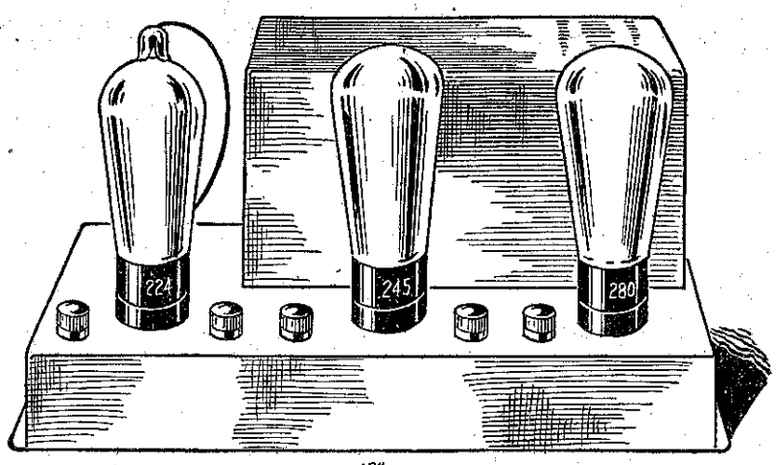

12"

DIRECT-COUPLED AMPLIFIER

Loftin-White System

FULL CONSTRUCTIONAL DETAILS

By "Megohm"

READERS have already been given an outline of the excellent qualities of the Loftin-White system of direct-coupled amplification. By its use a gain of 300 is obtained by the employment of two valves only—a UY224 and UX245, so that ample volume is obtained from any satisfactory pick-up.

The amount of apparatus with which this result is attained is comparatively small, and thus expense is kept down. It is well to remind constructors that as in other amplifiers, the last valve governs the volume of undistorted output. For the average constructor and listener this amplifier is a revolutionary change. Because, combined with simplicity and compactness ,it gives even amplification over a greater range than the ordinary working frequencies. With the 245 valve it gives volume and quality at least equal to that of a 210 valve, which is always considered as giving high grade results in connection with an ordinary receiver. With a 250 valve in the last stage, still greater volume may be handled.

The disadvantages of audio transformer amplification are numerous, including self-capacity, wave-form distortion, hysteresis, saturation effects, resonance, etc., and though research has found means of reducing many of these, the presence of iron in the circuit is always recognised as a drawback.

Resistance-coupling has its own disadvantages, but they are not so numerous. The new system eliminates most of these troubles, and its achievements depend chiefly upon the performance of the last valve and the loudspeaker. These two latter are now sufficiently improved at least to do some justice to the new system—when a screen-grid valve is used for the output, a flatter characteristic results, but a large power valve leaves little to be desired, so far as reproduction outside the laboratory is concerned.

The Apparatus Reviewed.

A SMALL power-pack comprises the greater part of the total apparatus, and enables the amplifier to be completely operated from the a.c. mains, whilst if so desired may also supply filament and high-tension current for the r.f. stages of a receiver.

An illustration gives a general idea of the amplifier as now being retailed in commercial form by Messrs. Fear & Co., of Wellington, who also supply kits or parts for home assembly. The compact size as indicated by the measurements should be noted. At the left is the screen-grid valve, the 245 in the centre, and at the right the 280 full-wave rectifier. Behind the screen-grid valve is a knob which is rotated to balance out the hum, and the metal box behind the valves contains the power-pack. The wiring, resistances, and by-pass condensers are under the metal base.

It is not likely that the amateur constructor will build his power-pack in so small a space as that occupied by the commercial product, especially if current is also to be supplied to r.f. stages, but it need be no less efficient on that account. It is absolutely essential for the power-pack to be completely shielded with metal, and if an aluminium chassis is used the cover for the power-pack may be of sheet-iron, which is the best for the purpose. The wiring lay-out shown should not be departed from to any great extent because long leads are to be avoided as much as possible.

Operation of the Circuit.

AN idea of the working of the circuit is obtained by examining the fundamental circuit, in which batteries are used for illustration, and the chain of resistances is represented by the one resistance, R. It will be seen that the circuit of the "B" battery is completed through the valve from plate to filament, and through the resistance, as shown by arrows.

The upper end of the resistance connecting to the negative pole of the battery is the most negative portion of the whole circuit. The battery voltage is distributed across the internal resistance of the first valve, and across the fixed resistance. There is a voltage drop in the resistance when plate current flows, whereby the lower end is more positive than the upper, and this places a negative bias on the grid of the next valve.

Variation in signal strength in the first valve causes its plate impedance to vary, as there is a continual change in voltage distribution between the valve and the resistance, the value of the latter being constant. When the plate impedance is large, the drop across the resistance is small, or the opposite condition may prevail, so that this continual variation is being impressed upon the grid of the second valve. Only a very low voltage is required upon the plate of the first valve, a condition which reduces possible trouble from microphonic noises, etc.

Referring to the full theoretical diagram, the path of the plate current for the power-valve may be followed from the plate to the filament to point A, where it divides, part going through the .5 meg. resistance to the plate of the 224, whilst the greater part returns to B minus through the resistors to the left. By either route the voltage drop will be equal.