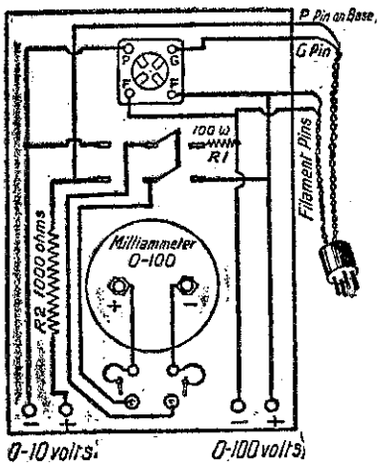
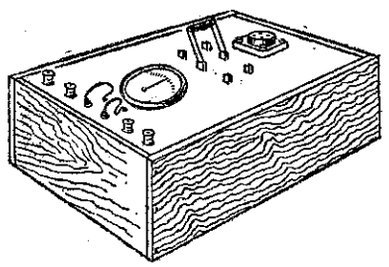
the free ends of the wires corresponding to their termination on the valve socket.

The Diagrams.

Proceed to wire up according to the diagram. This is a view looking down on the inverted panel, and is not a plan of the wiring as it would be seen if the panel was transparent. It will be noted that the grid and the plate terminals are apparently wrong, but this is due to the fact that it is upside down. The two lengths of flex wire can be fastened underneath by a small clip and a slot cut in





the side of the wooden box, so that it will slide in from the top. When connecting up the millimeter, do this by two short lengths of flexible wire, passing through the small holes in the ebonite, and fastened to the two valve pins outside, so that the connections to the millimeter can easily be reversed by simply changing over. The resistances are marked as R1, 100 ohms and R2, 1000 ohms.

Running over the connections one by one, it is seen that the grid terminals on both the socket and adapter are merely joined via the length of flexible wire. Plate pin or valve base joins to one end of the switch and one end of 1000 ohm resistance. Free end of resistance to one of the insulated terminals on panel. The adjacent terminal to D.P.D.T. switch and also to plate terminal on valve socket. The two middle pins on the switch join to the two valve pin sockets below. Now, the filament pins on valve base adapter join direct to the filament terminals on the valve socket. To one wire is joined one end of switch and one free terminal. The last terminal joins to the other filament lead and one end of 100 ohm resistance, the other end of which is joined to the last pin or terminal on the switch. This finishes the wiring and the whole can be mounted in the box ready for use.

Adjusting the Voltages.

FIRST of all let us try the A and C batteries. Disregard the adapter for a minute and work from the four terminals on the panel. On the left are the two reading O-10 volts, while on the right are the two reading O-100 volts.

Connect the A or C battery to the two terminals on the left and throw the switch over to that side. The voltage will be given on the milliameter as follows: For every 10 milliamps it denotes 1 volt. Then for 6 volts 60 ma. will be seen. Four volts will show 40 ma., etc. Now try the B batteries. Every 10 volts will be shown as 10 milliamps, so that a 90-volt battery will show 90 milliamps. Connect the B batteries to the right-hand pair of terminals, and throw the switch to the right. If the needle of the meter kicks the wrong way, either reverse the battery leads or alter the polarity by changing over the two valve pins and sockets at the front.

If the resistances are not known and can be varied, do this on a known voltage, such as a tested battery, and adjust the low voltage side until 4½ volts reads 45 milliamps, and the high voltage side by varying the resistance until 45 volts shows 40 mills or 90 volts, 90 mills.

Using the Instrument.

NOW, assuming that we wish to test the valves in the set, take out the valve and fit into this tester. Plug the adapter into the socket from which the valve has been taken. Throw the D.P.D.T. switch to the left and turn on the set. This will indicate on the meter the voltage that is being applied to the filaments. When the correct voltage is being registered note the position of the rheostat and use in this position while the receiver is being used.

Now throw the switch over to the right and the meter will at once indicate the plate current being taken by the valve. Take special note of the last stage, and while the music is being heard watch the needle of the meter. If this kicks with a loud passage, then distortion is occurring. Increase the B and C voltages until no kick is noticed.

If this is not successful use a larger power valve. Consult the characteristic curve as supplied by the makers. Read the grid bias or C voltage horizontally. The anode current in milliamps is seen on the vertical line, and various curves for different plate voltages (B voltages) are given. Select the curve with the longest "straight portion" and bias, so that it is working on a point a little below mid point of this straight portion. Check over by reading off the plate current as given by curve with the longest "straight portion" shown on test. In either case of testing valves or batteries, the switch thrown to the left gives low voltage reading, and to the right gives plate current or high voltage reading.

Regarding the milliameter, a warning which cannot be stressed too strongly should be noted by all those who have not handled this delicate instrument before. It is extremely fragile, and should never be used to test a battery by connecting direct across the terminals. The only way it can be used to test voltages is by the insertion of a suitable resistance in series. Therefore, after purchasing the milliameter, carefully put it away until it is ready to be built into this piece of apparatus.

There is still the method of determining resistances with the use of a milliameter to be discussed. Almost all electrical calculations are based on Ohm's Law. This is defined by the simple formulae, C eq. E over R, where C eq. current in amperes.

E eq. voltage, R eq. resistance, that is R. eq. E over C.

The milliameter and a known battery voltage will have to be used in this case. Assuming we want to find the resistance of a pair of phones, connect by insulated wire the milliameter, the two small valve pins in this case, the pair of phones and a 45-volt battery all in series. Just make connection long enough for a reading to be obtained.

Let us say it was 20 milliamps, which is .02 amprs.

R. eq. E over C, R eq. 45 over .02
eq. 2250 ohms.

Similarly any resistance can be determined by arranging the voltage to suit the readings of the milliameter.

A GOOD counterpoise earth may be made by running a rubber-covered wire along a fence, especially if this runs directly underneath the aerial.

A Long-lived Marconi Valve

THE following paragraph from the "Wireless World" will no doubt be of interest:—"5XX is making a bid for the valve longevity record. A modulator valve which has just been superannuated on account of low emission has spent a useful life of 12,571 hours 17 minutes. Work it out and you will find that this amounts to almost 524 days of continuous working!

"The valve was first put in circuit on November 21, 1925, and has functioned for every minute of Daventry's transmission since that date. There are several other valves at Daventry which are well on the way to equalling this record. One has been in use between ten and eleven thousand hours and another for nearly ten thousand, and they are both going strong."

The valve in question is a Marconi Cami valve.