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THE MARCONIGRAPH

An Illustrated Monthly Magazine of
WIRELESS TELEGRAPHY

EDITED BY J. ANDREW WHITE

Volume I. MARCH, 1913 No. 6

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MAURICE TRAVAILLEUR

THE MARCONIGRAPH

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Vol. I. March, 1913 No. 6

ACCORDING to Elbert Hubbard, one of neatest compliments ever paid a man who had yet to make a reputation for himself came from the lips of Lincoln when he first laid eyes on Walt Whitman. Whitman was only a hospital nurse serving without pay. He wore no uniform nor badge of office. But when Lincoln saw him coatless, with bared throat, walking by, he recognized a brother and involuntarily exclaimed, "There goes a Man!"

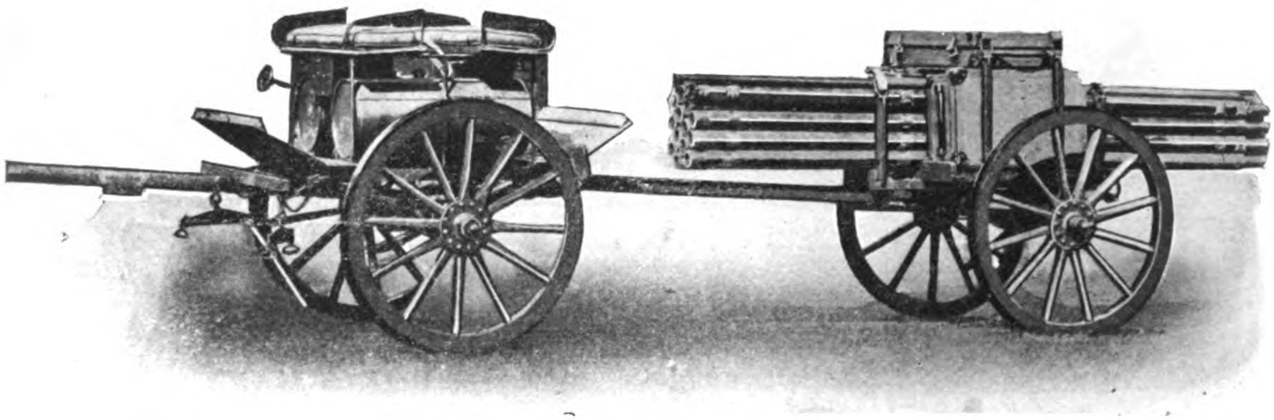
And that is the first impression one gets upon beholding the clean-cut, virile features of Maurice Travailleur, the managing director of the Compagnie de Télégraphic Sans Fil, whose picture appears on the opposite page. From mere photographic reproduction but a suggestion can be had of the calibre of a man, yet one glance at the broad, high forehead, the keen eyes and the determined set of the jaw line of the able executive who is the subject of our biographical sketch this month cannot fail to convey to the observer a sense of power, of capacity and, above all, that indefinable something that stamps a man the prodigious worker.

Among the fellow workers, old and new, who have gathered around Guglielmo Marconi there is no more interesting figure than M. Travailleur, whose activity and devotion in behalf of Marconi interests has won for him a special place in the phalanx of producers who are extending the great wireless system to the remotest corners of the earth. He was born in Brussels in 1871, and graduated as engineer at the Brussels University in 1893. Immediately afterwards he entered the service of the India Rubber, Gutta-Percha and Telegraph Works Co., of Silvertown, and under the direction of Mr. Stuart Russell was engaged in the construction of the central electric station of the city of Brussels, and also of the distribution network, both of which had been entrusted to the Silvertown Company. Upon the completion of this work M. Travailleur was transferred to the Brussels Municipal Service as engineer of this enterprise.

At 26 years of age he was appointed Electrical Engineer to the King of the Belgians, and filled this difficult position until the death of Leopold II. He continues to occupy the same post under His Majesty King Albert. It was in this capacity that his attention was drawn, towards the close of 1898, to the experiments of Mr. Marconi. Having pointed out the immense importance of these experiments to Colonel Thys, then aide-de-camp to King Leopold, and the founder of numerous and important financial and colonial enterprises, he was instructed by the latter gentleman at the commencement of 1899 to enter into relation with Marconi's Wireless Telegraph Co., Ltd., of London. At the first meeting with the Company he at once comprehended the extent of the new domain laid open by the genius of the inventor, and in an almost prophetic manner saw the possibility and desirability of affecting the telegraphic administration of the ocean by centralizing in one international organization the working of wireless telegraphy. As a result of the negotiations entered into by Colonel Thys and M. Travailleur with the Marconi Wireless Telegraph Co., it was decided a few months afterwards to found the Marconi International Marine Communication Co., Ltd., and that Company was organized at the end of April, 1900.

At this period M. Travailleur left the Brussels Municipal Service to become a director of the Marconi International Marine Communication Co., Ltd., and to be its manager for the Continent. In October, 1901, the continental branch of the International Company was transformed into a special Company, bearing the name of the Compagnie de Télégraphic Sans Fil. M. Travailleur became managing director of this company and occupies this position at the present day. He joined the Board of the Marconi's Wireless Telegraph Co., Ltd., last year, and is also a director of the Deutsche Betriebsgesellschaft für drahtlose Telegraphie.

In addition to his occupations in the domain of wireless telegraphy, M. Travailleur, who is a Chevalier of the Order of Leopold, finds outlets for his inexhaustible energy in the administration of many industrial enterprises, chiefly electrical and colonial, and he is director of several companies. Maurice Travailleur is not a believer in the word impossible. He is the highest type of the modern engineer, daring, full of conviction and enthusiasm, practical and prudent. With his fertile activity and ambition to do greater things, he will continue, in an ever-increasing measure, in the direction of enlarging to-day what were regarded as the limits of possibility yesterday.



Portable Stations Used in the Army

THE successful working of portable wireless stations during the Russo-Japanese War and the later conflicts in Europe brought to the attention of the experts of the Signal Corps of foreign countries the desirability of equipping detachments with portable sets, so constructed as to be easily transported and quickly erected in time of war. In a previous issue we gave some of the details in connection with the demonstrations of automobile wireless stations in practically all of the countries in Europe, resulting in the purchase by the several War Departments of various types of Marconi portable apparatus. The United States is the latest nation to investigate this field and at the present time the experts of our War Department are engaged in exhaustive tests of cart type stations.

It has recently been learned that the United States Signal Corps have decided to equip several detachments with cart stations of the Marconi quenched spark type and to later extend the equipment in conformity with the results of proposed exhaustive tests under service conditions.

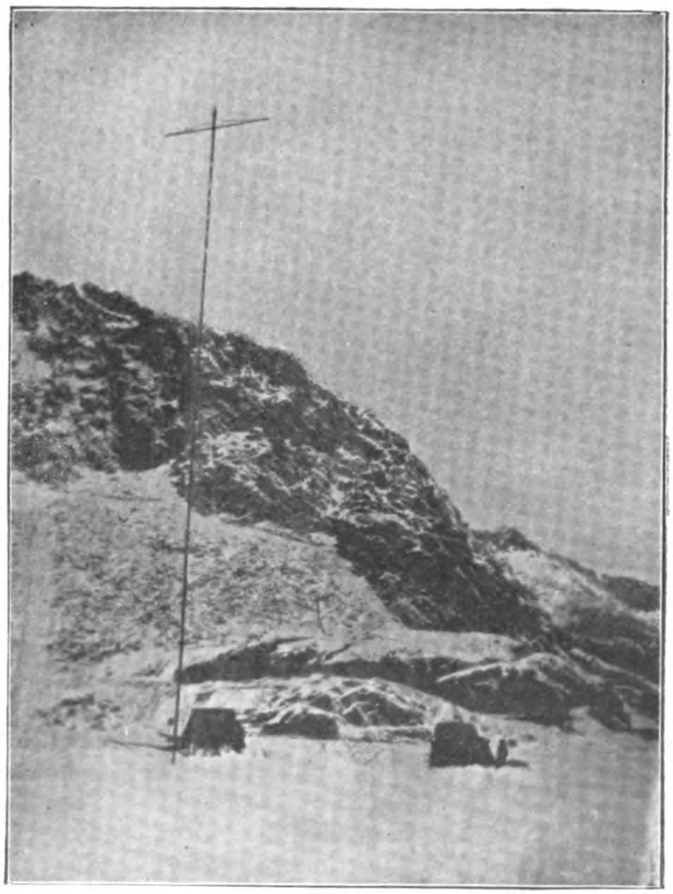
A general revision of ideas has taken place during the last few years as to the desiderata for transmitters and receivers for military purposes. A fairly typical example of the stipulations made in some of the old specifications for portable military stations is furnished by the following:

"The sharpness of the tuning of the stations is to be 5 per cent.—that is to say, a change of wave length of 5 per cent. in the tuning of the receiver must render readable signals inaudible, after which a corresponding change of 5 per cent. in the tuning of the transmitters must render the signals readable again."

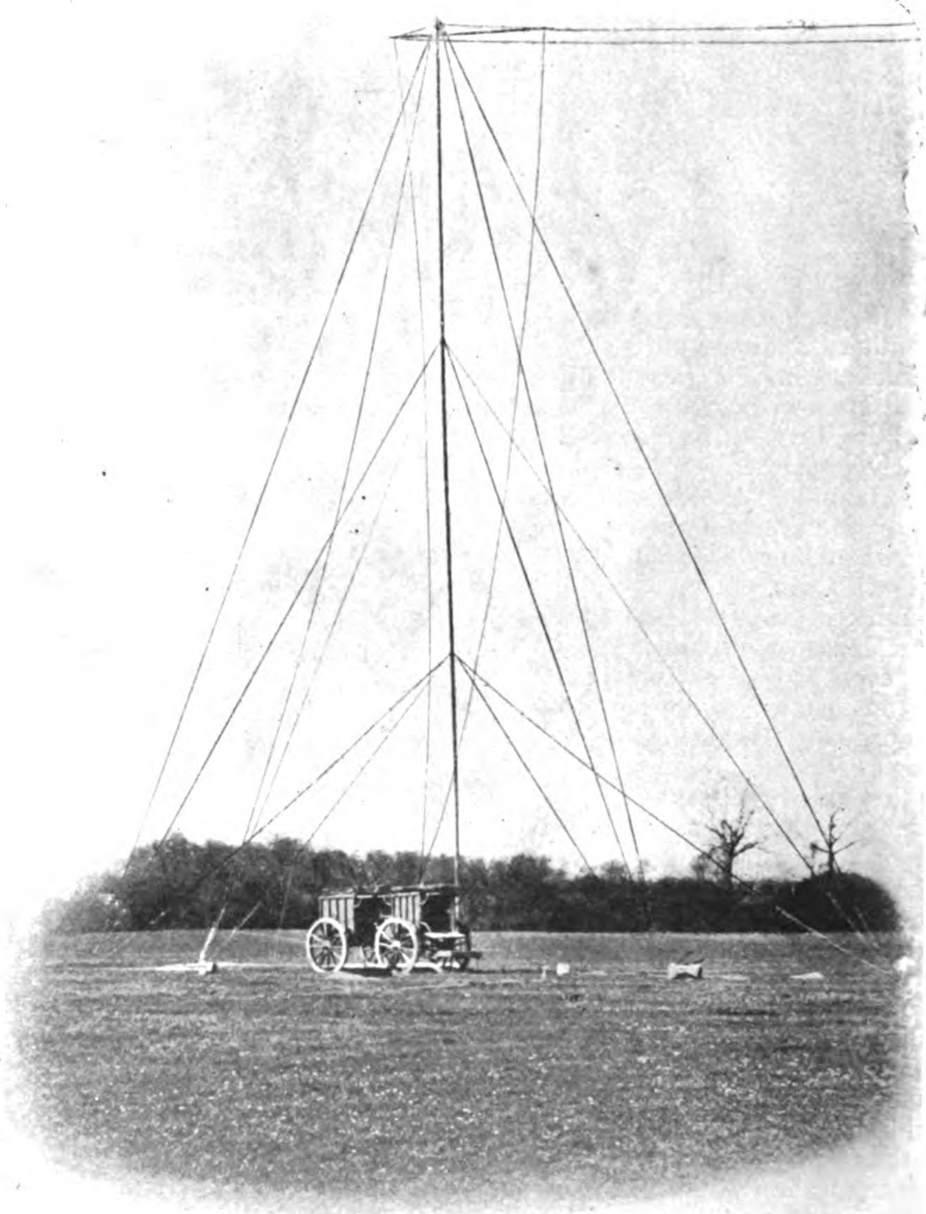
It is evident that the writers of this were under the impression that they were taking the best possible measures to ensure that the communication between their stations and would not be interrupted by hostile stations. The actual result was that experimenters developed very sharply tuned transmitters to meet these requirements, thus producing stations which interfered as little as possible with the working of the enemy's stations, but offering no advantages in the way of preventing interference of the enemy's stations with the communication between their own stations. The users of these stations found that, in accordance with their expectations, their receivers were not effected by their own transmitters if their wave-length differed by more than 5 per cent., but they also found another result that was quite unexpected; that was that other stations of a commercial type, differing in wave length by much more than 5 per cent., seriously interfered with their working. This was due to the fact that interfering stations were using close coupled transmitters, emitting a wave with flat tuning and a comparatively high damping. Incidentally, these interfering stations had sharply tuned receivers, which were not affected by the highly tuned transmitters of the military stations, differing slightly in wave-length. As a result the commercial stations maintained good communication between themselves and effectively interfered with messages between the military stations.

Thus in time of war users of military stations, fitted with sharply tuned transmitters, would find themselves at a disadvantage, even in comparison with an enemy equipped with ordinary commercial stations. It was readily seen that the sharply tuned transmitters offered no advantage to friendly stations in the matter of freedom from interference and offered clear advantages to the enemy in that respect. Another disadvantage which was found in the practical working of these stations fitted with sharply tuned transmitters, was that the slightest error in the syntonization of these stations caused a reduction in the strength of the signals, and often resulted in complete failure to communicate. While the stations were in the hands of experts and were working under the condition of demonstration, all went well—at any rate when a capacity earth was employed to keep the wave length of the antenna exactly constant; but when the stations were handed over to officers who had to use them under war conditions, where it was not possible to make the necessary delicate adjustments, it was found impracticable to obtain the necessary uniformity of wave length, especially when it became necessary to change the wave-length owing to interference. That it was necessary to have a single handle to control all circuits was made evident through the fact that accurate syntonization of the different circuits with each other was otherwise found to occupy too long a time when changing the wave-length.

Another serious difficulty which arose was that, in practice the stations all syntonized their apparatus to slightly different wave-lengths, consequent-



A cart station working at Andermatt in Switzerland. This picture was taken more than three years ago while the station was communicating with Lucerne, the mountains between being 13,000 feet high.



The military type 1½-kw. cart station ready for working.

ly any one station of a group had considerable difficulty of attracting the attention of one of the others. The confusion which always results in practice from the use of an indefinite number of different wave-lengths necessitates the use of only a few lengths, as variations in case of interference. The actual value of these waves can be changed when necessary. Off hand, the employment of an indefinite number of waves instead of only a few may appear to some people to be an advantage. But this impression will be removed when it is remembered that although it may be possible to use an indefinite number of waves, yet those waves will not be all independent, because a flat-tuned hostile station will cover an appreciable range of these wave-lengths, necessitating the use of the wave-length differing from it by 10 per cent.

Those who have closely observed the working of wireless stations under war conditions are agreed that the transmitters should not be sharply tuned, that the receivers should be capable of very sharp tuning, and that changes of wave length, either in the transmitter or the receiver, should be effected by the movements of a single handle controlling all the circuits. Excepting the simple cavalry stations, all these requirements have been fully met in the Marconi field stations. The coupling of the transmitting circuits is such as to give reasonable flat tuning to the transmitting wave, while retaining maximum efficiency. The change of wave length of both transmitter circuits is effected by the movement of a single handle, as is also the change of wave-length of the receiving circuit. The receiver is arranged as to give the sharpest possible tuning, even against interference from comparatively flat-tuned and highly damping stations, and, if the enemy use sharply-tuned transmitters, interference can be avoided with additional ease.

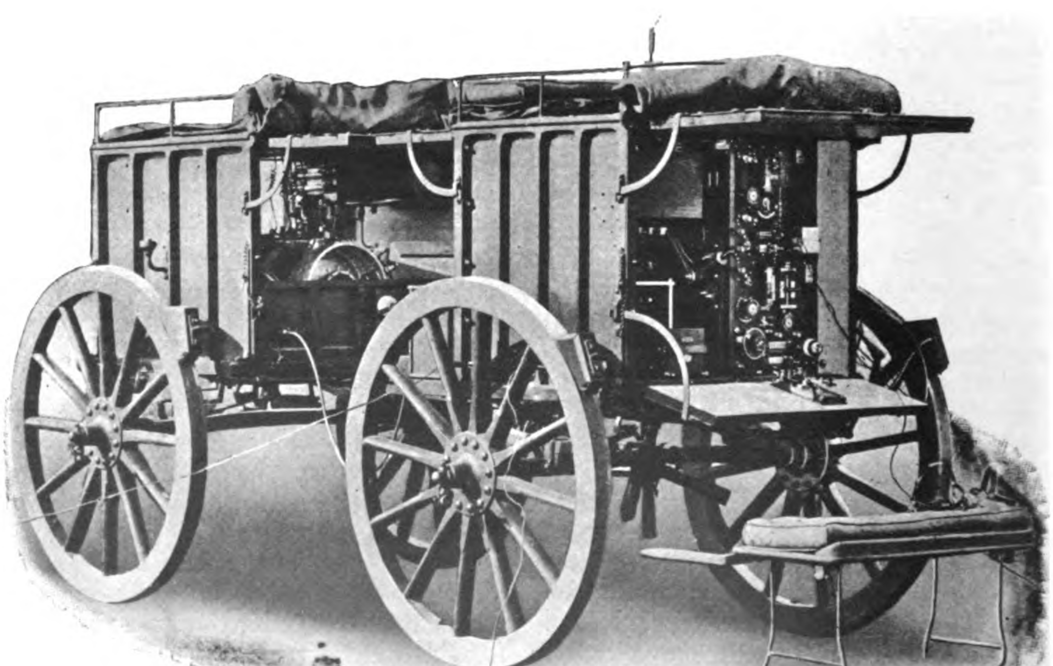
The question of secrecy is one that is obviously worthy of consideration while considering military transmitters and receivers. The first point which occurs is the problem of directional working. Directional wireless telegraphy may be roughly compared to signalling at night by a lamp, provided with a lens focussing the light strongly in one direction, while the direct light of the lamp is visible in other directions, but only at a shorter distance. Another direction in which secrecy has been sought is in the sharp tuning of the transmitter. This is quite useless, as any intelligent operator can pick up the signals with a flexible receiver, no matter how sharply the transmitter is tuned. In fact, the general statement may be made that no arrangement of the transmitter other than directional action can ensure secrecy, because, if the receivers of friendly stations can pick up the signals, similar receivers in the enemy's hands can do the same. Rapid and frequent changes of wave-length will do a good deal towards obtaining secrecy of communication, particularly if the stations are fitted to make the necessary changes without confusion and more quickly than those of the enemy. Important messages can always be sent in code. This is regularly done in naval wireless telegraphy, in fact, every day a very large number of messages are sent in this manner. It may be argued that any cipher may be deciphered in time by ingenious minds. This may be perfectly true, but the time required is very long if the cipher is changed at intervals and is usually sufficiently long to deprive the information obtained of all military value. So far as the station equipment goes the essential requirement for secrecy of communication is rapidity of change of wave-length without risk of confusion. This is fully provided for in the Marconi field stations.

To meet the requirements of the United States Government a number of changes have been made in the Marconi cart type station, notable among which is the installation of quenched spark sets. As the modifications of the apparatus have not been definitely determined up to this time it is impossible to give a full description of this later type of portable station, however, it may prove interesting to our readers to have a description of the largest standard portable station now manufactured by the Marconi Company, for which there is a considerable demand for military use by foreign nations. This is known as the "F" type station with 1½-kw. power and a range of from one hundred and fifty to two hundred miles. It is designed for wheel transportation only and since for this kind of transportation it is unnecessary to divide the loads into various small units, it has been possible to use a more powerful transmitter and to include a number of more or less elaborate devices for increasing the value and convenience of the stations.

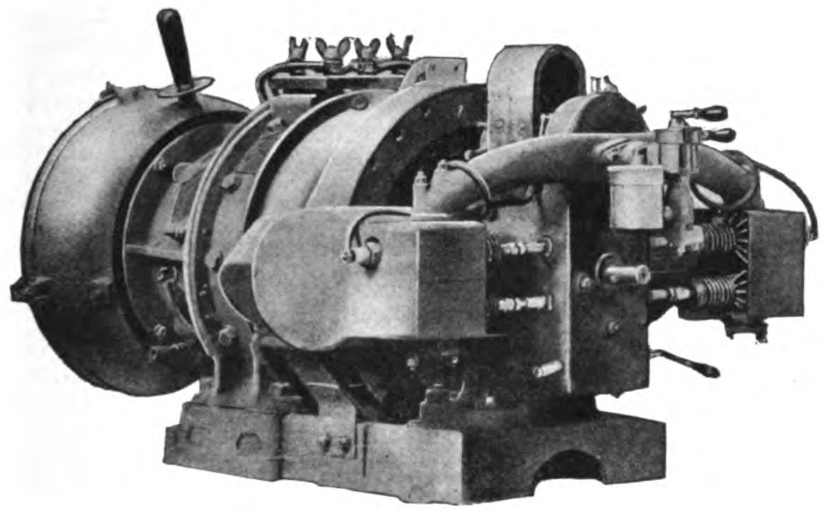
Exhaustive tests have proven that the 1½-kw. field stations work regularly at the distance mentioned over ordinary country, and maintain communication in time of war between military posts which might be required to change their position frequently. These cart stations are also able to maintain communication at a reduced distance between military posts and cavalry stations.

An important consideration is that the time of erection of a station of this type does not exceed twenty minutes with trained men, and that its total weight including carts and crew is but a trifle over three tons. Special measures have been taken to simplify the workings of the station by allowing an ample factor of safety in all electrical and mechanical features. The changes of wave-length of all circuits are effected by the movement of one handle, no syntonization being done by the operators when communicating with stations having the same system of wave-lengths. The limber and wagon type of vehicle has been adopted as the most suitable for military use. The first limber carries the generating plant, and the wagon carries the transmitting and receiving apparatus. The second limber carries supplies and spare parts and the wagon carries the masts, earths and aerials. As the maximum width of the cart bodies or frames is about forty-six inches they are suitable for axles of ordinary length. The height of the cart bodies has been kept as small as possible and the inside height in no case exceeds 30½ inches.

The generating plant consists of an engine alternator, and disk discharger mounted on a common bed-plate. A flexible spring coupling is fitted between the engine and alternator to save the armature from shocks due to sudden variations in the load. The complete unit can be taken from the vehicle by removing a few bolts and disconnecting the gasoline and oil pipes. The gasoline engine has been designed with an eye toward the greatest efficiency



Engine and instrument cart in working position.



A view of the generating group.

commensurate with minimum weight and simplicity. By the uses of especial aluminum alloy wherever practicable and by the careful design of the various component parts a high factor of safety has been obtained even though the weight of the engine has been kept low. The cylinders are horizontally opposed with cranks at 180 degs.; this has been done to insure steady running with minimum vibration. All moving parts are carefully balanced and, as the only unbalanced couple is that due to the cylinder not being exactly in line, the absence of vibration even at very high speeds is remarkable. For convenience all parts of the engine are made to standard gauge and are interchangeable and there is an ample margin of motor power allowed for the work to be done.

Owing to the fact that the engine is seldom required to run full power, the system of air cooling which has been adopted as a standard has been found to be very effective even for continuous running. It is apparent that air cooling has advantages in cold countries, but if on account of climatic conditions or other reasons, water cooling is desired, the engine is thus equipped and the weight is increased but slightly. The most modern type of high tension magneto and a simple and entirely automatic system of lubrication are used.

The electrical generator is a self-exciting alternator of 1.5-kw. capacity, giving alternating current at 150 volts and 200 frequency to the transformer of the transmitting apparatus. It has a separate winding connected to a commutator which supplies continuous current at 15 volts for the excitation of the field magneto and a current of four amperes for charging the accumulators used for the valve receiver.

The shaft of the generator is extended to carry a disc discharger of the well-known Marconi type. The disc is of ebonite and carries a toothed ring on its outer edge, the teeth of which pass in succession opposite two fixed electrodes. As the number of teeth on the disc is the same as the number of poles on the alternator, these teeth pass fixed electrodes once during every half alternation. The position of the electrodes can be varied in such a way to ensure the discharge taking place at the moment when the secondary alternating current voltage is maximum. For this purpose the electrodes are mounted on an outer casing, which can be rotated by hand on a generating frame, in the same way as the brush rocker of a dynamo. This casing completely encloses the disc and acts as a silencer for the spark. It is fitted with a fan, which keeps up a constant circulation of air through the casing, thus taking away the gas formed by the discharge, the inside and outside being made soundproof by means of material which allows the air to pass.

The limber body carries the necessary accessories for the engine and for the alternator power, including gasoline tanks and lubricating oil for the engine, an alternating current switchboard, and a direct current switchboard fitted with a small automatic charging switch for the accumulators; also guard lamps for both the alternating and continuous current terminals of the machine. These guard lamps are connected in series, across each pair of terminals, with the center point of each pair connected to the frame of the machine, serving to protect the windings of the machine from the effects of high-frequency discharges. To enable the operator to have the engine started and stopped at will, the signal for starting is an audible one and the signal for stopping a visible one, not affected by the noise of the engine. The alternator is connected to the transformer in the apparatus wagon by a cable and the disc discharger is connected with the apparatus by a pair of highly insulated conductors mounted on the pole of the wagon. These conductors are each amply protected against mechanical injury or electrical breakdown, and are connected at each end to flexible conductors, joining them to the highly insulated terminals, which are interconnected to the electrodes of the disc discharger and with the primary oscillating transmitting circuit.

The alternator is connected by means of a couple to the socket mounted on the apparatus wagon body and this socket is connected to the primary of the transformer through the manipulating key and a switch. The transformer is of the closed iron circuit type, and two bobbins being constructed on the same system as those employed in the manufacture of Ruhmkooff coils, giving a spark ten inches long, though, of course, the actual windings of this transformer are arranged to give voltage corresponding to only about a four-inch spark, giving all the advantages of the efficiency of a closed circuit transformer with a very high insulation of a ten-inch spark induction coil.

The secondary of the transformer is connected with the transmitting condenser circuit by air-cored choking coils, which are inserted to protect the secondary windings of the transformer from injury by the high-frequency oscillatory discharge.

The insulation of the transformer secondary is, of course, amply sufficient to prevent any possibility of a breakdown from the transformer secondary to earth, or between the ends of the secondary winding; but unless protecting coils are used the high-frequency discharges have a tendency to break down the insulation between turn and turn, at each end of the secondary winding, thus forming closed conducting circuits, which absorb energy. This effect is not a sudden breakdown and probably would not be noticed on a test, but it causes a gradual lessening of the efficiency of the transformer and has to be guarded against.

The transmitting condenser consists of 22 tubes with a coating of electrolytically-deposited copper inside and out. This form of condenser is best suited for withstanding the jolting of the wagon, at the same time affording the greatest facility for replacement, a very important consideration. In order to reduce the loss caused by brush discharge the tubes are made as long as the cart will permit. The transmitting condenser is connected on one side to the disc discharger, as shown in the drawing, and on the other side to the primary of the high-frequency oscillation transformer or "jigger," which, in turn, is connected to a variable syntonizing inductance. The circuit is completed by a three-way switch, which is connected on one side to the second electrode of the disc discharger, and on the other side to the various points on the variable syntonizing inductance. The primary of the jigger consists of one turn, composed of a number of wires which are insulated from each other in order to provide a large surface for the passage of the electrical oscillations. The va-

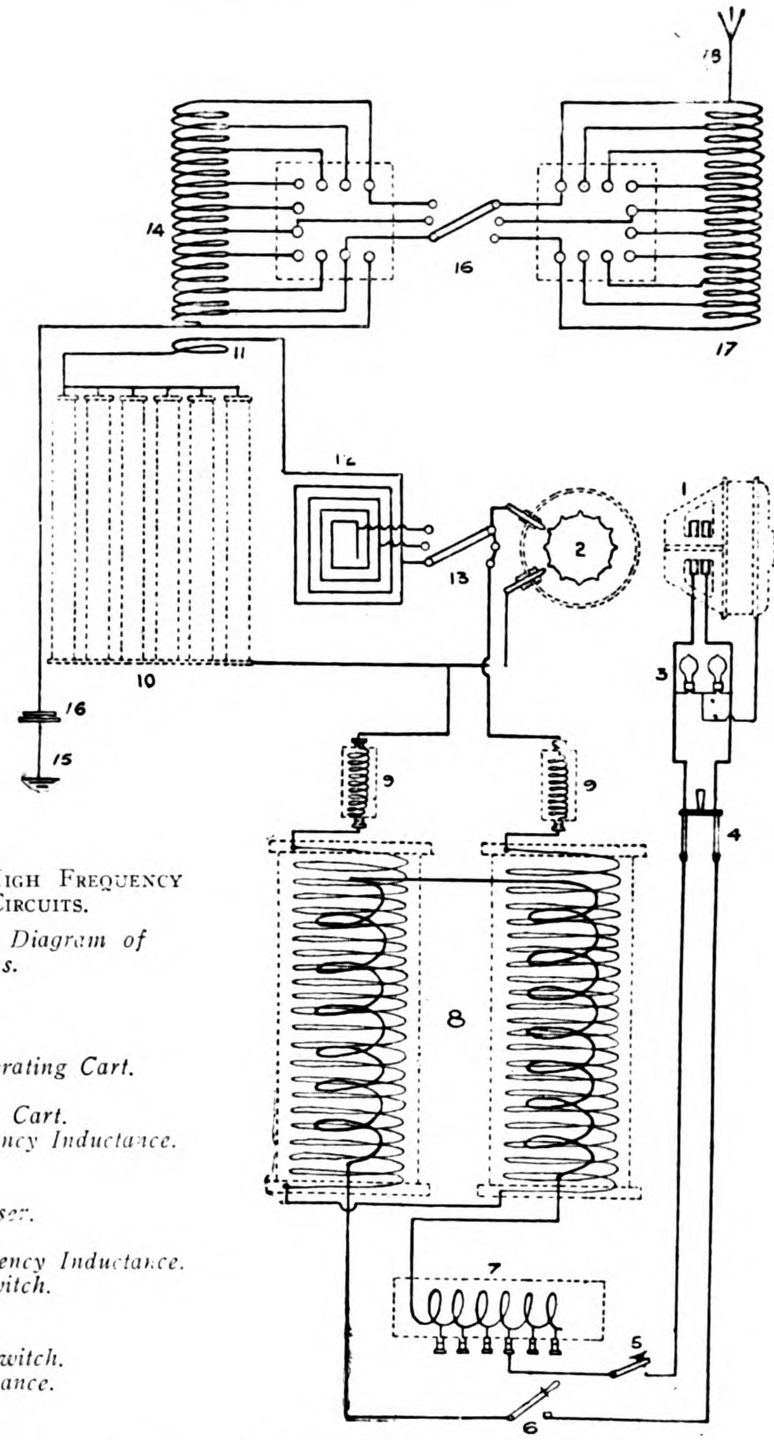


Fig. 1.

LOW FREQUENCY AND HIGH FREQUENCY TRANSMITTING CIRCUITS.

Key to Numbers on Diagram of Connections.

1. *Alternator.*
2. *Disc Discharger.*
3. *Guard Lamps.*
4. *Main Switch in Generating Cart.*
5. *Manipulating Key.*
6. *Switch in Apparatus Cart.*
7. *Primary Low Frequency Inductance.*
8. *Transformer.*
9. *Protecting Chokes.*
10. *Transmitting Condenser.*
11. *Jigger Primary.*
12. *Primary High Frequency Inductance.*
13. *Primary Multiple Switch.*
14. *Jigger Secondary.*
15. *Earth Connection.*
16. *Secondary Multiple Switch.*
17. *Aerial Tuning Inductance.*
18. *Aerial.*

riable primary syntonizing inductance consists of a winding of bare copper strip to which connection is made from the three primary conducts of the change tune switch. This switch connects the disc discharger at various points on the primary syntonizing inductance, including more or less of the inductance in the primary circuit and so varying its wave-length. By this means it is possible instantaneously to switch over to any of the three waves represented by the three contacts of the switch. It has been found in practice that to cut out deliberate interference by other stations—the chief object of syntonization—the changes of wave-length must be made instantaneously, so as to get the greatest possible number of words through before the enemy can syntonize to the new wave. By means of the three-way switch, the operator can instantaneously change his primary wave length; this switch is mechanically connected to a smaller three-way switch (secondary multiple switch), which changes the wave-length of the antenna circuit by an amount exactly corresponding to the change in the primary circuit. Thus one movement instantaneously changes the wave-length of both transmitting circuits.

The jigger secondary consists of fifteen turns of stranded cable and is joined on one side to the earth connection through a micrometric spark-gap; on the other side it is connected to an adjustable aerial tuning inductance by means of the secondary contacts of the three-way switch. Insulated terminals are connected to the winding in such a way that any number of turns from four upwards can be employed by connecting these terminals to the three contacts to the three-way switch, the corresponding three contacts on the other side of the switch being connected to various points on the aerial tuning inductance.

The aerial tuning inductance is wound with the same wire employed in the secondary of the oscillation transformer and connections are made at every turn by insulated terminals similar to those used for the jigger secondary. The arrangement of the three-way switch allows the inductance which is required for each wave to be composed of any desired proportions of secondary to aerial tuning inductance. This makes it possible to retain the same degree of coupling for all the waves without having to slide the secondary each time the wave-length is changed. The transmitting and receiving apparatus is connected to the aerial wires by means of an insulated conductor passing through the roof of the wagon body, and to the earth connection by plug sockets at the corners of the wagon body.

In the receiving apparatus two patterns of vacuum valve receiver are provided, one of which is intended to be used solely for communication with stations whose system of transmitted wave-lengths is similar to that just described, and is fitted with a commutator for instantaneous changes of the wave-length. The second receiver is of a more flexible type and is not fitted with a commutator for instantaneously changing the wave-length, but can easily be syntonized to any wave length employed by stations not using a similar transmitting system. This flexible receiver is provided to avoid the necessity of altering the adjustments of the "commutator" receiver when corresponding with stations using other wave lengths.

This "flexible" receiver can also be employed for receiving messages from other stations, when the "commutator" receiver is receiving quite different messages from a second transmitting station. For simultaneous reception at the maximum working distance it has been found advisable to employ a second antenna. For instance, if it is desired to receive from a cavalry station while the commutator receiver is occupied with some other station, the flexible receiver would be connected to a separate short antenna on two poles, 30 feet high, but in many cases, particularly at less than the maximum distance, the second antenna would not be found necessary, even for simultaneous reception. The accumulator supplying the current to the valve is of the unspillable type with a capacity sufficient to enable the valve to burn for eight days. A second accumulator is provided for replacement and the discharged accumulator is automatically recharged from the dynamo by means of the automatic charging switch mentioned in the description of the generating set. The internal connections of the receivers will be best understood by referring to their respective diagrams of connections.

Taking first the flexible receiver, the

primary circuit is composed as follows:

The antenna is connected to a variable aerial tuning inductance, the different turns of which are joined to a number of studs on the face of the receiver. A pivoted arm making contact with these studs connects the aerial tuning inductance to a variable aerial tuning condenser. The other side of this condenser is connected with the primary winding of the receiving high-frequency oscillation transformer or jigger, a break in this circuit being made at two terminals connected to circuit-breaker actuated by the manipulating key. The other end of the primary is connected to the earth, thus completing the primary circuit. The aerial tuning condenser is protected from possible breakdown, due to the accumulation of a static charge of atmospheric electricity in the aerial, by a highly inductive shunt. This shunt, which connects the aerial side of the condenser to earth, allows a constant discharge of static electricity from the aerial while its very high self-induction prevents the passage of the high-frequency oscillations of the electric wave signals. A micrometric spark discharger connected directly the aerial and the earth terminals of the receiver protects the whole of the primary circuit from accidental discharges from the transmitter.

The aerial tuning condenser is of the well-known Marconi disc type of a variable capacity up to 10,000 cms. that is contained in a flat cylinder four inches in diameter and less than two inches high. The primary is wound on a former of spherical shape mounted on a spindle which terminates in a handle on the face of the receiver. By turning this handle the primary is rotated relatively to the secondary, thus varying the electro-magnetic coupling between the two windings, and so varying the strength of the signals and the selectiveness of the receiver.

The secondary circuit receiving transformer is composed as follows:

A secondary winding of a large number of turns on an ebonite cylinder is connected directly to a sliding adjustable condenser, which, in turn, is shunted by the valve, a pair of high-resistance telephones, and a pontentiometer, all in series. The current for the filament is supplied by a battery through a series resistance.

The action of the valve is best explained by considering it as an arrangement which allows current to pass through it only in one direction. For general purposes it can be regarded as a receiver which allows only one-half of the electrical oscillation to pass through it. The potentiometer may be regarded as an arrangement for applying an initial electro-motive force to the valve in order to bring it to the point of maximum sensitiveness. The sensitiveness of the valve is quite unaffected by vibration or by strong signals or atmospheric discharges. The only conditions which it requires are that the filament, which is kept in a state of incandescence by a six-volt accumulator connected through an adjustable rheostat, should be kept at about the brightness employed in electric lamps, and that the potentiometer should be set at the position required for maximum sensitiveness. This adjustment has not been found to vary druing working, making a pleasing contrast to the delicate mechanical adjustment of the mineral detectors, with their sensitiveness to mechanical shocks and to strong electrical discharges.

The construction of the commutator valve receiver, as will be seen from its diagram of connections, is not quite so simple as that of the flexible pattern receiver. A careful study of the diagram on the next page will reveal the main points in which it differs from the simpler patterns.

These cart stations are also provided with a syntonization tester, in a form of a circuit consisting of fixed self-induction coil and a variable condenser, by which the circuit can be adjusted to any wave-length in accordance with the calibration of the condenser. The instrument is provided with a two-way switch, which connects the circuit either to a telephone and crystal detector for the measurement of the wave-length of the transmitter, or to a miniature oscillation exciter for emitting feeble oscillations for the syntonization of the receivers.

The earth connection consists of four nets of copper wire gauze, each net being provided with a connecting wire soldered into a metallic plug, which fits into the sockets at the corners of the apparatus cart body. Experiments show that this form of earth connection is a far more practical arrangement than the capacity earths, which cover the surroundings of the station with insulated wires supported at such a height that they interfere with horses and men, besides giving shocks to those who are unfortunate enough to touch them. Capacity earths were introduced some years ago when people were influenced by the idea that the transmitters for military work should be extremely sharply tuned. Those who have done practical field work have recognized the fallacy of this idea. Under the influence of this impression it was said that it will be impossible to ensure the natural wavelength of the antenna remaining sufficiently constant unless a capacity earth was introduced. It is doubtful if there was much real foundation for this, even in the early forms of transmitters, but in any case it does not apply to the properly designed modern military transmitter. Another reason given for the use of capacity earths was that the damping of the aerial was lower than in the case of an aerial with a direct earth, from which it was argued that the efficiency was greater, an assumption based on the injudicious use of measuring instruments rather than actual communication between stations. When tested in this way the strength of the signals was found, under all ordinary conditions, to be less with the capacity earth than with the direct earth. The discrepancy is due to the fact that the damping of an aerial is composed partly of damping due to resistance brush discharge and leakage, but also largely to the radiation of waves. The introducers of capacity earths found that the total damping was reduced, but did not realize that it was the damping due to radiation which they had reduced and not the damping due to loss in the aerial. Those who have to use the station under rough conditions greatly appreciate the simpler form of earth

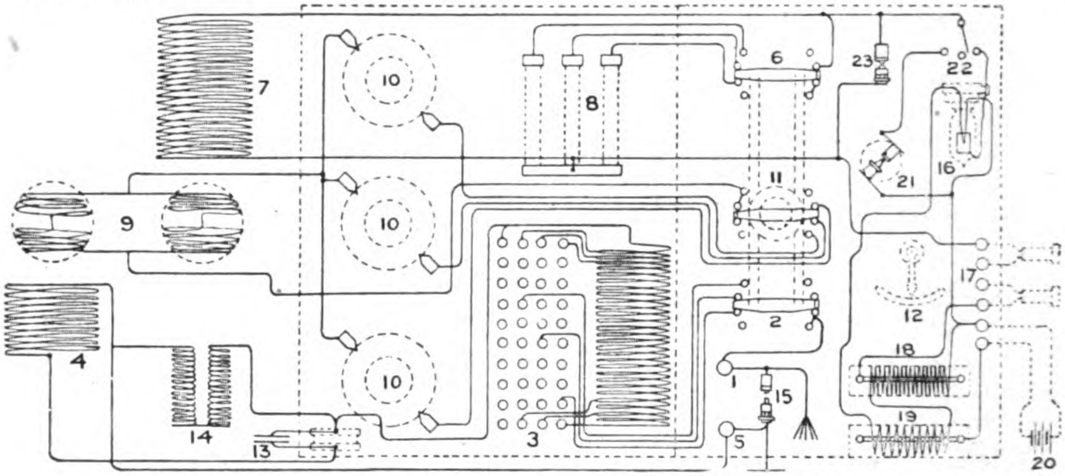


Fig. 2.—VALVE RECEIVER COMMUTATOR PATTERN.

Key to Numbers on Diagram of Connections.

1. *Aerial Terminal.*
2. *Aerial Multiple Switch.*
3. *Aerial Tuning Inductance.*
4. *Jigger Primary.*
5. *Earth Terminal.*
6. *Secondary Multiple Switch.*
7. *Jigger Secondary.*
8. *Secondary Tuning Condenser.*
9. *Coils of Intermediate Circuit.*
10. *Intermediate Circuit Condenser.*
11. *Intermediate Multiple Switch.*
12. *Coupling Handle.*
13. *Aerial Condenser.*
14. *Inductive Shunt.*
15. *Protecting Spark Gap.*
16. *Vacuum Valve.*
17. *Telephone Terminals.*
18. *Potentiometer.*
19. *Series Resistance.*
20. *Battery.*

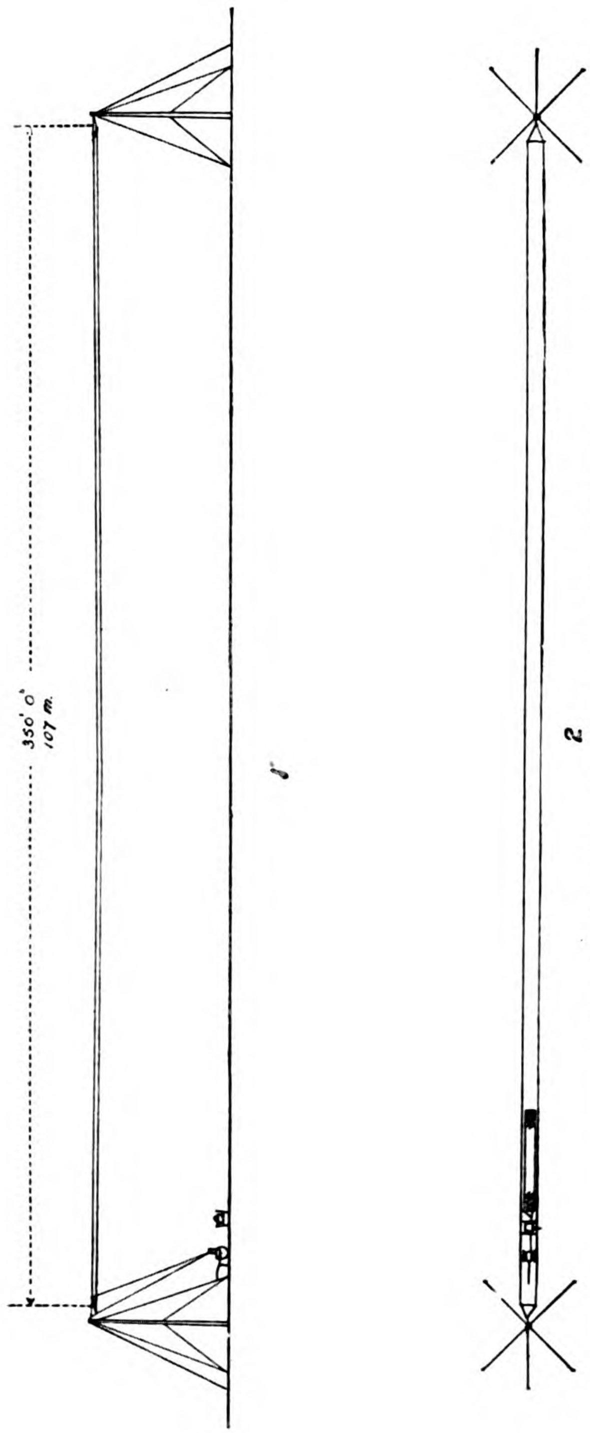


Fig. 3.—SIDE VIEW AND PLAN OF MASTS AND AERIAL.

1. *Apparatus Wagon.*
2. *Earth Nets.*
3. *First Spreader.*
4. *End Spreader.*

connection.

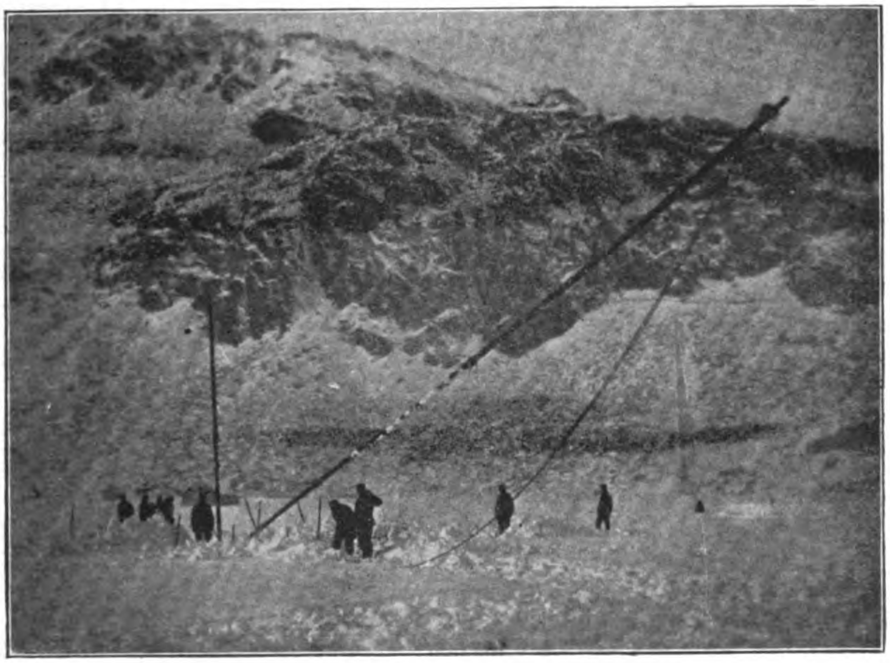
The aerial of the Marconi cart type portable station has been simplified as far as possible and consists of two conductors only, and as the oscillation keep to the surface and do not require a conducting core, each conductor consists of a number of bronze wires pleated on to a core of light but strong non-conducting material. Two aerial wires pass through the roof of the apparatus cart (Fig. 3) to the ends of a spreader suspended from the top of one of the masts, from which point they travel horizontally to the top of a second mast, where they are attached to a second spreader. The spreaders are insulated in the halyards of the masts by an insulator consisting of a core composed of cord covered with vulcanized India rubber, which presents a smooth surface and causes moisture to separate into drops. These flexible insulators possess considerable mechanical advantages over the ordinary insulators of ebonite, porcelain or glass, which frequently get broken in field use. The masts are wooden and divided into six equal and interchangeable sections, with a total height of 70 feet. The stays are attached to the masts at the top of the second, fourth and sixth sections. Two such masts are employed at each station to support a two-wire aerial having a total length of 525 feet each.

For the erection of the mast a derrick is employed, consisting of two sections identical with those of the mast. A number of telescopic masts, to be erected by turning a winch, have been brought forward from time to time as representing the ideal mast. Some of them work excellently when their erection is being demonstrated under ideal conditions, on an open space with no wind and plenty of men, but if a horse happened to tread on any of the parts or if the masts were subjected to any strain of any sort it becomes impossible either to erect it or lower it.

The mast section adopted for the Marconi portable stations will stand a wagon being driven over them, can easily be erected by four men each in a strong wind, and will stand well when up. With well-trained men the time of an erection of a mast has been found not to exceed fifteen minutes. As shown in the photograph the mast is carried on the limber wagon, its sections projecting equally over the perch and rear of the wagon. The stays, halyards, pegs and other fittings of each mast are contained in separate cases mounted on either side of the mast sections and held securely in position. Aerial wires are wound on light drums mounted on supports for unreeling and reeling up the wire.

The mast is made up of hollow wood in sections, built up of six boards forming a hexagonal outer surface, and a cylindrical hollow space inside, into which are fitted the connecting plugs of solid drawn steel tubing. The stays are attached by means of secure metal plates, which slip over the steel tube connecting plugs of the mast sections. The metal plugs are provided at each corner with a link to which the corresponding stay is attached by means of a snap hook. Figure 4 shows the arrangement of the mast fitting clearly. The bottom of the mast rests on a pivot peg, to which is attached a flat metal plate, which rests on the ground and prevents the mast from sinking in. The length of the derrick by which it is erected is one-third the height of the mast; it is composed of hollow wood in sections identical with those used for the mast, and is provided with rope stays and halyards.

When the required position of the mast is decided on, the point is marked with an instrument called a peg marker. This consists of a reel carrying a length of cord corresponding with the distance from the foot of the masts to the stay pegs, and four pointing arms at right angles to each other. The four pegs are driven into the ground at an angle of forty-five degrees to the horizontal and their position is so arranged that the strain of the aerial wires comes in a direction between two pegs. The peg marker is then taken out and replaced by the pivot peg, on which the mast will stand when erected. The mast is laid out on the ground, the bottom section fitting on to a shoe on the pivot peg, and the line of the mast in the direction of one of the stay pegs. The stay plates are put into position when building up the mast, the corresponding sets of stays being attached to the right hand and left hand stay pegs and rick falls the mast rises. The front set of mast stays serve to get the mast and derrick into the same relative position to each other and give even support to the mast at three points when it is going up. The right hand and left hand set of stays, being already

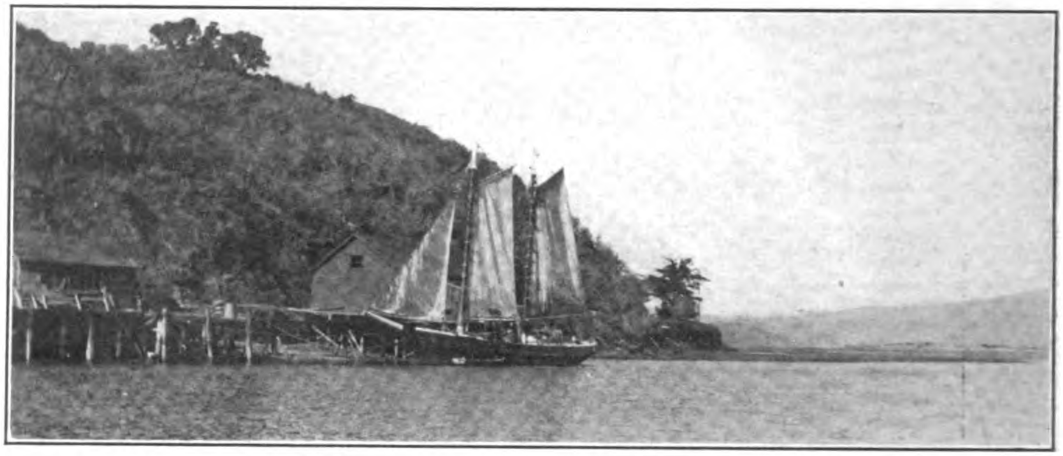


Erecting a seventy-foot mast under difficulties. The mast is made up of hollow wooden sections and fitted inside with connecting plugs of steel tubing. For erecting a small derrick is employed, consisting of two sections identical with those of the mast.

tightened by means of the stay adjusters. The derrick is then laid out at right angles to the mast and the front set of mast stays is attached to the top of the derrick. The derrick is then hoisted into a vertical position and the front set of mast stays are stretched taut in a vertical plane between the derrick head and the three-stay plates on the mast. When the head of the derrick is pulled down toward the front peg by means of the derrick halyard, the whole system of mast and derrick pivots on the pivot peg, and as the derrick attached to their respective pegs, prevent the mast from falling sideways. When the mast is nearly vertical the back stays are attached to the back peg by means of stay adjusters and are drawn tight as the mast becomes vertical. The front set of stays attached to the top of the derrick are removed one by one while it is lying on the ground and attached to the front stay peg. The mast is straightened, if necessary, by tightening or loosening the stay adjusters of the various stays, and is ready for use.

Ashton T. Work writes, "I would like to say that I am very much satisfied with THE MARCONIGRAPH and I hope it continues to be as interesting as it has been."

"I want to give you a word in praise of THE MARCONIGRAPH. It is the best magazine I have ever read," says August M. Korhnak, and adds that he wishes it great success.



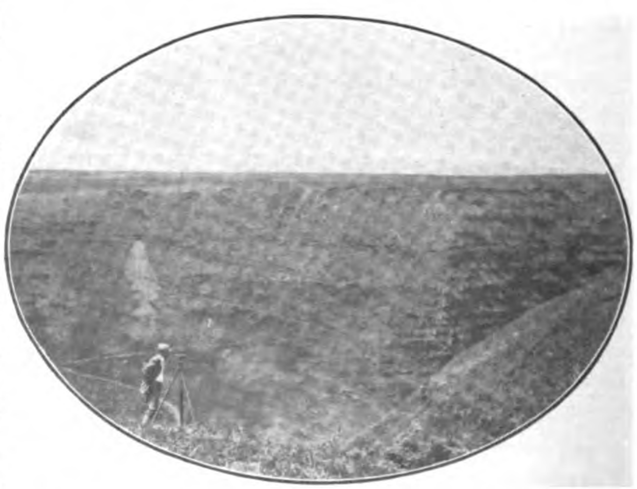
Marconi to Span the Pacific

THE tremendous value of wireless to the ocean traveler on his first day voyage across the Atlantic is everywhere fully appreciated. The mere suggestion of the subject brings forth a flood of reasons and examples, varying from incidents of luxury or convenience to services of incalculable value to the world at large. But very few realize the breadth of the activities of the Marconi companies or the commercial and social importance of the extensions they are making to their service.

A new network of stations is starting across the Pacific and around the globe.

The contract for the first eight of these new wireless stations has been awarded by the Marconi Wireless Telegraph Company of America to the J. G. White Engineering Corporation. Four of them will be generating and four receiving stations. The four stations to be used for the transmission of messages exclusively will be located at Oahu, in the Sandwich Islands; Tamales Bay, Cal.; New Brunswick, N. J.; and in New England. The four receiving stations will be located at Oahu; at Bolinas, Cal.; near Belmar, N. J.; and in New England. These stations are a part of the larger plan of the Marconi system to encircle the globe and to reach those countries where, because of great distances and local physical and climatic conditions, wireless telegraphy is the only satisfactory medium of rapid communication. The plans include stations to be erected in Europe, Asia, Africa, Japan and South America.

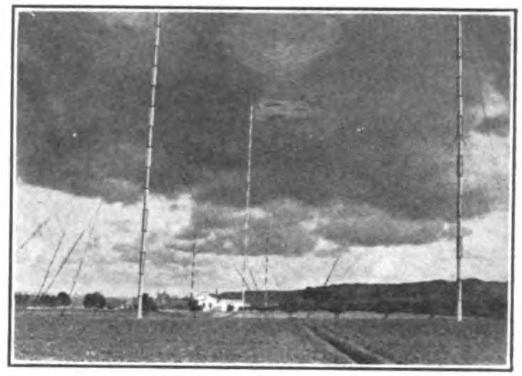
The eight new stations for which contracts have been let will not only permit the transmission of messages across the Pacific, but will greatly increase the capacity and



Surveying the Opiaula receiving site in Honolulu. The photograph shows a gulch at the flume of a nine-hundred-foot ditch.

speed of the service between New York and London. They will be located in pairs about 30 miles apart, so that the sending and receiving stations will not interfere with each other, and will have the longest range and highest power of any stations ever built so that messages can be received without effort, even at those periods of the day most adverse to wireless transmission, and only the most severe storms will have any effect upon the service. The masts, of which there will be twelve at each generating station and four at each receiving station will be 300 feet high in Oahu and California, and 400 feet high in New Jersey. The method of erecting will be unique. They will consist of 10 fort sections, bolted together, and will be constructed without scaffolding. The basket from which the work is done will be constantly hoisted above the open end of the hollow sections on a pole contained inside and raised as the lengths are added by means of a mast heel rope. The masts at the stations in Oahu, California and New Jersey will contain a total of 2,035 tons of steel, about 90,000 one and one-half and two inch bolts, and will require 93 miles of one inch galvanized cast steel wire rope rigging. They will rest upon concrete foundations containing 9,892 cubic yards of concrete. The antennae at these stations will require 82 miles of wire, while satisfactory grounding will be assured by the use of 126 miles of wire, all of which will be plowed under the earth's surface. The generating stations at Oahu will be steam driven, whereas those in California and New Jersey will be motor driven.

Inasmuch as the stations must necessarily be located in barren, level country, where vegetation cannot interfere with the wires and land is cheap, it is of considerable importance that the operators have comfortable living and working quarters and healthful surroundings. Each station will have a power house, commodious operating building, and a hotel with accommodations for from 18 to 30 men. The hotel at the receiving station at Oahu will contain a large assembly room with open fireplace, and a card and billiard room. All single rooms are to be equipped with running hot and cold water and are so arranged that they can be thrown en suite if desired, while one-half of the upper story can be divided into apartments with private baths for married couples. All the buildings will be built of reinforced concrete with red tile roofs and, on account of the high temperature, will have large verandas enclosed with copper screens. An auxiliary power station will supply power for lights, fans, the refrigerating plant and the central water works system. The chief operator and the assistant operator will have separate homes containing two bedrooms, bath, living room with fireplace, dining room and kitchen.



The masts, of which there will be twelve at each generating station and four at receiving stations, will be from 300 to 400 feet high and made of tubular steel, in sections, bolted together.

Each of the receiving and generating stations are to be as complete and perfect in every detail as the receiving stations at Oahu, although, of course, the variance in climatic conditions does not permit the same design or equipment in all stations.

The engineers sent out by the J. G. White Engineering Corporation have already reached the sites in Oahu and California and preliminary work has begun. It will be rushed to completion and it is expected that early in the fall it will be possible to send messages over the Pacific by Marconi wireless telegraph.

Slander Made Easy

The reckless mendacity of the scandal-mongering journalist, W. R. Lawson, has been fully exposed under masterly cross-examination by James Falconer, a Scotch member of Parliament, at the inquiry into the British Government's contract with the Marconi Company.

From the London dispatches appearing in the daily newspapers it is known in general that the charges of corruption made against members of the Cabinet were completely broken down. But it takes a detailed reading of the evidence brought out at the official inquiry, and of the cross-examination of the man, Mr. W. R. Lawson, who was chiefly responsible for spreading the slanders through the press, says *The Nation,* to give one an adequate idea of the monstrous nature of this attack on the integrity of Ministers of the Crown. The reputation for personal honesty on the part of members of the Government in England has long stood so high and has so rarely been impeached, that these scandalous insinuations caused a great sensation. Happily, they have been shown to be utterly without foundation. England has not suddenly lurched back to the days of Marlborough, and got a lot of jobbers in office. But the circumstances in which the damaging accusations were made, and the subsequent entire blowing away of the whole mass of rumor and surmise, are such as to justify more than a passing reference to the matter. If the result was to clear the Ministers, it was also to incriminate a certain type of journalism.

In a series of articles in the *Outlook* and the *National Review,* the assertion was explicitly made that Ministers had taken advantage of their official knowledge to speculate in these shares. The thing had been gossiped about in brokers' offices and clubs, but first got into print in the *Outlook*. It declared that "a sinister use had been made of the names of Cabinet Ministers in the City and elsewhere in association with Marconi shares." At another time Mr. Lawson spoke definitely of "four names," one of them being "a Kaffir magnate," and the others Cabinet Ministers. One of the latter was so plainly indicated that everybody knew the Attorney-General to be meant. At the inquiry, Mr. Lawson testified that the other two were the Chancellor of the Exchequer and the Postmaster-General. On cross-examination, he admitted that he really knew nothing about any Kaffir magnate. Now, note the questions and answers in the case of the members of the Cabinet:

The Chairman—Had you the slightest grounds for implicating those names in connection with the rumors?—Simply the rumors themselves.

Mr. W. Redmond—Had you a single shred of evidence that the rumors were true?—I had nothing beyond the rumors. I had no positive evidence.

Do you think that a charge so dreadfully serious as this against three Ministers of the Crown should have been made without evidence of any kind?—No.

There was a great deal more equally fatal for Mr. Lawson, who finally, in a kind of desperation over the plight in which he found himself, cried out: "If Ministers of the Crown will allow lying rumors to go about for months, how can you expect anyone to take more interest in their reputation than they do themselves?" This is the frankest admission of a code of newspaper ethics, practiced in some quarters, which we remember ever to have come across. The theory appears to be that you may catch up a lot of malicious inventions about public men, first circulated in pot-houses and back-alleys, then help them along with additions of your own, and at last put the whole mass in print, excusing yourself on the plea that if the stories were not true the slandered persons ought to have branded them as false long before. According to this, you are at liberty to start up out of the gutter and throw mud at a man, and then if he does not instantly brush his coat in public, to declare that he made the mud-throwing seem fully justified!

It is not worth while to follow Mr. Lawson as he was driven from hole to hole by a merciless cross-examiner.

His alleged facts were shown to be the merest moonshine, his boasted documentary evidence was burned to nothing by the acid of a few questions, and he was forced again and again to say, abjectly, "That was a mistake," "I should not have said it." "I withdraw that." But his impudence did not wholly desert him. "I maintain," he said at one point, "that, so far from doing the Ministers harm, I gave them an opportunity of clearing themselves." That is, to charge a Government official with villainous conduct is really a favor to him, since it enables him to affirm that he is an honest man! Was there ever such an attempt to make a victim appear a beneficiary?

It is needless to say that all journalists who are above picking pockets would repudiate with scorn the justification of his course which Mr. Lawson advanced, as if with the question, "What is a poor newspaper man to do if he does not give credence to and put into type every lying rumor that comes his way?" This is to make slander easy. It is to erect back-wounding calumny into an honorable calling. The libel laws offer a partial remedy. There appears to be no doubt that Mr. Lawson and his associate will have to answer in court for what they have said in their papers. It is to be hoped, after the pitiful exhibition they have made, that they will be cast in swingeing damages. But the moral of the whole will be lost unless the decent members of the press everywhere are prompted, by this exposure of reckless mendacity, to take anew an oath against all such hasty defiling of their columns—and poisoning the public mind—with back-stairs gossip and wicked efforts, by insinuation, to rob men of their good name.

Radio Fire Alarm Given

For the first time in the history of the New York Fire Department an alarm of fire has been turned in by wireless telegraph. The fire occurred in the steering engine room of the steamship *Olinda*, of the Munson Line, which plies between that port and Havana. The vessel was due to sail in the morning for Cuba and at 9 o'clock on the night of March 6 was lying in the lower bay about one mile south of Bedloe's Island, when it was reported to Capt. John O'Neil that a quantity of oil-soaked hemp and cordage in the engine room was on fire. The captain immediately ordered the wireless operator, Harold Curtis, to send out a call for help.

The message was received by the operator at the Brooklyn Navy Yard and the news was at once telephoned to Fire Headquarters in Manhattan, which in turn notified Deputy Fire Chief Worth at the Battery. Chief Worth boarded the fireboat *New Yorker* and directed Capt. Murray to proceed at once to the assistance of the *Olinda*. The trip was made in exactly seven minutes and shortly after the fireboat arrived alongside the Munson liner, the flames were extinguished. The damage done to the steamship was silght and the *Olinda* sailed on schedule.

Scattered Family Told of Mothers' Death Through Wireless

A story of how the wireless telegraph aboard the steamship *Admiral Schley* notified the relatives and children of Mrs. Annie Chipman, of 3513 North Twenty-third street, Philadelphia, of her death at sea, was related when the *Schley* reached that port.

Mrs. Chipman and her husband sailed from Philadelphia, January 18, on a trip to regain her health. She did not improve, and February 21 she died.

When Mrs. Chipman died Captain Jensen, of the *Schley*, placed the wireless at the disposal of her husband, and he telegraphed the news to his children. One son, W. E. Chipman, of Easton, was cruising in the Caribbean Sea, aboard the *Grosser Kurfuerest*, when notified.

One daughter, who lives in New York, was also notified by wireless. Another daughter, Mrs. M. C. Hall, of Germantown, received the news by relayed wireless. A third child, F. L. Chipman, who was in Hamilton, Canada, was told of the death of his mother, in a telegraph message sent by his sister in New York.

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No manuscripts will be returned unless return postage is enclosed.

Vol. I. MARCH No. 6

Editorial

Out in San Francisco a radio inspector has declared that the unwritten rule of the sea, "women and children first," effectively bars the thirty-odd women who have passed the operators' examination from the marine service. He further states that until this custom gives way to a free-for-all in time of stress, female telegraphists will not be acceptable in the wireless rooms of ocean liners.

To us this seems a poor reason for barring the ladies from the ships. There is something in the arguments of experienced wireless men that it might be difficult for a woman to climb a mast and effect a repair to the antennæ while a ship is at sea; and the female operator might find herself in a pretty predicament should a repair be necessary to one of the portions of apparatus too heavy for her strength. We can understand that in such emergency it might be better to have a man in charge of the instruments. But to believe that simply because it is the custom for women to leave a distressed vessel first, that the female operator would immediately demand this privilege in time of danger is to us not only a ridiculous but a very unfair supposition.

Bravery and devotion to duty are all in the heart. Sex is outside the question. Taking it from any angle heroism resolves itself into duty ably performed under trying circumstances. Heroes do not perform deeds of valor with noble thoughts of self-sacrifice uppermost in their minds. In the many cases that have come under our observation we have found that those who have covered themselves with fame and glory recall but one reason for their actions—duty. The wireless men whose actions in time of danger have formed epics of the sea have sent passengers to safety through blind devotion to duty. And what man, in the face of the inherent loyalty to duty that is shown by his own mother and sister every day in the year, is so narrow-minded as to believe that they, as well as he, would not stand by in time of danger?

The radio inspector should remember that the wireless operator aboard ship is one of the crew, signing the ship's articles as do the rest. Consequently, so long as operators may be useful in time of stress duty requires them to stay. And they do.

As a worthy contemporary observes, the female of the species is famous for fulfilling obligations. If her duty ever lies in the wireless room of an ocean liner overtaken by disaster, it is unquestionable that she will stick to her key, if necessary, until the ship sinks and the quick returning waters drown out the last strains of "Nearer, My God to Thee."

And even were the rule reversed so that it provided for "men first" it would be inapplicable to the officers and wireless operator. Duty alone would make the operator stand by his instruments so long as it was possible to send through the air a call for help.

But rule or no rule—

Remember that it was a woman—Mrs. Straus—who turned back to her husband on the deck of the *Titanic* and said calmly: "I will not go without you. My place is by your side."

* * *

There is a very serious looking young man on the engineering staff of the American Marconi Company, who has a reputation of always being fully posted in the latest achievements in the wireless field. The other day he dropped into our office and with scarcely any preliminary greeting announced that the purpose of his visit was to tell us about an interesting demonstration of a novel system of wireless telegraphy he had witnessed in the laboratory of Thomas A. Edison.

Immediately we sat up and took notice, for if the wizard of electricity was invading the wireless field something of interest and importance we felt would result. Anxiously we inquired the nature of the apparatus used in the demonstration, meanwhile conjuring up visions of a profusely illustrated, eight-page story for THE MARCONIGRAPH. The thought of this worthy project must have been reflected in our guileless countenance for our informant quickly dashed our hopes by saying that the system had not been patented, nor never would be, and added that the necessary illustrations for the article in mind would consist of a photograph of Mr. Edison in company with W. C. Brown, president of the New York Central Railroad.

For it seems that a few weeks ago a party of twenty-five men and women, including President Brown, journeyed to Mr. Edison's works at West Orange to see the wonders of the inventor's laboratory. The rest of the party noticed that after a time Mr. Brown and Mr. Edison separated themselves from the group, the railroad man walking with his arm over Edison's shoulder. At first the spectators thought that this was a token of esteem, the result of many years' friendship and that president Brown was patting the inventor on the back; but after a while some observant one in the party discovered that, as a matter of fact, Mr. Brown was tapping good, clear-cut Morse on Mr. Edison's shoulder blade.

The railroad man laughed when he was asked to tell about it.

"Why, I nearly always talk with Mr. Edison like that," he explained. "Mr. Edison is hard of hearing, and, moreover, a phonograph was playing that evening in the laboratory for the entertainment of the party of visitors, and we didn't want to stop it just to talk. So we two just sat down together and I talked to him by tapping, or rather, pressing his shoulder, using Morse code, while Mr. Edison answered by word of mouth."

Letters by Wireless Now

The "Ocean Letter" is the latest addition to our many forms of correspondence. It is a wireless message which reaches its destination by registered post.

The combination has been designed by the Marconi International Marine Communication Company to meet the demand of many travelers who desire to transmit inexpensive messages when they are beyond the range of direct communication with land stations. By this innovation it is now possible to send a wireless message from one ship to another ship going in an opposite direction for delivery by registered post from the first port of call of the latter vessel. Where registration cannot be effected the "Ocean Letter" will be forwarded by ordinary letter post.

The cost of such messages, which will only be transmitted when both vessels are beyond the range of communication with a shore station, is $1.32 for the first thirty words, including postage and registration fee, and two cents per word thereafter up to a maximum of 100 words, international counting.

The messages can only be transmitted between ship and ship, and between ships going in opposite directions. The sender of an "Ocean Letter" is not free to choose a ship to which the message shall be sent. Its disposal will depend entirely on local conditions.

"Ocean Letters" will rank in priority after fully paid and franked messages, and will only be dispatched after marconigrams accepted under the provisions of the International Convention, and after ordinary traffic. Special forms and envelopes for this new class of traffic have been issued.

Until further notice "Ocean Letters" will only be transmitted to ship stations controlled from the London, Paris, Brussels, Rome, Montreal and New York offices of the Marconi Companies.

The new service is already assured an extensive popularity with travelers, particularly commercial travelers and other business men, and when the facilities it affords are better appreciated the service will undoubtedly command an extremely large circle of users. Nearly two weeks in some cases will be saved by those who use "Ocean Letters" as a means of communication. A business man sailing from New York for London will probably find his vessel out of range of coast wireless stations three days later. Should he then wish to communicate with an associate at home he would have formerly had to wait until he reached England to post his letter. By means of the "Ocean Letter" he can now at a very slight expense have a letter transmitted to a vessel approaching New York which will but put in the registered post immediately on arrival in port and reach its destination a few hours later.

The Share Market

New low prices for the year have been established in several of the leading issues in the stock market, which has been acutely disturbed by the European financial stringency. It is the general opinion among leading bankers here that Germany's present situation, while serious, is not critical, and that it will be relieved by curtailment of her industrial enterprises until money for commercial uses becomes more plentiful.

The continued liquidation for foreign account, coming on top of the uncertainty of President Wilson's attitude in many commercial directions, has caused the market to continue its downward course, with declines that wiped out nearly the last of the recovery in prices made after the slump which culminated on February 25th.

Most of the activity of the day is in the first and last hours of trading. Between times the market is dull and price movements as a rule narrow. The downward movement is occasionally interrupted by brisk rallies but these rallies are not long maintained as they bring forth forced selling from professional speculators.

Chart readers and other people who revel in stock market statistics and are able to draw all sorts of wonderful conclusions from apparently insignificant data think that the stock market has now reached a crucial point. Any further decline from the present level, according to these people, will mean that the stock market has "broken new ground." In view of the fact that domestic news is encouraging, reports from the West concerning the winter wheat crop, showing that there is a prospect of a much larger yield this year than last, it seems that the next movement of the lethargic market should be an upward one. Well informed ones are looking for a gradual recovery among the standard industrials to the higher level prevailing during the latter part of the old year, and expect prices to remain steady once this condition has been attained. Marconi securities have held up well under the attacks of the bearish faction and the fact that these show but slight declines in the face of losses among most of the active stock ranging from fractions to more than 5 points, is significant of the prevailing opinion as to their high intrinsic value.

Bid and asked prices to-day:

American, 5—5¼; Canadian, 4—4⅜; English common, 20¾—20⅞; English, preferred, 17—17 15/16.

The April number of the English edition of THE MARCONIGRAPH will appear in an entirely new guise, under the title of *The Wireless World*. Its size will be considerably increased and its scope extended.

More Than Eight Hundred Wireless Equipments in Three Months

That the Marconi Wireless Telegraph Company of America controls practically the whole of the commercial wireless business of the United States is recognized by all those who have need for continuous wireless service. So rapidly are new installations being made that it is difficult to give comprehensive reports of new equipments made each month, but some idea of the immensity of this work is shown in the contracts entered into and fulfilled in the last three months of 1912. During this time more than eight hundred equipments were completed by this company.

Seven 1 kw. quenched spark gap sets have been delivered to the United States Army, while two more have been ordered and are in course of construction.

Two 5 kw. sets have been delivered to a sugar company in Porto Rico.

The Phelps Dodge Company have recently purchased two 2 kw. sets for use in their mines in the West.

One 5 kw. quenched gap set complete for direct current with gasolene generating plant has been shipped to Manila in charge of a wireless expert. It is proposed to use it in connection with some demonstrations which are to be held in the Philippines, as the Philippine Government is about to enter into a very large contract for the purchase of wireless apparatus, which will be installed throughout the islands.

One 25 kw. set with gasolene engine has been installed for temporary work at Honolulu.

One 5 kw. quenched gap set has been installed on the roof of Filene building, Boston, Mass., the offices of the Filene Company, one of the largest drygoods houses in Boston.

Four private yachts have been equipped with wireless apparatus.

Sets have been installed on forty trading vessels.

Two hundred and fifty ships have been equipped with auxiliary sets.

Four hundred and thirteen ships have been refitted with tuning apparatus, as well as fifty shore stations. These were necessary to fulfil the requirements of the existing wireless laws.

Besides the foregoing, numerous foreign vessels have been equipped with auxiliary sets and additional tuning apparatus.

Freighter Not Equipped Loses Salvage

Lack of wireless equipment on the steamship *Iberian* on her last trip from Manchester probably cost the officers and crew of the freighter thousands of dollars in prize money. The *Iberian* was within 50 miles of the French freighter *Mexico,* when that vessel sent out her calls for help.

The *Devonian,* 100 miles farther from the *Mexico* than the *Iberian* was, caught the S. O. S. of the *Mexico's* operator, and went to the vessel's assistance.

The first news that the *Iberian* had of the accident to the French steamer came when the freighter docked at East Boston. Officers of the vessel stated that they are sure that had they received a wireless call for help they would have got the job towing the disabled craft to Halifax, instead of the *Devonian,* a passenger boat bound for Liverpool, to which delay is a much more serious matter. Incidentally they would have shared a big salvage prize for the job.

Guam Happy With New Station

The lonely little island of Guam, far down in the South Pacific, which fell to the United States during the Spanish-American War, is at last linked with the rest of the world by wireless.

When the transport *Thomas* passed the island at a distance of 1,700 miles a few days ago the wireless operator picked up the station on the island, which sent back a happy response.

To Communicate Across Bering Sea

Arrangements are being made for the establishment of regular wireless service across Bering Sea, between the American and Russian Governments, which will insure telegraphic communication between America and Asia at all times, even in the event of the interruption of the cable service. The projected service, taken in connection with the existing transatlantic radio service, completes the circuit of the globe by this means of communication.

Distressed Schooner Saved Through Wireless

Another cargo schooner has been saved through wireless appeal for assistance. The heavy gales of the past few weeks made a target of the three-masted schooner *Frank B. Witherbee* and scored heavily.

The *Witherbee* was loaded with stone and the 700 ton cargo deprived her of much buoyancy when she poked her nose into the howling gale that was raging off the New England coast on the night of February 14. With water rushing into a strained hull, the vessel crept within 10 miles of Highland light finally and her signal of distress was sighted. The wireless appeal for aid was transmitted to Boston.

Rogers & Webb, owners of the *Witherbee,* appealed to Capt. Broadbent, of the revenue cutter service. The cutter *Itasca,* Capt. Winram, chanced to be cruising near Cape Cod. By wireless the *Itasca* was notified of the distressed coaster's position, 10 miles east northeast of Highland light, and ordered to her aid. Within a few minutes after the navy yard operator had flashed broadcast the *Itasca's* call he was in connection with her commander, who immediately prepared for action.

When the *Itasca* began her race to aid imperilled men on the *Witherbee* she was fully 35 miles from the foundering schooner. The cutter steadily cast the miles astern, and at 2:15 P. M. was alongside the vessel, where men were laboring at pumps.

The *Itasca* was a welcome sight to Capt. Nelson and crew of nine, who had spied her smoke long before the crossed masts and white hull had lifted above the vapory sea.

Capt. Winram passed steel hawsers to the *Witherbee* and began to tow her toward the land. Slowly, four or five miles an hour, the staggering schooner sulked behind the cutter, and Capt. Winram did not dare risk greater speed in getting his charge toward shelter. Word was sent by the *Itasca* that the *Witherbee* would be anchored in Provincetown, and that harbor was reached just before sunset. The owners then secured the tug *Neponset,* Capt. Sears, to tow the vessel to Boston.

Testing the Arlington Plant

The Navy Department at Washington reports that the scout cruiser *Salem* has succeeded in sending a wireless message at night to the naval station at Arlington from a point 1,500 miles distant.

The *Salem* is headed for Gibraltar and to test the sending and receiving capacities of the Arlington station is exchanging messages with it as she proceeds.

Arlington has had difficulty in hearing the *Salem* during daylight, but at night the messages are easily read.

It is said that if the tests are satistory the government will pay final instalment of $250,000 due to contractors who built the wireless towers.

France Exchanges Radio Experts With U. S.

The French government has ordered four officers to proceed to the wireless station at Arlington to work in conjunction with the American naval officers there on the preliminary tests to determine the precise difference of longitude between Washington and Paris. They will sail on board the *Provence* on March 8.

The French Navy Department has been officially informed that an American officer is to leave for France with the object of studying the same problem at the Eiffel Tower station.

At present the Arlington station receives messages direct from the Eiffel Tower, but none of those sent from Arlington has yet reached Paris.

WIRELESS ENGINEERING COURSE

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

Research Engineer of the Marconi Wireless Telegraph Company of America

CHAPTER III.

A careful consideration of the preceding formula will show conclusively that inductance is a property of the circuits and must not be confounded with its effects on the current and voltage of a circuit. When the permeability of the magnetic circuit is constant, which is the case for coils of copper wire without iron cores, the inductance will be constant for any frequency or current. The effect on the circuit will not be constant, however. Where inductance is present in a circuit, in which A. C. current is flowing, the flow of current does not obey ohm's law any longer. Its effect is to choke out the current by the self-induced E. M. F. of the inductance. This E. M. F. is called the E. M. F. of self-induction. It is proportional to the current flowing in the circuit, and the frequency and is expressed by the formula

(5) $E = 2 \pi n c L$.

The above expression gives the E. M. F. due to the inductance and does not take into consideration the E. M. F. necessary to force the current through the resistance of the circuit.

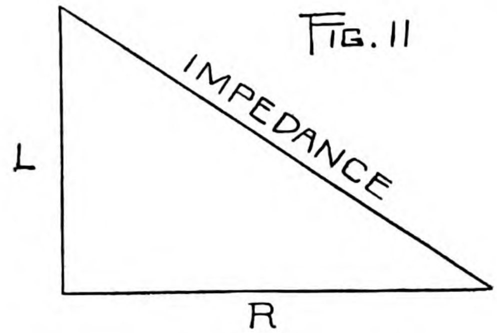


FIG. 11

Formula (5) can be used to measure self-induction of coils or circuits whose resistance is negligible. If we know the frequency, current flowing in the circuit and the voltage at the terminals of the circuit, we can then calculate L.

$$(6)\quad L = \frac{E}{2\pi n c}$$

If resistance is present in the circuit, then it would require a higher voltage E to force the current through the circuit. The voltage necessary to force C amperes through R ohms would be $E = C R$. (Ohm's Law.)

It will not, however, require $2\pi n c L + C R$ volts to get this current to flow in the circuit, as the voltage due to self-induction does not oppose the impressed volts with its maximum effect. This is due to the fact that the maximum instantaneous voltage due to self-induction does not occur at the same time as the impressed maximum instantaneous voltage. The reader to fully comprehend this process must distinguish between impressed E. M. F., current in the circuit and the E. M. F of self-induction. The current in the circuit is modified by both the impressed voltage and voltage of self-induction, the former causes it to flow while the latter tends to prevent its flow. The combined action of the two forces causes, not only a change in its value, but also causes it to lag behind the impressed volts, that is the maximum value of the voltage occurs before the maximum value of the current. The current can lag as much as one-fourth period. In this case the maximum current value occurs when the maximum voltage value is O. It is then said to lag 90°. This is the greatest amount by which the current can lag, however great the inductance.

The combined action of resistance and inductance of a circuit is called the impedance and is expressed in ohms. It is numerically equal to the volts divided by the amperes, or:

$$\text{Impedance} = \frac{E}{C}$$

The impedance is also equal to the square root of the resistance squared plus the square of $2\pi n L$. The letter p is generally used to express the quantity $2\pi n$ in the formula. Substituting p for $2\pi n$, the above can be expressed:

$$(7)\quad \text{Impedance} = \sqrt{R^2 + (p L)^2}.$$

And as impedance $= \frac{E}{C}$ we can put it in the form:

$$\frac{E}{C} = \sqrt{R^2 + (p L)^2}.$$

$$(8)\quad E = C\sqrt{R^2 + (p L)^2}.$$

$$(9)\quad C = \frac{E}{\sqrt{R^2 + (p L)^2}}.$$

It will be seen from 8 and 9 that if we substitute the impedance for resistance, then Ohm's law holds for alternating currents as well as direct.

The following diagrams will show the relation of the quantities:

In Fig. 11, p L is equal to $2\pi n L$ and R is the ohmic resistance of the circuit. If p L is expressed in Henrys, R in ohms and drawn at right angles, then the line joining the outer ends of these lines will be the value of the impedance. The angle Ø will be the angle of lag. It will be seen that as R de-

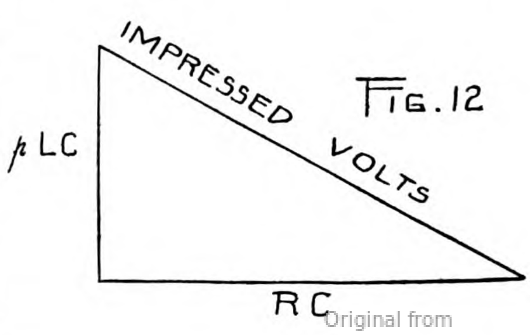


FIG. 12

creases or L increases this angle will also increase. If L = O then Ø = O. If R = O then Ø = 90°.

The triangle formed by these three quantities is a right angle triangle and the impedance (hypotenuse) is equal to the square root of the sum of the squares of the two other sides, whose values are p L and R. This is expressed by formula 7.

By trigonometry, the tangent of an angle of right triangle is equal to the opposite leg divided by the adjacent leg. In Fig. 11 $\tan Ø = \frac{p\,L}{R}$. Ø is the angle of lag, hence the tangent of the angle of lag is equal to p L/R.

If as in Fig. 12 we make the two legs of the triangle equal to p L c and R C, which is the voltage due to L and R, respectively, the hypotenuse will equal the impressed volts. This is expressed by formula 8.

By the use of the above formula and the proper meters for measuring the quantities involved, (volts, current and resistance) the inductance and angle of lag may be determined. The quantity 2π n or p must be determined from the speed of the generator; n will always equal one-half the number of poles on the generator times the revolutions per second.

The presence of inductance in a circuit not only tends to prevent an increase in current, but also tends to prevent a decrease, in fact, it acts very much like mechanical inertia, that is, it tends to prevent any change in current. The effect of this action is to cause the current to lag behind its E. M. F. This action is sometimes called *phase displacement*. Inductance is sometimes called *electrical inertia.*

The energy stored in a given inductance is equal to ½ L C^2, where C is the maximum value of the current. This energy is given back into the circuit without loss except that due to the resistance of the circuit. It is due to this fact that the power in an alternating current circuit cannot be expressed by the same law as that of a direct-current circuit. In direct-current circuits the power in watts is given by the product of the voltage and the current in amperes.

Power in watts = E × C.

With alternating current this product is called volt-amperes, or kilo-volt-amperes, if 1,000 volts is taken instead of 1 volt. At present most A. C. generators are rated in kilo-volt-amperes (K. V. A.).

When there is no inductance present in the circuit, that is when there is only resistance, then the volt amperes will be the watts or power consumed in the circuit. If inductance is present then the power or watts will be less than that given by the volt-amperes. The volt ampere reading is called the apparent watts and the power, or energy consumed is the true watts. The relation between the apparent watts and the real watts depends for its value on the angle of lag and is expressed by the formula:

(10) W = C V Cos. Ø

Ø can be determined by formula,

Tan Ø = p L/R.

The true watts can also be measured by means of a watt-meter. The watt-meter is so constructed that it gives readings in true watts and not the apparent watts.

The ratio of the true watts to the apparent watts gives the *POWER FACTOR* (P. F.). It is expressed by formula (in per cent.):

$$\text{P. F.} = \frac{\text{True Watts}}{V \times C}.$$

When the power factor is low the current is said to be wattless. This is the case when the angle of lag is nearly 90°.

The reason the current is wattless and does not possess energy is due to the fact that inductance returns back into the circuit the energy of its magnetic field, in fact, inductance cannot absorb or convert the energy into another form; as is the case with resistance, where the energy in electrical form is converted into heat.

So far we have considered the effect of inductance on A. C. current where the current is continuously varying according to the sine law. If we connect the terminals of an inductance, such as an electro magnet to a source of direct E. M. F., a current will start to flow, but it will take considerable time for the current to build up to its steady value. This is caused by the E. M. F. of self-induction opposing the impressed E. M. F. The steady value of the current will be given by Ohm's law.

$$C = \frac{V}{R}.$$

This value will be the maximum value for the current and it will require a certain time, from the closing of the circuit until this steady value is reached. These values may be determined by Helmholtz's Equation for time constant. This matter is fully discussed in article 460, Thompson's "Elementary Lessons in Electricity and Magnetism." Those desiring to go further into this matter should read this article.

If the circuit is opened while the current is flowing a spark is seen and very often it emits a noise. This spark is caused by the current produced by the collapse of the magnetic field when the current is interrupted.

This spark is very troublesome in apparatus where the current must be interrupted by contacts or switches. The energy stored in the inductance expends itself in heating and tearing away parts of the metal of the contacts. The E. M. F. of the spark is greatly in excess of the impressed E. M. F. as the interruption of the current is abrupt and the rate of the cutting by the magnetic lines is very great, thus giving the high E. M. F.

For the calculation of inductance from the dimensions and shape of the conductors, the reader is referred to Fleming's "Principles of Wireless Telegraphy," Chap. 2, articles 3, 4 and 5.

(To be continued)

This course commenced in the December, 1912, issue.

Principles of Sparkless Systems

In these days when a great deal is heard of sparkless systems of wireless telegraphy it may be well to explain that these systems depend upon the lengthening of the electric waves without increasing the length of the antenna.

Wireless transmission may be effected by the use of an antenna of great wave length, requiring a current of relatively small frequency or an antenna or small wave length, with a current of very great frequency.

Calculation shows that a wave length of three-fifths of a mile requires 300,000 oscillations per second; one of six miles, 30,000 oscillations. The second system has been used so far, for the wave length depends chiefly on the length of the antenna, and a wave length of six miles would require an expensive antenna nearly a mile long.

The antenna most used employing high frequency currents have a wave length of not more than three miles. The frequency of ordinary industrial currents is fifty periods per second, and for the 100,000 or even 200,000 oscillations per second for the wireless waves, delicate machines are required of enormous speeds up to 20,000 revolutions per second.

Instead of these inefficient machines, it has been more satisfactory to use currents of moderate frequency, with oscillations greatly increased by sparks. Induction coils add to the wave length of the new antenna, and a new generator sends double-phase current directly to the antenna without sparks.

Big Transformer Missing

Five hundred telegrams have been dispatched from Pittsfield, Mass., as a general alarm for a seven-ton transformer which was made there for the United States government wireless service three years ago and which since has been missing. After the big piece of steel was turned out there it was stored as the government was not ready to use it and when orders were recently received for its delivery the makers could not locate it.

AMATEUR CLUB NEWS

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.

The Plaza Wireless Club, of New York, is now known as the East Side Y. M. C. A. Radio Club, with headquarters at 153 East 86th street, New York City. The officers of the club state that it has been formed to meet and discuss wireless telegraphy and to assist the members in whatever manner may be necessary to improve their operating efficiency. Only amateurs who have a license are eligible for membership. Those desiring to join the club are invited to address the secretary, enclosing stamp for regulations and application blank.

* * *

When the University of Minnesota budget is approved by the Legislature and the money is available for the erection of a wireless telegraph experiment station, the *Minnesota Daily,* the university paper, will use the station for gathering news from other universities and colleges of the Northwest. The wires may be used in newspaper service next fall. The apparatus will be supervised by the electrical engineering department of the university.

The new departure in gathering news for the university's newspaper is said to be in line with a plan considered by President Vincent for the reestablishment of a school of journalism in the university course.

The plan of erecting wireless experimental stations was approved by State university presidents at a recent meeting. Among the schools which will establish the stations are the Universities of Montana, North and South Dakota, Kansas and Wisconsin.

* * *

A division of the city into twenty-six sections was decided upon at a recent meeting of the Wireless Association of St. Paul. Each of the sections will be designated with a letter and the sections will be subdivided into districts alphabetically named. The scheme is in line with plans of the association to make the wireless system of practical value to the city.

The call letter system utilizes a three-letter signal, as S. A. E. The "S" is for St. Paul, the second letter the section wanted, and the third letter the district within the particular section.

The establishment of the junior section has brought three requests from embryo operators for instruction from the older boys. Novices are taken into the junior section and later to the senior body, proficiency warranting. It is planned to interest Minneapolis, Mankato and Stillwater in the sectional scheme.

* * *

From Greenwich, Conn., comes word that Godfrey and Stillman Rockefeller, the young sons of William G. Rockefeller, have taken up the study of wireless telegraphy and their father intends to erect for them an up-to-date wireless station at their home here as soon as they prove they are able to operate it.

With this reward in sight the boys have set out with a determination to master the art. They go twice a week to the home of John Barrett, a mile from their home, and receive instruction. Mr. Barrett is an expert telegrapher, although he only operates the station at night for his own amusement, being a jeweler by day.

The Rockefeller boys and three of their chums take messages from all the stations along the coast and send to those within a radius of fifty miles, including Sound steamers.

* * *

Harold G. Lester, of the Marconi Wireless School of New York, delivered a lecture on "The Wireless," at the regular meeting of the Young Men's Club, of Plymouth Church, Brooklyn, a few weeks ago. His talk proved very interesting to the large audience gathered in the church parlors.

An Interesting Letter

Amateur wireless operators throughout the country resent the efforts of the federal authorities to restrict their experiments and refuse to see the necessity of action that the Government is urging on the score that amateurs interfere with regular wireless business. In view of this feeling, many of our readers are in hearty accord with the following communication which is reprinted from the *Scientific American:*

After reading the communication of Donald P. Beard in the issue of May 4, I am still inclined to hold my ground and will try to further prove the assertions made in my first letter in regard to your article entitled: "Curbing the Wireless Meddler."

I will not attempt to disprove the statement that wireless amateurs prevented the Siasconset station from getting news from the *Carpathia* for forty-eight hours, as I do not wish to make any statements which I cannot absolutely prove. However, it is interesting to note the following:

1. The *Carpathia* is listed in the Official Wireless Blue Book, published by the United States government, as having an effective sending range of only eighty-five miles. I wonder if the true reason why the operators at Siasconset could not pick up the *Carpathia* was not because at the beginning of the forty-eight hours the *Carpathia* was over ten times her actual sending distance away from the Siasconset station?

2. The operators on the *Carpathia* were under a censorship, and absolutely refused to send any news of the disaster to any of the different stations that were able to communicate with her.

3. I cannot seem to picture the wireless amateur who has the endurance to interfere for forty-eight consecutive hours.

The contents of the original article, "Curbing the Wireless Meddler," which provoked this controversy, indicate that the same was inspired by the alleged amateur interference when the *Terry* was in distress. Since writing my first letter, I have acquired some information which proves that there was absolutely no interference at the time stated, except one small case, in which one amateur called another. He was immediately requested to keep out, and no more was heard from him or any other amateur during the trouble with the *Terry*. Furthermore, the first news that the Brooklyn Navy Yard had of the *Terry's* distress was picked up by an amateur in Bayonne, N. J., and relayed to the government operator. I get this information from a letter published in the *Electrician and Mechanic* for May, and inclose the same herewith. Kindly take note of the fact that Charles E. Pearce, the writer of the letter, is willing to make affidavit to the effect that all the entries upon his record are true, and that nothing has been omitted. Mr. Pearce's letter seems to prove beyond a doubt that there was no interference in this instance; yet, since for some reason or other the naval operators could not do their work properly, the poor amateur got the blame. If the case of the *Carpathia* was thoroughly investigated, it would probably be shown that there was no more amateur interference than there was in the case of the *Terry*. It seems to be a popular excuse for authorized operators to blame the amateurs for all their troubles, no matter what the true cause may be, and the uninformed public accepts it as the truth.

Mr. Beard alludes to my statement that the government employs antiquated instruments, as being false and groundless, but he does not back up his assertion. Probably he could answer the following questions:

1. Why can the majority of amateurs of this city pick up messages from longer distances than the naval station, which is equipped with an aerial five or ten times longer than theirs?

2. Why can the amateurs and commercial stations work with one another, when the government stations have to shut down on account of interference?

3. Why can amateurs in Washington read Piver's Island on many occasions, when the naval station has to have them relayed by way of Norfolk?

4. Why do the majority of amateurs here get long distance signals louder than the government station?

5. Why can the amateurs read official messages the first time sent, when the government operator must have them repeated, on account of interference?

There are only two answers. Either they do not employ efficient tuning apparatus or the operators do not understand the manipulation of their own outfits. The Marconi, Fessenden, and De Forest companies all have patented systems for the cutting out of interference, each one of which has proved its worth. Why does not the navy adopt one of these systems and thus put a stop to their troubles? Is it because they need the money?

I still contend that to deprive the wireless amateur of his apparatus would put a strong hindrance on the advancement of the art, as many patents have been granted to them in the last three years, which could not happen if the experimenter were put out of business.

EDWIN L. POWELL,
Washington, D. C.

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, 263 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: S. W. Wooster, president; R. Haynes, vice-president; C. Stone, treasurer; F. D. Northland, 24 Scott St., Chicago, Ill., secretary and corresponding secretary.

CHICAGO — Lake View Wireless Club: E. M. Fackett, 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.

STONEHAM—Stoneham Radio Association: Stuart R. Ward, president; Russell Colley, vice-president; Wendell Smith, 33 Warren St., Stoneham, Mass., secretary and treasurer.

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—East Side Y. C. C. A. Radio Club: Harold Sachs, president; C. Broggini, vice-president; David Brown, 206 West 86th St., New York City, secretary and treasurer.

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.

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; ●. 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.

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.

W. J. K., Chicago, writes:

(1) Can I use a loading coil in connection with a three-slide tuner?

Ans.—There is no reason whatever why you cannot use a loading coil with a three-slide tuner.

(2) Is it absolutely necessary to have a large loose coupler to hear big Eastern stations from here, or can I use a Murdock or similar make with loading coil?

Ans.—It would be far better for you to have an especially built large loose coupler to read the longer wave-lengths such as we have on the large Eastern stations. However, it is possible to read them with the small loose couplers generally furnished, provided you use the extra inductance you speak of.

(3) How much loading coil would be needed with small loose coupler?

Ans.—As a loading coil for a small loose coupler we would suggest that you wind a piece of tubing 8 inches long, 3 inches in diameter with turns of No. 22 wire bringing out taps at every 5 turns to a multiple point switch.

(4) With above and crystal detector minus battery could I hear East?

Ans.—It is far better for you to use a small amount of battery with crystal detectors, however, you do not state what type of crystal you expect to use. We could answer your question more definitely if we knew.

(5) What is price of multiple tuner? Would it work as in 4?

Ans.—The price of a multiple tuner can be secured by addressing a letter to the Engineering Department of the Marconi Company. A crystal detector can be used in connection with the Marconi multiple tuner as well as any other detector.

A. G. W., Phila., asks:

(1) Does a detector require amperage or voltage?

Ans.—We cannot answer your question as it is entirely too vague. It does not specifically refer to any type of detector.

(2) How is it that I have an output of 1.5 amp. with a closed and only .5 amp. with an inductive circuit?

Ans.—This question also is not plain. We do not understand what you mean by "a closed and an inductive circuit."

(3) Please give me the standard Marconi inductive circuit?

Ans.—You do not state whether you are referring to transmitting or receiving apparatus.

(4) Could you tell me why I cannot send very far using the following apparatus and hook up: Clapp-Eastham ¼-kw. transformer (magnetic leakage type), thirty plate (glass and brass plates) high potential condensers, double helix type oscillation transformer, stationary spark gap, anchor gap, key. The aerial is of the "V" type, 60 ft. high at one end and 80 ft. at the other, 110 ft. long, insulated throughout with electrose and porcelain insulators?

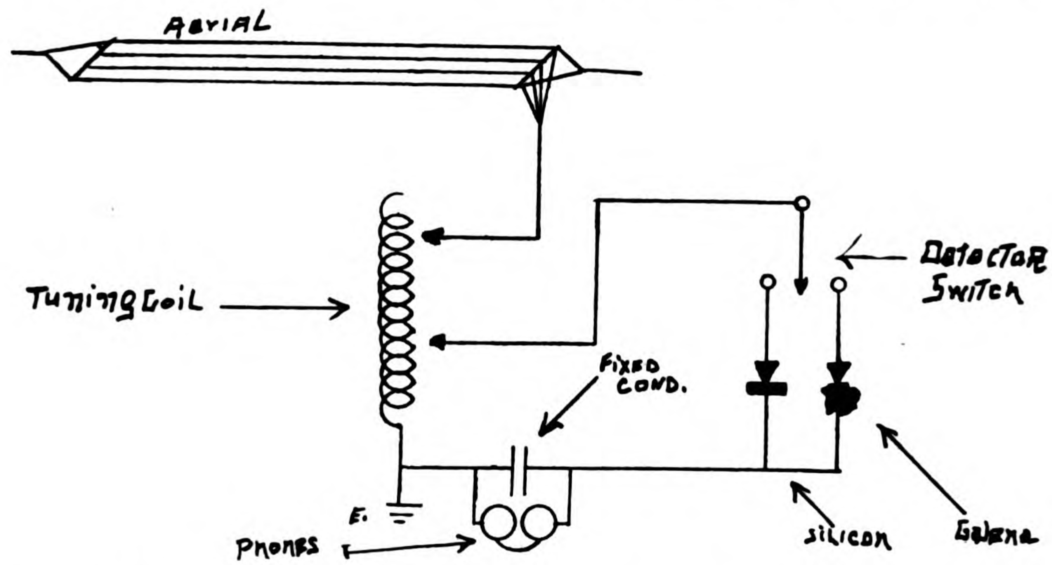
Ans.—In order to answer this question thoroughly we would have to know some of the constants of the circuits and data which no doubt you do not possess. For instance, you have not stated the size of the glass plate condensers so that we could figure approximately your capacity. It would, however, seem that your transmitting and receiving circuits are out of resonance.

(5) Could I use a helix according to the new law?

Ans.—This question also is not clear enough to be answered.,

(6) Would more condensers increase my sending range?

Ans.—We are unable to tell you, as we would have to know the capacity of your present condensers in order to answer this question.



G. R. E., New York City, asks:

(1) Please give me the wave-length of the following set: Aerial, 75 ft. long, 125 ft. high, 2 wires spaced 4½ ft. apart, lead in wire 40 ft. long, ground wire, 15 ft. long, connected to water pipe, 1 double slide tuner, 11 in. long, fixed condenser, silicon and galena detector and a 1,000-ohm receiver?

Ans.—The natural wave-length of your antennæ is approximately 165 meters. However, the tuning coil which you speak of should bring the wave-length up to approximately 2,000 meters.

(2) Has the *Times* a wireless set? If so, please give me their sending and receiving range, and where it is situated.

Ans.—So far as we know the *Times* has no wireless telegraph set. The *Times'* wireless foreign news is obtained by Marconi Transatlantic Wireless Telegraphy.

(3) Please give me a good diagram of connections for instruments described in my first question?

Ans.—The drawing gives a good practical diagram of your set.

(4) Why is it that I have to keep touching the key to my test buzzer when I am receiving? If I do not do this the signals die out altogether.

Ans.—In order to answer your question we would have to know more specifically the conditions surrounding your wireless set. The question is very vague. You should be more definite in asking questions.

Arctic Expedition Wireless Equipped

Carrying moving picture machines and a wireless apparatus Vilhjalmur Stefansson, discoverer of the blond Eskimos, is preparing to sail again for the polar regions, to be gone nearly four years. A new expedition sent out by the Canadian Government under his leadership will leave San Francisco the latter part of May or the first of June, in an effort to explore a vast tract of barren lands lying near the pole.

The explorer is taking along the picture apparatus to prove that Eskimos of light complexion are to be found there. The wireless will be used to keep in communication with the outposts of civilization.

Late Developments in the Investigation of the Imperial Contract

IN the February issue of THE MARCONIGRAPH we reported that when the House of Commons Committee inquiring into the contract for the establishment of Imperial wireless stations met on January 20, a letter was read from Mr. Godfrey C. Isaacs, managing director of the English Marconi Company, to the postmaster-general. We quoted the substance of this communication, which was submitted to the Select Committee, who ordered the following letter to be sent to the postmaster on January 27th:

SIR,—The Select Committee on Marconi's Wireless Telegraph Co. (Ltd.) Agreement direct me to inform you that at their meeting to-day they have come to the following resolution:

"That the Postmaster-General be informed, in reply to his letter of the 17th instant, that the Committee having now heard a statement from Mr. Marconi and the evidence of Sir Alexander King, are of opinion that, pending further inquiry, the Committee do not consider themselves in a position to advise the Postmaster-General as to the desirability of releasing the Marconi Company from the agreement entered into in July, 1912.

I am, Sir,
Your obedient servant,
R. BAILEY,
Clerk to the Committee.

The following letter was sent on February 5th by the direction of the Postmaster-General to the company:

GENTLEMEN. — With reference to your letter of the 15th ultimo, in which you ask that the Government will agree to the company's treating the contract of the 19th July, 1912, as no longer binding upon either party, I am directed by the Postmaster-General to express his regret that, after full consideration, His Majesty's Government are unable to accede to the company's request.

The Postmaster-General regards the delay which has taken place as very regrettable, but it is the consequence of the provision, embodied in the contract, that it should not take effect until approval had been given by the House of Commons. The fact that delay has occurred from this cause cannot be regarded by the Government as an adequate reason for releasing the company from their obligations.

I am to add that the Postmaster-General proposes to publish this reply.

I am, gentlemen,
Your obedient servant,
A. F. KING.

On February 6th the following letter was sent by the Marconi Company to the Secretary of the General Post Office:

SIR,—We have to acknowledge the receipt of your letter of the 5th instant. Whilst agreeing that the Postmaster-General that the delay is a consequence of the provision in the contract, we do not understand that it is suggested that such a delay is a natural or necessary consequence, or that it was such as was contemplated by either party to the contract.

For the reason set out in our letter of January 15th, we feel we are morally entitled to ask that the agreement should be considered as no longer binding on either party, and we had every hope that in view of the facts to which we called attention, and which are not in question, our request would have commended itself to His Majesty's Government, whose decision we now learn with much regret.

We should add that in addition to the matters in respect of which we were being prejudiced, and to which we have already called attention, we have been obliged to reserve, for nearly a year, to enable us to carry out the work which we have undertaken, a sum exceeding £300,000. This is a serious matter for a business company, and if continued would necessarily tend to restrict and hamper our commercial programme generally.

Apart altogether from the moral position, we thought it well to take the opinion of Sir Robert Finlay as to our legal rights, and he has advised that we are now entitled to intimate that unless the postmaster is in a position to definitely confirm the contract by March 1st next we will treat such contract as at an end.

We should, however, be reluctant to rely upon our legal rights did we not feel that we had strong moral grounds for the position we are taking up.

In these circumstances we would venture to ask that our letter of the 15th ultimo be further considered, and we trust that as a consequence we may not be put under the obligation, through no fault of our own, of rescinding a contract entered into with His Majesty's Government.

Inasmuch as this matter has become public, and your letter of yesterday has been published, we would ask that publicity be also given to this letter.

I am, Sir, your obedient servant,
Marconi's Wireless Telegraph Co., Ltd.,
GODFREY C. ISAACS,
Managing Director.

To this the Postmaster-General caused the following reply to be sent to the company on February 15th:

GENTLEMEN,—In reply to your letter of the 6th inst., I am directed by the Postmaster-General to say that he can do no more than repeat the conclusions stated in my letter of February 5th, and arrived at after careful consideration—namely, that, while he greatly regrets the delay which has taken place, he cannot admit that the delay has been such as to entitle you to withdraw from the contract.

In view of the deliberations of the Select Committee and of the inquiries that are being made at their request by the Technical Committee, there is, of course, no prospect that a decision can be reached in the matter by March 1st.

The company's reply on February 20th was as follows:

SIR,—We have to acknowledge the receipt of your letter of the 15th inst., in reply to our letter of the 6th inst. We regret to learn that the Postmaster-General is unable to do more than repeat the conclusion stated in your letter of February 5th.

In these circumstances we are very regretfully obliged to inform you that after March 1st next we shall no longer consider ourselves bound by the contract of July 19th last.

When a definite decision may be taken with regard to the building of the Imperial stations we will be pleased again to take this matter into consideration.

I am, Sir,
Your obedient servant,
G. C. ISAACS,
Managing Director.

On January 27th Mr. Marconi attended at the invitation of the Committee, and was asked to state the reasons for his desire to withdraw from the contract. He replied:

"My views on the suggested withdrawal of the Marconi Company from their agreement with the Postmaster-General are expressed in a general way in the letter which the company has addressed to the Postmaster-General, and which is now, I believe, in the hands of the Committee. I understand, however, it is the wish of the Committee that I should give my views at greater length. I am personally a party to this agreement, and I am, of course, very desirous of doing so. There is, however, only one way, in my opinion, that this can be done efficiently, and that is by my giving evidence in reply to all that has been said in this room. It is, I feel sure, the only possible means of the Committee understanding and appreciating the reasons for the course I have adopted. If the honorable members of this Committee do not wish to hear my reasons in full and the evidence which I have prepared in the form which I think necessary, it will be better for me to confine myself to my general views, which are expressed in the letter to the Postmaster-General:

but, inasmuch as my company, my work, and my honor have been frequently attacked during the three months the Committee have sat, if I am to say anything at all, I must be allowed to submit a full reply to those attacks."

Later, the Committee deliberated in private, and on the public being admitted to the Committee room, the Chairman, addressing Mr. Marconi, said:

"The Committee have considered your application to be heard, and they have decided that you be heard in full at a convenient date, probably at the end of the journalists' evidence, and we do not propose to call Mr. Godfrey Isaacs at this stage."

Sir Alexander King, the Secretary to the Post Office, was also recalled, and in reply to the Chairman said that his own view had been expressed on more than one occasion before the Committee, in a word, that the bargain the Government had made was a very good one.

Notable Patents

A new system of radiotelephony in which the transmitter is excited by means of continuous oscillations of constant amplitude in accordance with the known system of Thompson-Duddell is the combined invention of Wilhelm Schloemilch, a German engineer and Paul F. Pichon, a French engineer, residing in Germany. In this system the aerial transmitting conductor is exposed directly to the alterations of the resistance of the microphone instead of through the medium of the exciting circuit.

Another essential feature of this system consists in the dimensioning of the coupling between the exciting circuit and the transmitter circuit at the transmitter station and between the receiving circuit and the detector circuit at the receiving station.

A special advantage of the new system resides in the fact that resonance phenomena on the transmitter and receiver station which are extremely detrimental to the distinct transmission of the words, are obviated.

The well-known method of increasing the amplitude of oscillations in receivers by means of resonance inevitably results in an essential alteration of the shape of the oscillation. In wireless telephony it is however essential for a clear reproduction to have the shape of the curve in the telephone identical to the shape of the energy curve of the system containing the microphone. For this purpose the transmitter microphone is not connected to the exciter circuit but to the transmitter antenna. In the latter high frequency currents are conveniently induced by means of a loose coupled system. From empirical results it has been found that the best results are obtained if the degree of coupling does not exceed about 3 per cent. The loose coupling insures that the shape of the current curve is unaffected by reaction on the energy circuit. At the same time the purpose of making the amplitude of the oscillations in the aerial conductor very great is attained, inasmuch as resistance variations result in great variations of the radiating properties of the aerial conductor in case of loose coupling. Contrary to the usual scheme of connections for transmission with undamped oscillations or only slightly damped oscillations an integrating detector is connected to the receiving aerial conductor either directly or by means of a resonance circuit in such a manner that the aerial conductor is made practically aperiodic. In consequence the energy that has been received is transmitted to the detector instantly and produces in the telephone currents or variations of a direct current which are exactly in accordance with the amplitude of the high frequency currents in the transmitter.

The accompanying drawings show diagrammatically an application of the present invention in two modifications.

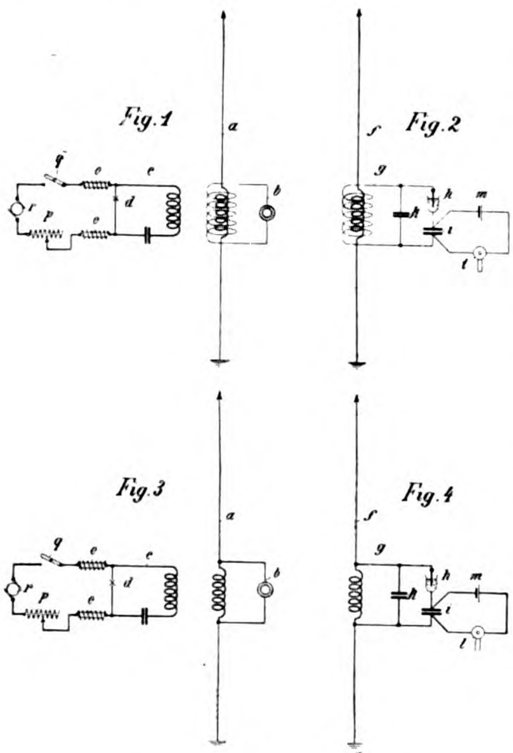


Figure 1 is a diagram of a transmitter station, according to the invention. Fig. 2 is a diagram of the co-operating receiving station. Fig. 3 is a diagram of a modification shown in Fig. 1, and Fig. 4 is a diagram of the co-operating receiving station, also modified accordingly.

In Fig. 1 *a* indicates the transmitter circuit or aerial conductor which is connected to the microphone circuit *b* inductively by means of a rigid coupling. The transmitter circuit is excited by means of the closed exciter circuit *c*, which is energized by a circuit containing dynamo *r*, regulatable resistance *p*, choking coils *o* and switch *q*. The circuit *c* is tuned to the transmitter circuit and contains an arc *d* for the production of undamped waves, the coupling between the exciting circuit and the transmitter circuit being less than 3 per cent.

In Fig. 2 *f* indicates the receiver circuit which is connected inductively to the detector circuit *g*. The detector circuit forms a resonance circuit which contains high self induction and a condenser *k* of low capacity; an integrating detector *h* for instance an electrolytic cell as shown, is connected in parallel to the condenser. In a case of this kind the resonance circuit must naturally be coupled as rigid as possible with the aerial conductor.

In series with the detector *h* is disposed a condenser *i*, to which an indicator *l* for instance a telephone and a source *m* of direct current energy is connected. The condenser *i* serves as blocking condenser with regard to the direct current produced by the current source *m*.

Instead of the inductive coupling between the microphone circuit and the transmitter circuit and between the detector circuit and the receiver circuit in both cases a conductive connection may be used, as shown in Figs. 3 and 4. As will be seen in Fig. 3, the microphone circuit *b* is conductively connected to the transmitter circuit, and from Fig. 4 it will be seen that the detector circuit is conductively connected to the receiver circuit.

* * *

Dedicating his invention to the public, Grier P. Mobley, a Texan, has evolved a wireless break key, which he states may be used by the Government or any of its officers or employees in the prosecution of work for the Government, or by any other person in the United States, without the payment of any royalty thereon.

This invention relates to wireless apparatus, and more particularly to a break key for the same.

The object of this invention is to provide a break key which will obviate the necessity of having more than one aerial for the transmission and receiving of wireless messages at one station

A further object of this invention is to provide a key which will eliminate the necessity of providing a disconnecting detector and the removal of the telephones from the head when sending a message.

Also to make it possible for both sending and receiving stations to instantly detect any interference from a third party, and to make it practically impossible for the operator to receive a shock and to prevent the burning out of the receiving instruments.

This invention is in general simple and at the same time eliminates the necessity of separate aerials being provided for the receiving and transmitting circuits of a wireless station, which have been provided in the past. At the same time it will be noted that the simplicity of the design of the apparatus is such that it practically eliminates any possibility of uncertainty in its action and at the same time permits it to be made very cheaply. Further, the parts are readily accessible for inspection and repair, whenever the same will be necessary, which increases the reliability of the apparatus and its value in this class of work.

Fig. 1.

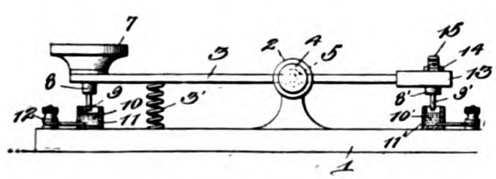


Fig. 2.

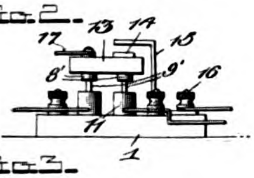
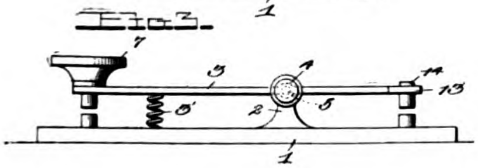


Fig. 3.



In the drawings Figure 1 is a view in elevation of a break key embodying this invention; Fig. 2 is an end elevation of Fig. 1: Fig. 3 is a modification of the contact points used in this invention, and Fig. 4 is a diagrammatic view of the break key as applied to a wireless transmitting and receiving circuit. Dotted lines in helix indicate wiring when helix is not used.

1 represents a suitable insulating base block for a break key on which is mounted a journal 2 for pivotally securing a key lever 3. This journal is preferably provided with the usual type of holding screws 4, so that the frictional resistance on the pins 5 disposed within them, that support the lever 3, can be varied to suit the conditions.

7 is a cap or head on which the operator can suitably play to actuate the key. Beneath the cap portion of the lever is a contact member 8 which is provided with a platinum pin 9 which actuates in mercury or other suitable substance 10 disposed within the cup 11 provided therefor, which is disposed on the base 1 and provided with a suitable terminal connection 12 arranged for the securing of the circuit wires thereto.

At the other end of the lever 3 is provided an insulating block 13 that is provided with a pair of contact blocks 8′ which are provided with platinum points 9′ and mercury 10′ and a suitable cup therefor 11′. The mercury cups being suitably secured to the insulating base 1 and provided with terminals for the connection of the circuit wires, as is clearly shown in the drawings.

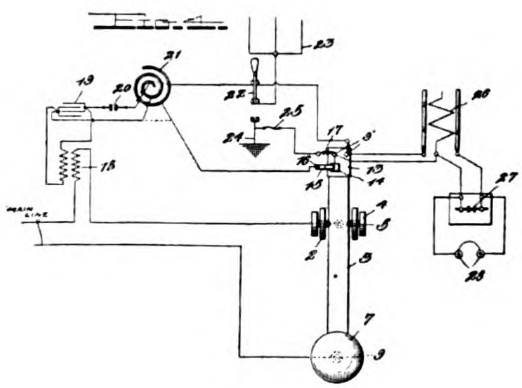
Mounted on the upper portion of the insulating block 13 is a strip of metal 4 electrically connected with one of the contact members. This strip of metal being arranged to come in contact with a Z-shaped conductor 15 fastened to the base, and slightly to one side of this portion of the key, and so that the piece 14 will come in contact therewith when the head 7 is depressed by the operator.

16 is a suitable binding post disposed on the Z-shaped member 15 so that the latter can be electrically connected to the circuit wires.

Electrically connected to the other contact member which is disposed on the block 13 is a flexible connection 17 that is suitably connected with the line wires of the circuit.

Referring to the modification shown in the contact points, which are merely solid pieces of metal, and arranged for those conditions where the mercury contact is not desirable and might prove objectionable, or where it is desired to cheapen the instruments.

While platinum has been referred to as the metal particularly desirable for the purpose of making the contact, it is of course understood that there are metals of a similar nature that can be used for the same purpose, and also that various other contacts can be arranged for, as is well known to those familiar with the art.



Referring particularly to Fig. 4, 18 is a transformer, 19 a condenser, 20 represents a spark gap, 21 a helix, 22 a suitable single-pole double-throw switch, that is suitably connected to an aerial 23, 24 is a ground wire that has a conductor connected to it that runs to the flexible contact 17, through the fuse 25. 26 denotes the tuning coil, and 27 a detector, that has suitable telephone receivers 28 connected thereto in the usual manner.

From the diagrams shown it is understood that the connections are made in the usual manner and that it is not necessary to go into details and describe each particular part of the apparatus, this particular system is only shown by way of example, in order to explain more fully the operation of this device. By suitably modifying the connections to this break key it can be connected to practically any wireless system and prove advantageous to use in them all. The connections arranged for the various parts of the key are preferably made so that they will be inconspicuous or concealed, or in any way suitable for the conditions arising. The general connections, however, being made to the various parts of the key, as is noted in the diagrammatic drawing.

In operation the operator depresses the head 7 of the key and causes the current to flow through the terminal 2 of the lever 3 thence to the contact member 8 and thence to the circuit connected with the transformer, so on back to the source of current. This depression, of course, energizes the transformer and sends the messages to the aerial and to the space beyond it. As this depression of the key is made contact is broken between the points 9′ and 10′ in the members disposed at the other end of the key, these break the receiving circuit and prevent the operator from receiving the messages that he is sending out, which often is the cause of burnt up instruments or injury to the former, at the same time any other messages being sent by another party are cut off from the operator. As the outer portion of the key arises the strip of metal 14 comes in contact with the Z-shaped member 15 and the current therefrom flows through the latter, through the circuit wire, attached thereto, which can be easily followed in the diagram, and which assists in the transmission of the message to the aerial.

When the operator permits the key head to rise under the action of the spring 3′ which is disposed adjacent to the head 7, it brings the contact members 8′ and 10′ together and completes the circuit for receiving, and at the same time the circuit that receives the current from the main source of current at this station is opened and does not flow through the transformer, thus enabling the operator to receive any messages being sent to him and eliminating any possibility of his transmitting apparatus interfering therewith.

Hear Aerial Conversation

Elmer Black, wireless man on the wrecking steamship *Tasco,* on returning to port from a recent trip, reported that while his vessel was in Long Island Sound he heard messages from a wireless telephone. The operator by adjusting his instruments heard conversation distinctly. Frequently a man was addressed as "Professor." About the same time while the naval radio station at Newport was tuning up to send messages to the Arlington station the operator was startled by voices, heard at somewhat irregular intervals. After a careful manipulation of the instrument a graphophone was distinctly heard and four or five tunes were recognized by the operators.

Commander George W. Williams, U. S. N., inspector in charge of the naval torpedo station, will make an official investigation and report to the Navy Department.

Book Reviews

Copies of books reviewed are obtainable through THE MARCONIGRAPH at listed prices. Address Book Department.

Engineering as a Vocation. By Ernest McCullough. New York: David Williams Company, 1912. Price, $1, net.

The aim of this book is to inform parents so that they may act wisely in selecting a career for their sons and to counteract what the author chooses to look upon as a present day evil; to wit, the fact that semi-technical periodicals and daily newspapers are bureaus of information consulted frequently by ill-informed parents who take the opinions thus obtained as valuable advice. In one chapter the author severely criticizes the methods of engineering schools, shows how a man is best prepared by some sixteen years of school work before graduating from the technical school and discusses the feasibility of the high school doing some of the preparatory work. After treating of the limitations and disheartening features of hurried preparation in the evening institutes and showing some of the difficulties besetting the completion of the correspondence courses for home study, the author gives a list of books intended for the man who has to do his studying at odd moments. Several typical courses of engineering are also given, but in the opinion of your reviewer it looks as if the home student is merely offered a choice of two evils, each as great as the other. It also seems that things are painted too darkly in the chapter, "Does it Pay to Study Engineering?" devoted to the engineer's hardships during dull periods and the injustice often done by persons in charge of the men, concluding with a discussion of the temporary nature of the work of the civil, mining, mechanical and electrical engineer of minor standing. The calling of the engineer may be arduous but the pay of graduate engineers is sufficiently high to encourage the young man and the same difficulties in reaching the top of the ladder undoubtedly apply to the other professions. In the whole, the book is admirably suited for those desiring a clear conception of engineering and a permanent value has been given it through the strong plea made for broad and thorough fundamental training and the elimination of specialties until the student knows himself.

The Wireless Man. By Francis A. Collins. New York: The Century Company, 1912. Price, $1.20 net.

Every one of the 100,000 boys in the United States who are actively engaged in operating amateur wireless stations should enjoy this fascinating book. From an absolutely non-technical viewpoint, the author explains the component parts of wireless apparatus in a manner that makes their functions at once apparent to all, and graphically the great commercial stations, shows the reader the men at work aboard the giant liners, tells of heroic rescues and unusual occurrences, and concludes with some of the novel uses to which wireless has been put. More in the nature of a personal chat on wireless in general, this book will be welcomed principally through its author having caught the romance and the real spirit of wireless.