An Improved Browning-Drake----Increasing Selectivity

Programme Features

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Improved Browning-Drake Receiver.

A Popular Circuit For Home Construction.

"By Megohm."

The four-valve Browning-Drake circuit at present enjoys a very widespread popularity, chiefly on account of its high efficiency, low up-keep cost and ease of handling. Another point much in its favour is the fact that the radio-frequency valve is neutralised in order to prevent interference radiating from the aerial to the detriment of reception on nearby sets.

The Browning-Drake is a good distance-getter on account of the employment of reaction, rendering it specially suitable for searching out distant stations, an operation which can be more easily carried out than upon a neutrodyne and some types of super-het. This four-valve circuit is often mentioned as being equal to many circuits employing five valves; this contention is certainly true and may easily be proved by demonstration.

The carefully constructed set will bring in New Zealand and Australian stations at good loud-speaker volume, and subject to the carpices of the ether and atmospheric conditions, may bring in stations at 'phone strength up to seven or eight thousand miles, extreme range being regulated to some extent by the operator's patience, skill and vigilance.

For the convenience of those who may wish to commence with a two-valve set, the radio and detector portion of the circuit is shown in the diagram in such a way that it may easily be separated from the amplifier portion. The two-valve portion will give good 'phone strength of New Zealand and Australian stations.

The theoretical circuit is given this week, together with the construction of the aerial coil. Low-loss methods are used for the inductances, as careful tests have shown that by their use there is a gain in both volume and selectivity. Some constructors may choose to wind the coils without spacing the wires, but it must be clearly understood that this method will introduce a certain amount of loss, especially if cotton-covered wire is used, as it is less efficient than enamelled. If the instructions are followed, the low-loss plan will present no difficulty in construction. As an instance of the selectivity of this set it may be stated that without any wave-trap or shielding, at a distance of two miles from 2YA, that station can be cut out and 3YA tuned in, only a faint trace of direct pick-up of 2YA being heard at the intervals. With 1YA there is slightly more background, but of course with a suitable wave-trap 2YA is easily cut out, and such trap will be described at a later date.

Altogether, the circuit is an ideal one for New Zealand conditions, and lends itself easily to home construction, and quite as important is the fact that it complies in every respect with the Government regulations.

The Aerial Coil.

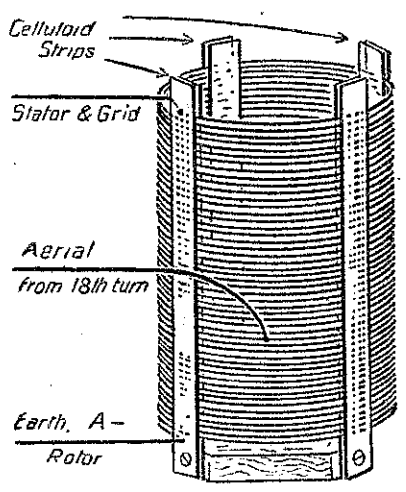
An illustration of the aerial coil is given, and upon reference to this it will be seen that it is a low-loss coil of thoroughly skeleton form. The 20's enamelled wire used is held together by eight strips of motor-hood celluloid about ½-inch wide, there being a strip inside and one outside at each quarter of the circle. The minimum spacing for low-loss coils is half the diameter of the wire, and in any case the spacing should not be over done, in order to keep the dimensions of the coil within reasonable limits. The spacing used for the coil in question is best obtained by winding a 24's enamelled wire alongside the 20's, afterwards unwinding the thinner wire. This is a much more reliable plan than relying upon twine for the spacing, and the 65 turns required will occupy just about four inches, which is short enough for any cabinet.

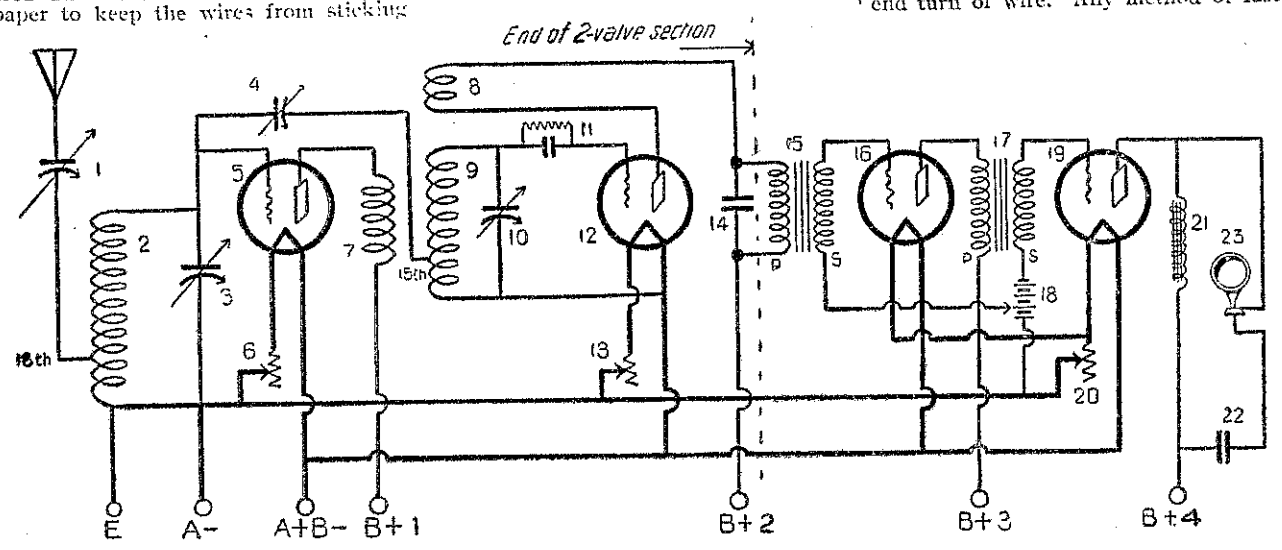
There will be 16 turns to the inch. The extra turns above those usually specified are to compensate for increasing the gauge of the wire, and to enable 7ZL to be tuned in, as this station transmits on 535 metres, which is an unusually high wave-length for ordinary broadcasts in this part of the world. These particulars are correct for an aerial and lead-in totalling 90 feet, and allow considerable latitude for longer or shorter aerials.

A former of three inches outside diameter is required upon which to construct the coil, and as this same former will be used in the construction of the radio-frequency transformer, the length should be not less than six inches, but seven would make handling easier. The former may be purchased ready-made, or constructed upon discs of cardboard as already shown in this column, but if this latter method is adopted the core upon which the former is made must be kept inside during the winding and cement required. A shilling's worth or case be a continuous strip 20 inches long and six inches wide, rolled round twice and glued down. Whichever kind of former is used, it must now be covered all round with a sheet of good paper to keep the wires from sticking to the former. The paper must only be stuck to itself and not to the former.

Now take a piece of hood light celluloid and cut eight strips six inches long half-inch wide, by scratching lines on the celluloid, which can then be broken on the scratches. Four of these strips are now held along the former at equal distances and each end is tightly tied around with twine to hold them in place. Winding is the next operation. Fasten the 20's enamel and the spacing wire through a hole in one end of the former, allowing a surplus of six inches the end of the wire, leaving sufficient for connections, is now bound to the former by several turns of twine running right round and firmly tied. The spacing material is now wound off, leaving the wire neatly spaced.

Celluloid cement, which must be prepared overnight, is made by cutting celluloid into small chips and dissolving it in acetone in a small bottle, preferably with a wide mouth. A couple of thimblefuls is about the amount of cement required. A shillings worth or a fluid ounce of acetone from the chemening the lower end of the baseboard may be used, but a simple way is to take a square of thin wood 2½ inches square, saw off the corners and secure a celluloid double strip to each corner, then by means of a central hole in the wood, secure the coil to the baseboard with a brass screw. It might here be mentioned that iron screws should never be used in a radio set, and in fact iron in any form should be avoided except where it has a legitimate purpose as in L.F. transformers. The celluloid strips should be left projecting a quarter or half inch at the top of the coil, as they may be required at a later date to support a small wavetrap inductance. Now deciding which is to be the lower end of the coil, count 18 turns up, counting from where the end of the wire comes out, but not counting the end. To this turn a tap is to be soldered, either by flattening the end of the tap wire, curling it round and soldering, or by attaching a strip of copper-foil and soldering the tap wire to that. The enamel must be carefully scraped off both inside and outside the part of turn to be soldered. This tap connects to the small series aerial condenser.





1. Aerial series condenser, midget variable or fixed.
2. Aerial inductance, low loss winding, 20's enamel wire, wound 18 to inch, tapped at 18th turn from earth end as shown.
3. Aerial tuning condenser .0005 mfd.
4. Neutralising condenser of very small capacity.
5. Radio-frequency valve, medium impedance, about 16,000 ohms.
6. R. F. Rheostat.
7. Primary coil of radio-frequency transformer. 14 to 20 turns of 30's wire.
8. Tickler, rotatable, 10 or more turns 30's wire.
9. Secondary coil of R.F. transformer, 75 turns 22's wire, space wound, tapped 15th turn from primary end.
10. Reaction condenser, .00025 mfd.

11, Grid Leak and Condenser. 12, Detector valve, medium impedance, about 16,000 ohms. 13, Detector rheostat or bradleystat 14, Condenser over 'phones or primary of first audio transformer, '001 mfd. 15, First audio transformer, 5 to 1 ratio. 16, First amplifying power valve, low impedance, about 7000 ohms. 17, Second audio transformer, 5 to 1, or 3 to 1. 18, Grid bias or C battery, voltage to suit amplifiers. 19, Second amplifying power valve, very low impedance, about 3500 ohms. 20, Rheostat controlling both audio valves. 21, audio choke, about 20 heures. 22, Fixed condenser, 1 to 2 mfds. 23, Loud speaker. B1, 2, 3, 4, are connected to the various voltages of B battery as required by the respective valves.

The Aerial Series Condenser.

This small condenser is intended to increase selectivity. The smaller this condenser, the greater the selectivity, but if the reduction is too great reaction may become somewhat unstable. The only method is to experiment and so find the correct value, giving ample volume and suitable selectivity. In order to save providing a number of fixed condensers for experiment, it is therefore a cheaper and easier plan to put in a midget variable condenser and once this is set it need not be altered.

The Aerial Tuning Condenser.

The maximum capacity of this condenser is .0005 mfd. In connecting up both this and the reaction condenser the moving plates, or rotor, should be connected to earth, as by that arrangement hand capacity which can be so troublesome is practically eliminated. This should be a low-loss straight-line frequency or the new centraline style, and a good friction drive vernier dial is recommended, about ten-to-one ratio. There is no backlash in a well constructed friction-drive, but some of the geared verniers are not blameless in the matter of backlash and uncertainty of movement. Brass is now replacing various kinds of white metal, hitherto used for the vanes. The centre-line method of modified straight line frequency spreads the stations more evenly over the dials and so makes for easier and yet sharper tuning.

R.F. and Detector Valves.

Mullard 4-volt valves are in use in the set being described, and certain details that are to be given are suited to these valves, but constructors must suit their own fancy in the matter of voltage to be used and the particular make of makes of valve to be adopted. Those whose situtaion makes the use of dry cells imperative will choose one of the 2-volt dull-emitters that may be obtained. If the constructor already possesses a 6-volt accumulator, and wishes to use 4-volt valves in order to increase the interval between charges, a 30-ohm filament resistance must be used. If 4-volt valves are to be run off a 4-volt accumulator, a 10-ohm rheostat must be included in the circuit. For the detector the braderystal in place of a wire-wound rheostat makes a smooth control which may often be used to advantage in DX work. The next instalment of this article will include a baseboard and panel wiring diagram showing positions of the valves, and other components. The type of R.F. valve used influences the number of turns required on the primary of the R.F. transformer. Mullard P.M. 3's have a suitable impedance of 16,000 ohms and an amplification factor of 13.5, the filament current 3.7 volts and 0.1 amp. The suitable H.T. voltage is about 80. The UX201A, a suitable valve for both positions, requires a filament current of 6 volts, .25 amperes, and a H.T. voltage about 90. The question of valve sockets must be decided as to whether the British or American type will be adopted. It should be noted that the Mullard valves may be obtained with either British or American base.

Referring to the diagram, if only a two-valve set is required, the 'phones will be connected to the two black spots above and below the 'phone condenser 14, and the connections to the primary of the L.F. transformer will be omitted.

(To Be Continued.)

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