The Browning Drake Four Valve Receiver

A useful resume of constructional details *(By Megohm)*

THE construction by readers of the Browning-Drake four-valve receiver as described in this column some time back, has been generally attended by good results, and many spontaneous letters of appreciation have been received from satisfied constructors. As the numbers of the "Record" containing this article have been out of print for some time, it is evident from inquiries continually received, that many readers are still desirous of constructing this popular and efficient receiver. A resume of the descriptive article is here given in altered, and, in some parts, abridged form.

Illustrations include the theoretical circuit diagram, construction of the aerial tuning coil with strips of celluloid, the radio-frequency transformer with primary and tickler coils, construction of the primary from cardboard discs, and the neutralising condenser.

THE AERIAL TUNING COIL.

This is wound on a 3in. cardboard former, the 20's s.w.g. tinned, or enamelled wire being spaced with 24's enamelled wire, which is then wound off, leaving the correct spacing between turns. Celluloid cement is then applied to hold the wires to the celluloid strips underneath, then duplicate strips are pressed over the cement on the outside, and the whole left to set for a few hours, when the former can be cut through and taken out, leaving the 65 turns supported by the celluloid strips alone. A tap is soldered to the 18th turn from the earth or lower end. The coil is screwed to a wood base by screws through the celluloid strips. The celluloid cement is made by dissolving chips of celluloid in liquid acetone obtained at the chemist's. The mixture must be made up in a very small bottle, 1oz. or less, kept well corked, and applied with a stick. It sets in two to three hours.

VARIABLE CONDENSERS.

Two are required, .0005 mfd. being most suited for the aerial tuner. If a condenser of less capacity is used, more turns are required on the coil. For the R.F. secondary tuner any of the following may be used. Vernier dials are necessary.

Condenser .0005, 3in. coil, 56 turns.
Condenser .00035, 3in. coil, 68 turns.
Condenser .00025, 3in. coil, 78 turns.

AERIAL SERIES CONDENSER.

Either a variable midget or a fixed .0001. The smaller this value, the greater the selectivity, but too small a capacity reduces volume unduly.

NEUTRALISING CONDENSER.

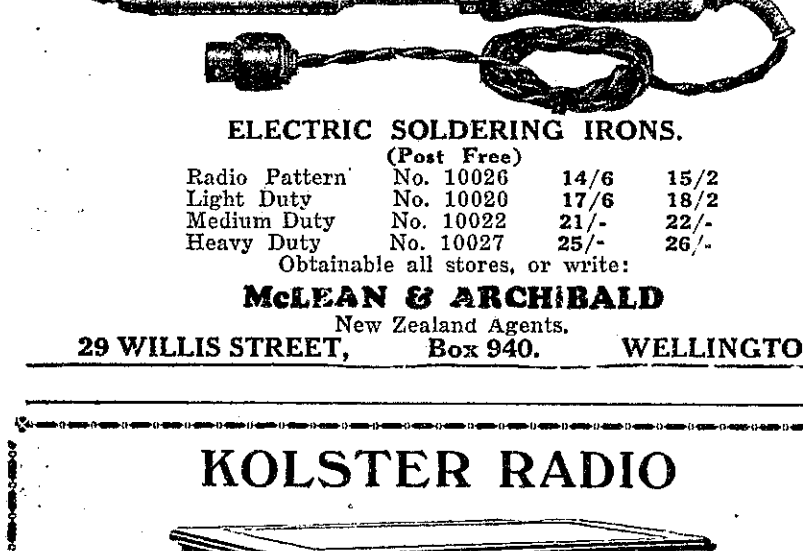
With space-wound coils as specified, the self-capacity of the circuit is kept to a minimum, with the consequence that many factory-made neutralising condensers have too great a minimum capacity, and therefore some of the moving plates must be removed. The only alternative is for the constructor to make a suitable one, which is not a difficult matter.

The diagram illustrates the construction of such a neutraliser. A piece of ebonite 2½ by 1⅞in. forms the panel, supported by a slip of wood, 1½ by ¾ by ⅜in. Only two plates should be required, made of 22's brass sheet the size shown. If the capacity is found to be too small, another fixed plate may be added, spaced with a nut. Though not essential, it is handy to have a pointer and scale on the front, the pointer of brass soldered to the head of bolt.

At the top are three 1-8-inch brass bolts, the two outside ones for connections, the centre one, B on side view, has the head outside the ebonite, inside the connecting strip (A), a nut, then the fixed plate, kept in place by another nut. At C is the bolt supporting the moving plate, the head outside the ebonite, then the pointer soldered on, then a washer, the ebonite, connecting strip A, two nuts, the moving plate, and a securing nut. The nuts must be adjusted so that the plate may be smoothly turned by a screw-driver inserted in the slot in head of bolt. A metal screw-driver introduces too much capacity to be any use to turn the neutraliser, so a tapered stick 10 inches long should be sharpened like a screw-driver, or a piece of celluloid cemented into a slot at the end (D)—metal should not be used. AA are strips of 30's brass or copper to connect the corner bolts to the fixed and moving plates as shown.

THE RADIO-FREQUENCY TRANSFORMER.

In three parts, the primary, a coil of few turns, inserted inside the first turn of the secondary coils, which is wound on a 3-in. former in the same way as the aerial coil, with celluloid trip supports. Note how celluloid strips are screwed to the sides of the wood base, the coil strips being cemented to the top edge of these. At the opposite end to the primary coil, is a rotatable tickler, 2 inches in diameter, on which are wound unspaced, ten turns on one side and four or more extra turns on the other side as required. The wire to use is 30's enamel or cotton-covered. The wire for the secondary coil is 22's tinned or enamelled, turns as given under "Variable Condensers." Care must be taken that the three coils of the R.F. transformer are all wound in the same direction and so placed in position. The primary coil may be wound in a 1-8-in. slot formed by two discs of cardboard cut as shown to just fit in the end of secondary coil, the 1-8-in.



THEORETICAL CIRCUIT DIAGRAM.

(1) Aerial series condenser, midget variable or fixed .0001. (2) Aerial inductance, 20's enamel spaced with 24's, tapped at 18th from earth end. (3) Aerial tuning condenser, .0005 mfd. (4) Neutralising condenser. (5) R.F. valve, medium impedance. (6) R.F. rheostat, 30 ohms. (7) Primary of R.F. transformer, 14 to 20 turns of 30's wire. (8) Rotating tickler, say, 16 turns 30's. (9) Secondary coil of R.F. transformer; 22's wire, spaced, tapped 15th from filament or primary end. (10) Secondary tuning condenser. (11) Grid leak, 2 to 4 megs, and condenser, .00025. (12) Detector valve, medium or high impedance. (13) Detector rheostat, 30 ohms. (14) Fixed .001 condenser over 'phones or primary of transformer. (15) First audio transformer, or resistance unit. (16) First amplifier valve, low impedance. (17) Ferranti A.F.3 transformer. (18) Grid bias or C battery, voltage to suit valves. (19) Second amplifier, power or super-power valve. (21) Output choke, 20 to 50 henries. (22) Fixed condenser, 2 mfds. (23) Loud speaker. B1, 2, 3, 4, are connected to various B voltages as required by valves. All wire sizes are S.W.G.

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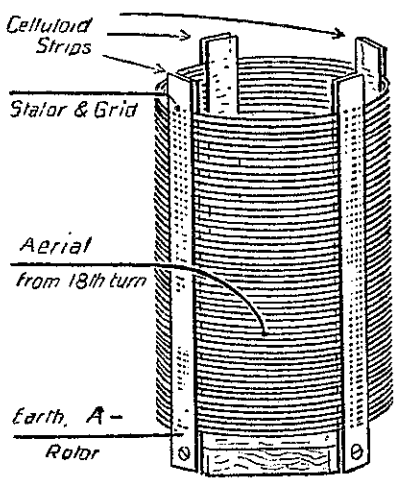


space between being made by discs ¼-in. less in diameter glued together to make 1-8 thickness, the two larger discs being glued outside. The beginning of the wire comes through the hole A and winding is carried out in the direction of the arrow, finishing through B. A connects to plate of R.F. valve and B to positive of R.F. valve. The primary coil is to be wound as irregularly as possible in the slot, and is sometimes constructed without a slotted former by winding the wire closely jumbled on a former or bottle to make the coil a fit for the inside of secondary, then it is bound with thin thread and tied in position by threads over the ends of the celluloid strips of secondary coil. The secondary coil is tapped at the fifteenth turn from the primary or filament end, this tap connecting to one side of the neutralising condenser.

THE WIRING DIAGRAM.

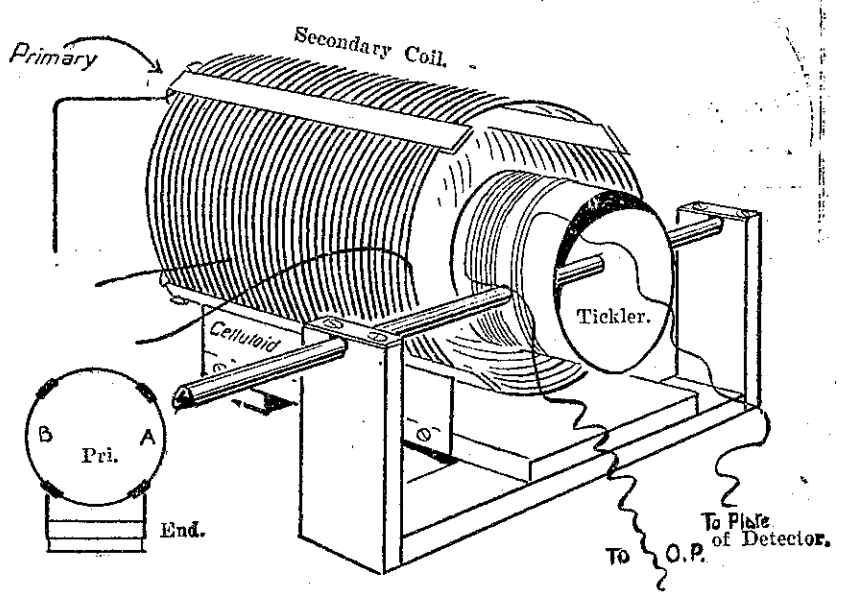
This is drawn to scale, and the position of all components on the radio-frequency side should be carefully noted and followed, as no crowding is permissible here.

British valve holders are shown in the diagram, but constructors are advised to adopt American UX holders, as British valves are now all stocked with American bases. A wire connects the filament positive of each valve, as shown, running under the baseboard. An output filter is shown incorporating a choke coil, as described in another column, but this is only necessary if a power valve is used in the last audio stage, with more than 90 volts on the plate. If the filter is not to be included, connect output jack to plate of last valve, and to "positive B power," which if the same B voltage is to be used on both audio valves, will be connected to "positive B audio" with a short piece of wire, or "jumper." If the filter is not fitted, a fixed condenser of .001 or more, best determined by trial, must be placed across the output, and in any case this may be found to effect a great improvement in tone of the speaker.

A fixed condenser of not less than .001 mfd is shown across the primary of the first audio transformer, and those constructing a two-valve set should not omit this across 'phones, otherwise regeneration may be difficult to obtain. Sometimes a grid-leak of 4 megohms will be found necessary to produce smooth oscillation. This depends to some extent upon the valve used.

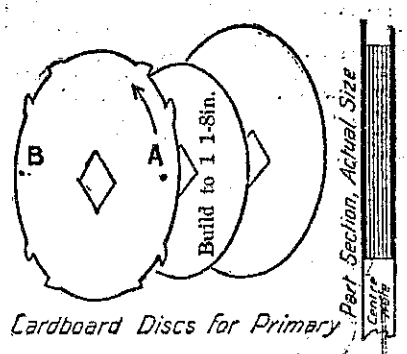
Two transformers are included in the audio circuit, any good make of 3 or 5 to 1 ratio in the first stage, and a Ferranti A.F. 3 in the second. In place of the first transformer, especially if a cone speaker is employed, a Philips resistance-coupling unit will give extremely good results. This unit, costing 25s., is provided with four market terminals, and connects up in place of the transformer without any alteration in the wiring.

The valve preceding the Ferranti transformer should not require a plate current exceeding 4 milliamps at the voltage employed on the plate.



HOW TO NEUTRALISE.

When all is complete, the operation of neutralising is carried out as follows: Tune in a loud station near



3YA, maximum volume being carefully obtained without oscillation, centre of broadcast waveband, 1YA or action being turned well down. Next turn out the filament of the R.F. valve, then with the neutralising stick turn neutralising condenser until signals are inaudible or at minimum strength, then turn on filament of R.F. valve, and the station should come through well. Now see that the variable condensers are both at maximum tuning; if not, they must be altered to get the