(4) STEEL WASHER—place over the rubber gasket with the concaved or hollow side facing the diaphragm. The concaved side of the steel washer may be found by laying a straight edge across the face of the washer and holding both up to the light.

(5) BRONZE SPRING WASHER—place in housing over the steel washer.

(6) HOUSING CAP—screw clockwise on housing.

F. Adjusting the Horn Speaker.

The speaker should be adjusted during reception of a strong and clear broadcast station. Screw up the knurled housing cap clockwise until the diaphragm snaps against the pole pieces, causing reception to become weak and rattling. It should then be unscrewed until a click occurs and reception comes out clear and normal, the best adjustment being as close (turned clockwise) as possible without rattling on a strong signal.

It is necessary to have the horn type speaker leads connected to the receiving set in the proper manner, which is clearly specified on the Atwater Kent horn type sound units and also on the Atwater Kent battery-type radio receivers.

2. Free Edge Cone Type (Models E and E-2)

The Atwater Kent Model E and Model E-2 Speakers are of the free edge cone type. Their construction is much more rugged than that of the average cone, so that repairs are seldom required. All steel parts are thoroughly rust-proofed, and both the coil windings and the cone itself are impregnated with moisture-proofing compound.

The sound unit used in these speakers as now manufactured, is enclosed in a dust-proof rubberized bag which protects the unit from iron particles and dust.

In order to examine and test the parts, it is necessary to disassemble the speaker. Instructions for doing this and instructions for testing, repairing and assembling this type of speaker are given below.

A. Disassembling the "Type E" Speaker.

(1) Removing Grill.

Remove the four screws around the outer housing of speaker, then remove the front (grill) in this way:

Stand the speaker on a firm table, place a double fold of heavy cloth over the top of the grill of the housing, hook the thumb of the left hand under the top edge of the grill, with the other fingers of the left hand pressing down on the top of the housing, and then, through the cloth, hit the top of the edge of the grill several sharp blows with a hammer, at the same time pulling forward with the thumb. The vibrational effect of the hammer blows tends to loosen the grill from the housing, while the steady pull with the thumb tends to move the grill forward and off the housing. The cloth is used to protect the finish of the grill, which would otherwise be marred by the hammer blows. In removing the grill, be careful not to let it hit against the cone.

(2) Removing Cone.

The cone is attached to the flat reed spring by a small bolt and nut. Two special wrenches (Part No. 9255) should be used in removing this bolt, the illustration, Fig. 86, showing how this should be done. Hold the cone by the small metal bracket at its apex and pull straight off from the reed spring.

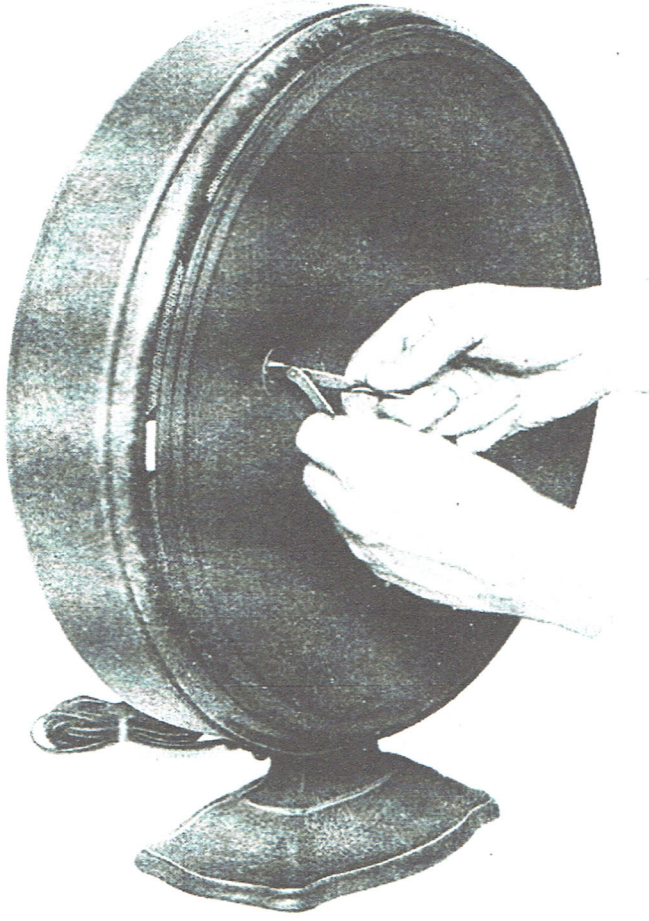

FIG. 86. REMOVING CONE, MODELS E AND E-2.

(3) Removing Sound Unit.

The sound unit is removed by unscrewing the two acorn nuts at the rear of the housing. Note how the cord is brought over the top and in back of the sound unit down to the small hole at the rear of the housing. When assembling the speaker, the cord should be arranged in the same way. In handling the sound unit be very careful not to strain the flat reed spring.

B. Possible Troubles.

1. OPEN COIL OR CORD—test with voltmeter and battery for continuity. Replace if found defective.

2. DAMAGED CONE—examine carefully for cracks and bends, especially around the apex. If no defect is found, hold the cone horizontally with hollow side up about 3 or 4 inches above a firm wood-topped table and then drop so that the apex will hit the table. If the cone is in satisfactory condition it will strike with a clear resonant "knock" rather than a dull, lifeless thump or thud. Replace cone if it seems to be defective.

3. METAL CHIPS ON POLE PIECES—carefully remove the dust-proof bag from the sound unit and examine the air-spaces between the reed and pole pieces to determine whether iron or other particles (caught up by the attraction of the magnets) are clogging up the air-spaces between reed and pole pieces and consequently interfering with free motion of the reed. If such a condition is found, it is sometimes possible to remove the particles, although usually it is advisable to replace the unit.

4. IMPERFECTLY ADJUSTED SOUND UNIT—examine the sound unit to see if the reed is adjusted centrally between the pole pieces so that the air-spaces at each side are equal. If the reed is not centered correctly, the unit should be replaced, although in exceptional cases a qualified service man may adjust the reed.

Adjustment of the reed is made through the two screws which pass through the magnet and bear on the reed. By loosening one screw and tightening the other, the reed may be moved to either side. When the reed has been adjusted exactly to the center the two screws should be tightened alternately little by little, until both are tight.

The adjustment may be tested by clasping the reed spring, near the reed, between the thumb and forefinger and pushing and pulling so as to cause reed to snap against either pole piece. The same force should be required to move the reed in each direction. If the unit is properly adjusted see that the air-spaces are free from chips and then carefully replace the dust-proof bag.

5. LOOSE NAME PLATE OR SERIAL PLATE—Suspend the grill by one hand and with the wood handle of a screw driver sharply tap the grill near the name plate. Listen carefully and if a "tinny" noise is heard, the name plate is not fastened securely and should be tightened by hammering down the holding tabs. Do the same with the serial plate on the back of the housing.

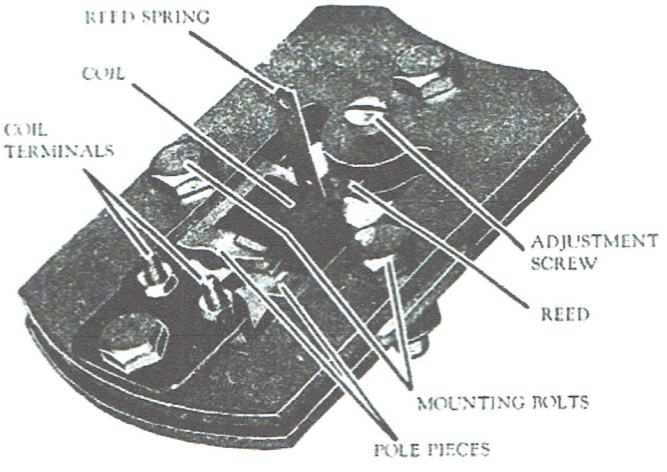

FIG. 87. CONE TYPE UNIT.

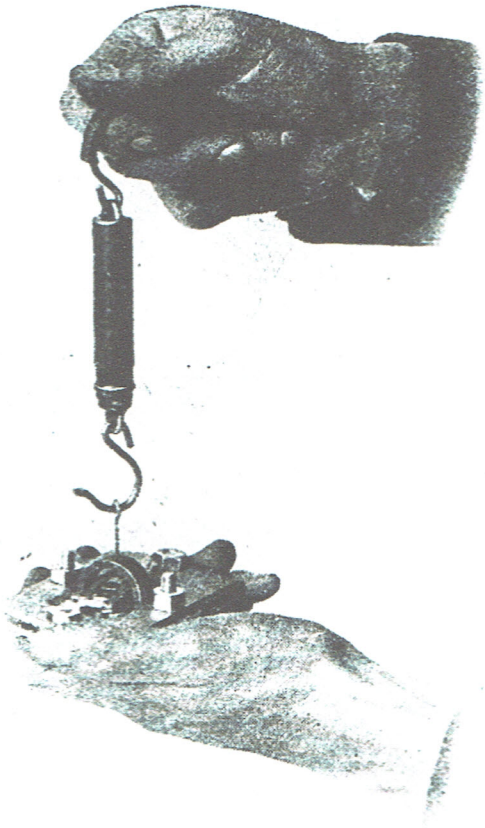

FIG. 88. TESTING MAGNET STRENGTH, CONE TYPE UNIT.

6. WEAK MAGNET—The testing outfit for determining the magnet strength is identical with that used for the horn speaker, except that instead of the flat disk a U-shaped bar is used. This bar must be accurately made so that when suspended, inverted, from the scale, its inside circumference clears the coil winding and the ends of the "U" rest flatly one on each magnet pole, lying clearly within the permanent magnet by about 1/64" on each side. It will be found more convenient to use the front or cone side of the unit for this test.

The dimensions of the bar are—width 3/8", thickness 3/32", diameter (over all) 1-3/16". If a straight pull of less than about 7 pounds will separate armature from magnet, a weak magnet is indicated and the unit should then be replaced. Fig. 88 illustrates the correct method of testing the magnet.

C. Assembling Cone Type Speaker.

1. ATTACHING SOUND UNIT—place the sound unit in the housing so that the mounting bolts pass through the holes in the back of the speaker, and screw on the acorn nuts. The unit should be enclosed in its dust-proof bag and the cord leads should be firmly attached to the coil terminals. The cord should be carried over the top of the unit, around the right-hand side and down to the outlet hole in the rear of the housing.

2. RUBBER DAMPER—push the small piece of rubber tubing on the flat reed spring, bringing it close to, but not touching, the unit.

3. MOUNTING CONE—push the metal bracket at the apex of the cone on to the flat reed spring and push the small screw thru holes. Screw on the nut but do not make it very tight.

With the two special wrenches (part No. 9255) on this small nut and bolt, tip the cone up or down so that its top and bottom edges are equally spaced from the housing, then carefully tighten the bolt. If the cone moves out of position, the bolt must be loosened and the cone again adjusted until the top and bottom edges are equally spaced from the housing when the bolt is fastened tightly.

Then examine the right- and left-hand edges of the cone to see if they are equally spaced from the housing. If they are not, use a pair of pliers to bend the reed spring very carefully and easily toward the side of the cone that is too close to the housing. When the spring is released it will be found that that edge of the cone is now spaced farther from the housing. Repeat this process until the right- and left-hand edges of the cone are equally spaced from the housing. The spacing between the edge of the cone and the housing should then be even all the way around. (In bending the reed spring, hold the pliers horizontally and grip the end of the metal bracket which fits over the reed spring. The best tool for this purpose is a parallel-jaw pliers, 3/8 inch wide, with the ends slotted to fit over the bolt and nut. The slot should be about 7/32 inch wide and 1/4 inch deep.)

4. REPLACING GRILL—Rest the speaker on its back and press the grill on to the housing, taking care to see that the screw holes coincide and that the grill is placed with the name plate right side up. It may be necessary to use a hammer in fitting the grill on the housing and, in this case, as before, a thick cloth should be used to protect the finish of the grill from the hammer blows. When the grill is in place, replace the four screws which hold it to frame.

3. Model E-3 Held-Edge Cone

The manner of disassembling, repairing and assembling the E-3 is exactly the same as for the E and E-2.

The cone of the Model E-3 speaker has a flexible rubberized fringe extending beyond the edge of the cone. Before the grill is placed on the housing, the cone and fringe are clear of the housing, with equal spacing all around between the rubber fringe and the housing. The grill has a strip of felt around its inside edge, and when the grill is pressed down on the housing, the outer edge of the rubber fringe is pressed tightly between the edge of the housing and the felt strip in the grill.

The small rubber damper is not used on the Model E-3 speaker.

Speaker in Model 52 Set

The speaker in Model 52 receiving set is of the "held-edge" type, somewhat like Model E-3. The flexible edge of the diaphragm is pressed all around between the housing flange and a large fibre ring.

To remove speaker, release cord tips from speaker posts on set, rest cabinet on its back, take out the six screws holding the speaker and draw out the speaker, fibre washer and grill.

An inspection of the speaker will then show that the diaphragm is mounted on the reed spring in the same way as in Models E, E-2 and E-3, with the exception that the edge of the diaphragm touches the metal flange all around.

Instructions for disassembling, testing, repairing, and re-assembling this speaker are similar to those given previously for the E, E-2 and E-3, with the following explanatory remarks:

(1) The small rubber reed-spring damper is not used on this model.

(2) In mounting the diaphragm, make certain that the edge of the cone (where it is joined to the flexible fringe) is level all around. If the diaphragm is not mounted properly on the reed spring, or if the spring is bent, the edge of the cone will extend up on one side and be depressed on the other. The remedy is the same as given above under the heading "Mounting Cone."

(3) The speaker is mounted in the cabinet with the outlet hole for speaker cord nearest the top, or set. The speaker cord is brought down and under the sound unit and up to the outlet hole.

(4) When replacing the speaker, put the fibre ring on top of the diaphragm, lining up the holes in the ring and those in the diaphragm and housing flange. Then place the wire grill on top of the fibre ring in such a way that, when mounted upright in normal position in cabinet, one set of equally-spaced grill wires will be horizontal and another set of equally-spaced wires will be vertical. (See paragraph immediately above.) Rest the cabinet of set on its back, and (for convenience of mounting) temporarily place a screw through the left hand hole in the housing flange, fibre ring and grill, with the head of screw toward the back of housing. Arrange the speaker in cabinet so this screw comes up through the left hand hole in front of cabinet and place a nut on this screw, meanwhile holding the speaker in place with one hand. Put in the other five screws (with the heads on outside of cabinet), remove the first screw and replace it properly.