487. **Capacity to Earth.**—The first thing to notice in considering the insulation of any circuit destined to carry an oscillatory current is that any and every sort of insulation does not insulate. That is to say, that a piece of insulating material whose resistance to direct voltages may be millions of megohms, may be perfectly capable of transmitting the whole aerial current of a wireless station.

The insulating properties depend not only upon the material used but also very largely upon the shape of the insulator.

If the insulator be in the form of a thin sheet between large conducting plates, it really forms a condenser of considerable capacity, and the high frequency current will pass through it with as little loss as if it were a thick conductor.

Let us consider the case of an aerial. Fig. 310 represents a "T" aerial, fed by a feeder going by a long trunk to an office several decks down. Let us assume that there is sufficient clearance in the trunk to prevent sparking over, but that there is considerable capacity between the feeder and the earthed side of the trunk.

This is denoted in Fig. 310 as C_2; we may term C_2 the "screened capacity."

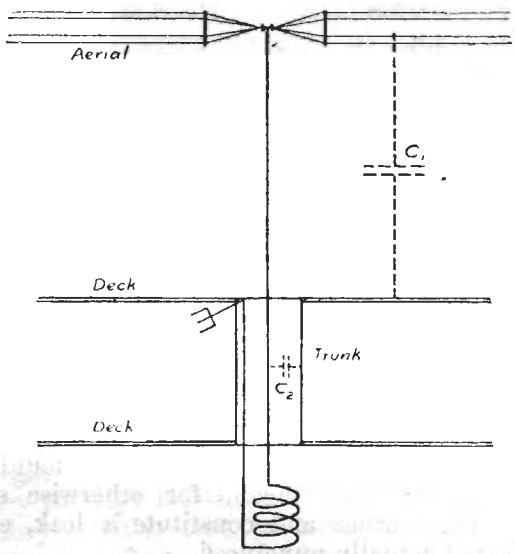

FIG. 310.

If C_2 is at all great it will carry a good proportion of the aerial current, which will accordingly not be available to charge up the "radiating capacity" shown dotted as C_1.

Remember that if several condensers are joined in parallel, current divides between them according to their relative sizes, most flowing through the biggest condenser.

Thus, if C_2 is equal to C_1, only half of the available current will do useful work in the aerial, while the other half will flow straight to earth through C_2.

To take another instance—if two insulated wires lie, or are wound, side by side throughout a few feet or inches of their length, there will be an appreciable capacity between them which will have to be reckoned with in tuning if they form part of a receiving circuit.

A non-inductive resistance—that is, a coil of wire wound on a bight—need not act as a continuous conductor at all when carrying a high frequency current, and may possibly conduct such a current equally well when the bight is severed as when the conducting circuit is complete.

Insulation of any circuit, therefore, which is intended to carry high frequency currents necessitates not only good dielectric strength but also a very small capacity to neighbouring conductors.

In the case before our notice, the conductor we wish to insulate is the aerial wire itself, and the other conductors from which we wish to insulate it will consist of wire stays, masts and the trunk between decks.

All these things may be taken as being more or less connected to "earth," which forms one plate of the open oscillator, the wire itself forming the other plate.

It follows, therefore, that the clearance of the aerial from earthed objects must be as great as possible to avoid having large capacity to earth at points where it is not required.

It must be borne in mind that the capacity of an aerial will not remain constant unless the aerial be kept hauled out uniformly at all times. Further, it is probable that it will vary if gun turrets near the aerial or feeder are moved, if the awnings are spread or furled and if the decks are wet or dry.

Another cause of alteration of aerial capacity will be that due to any alteration of the position of the feeder by the rolling of the ship or the action of the wind.

It is therefore important to keep the feeders as rigid as possible, and to check the aerial tuning at intervals.

Another cause of alteration of σ will be that due to any alteration of the position of the feeder by the rolling of the ship, or the action of the wind. It is the lower part of the feeder especially which we must try to keep rigid, for any small alteration here will have most effect upon the capacity. Hence the value, where main-deck offices are fitted, of a rigid copper pipe for the lower part of the feeder until it is clear of all large masses of iron, such as the after-turret or shelter-deck. The pipe should be carried in easy curves, not given any sharp bends.

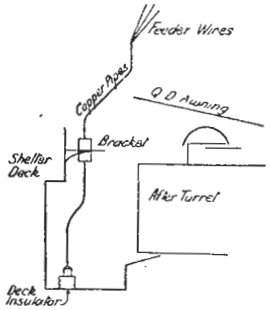

FIG. 114.

This arrangement is shown in Fig. 114 and has the additional advantage of making the aerial less liable to damage during evolutions.