CHAPTER I.

General Description of Set, Interference, &c.

Figure 1 gives a diagrammatic sketch of the transmitting and receiving circuits. "EE" are the two halves of the primary inductance, adjustable to give a range of tuning from about 3·6 to 7 L.S. It is in two halves, to equalise the distribution of potential along each side of the circuit. The waves used are 4 L.S. and 6·2 L.S.

"CC" are the transmitting condensers, each of nine jars capacity, contained in one tank, the four terminals being brought out close to each other on the top.

From the low-tension terminals of the condenser the circuit is led to the terminals of the coupling board "F," and from other terminals on the coupling board leads go to aerial and earth respectively.

The action of the set is as follows :—

The circuit is charged through the inductance "H," the condensers "G" being short-circuited by the inductance at the charging frequency (250 cycles), the D.P. between the plates, when charged, being only a few microvolts.

When the spark passes, however, the circuit oscillates at a frequency of $2{\cdot}4 \times 10^6$ cycles (if using 4 L.S.), and the back E.M.F. of the inductance "H" comes into play, the condensers are no longer short-circuited, and the D.P. between the plates rises to about 2,000 volts.

This D.P. charges the aerial and causes it to oscillate. Before, however, the potential across the plates can rise at all, the condenser "G" must be charged, a proceeding which delays the charging of the aerial and makes it a more gradual process, absorbing any shock, thus causing the aerial oscillations to commence very gradually.

It will be seen that the oscillations in the aerial are of a nature less likely to disturb neighbouring aerials by shock than in the usual circuits, and the interference from the auxiliary set experienced in the main office is thus reduced to negligible dimensions. That part of the interference due to sparking in the rigging, &c., will, of course, remain, and must be dealt with locally as the conditions will vary in different ships; a very probable cause of interference, and one that will be difficult to eradicate is the sparking that may occur at points where there is a bad or partial electrical contact between the different parts of stanchions, stays, guys, running rigging, &c. Discontinuities in the lead casing of electric cables and places where thimbles and eyes are served with hemp or partially insulated from wire

rope or shackles, &c., by paint, will possibly cause trouble; this can be removed by making good electrical contact across them. A very minute spark may cause serious trouble, especially if the natural frequency of the circuit in which it occurs should happen to be of about 4 or 6·2 L.S. Rigging sparking under these conditions has an effect similar to "plain spark," and is very hard to cut out.

Interference in Main Office by Auxiliary Set.—This should be excessively small, and, as a rule, the ordinary rejector adjustments should deal with it. It has been found that the coupling of the induction tuner is excessively critical for the position of minimum interference. The coupling must, therefore, be varied till interference is least. If interference is still bad, drains to earth may be tried of 2, 4, and 6·2 L.S. connected across the break-down fuse. These may be made by wrapping a few turns of 611 wire round a Leyden jar or other small capacity. It may be found necessary to have several drains of different values in parallel at the same time.

Interference in Auxiliary Office from Main.—This, as a rule, will be found much harder to deal with. All sparking in rigging must be absolutely stopped before anything further is done. All stays must have their ends efficiently earthed.

Where the main aerial is fed in a position not far from one end this short end may have a period of the same value or a multiple value of one of the auxiliary waves. Hence altering the position of feed may better matters.

Drains of the value of the auxiliary wave in use and joined to earth between the main office mutual and aerial coil may prove of value. To prevent the drains having a bad effect on receiving in the main office, the earth lead of the drain should be secured to the moving bridge piece of the type I. operating switch and so only come into circuit when sending. This does not apply to Type II. ships, where the drain would have to remain in circuit all the time unless disconnected by a switch.

It is important that the auxiliary aerial should be at the greatest angle possible relative to the main aerial and feeders, and also it should not be parallel to any stays. Two and three balance carborundum crystals have been tried with success against interference. The two balance is the simpler and is capable of cutting down interference to at least the same strength as the received signals and generally lower.

Receiving.—In the cruiser auxiliary receiving set there are only three circuits to tune, *i.e.*, the aerial tuners, first acceptor and second acceptor. The second acceptor is put in by opening the switch on the No. 7 condenser; this adds more mics to the circuit and a corresponding capacity, and so makes the whole circuit harder to start swinging by the interfering wave. The coupling can be loosened both in the No. 34 mutual and the

No. 33, which latter couples the circuit to the detector. Sometimes one has a better reducing effect on the interference than the other.

Transmitting.—The alternator should be run up to 100 volts, 250 cycles. The spark gap should not be opened up beyond 10 millimeters for full power. Start the blower; this also energises the operating circuit. Pressing the key with the full spark an unbroken note should be obtained; if not, the impedance coil requires adjusting (the circuit probably requires more impedance). To effect this ease up the nuts which secure the yoke farthest from the terminals, remove some of the presspahn packing, slide the yoke closer and screw up.

The coupling is tightest when the plunger of the coupling board is pulled right out. Full power is not to be used except when really necessary owing to interference with main office. It is better to use a tight coupling than a long spark. Hence to increase range tighten coupling first before lengthening spark. The spark is inclined to arc under 3 mms.

Tuning.—Four clips are provided for the primary, two spring and two stiff. The stiff clips should be used, one on each half, for tuning to 6·2 L.S., and left on permanently. The spring clips go on lower down and are for 4 L.S., being removed when sending on 6·2 L.S. When tuning great care must be taken that the same amount of primary is in use on both sides of the circuit. The primary must be tuned by wavemeter.

The aerial circuit must not be tuned by means of the radiation meter but with a wavemeter. Tuning clips are provided for the aerial coil; these should be set up permanently and the moving clip fastened to them as required. The tuning of the aerial coil for maximum reading of the radiation meter is not accurate, due to stray earth currents giving a false reading.

The aerial should be tuned with the coupling plunger in the middle position so that the error of tuning will be a minimum if the plunger is right in or right out.