A Power-pack for "250" Valves

Continued from last week

THE one or two dividers may be mounted upright on a small block of wood attached to the baseboard by a screw. If two dividers are used, only one is tapped, the connections being made to corresponding sockets on the panel. The Pilot divider is specially mentioned because the manufacturers definitely state that two can be used in series to reduce 400 volts.

Here is another scheme of resistances in series to break down 400 volts: B— 1500 (22) 1500 (42) 4000 (90) 11,500 (400 volts); total 18,500 ohms. This would run a high "waste" current, though another 1000 or 2000 ohms would be added for bias resistors. Any scheme can be made up of separate resistances, and by further dividing up the resistance values, a greater variety of voltages may be obtained. The objections to using a number of separate resistances in series are bulk and expense. Nothing but wire-wound resistances must be considered in any part of the eliminator circuit, excepting perhaps the detector and R.F. outputs if additional reduction is required.

It should be remembered that the greater the amount of current flowing through a resistance, the greater is the drop in voltage, so that when a heavy return plate current traverses the bias resistors, a lower value will be required to give a certain bias than that necessary to produce the necessary drop when the return current is small.

Grid Bias from Voltage Drop.

THE simplest method of obtaining grid-bias of two or more voltages is by extending the voltage divider resistance beyond B— and from this extra resistance tapping off the voltages required. The method of connecting up this system is shown in the diagrams.

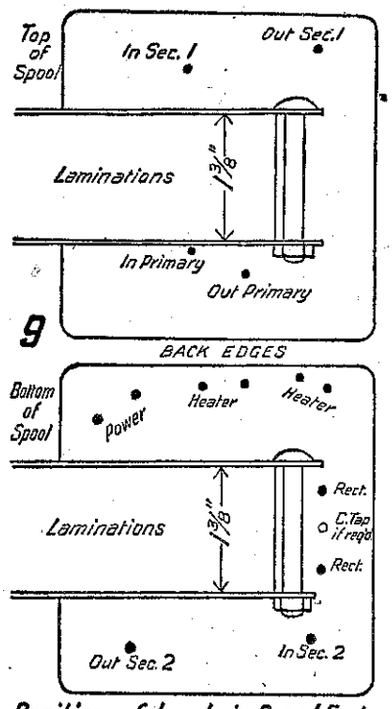
An important point to note when using this system is that the plate current for the whole receiver and also the "waste" current return to the transformer through the bias resistance, so that its carrying capacity must be high, say, about 40 watts dissipation. For this reason composition resistances are useless, as they would burn out rapidly, and only wire-wound types may be considered. Neither will it be permissible to use composition resistances that have wire contacts in the form of staples, giving the uninitiated an appearance of being wire-wound.

In order to provide a variable resistance having good heat-dissipating qualities, the writer has found the use of 400-ohm potentiometers to be very effective. Any number of these may be connected in series, but actually it is only necessary to employ one for each voltage required. The low bias voltage will be obtained from the arm of the resistance connected direct to B— whilst another potentiometer connected directly to the first will give a bias voltage up to about 28 or 30 volts. Should the power stage require a higher voltage than this, say 40 volts, it is an easy matter to raise the variable values by placing an extra fixed resistance of 500 to 1000 ohms between the two potentiometer resistances. Such extra resistance must have carrying capacity equal to the variable portion. The potentiometers actually used contain 36's resistance wire.

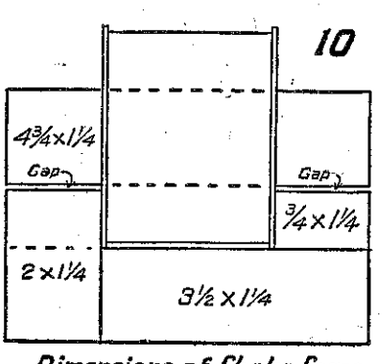
It is practically immaterial whether the B centre-tap is connected to the arm of the last bias resistance or to the end of the resistance-strip winding. Each variable arm connects to the corresponding socket on panel, or direct to the output seven-way sockets, if no panel is used. In either case the output socket at side of the container connects to its corresponding output condenser in the base.

When the amount of bias is variable it is a simple matter to adjust it by ear for best results whilst the receiver is in operation. Adjustment by means of a milliameter in the power-valve plate circuit is better still.

The highest bias voltage obtained in this way reduces the maximum plate voltage by that amount, but where, as in this case, the drop has been allowed for, it is of no consequence.



Position of Leads in Spool Ends



Dimensions of Choke Cores

This method of obtaining grid-bias is quite satisfactory for ordinary conditions, and, being variable, allows of the very best effect being obtained.

Grid Bias from Separate Rectifier.

SOME constructors may prefer to obtain the grid-bias from a separate rectifying and smoothing system. Though it mean a little additional cost, this method is the most reliable of all.

The chief additional expenditure would be a small smoothing choke, four 2 mfd. condensers, 400-volt test, a rectifying valve, and additional resistance.

The additional windings required upon the transformer are very small. The high-voltage winding consists of 860 turns of 36's s.w.g. enamelled wire, running into three layers. For the rectifier, half-wave, a 4 or 6-volt power-valve that has gone off in emission may be used, and a filament winding of 22's or 24's d.c.c. should be put on accordingly; 22 turns for 4 volts and 32 for 6 volts. The high voltage may be drawn from the centre-tap of a 50-60-ohm resistance across the filament terminals.

The rectifier and choke would be placed in front of the transformer, or better still, place the valve outside, well forward from the plate rectifiers. The condensers would be secured together to form a compact pile.

This type of bias supply was described in unit form on July 12 last, and in the All-Electric Handbook. For the present purpose a single wire-wound resistance should be used. This may consist of two 400-ohm potentiometers as in the preceding system, the only difference being that the total resistance from C + to C— must not be less than 11,000 or 12,000 ohms. To effect this, the two variable resistances may still be connected in series with any necessary extra resistance between, whilst in the connection to the return side of the high voltage winding, a 10,000 ohm fixed resistance will be included. This should be wire-wound, but may be of low dissipation, as only a few mills will be passed. The other side of the high-voltage winding connects to the rectifier grid and plate, which are both connected together.

An r.f. choke of 1000 turns of 36's enamelled wire on a flat spool should be included in the circuit before the first condensers.

The smoothing choke, which need not have a gap, may consist of 5000 turns of 36's or 40's s.w.g. enamelled wire on a 1-inch stalloy core with window about 1 3-8 × ½in. Long piece 2 3-8, short piece 1½in., if assembled without gap, which is quite permissable when the current passing does not exceed 10 mills, and a higher inductance is thus obtained.

Radio-Frequency Chokes.

A RADIO-FREQUENCY choke of 1000 turns of 30's s.w.g. enamelled wire should be placed in each rectifier plate lead. These chokes give greater selectivity to the receiver, as they prevent radio-frequency picked up by the mains acting as aerials, from reaching the plates of the valves. A flat formation should be adopted, giving a winding about ½in. thick and 2in. diameter. Two pieces of ebonite or other insulating material 2½ inches square, and bolted together with a ⅝-inch piece of wood or ebonite lead-in tube for separation, will serve well. The total thickness should not exceed ½in.

The Diagrams.

NO. 11 shows the layout of condensers, which should be adhered to as nearly as different makes will allow. Only the connections to the top of each pair of terminals is shown. The bottom connections of each group are all jointed together, and the common output condenser lead connected to B —. The bottom terminals of the 4 mfds. are all connected together with insulated wire, and connect to secondary centre-tap and C high output. This wiring cannot be shown here without confusion, but the connection is made to the top or output lug of 2 mfd. condenser marked "CT." A 2 mfd. condenser connects to each output except power and B —, the top pair in the diagram.

No. 12 shows the "CT" connection mentioned above. This comes from the connection of the two secondary windings at the front side of the transformer. Good rubber flex should be used for this wire, which connects to lower terminal of all 4 mfds., and to high bias output as already given. The two battens or stiffeners 1 x ½in. are shown at A and B; the latter must be grooved before screwing on, at each place where a lead is shown crossing it, so that no wires cross on the outside (underneath).

The two high-tension leads from the lower end of the fuses each pass