teries, open grid bias resistors, or open grid return connections. This condition is generally indicated by an absence of grid bias on the radio frequency valves.

4. If the trouble is due to motor-boating, it manifests itself by a steady "put put" sound resembling a motor-boat in action. This is due to a low oscillatory feed-back in the eliminator or power pack circuit. To eliminate this, connect large by-pass condensers across each of the voltage dividers to ground. By-pass condensers of about two microfarad capacity can be connected between the plate circuit and filament circuit to reduce motor-boating.

Noises Due to Valve Howling.

MICROPHONIC valves often cause a ringing sound in the loudspeaker gradually increasing in intensity, which is generally caused by the vibration of the valve elements in the detector or audio frequency stages. This vibration causes the plate current to change very rapidly, and the change in plate current is transmitted through the set resulting in the ringing sound. It is usually sound waves coming from the speaker that set the valve into vibration.

Special heavy weights can sometimes be placed on microphonic valves to prevent them from vibrating. An application of several turns of friction tape around the top of a valve will sometimes reduce a microphonic condition.

In most cases it is best to rearrange the valves until you find one that is not microphonic. In the modern receiver, microphonics are rarely encountered, and are nearly always due to a defective valve.

Further Notes on Mechanical Noises.

1. Spluttering, snapping noises—these noises are caused by electric sparks due to the breakdown of insulation in some part of the circuit. They can be heard even with the loudspeaker disconnected and are invariably due to defective insulation either on wires or the terminal strip. Where this occurs, separating the wires or cleaning terminal strips is the only remedy. A visual inspection while the set is operating will reveal where the breakdown occurs.

2. If there are any loose parts in the receiver such as loose screws and nuts, these parts may be set into vibration when the loudspeaker is in operation. Noises thus developed are clicking, rattling, metallic noises. The remedy, of course, is to tighten up these parts.

3. If the power transformer vibrates or hums excessively, tighten the clamps which hold the transformer core. If the windings are loose, wedge them by means of bakelite or dry wood spacers.

Speaker Noises.

THESE noises are mechanical in origin and consist of rattles, clicks and scratches. In most cases the defect can be established by visual inspection. The two main types of speakers in use are the magnetic and dynamic. Most troubles will be found to be in dynamics, as more dynamics than magnetics are in use.

In the case of a magnetic speaker, we generally have more moving parts, such as springs, driving pins, and more soldered connections. There are always two or three soldered connections on a magnetic speaker and they are likely to develop noise. Connections should be examined carefully and the cone

HAROLD SHAW,
a well-known Christchurch elocutionist, who will delight many listeners with his humorous items on May 2.
—Steffano Webb, photo.

and driving pin moved back and forth to see that the driving pin does not slip through the solder.

The most common trouble in dynamic speakers is caused by the voice coil dragging against pole piece. This produces scratching and distorted sounds, and is easily recognised. Some dynamic speakers have an adjusting screw attached to the centre of the electromagnet, which in turn is mechanically connected to the voice coil of the speaker by means of a bakelite strip which is called the spider. By adjusting the screw that is attached to the pole piece, the position of the voice coil can be varied in relation to the pole piece. This screw should be adjusted until the voice coil does not touch the pole piece at any point. A thin piece of paper inserted between pole piece and voice coil can be used to gauge the distance between the two.

Sometimes dust and foreign particles get between the pole piece and the voice coil, and these in turn cause certain noises. One effective way of removing these is to use a blower from an ordinary vacuum cleaner. Before using the blower, however, turn it on to be sure that no dirt is in the pipe. Then allow the full force of air to blow between the voice coil and pole piece, moving the diaphragm up and down at the same time with your hand. This generally removes all dust from this point.

Examine the cone both at the voice coil and outer edge. If it is torn or uncemented, use ambroid cement, which can be obtained from several radio dealers. If the leather strip or chamois skin is hard in spots, rub it with your fingers on each side until it becomes soft and pliable.

Tracing Noise.

THE best instrument which can be employed as an indicator of noise is a good speaker or pair of headphones, because in the last anaylsis, what you hear is what counts. It is of the utmost importance, however, that the speaker or 'phones be in good mechanical condition.

The most frequent sources of noise are varying resistors, intermittent contacts or shorts. An ohmmeter and continuity tester are frequently of great assistance in detecting these. Intermittent contacts can be quickly established by using the continuity tester shown schematically in Fig 2. This consists of a voltmeter connected in series with a 4½-volt C battery. When the two test leads are connected across the terminals of the resistor or the apparatus under test it will read less than 4½ volts.

If the meter needle flickers between values it indicates a varying resistance and that part of the circuit should be most carefully checked.

In checking the condition of resistors do not bear down on the resistance, but pull up with your test leads. This will serve to strain the connection, and if an intermittent contact is being made it will show up when making this test.

Stage by Stage Elimination.

IF it is determined that the noise is internal it is necessary to locate the particular circuit which is causing the trouble, namely, where it is in the audio or radio frequency system, the detector or power pack, and in which particular stage the trouble arises. The best method to follow here is the stage by stage elimination process. In this method one stage is added at a time and observation made when the noise comes in. All valves should be kept in operation. This method of test assumes that the aerial and earth system is in perfect mechanical condition and that it is not itself a source of noise.

Assume now that the noise is internal. Therefore, disconnect the aerial and earth. The noise should still be present. Then, short circuit the grid or grids of the output valves. This immediately disconnects all valves ahead of the output valve or valves. If noise is still present, it means that the source of trouble is in the output stage or in the voltage supply or the speaker, and these should be examined carefully.

If noise is not present, the output stage and voltage supply for these valves is O.K. Now add the first audio frequency stage by disconnecting the short on the grid of the output valves. Short circuit the grid of the first r.f. valve. If noise comes in now it is in the first audio frequency stage or voltage supply to this stage. These circuits should be critically examined. If noise is still absent, both these stages and their associated voltage supplies are O.K. Next remove the short circuit from the first audio frequency stage and short circuit the detector grid. Proceed this way until the source of trouble is definitely located in a particular circuit. Knowing the circuit in which the trouble is present, it is a simple matter to make corrections. When each radio frequency stage is checked and the grid of each radio frequency stage is shorted, rotate the variable condenser to see whether this introduces noise. Frequently the variable condenser plates may short at some point and cause noise. This test should be made with each radio frequency stage shorted so as to determine which particular variable condenser is causing the trouble, if any.

Visual Inspection.

KEEN visual inspection is one of the simplest and most effective means available for use in locating ordinary sources of noise. In this method no instruments other than the listener's eyes are needed, but he must exercise his powers of observation. A visual examination of the wiring of the set will show connections which are loose or unsoldered, soldered joints which are corroded or resinous, insulation which is punctured or mechanically injured, valve socket prongs which are bent and make imperfect contact and so on. The possible sources of trouble causing noise which can be detected by the observant eye are many. One of the first steps to be taken therefore is to examine critically the wiring and construction to see what defects can be found.

A.C. or D.C. Resistance?

THE phenomenon known as skin effect, or the peculiar property of alternating current especially at high frequencies to travel only through the outer portion and not through the core of a conductor, is generally ignored in figuring resistance values for radio purposes.

Thus the radio worker is frequently puzzled by the fact that a given solid resistor, rated at a given resistance, actually has considerably higher resistance value in actual use. He may hasten to blame the resistance manufacturer, whereas he has only a well-known electrical phenomenon to blame. A solid conductor offers considerably greater resistance to high-frequency current than to direct current, due to the skin effect.

It is for the above-mentioned reason that the metallised resistance is finding more and more applications in radio work. Such a resistance, having a metallic coating deposited on a glass filament, presents a virtually uniform resistance to either a.c. or d.c. energy. Since there is no core to such a resistance unit, the a.c. or d.c. energy flows through practically the same thin film or skin. Therefore, the resistance value is the same in either case, and there is no chance for error as when using solid resistance units.