Murphy, second operator, have been transferred from the Arapahoe to the Saratoga and Florizel, respectively. H. B. Cowan and A. C. Berg relieved them on the Arapahoe.

Patrick Barkley, who was relieved by F. J. Murphy on the Florizel, is now at Belmar.

Operator A. M. Mitchell has been transferred to the Grayson, vice A. H. Lynch, transferred to the S. S. Atlantic City, recently equipped with a ½ K.W. panel set.

Operator D. Brand, formerly on the Alliance, has been assigned to the Borinquen.

A. Schweider has been transferred from the Parima to the Matura, being relieved by operator Arnold.

Operator Heimbecker was transferred to the Creole from the laid-up Mohawk, leave having been extended to operator Ferrick.

Leave has been granted to operator J. M. Bassett, who will rejoin the Mohawk when she goes into commission.

Operator H. H. Hilcken, of the Panama, has resigned to go in the bookbinding business with his father at Newport, R. I. The Division has an idea that Hiram intends to abjure the ranks of cellibacy and take unto himself a life partner and its best wishes go with him.

J. B. Catanese, from the factory, who was assigned to the Karema as a listener, returned from St. Johns where he was disembarked, looking a very much-traveled man. It seems almost a pity to have to assign him to a pilot boat where his itinerary will be very limited.

Operator B. G. Suetter, who was transferred north from the City of Macon, via the El Oriente, has resigned to go to work again. We believe he is either at 253 or 195.

Second operator H. V. Griffing, of the El Oriente, was taken sick at Galveston on June 28 and removed from the vessel to the Marine Hospital.

Operator A. E. Ridley, for years on the Millinocket, has been transferred to the Calvin Austin, at his request.

Operator R. L. Brackett has been relieved from duty on the Ranson B. Fuller by operator W. J. Swett, of the Nacoochee. J. F. Forsyth has been transferred to the Nacoochee.

Operator E. E. Hayward has been placed on the Governor Dingley, which required a second operator commencing July 5.

Operator M. A. Campbell, of the Obidense, has been transferred to the El Norte, relieving C. E. Maps, who has resigned to take up his father's business.

Operator R. Toms has been transferred from the American Line steamer New York to the Bantu.

Operator R. L. Etheridge, of the Jefferson, has been granted indefinite leave in order to undergo an operation for appendicitis at Norfolk, Va. Best wishes for a successful operation and a speedy recovery.

Operator Eugene Hymel was assigned to the SS. Mexicano at Texas City, Tex.

Operator N. D. Talbot was assigned to the Maracas when the Algonquin laid up.

Operator F. Dawson has been transferred from the Antilla to the Carolina, junior operator William Sirken going to the Nickerie.

E. J. Oschman and R. Pettit, of the Comal (laid up), have been transferred to the Huron.

J. H. Rhettstatt, who has been on leave during the lay-up of the Creole, rejoined that vessel.

S. F. Patten was transferred from the Olinda to the Philadelphia.

P. H. Kriegen, from the school, has been assigned to the Olinda.

Southern Division

W. P. Grantlin has been transferred from Baltimore to the Miami station, where he will be manager.

Shallcross and Hartley have been transferred to the Miami station, Hartley from Virginia Beach and Shallcross from Philadelphia.

Summer season at Tolchester Beach opened June 1 when the excursion steamer Louise was placed in commission. Operator Linderborn has been detailed to the Louise.

Operator H. C. Fox has been transferred from Baltimore station to Cape May station, and is both painter and manager.

Engineer Eugene Murray has returned to Baltimore after accompanying U. S. Government Inspector R. Y. Cadmus on an inspection tour of the Southern Division coastal stations.

Operator Goldblatt had the misfortune last week to fall in a hatchway while visiting on the Toledo at Philadelphia. Two ribs were broken and he was otherwise injured.

Operator Edward McCauley, of the SS. City of Richmond, has resigned to accept a position on shore at Baltimore in a machine shop.

Illinsworth at Virginia Beach announces that he is very lonely since his side partner Hartley was transferred to Miami; so he has asked for two weeks' vacation.

J. C. Lewis, formerly manager at Miami, has been transferred to his old post at South Wellfleet.

Engineer Morris, at Philadelphia, intends to spend a couple of weeks at his home in Norfolk with Mrs. Morris this month.

Engineer Murray left for New York on the new ship Ohioan of the American Hawaiian Line with the Marconi equipment put on her at Baltimore.

Sammy Cessenfeld has been promoted to assistant operator at the Baltimore station.

Inspector Cadmus says the nearest approach to water south of Norfolk is coca cola.

Dempsey, of the SS. Somerset, came to life last month and captured the five dollar prize for sale of Ocean Wireless News. Dempsey looks like a new man.

Great Lakes Division

F. Benson, a graduate student from the Marconi School at Cleveland, was appointed wireless operator and purser on the SS. Ann Arbor No. 3.

Harry Lane, wireless operator on the SS. Wilpen, has been transferred to the second trick at the Chicago station. W. Miller, a graduate from the Marconi School at Cleveland, succeeds Harry Lane on the SS. Wilpen.

D. A. Nichols, formerly employed by the Marconi Wireless Company of

Canada on the Saronic, has been appointed night operator at the Buffalo station.

E. Dieghan, third trick operator at the Cleveland station, and Charles Beals, recently left Detroit for Duluth on board the City of Detroit III., with the Board of Commerce Excursion.

The City of Detroit III. started on her regular run between Detroit and Buffalo on June 23, at which date F. C. Goulding relieved operator E. Dieghan, and F. Stehmeyer relieved operator Charles Beals. Deigham has returned to his position as third trick operator at Cleveland, O. Beals has been appointed first operator on board the City of Detroit II., which has been in dry dock undergoing repairs to her engines. H. P. Roberts, a graduate from the Marconi School, has been appointed assistant to Beals on board the City of Detroit II.

W. A. Hutchins, who was operator on board the Seeandbee during the season of 1913, has returned. The Seeandbee went into commission on her regular run between Cleveland, O., and Buffalo, N. Y., on June 21.

A. E. Jackson, chief constructor of the Great Lakes Division, was recently in Port Huron installing a new one-half K.W. panel set on the Lakewood, the first of these sets to be installed in the Great Lakes Division. It is giving excellent results, a radiation being obtained of 4.4 amperes and a daylight range of 160 miles.

E. C. Newton, superintendent of the Great Lakes Division, who was recently married to Miss Bertha Sanda, is residing with his bride in their new home at 8909 Yale avenue, Cleveland, Ohio.

The Str. Eastland, formerly owned by the Eastland Navigation Co. of Cleveland, O., has been purchased by the Chicago and St. Joseph S. S. Co., and is plying between Chicago and St. Joseph, Mich. The wireless equipment has been maintained on board this vessel with operator A. Hamel in charge.

A. J. Therriault has returned to his position as operator-in-charge at the Mackinac Island, Mich., station, after spending eight months in the Gulf Division.

MARCONI AT CARNARVON BANQUET

A public banquet was held at Carnarvon, Wales, on May 20, in honor of Guglielmo Marconi, who was accompanied by Mrs. Marconi. The mayor of Carnarvon presided, and he was supported by representatives of Liverpool's shipping industry. The object of the gathering was to celebrate the completion of the new station.

Responding to the toast to his health, Mr. Marconi, who was cordially received, said that wireless telegraphy had made enormous progress in recent years, and he was certain that at the time of his first experiments, nearly twenty years ago, hardly anyone would have dreamt that it would have been possible to utilize it for direct commercial communication between England and America, or between England and South Africa. He remembered perfectly well that when he first started his experiments in England he received a letter from the Admiralty stating that if ten or fifteen miles could be covered, it would be all that was really wanted. Now if for some reason one could not communicate direct to almost any point in the Mediterranean or North Atlantic, they were all very much surprised, and had to admit that there must be something radically wrong either with the apparatus or the persons who were working it.

The uses of wireless telegraphy at the present day were many, but he thought that the first practical purpose to which it was put over seventeen years ago still remained the most important. He referred to its use on board ship in safeguarding the lives of those that travel on the sea. The number of ships and shore stations equipped with wireless telegraph apparatus was rapidly increasing, and that such equipment was now considered almost indispensable was shown by the fact that several governments had passed laws making a wireless telegraph installation compulsory in all ships entering their ports. Many of the results he had been able to obtain had been rendered possible by the work of his predecessors and by the co-operation and help which had been afforded him by his assistants.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with india ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

E. G. R., Trenton, N. J., asks:

Ques. (1) What station sends every night at 8:30 to about 9:15? It has a very high pitched spark note.

Ans. (1) We do not know.

Ques. (2) What is the wave-length of an aerial 300 feet long, 40 feet in height at one end and 50 feet in height at the others?

Ans. (2) About 530 meters.

Ques. (3) Will amateurs in New Jersey be able to hear the new high power station of the Marconi Company at New Brunswick, N. J.?

Ans. (3) It is very doubtful on account of the extremely long wave-lengths to be used.

Ques. (4) When does the Cape Cod station of the Marconi Company send press, and on what wave-length?

Ans. (4) It starts at 10:15 P. M. The wave-length used is 1,650 meters.

Ques. (5) When does Key West (NAR) send, and on what wave-lengths?

Ans. (5) From 2:00 A. M. to 11:00 P. M. on regular schedules. At 2:00 P. M. Key West communicates with Arlington on a wave-length of 4,000 meters; for the remainder of the day a wave-length of 1,500 meters is used when communicating with ships and other naval stations.

* * *

T. J. R., San Francisco, Cal., inquires:

In your description of a tuning transformer in the January number of THE WIRELESS AGE the statement is made that the primary of the receiving transformer is 3½ inches in diameter and 6 inches in length; the secondary winding 4 inches in diameter and 12 inches in length. Why is the secondary longer and larger in diameter than the primary? In all the instruments I have seen the conditions are the reverse.

Ans.—It is intended that an aerial tuning inductance should be used in series with the primary winding of this tuner and therefore the secondary winding should have considerably greater dimensions than the primary winding. The fact that the secondary of the transformer is larger in diameter than the primary and furthermore that the primary slides inside of the secondary is of no particular import, as the tuner will work equally well in either manner.

* * *

S. H., Hamilton, Ont., asks:

Ques. I desire to construct a spark coil for which you gave directions in one of the previous issues of your publication.

Ans. See the December, 1913, issue under the heading, "Instruction to Boy Scouts."

* * *

F. D. U., Elgin, Ill., writes:

Ques.—The last few mornings at 9:30, Central Standard Time, I have heard an unknown wireless station and am wondering if you can identify it. I hear a high-pitched note on a 2,400 meter wave-length and the station apparently signs WNU. Its signals run for about 5 minutes; they consist of repeated calls for another station which cannot be deciphered owing to the faintness of the signals. I notice in the July, 1913, "Radio Stations of the United States," that the call WNU had not been assigned and I am wondering if it has since been allotted to some new high power stations in this country.

Ans.—This is the 50 K. W. station of the Tropical Radio Company at New Orleans, La. It is equipped with apparatus furnished by the Marconi Wireless Telegraph Company of America.

* * *

J. E. P., Irvington, N. J., asks:

Ques. (1) Is there any formula by which I can construct condensers of different capacities? That is, is there any certain capacity in microfarads to a certain number of square inches to the surface of tin-foil or brass sheeting?

Ans. (1) The following formula would apply:

$$\frac{C=A\times K\times 0.2246}{T\times 10^6} \text{ Mfds.}$$

Where A equals the area in square inches of the tinfoil in use or, we might say, equals the area of the dialectric in use, K is the dialectric constant of the particular insulating substance used; T equals the thickness of the dialectric in inches.

The values of K may be found in tables in various text books on electricity, among them being "The Year Book of Wireless Telegraphy" for 1914. For glass the value of K lies between 6 and 9.

Ques. (2) When a condenser is said to have a certain number of square inches of surface, does the expression include one side of the plate or both sides?

Ans. (2) Generally the reference is made to the number of square inches on one side of the single plate condenser.

The information requested by you concerning the type 101 Marconi receiving tuner is not available for publication.

* * *

C. O. T., Lenora, Kas.:

It is impossible to calculate the distance you may expect to receive with your aerial and apparatus as we do not know whom you wish to receive from. There are no commercial stations in your vicinity, the nearest high power station being that of the Army at Fort Leavenworth, Kas. Your aerial is not quite high enough to receive signals from the Atlantic coast during the winter time. Under these conditions we can make no suggestions as to what your receiving range might be.

* * *

C. F. O., Marblehead Neck, Mass., asks:

Ques. (1) Do you give cash prizes for good photographs of amateur stations?

Ans. (1) THE WIRELESS AGE does not give prizes for photographs. Cash will be paid, however, for photographs that are available for publication.

Ques. (2) After taking a course in radio engineering at Columbia University, is there any field open to the graduates and what position may he expect?

Ans. (2) The field is fairly promising and positions may be obtained in the engineering departments of the commercial companies. The demand for such men is not large and you should not be mislead in this respect. The application files of commercial wireless telegraph companies are generally filled. Even after securing a first-class technical training at a college, you might find that you would be expected to enter the ship service of a commercial company and become familiar with practical wireless telegraphy before being placed in a more remunerative position.

Ques. (3) Where can I obtain a piece of cerusite like that used in the latest type of Marconi receiving sets? Is cerusite a crystal requiring a fine pressure, and what kind of wire makes the best contact—a small German silver wire or a brass wire of the same dimensions? During a conversation with a commercial operator, he said that the piece of cerusite which he used was more sensitive than galena and had more "points." Is this so?

Ans. (3) A first-class cerusite detector may be purchased from the Marconi Wireless Telegraph Company of America, 233 Broadway, New York, for $50. Cerusite requires a contact on the order of that of silicon or perikon. The contact wire is preferably of spring steel. The operator with whom you were in conversation is quite right in his statement, for it is a notable fact that with good crystals of cerusite a sensitive point of contact may be found at almost any spot on the crystal, as, of course, is not the case with crystals of galena. Cerusite is decidedly more stable in adjustment than galena, and from a commercial standpoint is far more preferable.

Ques. (4) Please tell me if this tuning inductance is of sufficient value to allow of the reception of signals from the Marconi Station at Glace Bay, N. S.:

Primary, 256 turns on a core 3 inches in diameter, inductance varied 1-20 of a turn; wire No. 26 B. & S. Secondary, No. 32 B. & S. wire on a core 2½ inches in diameter, 18 inches in length, wound closely; 11 taps. I have a Murdock loading coil with a 7-point switch, which is supposed to have 2,800 meters wave-length. The aerial I expect to use with this loose-coupler is 400 feet in length and consists of a single loose wire.

Could I receive Glace Bay with another aerial consisting of 4 wires 75 feet in length? I have a Blitzen variable condenser across the secondary and will use it if it is needed. My aerials are directional north.

Ans. (4) If your secondary winding is shunted by the Blitzen condenser you will be able to tune to the wave-length of Glace Bay. Your 400-foot aerial is a little short, and if possible, it is best to lengthen it to 800 or 900 feet. You will not be able to receive Glace Bay at all on a 75-foot aerial. If you lengthen the larger aerial to one like that which we have suggested, and the loading coil is placed in series with the primary inductance of the oscillation transformer, your apparatus should be in resonance with Glace Bay. It requires well-designed receiving equipment to receive signals from a high-power Marconi Station on an aerial of small proportions, so you should not be discouraged if you do not hear Glace Bay.

Ques. (5) Will you please give me a correct list of the letters sent out by Arlington in the meteorological report after the time signals? In the November or October number of THE WIRELESS AGE a list was given which slightly differs from the list Arlington sends out at the present time. If possible give me an authentic list and the places they represent. Also, could you tell me the comparative values of the Beaufort scale with the commonly known relative conditions?

Ans. (5) A full interpretation of the Beaufort scale is given on Page 645 of "The Year Book of Wireless Telegraphy and Telephony" for 1914. The new letters which you hear from Arlington are additional ones covering the Great Lakes district. You may secure a bulletin from the United States Department of Agriculture, Weather Bureau Office, covering the matter fully. This information will be sent from Arlington for the Great Lakes district from about April 15th to December 10th each year. The points for which weather conditions will be furnished are designated as follows:

DU, Duluth; M, Marquette; U, Sault Ste. Marie; G, Green Bay; CH, Chicago; L, Alpena; D, Detroit; V, Cleveland; F, Buffalo. The grouping is by lakes, beginning with Superior and ending with Erie.

In all other respects the method of sending this information is the same as that described on page 82 of the October, 1913, issue of THE WIRELESS AGE. A point that should be known in connection with the sending of the Beaufort scale is that no provision in the Weather Bureau code has been made for a wind force greater than 9, which designates a strong gale. Whenever a wind force greater

than a strong gale is to be reported, the number representing it will be given in words instead of in figures.

If the weather conditions for any particular station cannot be supplied, the initial of that station will be given, followed by the word "missing," and if any portion of the report cannot be furnished, it will be replaced by an equivalent number of letters "X."

The circular from the Weather Bureau previously referred to contains an interpretation of the Beaufort scale.

* * *

D. L., San Francisco, Cal., writes:

Ques. (1) I have two poles, each 60 feet high and 70 feet apart. My aerial consists of 4 wires, each 2 feet apart. It also has a 20-foot lead-in consisting of two wires. What type aerial would you advise me to use to get 200 meters?

Ans. (1) If you desire to emit a 200-meter wave, using an oscillation transformer in connection with the transmitting set, the natural wave-length of your aerial should not be more than 160 meters. An aerial consisting of 4 wires, spaced 2 feet apart, 50 feet in length and 40 feet in height, will have a natural wave-length of approximately 160 meters. This will allow a few turns of inductance to be inserted in series with the antenna for the transferance of energy from the enclosed to the open circuits; thus your station will emit a 200-meter wave and the coupling may be adjusted as desired.

Ques. (2) Will you kindly give a diagram of the aerial?

Ans. (2) No diagram is necessary; it need only be of the inverted type. We note that the drawing accompanying your communication indicated that you are using a freakish arrangement of connections in the aerial. There is no advantage in zigzagging the wires as shown in your drawing. Connect all 4 wires together at the extreme end and bring lead-in wires from the other end to your apparatus.

Ques. (3) Please tell me the wave-length of a 2-wire aerial, 70 feet in length and 60 feet in height. The wires are spaced 6 feet apart, with 2 wires for the lead-in 20 feet long.

Ans. (3) The wave-length of such an aerial would be approximately 250 meters.

* * *

G. E. F., Jubilee, N. B., Canada, writes:

Ques. (1) Will you kindly give me information concerning the Poulsen trans-Atlantic station at Newcastle, New Brunswick, Canada, in reference to wave-length, power and frequency?

Ans. (1) We have no information at hand concerning this station, but understand that it has been in course of construction for some time. We suggest that you get in touch with the Superintendent of the Radio Department of the Canadian government.

Ques. (2) What station has call letters WST operating on a 600-meter wave?

Ans. (2) The Marconi station at Miami, Fla.

Ques. (3) Will putting vaseline on the electrodes of a spark gap give the spark a quick break?

Ans. (3) For a few moments it might have the effect of making the spark discharge more abruptly, but the oil will soon be burned away and the benefit to be derived lost. There is no distinct advantage in smearing vaseline on a spark gap.

* * *

G. W. D., Tracy, Cal., inquires:

Ques. (1) What amount of No. 32 S. S. C. magnet wire is required for the secondary winding of a 4-inch spark coil and also what is the effect of using No. 32 instead of No. 36? I am aware that No. 32 wire will give a hotter spark. Does the coil draw more current with the coarser winding or does that depend on the primary winding alone?

Ans. (1) You will require 2½ pounds of No. 32 wire. Wire of this size will give a lower voltage than if you used No. 36. It will, however, allow you to use a larger condenser capacity across the secondary winding. The coil will draw more current with the coarser winding.

Your second query is not concise; furthermore, a variable condenser of .0008 mfds. does not give sufficient range to make a satisfactory wave-meter. You would require too many inductance coils. It is, however, possible to construct a wave-meter, where the inductance is of the variometer type shunted by a fixed condenser, that will give considerable range of wave-lengths. No. 28 D.C.C. wire is too small for the winding of the wave-meter coil. You should use at least No. 18. In reply to your reference to the head telephones and carborundum crystals, we would say that the crystal should be connected in series with the head telephones and one terminal of the crystal connected to the condenser of the wave-meter; the free terminal of the telephones should be connected to the other terminal of the condenser. Have you any means at hand for calibrating a wave-meter when it is completed? See the article on wave-meters, page 497 of the March issue of THE WIRELESS AGE.

Ques. (3) Is Hillcrest station in San Francisco a Marconi station? Also, what is the wave-length?

Ans. (3) The station is owned by the Marconi Company. The wave-length is 600 meters.

* * *

D. C. L., North Hampton, Mass., asks:

Ques. (1) What would be the most efficient form of oscillation transformer for a one K. W. set?

Ans. (1) If you wish to comply with the government law you will find it to your advantage to install an inductively coupled oscillation transformer. The primary of the oscillation transformer should consist of 8 turns of copper tubing ¼ of an inch in diameter, or No. 4 stranded wire wound on an insulating support 15 inches in diameter. Turns should be spaced ¾ of an inch. The secondary may have more or less turns of smaller diameter arranged to telescope into the primary.