

# Adding R.F. Amplification to the Straight Regenerator

## Untuned Stage Can Be Installed with Little Trouble and Improves Operation of Circuit Noticeably

**A** FREQUENTLY recurring question in the RADIO DESIGN mail concerns the addition of radio-frequency amplification to old style short-wave receivers of the straight regenerative type. As a stage of untuned or tuned screen-grid R.F. increases sensitivity, smooths out the regeneration, and eliminates "dead spots" due to antenna absorption, such addition is usually well worth while. It can be made at little expense or trouble, and often without disturbing the existing layout.

### FOR BATTERY CIRCUITS

Figure 1 shows how an untuned screen-grid stage is added to a battery operated set. Tube T1, which may be either a 222 or a 232, is coupled to the antenna circuit by the R.F. choke across its grid and filament. Its plate runs directly into the grid or input circuit of the detector, and receives plate voltage through the grid or secondary winding of the present plug-in coil. As this high voltage must be prevented from short-circuiting itself back through the filament, a blocking condenser C3 is inserted in the tuning circuit. This must be a good mica condenser of

about .01 mf. capacity. Its impedance to the radio-frequency currents in the tuning circuit is so slight that for all practical purposes it doesn't exist as far as the R.F. juice is concerned.

To keep the plate voltage of T1 off the grid of T2, the present grid condenser is left where it is, but the grid leak is removed from its usual connection across the condenser and swung across the grid and filament of the tube itself.

By-pass condensers of .01 mf. capacity are desirable across the R.F. "C" battery and between the screen of T1 and the filament. These condensers, as well as C3, are not critical in size. Anything between .01 and 1.0 mf. may be used as long as they are of the non-inductive type.

The various "B" and "C" voltages will depend on the particular tubes used. If T1 is of the 222 type, the "C" should be 1½ volts, "B" plus screen 45 volts, and "B" plus plate 135 volts. For a 232 type tube, use three volts "C," 67 volts screen, and 135 volts plate. The "C" battery may consist merely of one or two small flashlight cells, which cost only ten cents each.

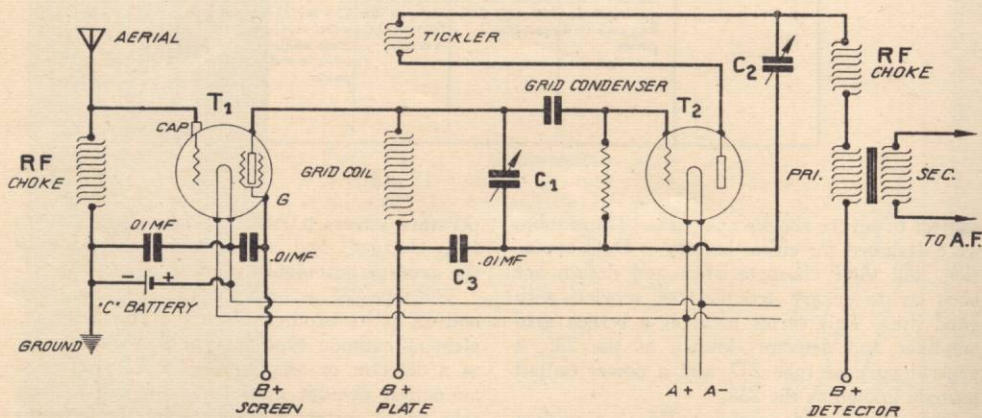


Fig. 1: How a stage of untuned radio-frequency amplification is added to the familiar straight regenerative tuner. The connections are shown only up to the detector, as the audio system remains unchanged.

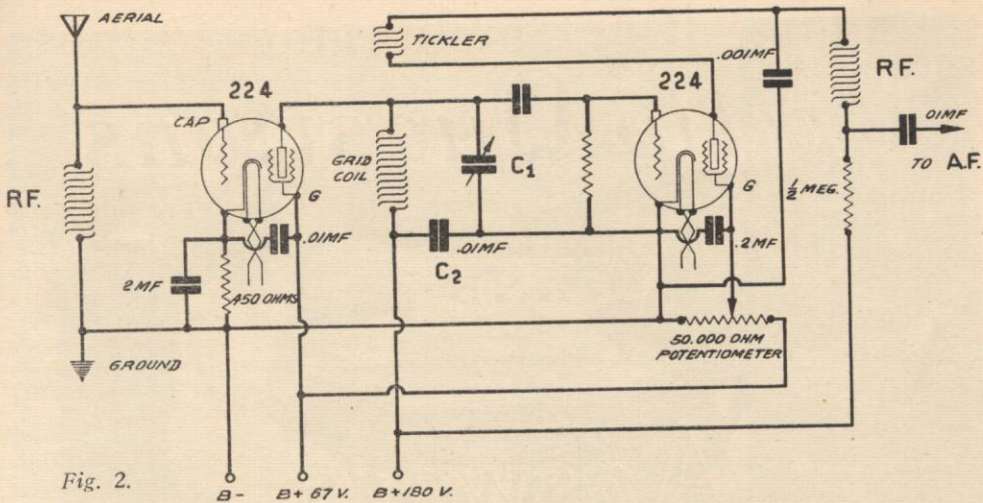


Fig. 2.

### A. C. OPERATION

Circuits of the A.C. type are easily revamped in a similar fashion, as shown in Figure 2. The same protective measures must be taken in the detector tuning circuit. The R.F. portion is a little different in that the grid bias for the 224 tube is obtained from a 450-ohm resistance connected in the cathode lead. As before, the fixed condenser capacities are not critical, but the condensers must be non-inductive. If rolled condensers of the old-fashioned variety are used the set will probably hum very badly, if it works at all.

The heater connections are not shown in Figure 2. The filaments are simply connected in parallel and run to the 2½-volt taps on the power pack, with center-tapped resistances and by-pass condensers added as on the K-115 model A. C. Super-Wasp. This "dope" is contained in the No. 115 data sheet, copies of which are free for the asking.

The detector shown in Figure 2 is of the screen-grid type. Regeneration is controlled by a 50,000 ohm potentiometer connected in the screen circuit. A fixed screen voltage of about 50 or 55 volts may be employed with a variable condenser from the tickler to "B" minus. Both methods are good.

### PLACING THE PARTS

The R. F. tube and its associated parts can usually be placed somewhere in the old set without requiring a rearrangement of the layout. It is not necessary to shield the screen-grid tube. The R. F. choke can simply be hung in mid-air by its own connecting wires.

The antenna choke, by the way, should be a good one. Most broadcast chokes have too much distributed capacity, but can be made to work nicely if about one-third of the wire on them is pulled off.

### TUNED R. F.

Some people have inquired about adding a tuned R. F. stage to their sets. This is not practical unless you are prepared to rebuild the whole outfit, as most straight regenerators are altogether too small for the additional parts and shielding. The hook-up, as shown in Figure 3, is simple enough. Antenna coil L is a plug-in coil having approximately the same number of turns as the grid winding of the detector coil for any particular wave range, while condenser C is a duplicate of the detector tuning condenser.

To prevent coupling and inter-stage feedback, the entire R. F. stage, including coil, condensers and tube, should be enclosed in a shield can. Similar shielding of the detector stage is desirable but not necessary.

A tuned R. F. stage gives more amplification than an untuned stage, but at the price of more apparatus and labor.

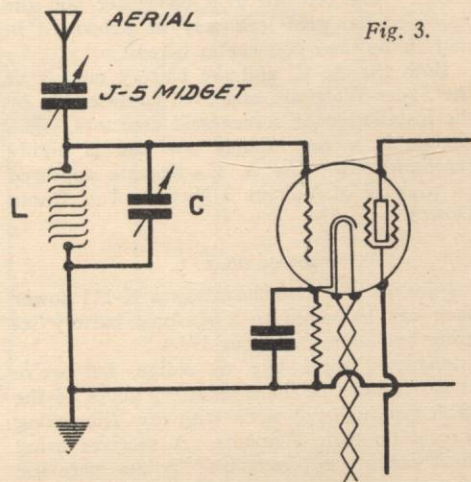


Fig. 3.