## Introducing. . .

# he "Differential Three



N proceeding to the three-valve version of the "differ-ential" series, the writer has again sought to avoid changes to the existing portion as far as possible.

Reference to the theoreti-

cal diagram of fig. 1 will show that the general design of the existing receiver remains unchanged, except for one thing—namely, that in-stead of the aerial lead connecting with a small coil inductively coupled to the tuning coil, the output of the grid end of the tuning coil.

The reason for this change is not difficult to see. In order to secure maximum amplification, a screen-grid valve is used for the radio-frequency stage, and it is a condition for the successful operation of this type of valve that the impedance in its plate circuit shall be very high; comparable. in fact, to the high impedance of the valve itself. Now, with the small and loosely-coupled aerial coil in the plate circuit of the screen-grid valve, the impedance would be quite low, so that impedance would be quite low, so that Owing to the very high amplifica-this change is very necessary. With tion factor of the usual type of screen the new connections, the plate impedance is practically that of the tuned circuit as, for reasons which have previously been discussed in these columns, the parallel path presented by the high-frequency choke is of so high an impedance as scarcely to affect matters at all.

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## Adding a Screen-grid R.F. Stage to the "Differential Two"

By "CATHODE"

There is very little else that need be more accurate to say that the filament point. The rather unusual tuning arhigh-frequency stage is conveyed via rangement whereby a small fixed cona small fixed condenser direct to the denser may be plugged in in series with the tuning condenser so as to reduce its capacity was fully discussed in con-nection with the "Differential One." The reader would be well advised to look out the issue of December 26 again and refresh his memory on this little point. The resistance R interposed in the negative filament lead to the screen-grid valve is intended not so much to reduce the filament voltage applied to this valve (although it has this effect) as to provide auto-matically a small negative bias to the control grid.

> grid valve, it is found that, except for very high plate voltages, the nagative bias of 12 volts, which is the minimum that can be provided by the C battery, is too high for optimum results. No harm is likely to result from reducing the filament voltage a trifle, no great accuracy is necessary. If a however, and this drop in voltage can

> discussed from the theoretical stand is positive with respect to the grid, but the effect is identical.

The operation of this means of obtaining a negative grid bias will be better understood from an actual example. Suppose that we are using a 6-volt valve which normally takes a filament current of 0.1 amps. Such a valve will operate just as well with an actual filament voltage of 5.4. Now, if we interpose a resistance of 6 ohms in the negative filament lead the actual voltage on the filament is reduced to 5.4 and the drop in voltage across the resistance automatically provides a grid bias of 0.6 volts.

A 4-volt 0.1 amp. valve might be provided with a resistance of 4 ohms. which would reduce the actual voltage across the filament to 3.6 and provide a blas of 0.4 volts. Valves of the 2-volt type usually take a filament current of 0.2 amps., so that a resistance of 1 ohm suffices to give a bias of 0.2 volts in this case.

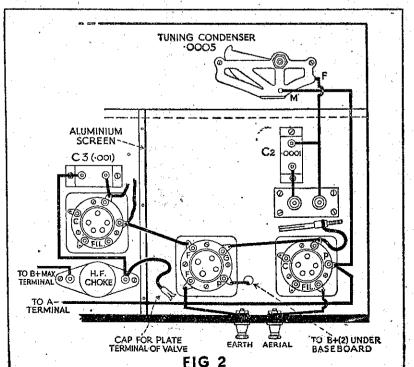
It is not necessary to use a proper filament resistor for this purpose, as scrap of resistance wire of approxiappropriately be employed for provid- mately the required resistance can be ing negative bias. It might perhaps be secured from an old rheostat or fixed

resistor this can be used as the actual connecting wire between the negative filament terminal on the valve-holder and the A lead. It will be seen that this arrangement is shown in the practical wiring diagram given in Fig. 2.

Screening has been reduced to the absolute minimum. It has been found that the inexperienced constructor is not at all happy about assembling and wiring components in the confined space of a screening box. Moreover, with the extremely short leads employed, there is no difficulty with regard to oscillation when the ordinary type of screen-grid valve is used. It is just possible that, with an unusually effi-cient valve, oscillation might be experienced. In such a case, however, all that is necessary is to interpose a resistance of a hundred or two hundred ohms in the lead to the control grid of the screen-grid valve. This will at once quell the oscillation without having any adverse effect on amplification. Do not make the resistance any higher than is necessary, however.

The screening actually consists of a simple flat vertical shield six inches high and of the same width as the baseboard. Either copper or aluminium may be used, the latter having the advantage of not corroding. It is, of course, permissible for the advanced constructor to use more complete screening if he so desires.

The constructional details which would otherwise be necessary have to large extent been covered by the previous articles on the "Differential" receivers. Thus it is unnecessary to describe the little plug-and-sock system for bringing a fixed condenser in series with the tuning condenser. as this has been fully explained in the issue of December 26. Similarly. the necessary coils are exactly similar to those previously described except



## Differential

Here are our prices for the components necessary to add a further stage to the popular "Two"

UY Valveholder Pilot, 2/3; UX, 2/-; "Buffalo" UX, 1/6.

.0005 Tuning Condenser Special Coil (4 pin base) ......3/6

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