# THE MARCONIGRAPH

## An Illustrated Monthly Magazine of WIRELESS TELEGRAPHY

EDITED BY J. ANDREW WHITE

Volume I. FEBRUARY, 1913 No. 5

## CONTENTS



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ANDREW A. ALLAN

# THE MARCONIGRAPH

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**WIRELESS TELEGRAPHY**

**Vol. I.** **February, 1913** **No. 5**

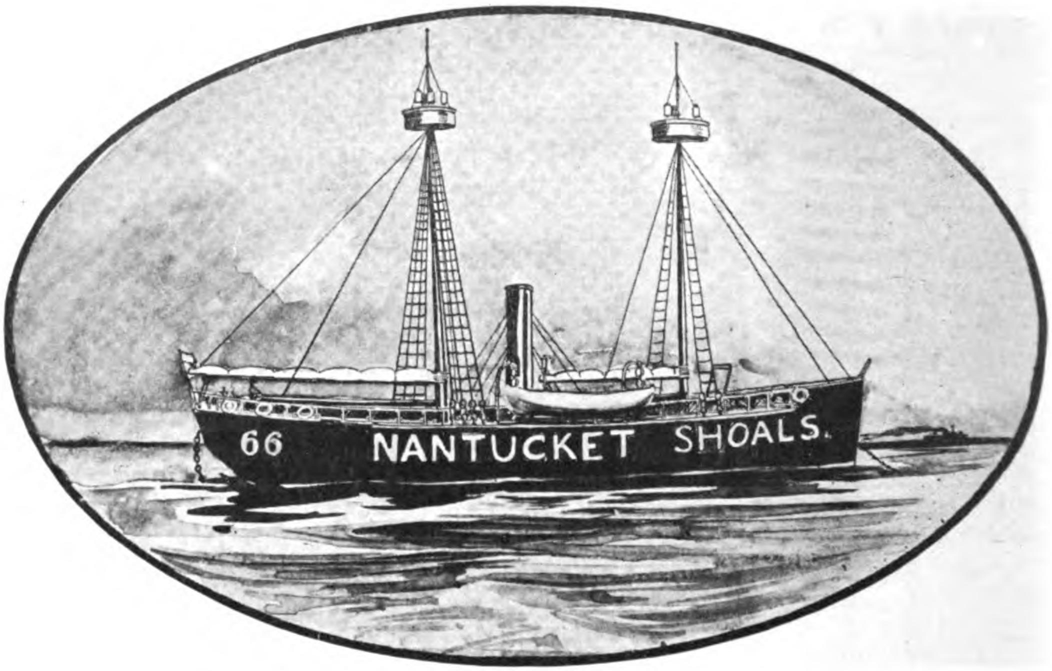


THE well-known, homely saying that a man may be known by the company he keeps may be applied to a great industry of which the outside world may glean some knowledge from those who are prominently associated with it. In previous issues of this journal there have appeared sketches of men who have helped to develop the practical utility of the great invention which the world owes to the genius of Mr. Marconi. The feature which distinguishes the subjects of these brief sketches is the great knowledge of affairs common to all. Business acumen, shrewd foresight, and indomitable energy, developed in varying spheres of activity and in countries scattered over the face of the globe, are only some of the traits of those who are captaining the Marconi teams in their arduous battles to bring within reach of all classes the beneficent advantages of wireless telegraphy. Mr. A. A. Allan, president of the Marconi Wireless Telegraph Company of Canada, who fills the niche in our gallery this month, is a worthy successor to the celebrities who have preceded him, and right worthily does he maintain the high traditions which are associated with those who are prominently identified with the Marconi interests.

Andrew Alexander Allan is well equipped for the position which he holds in the commercial world to-day. He was born on June 16th, 1860, at Montreal, Canada. His parents were of Scottish descent, and in the early training of their son they showed that love of education which is such a fine characteristic of their race. From Rugby, the youthful Allan returned to his native city for a course of study at the High School, Montreal, preparatory to being sent to France, where he was taken in hand by private tutors. His commercial career commenced when he joined the Allan line of steamships as an office boy in 1877, and from that lowly position he gradually worked his way up to that of manager of the great company whose destinies he still controls. The Allan Line have been the pioneers of Canadian shipping and navigation since the year 1882, and were the first regular mail carriers between Canada and the United Kingdom. Among other positions which Mr. Allan now occupies in the commercial world is that of president of the Shipping Federation of Canada, president of the Dominion Dry Dock Co., and director of the Merchants' Bank of Canada.

There is nothing more natural than that one so closely connected with shipping as is Mr. Allan should be interested in wireless telegraphy. He was not slow to perceive what an important part wireless telegraphy would play as an aid to navigation through the waterways of Eastern Canada and around the Canadian coast, and it is no surprise, therefore, to find him taking part in the movement towards extending the boundaries of the great scientific discovery which Mr. Marconi wrested from Nature. Mr. Allan succeeded Colonel F. C. Henshaw as president of the Marconi Wireless Telegraph Company of Canada, Ltd., in November, 1907, and the success of the company is in no small measure due to his marked ability as an executive.

Although deeply absorbed in the various undertakings with which he is connected, Mr. Allan still finds a little time for club life, being a member of the following clubs: The Montreal Jockey, Montreal Hunt, Mount Royal, St. James's, and the Forest and Stream, all of Montreal; the Garrison Club, of Quebec, and the Rideau and Country Club, of Ottawa.




# Dreary Life Aboard a Lightship

## A Glimpse of the Wireless Man's Life on the Nantucket Shoals Lightship, Anchored Forty-three Miles Out at Sea, Interminably Swinging, Swaying, Rolling and Pitching at the Mercy of the High Waves

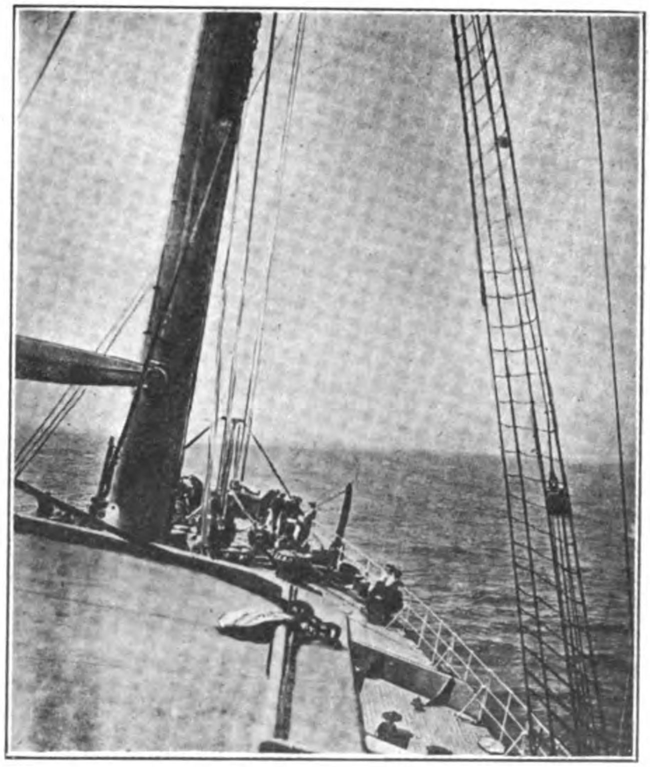
IN our last issue we gave some of the details of the early days of the Siasconset Station, originally planned to receive reports of incoming vessels from the Nantucket lightship, anchored forty-three miles off the coast of Nantucket Island. This lightship is ever an object of interest to visitors, as it is one of the most admirably equipped vessels of her class in the world, besides being the last connecting link with the North American Continent seen by many outward bound passenger steamers, and the first to greet those coming from Europe.

At the time the wireless service was first installed on this vessel it was considered a great achievement, for it effectively solved the problem of reporting incoming steamers in ample time for friends of passengers to meet them at the pier. It had frequently been suggested that the Government should lay a cable from the shore to this lightship, which is in the steamer lanes on the line of the billowy highway followed by the great number of the transatlantic boats, but there was no practical way of permanently maintaining the cable connection as the lightship not only drags her anchor but also swirls in circles around it. It was readily seen a cable would be quickly fouled and destroyed, hence it was finally made clear that the sole feasible plan of sending this information to shore was by the use of a wireless system.

While it is an unusual thing for a season to pass without having the lightship break from her anchorage, on such occasions nowadays she is always able to return by her own steam; meanwhile, the extent of the damage is reported by wireless and if it is of so serious a nature that she has to put into port for repairs, a relief ship is summoned. One of these vessels is always kept equipped and provisioned at the station of New Bedford, Mass., ready to take her place at short notice. Everyone now realizes the inestimable benefit of having lightships equipped with wireless, but when it was first decided to establish the service, about twelve years ago, the scheme was vigorously opposed by many and the arrangements were so bound up in red tape that it took several months to obtain the necessary formal permission from the Lighthouse Board, a branch of the Treasury Department. To A. P. Nazro, then United States Naval Lighthouse Inspector for the Second District, belongs much of the credit for pushing the preliminary negotiations to a successful conclusion, for after he had made a personal examination he decisively reported that the instalment was not only feasible but generally advantageous.

As a class and individually, the men who man the wireless stations aboard the lightships present a unique study of human nature. They appear contented yet for months they are cut off from all human intercourse with the exception of the yarns spun by their own captain, mate and crew of thirteen men. The monotony of being in close association with the same persons for eight months with never a chance to get off or even hear from home during this period can scarcely be realized by any but those who have made a visit to these lightships. As a small recompense for the hard life they lead Uncle Sam has given them the best quarters modern marine construction can produce for vessels of this class. The Nantucket Shoals Lightship, or "No. 1 Nantucket New South Shoal," as she is officially designated, is a two-masted steamer with main engines of 350 horsepower and capacity of developing a speed of seven knots. The electric engine is direct coupled with a dynamo of 90 volts and 8 kilowatts. Two powerful lamps forward, and two aft of the main mast which flash their warning to passing steamers, are included in the equipment. The hull of the vessel is divided into good accommodations for the officers and crew, ample room being allowed for the installation and operation of the Marconi wireless system.

The hardships these men are forced to endure can only be fully understood after a visit to the ever restless Nantucket lightship. Swinging and swaying, rolling and pitching, yet never getting further from the spot—that is perhaps the dreariest thing about life aboard these Government vessels. On an ordinary ship, no matter how dreary the horizon, even if you be sailing through mist and sleet, you are at least getting somewhere. There is a harbor ahead for which you are laying your course. But as old Oliver Coffin, who



*The deck of the lightship on one of the few days in the year when the sea is calm. Ordinarily she simply rolls around her moorings; the motion is like that of a vessel dismasted, rudderless and absolutely at the mercy of the sea* had made many whaling voyages up to the Arctic, said: "On the Nantucket lightship you never gets nowhere."

Too true. Swing, swing; sway, sway, roll, roll; pitch, pitch; and always just the same distance from Sankaty ahead. Nantucket Island, with nothing but white crested breakers to the westward, and the ocean, clear across to Spain to the eastward. The glad cry of "Land, ahoy!" never resounds from the look-out of the Nantucket lightship; she is anchored so far out that even the island from which she takes her name is below the horizon.

One who has spent considerable time as a visitor aboard this ship tells of an incident that is almost pathetic. One day the lookout came to the hatch and sang out, "S'conset!" How the crew tumbled out on deck! When the visitor got there, they were all at the rail straining their eyes in the direction of Nantucket Island, and there, sure enough, by a trick of mirage, seemingly not more than a few miles distant was Sankaty Head and the fishing hamlet of Sankaty, with everything so clear and distinct you could count the dories on the beach. Then it all faded away and there was nothing left but the ridge of breakers. The effect on the crew was immediate.

Where all had been strain and excitement, there was a sudden giving way to the tension, a drooping of spirit, a slackening of physique, a downcast air, which told of aching hearts. They had had a glimpse of home, but what a cruel glimpse! For here they were miles away and months apart from it.

The contrariness of lightship motion is something almost impossible to describe. If you can imagine a bucking bronco which bucks and rolls at the same time, you can get some idea of it. A lightship is like a vessel dismasted, rudderless and absolutely at the mercy of the sea. She simply rolls around her moorings.

One moment she may be on the crest of a wave, the next moment in the trough of the sea; one moment on an even keel, the next she will get up on her hind legs and scream, then plunge forward and buck into a wave; then roll and stagger, and so things go on, year in and year out with the men as helpless to guide the craft as if they were on a wreck.

During the winter season it is often necessary for both officers and crew to take their meals standing up. A basket is swung in a convenient place and the food prepared in the galley is put into it so all can help themselves. Then to the accompaniment of a howling gale and driving sleet, these men gulp down their sustenance as best they can. Few of we landlubbers would care to go through the experience of spending six months aboard one of these vessels, but somehow the applications for positions aboard Government lightships are always far in excess of the supply.

## Naval Operator Saves Warship from Harmless Bomb

The chief operator of the wireless station at the Philadelphia Navy Yard had a hand to hand fight recently with a crank, who visited the station and wanted to test an explosive he carried with him upon the hull of the cruiser *Brooklyn*.

The man, who gave his name as Walter Driscoll, of New York, went to Benson, the chief operator, and drew from his pocket an iron ball four inches in diameter, which he declared contained explosives powerful enough to drive it through any armor plate manufactured.

He volunteered to test it upon the *Brooklyn*, and was in the act of hurling the ball when Benson grappled with him. After marines had taken the man from the yard, Benson examined the ball, to find it harmless.

The Government of the Republic of Colombia has been authorized by Congress to proceed with the scheme for the establishment of radiotelegraph stations between the capital and other centres within the Republic and abroad. The amount voted for the purpose is $200,000.

# Marconi Quenched Spark Sets

ORIGINALLY designed for Government use the Marconi 2 kw., 500-cycle quenched spark sets are now invading the commercial field, having won favor among owners of private yachts. Requiring little attention, giving a high musical note, an almost entire absence of noise, and transmitting more energy into the aerial, the quenched spark, for certain classes of work, possess advantages over other types of apparatus.

So great has been the interest evinced by our readers in these sets that a description of a motor generator set, its installation and operation should be timely.

The drawings, Fig. 1 and Fig. 2, show clearly the proper connections, the quenched gap, oscillation transformer, aerial inductance and switchboard easily in reach of the operator's position when sending. The aerial ammeter and the antenna switch are located where these can be easily read and operated, respectively, from the operator's seat. The middle point of the carbon rod protective devices are grounded on some ground connection other than that used by the aerial circuit, one-half micro farad condenser protective devices being used in addition to the carbon rod protective devices in the motor of the A. C. driven set.

When operating, the switch connected to the automatic starter is closed and when the motor generator set has reached full speed it is adjusted by means of the motor field rheostat until the frequency meter indicates 500 cycles; after which the voltage of the generator is adjusted to about 200 volts, the eightp lates of the quenched spark gap are connected, the switch on the primary of oscillation transformer is set to the wave length desired and the generator field switch is closed, after first determining that the blower of the quenched spark gap is operating. The key is then closed and the handle of the oscillation transformer pulled out about 3 inches and rotated until the aerial meter shows a maximum reading. Should no maximum be found, that is, if radiation increases continually with the increase in number of turns in the secondary of the oscilation transformer, the operator knows that this means it is necessary to cut in some of the aerial

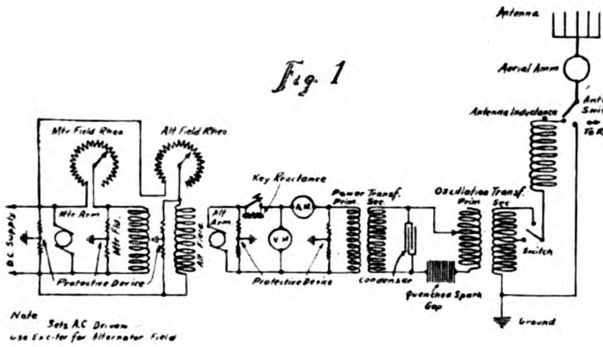


Fig. 1

proper adjustment the gap is provided with gaskets of two colors, gray and red. These gaskets are of slight difference in thickness and if when 13 plates are connected in more than 2 kw. is obtained, a gray gasket is substituted for a red one; vice versa if less than 2 kw. is obtained. When the gap is first received the number of gaskets of each kind found in it are generally the right number to use, but when the gap is opened for cleaning and again closed it is sometimes necessary to substitute one of one color for one of the other color. The gap is only opened when absolutely necessary, that is, only when the radiation falls below its usual value when the circuits are properly adjusted, when a clear note cannot be had or when there is a considerable reduction in the wattmeter reading when the proper number of plates are connected up. Under ordinary conditions the gap is opened not oftener than once in two or three months.

When this is necessary the set screw in the end of the gap is loosened and the plates lifted out. Usually it is found that the gaskets and plates are stuck tightly together, in which case a wrench provided for the purpose is slipped over the gasket and given a few

inductance, and the handle is rotated until the maximum reading of the aerial meter is obtained. Next the coupling is adjusted by pulling the handle of the oscillation transformer in and out until the highest possible reading of the aerial master is obtained. It is usually required that a slight change be made in the number of turns in the secondary of the oscillation transformer simultaneously with this adjustment, 1/8 or 1/4 of a turn being sufficient.

The operator then puts on the head 'phones to adjust the note, the receiver being disconnected from the aerial but keeping its ground connection. When the note is heard, if it is not a high, clear whistle, the voltage is adjusted until it is so; the frequency meter, meanwhile, showing 500 cycles when the key is closed. If an absolutely clear note is not then obtained, slight variations are made in the coupling of the oscillation transformer and number of turns in the secondary, care being taken that these adjustments do not appreciably reduce the readings of the aerial meter. With a little practice these adjustments are easily and quickly made through familiarity with the proper sound, for if the generator voltage is too low various clear notes of lower pitch are obtained and if too high, the note is rough and in some cases too low in pitch.

As the wattmeter does not yet show 2 kw., the field switch is opened and the full number of plates necessary are connected in, leaving two spare plates unused, after which the switch is closed and the generator voltage raised until the note is again perfectly clear and of the proper high pitch. To permit the

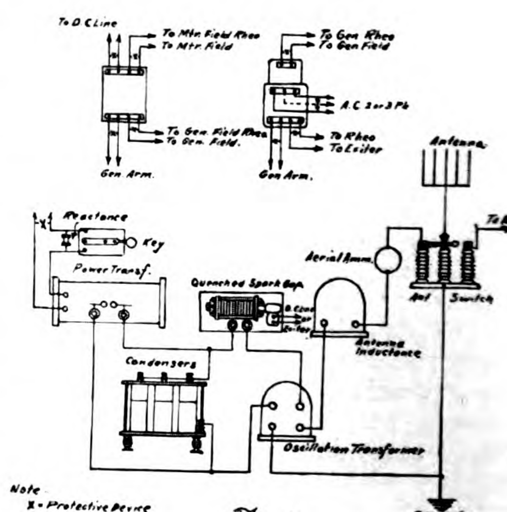


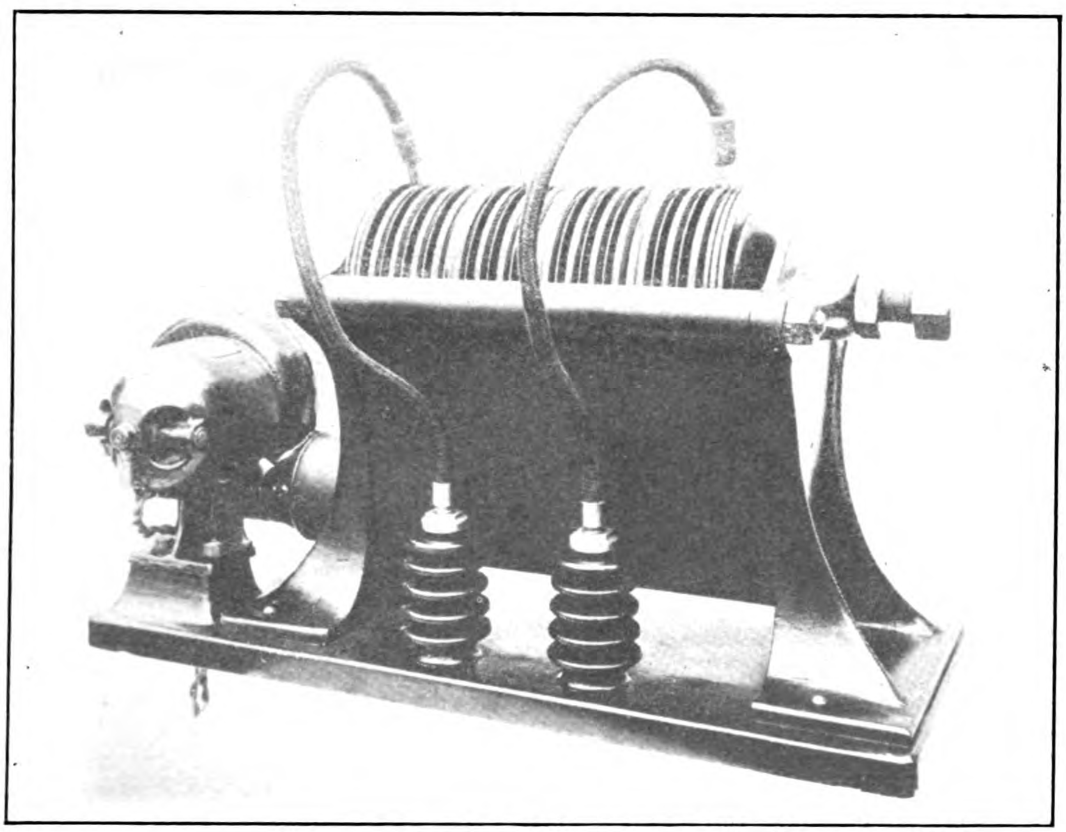
Fig. 2

slight twists until the plates separate. When irregularities are found the surface of the plates are smoothed off with fine emery and the plates wiped perfectly clean before being put back. The gaskets are expected to keep the sparking space air tight, and if such is the case the surfaces of the plates have a bright granulated appearance; when the space has not been airtight the plates show black surfaces. When the gap is opened should a plate be found whose sparking surface is only partly black, it is not an indication that the gap is leaking air, but that this particular plate has not been in use long enough to consume the air between the plates when first put together.

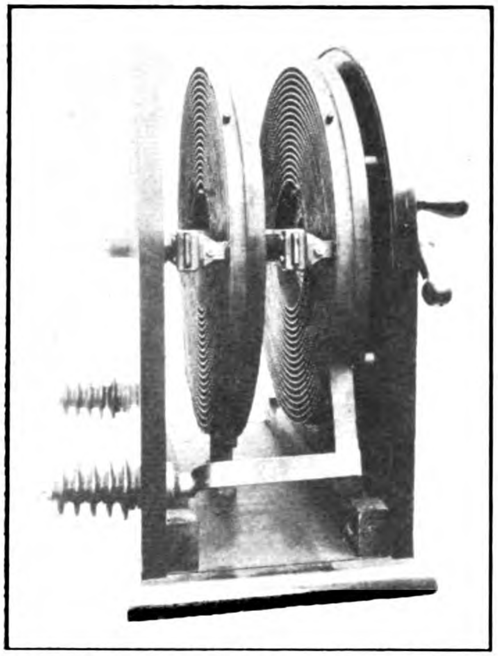
If at any time the operator finds it necessary to get at the contacts of the oscillation transformer or aerial inductance, he places the instrument on the edge of the table with the slotted side of the base overhanging, inserts a screwdriver or other convenient tool in one of the holes of the cover and presses down on it whereupon the cover slides down through the slot, exposing completely the coils and contacts.

One thing the experienced manipulator of the quenched spark sets never does is to move the secondary switch with the key closed; it is intended, however, that the handles of the oscillation transformer and aerial inductance are to be operated when the key is closed. Nor does he touch any circuit which may be alive without first opening the field switch, the generator main switch, or both; even when the key is open the high tension circuits are not safe to handle, because of the reactance coil across the key which permits the flow of sufficient current to render the high frequency circuits dangerous.

It has been found advisable to close the ammeter short-circuiting switch and open the voltmeter switch on the board after the set has been tuned up, as it protects them from the jerk due to opening and closing the key. Owing to the very large drop in voltage when



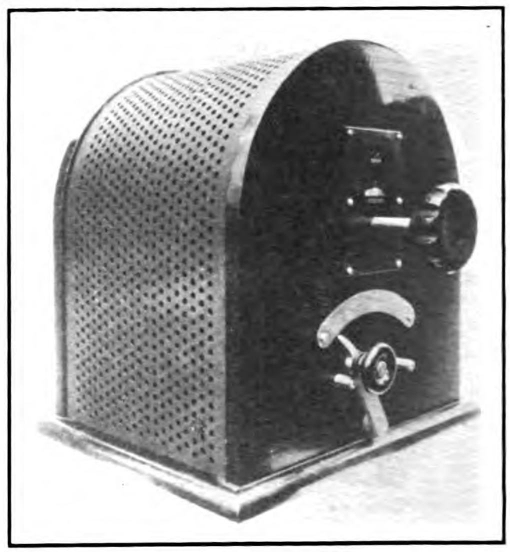
*The Quenched Gap.*



*Continuously variable aerial tuning inductance, showing interior and terminals.*

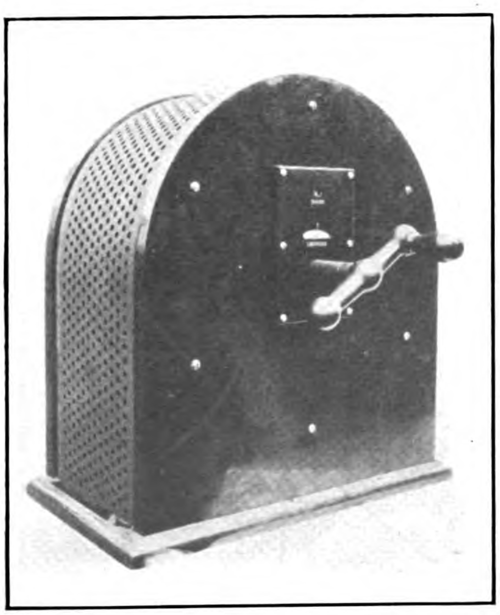
closed. Usually, however, the motion of the reed is sufficient with the key closed, except when working at reduced power. It is possible to operate at any power between ½ and 2½ kilowatts by cutting in circuit the right number of plates and making proper adjustment of the generator voltage.

When working at 2 kw. with proper adjustment of all circuits, the A. C. ammeter reads between 18 and 22 amps. and the A. C. voltage will vary between 125 and 150 volts with the key closed. The power factor will vary between 80 and 85 per cent. All of these readings vary somewhat with the wave length used, the constants of the particular aerial with which the set is used and the adjustments made, but are generally within the limits mentioned.



*Oscillation transformer. Front view, showing dials.*

the key is closed the reading of the frequency meter may not be very plain and if such is the case the key may be opened and the first reed which starts to vibrate after opening the key indicates the frequency when the key is



*Continuously variable tuning inductance Front view, showing dials.*

Secondary switch of oscillation transformer should be at position 2 except when very short wave lengths are used, in which case it should be at position 1. Intermediate variations of secondary inductance to be taken on the aerial inductance. For wave lengths under 400 meters .008 mf. may be used in place of 0.12 mf. capacity in the closed oscillating circuit and all plates in gap used.

# The Progress of Wireless Telegraphy

By Guglielmo Marconi

(PART III.—*Continued from the January number*)

A VERY considerable economy in working also results from the absence or dielectric breakages, for, should the potential be so raised as to even produce a discharge from plate to plate across the condenser, this does not permanently affect the value of the dielectric, as air is self-healing and one of the few commodities which can be replaced at a minimum of cost.

An interesting feature of the Clifden plant, especially from the practical and engineering point of view, is the regular employment of high tension direct current for charging the condenser. Continuous current at a potential which is capable of being raised to 20,000 volts is obtained by means of special direct-current generators; these machines charge a storage battery consisting of 6,000 cells all connected in series, and it may be pointed out that this battery is the largest of its kind in existence. The capacity of each cell is forty ampere hours. When employing the cells alone the working voltage is from 11,000 to 12,000 volts, and when both the direct-current generators and the battery are used together the potential may be raised to 15,000 volts through utilizing the gassing voltage of the storage cells.

The apparatus which I have been using for producing continuous or closely adjacent train of electric oscillations is as follows:

A metal disc A (Fig. 15) insulated from the earth is caused to rotate at a very high speed by means of a high-speed electric motor or steam turbine.

Adjacent to this disc, which I shall call the middle disc, are placed two other discs C1 and C2, which may be called polar discs, and which also can be rotated at a high rate of speed.

These polar discs should have their peripheries very close to the surface or edges of the middle disc.

The two polar discs are connected respectively through suitable brushes to the outer ends or terminals of two condensers K, joined in the series, and these condensers are also connected through suitable inductive resistances to the terminals of a generator, which should be a high-tension continuous-current dynamo.

The high speed or middle disc is connected to the middle point of the two condensers consisting of a condenser E in series with the inductance, which last is connected inductively or conductively to the aerial.

If the necessary conditions are fulfilled, and a sufficient E.M.F. is employed, a discharge will pass between the outer discs and the middle disc, which discharge is neither an oscillatory circuit F.

I have found that in order to obtain good effects a peripheral speed of over 100 meters per second is desirable; therefore, particular precautions have to be taken in the construction of the discs. Electrical oscillations of a fre-

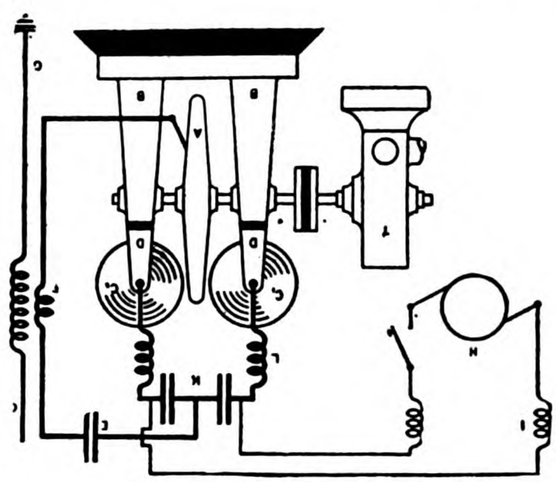


*Fig. 15.*

quency as high as 200,000 per second can be obtained.

The apparatus which I have so far constructed is on a large scale and suitable for demonstrations in a lecture hall.

The apparatus works probably in the following manner:

Let us imagine that the source of electricity is gradually charging the double K condenser and increasing the potential at the discs, say C1 positively and C2 negatively; at a certain instant the potential will cause this charge to jump across one of the small gaps, say between C2 and A. This will then start an oscillation through the inductance and condenser E, and the charge is reversing its polarity will jump in preference from A to C1, which is charged to the opposite potential. The charge of E will again reverse, picking up energy at each reversal from the condensers K. The same process will go on indefinitely, and the losses which occur in the oscillating circuit EF being made good by the energy supplied from the generator H.

If the disc is not rotated, or rotated slowly, an ordinary arc is at once established across the small gaps and no oscillations take place.

The efficient cooling of the discharge by the rapidly-revolving disc seems to be one of the conditions necessary for the production of the phenomena.

By means of this apparatus, tests were carried out, but it was found, as was to be expected, that the oscillations were too continuous and of too high a frequency to affect a receiver such as the magnetic detector, unless an interrupter was inserted in one of the circuits of the receiver. A syntonic coherer receiver would, however, work in consequence no doubt of the considerable rise of potential which occurred at its terminals through the cumulative effect of resonance.

The best results over long distances have, however, been obtained by a disc as shown in Fig. 16, in which the active surface is not smooth, but consists of a number of knobs or pegs, at the end of which the discharges take place at regular intervals. In this case, of course, the oscillations are not continuous, but consist of a regular succession of undamped or slightly damped waves.

In that manner it is possible to cause the groups of oscillations, radiated to reproduce a musical note in the receiver, distinguishable in a telephone, and thereby it is easier to differentiate between the signals emanating from the transmitting station and noises caused by atmospheric electrical disturbances. By this method very efficient resonance can moreover be obtained in appropriately designed receivers.

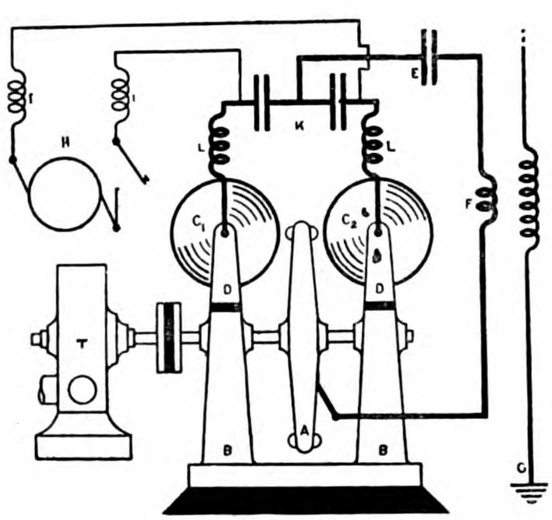
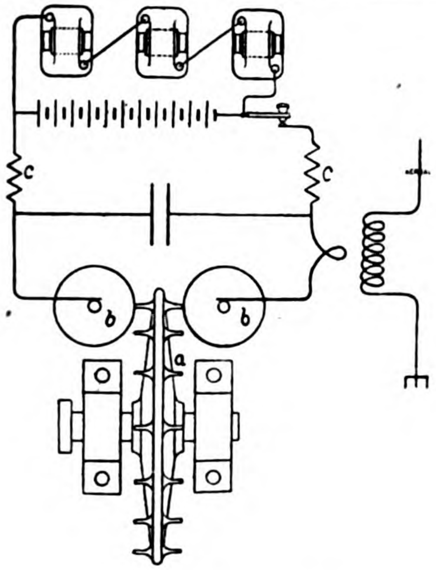


*Fig.* 16.

The apparatus shown in Fig. 17 consists of a metal disc *a*, having copper studs firmly fixed at regular intervals in its periphery and placed transversely to its plane. This disc is caused to rotate very rapidly between two other discs *b*, by means of a rapidly revolving electric motor or steam turbine. These side discs are also made to slowly turn around in a plane at right angles to that of the middle disc. The connections are as illustrated in the figure. The studs are of such length as to just touch the discs in passing, and thereby bridge the gap between the latter.




DISC DISCHARGER
CONTINUOUS CURRENT

*Fig.* 17.

With the frequency employed at Clifden, namely 45,000, when a potential of 15,000 volts is used on the condenser, the spark gap is practically closed during the time in which one complete oscillation only is taking place, when the peripheral speed of the disc is about 600 feet per second. The result is that the primary circuit can continue oscillating without material loss by resistance in the spark gap. Of course, the number of oscillations which can take place is governed by the breadth or thickness of the side discs, the primary circuit being abruptly opened as soon as the studs attached to the middle disc leave the side discs.

This sudden opening of the primary circuit tends to immediately quench any oscillations which may still persist in the condenser circuit; for, if the coupling of the condenser circuit to the aerial is of a suitable value, the energy of the primary will have practically all passed to the aerial circuit during the period of time in which the primary condenser circuit is closed by the stud filling the gap between the side discs; but, after this, the opening of the gap at the discs prevents the energy returning to the condenser circuit from the aerial, as would happen were the ordinary spark gap employed. In this manner the usual reaction which would take place between the aerial and the condenser circuit can be obviated, with the result that with this type of discharger and with a suitable degree of coupling the energy is radiated from the aerial in the form of a pure wave, the loss from the spark-gap resistance being reduced to a minimum.

Many suggestions respecting methods for limiting the direction of radiation or construction of a particular receiver so as to make it sensitive only to signals coming from a certain direction have been made by various workers, notably by Prof. F. Braun, J. Stone Stone, Prof. Artom and Messrs. Bellini and Tosi.

In a paper read before the Royal Society in London in March, 1906, I showed how it was possible by means of horizontal aerials to confine the emitted radiations mainly in the direction of their vertical plane pointing away from their earthed end. In a similar manner it is possible to locate the bearing or direction of a sending station. Unfortunately up to quite recently the large space occupied by air wires which had to be at a given distance from each other made these difficult for employment on board ship.

A very recent development has, however, enabled me to construct an apparatus which can be easily mounted on any ship, however small, and by means of this apparatus I hope it will be possible for the officers to accurately locate the bearing or direction of another ship or land station in a fog within an error of only a fraction of a degree.

The importance of such an arrangement if such should prove to be capable of wide and practical application would be enormous, as it would not only furnish means for preventing collisions at sea but also, through the employment of two or more stations on shore, enable ships to ascertain their exact position in a fog by means of cross-bearings.

One of the arrangements of elevated conductors or air wires which I have tried during my long distance tests is shown in Fig. 18.

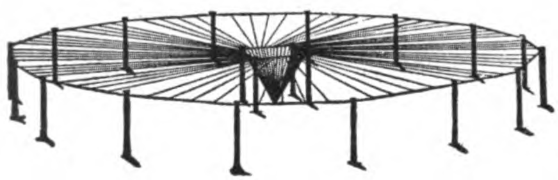


*Fig.* 18.

Experiments were made with this arrangement in 1905 and with a wave length of 12,000 feet signals could be received across the Atlantic by day as well as by night. The system of air wires I have adopted for the long distance stations in England and Canada is shown in Fig. 19. This arrangement not only makes it possible efficiently to radiate and receive waves of any desired length but it also tends to confine the main portion of the radiation to a given direction. The horizontal part of this air wire is placed high enough in order that the limitation of transmission to one direction should not be too sharply defined. The results obtained with this type of air wire are exceedingly efficient.

In regard to the receivers or detectors at present in use, material improvements are being continually introduced. In the early days of wireless some form or other of coherer or variable contact either requiring tapping or self-restoring was employed. To-day on most of the ships controlled by the Marconi Companies my magnetic receiver is almost exclusively employed.

This receiver is based on the decrease of magnetic hysteresis which occurs in iron when under certain conditions this metal is subjected to the effects of electrical oscillations of high frequency. It has recently been found possible to greatly increase the sensitiveness of these magnetic receivers, and to employ them in connection with the high speed relay, so as to record messages at a considerable speed.

Another form of detector is based on the principle of the Fleming oscillation valve. It consists of an electric glow lamp, the filament of which is surrounded, but not touched, by a cylindrical face of metal.

The valve is exhausted but of course contains some highly rarified gas. When the valve is lighted up it emits electrons, and these electrons or negative ions give to the gas or space between the filament and the metal cylinder unilateral conductivity, as was shown by Prof. J. A. Fleming in a lecture at the Royal Institution in London nineteen years ago.

Moreover the ionized gas not only possesses unilateral conductivity but its conductivity like that of some other substances to which I shall refer, is a function of the voltage applied to it.

The result is that when such an arrangement is placed in a suitably attuned and arranged receiver circuit it rectifies the train of high frequency oscillations set up in the air wire, which could not by themselves affect a galvanometer or telephone, but which when rectified by the valve are changed into

*Fig.* 19.

unidirective impulses and can then affect a telephone or galvanometer or any of the ordinary instruments for showing the passage of direct currents.

A number of oscillation detectors have recently been successfully employed which depend upon the quality of certain crystals acting as current rectifiers, that is having conductivity in one direction, and not in the other, and also in not obeying Ohm's law as conductors.

General Dunwoodie of the United States Army discovered in 1906 that a piece of carborundum can act as a detector of electrical oscillations if properly inserted in the receiving air wire circuit. This property of carborundum has been further carefully investigated by Prof. G. W. Pierce of Harvard, and he showed that a crystal of carborundum possesses unilateral conductivity to a marked degree when fixed in a certain manner under pressure between metallic clips. He further showed that the current voltage curve or characteristic curve of a carborundum crystal, as a conductor, does not comply with Ohm's law, for the resistance of the crystal decreases as the current increases; therefore, the conductivity of the crystal is a function of the voltage acting on it.

A great number of other detectors or receivers are now in use, mostly for experimental purposes. Time does not permit me to refer to them, and I have therefore confined my remarks to those with which I have had most practical experience.

We should always bear in mind that sensitiveness is not the only virtue which an electric wave detector should possess. It is important that it should be simple, easily adjusted, not likely to get out of adjustment and not injured by the requirement passage through it of unusually large currents caused by the natural electrical effects of the atmosphere.

Although the mathematical theory of electric wave propagation through space was worked out by Clerk Maxwell more than fifty years ago, and notwithstanding all the experimental evidence since obtained concerning the nature of these waves, yet so far we understand but incompletely the true fundamental principles concerning what effects the propagation of the waves on which wireless telegraph transmission is based along the surface of the earth. Although it is now perfectly easy to design, construct and operate stations capable of satisfactory commercial working over any distance up to 2,500 miles, no really clear explanation has yet been given of many absolutely authenticated facts concerning these waves.

Why is it that when using short waves the distances covered at night are usually very much greater than those traversed in the daytime, whilst when using much longer waves the range of transmission by day and night is about equal or sometimes even greater by day?

What explanation has been given of the fact that the night distances obtainable in a North-southerly direction are so much greater than those which can be effected in an East-westerly one?

Why is it that mountains and land generally should so greatly obstruct the propagation of short waves when sunlight is present and not during the hours of darkness?

There is a question connected with wireless transmission which I believe is only now beginning to attract the attention which it deserves. It is the function of the earth in radiotelegraphy.

In my opinion, for a considerable time not sufficient account was taken of the probable effect of earth conduction especially in regard to the transmission of oscillations over long distances.

Physicists seemed to consider for a long time that wireless telegraphy was solely dependent on the effects of free Hertzian radiation through space, and it was years before the probable effect of the conductivity of the earth was considered or discussed.

Lord Rayleigh in referring to transatlantic wireless telegraphy in a paper read before the Royal Society of London in May, 1903, expressed the view that diffraction alone could not explain the bending of the waves around the curvature of the earth. Prof. J. A. Fleming has given diagrams setting forth his hypothesis of a diagrammatic

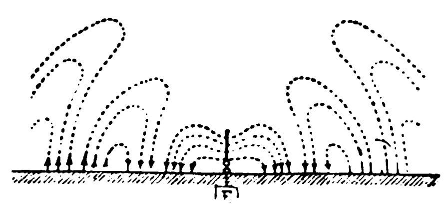


*Fig.* 20.

representation of the detachment of semi-loops of electrical strain from a single vertical wire. (Fig. 20.) As will be seen, according to this hypothesis, the waves do not propagate in the same manner as free radiation but glide along the surface of the earth.

Prof. Zennick has carefully examined the effect of earthed receiving and transmitting aerials and has endeavored to show mathematically that when the lines of electrical force, constituting a wave front, pass along a surface of low specific inductive capacity such as the earth, they become inclined forward, their lower ends being retarded by the resistance of the conductor by which they are attached.

The researches of Zenneck point out that the increase of wave length reduced the energy dissipated by the conductivity of the earth.

Professors Poincaré and Vreeland have also dealt fully with the question of the effect of the earth's conductivity on the transmission of wireless signals.

It therefore seems fairly well established that wireless telegraphy as practised at the present day is to a large extent dependent on the conductivity of the surface of the earth and that the difference in conductivity between the surface of the sea and land is sufficient to explain the increased distance obtainable over sea as compared with over land.

I therefore venture to say that I was not so far wrong as some seemed to imagine when, in utilizing the earth as part of my oscillating circuit, I stated that transmission would be carried on through the earth by provoking along its surface a species of electrical earthquake.

If free waves in space are also transmitted over long distances it may be that they often reach the receivers not in phase with the conducted waves coming along the surface of the ground. This may explain the anomaly often noticed in wireless transmission in regard to the difficulty of communicating between certain particular positions compared to the ease with which one can correspond with other places, even if situated at greater distances.

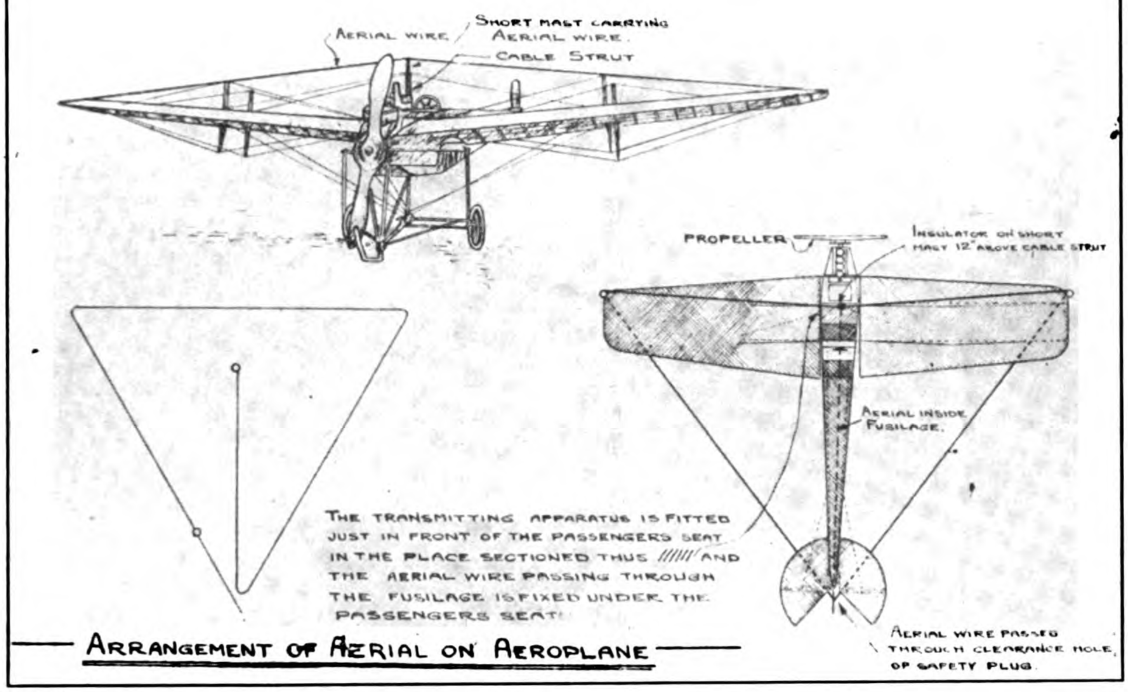
A well ascertained and confirmed fact remains, that it is easier to communicate over sea than over land. We fortunately have in this case another instance of nature helping us in the utilization of her forces. Over land where it is easy to erect and maintain the poles and wires of the ordinary telegraph, wireless telegraphy has had some difficulties to contend with; but on the sea where connection and communication between ships is essential for their safety and where telegraph poles and wires between them are utterly impossible, special facilities seem to have been afforded us for the prompt utilization of this which is in so many cases the only possible means of communication.

In the same way that great enemy of the safety of ships—fog—seems to favor wireless transmission, which is usually more essential to them in foggy weather than in fine.

Whether wireless telegraphy will or will not displace the cables is a question which only time will decide. The view that it will soon be one of the principal means of communication in England where over $300,000,000 are already invested in cables.

There is no doubt, however, that this new method which knows no frontiers or political division is tending to cheapen and extend our means of communication between distant points of the earth and to bring telegraph communication within reach of the great majority of people to whom present telegraph rates are prohibitive. For press service it is already largely used. Nearly all the European news published in some of the great New York dailies come across the Atlantic without the aid of any cable or artificial conductor. The "New York Times" which has done so much to encourage the commercial application of long distance wireless telegraphy, has received messages in New York from London in less than ten minutes, although these messages have to be repeated over land lines connecting the coast stations respectively with London and New York.

With wireless stations in or near the two great cities it should be possible to equal the cables in regard to speed without any sacrifice of accuracy.




ARRANGEMENT OF AERIAL ON AEROPLANE

The facility with which interference has been prevented at the high power transatlantic stations has to some extent exceeded my expectations, and arrangements are now being made in England for the simultaneous operation of a number of long distance stations in limited areas.

In eleven years the useful range of wireless telegraphy has increased from 200 miles to over 3,000. In view of that fact one would have to be a very bold prophet to affirm what it will not do in another eleven years.

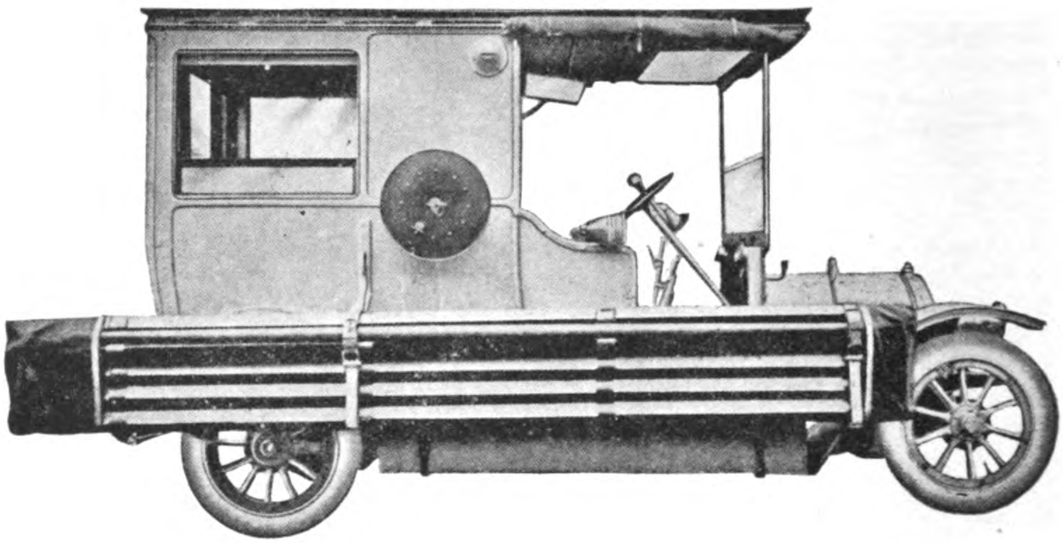
During the Tripoli war and also in England tests have been carried out in regard to the question of the applicability of wireless telegraphy to aeroplanes. Aeroplanes have become year by year more reliable means for taking military observations, and like ships at sea can only use some form of wireless for communicating over any considerable distance.

Successful experiments have been carried out from aeroplanes flying at a distance of a few miles from their base and the movements of troops have been successfully recorded.

The method adopted is to employ a hanging down wire from the aeroplane, which wire acts as the aerial radiator and collector, the metallic frame of the flying machine being used as the balancing capacity.

However, apart from long distance work the principal value of wireless telegraphy may perhaps at present be divided into two parts, first when used for transmission over sea, and secondly when used for transmission over land. Many countries including Italy, Canada and Spain have already supplemented their ordinary telegraph systems by wireless telegraph installations, but some time must pass before this method of communication will be very largely used for inland purposes in Europe or the United States, owing to the efficient network of land lines, both telegraph and telephone, already existing and which render further means of communication unnecessary.

It is therefore probable that at any rate for the present the main use of wireless telegraphy will be confined to the sea and new and undeveloped countries, in some of which climatic conditions and other causes absolutely prohibit the efficient maintenance of land line telegraphy. A proof of this has been afforded by the success which has attended the working of the stations recently erected in East Africa.



# Automobile Wireless Stations

IT is more than ten years since the first experiments with portable wireless stations were commenced, the purpose being then, as now, an application to military purposes. The first portable stations constructed were carried on a light van and had a range of about eight miles. Two of these were experimented with by the British War Office, which reported that unless a station had a range of at least twelve miles it would be of little use. The increased range was obtained, but as a still farther range was later demanded, the accumulator batteries used in the original sets were replaced by a dynamo driven by a gasoline engine, and so successful were the demonstrations of their working that at the commencement of the Russo-Japanese War that the Russian army officers immediately ordered a number of the improved sets. These stations had a range of twenty miles and were used in the war in Manchuria. This was the first time wireless telegraphy was used by an army actively engaged in warfare.

Through continuous and exhaustive experimentations the portable wireless stations have been developed to a degree of efficiency which proves a revelation to those not familiar with the various types of portable wireless stations made by the Marconi Company.

These include cart and automobile equipments, cavalry stations, sets for landing parties from warships, also knapsack and airship types.

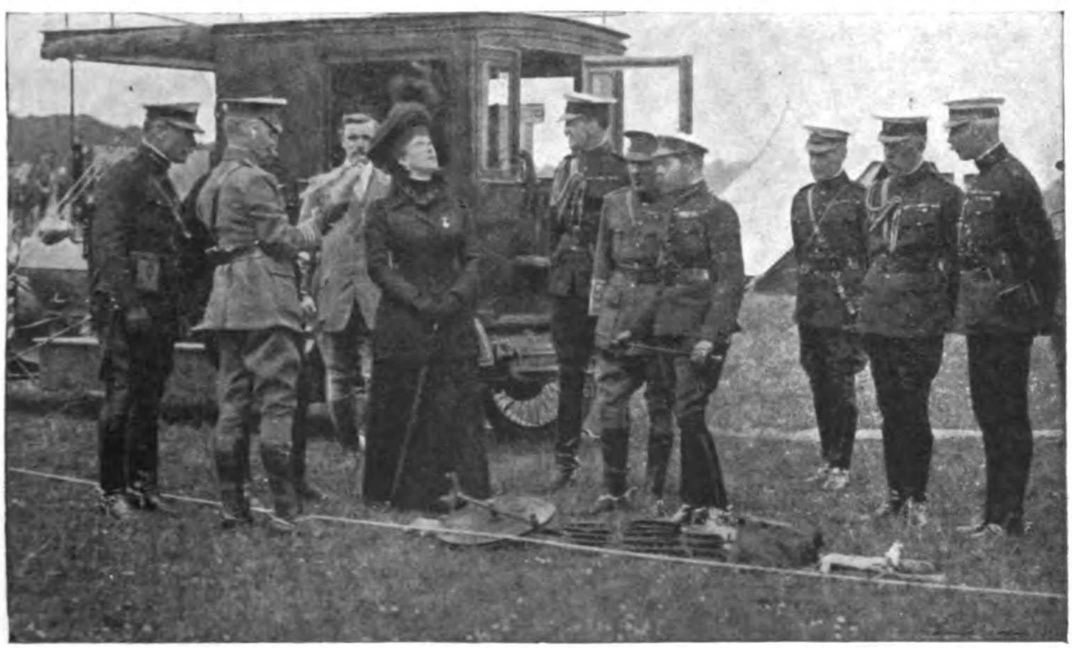
The demonstrations which have been given in practically all of the countries of Europe caused a general revision of ideas in transmitters and receivers, until to-day the apparatus proves an unqualified success when subjected to the most rigorous tests.

The automobile stations, the largest for which any great demand for military use has been found, are of 1½ kilowatt power, with a range of 150 to 200 miles. The apparatus is mounted on a suitable motor car chassis, a subframe carrying the alternator, which is driven by the engine of the car through a specially designed gear box, which gives three speeds forward and reverse for the car, as well as the drive for the alternator. Special measures have been taken to simplify the working of the station in all electrical and mechanical features and the apparatus is so arranged that the erection of the station does not exceed twenty minutes with trained men.

One of the most interesting of the

series of demonstrations given under the supervision of the army and navy officers of various countries was the recent one held in Belgium. After a station had been erected on a selected site adjoining the barracks at Antwerp a motor car station was dispatched to Brussels and, after a demonstration had been given to the cadets at the military school, the station was erected on the most difficult site to be found. A stonemason's yard was chosen as the site for one mast and a ploughed field for the other. By substituting wooden posts for pegs in the field the station was satisfactorily erected and communication established with Antwerp, a distance of about 29 miles. The six Belgian soldiers who mounted and dismounted the apparatus, as well as the staff of officers present, were greatly impressed by the short time required to do this and by the fact that it was possible for those at Antwerp to read the messages despite the interference from the barracks station, only 500 yards away from the portable installation at the latter point. The next day the station was erected on a site at Namur and the military operators were able to interchange messages with ease; later the Namur station called the Broomfield station in England. The trials ended with a successful interchange of messages between Antwerp and St. Hubert, nearly 100 miles apart.

King Alfonso of Spain showed a keen interest in the demonstrations of the cart and automobile stations, given before a distinguished body of Spanish military authorities last summer. The tests lasted for several weeks, during which time the portable apparatus was sent to various points and communication was established with the headquarters of the officials at Madrid. Some of the ranges covered drew forth expressions of admiration from the King and Queen and the various other distinguished persons who viewed the proceedings. A few of the distances spanned were: Segovia to San Sebastian, about 220 miles; Madrid to Burgos, about 155 miles; Madrid to Victoria, more than 190 miles, and Madrid to San Sebastian, nearly 240 miles.



*England's King and Queen inspecting the motor car station supplied to the British War Office.*

The Sultan of Turkey, who is noted as a monarch with a high degree of culture, combined with zeal for the welfare of his people, was an interested spectator at a similar series of tests conducted by the Turkish soldiers at Constantinople and Scutari. The trials were highly successful. A specially selected commission, composed of six members from the army and navy posts, were very favorably impressed with the portability, speed of erection and ease of manipulation of the Marconi stations, for all through the tests communication was easily established over similar distances. On the other hand, the two other systems tried in addition to the Marconi had great difficulty in communicating with their stations, one being unable to get messages through for two days and the other being unable to get any through at all.

Almost every country in Europe has adopted Marconi portable apparatus for use in both army and navy. England was among the first to recognize the value of this type and as early as 1903 commenced a series of tests under service conditions that have extended to the present day, enabling the Marconi Company to carry out from time to time valuable modifications and improvements. Elaborate cart and automobile stations have been sold to Italy, some to Siam and similar equipments have been taken through the enormously difficult Swiss Alps, where communication was successfully maintained despite the 13,000 foot altitude and the exceptionally unfavorable transportation facilities.

*This station, which was thoroughly tested by the Belgian government, is so arranged that it requires but twenty minutes to erect the mast and establish communication. At the time this photograph was taken messages were being interchanged between St. Hubert and Antwerp, nearly 100 miles apart.*

## Ten Marconi Stations for Newfoundland Government

Information has been received from J. H. Lauer, General Manager of the Canadian Marconi Company that a new agreement has just been completed between the Newfoundland Government and that company. The Canadian Marconi Company has been operating five stations for the Newfoundland Government for some years past; the number of stations has now been increased to ten, and the Canadian Marconi Company undertake to operate them until the year Nineteen Hundred and Twenty-six and will receive from the Government a subsidy of $4,500 a year. Through other considerations in the agreement the Marconi Company's exclusive rights in Newfoundland are continued until the year Nineteen Hundred and Twenty-six.

"It will be interesting to you to know," says Mr. Lauer, "the change that has taken place in the Marconi Company's policy in Newfoundland since the early days of wireless telegraphy. Nine years ago when the Marconi Company first undertook the construction of stations in Newfoundland it was with the understanding that none other than Marconi wireless stations should be built in Newfoundland. At that date there were no laws governing the operation of wireless telegraph stations, and the Marconi Companies appreciated that the only means by which a satisfactory service could be maintained was that one organization should have complete control of all wireless stations in any neighborhood. The policy of endeavoring to maintain this condition was continued until quite recently when the United States and British Governments ratified in all parts the decisions of the International Radio-telegraphic Conventions. International law now governs wireless telegraphy in almost all parts of the world and the Canadian Marconi Company have now consented that its Newfoundland stations shall be open for communication to steamers equipped with any system."

The importance of Newfoundland from a wireless standpoint is easily understood. The Canadian Marconi Company's stations at Cape Race in the southeast and Belle Isle in the north communicates with steamers when almost half way between American ports and European ports. The plans for enlargement of the Cape Race station now in hand will enable that station to communicate with vessels when more than half way between New York and Liverpool. Newfoundland has, for the last sixty years, been the centre of transatlantic telegraphy and nearly every transatlantic cable uses Newfoundland as a relaying point. In the early days it was thought that it would be a good place for a transatlantic wireless telegraph station, but the Anglo-American Telegraph Company then held a monopoly in Newfoundland and would not allow Mr. Marconi to establish a station there. Now that a satisfactory wireless telegraph service has been established between Ireland and Nova Scotia a half way station in Newfoundland is not at the moment absolutely essential, but should it ever be deemed advisable to increase the number of high-power transatlantic wireless telegraph stations, the privileges to establish such a station in Newfoundland will be a valuable asset for the Canadian Marconi Company.

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## Trips to the Planets?

A Paris literary man predicts that trips to the neighboring planets will be possible some day. It is just a prediction, however. There are no grounds for it. He thinks it not more impossible than wireless telegraphy would have seemed 300 years ago. But perhaps we are nearing the end of the scientific age, instead of being at the beginning. It has accomplished quite enough in the field of transportation, and mankind should be content if it turns its time to improving the quality of the things that the world has now gained.

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**Vol. I. FEBRUARY No. 5**

## Editorial

It looks as if ratifications of the wireless telegraph treaty, signed at London last July, will be exchanged at the British capital within a few weeks by the twenty-one signatory powers.

The United States Senate's ratification of the treaty a few days ago paves the way for this formality, as practically all the other governments are understood to have approved the treaty, which will become effective July 1, 1913.

By this convention the important maritime nations of the world have linked themselves together to obtain the widest range of international usefulness of the wireless without restriction as to its further development.

One of the most important provisions of the treaty is that compelling the free exchange of communication between ships and coast stations employing the different systems of radio appliances. With the *Titanic* disaster fresh in the minds of the delegates all opposition to this doctrine faded. It is provided that the transmission of long distance wireless messages shall be interrupted for but three minutes at the end of every quarter hour to permit all stations to listen for distress calls, which are given precedence over everything else.

This was an American proposition, based, according to the report of the American delegation to Secretary Knox, upon the fact that at least two steamships that were nearer the *Titanic* than the *Carpathia* were prevented from hearing the distress calls of the sinking vessel by reason of the fact that the transmission of press news prevented the *Titanic's* signal from being received by ships fitted with radio apparatus of limited capacity.

Other provisions relate to transmission of weather reports, measures to prevent the interference of long distance with ordinary wave lengths, compelling the installation of wireless on certain classes of ships and the maintenance of a continuous watch for distress signals.

* * *

A rebuke to the British Board of Trade's shipping department has just been administered by the commonwealth of Australia in the shape of a navigation bill passed by the Legislature.

The bill has been reserved for the consideration of the home government.

The criticism of the colonial office, the Board of Trade and Certain Australian interests have resulted in numerous modifications of the act, but it is hardly likely that its framers will consent to any further emasculation.

The proposed law provides that every foreign-going ship, Australian trade ship or vessel engaged in the coasting trade carrying fifty or more persons, including passengers and crew, shall be equipped with efficient wireless apparatus for communication over distances not less than 100 miles day and night.

* * *

Viewing it from any angle, a term

behind the bars of a Federal prison is hardly attractive. Three more of the many charlatans who have desecrated the greatest boon ever given to humanity, to the end of accumulating some millions of dollars, have gone to prison.

With their promotion bubble exploded by the Post Office authorities, Cameron Spear, Charles L. Vaughan and A. Frederick Collins, moving spirits in the Collins Wireless Telephone Company, the Continental, and several other so-called radio companies, are now lodged in prison cells.

The testimony clearly showed that the "wireless" telephone, upon which was based the sale of several million dollars' worth of stock, was useless. From a commercial standpoint it was not worth one cent, yet these three men deliberately organized a concern for unloading worthless stock on a gullible public and ran their dishonest operations up into millions. Let us hope that you, patient reader, are not one of those who gave up your hard-earned money to these swindlers. We know that some among our readers did, for we have received letters to that effect in the past. We trust they are few in number.

One would think that the conviction of this deliberately dishonest trio would serve as a warning to those enterprising "inventors" who are constantly filling the press of the country with reports of alleged discoveries of telephones which communicate over long distances without the aid of wire lines. Yet this is not the case. A glance through our file of morning papers shows the regular number of contributions of this kind. No less than three obscure young gentlemen report that they are on the eve of making wirelsss telephony absolutely practicable.

We wonder how many of these enterprising, self-styled geniuses are selling stock in their inventions.

Mind you, we do not wish to appear in the light of unbelievers in the future of radiotelephony. Far from it. We feel confident that at no far distant date a practical wireless telephone will be evolved. But so far as we are aware there is to-day no instrument of this kind of actual commercial value, no apparatus worthy of your consideration from an investment standpoint. And if there were, one thing that the prospective investor should remember is that the translation of a piece of apparatus into an annual dividend is at best a problematical process and the unknown factors are exceptionally numerous and vague in wireless telephony.

A worthy contemporary of ours throws considerable light on the subject in saying that wireless telephony is feasible in a technical sense—if careful preparations are made under favorable conditions. Wireless telephony is much in the same position as wireless telegraphy when Marconi made his first experiments at Bologna in 1896. The period between these early experiments and the stage of commercial success may serve as an index to time which must be given to similar development in wireless telephony. But only a partial index. Wireless telephone apparatus is much more complicated than early wireless telegraph apparatus, and a great deal more delicate. Inventors are a long way from having achieved an apparatus which will work with certainty over even a short range; and they are a still longer way off from an apparatus which will meet daily exigencies of a commercial wireless telephone service. More money and time will be required for transition from technical to commercial feasibility than in wireless telegraphy. On the question of money, the history of wireless telegraphy has a very salutary moral. There are several systems of wireless telegraphy technically feasible and one or two commercially feasible, but the minority which have survived to the revenue-earning stage have been fertilized with unlimited capital for a long span of years.

The Marconi Companies spent hundreds of thousands of dollars before apparatus far more simple and reliable than wireless telephone apparatus could be brought to revenue earning. Much of that money was spent in building up an organization for carrying on a public wireless telegraph service; and if we seek a fundamental reason for pre-eminence of the Marconi system we may find it in the fact that they lavished money simultaneously upon experiments with apparatus and upon commercial organization. Both types of expenditure being necessary in a large degree with wireless telephony, it is quite impossible to regard any system of wireless telephony as other than a large-scale speculation of the most risky kind. Moreover, this large wireless telegraph company has the staff, the technical experience and the organization—to say nothing of the money—for putting wireless telephone apparatus to the test under commercial conditions. With very few exceptions the men who know anything about wireless work (apart from naval and military experts) are employed by or associated with Marconi interests. Therefore, the inevitable tendency will be for successful wireless telephone progress to take place within these companies rather than in new undertakings financed and managed by men new to the most specialized branch of the electrical industry. At the last meeting of the parent Marconi company it was stated that the company was experimenting with wireless telephone apparatus. Its experiments are likely to be sounder in principle and more practical than the casual demonstrations of which so much is heard.

### The Share Market

New York, February 3.

To-day's trading in the stock market shows that the curb and exchanges have worked into a position in which they are much in need of some new incentive if the market is to be kept from drifting in idleness. A "waiting market" is what Wall street calls it, though no two brokers are agreed as to the reason for the dealings falling below anything like the customary totals.

To this inexplicable condition of the general market may be attributed the inactivity of Marconi issues. It would appear that the bearish faction, which regarded the select committee's recommendations in the British Government contract investigation as a decided bear argument, have been routed by the holders of English Marconi stock themselves, who are refusing to part with their holdings in view of the generally admitted superiority of the Marconi system. Consequently, the slight decline in prices that accompanied the publication of Mr. Isaac's letter asking to be released from the contract (published elsewhere in our pages) was quickly offset and the stock regained its normal level. To-day both common and preferred stock show even a slight advance over the quotations in our last issue and the market holds firm.

American Marconi stock remains about the same, despite the excellent prospects of the company. This is attributed by the brokers to the inactivity of the market. In response to the interest evinced in the progress of the American company, the Board of Directors of the Marconi Wireless Telegraph Company, Ltd., ordered a full report of its condition at the first of the year. This report, coming as it does from the parent company, should be of interest to shareholders in the American company. It is substantially as follows:

The company has made very considerable progress during the past six months. Notwithstanding the fact that it has been engaged in the very big work of taking over the fleet formerly controlled and equipped by the United Wireless Telegraph Company, it has continued its activity in the matter of additional contracts for equipping new boats, both passenger, cargo and private yachts, with wireless installations.

Considerable success has been achieved in obtaining the cancellation of the old and somewhat unsatisfactory contracts made by the United Wireless Telegraph Company, when they were competing with our company, and the great majority of the vessels, all of which have not passed into our control, are operating under new contracts upon a sound paying basis, the result of which will be apparent when our next balance sheet is issued.

During the year no less than two hundred additional craft have been equipped with the Marconi system, and it is estimated that no fewer than fifteen hundred vessels are now so equipped, the majority of which contribute traffic to our American land stations.

Traffic returns for ships' correspondence from the Pacific coast, to which the company has only recently directed its attention, show that the net profits for the six months ending September 1 amount to over $25,000 (twenty-five thousand dollars). Owing to the immense pressure of work for new installations the books of the company in the East are not yet properly written up, but it is estimated that the net profit for the same period will be considerably in excess of those of the Pacific coast, but this period does not fairly represent what the returns will be, for the increased rentals cannot yet be computed.

Very good work indeed has been turned out by the Engineering Department; a contract has been completed for the United Fruit Company of a 50 k. w. station at Santa Marta, and further stations at New Orleans and Swan Island are in course of construction. Five stations have been constructed, delivered to, and accepted by the War Department of the United States Government, and other stations are in course of construction for the government.

Sites have been purchased at Belmar, N. J., and at Somerville for the construction of high-power stations for the American-Anglo Circuit, and at San Francisco and Honolulu for the American-Eastern Circuit, which is destined finally to reach the Philippines and Japan.

All the orders for material have been placed and the special engineers to whom is entrusted the erection of these high-power stations have been doing their work with great assiduity. The work of construction is now well in hand and whilst it is too early to prophesy results, the directors of our company are confident that before a year is out all these stations will be in thorough working order, and conducting a large and profitable business.

The recent new Acts controlling wireless telegraphy passed by the United States Government, which have required the furnishing of additional operators, and changes and conditions in the apparatus generally installed on vessels, have given great satisfaction to our company. They have not only ensured to us far more satisfactory working conditions by reason of the non-interference from irresponsible amateurs and others, but have induced steamship owners to willingly pay for the additional advantages which they receive.

Pending the completion of the several high-power stations in construction and to be constructed, the greater part of the additional capital raised by the company during last year has not yet been utilized; owing, however, to the dearness of money prevailing in the United States, good interest is being earned thereon. † † † †

Several financial writers well qualified for the task have recently made careful investigation into the affairs of the American company and the resulting analysis of its position and prospects take the form of a very favorable dividend forecast. Leading financial journals present the results of these investigations and our readers may draw their own conclusions from these articles.

The Canadian company is not so far advanced as its American contemporary in regard to construction work, its inception being more recent, but its prospects are nevertheless encouraging. In the first place it will co-operate with the parent English company and with the American concern, receiving messages from both of these systems and also passing a great deal of business to them. The earnings of the Canadian company are steadily increasing, in addition to which all stations which are subsidized by the government are being opened to commercial traffic as they are finished, while the whole of the receipts are retained by the company. Under the contracts with the Canadian Government the company is erecting forty-three stations, of which thirty-nine have been completed and are earning the subsidy, which continues for a period of nineteen years. The Canadian undertakings will benefit from the growing volume of business of the affiliated companies and its prospects are in reality very much on a par with both English and American Marconi companies.

Bid and asked prices to-day:

American, $5\frac{3}{4}$—6; Canadian, $4\frac{1}{4}$—$4\frac{3}{4}$; English, common, $22\frac{3}{4}$—$23\frac{1}{2}$; English, preferred, $19\frac{3}{4}$—$20\frac{5}{8}$.

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## American Marconi Company Has New Executive Offices

The south half of the eighteenth floor of the Woolworth Building has been leased for a term of years by the Marconi Wireless Telegraph Company of America. The steady growth of the operations of the company necessitated the removal of its executive offices to larger quarters. It is expected that the office staff will be installed in its new home—the tallest building in the world—by the first of next month.

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## Memorial to Wireless Heroes

On January 15, Park Commissioner Stover by appointment met H. B. Walker, president of the Old Dominion Steamship Company; H. H. Raymond, vice-president of the Clyde line, and C. C. Galbraith of the Marconi Company, chairman of the Jack Phillips Memorial Fund, at Battery Park, and selected a location for the fountain for Jack Phillips, George Sczpanck and George C. Eccles, wireless operators who have gone down with their ships.

A prominent corner in the Children's Playground at Battery Park was chosen. Commissioner Stover is fully in accord with the proposed memorial and not only made the best location in Battery Park, but will transplant two trees to shade the fountain.

## New Stations for Brazil

The Brazilian Government has made an important contract with the Marconi Wireless Telegraph Company for the erection of powerful stations at Rio de Janeiro, Santa Martha, Bauru and Ladario, the two last named being important towns in the Sao Paulo and Matto Grosso regions.

These stations will form the southern nucleus of the Brazilian internal wireless network first proposed by Dr. Bhering, the delegate of the Brazilian Government to the recent London Radiotelegraphic Conference.

In all, not less than thirty such wireless stations will be required for the main lines of Dr. Bhering's plan, and the Marconi Company's success in obtaining the contract for the four stations now to be erected in the South is the result of the very satisfactory working of the Manaos and Porto Velho stations, which form the northern nucleus of the general plan. These stations are situated in the tropics on the Amazon River, where severe electrical storms are almost continuous.

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## To Send Messages Through Earth

For the transmission of wireless messages through the earth, rather than through the air, the Germans recently established an experimental station at Belzig, consisting of six horizontal radial antennæ from 120 to 300 metres long, each earthed at the outer end and connected to the receiving instrument in the centre. Not only were the signals from the great stations, such as the Eiffel Tower, Norddeich and Poldhu, clearly and audibly heard, but British Admiralty messages from Whitehall could be read with ease. Since only one of the antennæ—namely, that extending in the direction of the sending station—picks up messages from it, there is little liability to confusion.

liability to confusion. The military value of the invention lies in the fact that no mast is required, and that it is merely necessary to lay out a wire in the direction of the sending station in order to communicate with it.


EDITOR'S NOTE:—This course of instruction has been prepared with the view of teaching both the beginner and the practical radio operator basic principles and the electro-magnetic phenomena encountered in the wireless art. While much of value to the experimenter of some experience will be found throughout the course it has been designed primarily for those who are sufficiently interested in wireless telegraphy to apply themselves diligently toward the mastering of basic principles before attempting to construct apparatus and arrange circuits. Due to the tendency of youth to miss the first rung in the ladder of progress there are many amateurs operating sets at the present time who are not in the slightest degree informed upon the why and wherefore of the experiments they are conducting. They know that a certain result may be obtained under certain conditions and that various arrangements of circuits will produce various effects, but they have no conception of the electro-magnetic phenomena that make these possible. To this ignorance of fundamental principles may be ascribed most of the difficulties and discouragements experienced by those who have the ambition and enthusiasm to accomplish something of note in the wireless field but lack the patience to first acquire a true understanding of the subject. Those who will apply themselves to mastering the contents of this course will find that the art of studying properly will soon be acquired. Upon this trait is based the chief factor in education, enthusiasm, without which none can hope for success.

The publishers of this magazine have given weighty consideration to every detail connected with the proper instruction of serious students and are confident that this course will receive recognition as the most valuable work of its kind ever attempted. With the world's greatest authorities to choose from they have selected the man who, in their judgment, was best qualified to handle the subject and our readers will unquestionably recognize the wisdom of the choice as the instruction progresses.

The achievements of Mr. Shoemaker are familiar to every one engaged in wireless work throughout the world. One of the pioneers, he first commenced devoting his energies to the subject in 1900 with the American Wireless Telegraph & Telephone Company, remaining with that concern until it and its successors were merged into the American De Forest Company. Soon after the merger was effected he severed his connection with the combination and organized the International Telegraph Construction Company, which he sold in 1908 to the United Wireless. When the assets of the latter company were acquired by the Marconi Company he was appointed Research Engineer and his exclusive services are now given to the development of the Marconi system. His present high position in the commercial field, together with the fact that he has designed and built a great number of wireless sets for the Army and Navy Departments of the United States and foreign governments are the best indications of his rating as a wireless expert.

That Mr. Shoemaker can explain in understandable English the principles and use of each component part of the apparatus used in wireless telegraphy will be clearly demonstrated to careful readers.

**By H. Shoemaker**

**Consulting Engineer of the Marconi Wirelss Telegraph Company of America**



## CHAPTER II.

The tangent (tan) and co-tangent (Cot.) of an angle is represented graphically by a straight line at right angles to the horizontal axes of a circle of unit radius, at its point of intersection with the axes and extending to the point of intersection with the extended radius forming the angle.

In Fig. 9 X X′ is the horizontal axes, Y Y′, the vertical axes. $\theta$ is the angle and $a$ the radius of the circle (considered unity) $b$ is the tangent of the angle $\theta$, and is written tan $\theta = b$. Tan $\theta$ also $= b\ c$ and is written tan $\theta = b\ c$. It will be seen that $c = a$, as they are both radii of the same circle. When $\theta = O$, $b = O$ and tan $\theta = O/c = O$. When $\theta = 90°$ the extended radius or line $o\ e$ will coincide with Y Y′ and will be parallel with $b$, consequently will never intersect. Hence tan $90° = \infty$ (Infinity.)

In the first quadrant the tangent of the angle increases from O to $\infty$. In the second quadrant it decreases from infinity to O. In the third quadrant it increases from O to $\infty$ and in the fourth quadrant it decreases from ∞ to O.

The co-tangent of an angle is equal to the tangent of the complement of the angle or 90° — the angle and is written cot. $\theta = c'$ (see Fig. 9), and is also equal to $c/b$ and is written cot. $\theta = c/b$. It will be seen that the cotangent of $\theta$ when O is ∞ and when $\theta$ is 90° it is O. Hence the cotangent decreases from ∞ to O as the angle increases from O to 90°. In the second quadrant the co-tangent increases from O to ∞. In the third it decreases from ∞ to O and in the fourth it increases from O to ∞.

The secant and cosecant are represented in Fig 9 by the extended radius *a, o c* is the secant and is the distance from O to the center of the circle to the point of intersection with tangent *b*. *o d* is the cosecant. These functions are not important enough for consideration in this article.

The following table gives the limiting values of the functions and their signs in the different quadrants:

| FUNCTIONS. | QUADRANTS. 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Sine & Cosecant........ | + | + | − | − |
| Cosine & Secant........ | + | − | − | + |
| Tangent & Cotangent.... | + | − | + | 1 |

| | 0° | 90° | 180° | 270° | 360° |
|---|---|---|---|---|---|
| Sine ....... | ±0 | 1 | ±0 | −1 | ±0 |
| Cosine ..... | 1 | ±0 | −1 | ±0 | 1 |
| Tangent ... | ±0 | ±∞ | ±0 | ±∞ | ±0 |
| Cotangent .. | ±∞ | ±0 | ±∞ | ±0 | ±∞ |
| Secant ..... | 1 | ±∞ | −1 | ±∞ | 1 |
| Cosecant ... | ±∞ | 1 | ±∞ | −1 | ±∞ |

The reader will probably wonder why the double sign (±) is used before some of the above values, consideration of the change of values of the functions show that they always change signs when passing through O or ∞, and the prefixing of the signs shows the direction from which the value is reached.

We have, so far treated the measurement of angles in degrees, that is, by arbitrarily dividing the circumference of the circle into 360° parts, called degrees. The degrees being divided into 60 parts, called minutes, and the minute into 60 parts, called seconds.

We can also measure angles by the ratio of the arc or circumference of a circle to the diameter or radius. The circumference of a circle is equal to the diameter times a constant (3.1416). This constant is represented by $\pi$ (Greek Letter Pi). The circumference also equals $2\pi$ R, where R is the radius, or $2\pi$ radians. Also one radian equals the circumference divided by $2\pi$. The circumference equals 360°, therefore one radian $= 360°/2\pi = 180°/\pi = 57.29°$.

This relation between the radius and circumference of a circle or $\pi$ enters into most of the formula used in alternating current work and is of great importance. It is also often necessary to convert circular measure in degrees into radians and vice versa.

*INSTANTANEOUS VALUES* of E. M. F. and current are the values at any instant corresponding to the angle which the coil has turned through. (See Figs. 1, 2, 3 and 4.) These values are proportional to the sine of the angle the coil makes with the position of zero E. M. F. These values vary in exactly the same manner as the sines of an angle.

We can now represent an alternating E. M. F. or current graphically by means of the co-ordinates.

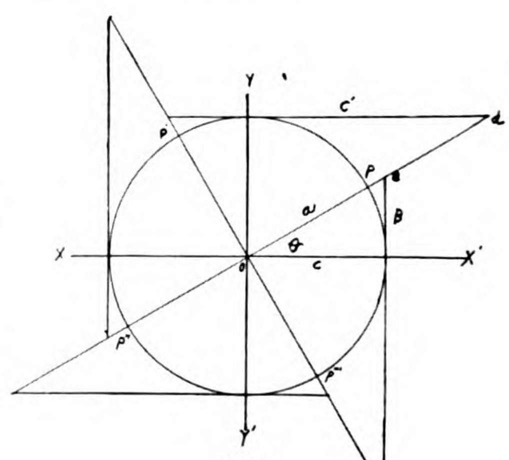


Fig 8.

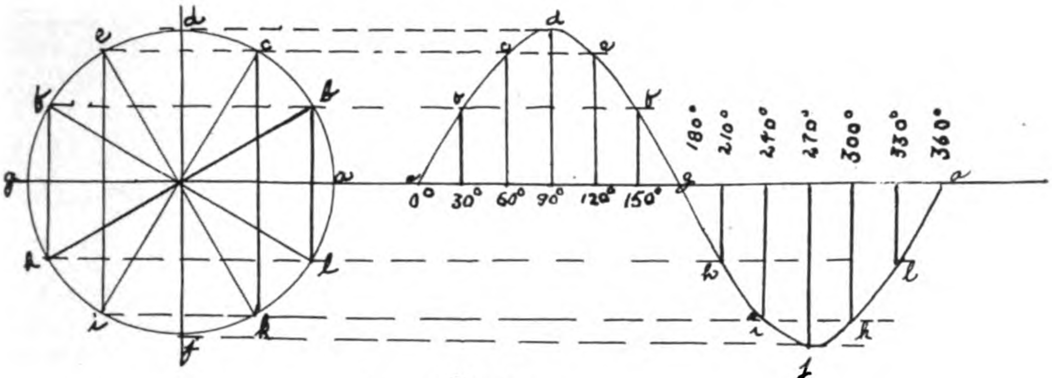


Fig. 10.

In Fig. 9 let X X′ be the axis of ordinates, Y Y′ the axis of abscissa. At the intersection of X X′ and Y Y′ as a center draw a circle, let the points *a, b, c, d, e, f, g, h, i,* j, ***k*** and I represent the position of a conductor as it has turned through the angles 0*, 30°, 60°, 90°, 120°, 150°, 180°, 210°, 240°, 270°, 300°, 330° and 360° respectively. From these points erect perpendiculars to line X X′. These perpendiculars will be the sines of the respective angles. On X X′ lay off equal distances representing the angles; at these points erect perpendiculars having values corresponding to their respective sines, or draw lines through points representing the different positions of the conductor perpendicular to Y Y′ until they intersect the vertical lines. These points of intersection will then give the values of the sines for the different angles. Through these points draw a line which will be a curve, as shown in the figure. This curve is called a sine curve, as it is a grath of a sine function. The ordinates represent instantaneous values.

*MAXIMUM E. M. F. OR CURRENT* is represented by the maximum ordinate. It is the greatest instantaneous value and is of considerable importance in wireless telegraphy.

The average E. M. F. bears to the maximum E. M. F. the relation

By formula

(1) Eavg. $= 4\, n\, N\, \Phi\, 10^{-8}$.

Therefore Emax. $= 4\, n\, N\, \Phi\, 10^{-8} \times \pi/2$.

Or Emax. $= 2\, \pi\, n\, N\, \Phi\, 10^{-8}$

(2). The maximum E. M. F. bears to the effective E. M. F. the relation

$$\text{Eeff} = \frac{\text{E. Max}}{\sqrt{2}}$$

Therefore Eeff. $= 2\, \pi\, n\, N\, \Phi\, 10^{-8}/\sqrt{2}$.

Or Eeff. $= 4.44\, n\, N\, \Phi\, 10^{-8}$.

(3) The effective, or as generally called root, means square values of E. M. F., or current are the ones generally used in practice and are those values given by measuring devices or meters. When volt or ammeters, constructed to operate on either direct or alternating current are used, the effective value of the alternating current or voltage will give the same reading as the corresponding direct current or voltage. All values of E. M. F. and current are considered as effective values when not otherwise designated.

The method of determining the above relations are given in Arts. 470 to 476 of Thompson.

Where only resistance is involved alternating current obeys Ohm's law, which is expressed as follows:

E = C R.

Where E is the E. M. F. in volts, C the current in amperes, and R the resistance in Ohms.

Also—C = E/R and R = E/C.

If maximum values are given then

Emax. = E $\sqrt{2}$ and C = C $\sqrt{2}$, in which case Emax. = Cmax. X R.

Cmax = Emax./R.

R = E max./C max.

*SELF INDUCTION* may be defined as that property of a conductor by virtue of which energy in magnetic form may be stored. All conductors have self induction, the amount depending on the size and shape of the conductor. The reader should remember that self induction is constant, depending for its value only on the size and shape of the conductor. This statement does not take into consideration material of which the conductor is made or the presence of iron. These two factors greatly modify the values, but must be considered as special cases.

The unit of self induction is the henry and represents the cutting of $10^8$ magnetic lines when one ampere is turned on or off. This means that a conductor, to have a henry self induction must be of such length and shape that when one ampere is flowing it is surrounded by $10^8$ magnetic lines, so that when the current is stopped these $10^8$ magnetic lines will cut the conductor.

This can be expressed by the following formula:

$$\text{Self induction (in henrys)} = \frac{\Phi N 10^8}{\text{current in amperes}}$$

(4) The symbol for self-induction is L and is called the inductance. As just stated the inductance of a conductor depends on its size (length and cross-section) and shape. Conductors in the form of a coil or helix have greater inductance than straight ones. (See Thompson Arts., 458 to 461.)

Also $L = 4\pi N^2/Z$.

Where Z = the reluctance of the magnetic circuit or the resistance of the magnetic circuit to the flux. The presence of iron or other magnetic material greatly decreases Z and consequently increases L.

For this reason iron is used in all dynamo machinery and transformers. By its use a great quantity of copper wire is saved for a machine of given output. For alternating current dynamos or alternators and transformers the iron must be laminated or in thin sheets or fine wire, to prevent currents (called eddy currents), from being generated in the mass of iron. These currents cause considerable loss of energy by heating the iron.

The property of a material which enables it to conduct magnetic flux is called its permeability and is represented by the symbol $\mu$.

The permeability of air and the non-magnetic metals is considered unity, except a few which are less than unity. The permeability of iron is of 2,000 or 3,000 times that of air. In other words, with the magnetizing force or current 2,000 or 3,000 lines can be forced through a coil when it has an iron core, when only one line would be forced through with only air inside the coil. (See Thompson Arts., 362 to 369.)

For iron $\mu$ is not a constant, but its value depends on the density of the flux, that is the number of lines per square unit of cross-section.

The density is expressed by $D = A/\Phi$, where D is the density A the cross-section (Sq. Cm. or Sq. In.) and $\Phi$ the total flux. If the flux is increased a point is reached where no more lines can be forced through the iron, however strong the magnetizing force. It is then said to be saturated. Near saturation $\mu$ decreases greatly.

The formula for magnetic circuits are very similar to those for volt, current and resistance or Ohm's law.

If $\Phi$ is the total flux, M the magneto motive force (M. M. F.) and Z the reluctance of the magnetic circuit then:

$$\Phi = \frac{(\text{M. M. F.})}{\text{reluctance}} \text{ or } \Phi = M/Z$$

The M. M. F. is proportional to the current and number of turns in a coil or M: = C $\times$ N.

The product C $\times$ N is called the ampere turns of a coil or magnet. As long as this product is constant the M. M. F. produced will be constant.

The M. M. F. produced by C amperes in N turns will be

$M = 4\pi$ C N/10.

Hence, $\Phi = 4\pi$ CN/10Z.

Also, Z = L/A where L is the length of magnetic circuit, A its cross-section (in Cm.) and $\mu$ the permeability.

Therefore, $\Phi = 4\pi$ CN/C10l/A$\mu$.

All the above formulas are of great use in the design of dynamos and transformers and its practical use will appear later in this treatise. The reader should also carefully read the references as they give a very full and simple explanation of derivation of the formula.

*(To be continued.)*

This course commenced in the December, 1912, issue.

## Wireless Amenities in Battle

In this era, Captain Pearson, from the deck of his majesty's ship *Serapis,* would not raise his voice above the roar of battle to know if Captain Jones, of the *Bon Homme Richard,* has struck his colors. And John Paul would not shout back, "No; I have just begun to fight." Nor would the megaphone be employed to assist the vocal equipment. Banging away at each other across five or six miles of ocean, the skippers would exchange their compliments via wireless, provided the operator and his instrument had escaped shot and shell. In the "naval battle" between the Greek and Turkish "fleets," the other day, the wireless men were as snug as a bug in a rug. The gunnery appears to have been directed on the theory that aeroplanes or submarines were attacking. "We have occupied one of your islands and await your orders," the Greek admiral slyly remarked to the enemy in a marconigram from a discreet distance. "Your shells are falling wide. I would recommend you to take better aim," the Turkish admiral airily sent back. The engagement was concluded before either belligerent thought of calling "S. O. S."

## Promoters Go to Prison

Five years in the Atlanta penitentiary and a fine of $2,000 was the penalty imposed early in January by Judge Hunt in United States Court in Manhattan on Cameron Spear, noted wireless promoter and former associate of the late Col. C. C. Wilson.

The court also sentenced Archie F. Collins to three years in the penitentiary and $200 fine and Charles L. Vaughan to two years in the penitentiary. They were found guilty of using the mails to defraud in connection with the exploitation of stock in the Collins wireless telephone and telegraph company and the Continental Wireless Telegraph and Telephone Co.

To Spear Judge Hunt said: "It was said in your behalf that 'it was the business of the directors of the company to direct.' It should have been said: 'Honest directors should have been permitted to direct honestly.'"

The judge told Collins he had made false representations as to the merits of his patents and the progress of his work.

The trial had been in progress since November 16, and the government called many witnesses. Spear, charged by the government with having furnished the office machinery and methods by which thousands of persons were swindled, did not take the stand.

United States District Attorney Wise, who summed up for the government, did not mince words. "The wireless telephone can be patented to-day if it is invented in a form to be a boon to society, but it can never be such in the hands of such a charlatan as Collins and such a faker as Spear," he shouted.

Scornfully alluding to Collins as "Professor," Mr. Wise said that after he had "kicked about" with his wireless schemes and tried, "by process of prestidigitation, to turn them into gold," he came upon "the great financier, Spear."

"God save the mark, if in addition to its other sins there are to be charged up against Wall Street such charlatans as spear and Collins; it is time we should go down there and mob the place out of existence."


**In this department the affairs of the various wireless clubs and associations will receive attention. Believing that all amateurs are interested in the experiments and research work of others the publishers plan to give readers each month distinctive items on the progress made by club members, thus offering all an exchange of ideas in organization and experimental matters and bringing students in closer touch with each other. To this end we will also publish a Wireless Club Directory. The names of the officers and the street address of the secretary are requested from all clubs. Notification of any changes should be forwarded at once. Short descriptive articles of experiments or new stations with distinctive features, accompanied by drawings or photographs, will be published.**

President Power, on behalf of the Tufts Wireless Society, is working to have a course opened to the students in electrical engineering, who are interested in wireless telegraphy. President Powers suggests that it be made a course in radio-electricity, thus covering the wave oscillations on which wireless telegraphy depends. The wireless society has made great progress at Tufts during the past two years and is now constructing an aerial between Page and Miner halls. The society recently became affiliated with the New England Confederation of Wireless Clubs.

* * *

After two years of successful service, the wireless telegraph equipment of Mechanics Institute, erected on the roof of the Eastman building, was thrown down by the weight of snow and ice a few days ago. During the two years of its existence at the institute the wireless equipment had made possible the receiving of messages from many points of the country.

* * *

Philadelphia now has a church with a wireless telegraph apparatus on its roof. It is the Fifth Street Methodist Temple which has adopted this innovation. The Rev. H. K. Holtzinger, who retired from the banking business to become a minister, is pastor of the temple and has inaugurated a number of industrial and educational classes on week-days in the building. Recently he organized a class of 12 young persons, three of them girls, in wireless telegraphy.

The station, which has a radius of about 400 miles, having sometimes intercepted messages from Cape Cod, is complete with receiving and practice sending apparatus, and the members of the class are enthusiastic about it.

* * *

As predicted in our last issue, the United States Government has commenced investigation into the thoughtless acts of irresponsible amateur operators. The names of those who interfered with the wireless work when the *Turrialba* went ashore a few weeks ago are known to the officials, and it will undoubtedly go hard with them.

In the effort to check the widespread interference with regular wireless business the investigations have extended to towns along the New Jersey coast, and the local authorities have been appealed to in an effort to break up the practice.

A few days ago a Philadelphia newspaper published a statement which gave the impression that the interference at the time of the *Titanic* disaster and the more recent indulgence in service tapping was traceable to the amateurs in and about Atlantic City.

E. Godfrey and E. Kenneth Johnson, of that city, have written a letter defending themselves and their associates, which contains the following:

"We would first call your attention to the *Titanic* disaster. Therein you state it was reported that much annoyance was caused by amateur operators along the Jersey coast. We would state that had all the amateurs in Atlantic City fastened down their keys for continuous operation the disturbances could hardly be detected beyond the city limits, of such limited output are the transmitting sets. Those which are of slightly larger dimensions we personally know were not in operation at that time. If there was any undue interference it was caused by the operation of the higher powered commercial stations.

"Secondly, we challenge any one to prove that any amateur in this city has transmitted any fictitious messages and caused any 'wild goose chases after ships supposed to be in need of help.' We would like those persons who have put forth such assertions to prove same.

"There seems to be a rumor afloat that the amateurs in Atlantic City openly defy the law. This is certainly a gross misunderstanding. Every one connected with the 'Wireless Association of Atlantic City' is desirous of Federal laws controlling the operation of all wireless stations, because these laws give the amateur protection and at the same time recognition under the United States Government.

"We do not consider it necessary that the Government send Secret Service men to ascertain the location of the several stations, for those persons operating sets will gladly give any information concerning their respective stations as may be desired from a Federal authority. Same may be had by applying to the president of the association, N. J. Jeffries, at the association headquarters, 314 Bartlett Building."

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The wireless station at Sayville, L. I., is to have a new system installed.

*Photo, Underwood & Underwood, N. Y.*

*The Rev. Horace K. Holtzinger, in the study of the Fifth Street M. E. Church receiving a wireless message.*

## Comments on the License Examinations

That wireless clubs and associations are of far greater benefit to the amateur experimenter than is realized by most people is clearly demonstrated in the results of the license examinations now being held to determine the fitness of amateurs. Two versions of these tests are given in the following open letters:

Sir:—The marvels of wireless are so great, so almost beyond ordinary comprehension, that the average person makes little, if any, attempt to solve them, contenting himself with the fact that somehow or other an Arlington operator can "pick up" Paris, and hopes to do better later on.

It was up to the boys and young men to dig into the "why and wherefor" and study this new force out, and they have done so at considerable expense, my son (16 years) having invested of his savings some $50 or more. These boys have become quite proficient—at least some of them—but through some real or fancied errors or careless acts it seems the boys are all to be "canned," as they call it; in other words, put out of business, the United States Government having taken the whole matter in hand—the granting of licenses to operate, etc., making rules and penalties for violations, etc., all of which is quite proper. In accordance with this, all desirous of making use of wireless, amateurs and professionals alike, have been compelled to pass an examination as to competence and efficiency.

It seems that the boys have been held to a standard that freezes them out, and they claim—or my boy does—a harder "receiving" test than specified in the Government regulations. It doesn't seem fair to exact from a boy who can prove he is a reliable and responsible boy, intelligent enough to use his outfit as prescribed, the qualifications that are demanded from a commercial operator. I don't mean to say he is, quite, but (I may be wrong) it seems he and others have been tested by experts just to a point to "break" them. My boy did not pass nor did hundreds of other boys, as you can readily find out, and though eliminating the fact that I am his father, I think "during good behavior" they should be given a chance.

I believe your attention in the matter would show what a feeling there is in this matter, and either bring what the boys feel is justice or some sort of help to get at least some statement of the case that will ease their minds. If there is anything new for the boys to do, let the officials make it clear, and some boy—if not my boy—will have a chance to go further into the mystery of etheric waves and use the outfit that he has purchased at considerable self-sacrifice.

I have been an interested participant in my son's "research," and am very glad that I gave him in his spare time something "worth while" to be busy on. I have been astonished at results and hopeful for future developments, but if you can't help I don't know how else to help. FATHER.

PHILADELPHIA, January 11, 1913.

Three amateurs who have successfully passed the examinations answer "Father's" complaint in this manner:

Having all successfully passed the first grade commercial examination for wireless operators, we are in a position to talk. We are also amateurs, having been on the job for about four years.

In our experience we have found that if a fellow is as proficient as "Father" says his son is, he would have no difficulty in taking out at least an amateur license. In the amateur examination the speed of receiving and sending is established by the applicant, and if any question is not fully understood the examining officers are only too glad to explain the difficulty. We have many friends who are members of the Wireless Association of Pennsylvania, and from what the majority of them say the treatment which they received while taking the examination could not have been more fair or courteous.

Of course, there are a certain few "soreheads" who do not know enough to hold the responsibility of operating a wireless station and did not pass and blame the officials for their own incompetence. These fellows belong in the class that "sit" on their keys all day to hear the noise of their spark and break up communication of other fellows. They do not realize the interference they are causing. This is the style of amateur the Government is getting after. It is not the object of the Government to stop the real amateur, but "kids" who have no consideration for the rights of others. We might say that if all amateurs were as "reliable, responsible and have the intelligence to use their outfit" as "Father" says his son is there would be no need of legislation to govern them. If the examining officers and experts "try to break" the applicants, as "Father" says, it is to be remarked that fully 90 per cent. of those who have been examined that we have heard of passed. When an amateur takes his examination he must remember that it is no "cinch" and requires preparation.

We would say that if "Father" and son would join some substantial wireless club, for instance, the Wireless Association of Pennsylvania, they would meet fellows who have passed and profit from their experiences. As to "canning" any one, we have yet to see it done where it is not justified.

"X," "BU" AND "DF."

Another amateur's experience is revealed in his supplemental letter to the one just given. He believes that the wireless tests are easy.

While I did not take the examination for a commercial license, I did take the first grade amateur examination which it seems "Father's" son was not able to pass. Now, I do not by any means consider myself near to being an expert. I have only had my station since last April and have only been using the Continental code part of that time. When I took the examination several weeks ago the officers in charge were very courteous, even explaining one or two questions which I did not fully understand. There are some half-dozen questions which are very simple, being based mainly on the new wireless law. I am no speed expert and was afraid that I would fail on the code test. The officer that had charge of the buzzer used in the test asked about what speed I could receive. I told him and he very kindly sent slow to me. Now if, to use "Father's" expression, the Government would want to "can" any amateur it would be only too easy to do so by sending to him faster than he could receive. The officers down at the Navy Yard are as pleasant as anybody could possibly be and I am sure that anybody that takes the test will get a fair show. I think that any person that is as intelligent in handling the apparatus as "Father's" son seems to be ought to go through with flying colors.

If the son would get into the Wireless Association of Pennsylvania, as "X," "BU" and "DF" suggest, I think he could get enough advice to be able to get his license.

A LICENSED AMATEUR.

## Wireless Club Directory

**Amateur wireless clubs and associations are requested to keep us posted in regard to any changes that should be made. New Clubs will be entered in the issue following receipt of notices in the form given below.**

### ARKANSAS

**LITTLE ROCK—Arkansas Wireless association: G. A. Rauch, president; Edward Vaughn, 2622 State St., Little Rock, Ark., secretary and treasurer.**

### BRITISH COLUMBIA

**VANCOUVER—Wireless Association of British Columbia: Clifford C. Watson, president; J. Arnott, vice-president; E. Kelly, treasurer; H. C. Bothel, 800 Fourteenth Ave., E. Vancouver, B. C., secretary.**

### CALIFORNIA

**LONG BEACH—Long Beach Radio Research Club: Bernard Williams, 555 E. Seaside Blvd., Long Beach, Cal., secretary.**

**LOS ANGELES — Custer Wireless Club: Franklin Webber, president; Oakley Ashton, treasurer; Walter Maynes, 438 Custer Ave., Los Angeles, Cal., secretary.**

**NAPA—Aero Wireless Club: A. Garland, president; W. Ladley, vice-president; D. Beard, Napa, Cal., secretary and treasurer.**

**OAKLAND — Fruitvale Wireless Club: Joseph C. Brewer, president; Alan Downing, vice-president; Chrissie Eiferle, treasurer; Abner Scoville, 2510 Fruitvale Ave., Oakland, Cal., secretary.**

**OAKLAND — Oakland Wireless Club: H. Montag, president; W. L. Walker, treasurer; W. R. Sibbert, 916 Chester St., Oakland, Cal., secretary.**

**SACRAMENTO — Sacramento Wireless Signal Club: E. Rackliff, president; J. Murray, vice-president; G. Banvard, treasurer; W. E. Totten, 1524 "M" St., Sacramento, Cal., secretary.**

**SANTA CRUZ — Santa Cruz Wireless Association: Orville Johnson, president; Harold E. Sentor, 184 Walnut St., Santa Cruz, secretary and treasurer.**

### CANADA

**PETERBORO, Ontario — Peterboro Wireless Club: G. B. Powell, president; C. V. Miller, vice-president; E. W. Oke, 268 Engleburn Ave., Peterboro, Ontario, Can., secretary and treasurer.**

**WINNIPEG, Manitoba—Canadian Central Wireless Club: Alexander Polson, president; Stuart Scorer, vice-president; Benj. Lazarus, P. O. Box 1115, Winnipeg, Manitoba, Can., secretary and treasurer.**

### COLORADO

**DENVER—Colorado Wireless Association: William Cawley, president; Thomas Ekren, vice-president; W. F. Lapham, 1545 Milwaukee St., Denver, Colo., secretary and treasurer.**

### CONNECTICUT

**NEW HAVEN—New Haven Wireless Association: Roy E. Wilmot, president; Arthur P. Seeley, vice-president; Russel O'Connor, 27 Vernon St., New Haven, Conn., secretary and treasurer.**

**WATERBURY — Waterbury Wireless Association: Weston Jenks, president; Alfred Upham, treasurer; H. M. Rogers, Jr., 25 Linden St., Waterbury, Conn., secretary.**

### GEORGIA

**SAVANNAH — Wireless Association of Savannah: Philip C. Bangs, president; Arthur A. Funk, vice-president; Hugh Jenkins, treasurer; Lewis Cole, 803 Price St., Savannah, Ga., secretary.**

### ILLINOIS

**CHICAGO — Chicago Wireless Association: John Walters, Jr., president; E. J. Stein, vice-president; C. Stone, treasurer; F. D. Northland, secretary; R. P. Bradley, 4418 South Wabash Ave., Chicago, Ill., corresponding secretary.**

**CHICAGO — Lake View Wireless Club: E. M. Fickett, president; R. Ludwig, treasurer; R. F. Becker, 1439 Winona Ave., Chicago, Ill., secretary.**

**CHICAGO — Northwestern Wireless Association of Chicago: Rolf Rolfson, president; H. Kunde, treasurer; Edw. G. Egloff, 2720 Noble Ave., Chicago, Ill., secretary.**

**DE KALB—De Kalb Radio Transmission Association: Bruce Lundberg, president; Walter Bergendorf, vice-president; De Estin Snow, treasurer; Bayard Clark, 205 Augusta Ave., De Kalb, Ill., secretary.**

### INDIANA

**FAIRMOUNT—Southeastern Indiana Wireless Association: R. F. Vanter, president; D. C. Cox, vice-president and treasurer; H. Hitz, Fairmont, Madison, Ind., corresponding secretary.**

**HOBART—Hobart Wireless Association: Asa Bullock, president; Charles Clifford, Hobart, Ind., secretary.**

**INDIANAPOLIS — Wireless Club of the Shortridge High School: Robert C. Schimmel, 2220 N. Penn St., Indianapolis, Ind., president; George R. Popp, vice-president; Bayard Brill, treasurer; Oliver Hamilton, secretary.**

**RICHMOND—Aerograph Club of Richmond, Ind.; H. J. Trueblood, president; Richard Gatzek, vice-president; James Pardieck, 320 South Eighth St., Richmond, Ind., secretary.**

**VALPARAISO—Alpha Wireless Association: L. L. Martin, president; F. A. Schaeffer, vice-president; G. F. Girton, Box 57, Valparaiso, Ind., secretary and treasurer.**

### KANSAS

**INDEPENDENCE — Independence Wireless Association: Boyce Miller, president; Ralph Elliott, secretary; Joseh Mahan, 214 South Sixth St., Independence Kan., vice-president.**

### LOUISIANA

**NEW ORLEANS — Southern Wireless Association: B. Oppenheim, president; P. Gernsbacher, 1435 Henry Clay Ave., New Orleans, La., secretary.**

### MARYLAND

**BALTIMORE—Wireless Club of Baltimore: Harry Richards, president; William Pules, vice-president;**

Curtis Garret, treasurer; Winters Jones, 728 North Monroe St., Baltimore, Md., secretary.

MASSACHUSETTS

ADAMS — Berkshire Wireless Club: Warren A. Ford, president; William Yarkee, vice-president; Charles Hodecker, treasurer; Jas. H. Ferguson, 18 Dean St., Adams, Mass., secretary.

HAVERHILL — Haverhill Wireless Association; Riedel G. Sprague, president; Charles Farrington, vice-president; Leon R. Westbrook, Haverhill, Mass., secretary and treasurer.

ROSLINDALE—Roslindale Wireless Association: O. Gilus, president; E. T. McKay, Treasurer; Fred C. Fruth, 962 South St., Roslindale, Mass., secretary.

SOMERVILLE — Spring Hill Wireless Association: R. D. Thiery, president; H. P. Hood, Second and Benton Road, Somerville, Mass., secretary and treasurer.

SPRINGFIELD — Springfield Wireless Association: W. S. Robinson, Jr., president; William Crawford, R. F. D. No. 1, Springfield, Mass., secretary.

SPRINGFIELD—Forest Park School Wireless Club: A. C. Gravel, president; C. K. Seely, vice-president; D. W. Martenson, secretary. Club Rooms, 323 King St., Springfield, Mass.

WEST MEDFORD—Independent Wireless Transmission Co., Starr W. Stanyan, 76 Boston Ave., West Medford, Mass., secretary.

MICHIGAN

JONESVILLE — Jonesville Wireless Association: Frederic Wetmore, president; Webb Virmylia, vice-president; Richard Hawkins, treasurer; Merritt Green, Lock Box 82, Jonesville, Mich., secretary.

MINNESOTA

ST. PAUL—St. Paul Wireless Club: Thos. Taylor, president; L. R. Moore, vice-president; E. C. Estes, treasurer; R. H. Milton, 217 Dayton Ave., St. Paul, Minn., secretary.

MISSOURI

HANNIBAL — Hannibal Amateur Wireless Club: Charles A. Cruickshank, president; J. C. Rowland, vice-president; William Youse, treasurer; G. G. Owens, 1306 Hill St., Hannibal, Mo., secretary.

MONTANA

BUTTE—Wireless Association of Montana: Roy Tusel, president; Elliot Gillie, vice-president; Harold Satter, 309 South Ohio St., Butte, Mont., secretary.

NEW HAMPSHIRE

MANCHESTER — Manchester Radio Club: Homer B. Lincoln, president; Clarence Campbell, vice-president; Elmer Cutts, treasurer; Earle Freeman, 759 Pine St., Manchester, N. H., secretary.

NEW JERSEY

WILDWOOD—Wildwood Wireless Association: Russell Kurtz, president; Walter Nefferdorf, vice-president; J. Crozier Todd, treasurer; Chas. E. Rockstraw, Jr., 110 East Pine Ave., Wildwood, N. J., secretary.

NEW YORK

BUFFALO — Frontier Wireless Club: Chas. B. Coxhead, president; John D. Camp, vice-president; Franklin J. Kidd, Jr., treasurer; Herbert M. Graves, 458 Potomac Ave., Buffalo, N. Y., secretary.

GENEVA—Amateur Wireless Club of Geneva: H. B. Graves, Jr., president; C. Hartman, vice-president; L. Reid, treasurer; Benj. Merry, 148 William St., Geneva, N. Y., secretary.

GENEVA — Geneva Wireless Club: Charles B. Hartman, president; Charles Smith, vice-president; Benj. Merry, treasurer; Henry B. Graves, Jr., 448 Castle Ave., Geneva, N. Y., secretary.

MT. VERNON—Chester Hill Wireless Club: Waller Morgan, president; Richard D. Zucker, 46 Clinton Place, Mt. Vernon, N. Y., secretary.

NEW YORK — Gramercy Wireless Club: James Platt, President; John Gebhard, vice-president; John Diehl, treasurer; John Jordan, 219 East 23d St., New York, secretary.

NEW YORK—Metropolis Club: J. T. Smith, president; William E. Meyer, 131 West 60th St., New York City, secretary and treasurer.

NEW YORK—Plaza Wireless Club: Paul Elliot, president; Myron Hanover, 156 East 66th St., New York, secretary and treasurer.

NYACK — Rockland County Wireless Association: W. F. Crosby, president; Marquis Bryant, secretary; Erskine Van Houten, 24 De Pew Ave., Nyack, N. Y., corresponding secretary.

SCHENECTADY — Amateur Wireless Association of Schenectady: D. F. Crawford, president; L. Beebe, vice-president; C. Wright, treasurer; L. S. Uphoff, 122 Ave. "B," Schenectady, N. Y., secretary.

NORTH DAKOTA

FARGO — Fargo Wireless Association: Kenneth Hance, president; John Bathrick, vice-president; Earl C. Reineke, 518 Ninth St., Fargo, N. D., Secretary.

OKLAHOMA

MUSKOGEE—Oklahoma State Wireless Association: T. E. Reid, president; G. O. Sutton, vice-president; Ralph Johns, Box 1448, Muskogee, Okla., secretary.

OREGON

LENTS — Oregon State Wireless Association: Charles Austin, president; Joyce Kelly, recording secretary; Edward Murray, sergeant-at-arms; Clarence Bischoff, Lents, Ore., treasurer and corresponding secretary.

PENNSYLVANIA

LEETSDALE — Allegheny County Wireless Association: Arthur O. Davis, president; Theodore D. Richards, vice-president: James Seaman, Leetsdale, Pa., secretary and treasurer.

PITTSBURG—Greenfield Wireless Association: Edward M. Wolf, president and corresponding secretary, 4125 Haldane St., Pittsburg, Pa.

WILLIAMSPORT — Y. M. C. A. Wireless Club: Lewis Holtzinger, president; Christian Coup, vice-president; Robert Templeman, treasurer; Lester Lighton, 211 West Fourth St., Williamsport, Pa., secretary.

RHODE ISLAND

NEWPORT — Aerogram Club: J. Stedman, president; A. Hayward Carr, chairman Board of Directors; Albert S. Hayward, treasurer; Donald P. Thurston, secretary; Walter B. Clarke, 17 May St., Newport, R. I., corresponding secretary.

TENNESSEE

MEMPHIS—Tri-State Wireless Association: C. B. De La Hunt, president; D. F. Lyons, vice-president; T. J. Daly, treasurer; C. J. Cowan, Memphis, Tenn., secretary.

WISCONSIN

MILWAUKEE—Cardinal Wireless Club: K. Walthers, president; F. Dannenfelser, vice-president; Miss A. Peterson, South Division High School, Milwaukee, Wis., secretary.

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## Wireless Treaty Approved

The Senate Foreign Relations Committee has approved and will report favorably at the next executive session of the Senate on the new international wireless telegraph treaty negotiated as a result of the recommendations of the International Radio-Telegraphic Conference in London last July. Its more important provisions are compulsory intercommunication between stations using different systems and continuous duties for operators.

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## Women Now Eligible as Operators

Under the new wireless law, in effect December 13, women are eligible as operators. In the new regulations issued by the Department of Commerce and Labor appears the following:

"Women are eligible as applicants for licenses of any class or grade upon the same conditions as men."

# 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.**

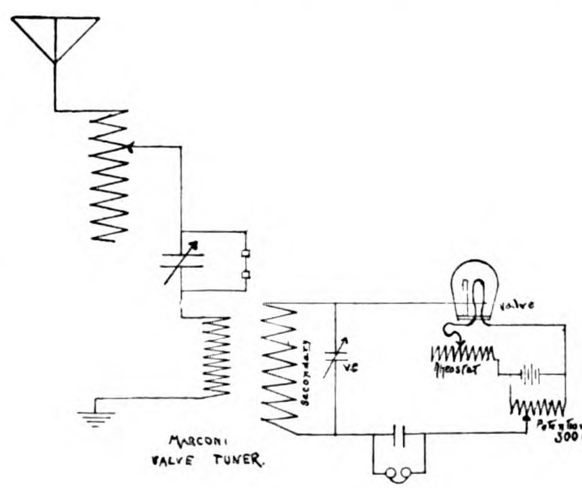
X. D., Baltimore, writes:

(1) Have induction fan type motor giving speed of 1,100 r.p.m. (motor is General Electric make). With pulley 1½ in. pulley this motor is belted to shaft having ¾ in. pulley. On this shaft is rotary spark gap disc 5 in. in diameter, having 16 studs. The gap is cut from sheet aluminum and about 1/16 in. thick. This gap does not give very high or even musical spark. I would like to get a soft musical spark somewhat higher than the M.C.C. station. Could you give me details of a gap, giving number of studs, diameter, and material used, also diameter of stationary studs. Would I get better results if gap is coupled directly to motor shaft? The rest of set consists of plate glass condenser (adjustable capacity), ¼ kw. Blitzen transformer, oscillation transformer. Power is taken from 110 volt, 60 cycle city mains.

Ans.—The trouble with your rotary gap lies in the fact that it is entirely of too small diameter. You cannot expect to get a musical note with a gap 5 in. in diameter, and, furthermore, you have too many studs on it. You should get a disc 8 in. in diameter and fit it with 8 studs and at the speed you mention (2,200) r.p.m., you should get a good musical note. You must take into consideration that the note of the spark does not depend entirely upon the number of sparks per second, but upon the distance between the electrodes or studs on the disc, and you will find for musical tones that the electrodes should be from two to three inches apart. Also, that in this type of rotary gap, you should cut down the condenser capacity of your transmitting set. It should not be more than one-half of that used with the plain or ordinary gap.

(2) Have Fleming oscillation valve detector, but am unable to get same to work satisfactorily. Understand the Marconi Co. use storage cell. I have tried dry cells, but fail to get the valve to work. Receiving set is mounted in cabinet with selective detector switch, permitting the use of several detectors. Please give me diagram showing how valve can be used to advantage with my set, diagram of set given. What size storage cell does the M. W. T. Co. use and what make, voltage and amperage, also the kinds of resistances used.

Ans.—The circuit diagram shown herewith gives clearly the circuits or connections for the Fleming oscillation valve detector. It is perfectly possible to operate this type of detector with dry cells for short periods, and there is no reason whatever why you should not get good results from it. However, storage cells are de-



cidedly better. You have not stated whether you have a valve with a 4 volt or a 12 volt filament. It makes no difference in the operation except, of course, that a 12 volt filament valve requires more current. The variable condenser in shunt with the closed circuit inductance shown in our sketch should be of very low maximum capacity and the inductance in the closed circuit marked (secondary) should be of high value. As a matter of fact, you should use doubly the number of turns that you use with an ordinary crystal detector. Also note that the potentiometer is connected across the same cells which are used to light the filament. The potentiometer should have a resistance of about 300 ohms.

(3) At what speed does the Marconi radio station at Cape Cod, Mass., transmit, also the new radio station at Sayville, L. I.? Also what is meant by Debg or Bedg apparatus that M. C. C. refers to when they start sending press?

Ans.—The Marconi radio station at Cape Cod on the 10 o'clock schedule transmits at an average speed of 20 words per minute. An automatic traismitter is used. "DEBEG" refers to the German Company operating the Telefunken system. It is an abbreviation for the company's name which is too long for ordinary usage. The full name is, "Deutsche Betriebs Gesellschaft Fur Drahtlose Telegrafie M. B. H."

(4) Using the loading coil as in enclosed diagram connected to the Blitzen tuner I can tune the Sayville station in very good; that is, when they send press at 9.15 P. M. I can leave the slider in the place for the Sayville tune and at 10.03 P. M. when the Marconi Cape Cod station starts can hear them on same tune; in other words, the tune of the wave for Sayville is the same as that of Cape Cod on my coil. To get the Cape Cod station to its maximum tune, there is hardly a quarter of an inch difference in the tune for the two waves on this coil, which is bare wire wound (copper) on grooved fibre tube 4 in. diameter, with winding space of 11 in. Can you explain this, as I thought the waves were different of these two stations. Every one else gets these stations on different positions on their coils.

Ans.—At the particular time you were listening to Sayville there was only 150 meters difference in their wave lengths, consequently you would be able to hear both at the same setting. However, at the present time Sayville is using 2,800 meters on his 9.15 schedule, consequently you should not hear him on Cape Cod's wave length. Possibly your receiving circuits have too much resistance, causing them to tune "broadly." We would have to know the constants of your tuner in order to answer your question more fully.

W. H., Philadelphia, requests:

Please give me the wave length of the following set: Aerial, 65 feet high at one end, 60 feet at the other, and 90 feet long; 6 wires, 1 foot apart. Ground 5 feet long No. 4 aerial lead wire 40 feet. 1½ inch spark coil Chambers make, 1 condenser, Murdock $200 section, 1 helix, 10 turns ¼ in. ribbon, brass, 8 in. diam., 12 in. high. Sixteen Red Seal batteries, series multiple, 1 stationary spark gap.

Ans.—The natural wave length of your antennæ is approximately 120 meters which would probably increase 60 or 70 meters by the addition of a helix.

F. W. P., Ontario, writes:

(1) My aerial consists of 4 wires with 4 wires taken from center run to switch and connected at both ends. Would I get better results if the ends were not connected?

Ans.—If you are using plain aerial connections to your receiving apparatus you would get no better results with the ends of the antennæ connected or separate. If you are using the "loop" connections you would need to connect the ends together.

(2) Why is it that while receiving the sounds will be very strong and then will die out? What is the reason for this?

Ans.—The fading signals are probably due to atmospheric conditions, the effects of which are not yet fully understood. This may also be due to poor design of the transmitting apparatus causing irregularities in the spark. It might be also caused by excessive heating of the transmitting apparatus. A number of theories have been advanced for it, but it can be stated that the effect has not yet been understood. This is most noticeable when receiving signals from a transmitting station which is beyond the daylight range of your set.

(3) I receive better and get better results from six to eight hundred miles between the hours of 6 and 7. Why is this?

Ans.—Exhaustive tests might determine this, but offhand we do not understand this peculiarity and can see no reason for it.

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N. G. S., Ithaca, says in his letter:

(1) Please tell me which kind of crystal is best for long distance work—silicon, galena, iron pyrites, carborundum or molybenite?

Ans.—Galena is generally accepted as being the most sensitive of the crystals for long distance work; however, it requires some experience to properly adjust it. Silicon is the next in sensitiveness and considerably easier to adjust.

(2) What kind of metal point is used to best advantage with these minerals?

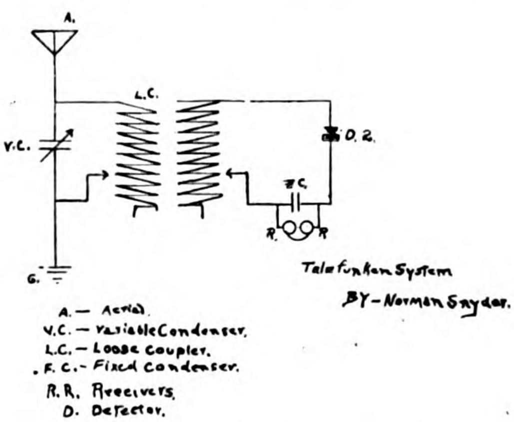
Ans.—With silicon or galena we would suggest that you use a piece of "springy" brass wire, about No. 28.

(3) Recently I read in one of our daily papers that the Sayville, L. I., station had established communication with Nauen, Germany. Please tell me the wave length, power and system used.

Ans.—The Sayville station is working on a wave length of 2,800 meters and the power is supposed to be 100 kw. A quenched spark transmitting set is used. The station is also equipped with a 600 meter wave for short distance work. The Telefunken or Debeg system is used.

(4) Please tell me why it is better to take the receivers off at 1 rather than 2, as shown in the enclosed diagram. I find that I do much better work with the receivers at 1 rather than at 2. Why is this?

Ans.—The reason you secure better signals with the phones at 1 is that you receive impulses direct from the condenser into the head-phones; that is to say, the energy from the closed oscillatory circuit charges the condenser with a series of impulses. The condenser in turn discharges through the head-phones, producing sounds.




If the head-phones were connected around the crystal, as at 2, a portion of the energy from this condenser would flow through the detector rather than through the 'phones.

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G. P. B., Halifax, asks:

Is it possible to buy a ½ kw. transformer which will not make the local lights flicker of a 110 volt, 60 cycle alternating circuit? With the transformer I am using at present the lights in the neighboring houses flicker, and so much so that I am unable to use my set at night. I have tried to overcome the difficulty in a number of ways, but so far have found it impossible.

Ans.—It is possible to secure a ½ kw. transformer which will not make the electric lights flicker. We would advise either an open core transformer with a high power factor or a closed core transformer of the magnetic leakage type. With this type there is no reason for the lights to flicker, particularly if you take your leads from the current supply as near to the meter as possible.

WE WOULD LIKE TO HEAR FROM OUR AMATEUR READERS AS TO THE RESULTS OBTAINED WITH THE MAGNETIC SHUNT TYPE OF TRANSFORMER. THIS TRANSFORMER POSSESSES MANY ADVANTAGES WHICH ARE HIGHLY DESIRABLE FOR WIRELESS TELEGRAPH WORK, THE PRINCIPAL ONE BEING THAT DURING THE INTERVAL THAT THE CONDENSER IS DISCHARGING ACROSS THE SPARK GAP THE ARC, DUE TO THE HIGH POTENTIAL OF THE TRANSFORMER, IS PRACTICALLY ELIMINATED, RESULTING IN A PURE OSCILLATORY DISCHARGE FROM THE CONDENSER. THE AMPLITUDE OF THE OSCILLATIONS RADIATED FROM A WIRELESS TELEGRAPH ANTENNAE, WHERE THE TRANSMITTER IS SUPPLIED WITH THIS TYPE OF TRANSFORMER, SHOULD BE GREATLY INCREASED.

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## Cruiser to Test Arlington Stations

The scout cruiser *Salem*, of the Atlantic reserve fleet, now at League Island, is being prepared for an extensive wireless testing cruise to begin early in February and continue through the winter, during which radio communication will be established with the big new station at Arlington, near Washington, from all parts of the Atlantic. Several experts from the Navy Department at Washington, will accompany the vessel and direct the experiments.

Communication will also be made with every wireless station on the coast as well as naval vessels wherever possible for the purpose of determining accurately the exact range of the naval wireless outfits at different distances and under different conditions. The supreme test will be an effort to signal from the Arlington station entirely across the Atlantic without the assistance of relays. The *Salem* will take up a position off the coast of Africa at a distance of 3,000 miles, when the transmission will be subjected to every test. It will be the first thorough test of the world-encircling system recently provided for by Congress.

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## Marconi Company Seeks Release from British Contract

From London comes word that the Marconi Company has asked the government to annul its contract for the establishment of imperial wireless stations, in view of the expense caused by the unexpected delay in the fulfillment of the contract. When the House of Commons Committee inquiring into the contract met on January 20, a letter was read from Mr. Godfrey Isaacs, managing director of the Marconi Company, to the postmaster general, in which were the following passages:

"When I submited to your department the tender of March 7, my company contemplated that an agreement would be drawn up forthwith and within a very few weeks could have been submitted to Parliament and ratified. When the agreement was signed on July 19, my company was reasonably entitled to expect it would have been forthwith submitted to Parliament for ratification. More than three months elapsed since the decision of the House of Commons to appoint a committee.

"No fewer than twenty-eight public sittings of the committee have been held and although many witnesses have been called the committee has had no evidence upon the questions of long distance commercial wireless telegraphy from those best qualified to speak with experience upon the subject. Moreover, much of the evidence given standing alone and without opportunity of refutation being afforded to my company has resulted in erroneous statements, technical and otherwise, being reproduced in the press of nearly every country to the serious detriment of the company. My company regrets that the proposed technical committee was not appointed three months ago. If it was the intention of the House of Commons that the select committee should enter into a highly technical, scientific inquiry the necessity for such an inquiry, if it existed, is not more apparent now than it was then.

"Already the staff of engineers retained and prepared by the company for the purpose of this contract have been kept idle many months, and the expense to which the company has been subjected in this direction alone is considerable. It is inequitable that the company should remain bound while investigation is being made, as it never was contemplated that it should be continued for an indefinite period.

"In all these circumstances, and in order to continue to maintain the company's position in an important industry employing more than 2,000 British workers, our engineers must be released and Mr. Marconi and I freed to attend to other important work. I therefore respectfully suggest that the government agree to the company's treating the contract as no longer binding upon either party. This course is necessitated solely by reason of the very serious expense and detriment to which the company is being subjected. The company will be prepared when the investigation is completed to devote its whole energy, experience and staff to the construction of imperial stations on such terms as may be then agreed if the government should so desire."

Mr. Isaacs in a published interview stated that he did not wish further to discuss his letter till the postmaster general's reply is received, but he declared it intolerable that the government should retain its option for an unlimited period. Some of the London newspapers recommended to their readers that judgment should be suspended on the questions at issue until Mr. Marconi and other experts who can speak with authority for the Marconi Company are heard by the select committee, which up to now has chiefly examined critics of the contract and advocates of other systems of wireless telegraphy.

On this point both Mr. Marconi and Mr. Isaacs, it may be added, are very bitter. Mr. Marconi has repeatedly asked that he be called before the committee, and yet the committee issued an interim report before he had had an opportunity of replying to witnesses called to give evidence about other systems.

Most of the London morning papers which commented on the letter consider the company's attitude well taken. The *Chronicle* called attention to the fact that "witnesses were heard who knew little of the technical side of wireless telegraphy, while Mr. Marconi, the leading inventor in this department of scientific discovery, and the person most concerned, was not given an opportunity of meeting the charges made. It is probable that if Mr. Marconi had been examined he would have disposed of the need of further expert investigation. He would have had a chance, at any rate, of satisfying the committee on scientific grounds of the value of his system."

The *Daily News* editorially said that the select committee has done little to illuminate the true nature of the Marconi contract. It stated:

"No evidence has yet been produced which has lent support to the charges of corruption, nor is there much reason to suppose the bargain a bad one for the government, considering the actual circumstances under which it was concluded."

Another paper pointed out the possibility, even the probability, that the government, if it wants to establish an imperial wireless system, may eventually have no alternative but to fall back on Marconi, whose system is the one which has proved of the greatest practical value up to the present.

This just criticism of the investigation, which has been going on for nearly four months with little testimony of importance elicited, resulted in Mr. Marconi being called before the Parliamentary select committee about a week after the letter had been made public. When the inventor appeared the chairman said that at present the committee only wished to hear his reasons for the company's suggested withdrawal from the agreement with the Post Office.

Mr. Marconi replied that unless he were allowed to go fully into all that had been said before the committee he thought it better to confine himself to the general reasons stated in Managing Director Isaacs' letter to the postmaster general. His company, his work and his honor had so frequently been attacked in the last three months that he preferred, if he were to say anything at all, that he should have an opportunity to submit a full reply to the statements made.

The committee considered the point privately, and the chairman later announced that Mr. Marconi would be heard in full at a convenient date.

Sir Alexander King then explained the attitude of the postmaster general toward the Marconi Company and the latter's withdrawal. He said he could not help thinking that Mr. Marconi had not been well treated. He had been attacked by all and sundry, and, although he was the wireless expert of the age, no opportunity to refute the statements had been given to him.

Mr. Redmond remarked: "That is the view of a good many members of the committee."

Sir Alexander added that he believed that on the whole the Marconi Company had grounds for complaint on the score of delay on unsufficient grounds in releasing it from the contract. The government had everything to gain and nothing to lose by holding the company to the agreement.

## Personal Items

George Scarlett De Sousa, traffic manager of the Marconi Wireless Telegraph Company of America, was the recipient of the most sincere well wishes of the entire staff on the occasion of his marriage to Clementina Weyman, of Woodhaven, N. Y. The ceremony, which was solemnized at the home of the bride, took place in the late afternoon of February 3. Directly afterward the couple left for Atlantic City, where the honeymoon will be spent.

* * *

For the purpose of making a careful study of conditions in the message service of the affiliated Marconi companies, Mr. W. R. Cross, traffic manager of Marconi's Wireless Telegraph Company, Ltd., stopped off at New York on his recent visit to this country. After a short stay Mr. Cross left for Montreal, were he is to assist in the installation of a comprehensive scheme of message traffic regulation to meet the increasing needs of the Canadian Marconi Company.

## Try to Obstruct Libel Suit

On December 20 another hearing, the first since the opening of the case in October, was held in the suit for libel brought by Guglielmo Marconi and Godfrey C. Isaacs against *Die Welt Am Montag*, for making charges in an issue of last April that the Marconi Company "entered into an agreement with the New York *Times* to suppress the full story of the *Titanic* disaster for a colossal consideration."

The counsel for the defense, as a pretext for obstructing the continuance of the trial, declared that his clients were not in a position to accept as authoritative the copy of the Senatorial Inquiry Commission's *Titanic* report, to obtain which the hearing of last October was ostensibly adjourned. The representative of the Marconi Company, who was attending the trial, offered to have the report authenticated by the American Embassy in Berlin. The presiding Judge interrupted to express the wonder that Mr. Marconi had not prosecuted the English and American newspapers.

**Court Orders Confiscation of French Government Apparatus**

Judgment has just been delivered in the High Courts of Justice of France in the action for infringement brought by Marconi's Wireless Telegraph Company against La Société Francaise Radio-electrique, La Companie Générale Radio-télégraphique, and La Société des Transports Maritimes á Vapeur. The case was heard by three judges—the president of the court, Judge Bonjean, and the Judges Dréfus and Clément. The judgment was unanimous, and its delivery occupied two hours and twelve minutes. It covers 137 typewritten pages, and constitutes a record for length in the French courts. In the result the court declares the validity of all the claims of the Marconi patent. All the defendants are declared to be infringers, and an investigation of their accounts has been ordered to arrive at the amount to be paid as damages to the Marconi Company. The court further orders the confiscation of all infringing apparatus supplied by the defendant companies, and a perpetual injunction, the defendants to pay the costs.

This judgment is of the highest importance and will have far-reaching effects, as the defendant companies have supplied all the wireless installations to all the departments of the French Government, including the Post Office, the Colonies, the Marine and the Army, which embraces the station of the Eiffel Tower.

## Book Reviews

*Experimental Wireless Stations.* By Philip E. Edelman. Minneapolis: Philip E. Edelman, 1912. Price, $2.00 net.

This book has been written especially for amateur operators, or—as its author will have it—experimenters. His object has been to prepare a guide for those who regard their instruments as more than an idle plaything; so eliminating all matter which does not directly contribute to a practical presentation of the art, he goes directly to the pith of the subject. The important principles upon which wireless systems depend and the working principle of the separate instruments are treated in some detail and include directions and cost of making. In the hope of correcting the hit and miss methods employed by amateurs in constructing apparatus standard designs for experimental stations are given.

*Wireless Telegraphy and Telephony.* By C. I. Hoppough. Valparaiso: G. M. Dodge, 1912. Price, $1.50 net.

As filling a noticeable gap in the literature of the wireless art this work will be welcomed by those commercial operators who, having had no previous training, are unable to master the technical explanations of the principles governing the action of wireless instruments on account of the mathematical reasoning generally employed by prominent authors on wireless subjects. Without attempting to go deeply into the study of radio communication—for this cannot be done without the aid of higher mathematics—the fundamental principles are clearly explained, as is their application to the solution of practical problems which arise daily in the routine of wireless operating. The author's selection of these is especially comprehensive as it has been based on his observations while serving as inspector for one of the great commercial wireless telegraph companies.

*Practical Electricity.* Cleveland: Cleveland Armature Works, 1911. Price. $2.00 net.

Those who have some practical knowledge of electricity and wish to learn more of dynamo electric machine design and the method of calculating wiring have been provided for in this work, of which 30,000 copies have been sold. The arrangement of the subjects and the careful and concise explanations bring to the student's mind a clear conception of all the more important ideas and laws that underlie electrical working. The questions which follow each chapter throw a great deal of light on the text, which includes all the tables required in contract calculations and a dictionary of electrical words and phrases.