REPORT ON CLIFDEN W/T STATION, VISITED 27TH AUGUST 1913.

The technical alterations since last year's report are as follows :—

1. Transmitting Arrangements.

Power.—This is obtained from 5,000 16 ampere cells, charged by four 5,000 volt dynamos in series, Cooper-Hewitt rectifiers being no longer used. The main condenser is charged at 14,600 volts, and 16 amperes.

The tuning of the primary is never altered, but the aerial is tuned to the primary. A 50-c.p. lamp placed in the aerial indicating when the tuning is correct.

The aerial and earth are identical with those seen last year.

A total period of 10 hours per month is allowed for repairs.

2. Continuous-Wave Transmitting Sets.

Small Continuous-Wave Set.—A small Continuous-Wave set was inspected, consisting of a 10-H.P. D.C. motor designed to run at 1,800 revolutions, and, by means of gearing, drive an induction alternator. The latter comprises a rotor, with slotted discs, placed between the poles of a stator situated on either side of it. The alternator was said to give 2 k.w. at 100,000 cycles. This machine was not in use, and apparently no further trials were contemplated.

The set appears to be identical with that supplied by the General Electric Company of U.S.A.

Description of Large Continuous-Wave Set.—The arrangement of the High Frequency Circuits used in this Set, for the production of Continuous-Waves in the Aerial, is shown diagrammatically in Plate XII.; from which it will be observed that there are two main circuits, and that each Main Circuit is provided with a Trigger Circuit, thus making four Circuits in all.

Each Trigger Circuit is connected to its Main Circuit by means of a High Frequency Transformer, the windings of which are shown at T_1 and T_2.

The two Main Circuits discharge across to the Main Spark Disc, which is common to both Main Circuits.

Similarly the two Trigger Circuits discharge across to the Trigger Spark Disc, which is common to both Trigger Circuits.

The periphery of each disc is provided with an equal number of studs, placed at equal distances apart.

The Main and Trigger Spark Discs are mounted on the same Spindle, which is driven by a 16-H.P. motor. When signalling on a Wave-Length of 19,000 feet, the discs have to be rotated at a speed of 9,000 revolutions per minute, to attain which the motor is geared up with a 5 to 1 gearing. The speed of the motor can be varied by means of a Field Regulator.

The action of these circuits is best described by considering one Main and Trigger Circuit only.

The Main Condenser, consisting of two Poldhu pots, *i.e.*, a capacity of 100 jars, is charged to a pressure of 4,000 volts, D.C., which is insufficient to discharge across to the disc.

The Signalling Key is placed in the charging leads to the Trigger Circuit, and when pressed charges the latter to 4,500 volts D.C., which is sufficient to cause that circuit to discharge across to the Trigger Disc, thereby raising the voltage of the Main Circuit sufficiently to make the latter discharges across to the Main Disc.

Twenty-four Quenched Spark Gaps with copper electrodes are inserted in the Main Circuit to quench the oscillation thus produced.

The gaps are cooled by an air blast having a pressure of 20 lbs. per square inch.

The studs on the discs are so arranged that each Main Circuit discharges once for every ten oscillations in the Aerial, and since they discharge alternately at equal intervals, a fresh charge passes into the Aerial at each fifth oscillation of the latter.

The formation of the Continuous Waves is shown in Fig. 13.

This system is being further developed in the hope that it will be possible to charge the Aerial at every third oscillation of the latter instead of at every fifth; difficulty, however, is experienced in doing so as the Spark of each Main Circuit must be extinguished before the other Main Circuit discharges, otherwise the energy merely passes from one Main Circuit to the other, instead of into the Aerial.

It was stated that trouble had been experienced with the disc and motor bearings, ball bearings being employed with the former, but plain bearings with the latter. Drip and ring lubrication were fitted to both types.

Signals were sent by this set for a few minutes at 10 a.m., Horsea having been instructed to look out for them.

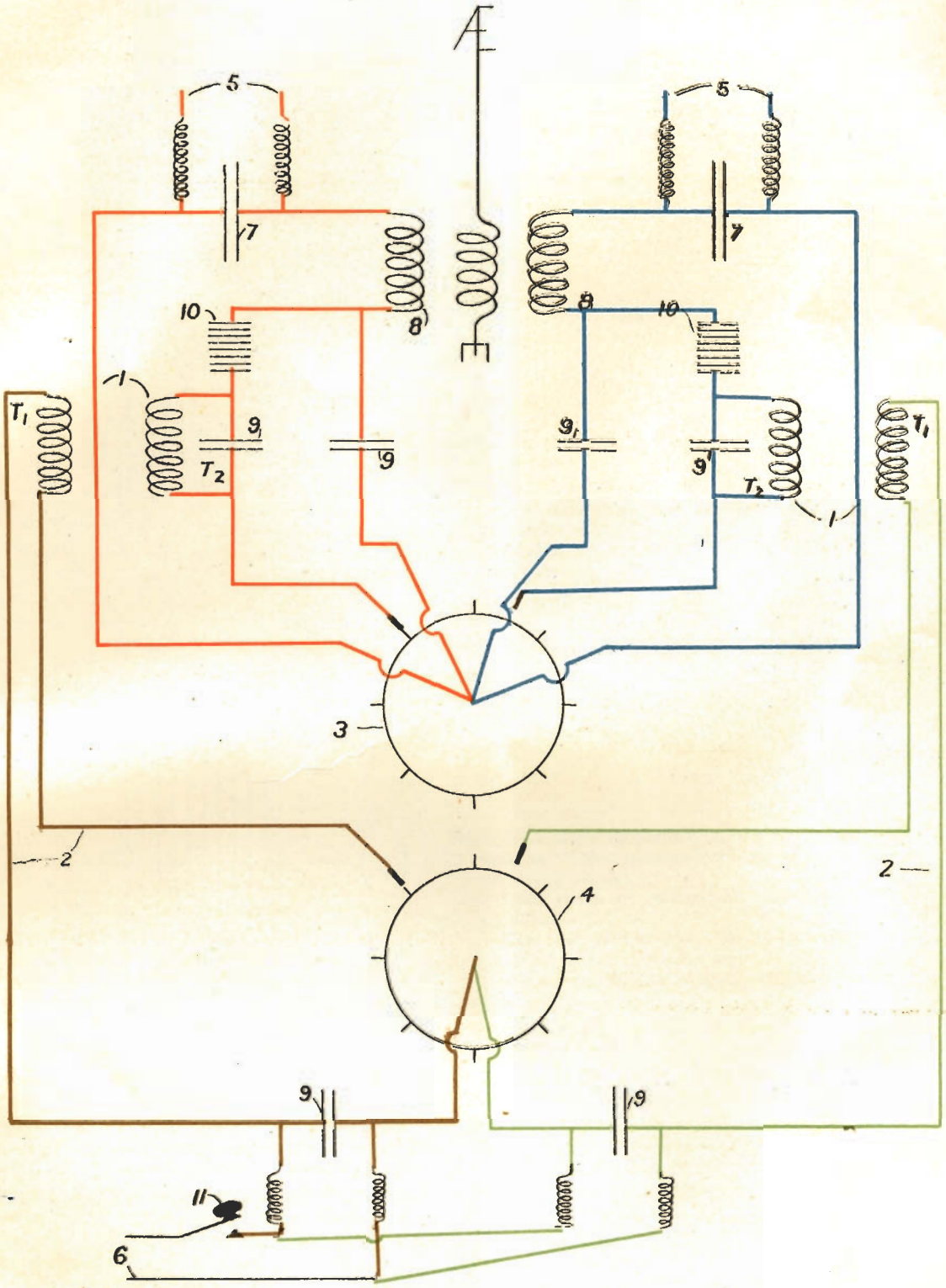
3. Interception of Clifden by H.M.S. "Vernon" 10–11 a.m. August 28th.

The Heterodyne Arc at Horsea was switched on at 9.30 a.m.; Clifden was heard, sending on spark, with her usual note and wave-length, between 9.30 and 10 a.m.

A few minutes after 10 a.m., Clifden was heard making alphabets on the Continuous-Wave Set. The note was very steady and clear, but not such a flute-like note as that produced by an arc: the note was controllable with the Heterodyne, and nothing could be heard when the Heterodyne was switched off. Attempts were made to read signals on the rotary tikker, but owing to defective contacts nothing could be heard.

CONTINUOUS WAVE SET.

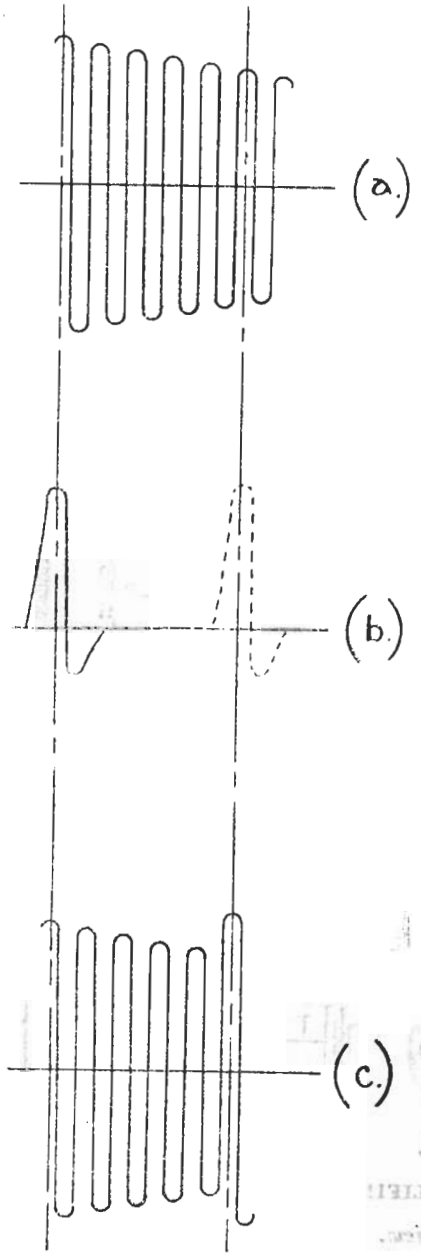
32. KILOWATT.



REFERENCE

1	Main Circuits (red & blue)
2	Trigger Circuits (brown & green)
3	Main spark disc
4	Trigger spark disc
5	D.C. supply 4,000 volts 4 amps
6	D.C. " 4,500 "
7	Main Condenser (2 Poldhu Pots
8	" Primary
9	Single Poldhu Pot · (50 Jars)
10	24 Quenched spark Gaps
11	Signalling key
T_1 & T_2	Primary & Secondary of Trigger Circuits

FIG. 13.



(a.) Showing wave form of ordinary feebly damped oscillations in an aerial.

(b.) Probable form of spark oscillation.
Full line represents one oscillation of one main circuit.
Dotted line represents one oscillation of the other main circuit.

(c.) Form of continuous oscillations in the aerial used at Clifden as actually observed in the revolving mirror.
Oscillations are continuous, but vary in amplitude.
This is borne out by the results obtained at the receiving end.
Signals are said to be easily readable at Glace Bay.

Since Clifden's note was quite steady it points to the fact that the extemporised Heterodyne arcs burn steadily, as any unsteadiness on their part would have upset the note.

A 5-k.w arc, on a shunted oscillating circuit, was switched on occasionally during the programme so as to compare the two notes.

The Wave-Length as measured on the Heterodyne was 9,000 L.S., *i.e.*, 19,550 feet. No variation was noted in the strengths of the various alphabets made by Clifden, whose continuous-wave signals were strength 7, her ordinary spark signals being strength 9.

RECEIVING INSTRUMENTS.

4. The main point of interest in the Receiving Instruments was the Lieben Valve or Amplifier. The Receiving Circuit is shown in Fig. 14, the valve being worked in conjunction with Carborundum Detectors. The details of the valve are shown in Fig. 15.

The Lieben Valve.—According to information obtained from the Company, the current in C1 (*see* Fig. 14) was about 10 milleampères and that in C2 about 5 milleampères when under working conditions. An increase of power is obtained in C2 owing to the fact that C2 is at more than double the voltage of C1: these currents were said, however, to have an approximately constant ratio. It was also stated that if L3 is placed to influence L2, the Lieben valve will act as an independent source of continuous oscillations.

The action of the valve is said to be very satisfactory; it is used at the main station and also at the receiving station at Letterfrack.

The mutual inductances used were wound on wooden formers, the latter consisting of spheres hinged inside zone-shaped coils.

Plain inductances were wound on a species of pertinax tubing.

A Service No. 1 Condenser was in use, also some ebonite Condensers, which were filled in at the edges with blocks of paraffin wax.

FIG. 14.

LIEBEN OSCILLATION AMPLIFIER.

Arrangement of Circuit.

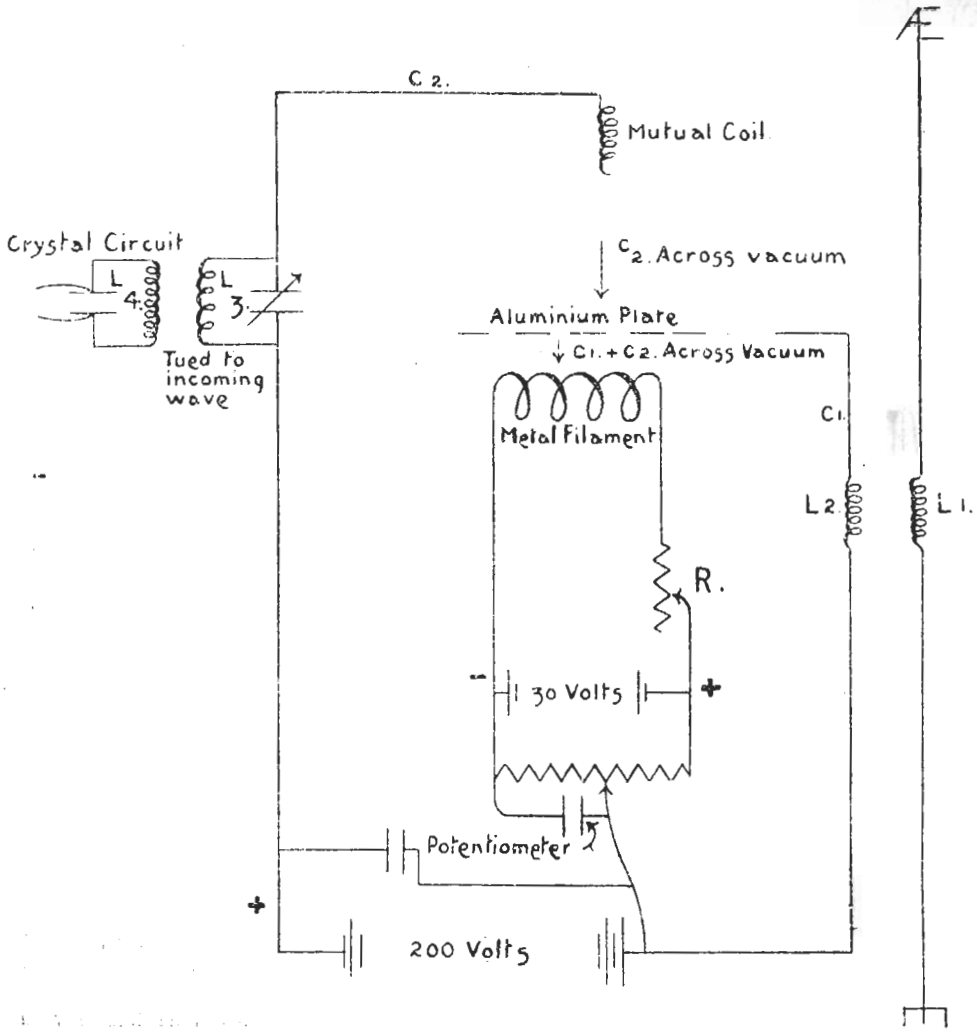
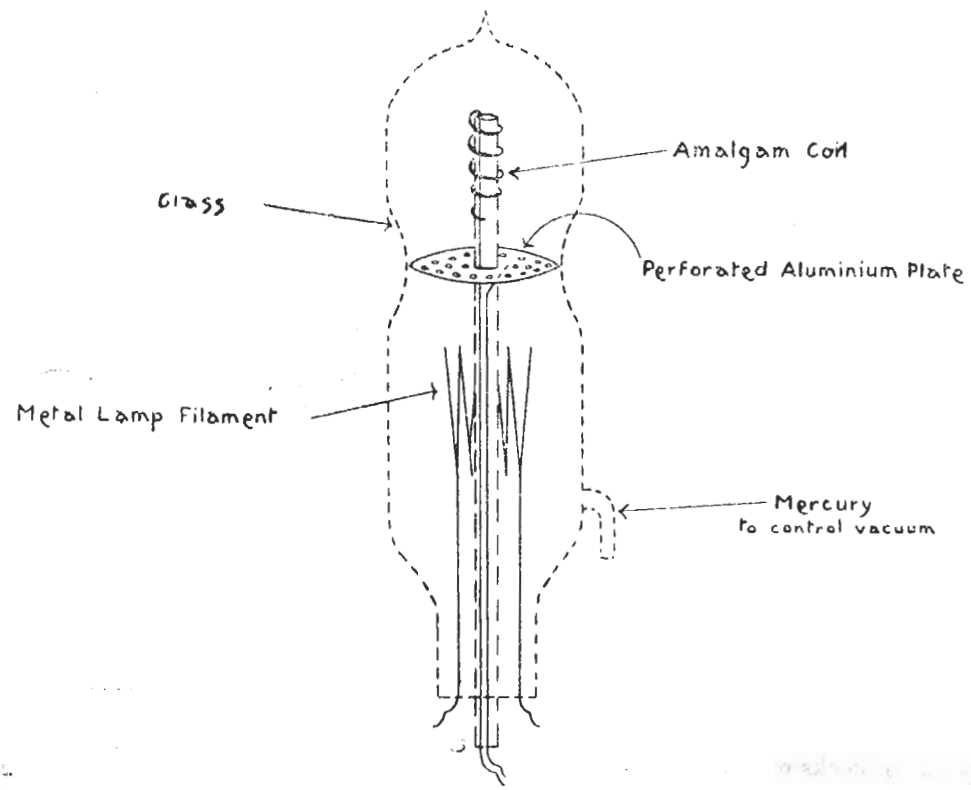


FIG. 15.

LIEBEN AMPLIFIER.

General View.



High Speed Working.

5. Reception from, and transmission to, Glace Bay at high speed took place during the visit, the rate being 50 words per minute.

Reception was carried out with the Lieben valve and carborundum crystals in conjunction with three "G" type, Brown's Relays in series, the latter working a Brown's Telephone attached to a Dictaphone.

Bad interference from atmospherics was experienced and several words were missed.

6. It was stated in conversation that the audibility of Brown's "G" type relay was only 50 per cent. to 60 per cent. of that of "W" type, but that the "G" type were far more reliable and needed little adjustment or hardly any attention when once adjusted.

7. There was no opportunity to compare the Lieben Valve with any other form of receiver.

Letterfrack Station. (*See* Fig. 16.)

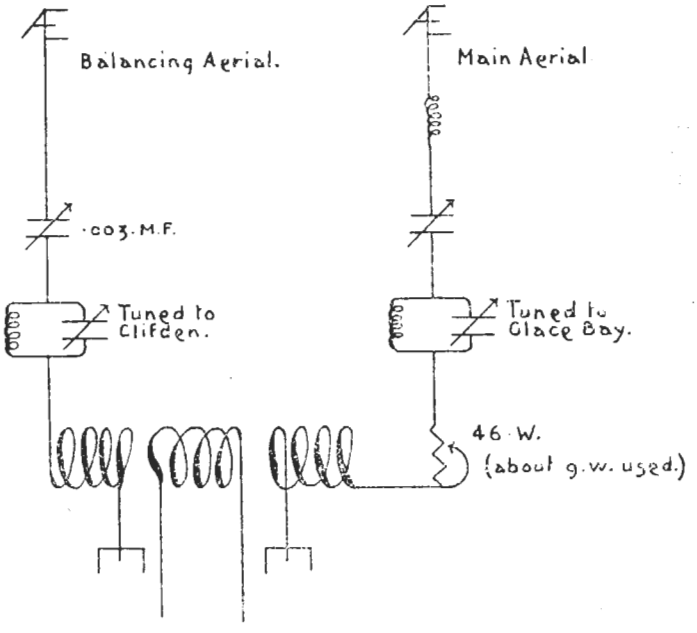
8. This presented no new features since last year's report. The Main Receiving Aerial is directional, and tuned for reception of Glace Bay.

The Balancing Aerial is directional, and tuned for Clifden.

The general arrangement of the two aerials is shown in Fig. 16.

Fig. 16.

Letterfrack Station.



To Receiving Gear.

Glace Bay was heard signalling, Clifden sending on full power at the same time. A resistance was inserted in the Main Aerial to adjust its decrement to that of the balancing aerial; this reduced signals about 10 per cent. By placing earth wires under the Balanced Aerial, or by increasing the number of wires in it, it is hoped to get the decrements of the two aerials identical without the necessity of inserting resistance.

The Balanced Aerial weakens signals from Glace Bay by about 5 per cent., but by its use Clifden can be entirely cut out and tuning rendered fairly sharp, which would not otherwise be possible.