ELECTROLYTIC DETECTOR.

This form of detector has been further experimented with in order to test its suitability for Service purposes, and although some excellent results have been obtained, it requires very careful handling and much supervision.

Comparison with M.D.

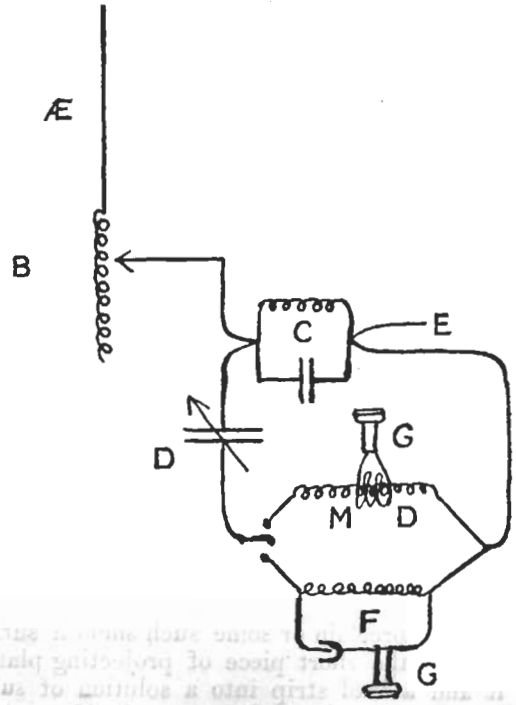
The magnetic detector is essentially reliable and of simple construction, moreover it is efficient for long waves. As a rule the only attention necessary is to see the terminals tightly screwed up and the band moving. On the other hand, an electrolytic detector is generally some 30 per cent. more sensitive than the M.D., and is more suitable than the latter for short waves; hence its introduction into the experimental short-distance set described on pages 23 and 24. As against the increased sensitiveness, the electrolytic requires, in addition to the Service receiving circuit, a specially and carefully constructed circuit, including primary cells. The electrolytic is liable to be burnt out, due to ships signalling with a large spark close to, or by atmospherics. In such cases there is no visible indication of the instrument becoming insensitive.

In order to give the electrolytic detector a thorough trial, a certain number of complete sets were constructed in the "Vernon."

The sets have been so designed that they can be inserted in the present Service receiving circuits, viz., the acceptor circuit, and by means of a single-pole two-way switch either the magnetic or the electrolytic detector can be used without altering the adjustments of the ordinary Service circuits (*see* Fig. *a*).

Diagrammatic Sketch showing method of joining up Electrolytic and Magnetic Detector Circuits.

FIG. *a*.



B. Tuner. D. Acceptor condenser. G. Telephone receivers.
C. Rejector. F. Electrolytic circuit. M.D. Magnetic detector.

A diagrammatic sketch of connections is given in Plate XI.

Details of various component parts.

The Mutual Inductance of 200 mics. consists of 88 turns of 18-gauge D.S.C. wire, wound on an ebonite former 7 inches by $3\frac{1}{8}$ inches, tapped every four turns.

The Strengthener of 2,000 mics. has 231 turns of 24-gauge D.S.C. on a similar former, tapped every 11 turns.

The two fixed capacities have mica for the dielectric.

Variable Capacity.—No. 4 condenser to be fitted and supplied by ship.

Telephones are Sullivan's 6,000 ohms. high-resistance telephones.

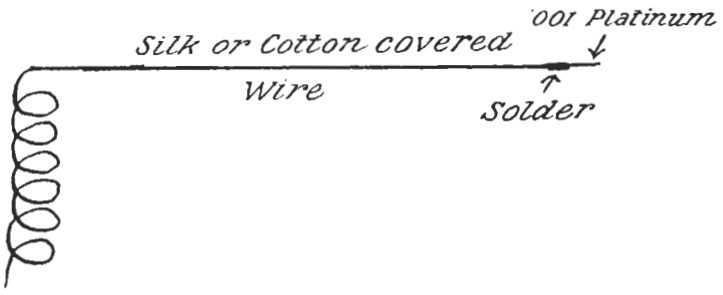
Potentiometer has current-carrying capacity ; ·5 ampères resistance, 160 ohms.

Construction of electrolytic point.

The actual electrolytic detector consists of a short length of ·001-inch platinum wire fuzed into a small soft glass tube whose external diameter is approximately ·125 inch.

To construct a point, take a short piece of insulated soft copper wire, say 26-gauge, and about 9 inches long, tin one end of this wire and carefully solder to it about $\frac{1}{8}$ inch of ·001 platinum wire. (Fig. *b*.)

FIG. *b*.



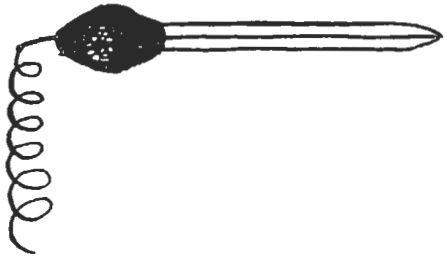
Next take a glass tube not less than 4 inches long, heat it right in the centre by means of a spirit lamp, with a blow-pipe for preference, and draw it out until the neck has a diameter of, roughly, $\frac{1}{32}$ inch ; let it cool, and then break in two. (Fig. *c*.)

FIG. *c*.

Insert the copper wire into the open end of the tube, and carefully pass it down the tube until the platinum wire just projects through the neck. Then seal it into the glass by placing the tip of the latter in the flame until it becomes red-hot (Fig. *d*), and secure the wire into the open end by means of Chatterton's or sealing-wax (Fig. *e*). This should be very carefully done to ensure an airtight joint between the glass and Chatterton.

FIG. *d*.

FIG. *e*.



To sensitise the point.

Obtain a piece of broken porcelain or some such smooth surface, and carefully rub the fine point on it to remove the short piece of projecting platinum wire. Next test the point by inserting it and a lead strip into a solution of sulphuric acid and water containing 30 per cent. pure acid, and join it up in the electrolytic circuit. Probably one of four things will now happen : either—

(1) It will always bubble, no matter how the potentiometer is adjusted. This means the platinum point still projects too far, and that a further rub on the porcelain is necessary.

(2) It will bubble very little, even with maximum potentiometer adjustment. In this case the platinum does not project sufficiently; therefore, dry glass and place it again in flame. This shrinks the glass and uncovers platinum. Great care is necessary not to heat anything but the very tip of the glass.

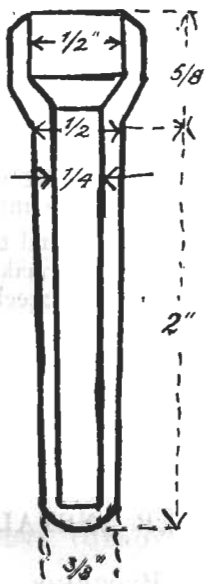
(3) No sound will be heard. This seldom occurs if care has been taken. It is pretty sure to be due to the platinum wire being parted, and nothing further can be done with the point.

(4) There will be a loud bang in the telephones as the point is inserted in the solution, and nothing further. This is generally due to a short-circuit, either through the platinum not being properly sealed in, in which case it is little use trying to save the point, or else it may be due to the acid creeping up the glass and so on to the copper wire. Careful drying and extra Chatterton will remedy this.

To mount point.

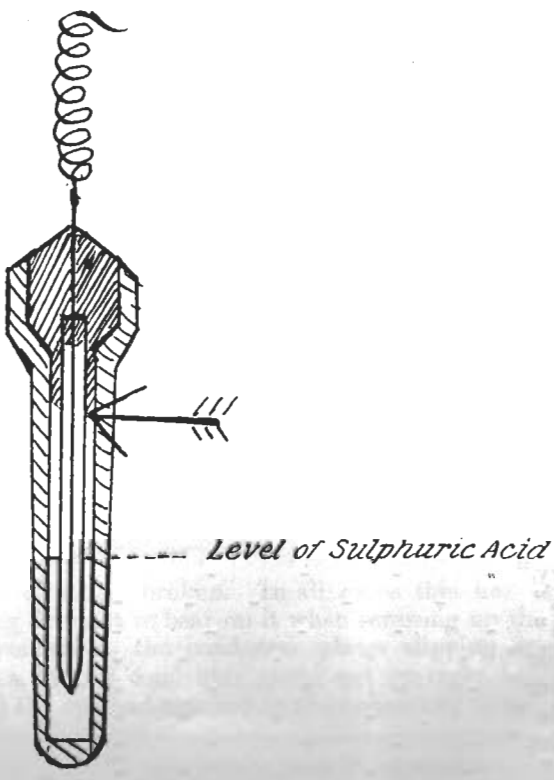
It is obviously impracticable at sea to use an open cup in which to place the acid. Several methods have been tried in "Vernon" for obtaining a suitable cup, and the following appears to be the simplest method. Turn down a *solid* lead cup, as shown in Fig. *f*. Fill half full with acid, insert the point and *very carefully* seal it with

FIG. *f*.



Chatterton. Great care must be employed to prevent any creeping, especially at the arrow point in Fig. *g*.

FIG. *g*.



Reason for adjustable mutual.

The mutual inductance has been made adjustable, as it was found that a smaller inductance than 80 mics. was better for short waves, and a larger inductance for the longer waves. However, stop No. 6 has a value of, roughly, 80 mics., namely, that of an M.D.

Note.—Although excellent results can be obtained with an electrolytic, *yet* it must always be remembered that it undoubtedly requires very careful handling and adjusting, and, further, that it is hardly sufficiently constant to be considered a reliable instrument for watch-keeping purposes.

To join up the experimental electrolytic set.

The experimental sets made by "Vernon" have been lettered in the same way as shown in Plate XI.

Using the ordinary Service receiving circuit, insert a two-way switch between the acceptor capacity and magnetic detector, so that when switched over on one side the M.D. is in the circuit, and when over to the other side the receiving circuit passes through the mutual inductance of the electrolytic set, the terminals of which are marked A and E for connection from acceptor condenser and earth respectively.

Four electrolytic elements and a two-way switch are mounted on each set. This allows for one element being in use, another joined up ready for use, and two spare ones.

To adjust experimental electrolytic set.

Put handle of mutual inductance, coloured red, to the stop No. 6 (or stop G, according to whether inductance stops are lettered or numbered). This puts in an inductance of about 80 mics., or, roughly, the equivalent of the M.D., so that the ordinary receiving adjustments hold good whether M.D. or electrolytic is in circuit. Plug up battery plug (I.H.) and vary the adjustment of potentiometer until no sound of hissing or bubbling is heard in telephones. Put the strengthener inductance and adjustable condenser to zero.

Switch over to the electrolytic set, and bring electrolytic circuit into resonance by adjusting strengthener and adjustable condenser until signals are loudest.

It will be found preferable to use less mutual than 80 mics. for short-wave lengths, and more than 80 for long ones. Therefore, make final adjustments by moving red handle until desired mutual is obtained, and check adjustments on strengthener and adjustable condenser.

For receiving very long waves, *e.g.*, Clifden, plug up "long-wave" plug (O.P.). This puts an extra capacity in parallel with the electrolytic, other adjustments as before.

DESTROYER INSTALLATION.

Progress.

During the past year 45 destroyer sets have been delivered, out of which 35 are installed up to the present date and are appropriated as follows:—

Destroyer.	Allocation.
"Arun"	Channel Fleet.
"Blackwater"	" "
"Chelmer"	" "
"Derwent"	" "
"Doon"	" "
"Foyle"	" "
"Itchen"	" "
"Jed"	" "
"Kennet"	" "
"Liffey"	" "
"Moy"	" "
"Ouse"	" "
"Boyne"	Home Fleet.
"Cherwell"	" "
"Dee"	" "
"Eden"	" "
"Erne"	" "
"Ettrick"	" "
"Exe"	" "
"Garry"	" "
"Ness"	" "
"Nith"	" "
"Ribble"	" "
"Rother"	" "
"Swale"	" "
"Teviot"	" "
"Ure"	" "

Destroyer.	Allocation.
"Usk"	Home Fleet.
"Waveney"	" "
"Wear"	" "
"Welland"	" "
"Velox"	Attached to "Vernon."

Establishments Fitted.

"Vernon," "Defiance," and "Actæon" have each got an instructional set.

List of destroyers shortly to be fitted with W.T.

Destroyer.	Allocation.
"Kale"	Channel Fleet.
"Colne"	" "
"Afridi"	Home Fleet.
"Cossack"	" "
"Tartar"	" "
"Ghurka"	" "
"Mohawk"	" "
"Amazon"	" "
"Saracen"	" "
*"Swift"	" "

Seven additional sets, in which certain modifications have been embodied, are now on order for the following Tribal Class Destroyers :—

"Crusader." "Viking."
"Maori." "Zulu."
"Nubian."
Two others unnamed : Nos. 786 and 787.

Results obtained.

The results obtained by the sets at sea prove them to be both efficient and reliable.
The range between destroyers has been found to be reliable for 50 miles under all ordinary conditions.

Recent Improvements.

Several small improvements are being introduced into the later sets.

Combined spark gap and oscillator.

The porcelain base has been replaced by an ebonite one which allows the full 8-millimetre spark to be used ; also, by employing two bayonet-jointed rods in place of three, easier access is given to the spark gap.

Woodite washer.

The leather washer, originally supplied for making an oiltight joint between the top of container and combined oscillator and spark gap, has been abolished and a woodite washer substituted.
Woodite is a patent material of a soft rubber nature which is unaffected by oil, and which is a good insulator.
With this washer it is easy to procure a good oiltight joint.

Protecting coils.

The protecting coils have been fitted with terminals for convenience in joining up.

Safety screen.

The single lifting handle on the safety screen has been replaced by a handle on each side of the screen, and the screen made lighter.

Combined starter and field regulator.

The brushes are now made of phosphor bronze, and the cover is designed to lift off without first unshipping the handle.

Failures that have occurred, and their Causes.

Rotary.

Slip rings on rotary worn down and short-circuited owing to brushes bearing too heavily.

Starter burned out.

Rotary starter burned out, due, probably, to its brushes not making proper contact.

Oscillator, broken porcelain top.

Porcelain top of oscillator broken. In all cases this has been the result of too great a pressure being brought to bear on it when screwing up the holding-down clamps.
In one case it was due to the condenser plates slipping down below the level of the wooden end plates, so that condenser could not go right home in container. This was not noticed until the top had cracked in the endeavour to get a tight joint.

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* To have Service Mark I*. apparatus.

Should the plates drop down below the wooden end plates, remove porcelain top, slightly ease up the nuts on the rods clamping together the two end plates, drive the ebonite plates bodily upwards, up-end the condenser on the deck until it rests on the brass lugs that secure it to porcelain top, raise it bodily a short distance from the deck and let it land with a slight bump on its lugs again.

This will shift condenser without disturbing the relative position of the plates. A very slight bump will do this.

VISIT OF OFFICERS FROM D.N.O. DEPARTMENT, ADMIRALTY, AND "VERNON" TO CLIFDEN ON 3RD AND 4TH FEBRUARY 1908.

Technical Details.

Details of the site of the large-power station at Clifden, within two miles of the sea, its six masts, each 215 feet high, the air condenser house, 400 feet long and 70 feet high, &c., &c., have been fully dealt with in the report by Officers of Atlantic Fleet dated 23rd July 1907.

During the whole of the visit, the station at Glace Bay was available for communicating with, and several experiments were carried out between the stations to test the capabilities of various instruments and to investigate their peculiarities.

Description of Transmitting Instruments.

Power plant.

There are six boilers, nominal rating 100-H.P. each, in the power house. Peat, obtained from the surrounding land, is principally used for fuel, and a number of hands are constantly employed in digging it up.

A supply of coal is also available, and small quantities are at present used with the peat. During the visit only two boilers were alight.

The generating plant was placed in the centre of the power house, and consisted of a 500-K.W. 25-cycle alternator, directly driven off a 500-H.P. vertical engine. The rotating part of the alternator, which is of large diameter and weighs 7½ tons, acts as a flywheel, and is relied upon to supply the intermittent overloads required during the time a dot or a dash is being made. The engine working continuously, enables the necessary momentum to be stored up during the intervals between the dots and dashes, and is therefore designed for working at a lower mean power. At present no superheater or other means of keeping the cylinders warm is fitted, accordingly the engine, which nominally is kept running slowly, has to be worked up gradually before signalling. This causes a delay of about half a minute before a message can be sent or a signal acknowledged.

There are no special features of importance in the engine or its governor.

From the power house the cables (armoured) are led in trenches through the bog to the condenser house, which now contains the whole of the transmitting and receiving apparatus. The entrance to the building opens into a small room, which forms the only entrance into the other parts of the building. In this room a member of the technical staff is always on watch. He has control of the main switch, and is responsible that no one enters the dangerous quarters of the building while the transmitting instruments are in use. There are various measuring instruments on the switchboard, by which he is enabled to see that the station is working properly. From this room a door leads into the transformer room, and another door from the entrance to the receiving room, which latter is of two thicknesses of planking lined with sawdust to keep out the noise and echo of the spark. A spiral staircase from the control room leads up to an upper flooring containing the spark gap, magnetic key, primary leads and oscillator, on either side of which hang the condenser plates.

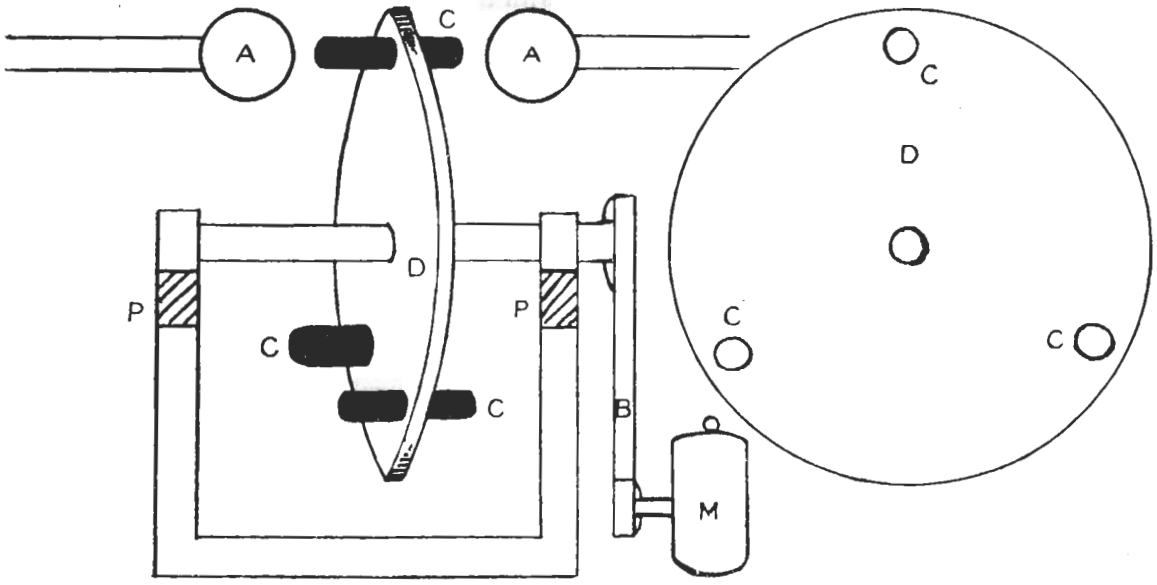
The spark gap.

This was of a peculiar type, being designed to give a musical note from a low frequency alternating current supply. It consisted of two balls and a revolving metal disc with copper studs, close to the circumference, fitted through the disc and projecting on either side of it. (*See* Fig. I.)

There are three studs on each side of the disc, those on one side being a continuation of those on the other.

This disc is rotated at a high speed; the copper studs pass in turn between the balls, leaving a clearance of only about a millimetre when directly between the balls. The disc is nearly 2 feet in diameter, and revolves at a speed of 3,000 revolutions a minute; this brings a pair of studs between the balls 150 times a second, which corresponds to the note D flat (below the middle C).

FIG. 1.



A. Copper ball. C. Copper stud. M. Motor.
B. Belt. D. Revolving disc. P. Porcelain insulator.

Another advantage claimed for this design is that a more persistent train of waves is obtained than with the ordinary fixed spark balls. This was explained to be due to the rapid decrease in spark length that is taking place whilst the spark is oscillating, and to the fact that, although the voltage to produce the spark is equivalent to that required for a long spark, the mean damping while the spark is passing is that due to a much shorter spark length. To increase this latter effect a higher peripheral speed is proposed.

The oscillator. The oscillator consists of a rough wooden drum of 4 feet diameter ; inside is placed the primary winding, consisting of one turn of many parts of insulated wire, and outside the secondary is wound the conductor, consisting of a number of strands of small wires laid up round a 3-inch hemp core. The primary and secondary windings are insulated from the drum by layers of ebonite.

Two spark gaps and oscillators of the above type are installed with the object of rapidly changing wave-lengths, so that a longer or shorter pair can be used as required.

The mean length of the present longer pair of waves is 14,000 feet, and that of the shorter pair 12,000 feet.

The two waves in each pair differ from one another by about 1,000 feet in length.

Magnetic key. The magnetic key is also placed on this flooring, and now consists of a rocking arm, pivoted at the centre, with a contact at each end forming two breaks in series in the high-tension charging circuit to the transformers. The contacts are prevented from arcing by a powerful air blast delivered from a 2-H.P. motor-driven fan. The rocking arm is controlled by an electro-magnet, the leads of which are led down to the receiving room and connected to the signalling key.

The spark-gap balls and studs are made of copper.

Air condensers. The air condensers, under present working conditions, are only charged to a D.P. equivalent to a 1-cm. spark, whereas their breaking down D.P. is as large as that of a 6-cm. spark, so that they are capable of working with a considerably larger power.

The total cost of the condenser, complete, including the house, material, and labour, was stated to be 10,000*l.*

The arrangement of the aerial and earth are exactly the same as previously described in the report by Officers of Atlantic Fleet dated 23rd July 1907.

DESCRIPTION OF RECEIVING INSTRUMENTS.

Telephonic reception only is at present in use. There are two types of receiver—the magnetic detector and the oscillation valve—and either is used at the option of the operator on watch. The circuits are arranged for quickly switching over from one to the other.

Magnetic detector.

The magnetic detector differs principally from those in use in the Service by having electro-magnets instead of permanent magnets. For adjusting the strength of the field an adjustable resistance is placed in series with the coils of the electro-magnets.

The M.D. is placed in a closed circuit consisting of the M.D., an adjustable condenser, and an inductance; the latter forms the secondary of an oscillation transformer. (*See* Fig. III.)

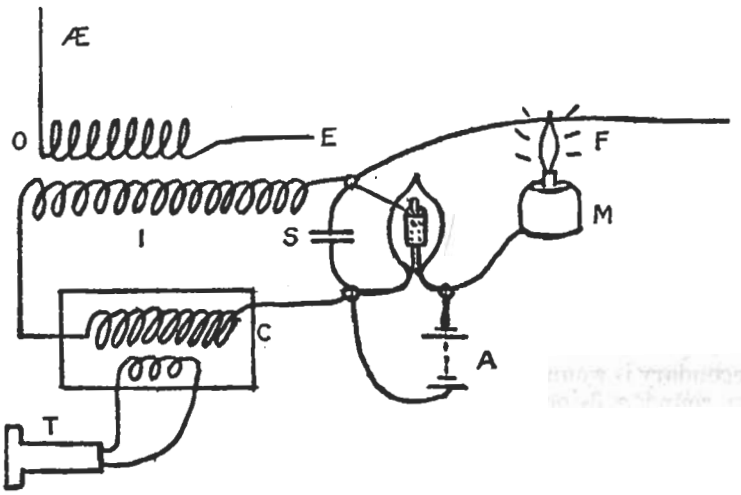
The primary of the oscillation transformer consists of another inductance, and is connected one side to an adjustable condenser and inductance in series with the aerial, and the other to earth.

The distance apart of these inductances is adjustable, to enable the coupling to be altered.

Oscillation wave.

The oscillation wave is arranged as described in patent. It consists of a small 12-volt incandescent lamp (supplied with current from a small set of accumulators), the filament of which is surrounded by a thin aluminium cylinder placed inside the glass globe close to the filament; the aluminium cylinder is connected by a lead passing through the globe to a terminal outside. A flame and step-down transformer (an ordinary induction coil, 10 inches) are also used, connected up as shown in Fig. II.

Fig. II.



A. Accumulator.
C. Ordinary 10-inch induction coil.
F. Flame.
I. Large inductance.
M. Spirit lamp.
O. Oscillator transformer.
S. Small adjustable condenser.
T. Telephone.

In general, two lamps are placed in parallel. The flame appears to have only quite recently been introduced; it markedly improves the strength of signals and is said to make the working of the lamp more reliable, especially when atmospherics are present. A strong atmospheric tends to leave the lamp in a temporarily insensitive condition if not shunted by the flame. The life of the lamp is stated to be 1,000 hours, and about 20 per cent. of new lamps are usually discarded as insensitive.

Experiments were carried out to compare the relative strength of signals from Glace Bay when received by the magnetic detector and oscillation valve respectively.

The circuits were most carefully tuned, and the results showed that there was nothing to choose between them; but when the flame was removed, the signals were distinctly weaker with the oscillation valve.

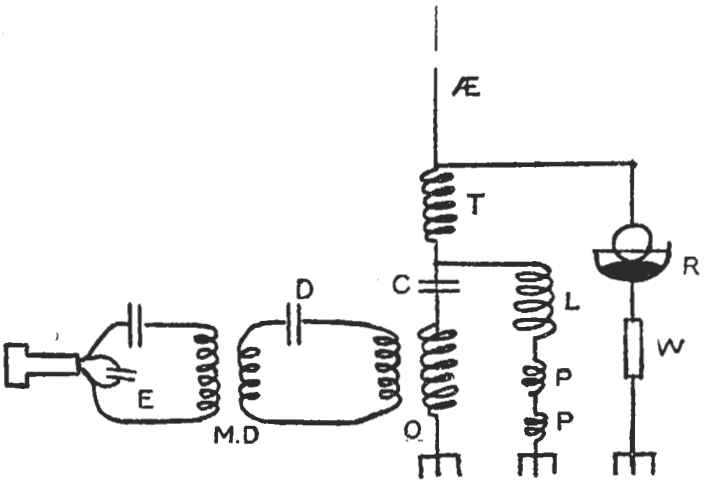
Aerial and atmospheric drain.

The aerial used for receiving consisted of a pair of wires on either side of the transmitting aerial, supported a few feet above it, and running parallel to it for its entire length.

Several devices were shown for cutting out atmospherics. The principal one consisted of a large inductance in series with the primaries of two magnetic detectors; this circuit allows statical charges to discharge to earth, and the M.D.'s act as damping devices and prevent the circuit from oscillating. The term used by Mr. Marconi for this circuit is an atmospheric "drain."

Another circuit, connected as shown in Fig. III., allowed very strong atmospherics to pass to earth by breaking down the oil film of the Lodge coherer and passing by the mercury to earth; the wheel is kept revolving in the usual manner.

FIG. III.



C. Adjustable condenser.
D. Condenser of 180 jars.
E. Telephone condenser.
L. Large adjustable inductance.
M.D. Magnetic detector.
P. Primary of M.D.
R. Lodge coherer.
T. Tuner.
W. Water resistance.

Experiments were carried out to test the efficiency of the former device. The large adjustable inductance was varied until the strength of atmospherics heard in the telephone of one of the M.D.'s in series with it were loudest. The receiving circuit was then adjusted for signals from Glace Bay, and messages were received with only occasional slight ticks of atmospheric interference.

At the same time the atmospherics received on the M.D.'s in the drain circuit were practically continuous.

The present rate of working is about 12 words a minute, but it is considered that the new type of magnetic key, described in this Report, will allow of a speed of 20 words per minute being obtained without difficulty.

The speed of working is considered to be only limited by the possible rate of reception.

GENERAL NOTES ON THE STATION.

Although there is no doubt that reliable communication can be obtained with Glace Bay when everything is in working order, it appears that many parts are liable to break down due to the primitive manner in which they have been constructed. For instance, the spark gap, oscillator, and primary connections, all get seriously overheated if continuous work is carried on. The condenser house is commencing to leak, and appears hardly strong enough to withstand heavy gales. Also, at present interference takes place between the wireless working and the working of the telegraph land line to the station, and *vice versâ*.

These difficulties interfere with the commercial prospects of the station, but can all be overcome by further expenditure of money.

The present number of men employed at the station is 50. Their duties are as follows:—

1 Electrical engineer responsible for the station.
6 Operators (two always on watch at the same time).
3 Technical staff.
3 Engineers (for charge of power plant).

The remainder include stokers, riggers, and working parties obtained from local sources. These parties are employed digging peat for fuel, and for the general upkeep of the station, and are liable to vary in numbers according to circumstances.

With regard to the method employed for obtaining the musical note, it is observed that on account of the periodicity of alternating current being 25 cycles per second, and the number of sparks per second being 150, the sparks are not all of equal power. During each cycle two powerful and four weak sparks are obtained, the powerful sparks only occurring when the alternating voltage is at or near its maximum.

It is not considered by "Vernon" that the decrease in damping due to this type of spark gap is as marked as it is claimed to be on account of the great losses taking place elsewhere.

All the lighting circuits are run in earthed steel tubes, and all dynamos and motors have insulation suitable for a much higher voltage than that used.

These precautions have been taken to prevent damage due to induced current from the wireless plant, and were found necessary after the experience gained at Poldhu.

The magnetic key appears to work well, and is a great improvement on the one described in the previous report.

The outlet from the lake into which the earthed strips are led has been recently closed by a dam, and the level of the water has thus risen several feet, which brings the edge nearer the station.

It is not a salt-water lake, but it has absorbed acid from the peat and is said to be a good conductor.

A small permanent spark gap is placed in the earth lead of the transmitting aerial. This gap sparks over and automatically short-circuits itself when sending, and leaves the transmitting aerial disconnected from earth when receiving.

Points of Interest obtained during Conversation with Mr. Marconi.

Mr. Marconi explained certain experiments carried out by him at Poldhu with a plain disc previous to the trial of the studded disc. He used a direct-current dynamo giving about 1,600 volts, and with the plain disc running at a high speed between fixed spark balls he obtained continuous oscillations. These waves could not be received on a M.D. unless an intermittent contact was introduced into the receiving aerial.

The disadvantages of this system are :—

(1) The difficulty of obtaining a machine to give direct-current supply at high voltage and not to be damaged by the inductive effects of high-frequency currents.

(2) The large amount of power required.

He explained that only, say, 40 oscillations as a maximum could be usefully employed by the receiving instrument in working up the energy to produce a wave of audible sound in the telephone, and that, therefore, the greater part of the energy radiated by the transmitter has no effect in increasing the strength of signals in the receiver, and is accordingly wasted.

This led him to the idea of the studded disc, and he now proposes to carry out experiments with the studded disc, using a direct-current supply.

To overcome the inductive effects of high-frequency currents he is going to try a secondary battery giving about 6,000 volts connected in parallel with a dynamo. If these experiments are successful, a suitable set of this plant will be installed at Clifden, the present 25-cycle alternator being retained as a stand-by.

Should the experiments not be successful, another 25-cycle set will be installed to duplicate the present one.

He also proposes to try experiments at Poldhu with an increased number of studs so as to try a higher note, and to experiment with wave-lengths longer than those at present in use at Clifden.

With regard to receiving instruments Mr. Marconi stated that he had carried out some experiments with tuned telephones and relays. The results showed that atmospherics caused these instruments to work up vibrations, and as they had been tuned to a definite note the vibrations worked up in them always produced the same sound as the signals for which they were arranged to receive, and the signals therefore could not be distinguished from the sounds produced by the atmospherics.

In short, the human ear, when atmospherics are present, can better distinguish between the signal and the atmospheric than the mechanically tuned device. Similar objections apply to recording instruments, due to their incompetence to distinguish between the atmospherics and signals.

Some very interesting theories based on practical experience and laboratory experiments were described by Mr. Marconi to explain certain phenomena which occur in the intervening space between the sending and receiving stations during the transmission of electric waves. They are concerned with the apparently erratic manner in which signals of various wave-lengths behave under different atmospheric conditions.

It has been observed during the working between Clifden and Glace Bay that sometimes one wave-length will get through strongly when no signs of another can be detected, and *vice versâ*.

Thus in general a long wave will get through strongest by day and a shorter one by night. This he considers is due to the ionisation by sunlight which makes the air slightly conducting, and the following experiment appears to bear out the theory :—

If a wet sheet is held across the path of electric waves it is found to largely absorb those of the short wave-length and to only very slightly effect those of a long wave-length ; the damp sheet is equivalent to the slightly conducting state of the atmosphere during sunlight.

When part day and part night intervenes between Clifden and Glace Bay, it is found that sometimes only the longer and sometimes only the shorter will get through.

Again, during stormy weather, and especially when storms are general across the whole of the Atlantic, it is difficult to tell which wave will get through. This he considers is due to streaks or banks of ions being blown about irregularly by the wind, their distribution sometimes allowing the shorter wave to pass whilst the longer one is impeded, and *vice versâ*.

An experiment showing that ions can be carried about by the wind has recently been made by Professor J. J. Thomson. He placed an electrometer inside a metal box divided in two by a metal partition ; the portion in which the electrometer was placed was completely closed, whilst the other, containing ionised air, had a slit in it. On blowing a jet of air into the slit the electrometer was affected by the ions, which had been set in motion by the air and had passed right through the metal partition into the other compartment.

Thirdly, it has been observed that long waves such as are used at Clifden are at their best in dry weather, and in wet or foggy weather short waves used by small-power stations appear to be at their best. This, although not accounted for by Mr. Marconi, may be due to the moisture of the ground in the neighbourhood of the stations.

The secret box at Poldhu.

Mr. Marconi was asked what were the contents of the wooden box shown to the officers of "Vernon" some two years ago at Poldhu, on which point no information could be obtained, although inquiries from the Marconi Company or their representatives have on several occasions been made. He stated that it contained an oscillation valve.

Information required from the Marconi Company.

In view of the probable changes that are likely to take place at both Clifden and Poldhu, due to the result of experiments, it is suggested that the Marconi Company be asked to inform Admiralty of any changes in wave-length or apparatus which may occur from time to time in either of these stations.

POLDHU.

This station was visited on the 11th February.

The general arrangement of the station calls for but few remarks.

With the exception of the revolving studded disc type of spark gap, the action of which is explained in attached report on Clifden, no apparent change has been made in the station since the last Admiralty visit reported on in April 1907. The hours of working are now from 7 to 9.30 a.m. and 10.30 p.m. to midnight, or until the messages are completed. Press messages are sent at these times for the benefit of the Atlantic Liners. The day range of the station, sending to ships, is stated to be 800 miles, the night range 1,400 miles. The wave-length used is 8,000 feet.

The following are some general notes on the station:—

Power.

There are three 40-H.P. boilers. There is room for another three in the boiler house. Takes half hour to work up from the banked fires condition; 1 steam engine, 80 to 100 B.H.P.; 1 120-K.W. belt driven alternator. The original 32-H.P. oil engine and alternator is still at the station, but is never used now.

Spark gap.

The spark gap consists of revolving discs, 1,440 R.P.M., 2 feet in diameter, has 12 steel studs.

Magnetic key.

The magnetic key consists of a rocking arm, with finger contacts at each end.

Condensers.

The condensers used are Poldhu pots, arranged four in series. Total capacity, one microfarad.

Receiving.

No regular receiving is done at this station, although there is a receiving room for experimental purposes.

Aerial.

The aerial is directional on the great circle to Glace Bay. Four masts are erected and two of the original towers used for spreading the aerial. The other two towers are not used now. Directional part of aerial consists of 30 wires $\frac{7}{3/2}$, extending to a distance of 1,000 feet from the towers in use.

Land line.

There is a private land telegraph from Falmouth to the station.

Staff.

The present staff consists of 20, all told:—

1 Engineer in charge.
2 Engineers.
2 Operators.
2 Watchmen.
3 Stokers.
3 Labourers, permanent.
7 other labourers at present employed.

Additional hands are hired locally for painting masts, refitting rigging, &c. during the summer months.

LIZARD.

This small-power station for ship-to-shore communication is in a very primitive state, and appears to have had no improvement added to it for several years. Plain aerial worked off an induction coil is used, and a magnetic detector for receiving.

The Marconi receiving boxes with coherer are still at the station, and also the "A" tune transmitting oscillator, but none of these instruments are now used. The old pattern Marconi condenser and tuner has been recently sent to another station, so that considerable interference is now experienced from Poldhu and other stations.

There are four operators—one in general charge of the station, and three who keep three watches, being relieved by the operator in charge for meals. There is also a boy employed to clean out the rooms, &c.

The erection of the Marconi station at Brow Head has taken a lot of work from this station.

There is a telegraph line from Falmouth to the station.