

Of course if small compensating condensers are used in the set, this is not necessary, as any discrepancy is made up by final tuning on the midget condensers.

Methods of Coupling.

PASSING to the audio-frequency side, there are two or three methods of coupling to be considered. Transformer coupling is most popular; resistance and impedance coupling can be considered together, as they are subject to similar failings. It is on the audio side that the tonal qualities are mostly developed, and it is this end that so many receivers fall short of perfection.

It is possible to get almost perfect results from either of the above methods of intervalve coupling, and it is a mistaken idea to think that better quality can be obtained using resistance than transformer coupling. Especially is this a fact when a study is made of the different methods adopted by the average constructor when using a resistance coupled amplifier.

In the first place all high frequency currents must be rigorously excluded from the low frequency amplifier. After the detector valve must be a suitable by-pass condenser from the plate to the earth. If it is possible to insert a RF choke in the plate lead between the plate or reaction coil and the audio-transformer or resistance the tonal qualities will be greatly improved.

Transformers.

A WORD on transformers. During recent years manufacturers have been experimenting with and improving their instruments until they have obtained a uniform amplification over a very wide range of frequencies. This has been brought about merely in the design and use of special forms of iron compound. Cheap transformers and ones that are several years old were not made on any scientific principle and in use give distorted and unfaithful reproduction.

No casual test can be applied to see if the transformers are efficient, and the owners of any set that utilises cheap transformers is well advised to substitute for components made by a firm of standing. If replacements are undertaken, carefully tag each wire directly it is unfastened from the old transformer, so that no mistake can be made when the new one is substituted.

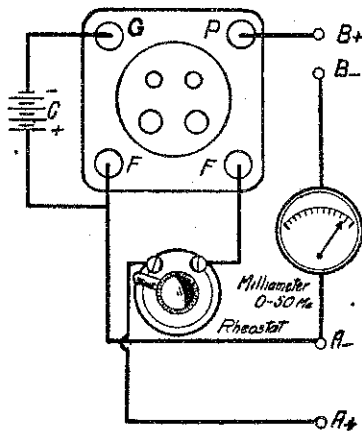
Resistance-Coupled Stages.

Receivers employing resistance, or impedance, coupling are liable to one or two serious breakdowns. In the anode of each valve is either a resistance or a choke. If either are at all defective, the anode current cannot get to the valve which refuses to operate. The coupling condensers also are the cause of 75 per cent. of the trouble experienced with these forms of amplifiers. All coupling condensers have to be of good quality and free from even the slightest leak. Only reliable mica condensers should be used, and even these checked over with a 90 volt battery and a pair of 'phones. After the first loud click no more should be heard until the condenser is discharged.

The grid leaks, too, sometimes cause trouble. Usually the valves are one meg., $\frac{1}{2}$ -meg., and $\frac{1}{4}$ -megohms for first, second, and third stages respectively, and these can be tested roughly with a pair of 'phones and a 22½ volt battery. If a constant subdued whistle is present

throughout the broadcast, and it is found to be due to slight oscillation on the audio frequency side, this can generally be remedied by connecting a $\frac{1}{4}$ -meg. grid leak in series with the grid leak of the first audio frequency valve. This subdued oscillation often occurs when using two transformers of the same make and type.

Having gone over the set bit by bit, all that remains to be examined are the valves, batteries, and speaker. Let us try the batteries first. When testing the B battery with a high resistance voltmeter, good class instruments are usually of this type, always take the



A Simple Valve Tester.

reading after the set has been in use for an hour or so. Dry batteries quickly recuperate when not in use, and a high resistance instrument gives a reading in excess to that of the actual voltage, as applied to the set. The surest way to test an accumulator is by the use of a hydrometer. Two volts per cell is maintained right to the bitter end, but a hydrometer indicates the state of the change at any time.

Speaking to the owners of small amplifiers, merely 45 volts B voltage cannot give good quality reproduction. For an average-sized room even 90 volts is not enough. It is said, with good reasons, that real quality cannot be expected with voltages lower than 300 volts.

Some readers may take exception to this, saying that their reception is perfect with only 90 volts. The reply is simple. It is well-known that a moving coil speaker reproduces all orderable frequencies with most fidelity. Try to operate a dynamic speaker with merely 90 volts, using but a single valve in the last stage. Radio assumes a totally different complexion when really good quality is produced, and it pays the listener to keep his batteries right up to scratch, substituting new ones for those in which the voltage has dropped more than two-thirds the rating.

C. batteries are inclined to be neglected. The public are told that these batteries last from 12 to 18 months, and leave it at that. Poor insulation of transformers, damp battery cable, etc., will often reduce the life of a C battery to merely a few months, and these should be tested with a voltmeter. A run-down C battery can account for distortion, paralysed valves, and quickly run down B batteries.

The Valves.

NEXT come the valves. After two years' service it can be assumed that a valve has done its duty, and, al-

though the filaments may be intact, these veterans can be put aside, to be called on in case of emergency. A diagram is attached for a simple method of checking over the valves, and those that have lost their emission through old age. The grid bias battery in dotted lines can be inserted to check over the characteristics to see if they conform to those given by the makers.

Pay special attention to the last valve. If good quality for an average-sized room is required, this must be of the power of semi-power type.

Loudspeaker.

FINALLY, there is the loudspeaker that demands a little attention. The bell of a horn type seems to be a magnet for little pieces of paper and chips of wood, especially in the hands of the young folk. Take off the horn and shake out any dirt that is resting on the top of the diaphragm. This is a tip to the owners of the short horn type of speakers. Obtain a length of brass or lead tubing of the same dia-

meter as the small end of the horn, and about 12 to 15 in. long. Unscrew the horn from the unit, and insert this length of tubing between the two, fastening with small lengths of rubber tubing slipped over. This increases the length of the horn, and prevents a great deal of the rattle and tinny effect so often noticed in a horn speaker.

Unscrew the unit, and inspect the magnets. If these have lost their magnetism, it is well worth the trouble and expense of getting them remagnetised. If the speaker ever has the misfortune to burn out during the early evening, quite good results can be obtained if the burnt-out coil is located and short circuited, running temporarily on one coil only. It is very seldom that both the coils go simultaneously.

A small hole about 1-16 in. diameter, drilled in the centre of the diaphragm of a horn type speaker, will often make quite a difference to sensitivity and tone. With the latest cone types of speakers very little adjustment can be



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