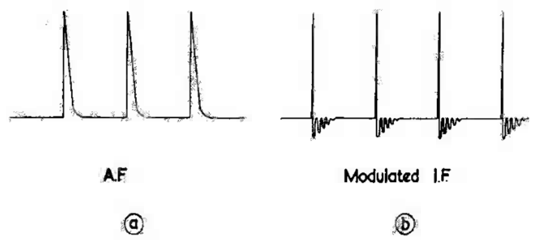

C_1 is a moulded mica component because it is required to have a high internal resistance. Also, it has end lugs, one of which provides an anchor for the neon.

The a.f. and r.f. outputs can be taken to sockets or wires may be brought through holes in the panel. The neon employed by the writer had the dimensions and instructions shown in Fig. 3.

Results

The a.f. output waveform is illustrated in Fig. 4 (*a*) and is strong enough to be heard in earphones held away from the head. When the switch is in the "I.F." position, the waveform is that shown in Fig. 4 (*b*). The wide band r.f. output is comparable with the strength of the medium wave Home Service programme in the writer's locality.

The R107 Receiver

For Amateur Use

By **J. ANDERSON**

THE R107 RECEIVER IS CURRENTLY AVAILABLE ON the amateur market, albeit in small quantities, and is considered by many to be the best general-purpose receiver available in the range 1.2 to 17.5 Mc/s, especially in view of its current price.

It is, however, capable of some small improvements, as the following details will show. Firstly there is the appearance, which often leaves a great deal to be desired. After removing all the knobs, and the switches (by their centre-screws), as well as the plugs and the rack handles on each side of the panel, a coat of grey lacquer or enamel can be applied in very little time. When it has set (after a second coat if necessary) the knobs should be replaced temporarily whilst their positions are marked with a pin or scrap of Sellotape. The wording can then be reapplied with panel transfers, and a final coat of varnish applied. The switch knobs will often benefit from a coat of thin black paint as well. The rack handles can be painted a different colour (e.g. light grey for a dark grey panel, or brown for an "olive grey" panel), and replaced when dried. It is quite safe, incidentally, to paint over "anti-insect" varnishes.

Technical Improvements

The more technical improvements also concern the panel to a large extent. The first is concerned with the meter testing panel situated at the top centre. This is an efficient dust collector, and two hands are needed to hold the meter leads to it. If an eight-way single wafer rotary switch is available it can be used to select the individual test points to take the switch. A small metal panel is drilled and fitted as in Fig. 1, and the test leads from the receiver circuits connected to the switch points in sequence. The two wander-plug sockets shown will give a good grip for test prods. It is immaterial whether the switch used is break-before-make or not, as the test terminals are each connected via a $3k\Omega$ resistor to the h.t. positive line, and the only effect on turning the switch will be a click in the loudspeaker. This small metal panel can be painted the same colour as the panel, and can have a series of transfer labels as suggested in Fig. 1.

There is often considerable advantage to be gained from a tuning meter. It is a simple matter to install such a meter, the first requirement being

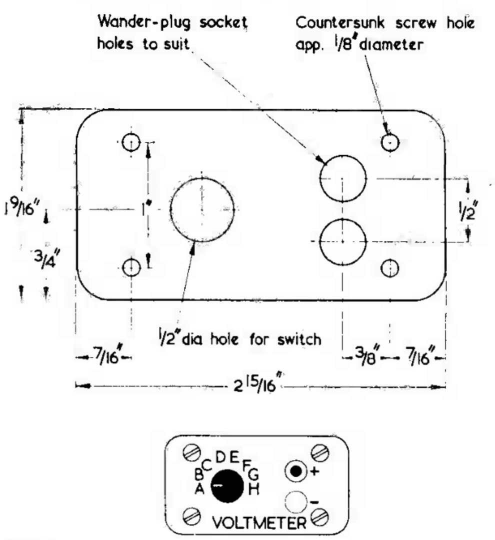

Fig. 1. The panel which replaces the meter test-point area on the original set. Also shown is the final appearance of the panel

to cut out a sheet of metal to the shape and dimensions of Fig. 2. Then, with a hacksaw (having first removed all the valves to avoid damage due to vibration) cut through the four metal areas separating the four holes covering the face of the loudspeaker, and fit the sheet in place. This converts the previous speaker aperture into a meter aperture. The loudspeaker will now, of course, have to be accommodated outside the set but, in view of the number of broadcast stations which can be received, this is not a bad thing, since the present speaker does not reproduce music very well and an external wooden case is preferable. The speaker cable required may be taken to the "Phone" socket (lower), and passed through this hole. A 5mA meter can then be fitted at the centre of the new metal sheet, and screwed into place.

The chassis must next be turned over. In the central i.f. unit (the second compartment from the rear) will be found a small tag-panel carrying two 5kΩ resistors. The one nearer the front of the set (R5C on the circuit diagram if this is available) should be removed, and about 14in of twin cable fitted across the two terminals. The other end of the cable can then be threaded up through the hole for the meter panel wiring, and forward between the i.f. transformers, to turn towards the power unit behind the front panel. The cable must then be fitted to the meter, one wire connecting to the negative terminal and the other to the positive terminal via the resistor taken from the tag-panel underneath. (See Fig. 3.) A 210Ω ¼ watt resistor shunts the meter, and it must be pointed out that the voltage across the meter will vary slightly from set to set. However, the arrangement shown in Fig. 3 should give a meter reading of about 4mA for no signal, and a dip falling to about 1.5mA when receiving a powerful transmitter.*

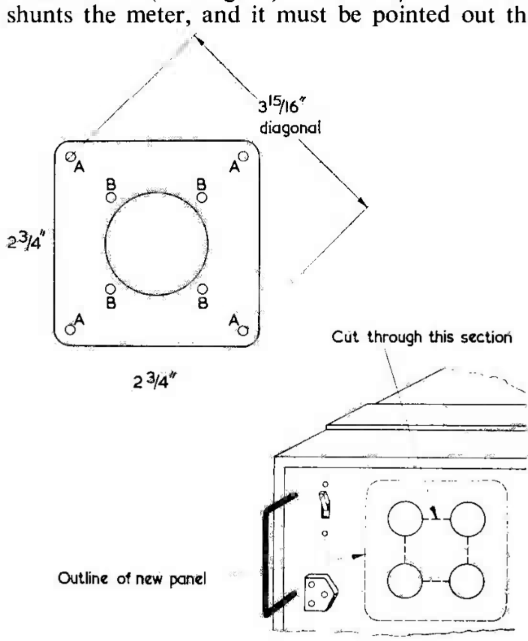

Fig. 2. Fitting a tuning meter panel. Holes "A" are countersunk and match the existing speaker holes. Holes "B" are for the meter mounting screws and should be appropriately positioned. The large hole in the panel takes the meter body

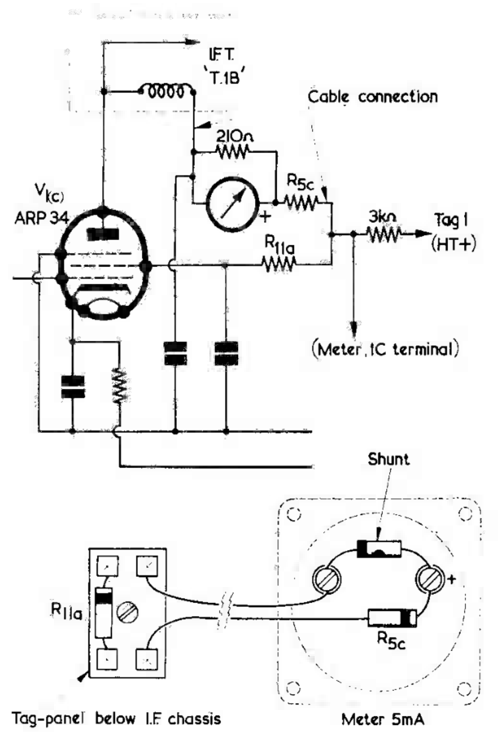

Fig. 3. The tuning meter circuit and connections

Other Modifications

Having fitted a tuning meter, cleaned up the panel and made a wooden case for the loudspeaker, there is little else to be done. If desired, a two-way rotary ceramic switch can be fitted in the r.f. connection between chassis units 1 and 2. This will enable an external feeder to feed a signal straight to the first i.f. amplifier (465 kc/s) via a coaxial socket fitted into the existing "open aerial" terminal aperture. Otherwise, it will be found very hard to improve on the set technically.

If an open aerial is being used, best results should be obtained by connecting it to the left-hand dipole feeder terminal, the right-hand feeder terminal being connected to the earth terminal. The open aerial terminal wires can then be traced back and removed, and the socket used for a converter input, as just suggested. Alternatively, a 2in length of wire can be attached to the back of the socket and twisted loosely round the feeder leads to provide a connection on the front panel for a wavemeter of the heterodyne type. Indeed, one constructor has been

* A shunt of 210Ω gives satisfactory results with the author's receiver, the resistance of the meter employed being 20Ω. It may be necessary to vary the value of the shunt with some secondhand receivers, or with meters having different resistances.—EDITOR.

known to remove the d.c. power section, and cram a wavemeter type "D" in its place. However, this had the effect of feeding harmonics into the main supply when it was switched on.

If the set is purchased without the booklet, an effort should be made to buy or borrow one without delay, as the performance will be much improved by adhering to the installation and testing instructions provided. The voltages measured from the test panel and noted in it are for an Avometer model 7 on the 100 volt range, and different readings will be obtained when a different meter and an aged set meet. Examples of satisfactory readings using a 1,000Ω pen voltmeter on its 50V range are given below:

V1 ($_{a}$) 1 volt V2 ($_{a'}$) 14 volts V2 ($_{b}$) 12 volts
V1 ($_{b}$) 3 volts V1 ($_{c}$) 2 volts V1 ($_{d}$) 4 volts
V2 ($_{a}$) 7 volts V2 ($_{b'}$) 27 volts

These figures are for Range 3 with a.g.c. out and no signal applied, and will vary in proportion with those given in the handbook for other ranges.

The twenty-first in a series of articles which, starting from first principles, discusses the basic theory and practice of radio

part 21

understanding radio

By W. G. MORLEY

IN LAST MONTH'S ARTICLE WE CONCLUDED OUR examination of tuned circuits by examining dielectric loss in the capacitor and the inductor, inductor efficiency, and practical tuned circuits.

We shall now carry on to the transformer.

The Transformer

When we introduced the subjects of self-inductance and mutual inductance[1] we saw that, if a coil is connected to a sensitive moving-coil meter, the needle of the latter gives a temporary deflection when a bar magnet is quickly lowered into the coil. The meter needle similarly gives a temporary deflection, but in the opposite direction, if the bar magnet is quickly removed. The reason for the deflections is that the moving magnetic field about the magnet cuts the turns of the coil and thereby induces a voltage in them. The polarity of the voltage reverses when the direction of the moving field reverses, this being indicated by the opposite deflection in the meter when the magnet is removed.

In our previous discussion, we next dispensed with the bar magnet and mounted a second coil above the first. To this second coil we connected a battery in series with a switch, and found that the moving-coil meter needle gives a temporary deflection in one direction when the switch is closed, and a temporary deflection in the other direction when the switch is opened. In this instance, closing the switch causes an expanding magnetic field to be built up around the second coil, the lines of magnetic force in this field cutting the turns of the first coil and inducing a voltage in them. When the switch is opened the field collapses, whereupon the lines of force cut the turns of the first coil in the opposite direction, inducing thereby a temporary voltage of opposite polarity.

This arrangement is, basically, a *transformer*, and is illustrated in Fig. 121. However, in Fig. 121, we dispense with the battery and switch, and apply an alternating voltage instead. The alternating voltage causes the magnetic field about the coil to which it is applied to be continually expanding, contracting and reversing in polarity, whereupon an alternating voltage having the same frequency is induced in the other coil. The induced voltage will then cause an alternating current to flow in a resistor, which we may designate a "load".

[1] In "Understanding Radio", part 12, August 1962 issue.