Mainly about Construction

By "Megohm."

The Two R. F. Browning-Drake Unit

THE FIRST COMPLETED

THE first letter to hand announcing completion of the two R.F. and detector unit for the Browning-Drake is from Auckland, and reads as follows:—

"I HAVE completed, and have in operation, the 2.R.F. shielded Browning-Drake as described by you in the 'Radio Record.' I have finished the shielding by oxidising and lacquering, and the completed receiver is worthy of a place in any home. I am using a separate two-valve amplifier, or perhaps I should say that I am using one stage of a two-valve amplifier because it is impossible to use the two owing to excessive volume, even on Australian stations with reaction at zero. Selectivity leaves nothing to be desired when I can get 3YA Christchurch or 2BL Sydney with Auckland working ¾-mile distant only, and *no* background. Even with the foregoing praise of this receiver I do not think that I am getting the results that the set could deliver with a little adjustment, and in that particular I would be obliged if you could advise me on the following points. . . ."

THIS constructor then asks three questions concerning the working of the unit. The first deals with the matter of filament voltage, which requires adjustment for each station, and the other questions refer to primary turns and neutralisation.

The fact is, that this constructor is obtaining too much amplification per R.F. stage, which is a thing to be avoided in all receivers with more than one R.F. stage. In commercial receivers, R.F. amplification is kept low, in order to obtain undoubted stability under any conditions, with perhaps a different valve, and unskilled operation, and to make up for the comparatively low amplification per stage, an extra stage will be added, and the advantage of greater selectivity gained, for each tuned radio frequency stage increases selectivity.

SUPPOSE we have one R.F. stage working on a receiver of any type, and from this stage the highest possible amplification is being obtained. We will give this amount of amplification the value of 10. Now we cannot add extra stages and get an amplification of 10 from each, and at the same time preserve stability. But suppose that we have a stable circuit with an amplification of 8 from each stage, then the total R.F. amplification is 64 in place of 10, and with three stages it might be 7 per stage, giving a total of 343. This is given to show the principle upon which R.F. amplification is to be worked. Stabilisation of R.F. stages is the suppression of any tendency to self-oscillation of the valves, which is chiefly met with on the lower wave-lengths. Other conditions being suitable, neutralisation forms an effective means of stabilisation by balancing out the stray capacities of the circuit, and shielding reduces to a negligible minimum the interaction that would otherwise be present between one stage and the next.

IT is a recognised fact that an amateur constructor expects to obtain greater amplification per R.F. stage than is usual in a commercial receiver, and there is no harm in this, provided the gain per stage is not overdone. The commercial proposition is a receiver that will suit all conditions and unskilful operation, whereas the constructor knows, or soon will know, sufficient to enable him to handle his receiver quickly and efficiently, correcting any tendencies that might prove troublesome to a less experinced operator. The constructor knows all that his set contains, and is, or should be, keen upon learning the purpose of each part, and how it should be handled.

It is impossible for two constructors to build their sets exactly alike, even from the specifications published, as there may easily be slight differences in sizes of coils, and placing of parts, and then there is the choice of valves, which, of course, leaves a loophole for considerable differences. Nevertheless, the writer does not anticipate that constructors will experience any greater difficulty in this work than on any other circuit, especially if they have already had the experience of constructing the four-valver.

A WARNING was given to constructors to look over the coils when in position in order to ensure that adjacent turns are not touching anywhere, as such a happening causes great instability, and was the experience of the writer at the outset, a fine hair-like shred of solder making a loose connection between the two bottom turns in this detector stage, a varying contact that would sometimes change with the rotation of the tickler, and so insignificant as to be difficult to locate. Apart from this trouble, the unit neutralised with ease, and functioned well from the start, using PM3's (of which PM5 is the six-volt equivalent) with 16 primary turns.

COMMERCIAL Browning-Drake sets with two R.F. stages have been turned out of the factory for some time, and the writer is of opinion that bogeys raised by some people about the difficulty of adding an R.F. stage to the Browning-Drake have been the outcome of half-hearted attempts to carry it out. One correspondent states that his dealer told him he would gain nothing by carrying out the method advocated by "Megohm." This is sheer nonsense, and if the dealer in question took the trouble to construct the unit, adhering faithfully to the specifications, he would find that his ideas would require revision.

THE extra R.F. stage gives a great improvement in quality of reception over the four-valver, because its greater reserve gets signals well above the noise level, so that the background of rushing noises, usually present, is minimised when receiving New Zealand or Australian main stations.

Our correspondent is to be congratulated upon his construction, and when he has cut down the amplification to a reasonable amount by reducing primary turns, he will still be well satisfied with his receiver and its performance.

It is as well to remind constructors of the two R.F. unit that something more than ordinary in the way of an audio amplifier is required to efficiently handle the heavy volume which the unit is capable of delivering, and this matter will have early attention.

Transformer-Coupled Audio Amplifiers

POINTS OF VALUE

WHERE two or more transformer-coupled amplifying stages are used trouble may be experienced with the set howling at a high-pitched frequency. This is most common when the A.F. amplifier is preceded by a detector valve in which the grid condenser and leak method of rectification is employed. The grid connections of such a detector are very sensitive to stray electrostatic pick-up, and in particular are likely to be affected by the stray field set up by the large A.F. potentials generated in the last stage of the amplifier! this provides enough reaction to maintain the whole amplifier in a state of A.F. oscillation. This pick-up by the grid-leak detector is the seat of a number of troubles for which the succeeding A.F. stages are apt to be unjustly blamed. The remedy is to arrange the detector layout so that the length of connecting wire between the grid condenser and the grid of the detector valve is an absolute minimum. Also arrange things so that nothing carrying amplified A.F. currents comes within several inches of the grid connections of the detector valve. This form of instability is entirely absent from receivers employing anode bend detection.

SETS are sometimes described in which the detector unit is completely screened by a metal compartment of its own. This is an excellent plan, as it materially assists both A.F. and R.F. stability.

Sometimes, of course, the trouble does actually arise in the amplifier itself. The simple expedient of reversing the leads to one of the inter-valve transformer primaries is often resorted to. This is not, however, invariably effective, especially when there is electrostatic feed-back from the output to the input of the amplifier.

BREAK-DOWN OF WINDINGS.

MOISTURE getting into the windings of audio transformers is a frequent cause of what is usually classed as a "burn-out," but is really a corrosion of the wire by electrolysis made possible by the dampness.

MANY manufacturers now adopt various methods of impregnating the windings with moisture-proof compositions, including waxes of various sorts, and there is no doubt that in the better-class transformer moisture is effectually excluded. In a new transformer some very special process is used in which the whole transformer, including the stallory laminations and leading-out wires all complete, is absolutely sealed in a special preparation which, as the description says, "seals them for ever against the inroads of moisture, rust, and electrolysis." As a test, instruments which were immersed in water for three months were afterwards just dried on the exterior, and were then found to work as well as those which had not been so treated.

TESTING TRANSFORMERS FOR CONTINUITY.

TESTING the windings of transformers for continuity is a simple matter, and should be carried out on a new transformer when purchased. A single dry-cell, which may be one that has done service, is connected to one end of a pair of 'phones. To the other side of the cell a length of wire is attached. Place the 'phones on the head, touch one end of the primary winding with the wire from the cell, and the other end with the free 'phone tip. A good click should be heard in the 'phones, almost equal to that when the connection is made without including the primary winding. If only a very faint click is heard, the winding is not continuous. The secondary winding is tested in the same way. High voltages must not be used for this test.

PLATE CURRENT FEED RESISTANCES.

SOME time ago in this column was mentioned a system of supplying B accumulator plate current to several valves by adopting the method of placing a resistance in each common plate lead in order to cut down the voltage to the required value, thus doing away with battery tappings and evenly exhausting the whole accumulator. This was taken from an American source, but it appears that this method is advocated by Ferranti's chief radio engineer, Mr. A. Hall, A.R.C.S., who has been making searching investigation into the matter of preventing oscillation in audio circuits.

It has been shown that as a result of feed-back when using two stages transformer coupled with the same B battery feeding both stages, that the overall amplification is by no means the product of the two stages when measured separately, and that in fact this ideal condition could only be obtained by supplying each (audio) plate from a separate B battery, or could nearly be obtained with a separate B battery for the detector.

MR. HALL found that a low-frequency choke of high inductance could be placed in each plate lead and would effectively prevent any back-coupling, provided that the battery end of the choke be connected to earth potential through a condenser of 4 mfd. capacity in the same way as obtains across separate output resistances of an eliminator. For the benefit of new readers it may here be explained that back-coupling mentioned above is the action or inter-action of one valve upon another through the medium of the B battery.

(Continued Next Page.)

QUERIES BY CORRESPONDENCE.

1. Every communication enclosing queries is to be addressed to "Megohm," Box 1032, Wellington, and must be accompanied by a stamped addressed envelope for reply by post.
2. Questions must be written so that a space is left in which the reply may be added.
3. No charge is made for replies.

THE UX222 BOOSTER UNIT

A READER writes for information as to what this unit will actually do. What is claimed for it is clearly stated in the heading to the article—"Adds high R.F. amplification to any receiver." It was also stated in the preliminary announcement the previous week that when attached to an ordinary four-valve Browning-Drake receiver the volume would be doubled. This was proved by an actual test on such a receiver, tuning in several Australian stations. Added to the two R.F. Browning Drake, tremendous volume, far too heavy for the present audio system, was the result, this increase being upon reception of distant stations. The unit in a slightly different form as to lay-out is being extensively used in America, and time only permitted the writer to make such tests as would confirm the correctness of the claims made for it.

The Editor has just received a letter from a correspondent who, amongst other matters, states: "I have built a Booster, using the new UX222 valve, and attached to my receiver it makes it a set of great volume and a help to DX reception. It can recommend it to anyone: it does all it is claimed to do."

There is no doubt that the unit, if constructed to specifications, will "deliver the goods."