

DISTORTION---Its Cause and Cure

(By the Technical Editor)

DISTORTION in its widest sense is radio itself, for it is inherent in every component. It is sometimes very difficult to trace and often more difficult to cure. However, let us examine the question a little more closely and see exactly what is wanted, for one could write for the whole three hours on the subject.

The owner complains that his loudspeaker will not handle sufficient volume without distorting. That is the usual complaint. To the average owner all distortion is in his speaker which, being the last link, is the one to be blamed.

However, the radio serviceman must not take it for granted that the distortion is in the speaker, for in nine cases out of ten it will be elsewhere. So the first thing when going on a job such as this is to turn on the set and listen for yourself. Is the man expecting too much of his radio? Has he heard a new one that will handle far more than his older battery set, become dissatisfied, and blamed his speaker? We must take it for granted that he is not expecting too much, that there is real distortion.

Types of Distortion.

NOW distortion can be of two kinds—wave form distortion and tone distortion. The former is of the type which shows itself in a rattle, blasting, etc., when the volume is turned up. The latter manifests itself in an absence of certain notes in the musical scale. It may be the bass, the middle notes, or the treble. The question, however, says that he complains that it will not handle sufficient volume, therefore we can take it for granted that the trouble is wave form distortion.

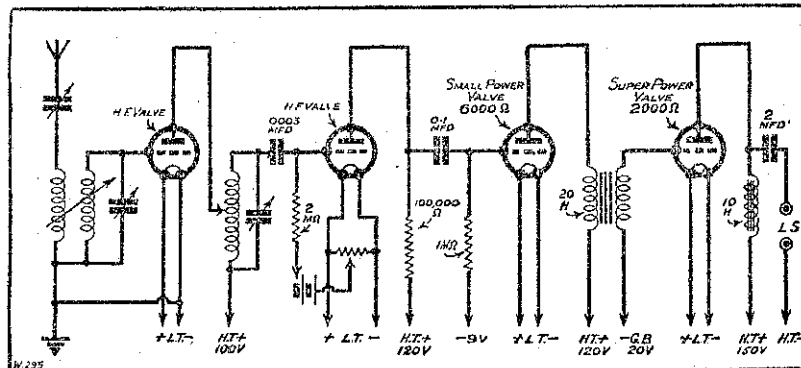
The Speaker.

THE first duty of the serviceman is naturally to take a cursory glance at the speaker, making any adjustments possible. If this does not effect a cure, as it will probably not do, then he must look elsewhere. An experienced serviceman will be able to locate

Week by week we are going through the questions asked in the recently held radio serviceman's examination. Last week we dealt with the aerial—Question 1, and this week we go on to Question 2.

An owner complains that the loudspeaker of his set will not handle reasonable volume without distorting. Explain how you would go about curing the trouble.

- In the case of a battery operated set with magnetic speaker.
- In the case of a mains-operated set with dynamic speaker.



A well-designed set that will give reasonable volume without distorting. Note particularly the valves of the coupling resistances and condensers.

roughly from the sound in the speaker the source of the trouble. However, it must not be taken for granted that the examiner knows anything about radio and we must detail exactly what to do.

As it is rather difficult to describe the varying types of noises and how they represent distortion in different parts of the set, we shall make a systematic search, beginning of course with the batteries.

The Batteries.

TURN the set on, leave it on for a few minutes, and then test every

battery commencing with the "A," which is tested both with the voltmeter and hydrometer. The "B" battery is tested not only from a positive maximum to negative, but to each of theappings, as it is possible that a high resistance cell may cause all the trouble. Likewise the "C" battery is measured. When we are taking the measurements we must notice particularly if all connections are correct. Trace these out along the battery cable to the set, checking particularly the polarity of the "C" battery. Often this has been replaced and either the batteries are connected together wrongly or the battery as a whole is reversed.

Now, having checked the batteries, check the voltages at the valves themselves. If the serviceman is possessed of a high quality tester he need merely slip the plug into each socket in turn and run through the various measurements, plate current, plate voltage, filament voltage, filament current, etc., and he can soon see if a valve is operating under its correct

characteristics. This will often reveal trouble in nearby components. It will also act as a test on the valves.

Valves.

WHILE doing this note particularly that the correct valves are used in their right places. For instance, in a resistance capacity set you will not expect to find valves of a low impedance unless, of course, they were in the last stage. Similarly, in a transformer coupled set you would not expect to find a semi-power valve in the second last stage. Actually quite a large number of sets employ a valve of this type in that socket, and distortion is caused in a rather interesting manner. This valve has a high plate current which, when flowing through the primary of the preceding transformer, lowers its inductance, matching becomes impossible, and distortion results. The first audio valve should have an impedance of about 10,000 ohms, although if it is followed by resistance coupling, high frequency or resistance capacity type is necessary, in which case great care must be taken to ensure correct operating conditions.

The second i.f. valve should be of low impedance of approximately 6000 ohms. Where a heavy speaker is employed and more volume is expected, the impedance should be even lower.

Use of a Milliammeter.

WE mentioned a moment ago that we should test each stage by a high quality commercial tester. Many servicemen cannot afford these rather expensive instruments, and must use the ordinary milliammeter. Turn the set off and place the milliammeter in turn in the B+ lead to each valve, commencing with the detector. If we are to make an exacting test, a meter with several scales will be required, because whereas we may only need a maximum of 5 mils for the detector, one with 20 may be needed for the power valve.

When the meter is in the circuit it should, when the set is turned on and tuned, remain fairly steady, or at least flicker not greater than 10 per cent. If, however, there is a kicking and it is occurring downward each time, there is too little grid bias, or too much "B" voltage for the bias used, and the remedy here is obvious. Increase grid bias or decrease the "B" until the kicking ceases or is fairly equal in either direction. If, however, the milliammeter kicks upward we have

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