"DAILY MIRROR" W.T. DEMONSTRATION.

This demonstration, which was initiated by the "Daily Mirror," took place at Ramsgate, on September 27th, 1911, and was attended by representatives from the Admiralty, War Office, Trinity House, and many other bodies.

The inventor of the system, Mr. Sharman, explained briefly his method of communication, after which he carried out wireless telegraphy communication between the lecture room and a boat moored out in the bay at a distance of about a mile from the shore, using a power of about 6 watts. The attempt to establish wireless telephony communication with the same boat was not successful, though Mr. Sharman stated that he had never previously experienced any difficulty.

The invention is based on the following principle :—

If a current be caused to flow between two earthed plates separated, say, about 100 yards from each other, the current will not, if of sufficient density, take the most direct path between the two plates, but will spread out and take up a path similar to that taken by the lines of force between the poles of a horse-shoe magnet; if, now, two similar earthed plates, about the same distance apart as in the case of the first pair, be placed in this field of "current leakage," and a device for detecting minute electric currents be placed in the circuit joining them, then some of the leakage current will pass through this circuit by these earth plates and cause the receiving device to respond.

In practice it has only been possible up to now to obtain communication in this manner over a distance between the pairs of earth plates of about five times the distance separating the two earth plates of a pair, but this invention claimed that, under certain conditions, and with the instruments designed by the inventor, the available range had been increased by four times that formerly obtained.

The system was worked as follows :—

On the shore there were two earthed plates separated about 100 yards apart, from which two insulated wires were led, and connected to a specially constructed auto-transformer, the winding of which was rather similar to the primary of an induction coil, but having many more turns of wire, in such a manner that the transformer gave a step down voltage to the line wires, the ends of the coil being connected through a morse key and hammer make and break to six dry cells connected in series.

For transmitting, the hammer make and break was operated in the usual manner, thus inducing high voltages in the transformer and stepping down the induced voltage between the earth plates, with a consequent rise of current capacity output, thereby obtaining proportionately high momentary current density in the line circuit and between the earth plates.

For telephony, the hammer make and break was replaced by a microphone transmitter.

In order to "receive" the only alteration made was to switch a telephone receiver having a resistance of $\frac{3}{4}$ ohm into the line circuit.

In the boat were placed exactly similar devices and instruments as on shore, one earth plate being hung over from the boat, the other from a buoy towed about 100 yards astern.

The greatest range for a given base length is obtained when communication takes place through salt or brackish water, the range for telegraphy under these circumstances being about 20 times the base length when the bases are squarely opposite one another, about twice the base length when the bases are in line with one another, and no communication at all when the bases are at right angles and opposite to one another (forming letter "T"); for telephonic communication the distances are about one third those for telegraphic communication; when communication is through land the ranges are about half those obtained through sea, though this varies with the nature of the soil.

In its present state the system is entirely useless for Service purposes, principally due to its extremely directional effect. It is thought that, with larger power and in some way overcoming the present directive effect, the invention might be made of some use, but it is not proposed that "Vernon" should take up the matter experimentally.

The difficulty against increasing the range for telephony by means of using larger power is due to the usual trouble with the microphone transmitter, when the current passed through it is increased beyond a certain maximum.

CLIFDEN W.T. STATION.

(Abstract of report by the G.P.O. Inspector of W.T. on the working of Clifden, during December 1910 to January 1911, as observed at Skegness W.T. Station.)

Summary.		Average per diem.
Total number of public radio-telegrams from Clifden in 29 days	1,406	48
Number of words in above telegrams	10,718	370
Estimate.		
*Number of telegrams from Glace Bay 23 days	1,352	59
Number of words in press messages from Clifden, 29 days	17,453	603
Number of Service messages from Clifden, 29 days	473	16

2. In my opinion, the communication between Clifden and Glace Bay is good only under favourable conditions. The time of year at which these observations were made is the most favourable for wireless telegraphy, *i.e.*, short days and few atmospheric disturbances.

3. Under unfavourable conditions the communication is likely to be very difficult as now arranged over the circuit.

4. I do not think there is much in transatlantic wireless telegraphy under present conditions as a commercial undertaking.

5. I think communication over 2,500 miles is quite good enough, however, for places where there is but little traffic, or in any case where it is strategically desirable. I should call it very much slower, but quite as reliable, as cables. A message may be delayed many hours owing to local conditions, but it is practically certain to get through in the end.

6. Other localities in the world might, perhaps, give better technical possibilities.

7. After conversations with the operators, I think a speed of ten words per minute in plain language could be maintained between Clifden and Glace Bay, under normal conditions, for 12 hours per diem each way, including repetitions, &c.

8. The best speed does not exceed 20 words per minute.

Report on Clifden W.T. Stations.

(By Capt. C. G. Crawley, R.M.A., H.M.S. "Defiance," dated 29/5/11.)

(1) The following are the changes in the station itself since last year's report, August 1910:—

Transmitting Arrangements.

Spark Gap.—A new disc spark gap was in use. This disc has 12 studs, and is run at 1,600 revolutions, and is mechanically more efficient than the older pattern.

Blower.—A blower is now used on the spark. The air from the fan motor passes through a cylindrical metal reservoir on its way to the gap. This arrangement steadies the air pressure on the spark, and assists in keeping the air cool.

Mr. Marconi stated that the chief use of the blower was to "quench" the spark, not to prevent arcing, and that since it was fitted, one wave only—the wave to which the primary and aerial are tuned—was transmitted.

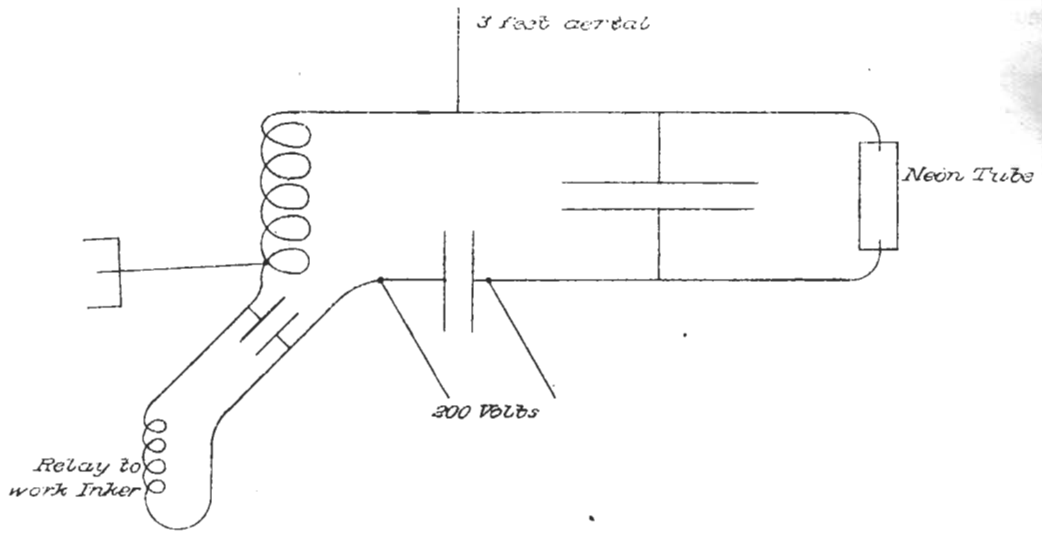
Traffic.—The total traffic sent and received averages 20,000 words per week, and an increase is not desired just at present, owing to the difficulty of fitting in experimental work.

Inker.—An inker recorder is used. It is placed next the sending Morse key, and is used as in Fig. 1, being operated by a "neon" tube connected as a coherer in a circuit influenced by the aerial. It thus has the advantage of recording the signals made by the spark, not necessarily by the key.

Earth Gap.—The gap in the earth lead of the aerial is shorted, when sending, by a solenoid switch, worked off contacts on the send receive switch in the receiving room. This is done as the gap is sometimes shorted permanently by the metal fusing.

* Observations only obtained on 23 days, and then only from Clifden's acknowledgments, not by nearing Glace Bay itself.

FIG. 1.



Receiving Arrangements.

A balanced circuit is still used to reduce atmospherics. It certainly does reduce atmospherics more than signals, but it was not possible to obtain a conclusive test of its efficiency on the 22nd May, as the atmospherics were not strong enough. It was said that the oscillation valve is suitable for the reduction of atmospherics owing to the limiting value of the current through the valve. Carbon filament valves were in use, but it was said that the tungsten ones were also often used.

Experiments.

(a) *Duplex Working.*—Mr. Marconi demonstrated the practibility of sending full power from the Clifden Station on a 15,750-foot wave at the same time as signals were being received from Glace Bay at a station 8 miles from Clifden on a 21,000-foot wave.

This latter station was at Letterfrack, 8 miles N. 10° E. of Clifden Station, with no high land intervening in a straight line between the stations.

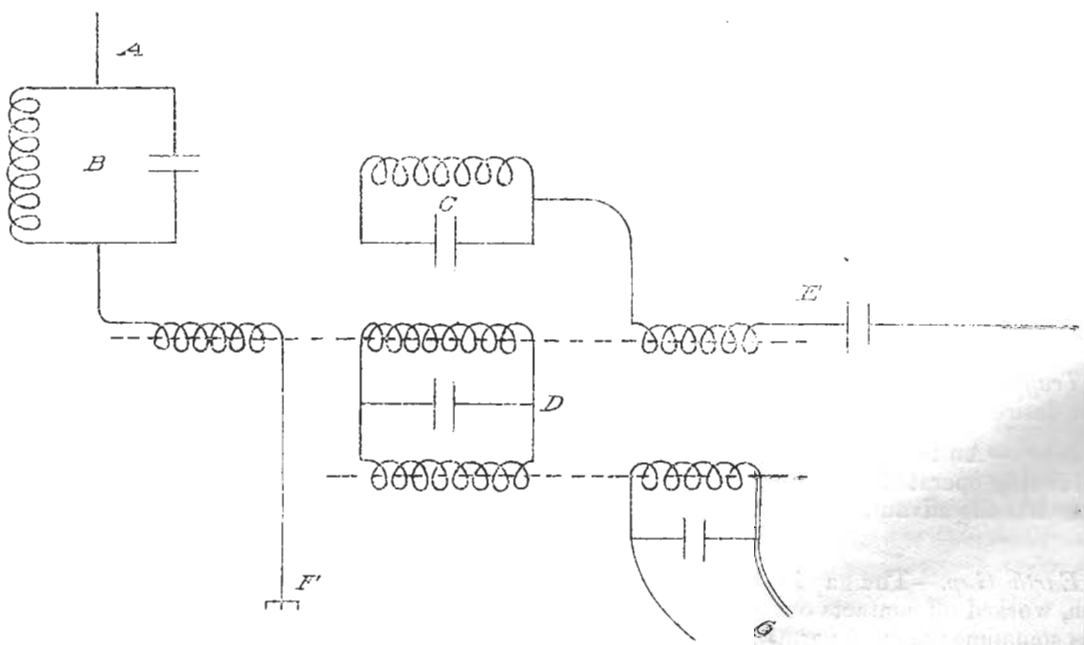
The receiving circuit is shown in Fig. 2. A second low directional aerial for Clifden joined to the rejector in prolongation of the one shown, and exactly similar to it, was also tried and appeared to improve the effect.

The vertical plane through these low aerials is, roughly, at right angles to that through the high aerial.

Receiving Circuit at Letterfrack :—

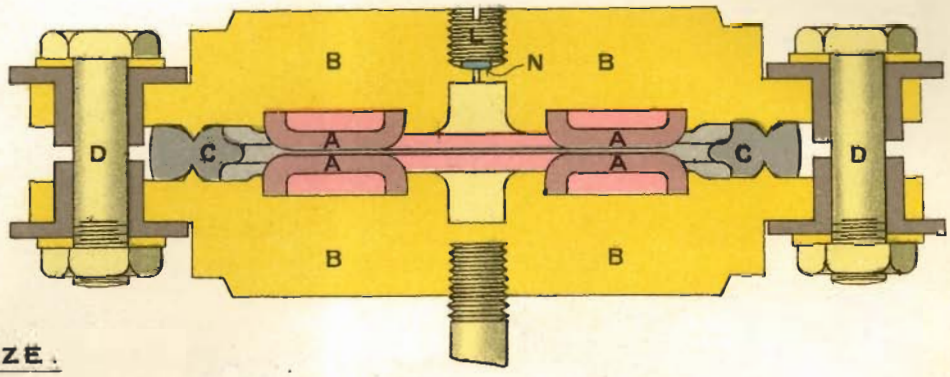
Glace Bay, 3,000 miles away, sends 21,000-foot wave.
Clifden, same power, 8 miles away, sends 15,750-foot wave.
Letterfrack receives Glace Bay ; cuts out Clifden.

FIG. 2.

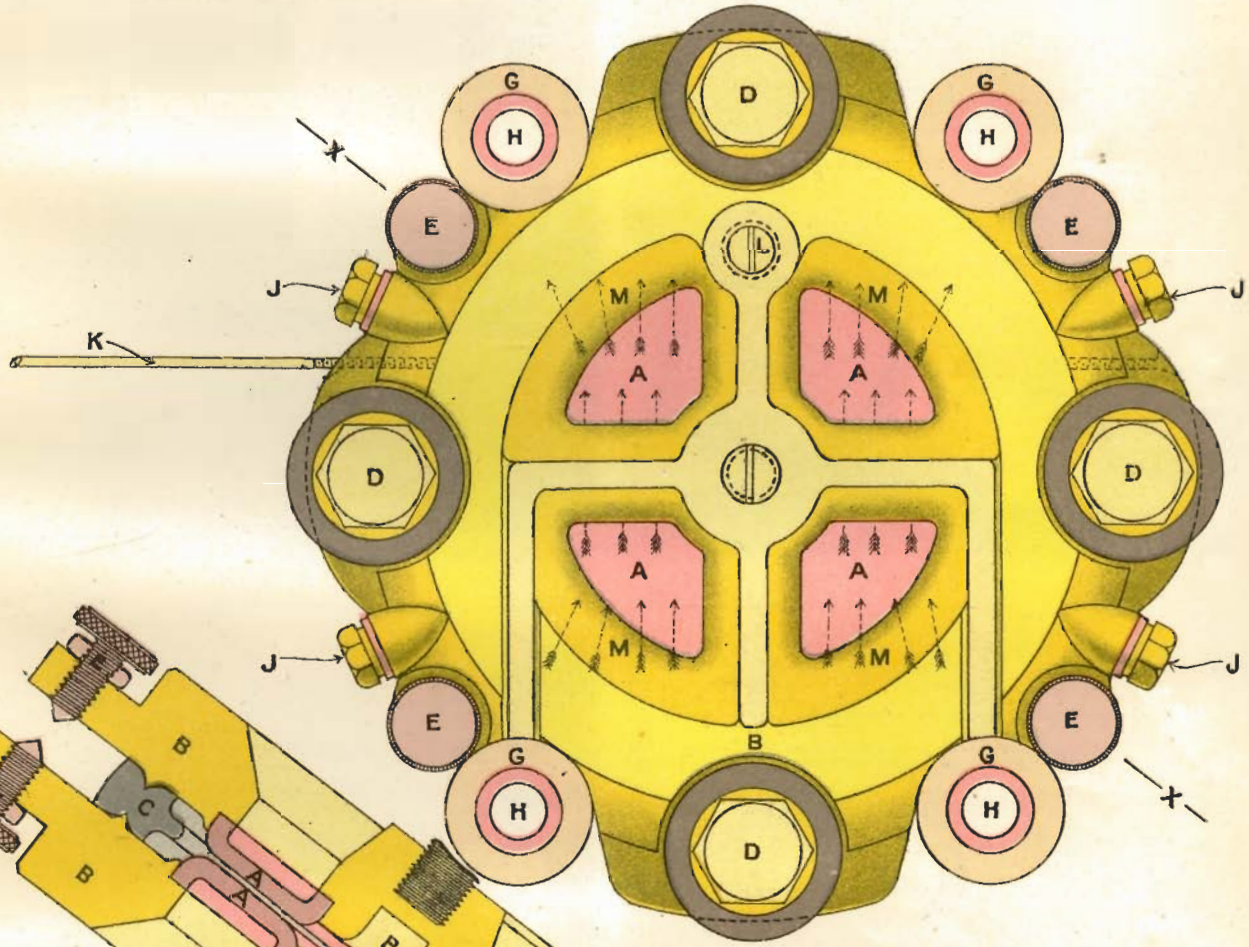


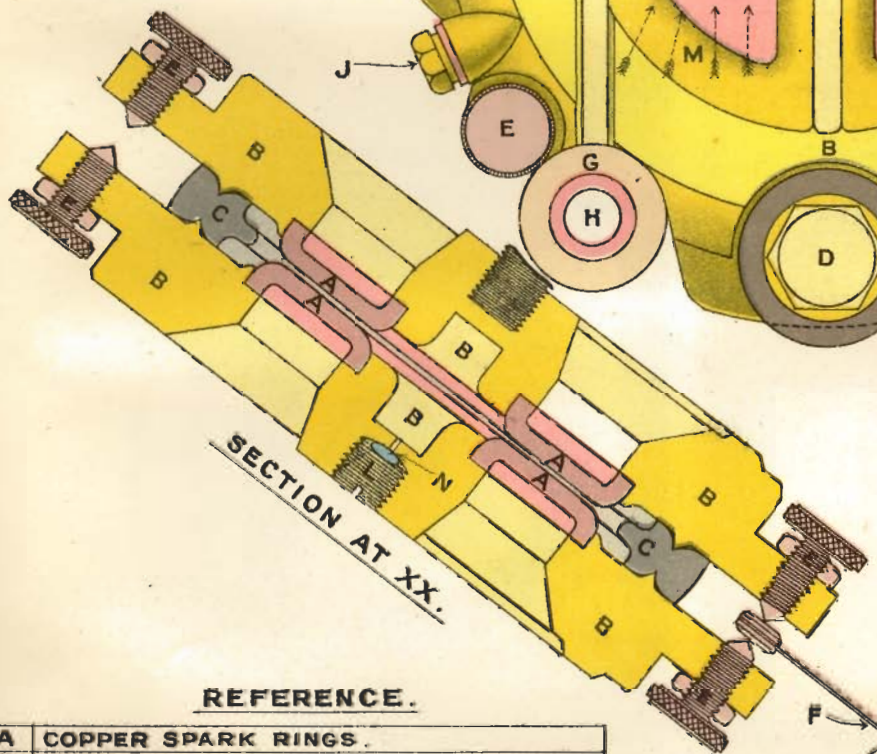
A = Single wire, 6,000 feet long from top of hill 1,280 feet above station, tuned to 21,000-foot wave, directional for Glace Bay. B = Rejector for 15,750-foot wave. C = Rejector for 15,750-foot wave. D = Tuned to 21,000-foot wave. E = Single wire 5,000 feet long, 30 feet above station, tuned to 21,000-foot wave, directional for Clifden. F = Conductive earth in pond. G = To valve circuit.

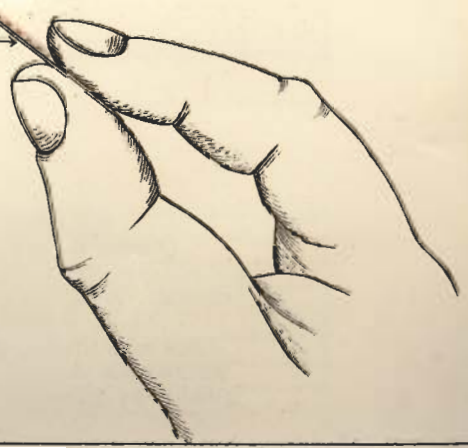
TYPICAL QUENCHED GAP.



SCALE ¾ FULL SIZE.



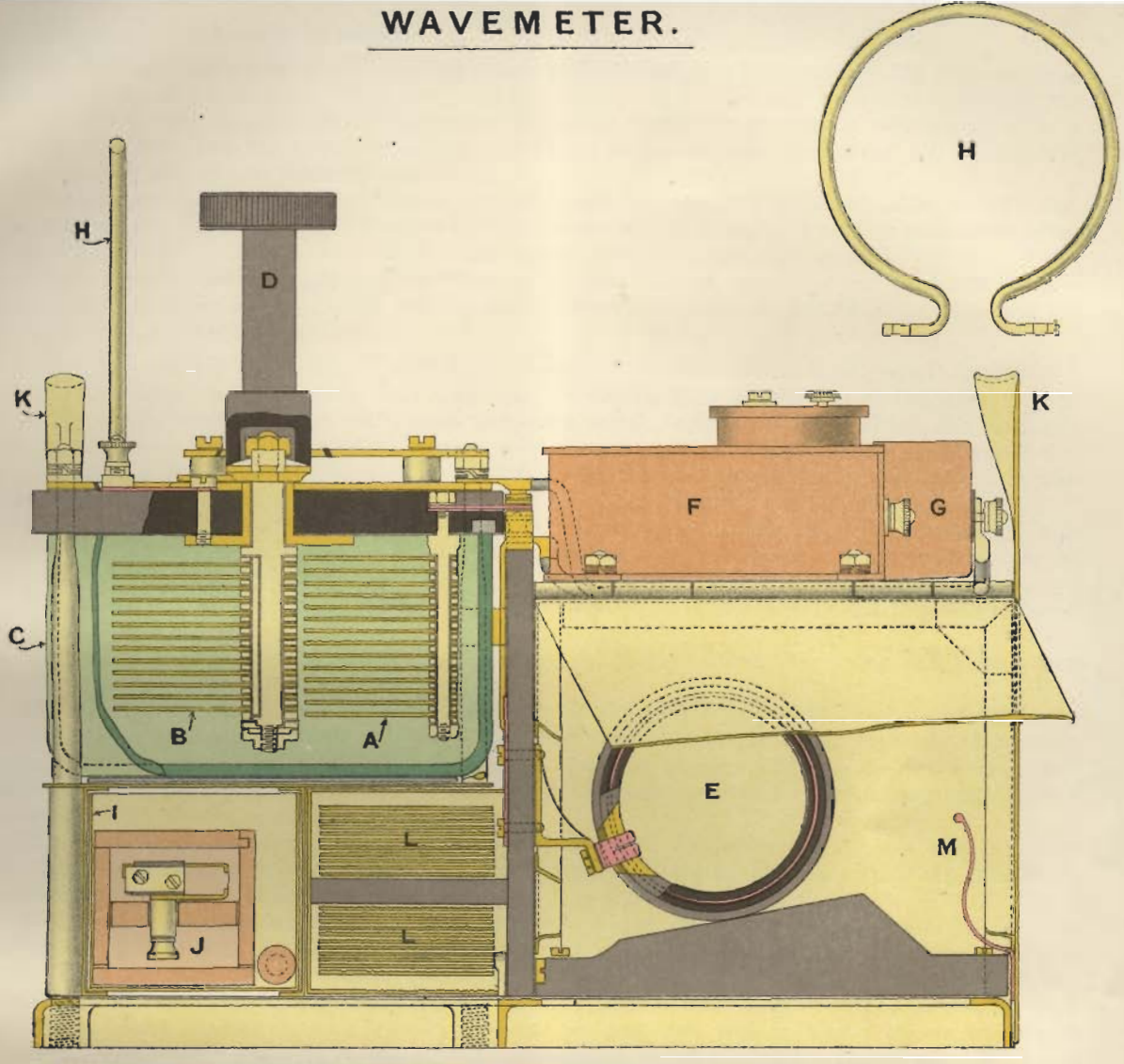




REFERENCE.

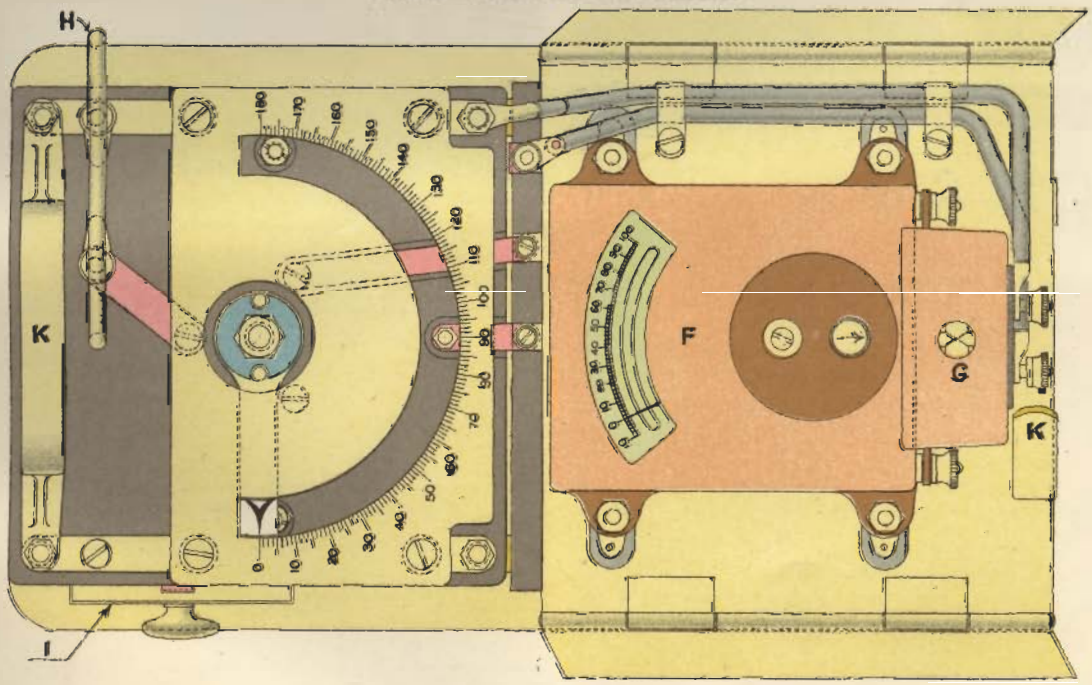
A	COPPER SPARK RINGS.
B	BRASS HOLDER.
C	WOODITE COMPRESSION RING.
D	BOLTS FOR ADJUSTING GAP.
E	SCREWS FOR GAUGING GAP.
F	GAUGE FOR SETTING GAP.
G	PERTINAX TUBE.
H	COPPER TUBE.
J	TERMINALS FOR CONNECTING UP GAPS.
K	SCREWS FOR CONNECTING TO RESISTANCES.
L	PLUG FOR FILLING WITH HYDROGEN.
M	COOLING AIR BLAST.
N	LEAD PLUG.

WAVEMETER.



PLAN.

WITH HANDLE REMOVED



REFERENCE.

A.	FIXED VANES FOR CONDENSER. (VARIABLE.)	F	THERMO-GALVANOMETER.
B.	MOVING VANES FOR CONDENSER.	G	THERMO-JUNCTION (IN COVER).
C.	GLASS CONTAINER FOR CONDENSER.	H	MUTUAL FOR USE WHEN MEASURING
D.	DETACHABLE HANDLE FOR		WAVES NOT INSIDE SAFETY SCREEN.
	WORKING CONDENSER.	I	DRAWER FOR REPAIR OUTFIT.
E	INDUCTANCE ENGAGING CONTACTS	J	SPARE THERMO-JUNCTION (IN BOX).
	INSIDE OF BRASS BOX.	K	HANDLES FOR LIFTING WAVEMETER.
L.	FIXED VANE CONDENSERS.	M	SPRING CLIPS TO RECEIVE STAND
			FOR MUTUAL.

The arrangement works as follows:—

The high aerial is tuned to and receives Glace Bay because it is high enough and is directional. The high aerial also receives Clifden very strongly because it is close and high, although it is not in tune and is not directional. Its rejector, however, tends to prevent it oscillating with a 15,750-foot wave, and the principal effect of Clifden is to oscillate the aerial at its natural frequency, *i.e.*, that of a 21,000-foot wave.

The low aerial is tuned to but cannot receive Glace Bay because it is not high enough and is not directional. The low aerial receives Clifden very strongly because it is close and directional, although it is not in tune and is not high. Its rejector acts as in the high aerial.

It can therefore be arranged that the effects of Clifden on each aerial are the same and balance each other so as to produce no effect on the intermediate receiving circuit, which, influenced by the high aerial, receives Glace Bay.

Remarks.—In this experiment, before Clifden sent at all, the strength of signals from Glace Bay, at Letterfrack, was not more than 5, so that the results were a good test of the efficiency of the arrangement, because with a really good receiving aerial, such as that at Clifden, the strength would have been 8, and the fact of its being a good receiving aerial would not have influenced the effect of Clifden, as the increased strength of Clifden could have been cancelled by increasing the efficiency of the low aerial, which, in any case, would not be affected by Glace Bay.

This point was not mentioned by Mr. Marconi, which tends to show that he considered the efficiency of the arrangement was sufficiently apparent to render unnecessary any remarks as to how it would be improved in practice.

In adjusting the circuit to completely cut out Clifden, the strength of Glace Bay was reduced from 5 to 3.

The value of the test of course depended on whether Clifden was using full power, and Mr. Marconi stated that she was doing so.

Mr. Marconi further stated that these were only preliminary experiments, and that he thought that very soon simultaneous transmission and reception on waves much closer together than those shown would be practicable, and that he intended to push on at once with this duplex system and obtain the necessary rights over land, &c., and also the licence required for a receiving station near Clifden, at Letterfrack, or other convenient place.

It was apparent that the aerials and temporary station at Letterfrack had only very recently been rigged up and the results of these preliminary tests would appear to fully justify Mr. Marconi's optimism on the success of the system.

Mr. Marconi suggested that the arrangement might be useful in ships for cutting out interference. That is to say, a ship with a high aerial and a low directional aerial might receive on the high one and direct her low one on the interference so as to balance the effect of the interference on the high aerial by its effect on the low one. This, however, does not seem very practical, as to cut out interference would entail manœuvring the ship for that purpose, and would even then be extremely difficult, as an efficient directional aerial cannot be rigged in a ship, and the wave-length and the direction of the interference may be difficult to discover, and indeed this latter may be continually altering.

(b) *Mercury Oscillation Valve.*—This valve, Fig. 3, is said to be far more sensitive than the Fleming valve, and when tried during the visit, signals from Glace Bay, which were 8 on the Fleming valve, were 11 on this one.

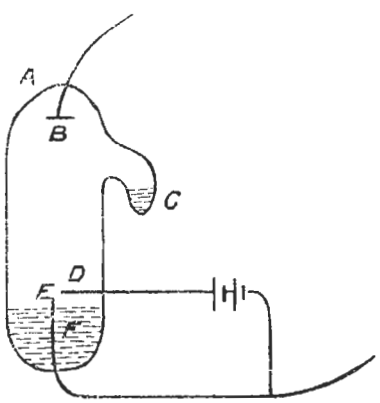
It was said that as the platinum point must protrude only a minute amount from the mercury the surface of the latter must remain constant, and that accordingly at present there seems little chance of adapting the valve to ship use.

The valve is a rectifier, a small arc being formed in mercury vapour between the platinum point and the metal electrode which forms the anode for the stream of ions. The arc takes place in a magnetic field, which was provided by electro-magnets outside.

The valve is connected in the usual circuit.

Mr. Marconi said they were prepared to supply one to the Admiralty for trial, and would like to send a representative to fit it up.

FIG. 3.



A = Exhausted glass bulb.
B = Metal plate.
C = Hg reservoir.
D = Metal plate.
E = Pt. point.
F = Hg.

(c) *Eintloven Galvanometer.*—The galvanometer was connected up, the filament being in series with the oscillation valve, so that signals from Glace Bay could be heard, and at the same time read by the deflection of the shadow on the screen.

This arrangement had been fitted up for the occasion, as the work at the station is done by sound only.

The disadvantage of the galvanometer, due to the fact that the atmospheric difficulty is greater with the galvanometer than with the telephones, was referred to in last year's report, and has not yet been overcome, but is thought to be by no means insuperable.

A few very good photographic films of signals received from Glace Bay by the galvanometer were shown.

(d) *Rectifier.*—Mercury-carbon rectifiers, supplied by Westinghouse Cooper Hewitt Company, were being tried to save expense by utilising the alternators for charging the cells.

It was thought this would prove practicable.

(e) *Ship's System.*—No further experiments with the sparkless system have been carried out, nor is it apparently intended to do so, at any rate, just at present.

Mr. Marconi said that he had no experience with the quenched spark system, but that he thought it might prove efficient for ships, &c., though it was not adaptable to high power.

He also said that kites might be used with advantage in ships.

It would appear that the Marconi Company have made no material advance in ship installations for some time, and the fact that the spark gap is enclosed was referred to as one of the latest improvements.

(f) *Other Stations.*—Coltano is expected to be working by the autumn.

The agreement by which Marconi Company takes over the Eiffel Tower station and builds a high-power station at S. Lazaar is apparently about to be signed.

(III.) Points, already referred to, that Mr. Marconi wished to be brought forward:—

(1) The question of increasing Clifden's wave to about 24,000 feet.

(2) The fact that he intended to try to acquire land and a licence for a receiving station near Clifden.

(3) The fact that the Company were prepared to supply a mercury oscillation valve to the Admiralty for trial and would like their representative to fit it up.

FOREIGN W.T.

(Abstracted from Official Reports received in "Vernon.")

France.

Fiffel Tower seems able to change her note at will. Confirmation is required. Usual wave 6,500 feet, 7,560 also heard. The *Eiffel Tower* is also reported to have been in communication with *Glace Bay*. *Bizerta* was heard on wave-lengths of 5,000 feet and 2,500 feet.

It is intended to instal many small stations in Belgian and French Congo.

The French Army has eleven sets on motor cars, and each army corps will shortly have a motor car 250-kilometre set.

"*W.T. Lighthouses*" are being fitted. The sets are to send automatically the respective call-sign at definite intervals. It is understood that this is intended primarily for the benefit of ships fitted with the Bellini Tosi directive system as an aid to navigation.

Only three public coast stations are working in France, compared with 19 in England, 16 in Germany. (September 1911) SFR (Paris), using U tune, heard communicating with Lepel experimental station at Slough.

Germany.

Experiments with the high note mentioned in 1910 continue to occupy German ships and stations. The principal wave-length noted is 6,500, which completely swamps our "W" tune. Poulsen sets are reported to be fitted to all German battleships. These have an interrupter in the transmitting circuit, which might produce the peculiar high note. Men-of-war have call signs such as WXXW, ZPPZ, &c.

Three classes of code are in use: single letters, three letter, and 5 to 10 letter; the last apparently a transposed alphabet, like the Aldershot cypher.

The German Government are building two stations in German S.W. Africa at Luederitz Bay and Swakopmund to be ready in February. These are to communicate with Kamerun and Monrovia, whence there is direct cable communication with Germany. These stations should be heard by the Cape squadron.

Greece, Athens W.T. Station.

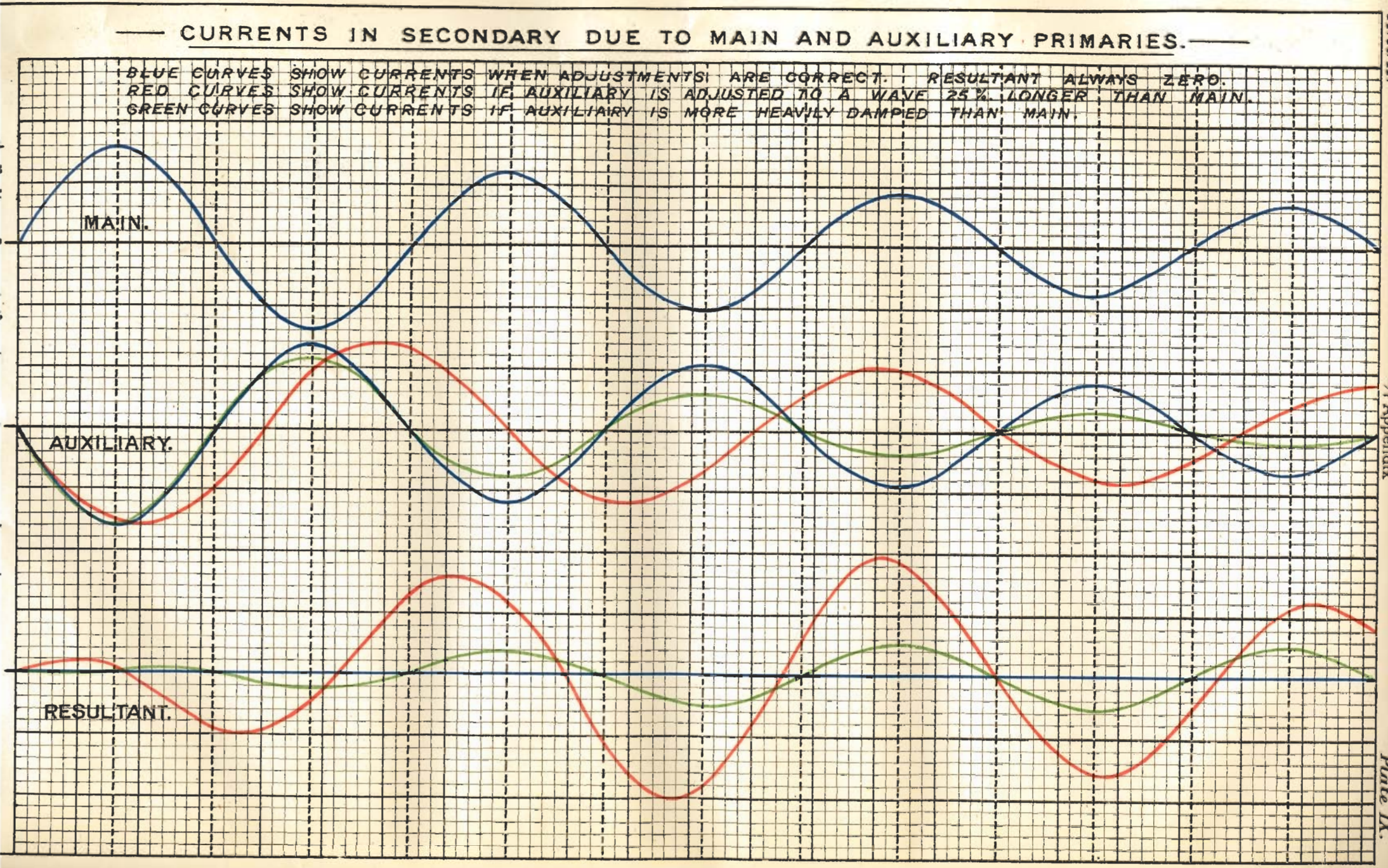
Masts.—Four 50-foot masts at the corners of a square of side about 100 yards, and a central 150-foot mast.

Aerials.—(1) Small aerial of four wires, one to the top of each short mast, radiating from the top of the central mast; used for the 300 and 600 metre waves.

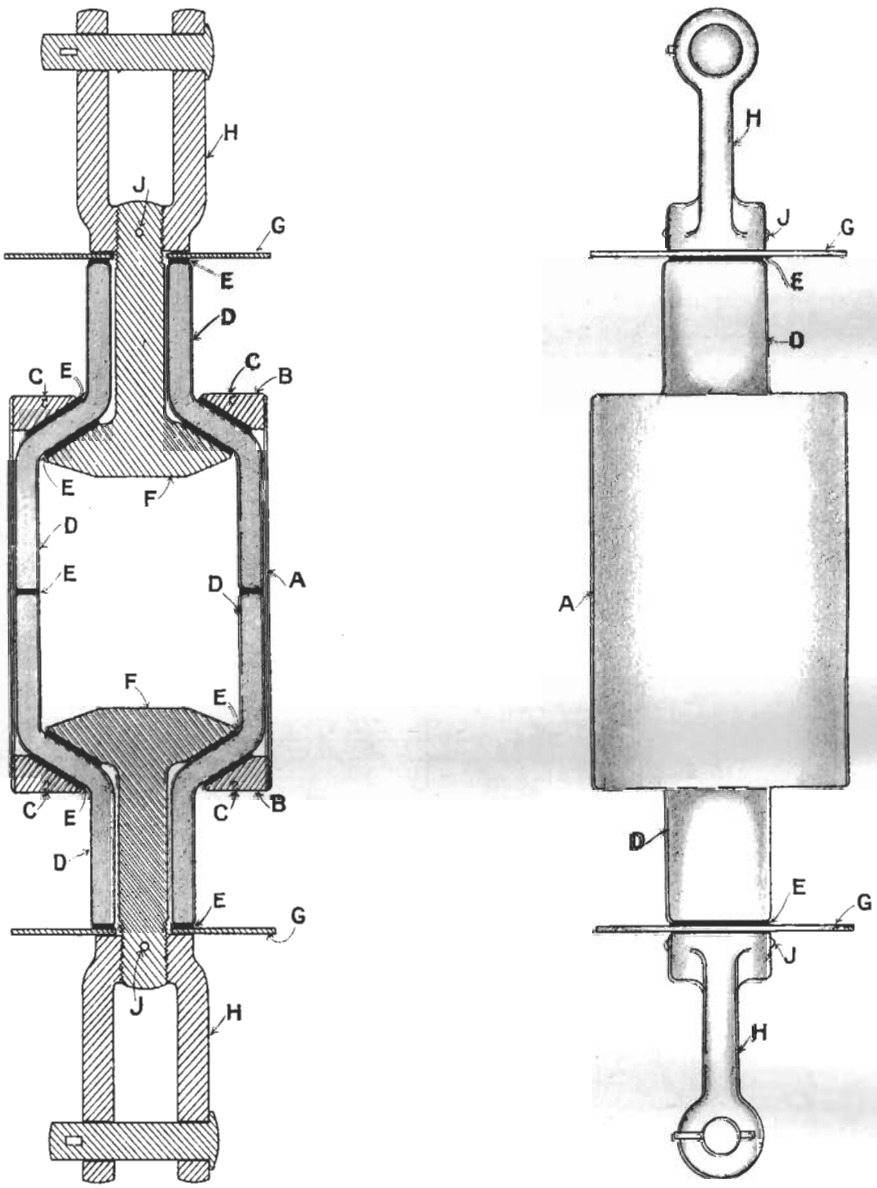
(2) Large aerial, umbrella type, four sections of eight wires, in the form of a Maltese cross, about 6 feet lower than the small aerial, with a 32-foot feeder; used for the 1,200-metre wave.

CURRENTS IN SECONDARY DUE TO MAIN AND AUXILIARY PRIMARIES.

BLUE CURVES SHOW CURRENTS WHEN ADJUSTMENTS ARE CORRECT. RESULTANT ALWAYS ZERO.
RED CURVES SHOW CURRENTS IF AUXILIARY IS ADJUSTED TO A WAVE 25% LONGER THAN MAIN.
GREEN CURVES SHOW CURRENTS IF AUXILIARY IS MORE HEAVILY DAMPED THAN MAIN.



NEW RIGGING INSULATOR.



REFERENCE.

A	STEEL CYLINDER.
B	SCREWED END PIECE.
C	HOLES FOR PIN SPANNER.
D	PORCELAIN.
E	LEAD WASHERS.
F	STEEL BOLT.
G	PLATE WASHER
H	SCREW SHACKLE.
J	PIN.

Earth consists of 132 galvanised iron plates buried vertically in ground to the depth of 2 metres, forming a circle, and joined to instrument room by copper wire.

W.T. Office.—The transmitting room is not screened.

The receiving room is not padded, but is fairly silent.

Transmitting Apparatus.—Power is supplied by a 10 h.p. Gardner oil engine, Otto cycle, driving a 10-kw. eight-pole rotary, which supplies 400 volts D.C. for lighting, blower, &c., and A.C. 100 to 300 volts at 100 cycles.

The insulated copper disc, 1 foot in diameter, of the revolving spark gap, fitted with teeth, is secured to the shaft of the rotary.

The fixed spark plugs are of $\frac{3}{8}$ inch copper rod.

The note is clear, but not very high, about 200 cycles.

The condensers, glass plates in oil, can be arranged for capacities of 1,200, 600, or 300 jars.

The mutual consists of one turn; adjustment for tuning being obtained on a copper helix, 7 inches diameter, 1 inch pitch, about 4 feet away from the mutual coil.

The coupling was said to be 9 per cent.

The main transformer can be adjusted to suit 1,200, 600, or 300 metre waves. The current is first passed through a small 3 to 1 step-up transformer. Both transformers are oil cooled.

Protecting coils are fitted.

No impedance coil is used.

No part of the H.T. circuit is earthed.

The magnetic key forms a single pole break in the H.T. circuit, is similar to the Clifden key, and is fitted with a powerful blower.

No safety gear is fitted, and few of the leads are lead cased.

A break in the E. lead, consisting of two discs, separated by a thin disc of mica, round the edges of which the spark takes place, forms the operating device

Receiving Apparatus.—The usual Marconi receiving circuit was fitted. AM.D., with one magnet only, was used.

An old Marconi box was also provided, and it was intended to purchase a "valve receiver."

Distance.—The 1,200-metre wave had so far failed hopelessly, and never done anything near the distance expected, *i.e.*, 1,000 kilometres by day. The failure was attributed to the "earth." The distances of the other waves were satisfactory.

Staff.—One officer, three mechanicians, six operators.