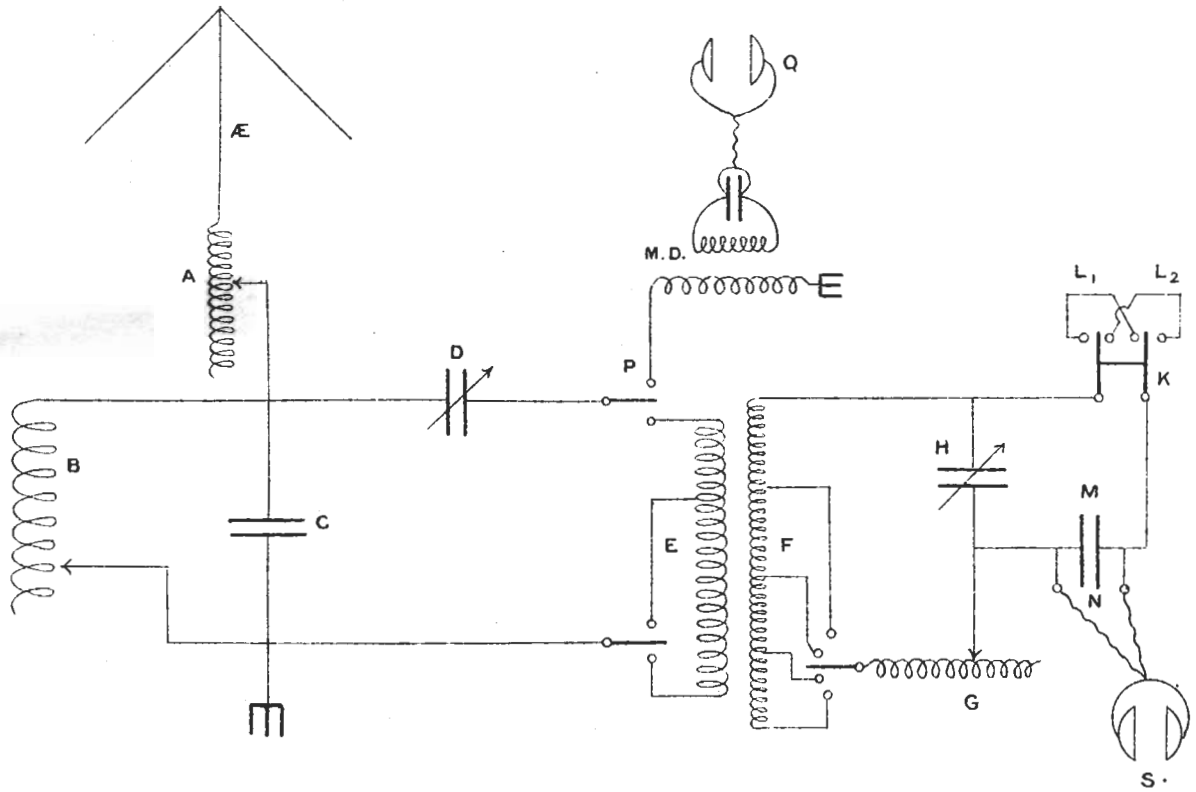
RECEIVING SET, TYPE "B"

DIAGRAM OF CIRCUIT.



REFERENCE.

A. ORDINARY SERVICE TUNER.

B. REJECTOR INDUCTANCE.

C. " CAPACITY.

D. CONDENSER, No1.

E. INDUCTION TUNER, PRIMARY.

F. " " SECONDARY

G. STRENGTHENER.

H. CONDENSER No4. (THE SMALL ACCEPTOR CONDENSER)

K. OOUBLE POLE, TWO WAY SWITCH.

L_1, L_2, CRYSTALITE DETECTORS.

M. TELEPHONE CONDENSER, (SPECIAL MICA CONDENSER)

N. " TERMINALS.

M.D. MAGNETIC DETECTOR.

P. RECEIVING SWITCH.

Q. SERVICE PATTERN LOW RESISTANCE TELEPHONES.

S. SPECIAL " HIGH " "

strengthener and secondary of the induction tuner. Should the transmitting station be fitted with a continuous wave system this direct current would be more or less constant and signals would be inaudible. With the usual spark system the trains of oscillations are, however, intermittent, varying from 25 to 350 per second; the direct current, therefore, is, in this case, also intermittent, giving a distinctive sound according to the frequency.

The telephone condenser is provided to give the most suitable quality of note for reception by the human ear. If no telephone condenser is used the note appears slightly harsh and broken; this being accounted for by the fact that between each train of oscillations there is a considerable time interval during which the circuit is inactive, and there is silence in the telephones.

By providing a condenser across the telephones the quantity of D.C. electricity generated in the detector per train of oscillations divides itself, part flowing through the telephones and part charging the condenser. When the train of oscillations ceases, the condenser discharges itself through the telephones, thus partially filling the silent period before the next train. If the condenser has too large a capacity a larger quantity of the electricity generated is taken to charge it and less flows through the telephones, the subsequent condenser discharge being more sustained. The effect of this is to weaken the strength of signals and to give a deeper note.

The best value of the telephone condenser depends on the resistance and inductance of the telephones and can only be determined by trial. This value for use with the 2,000 ohms receivers (two receivers in series each approximately 1,000 ohms resistance) has been found to be approximately 5 jars.

Adjusting to a known wave.

To adjust to a known wave the red plug should be removed and the aerial, acceptor and intermediate circuits roughly tuned to the correct L.S., the coupling of the induction tuner being tight, *i.e.*, right in.

A rejector value should then be obtained and the circuits varied in turn for the loudest signals.

When in adjustment the coupling can be loosened to obtain increased selectivity.

It should be noted that any considerable alteration of the coupling alters the effective inductance of the induction tuner. Condenser No. 1 must therefore be readjusted to suit the new coupling.

Small values of the No. 4 condenser give the best result, such as ·07 jar for "S" tune.

For table giving the approximate adjustments on the receiving set for the various tunes, *see* page 38.

Maintenance in adjustment.

Owing to the deleterious effects on the detector of very powerful discharges, the two detectors should be frequently tested against each other by means of the testing buzzer.

Earthed box and protecting switch.

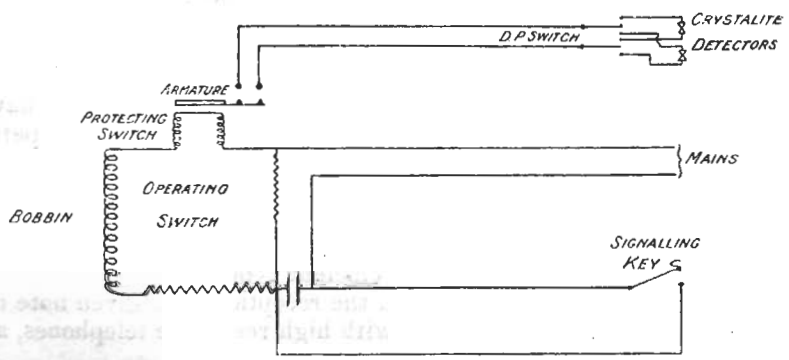
It has been found that the detectors are only efficiently protected, when sending, if fitted in an unearthed metal box with both leads broken close to it. Both detectors and the double-pole switch must be removed from the induction tuner and mounted inside this box. Attached to the box is an electrically operated protecting switch, the armature of which carries two insulated contacts which make and break connection to the detectors. The bobbins of the protecting switch are put in series with the bobbin of the operating switch, the former being designed so that the detector circuit is broken just before the operating switch makes, and is made directly after it breaks. This prevents the detectors from being affected by induced currents. The correct adjustment of the protecting switch armature is of great importance to ensure that the make and break occurs at exactly the right instant. An arrangement has been provided for varying the air gap between the armature and the pole pieces to enable the action of the former to be accelerated or retarded as necessary.

A diagram of the circuit is shown in Fig. 2.

Full instructions for installing and adjusting the protecting switch will be issued in the "Instructions for fitting operating switches."

FIG. 2.

DIAGRAM OF CIRCUIT OF PROTECTING SWITCH.



Position of instruments in silent cabinet.

The available space in the cabinet being rather limited, it is desirable to adopt a uniform position for the various instruments. This is shown in Plate VIII.

To avoid undue crowding of the table in the silent cabinet, the induction tuner should be placed with its front facing to the right of the operator as shown in Plate VIII. The metal

box and protecting switch should be fitted on an extension of the shelf for magnetic detector, sufficient room being provided to enable the operator to wind up the M.D.

The instruments should be secured from the rolling of the ship by battens, screwed to the table.

The leads connecting the induction tuner to the protecting switch should be clipped as most convenient to the sides of the cabinet.

Filling containers with oil.

The containers for the detectors should be filled with insulating oil until the crystals are just covered.

Cleaning crystals.

About once a week it is desirable to clean the containers and crystals. This should be done with a clean paint brush and insulating oil.

The dirty oil must be thrown away and replaced by clean.

Fusible metal.

It should be noted that the fusible metal, in which the crystals are embedded, melts at a temperature of about 160° Fahr.

Care must be taken when either removing the crystals from, or placing new crystals into, the fusible metal, not to exceed this temperature, otherwise the crystals are damaged and lose their sensitiveness.

Assembling receiving set.

When supplied, the receiving set will consist of the induction tuner with the telephone condenser fixed in place and the wiring completed, the strengthener, two gauge glasses and containers with the zincite crystals in place, and two bornite crystals fitted to spring rods.

To assemble the set it is necessary to fix the strengthener and the ship's No. 4 condenser (small acceptor condenser) in the compartments provided for them, and to connect up the leads.

The top of the gauge glass and container should be removed, and the ebonite knob on the spring rod holding the bornite crystal must be unscrewed, the spring rod being inserted through the hole in the brass ball and the set screw set up in such a position that the bornite crystal will make good contact on the zincite, and can at the same time be lifted clear against the action of the spring. The tinned sleeve on the flexible attached to the gauge glass and container is then sweated to the upper end of the spring rod, and the ebonite knob screwed on so that the point of arrow coincides with the position of the bornite. Sufficient insulating oil is then poured into the glass just to cover the crystals, and the top of the gauge glass and container is replaced, the container being screwed into the holes provided in the induction tuner and joined up to the double-pole switch.

Adjustments for Receiving Set Type B.

Tune.	Acceptor Condenser.	Acceptor Inductance.	Secondary.	Strengthener.	No. 4 Condenser.
"D" - - -	·3	Short wave -	B.	A.	Zero.
"Q" - - -	·5	Long wave -	C.	A.	·07
"S" - - -	1·4	.. -	C.	H.	·13
"U" - - -	3·0	.. -	C.	H.	·25
"W" - -	5·5	.. -	C.	O.	·32

Telephone Receivers.

Trials of various forms of telephone receiver and headgear have been carried out with a view to the adoption of a type which will combine the maximum electrical and acoustic efficiency with comfort to the operator and the exclusion of external noises.

The low resistance telephones supplied for use with the magnetic detector are not suitable for use with the crystalite detector, for which a telephone of about 2,000 ohms resistance is found to be more efficient. It has therefore been decided to introduce two forms of receiver into the Service, viz :—high resistance and low resistance. The receivers, headgear and leads for, will each be supplied in future as separate articles.

A particularly efficient low resistance receiver and a comfortable headgear have been obtained from the British Insulated and Helsby Cable Co. It is proposed to make this pattern of headgear universal for both high and low resistance receivers.

The results of trials with high resistance receivers have not been quite so satisfactory. At present the Sullivan type is distinctly the most sensitive, but the shape of the earpiece is neither very comfortable nor adapted to the exclusion of noise. Samples are being obtained from other firms for trial and it is hoped shortly to evolve an efficient type.

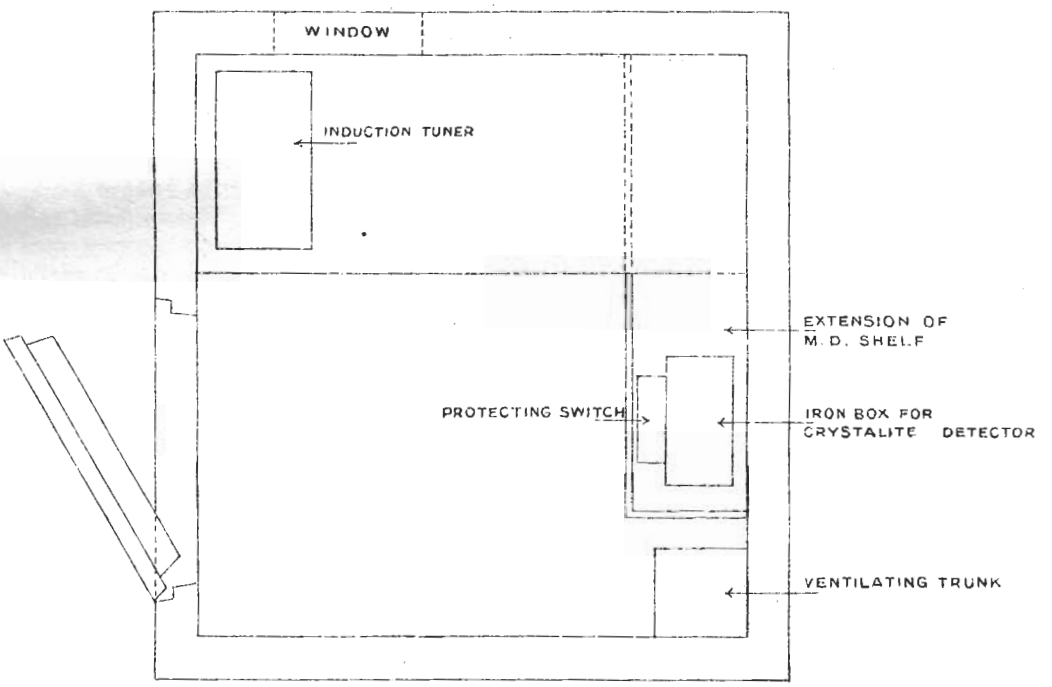
There are indications that added selectivity in the reception of a given note may be obtained by a finer adjustment of the telephone condenser with high resistance telephones, and trials will be carried out with this object.

It is thought that the best arrangement is when the L.S. of the telephones and telephone condenser is the oscillation constant of the note it is desired to receive.

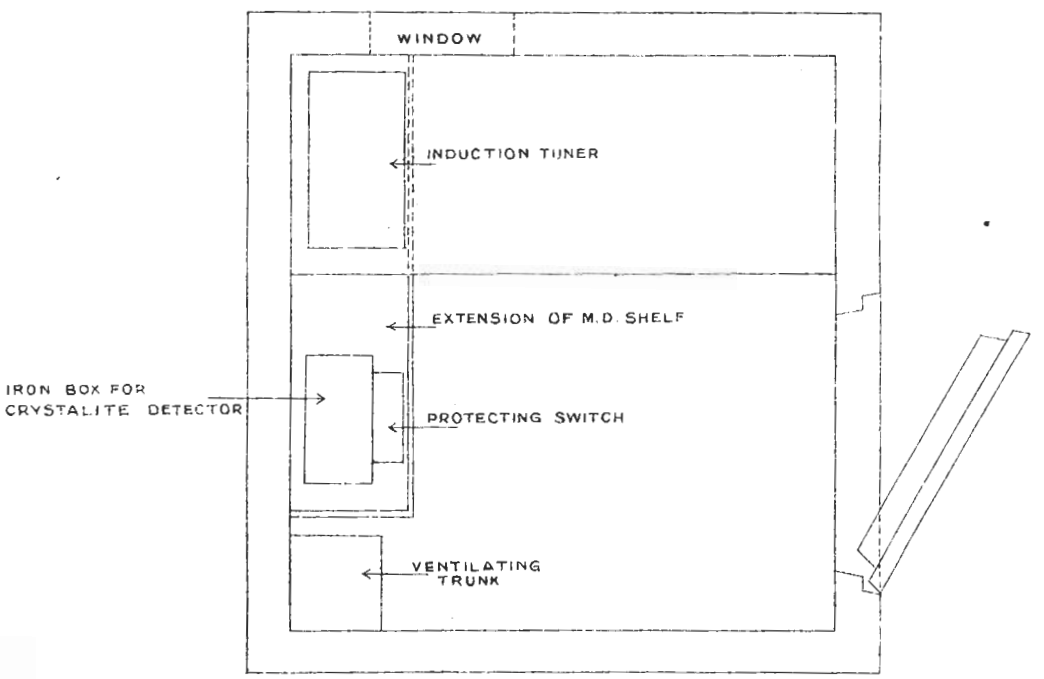
It may be mentioned that many of the flexible cords, supplied with telephone receivers, only have an insulation resistance between the conductors of the order of one megohm, or less, and also

POSITION OF RECEIVING SET. TYPE "B".

A. RIGHT HAND CABINET.



B. LEFT HAND CABINET.



appear to be absorbent. The results are not very apparent when using low resistance telephones, but with receivers wound to a resistance of some thousands of ohms the loss from this cause is quite appreciable.

All receivers will in future be supplied with rubber insulation next to the conductor.

Sound Intensifiers.

Sound intensifiers can be of two descriptions; either sound magnifiers only, or electrical relays by means of which weak impulses can be made to operate a secondary circuit.

Mr. Hellyer's current magnifier belongs to the former class of intensifier. Its action is a secret, and, when tried in "Vernon," the apparatus was contained in a sealed box. Readable signals were considerably strengthened and loud signals became positively deafening. In addition the ordinary noises of the ship were much intensified, and any movement by the operator caused sounds in the telephones. On the other hand weak signals were not made more readable, and the instrument was in no way suited to Service requirements. Mr. Hellyer's current magnifier.

Mr. S. G. Brown's telephone relay is electrically operated, and has given very promising results, weak signals being much strengthened while strong signals are not made too loud, and, provided the relay is mounted on a felt base, external noises are not appreciably intensified. Mr. S. G. Brown's telephone relay.

The "make and break" of the relay consists of two contacts of osmium iridium alloy, moistened with a drop of fine machine oil. The principle of the instrument consists of an electro magnet influencing an iron tongue, which carries one of the osmium iridium contacts. The local circuit includes the winding of the electro magnet, the telephone receiver, the "make and break" contact and a single cell accumulator. On the pole pieces is wound a secondary circuit connected to the telephone terminals of the magnetic detector. Under normal conditions a current of about ·04 ampère flows through the local circuits, but, on the receipt of a signal, the secondary winding influences the tongue, causing slight variations in the current through the telephones. Signals of strength 4 are increased to strength 7, the results being that the magnetic detector in combination with the relay is nearly as sensitive as the crystalite detector. Considerable care and practice are required in the adjustment of the relay, and further trial is necessary before its suitability can be determined.