RADIO SERVICE TRADE KINKS

BY

LEWIS S. SIMON, R.E.

Manager, Rexall Radio Stores,
Brooklyn, New York

FIRST EDITION
SECOND IMPRESSION

McGRAW-HILL BOOK COMPANY, INC.
NEW YORK AND LONDON
1939

THE MAPLE PRESS COMPANY, YORK, PA.

RADIO SERVICE TRADE KINKS

PREFACE

This volume illustrates once again the old saying that necessity is the mother of invention. I assembled the original notes because I needed them as a guide in my work as an active radio serviceman. The need for a "kink book" that might be used with a minimum of effort and no loss of time persuaded me to offer the results of my own experience for publication.

Servicemen who have been confused rather than aided in their work by books in which the intricate arrangement of contents makes it almost as difficult to find the instruction for which they are looking as to locate the trouble in the set by the old trial-and-error method will, I am sure, appreciate the sequential arrangement of material and the convenience of the index, which this book offers. Moreover, the solutions it sets forth are dependable. My assistants and I labored assiduously on every detail in order to produce as nearly flawless a work as possible. We worked at contiguous benches, and when one of us announced a solution, the others checked and rechecked it before we were satisfied to classify it as a specific remedy.

The degree of dependableness thus attained is fittingly supplemented by a simple technique for locating troubles and correcting them. The system of reference to the receiver and model readily reveals what is wrong and what has to be done to put a given set in working order.

As a practical man who has been installing, servicing, and repairing sets since 1921, I feel satisfied that the effort to make the book as clear and as comprehensive as possible has not been misspent. From the reader's point of view, the practical application of any single suggestion contained herein will more than pay for the book itself. Moreover, such application will surely result in considerable time economy.

The serviceman's time and skill are his chief assets. That is why I am happy to be able to give servicemen everywhere a book that will increase their skill and afford them more time in which to put it to practical use.

LEWIS S. SIMON.

BROOKLYN, N. Y.,
June, 1939.

RADIO SERVICE TRADE KINKS

Admiral

Admiral BA41

Inoperative. Generally a defective 0.01-mf. condenser in the power-supply can. One is connected to the vibrator socket. The other lead returns to the ground or chassis.

Airline

Airline Auto Radio

Interference Not Due to Ignition Trouble. See if rubber grommet is used over the station-selector drive cable to hold it securely in place. If so, try removing this rubber bushing and building the space up with ¼-in. shielding to provide better ground.

Airline 5 (Battery)

Improving Sensitivity and Tone. Replace detector 34 unshielded at rear of chassis with a 32 connecting the grid return directly to minus C_9 volts. (Brown lead.) This eliminates the 1-megohm resistor in this lead. The grid lead is originally connected to the plus filament.

Airline 62–149

Distortion. This trouble is generally caused by oscillation in the i.f. circuit. Adjust the i.f. trimmers for higher sensitivity and stability rather than for any special frequency. We suggest that you shield the grid leads on tubes 32 and 34. Replacing the second-detector tube 34 with a 32 or a 1B4 also will give better results. However, in making this change, the *C* bias applied to the detector tubes should be reduced to 6 volts.

Airline 62–425

Hum and Inoperative. An 8-mf. electrolytic condenser found in the cylindrical container on top of the chassis is generally found open. You may replace this with a general replacement part.

Airline 77, 95

Poor tone quality was noted after replacing defective 19 tube. Change bias from 6 to 4½. If in cable, disconnect from 6-volt pin and connect to 4½-volt pin.

Static-like noise. Replace push-pull input transformer. Intermediate frequency: 175 kc.

Airline 209

Erratic Operation, Often Dead on S.W. Bands. Use plenty of carbon tetrachloride over the contacts on the band switch.

Airline 225

Intermittent Distortion after Playing a While. Voice coil in the speaker is generally found warped, rubbing against the speaker pole piece.

Amrad

Amrad 81

If set hums, check four-anode 52-mf. Mershon. Disconnect each wire separately from each anode of Mershon, inserting in series 0 to 10 milliammeter. If

meter registers over 4-ma. leakage per 8-mf. anode, replace with 2-mf. 400-volt condenser. If it registers over 10 ma. for 18-mf. anode, replace with 4-mf. 400-volt condenser. The two anodes that are nearer the copper container are the 8-mf. anodes.

Loss of Volume. In servicing Model 81 Amrad for loss of volume and tone that sounded like faulty cone centering, we tightened the two bolts that fasten the single-turn secondary of output transformer to the single-turn voice coil. This completely cured the trouble.

Amrad 7100

Inoperative. The particular type of hookup wire employed in these models because of heat and moisture is often the cause of an inoperative receiver or one that operates intermittently. The insulation cracks and peels, and since most of the leads are cabled, short circuits occur. The only remedy in this case is rewiring.

Fading. The Amrad Nocturne, one of the 7100 models, has furnished several causes for fading that, although not unusual, may take some time to locate. A common cause can be traced to the fuse block fastened to the side of the cabinet. The fuse clips become corroded with time and lose their tension, resulting in poor contact. Because the dial is black, with white figures, the flickering or dimming of the fuse clips will not be apparent. To clean and bend up the clips takes only a moment or two and may prevent a repeat call.

Although fading may be due to loose element tubes of a poorweld, most complaints of this nature have been traced to the audio-transformer leads that pass through holes in the chassis to the terminals mounted under the chassis. Strain and vibration cause these leads to short to the chassis, since the openings are just large enough for the leads to pass through. The quickest method of determining this failure is to pull and move the leads while the set is in operation. At times, the fading is due to the transformer winding or lead shorting to the shield can internally. This may be repaired quite often by heating the entire unit so that the wax compound may flow and insulate the shorted winding or lead from the shield can.

Hum is often caused by an open 27 center-tapped filament resistor or a 27 with poor cathode-heater insulation. The latter condition may not be revealed on a tube checker, and therefore it is advisable to substitute another tube.

❖ ❖

Ansco

Ansco

No Reception. The set was found to have a gassy 80 tube that acted as practically a dead short across the power supply. A new tube was put in, but there was still no reception. A further check

of the tubes unearthed a burned-out 27 tube in the set.

This receiver uses a 24 first r.f. or preselector tube, two stages of tuned radio frequency using 27's, a 27 detector, a 27 first audio, and push-pull 45's. (This seems to be an "orphan" set. It was manufactured in New York by a private concern.) The 27 was replaced with a new one; still not a sound from the set. The voltages were checked, and it was found that the tubes were getting little or no voltage.

Tracing the leads led to a green resistor in the can, on the rear of the chassis that houses the power pack. The negative end of this resistor was found to connect to a bolt that held the terminal resistor strip. The bolt, in turn, connected to the chassis. The chassis, of course, was grounded, but the bolt itself was loose. Tightening the bolt made a good connection for the resistor, and that cleared all the trouble. (The imperfect contact had a resistance of sufficient value to develop a drop of 50 volts across it; this drop, of course, was in series with the normal, rated drop of 50 volts, and the tube voltage when applied to the grid of the tube greatly reduced its amplification factor.)

❖ ❖

Apex

Apex 7

Intermittent on Low-frequency End of Dial. The filter condensers in this receiver were found to have decreased in their capacities. We simply installed new ones, and the trouble was ended.

Apex 7

Touching the antenna results in some sound, however, no reception. Replace the 20,000-ohm resistor in the circuits of the second-detector tubes. Also, for sure-fire results, replace the 18,000-ohm resistor, a section in the bleeder divider.

Apex 8 Series

Weak reception and excessive plate voltage on 27 oscillator tube caused by broken-down 50,000-ohm plate carbon series resistor. Replace with a 2-watt resistor instead of the original 1 watt.

Apex 8 and 10 Series

Sudden Changes of Volume. A.v.c. Superheterodynes. If volume suddenly drops or increases, especially when a light is turned on in the house, trouble is due to opening up of 0.5-mf. condenser connected between r.f. cathode and grid return of r.f. and i.f. coils. Replace with a good 0.5-mf. 400-volt condenser.

Distortion was found to be caused by a type 27 second-detector tube, although this was not all. The volume was found to be below normal if the volume control was turned on full. This would cause a rumbling sound similar to motorboating. The 8-mf. electrolytic condenser across the output of the filter had apparently dropped in capacity. Replacement effected a complete cure.

Apex 8A Series

Distortion. Set o.k. until after being in operation for about 30 min., when distorted reproduction takes place, and the 47 tube grid gets extremely red. Check the 47 filament center tap for an intermittent open. Best remedy is to connect a 20-ohm center-tapped resistor across the filament winding, using the center tap of resistor in place of the transformer center tap.

Apex 9A

Feeble Signals. We found the socket containing the dial light shorting to the chassis, resulting in a lower filament voltage supplying the tubes.

Apex 10

Static and noise on this receiver were due to an 8-mf. dry electrolytic paper case condenser that by-passes the detector-plate feed resistor. This trouble occurred in several sets of this model and was eliminated by replacement of the condenser.

Low plate voltage was found throughout the set. Rotating the tone control localized the trouble, and removing the tone control from the front of the chassis produced correct voltages on the set.

Upon taking the cover off the set, we found that the small insulating peg fastened to the arm of the control was worn to the extent that it was touching the floating disk that regulates the resistance of the control. Making a new insulating peg of fiber and cementing it to the arm cleared up this trouble without the necessity of ordering a new tone control.

Apex 10B

Inoperative. Center tap of the filament transformer of the 47 tubes had become shorted to one side of the high voltage. We disconnected center tap, and the trouble disappeared. We checked grid-bias resistor for the 47 tubes and found it to be burned out. We replaced this resistor with a new 425-ohm resistor that Apex uses for grid bias between center tap and ground for chassis.

Apex 20

Low Volume. A case of very low volume was the complaint for a service call on United States Radio and Television Corporation Apex Model 20 midget receiver. A check-up with the set analyzer failed to show any variation of the tube voltages from normal. Checking the fixed condensers revealed an open 0.05-mf. blocking condenser in the input circuit of the type 24 detector stage. The defective unit was replaced with a cartridge-type condenser similar to the original unit.

This circuit is rather unusual in that a single transformer winding is used to supply the type 24 heaters (2.5 volts) and the 71A filament (5 volts).

The dynamic speaker in this receiver has two separate field coils; a 935-ohm section in the negative side and a 5,000-ohm section in the positive side of the power-supply system.

Apex 26

No Reception, Smoke from Transformer. The power transformer was not at fault. However, we found faulty insulation on the wires in the cord-bound cable. Upon turning the receiver upside down, we noticed sparks and flashing at the points where the wires were shorting. We simply cut the cord at these points and separated the wires where we found the trouble, retaping the wires where they were shorting.

Apex 27

Intermittent Oscillation. Increase the r.f. by-pass condenser from ½ to 1 mf.

Apex 31

Noise When the Set Is Moved. We found the r.f. chokes that are located on the inside of the r.f. coils loose. We tightened them with an acetate-base cement.

Apex 36

If the set had a habit of dying out with the lights still on, the voltages and tubes were examined. After these had checked o.k., however, the same fading occurred. The set was examined again, and it was found that all filaments were lighted but that there was no plate voltage on any tubes whatever. There was, however, a slight excess plate voltage on the leads from the 80 rectifier.

Tests showed that the trouble was in the aluminum can that housed the power transformer and the filter chokes, because after the leads had been disconnected the condensers and the resistors all checked o.k. An examination of this can revealed that the transformer and double choke had been dropped in haphazardly and then filled with compound. Naturally, when the compound was heated, after the set had been in operation for about 20 min., any vibration whatever would cause the chokes to drop down and touch the high-voltage terminal. As soon as the set was turned off, the contraction of the mass of compound would open this contact and the machine would operate until sufficient heat was generated to soften the compound, allowing the choke to sink, at which time it would cease operating.

The can was opened instead of being replaced. The unit was heated in an oven until the compound ran, and then the chokes were insulated together with the transformer from the side of the can and from the high-voltage terminal.

Apex 41, 42

Oscillation over Entire Scale. Try 2,000-ohm resistor in second r.f. grid lead.

❖ ❖

Arborphone

Arborphone

Weak Volume together with Steady Frying, Crackly Sounds. The weak volume being traced to corroded chassis connections of the r.f. grid-return leads, resoldering these connections brought back the volume. But the frying noises still remained. After suspecting and

changing all carbon resistors, we finally traced the trouble to the primary of the first a.f. transformer, which, because of the dampness of this particular house, caused the fine wires of the primary to corrode, causing this steady, nerve-racking noise.

Arborphone 45

Fading and Interference. A number of these sets have given fading trouble and have failed to separate stations. The troubles have been cured by cleaning and soldering the rivets that are used on the balancing panel located on the under side of the set. These rivets are of one kind of metal, and the units they hold, of another, which seems to cause corrosion to form. Do not try to balance these sets by ear. Balancing by meter makes all the difference in the way the set works.

❖ ❖

Arvin

Arvin Auto Sets

Noisy. Very often you will find that the metal braid on the tuning condenser breaks and causes noise, since the rotatory plates are insulated from the chassis by rubber grommets. Replace this ground with a longer braid.

Inoperative. Rocking the variable condenser gang breaks the lead from the oscillator stator plate that has been made too short. Lengthen this lead slightly, since if it is made too long the set will not align properly.

Intense Motor Noise. Check the matching transformers in the antenna lead for a short to the chassis.

Arvin Car Radio, 1935

Poor Quality and Low Volume. Should these sets come in for servicing because they have poor quality, volume, etc., examine the plug in the side of the box where the local-distance change is made. The trouble may be due to this unit being loose.

Excessive vibrator hum in 1935 models of these car sets. Move large yellow *A* wire running from volume-control switch to power-supply compartment as far as possible from second i.f. coil.

Arvin 7

Changes. In this receiver the 6F7 is used as an r.f. amplifier, employing the pentode portion, and the triode portion is employed as the first stage a.f. amplifier. This is not reflexing, since the tube is a dual-purpose tube consisting of a triode and a pentode portion. The cathode is common. The i.f. peak is 170 kc. The balance of the receiver employs a 6A7 as a combination mixer oscillator, a 6B7 as an i.f. amplifier and half-wave diode rectifier, and also a.v.c. The output tube is a 41, and the power supply employs an 84.

The following changes have been made in the receiver. A 200-ohm ¼-watt resistor has been added across the vibrator points in the power supply. The grid circuit of the 6A7 oscillator system origi-

nally employed a 100,000-ohm resistor. This has been changed to a 50,000-ohm resistor, rated at ¼ watt.

Arvin 7, 17, 27, 37

Intermittent Oscillation or Motorboating. Replace twin a.v.c. condenser located between the 78 socket and the antenna coil. In Model 7, the condenser is located between the 6F7 socket and the antenna coil.

Intermittent or No Operation. In this make of radio, which has two separate units, intermittent or no operation quite frequently develops. This is usually caused by the breaking of the wire on the *A* filter choke. This choke is wire-wound, with both wires coming out the same end. Vibration breaks one of these wires, resulting in intermittent or shutting off of the *A* supply from the amplifier.

Oscillation While Tuning. In Models 17 and 27, this is the remedy for oscillation while tuning. Condensers 17-4731 and 17-4712 may be making poor ground contact through metal collar to chassis. Replace with new type 17-14020 and 17-14007 equipped with separate ground leads. For ignition noise, see that cables are grounded. Some come through without lugs.

Arvin 10A

Intermittent. Poor contacts at the i.f. transformers where the brown lead to each makes its contacts are often the cause of intermittency of reception.

Arvin 16

Signal Strength Low. Arvin Model 16 auto-radio receiver employs an intermediate frequency of 175 kc.

In connection with this receiver, it is suggested by the manufacturer that in districts where signal strength is abnormally low, a slight increase in sensitivity may be obtained by removing the interchannel noise-suppression feature.

For those who have diagrams of this receiver, this may be accomplished by disconnecting resistor R_7 at point *A* and reconnecting it at point *B*. Thus, a slight bias is placed on the diode plates of the second detector. If this resistor is connected directly to the cathode of the second-detector tube—the point *B* referred to—the diode plates will no longer be biased, and the sensitivity will therefore be slightly increased.

Arvin 20

Cutting Out. Check 0.05-r.f. and i.f. grid-return coupling condensers for opens.

Arvin 25

Intermittent Reception. The Model 25 Arvin car set, which gives intermittent reception and at times is dead on the low side of the band, can be traced to the 6A7 oscillator tube. It may check well and work on other sets.

Arvin 28

Blows Fuses. The vibrator is generally the cause, since the points have a tendency to stick.

Arvin 41, 51

Distortion at low volume-control settings on strong signals. Due to overbias of 6F7 grid. Remove 100-ohm resistor from cathode of this tube and connect the cathode to ground through an 800-ohm resistor. The volume control, in other words, should affect bias only on the 6A7, rather than on this tube and the 6F7 together. The 6F7 should be fixed biased all by itself.

The voltage and alignment data for this model will be found below. The schematic diagram on Arvin appeared on page 18 of Vol. VI of Rider's *Perpetual Trouble Shooter's Manuals.** The accompanying diagrams indicate the locations of the tubes and trimmers.

VOLTAGE

Tube	Plate	Screen	Cathode	Osc. grid, 1,500 kc.	Anode grid
6A7	265	100	3.0	3.5	150
6D6	265	100	3.0		
75	135	...	1.7		
41	251	265	17.0		
80	330 a.c.				

* Throughout this book frequent reference is made to *Perpetual Trouble Shooter's Manuals* (8 volumes) by John F. Rider and to the *Combination Manual* by John F. Rider, both published by the author. For convenience, reference to these volumes is given in shortened form, as Rider's Vol. VIII or Rider's *Combination Manual.*

Alignment. Set test oscillator to 456 kc. Connect to 6A7 grid cap. Adjust trimmers 1, 2, 3, 4 in the order named.

For the remainder of the adjustments the test oscillator is connected to the antenna and ground wires of the receiver.

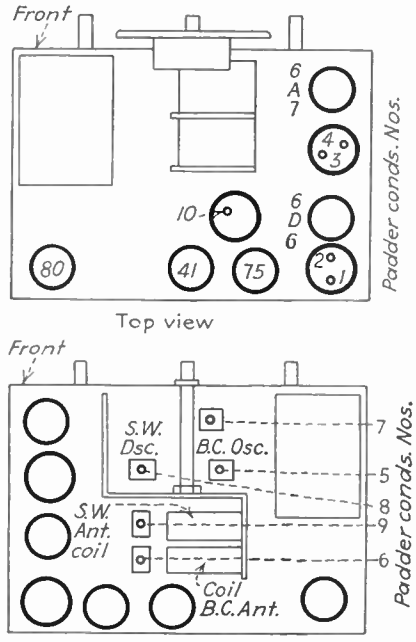

FIG. 1.

Trimmer	Test osc. frequency	Set radio dial to	Set wave switch to
5	1,500 kc.	150	Broadcast 0.55 to 1.75
7	600 kc.	0.60	Broadcast 0.55 to 1.75
8*	15 mc.	15.0	Short wave 18 to 5.5 mc.
9	15 mc.		Short wave 18 to 5.5 mc.
10†	456 kc.	1.0	Broadcast

* To adjust oscillator padder on 6 to 18 mc. band, unscrew padder wide open, then tighten until first signal is reached and tuned to resonance. † Balance for minimum signal. Wave trap to eliminate 456-kc. code signal.

Arvin 35

Poor Tone. Replace both 0.01-mf. audio coupling condensers with mica molded types of same value.

Arvin. Chassis 518

In order to correct the calibration of the dial, the following procedure is to be used:

Rotate the dial point to 550 kc. Press with the thumb on the dial face above its center. Rotate the tuning knob while preventing the dial pointer from moving. This will enable the position of the dial pointer to be varied with respect to the tuning condenser and will make it possible to readjust the calibration without removing the chassis from its cabinet.

Arvin 618

Hum. A rivet holds the 6Q7G tube socket to the chassis. This lug has a tendency to loosen, because of vibration. It is used for a ground return. Bend this lug over as close to the chassis as you can possibly get it and solder well.

Arvin 1427

Bad Frequency Drift. Look for the low padder-condenser strip. Should you find this is of the bakelite-base type, replace it with another made of porcelain. We have made several attempts in this set to cure a bad frequency drift by other methods. However, we found finally that by changing this socket the repair was successful.

❖ ❖

Atwater Kent

To Eliminate Slipping of the Tuning-gang Assembly. Remove the flange that holds and bears on the three ball bearings that gear the rotor. Place on bench. Then place washer from a snap switch over same, and tap evenly with a socket wrench of the correct size. Assemble, and gang will not slip.

Atwater Kent. Early Models

Noisy Wire-wound Volume Controls. Clean control arm and winding with alcohol. Using No. 1 soft lead pencil, fill in spaces between windings at contact edge until surface appears level and smooth.

In all the earlier models that use belts to drive the tuning condensers (both battery and electric models) the belts are often too tight and pull the condenser plates out of line. The reason for this is that the pulleys, which are made of white metal, expand, a peculiarity of this metal. Loosen the belts by means of adjusting screws to be found behind each condenser at the back of the chassis. These belts do not need to be tight, only snug. The manufacturers will furnish brass pulleys for replacement if they are desired.

Speaker Rattling. If the paper diaphragm of any cone speaker develops a rattle, it may usually be remedied by

applying a coat of rubber cement to both sides of diaphragm.

Phonograph Models. Certain Atwater Kent models have three terminals at the rear of the chassis for phonograph connections, instructions for which are given below.

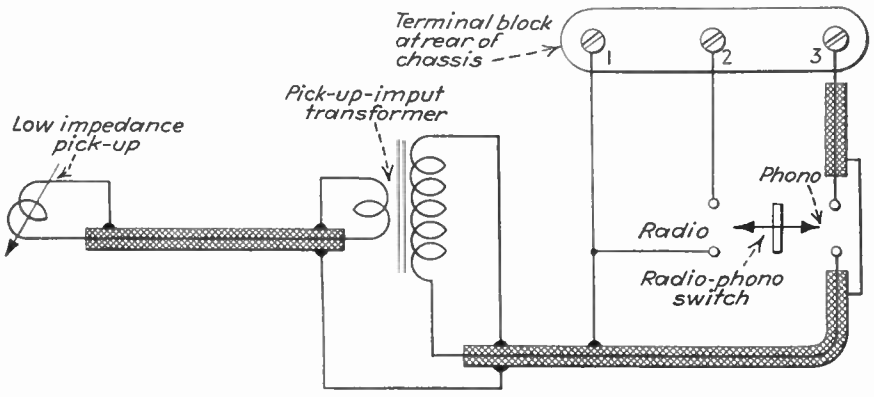

FIG. 2.

The switch to change from radio to phonograph is not provided with the receiver. Some phonograph manufacturers furnish a special switch with their equipment, as, for instance, RCA Model R-93, which has a switch connected, as shown in Fig. 2. However, a double-pole double-throw switch can be secured for this purpose when one is not provided with the phonograph attachment. In using this switch, the two center contacts must be connected together.

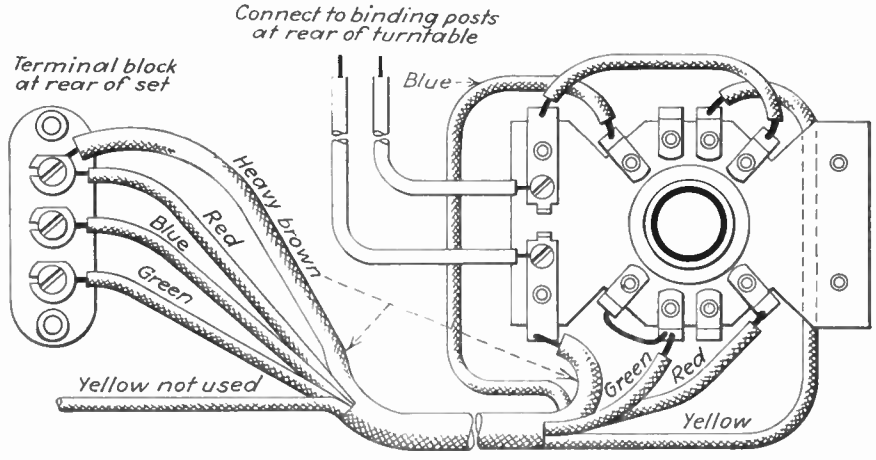

FIG. 3.

The phonograph pickup, which can be either high-impedance with a step-up transformer, should be designed so that it will deliver at least 1 volt across a 100,000-ohm load. Late-type Model 649

receivers, which are equipped with phonograph terminals, require 2.5 volts across a load of 250,000 ohms.

If the turntable is to be used some distance away from the set, it is generally advisable to use a low-impedance pickup with a step-up transformer, which is mounted near the receiver. If this setup is used, connect as is shown in Fig. 3. It is important to mount the pickup input transformer so that it does not pick up hum from the receiver or from the phonograph motor. The cable between the pickup and the transformer may be of any desired length, but the cabling between the transformer, switch, and set should be as short as possible.

If the turntable is to be placed near the receiver, it is advisable to use a high-impedance pickup, but the type mentioned in the previous paragraph will also be satisfactory. Connections for a high-impedance pickup are given in Fig. 4. All leads should be as short as conveniently possible.

Because of the circuit arrangement used in Atwater Kent sets, a separate volume control is not needed for the pickup, since the radio volume control regulates the phonograph. The tone control on the receiver also regulates the tone of the phonograph.

When connecting the phonograph, be sure to remove the short jumper wire between contacts 1 and 2 on the terminal strip. This is attached at the factory and is required only in case the radio is operated without being connected to a phonograph. A scratch filter is not needed unless specified by the pickup manufacturer. The tone control in the

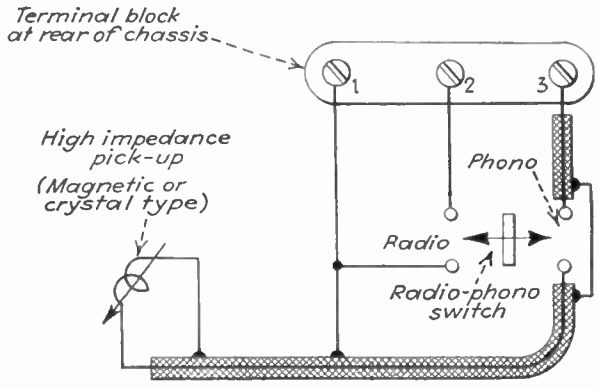

FIG. 4.

set, which acts on the phonograph, aids in reducing scratch.

Atwater Kent P

Oscillation. In replacing old 24 tubes in the r.f. amplifier, violent oscillation will sometimes occur, due to the greater gain of the new tubes or to changing of the coils. To cure, shunt a 0.00015-mf. condenser from plate to cathode of first r.f. stage. Proper screen potential on the three r.f. stages is 85 volts with volume full on. Any increase in screen voltage tends to make the r.f. amplifier unstable and to increase distortion, with no appreciable gain in signal strength or sensitivity. To adjust screen voltage to a maximum of 85, insert a suitable resistor between volume control and screens. This applies particularly when plate voltage to r.f. tubes is approximately 185 volts with volume full on. Substituting

a 56 for the 27 first audio also makes a noticeable improvement. If necessary, change the first audio bias resistor. The set should then be aligned with a suitable oscillator operating on exactly 1,500 kc. Adjust first the detector trimmer, and work toward the first r.f. stage, adjusting the last. With these adjustments, there are practically uniform sensitivity and selectivity over the entire broadcast band.

Atwater Kent 30, 40

No Reception. A common difficulty is shorting of the wire-wound resistor beneath the chassis to ground. The fiber base warps, causing the trouble, which can be corrected by sliding a piece of fiber under the unit. No reception: Check the speaker filter condenser.

Oscillation after Replacement of R.F. and Detector Tubes. Bend a piece of brass about 1½ in. square in the form of an L. Drill a hole through it, and bolt it in place between the first- and second-stage tuning condensers.

Atwater Kent 36, 37, 38, 40, 41, 42, 44, 45, 46, 47, 50, 52

Station Shifting. A difficulty frequently encountered with these models is the inability to get the tuning dial accurately for any station, since the station may be received at various points at different times within one or two divisions on the dial. This condition is due to loose tension of these belts and take-up screws holding the two end tuning condensers to the chassis. These condensers are moved out or away from the dial or center condenser to take up the slack in the belts, and the three mounting screws are then securely tightened.

Volume Very Weak. Cause: no detector plate voltage. Effect: detector plate voltage dropping resistor in power pack was found to be open. Inspection of the resistor disclosed a loose metal cap at one end. This particular resistor is constructed of a carbon element enclosed in a glass tube with metal caps at each end sealed with solder. By heating the loose cap with a soldering iron, the old solder was cleaned out and fresh solder applied to reseal the cap.

The repaired resistor showed no change in value when tested, and when placed back in the power pack, the receiver was resorted to full volume.

Atwater Kent 37, 38

Weak, Distorted, or Dead. The most common cause for complaint with these sets probably is "shot" filter condensers. Since these condensers are connected internally to the chokes in the power pack, which consists of two sections, the power-transformer block and the filter block, the problem of the best method of repair arises. At the time that these sets were considered the last word in radio receivers, the cost of a new filter block was high, because only the original could be obtained and that from the manufacturer. However, today these or replacement blocks can be ob-

tained quite readily and at most reasonable cost. Some servicemen, however, may prefer to repair these blocks. This can be done quite easily.

After the defective unit (the block) has been removed from the pack, it may be inverted upon two strips of wood in a can and heated in an oven or over a gas flame. The heat will soon melt the pitch used as a sealing compound, and if care is taken, the filter choke and output choke and small condensers may be saved as they fall out. After the can has been cleaned, all necessary parts are replaced, together with the salvaged parts, and melted paraffin or other insulating compound may be poured into the assembly to complete the job.

Inoperative. Another frequent and common failure in this receiver is due to a shorted or leaky-output speaker condenser. When this condenser is shorted, the receiver will be inoperative. A leaky condenser, however, will produce symptoms of choky or muffled reception similar to those obtained when an output stage is operating without grid bias. Although this condenser may be replaced, a repair may often be effected by disconnecting the leads to the speaker condenser and applying high voltage to the terminals. The high-voltage source may be that secured across the plates of the rectifying tube or that obtained from some external power supply. The condenser should be sparked with the voltage several times and then tested. If the condition is the same, the sparking should be continued. Should the shorted or leaky condenser fail to heal after a few minutes of the process, it should be discarded.

Choky, distorted and weak reception is also caused by an open detector-plate resistor. This resistor is of the grid-leak type and fits into clips located beneath the terminal strip of the power pack. Its value is approximately 100,000 ohms. The failure of this resistor is usually due to poor contact of the Wood's metal ends to the resistance element. If a hot soldering iron is applied to the Wood's metal for a brief instant, in order not to melt the solder entirely, it is possible to repair the resistor. This failure will be readily disclosed by the lack of plate voltage on the detector tube, the primary of the audio transformer usually being suspected.

Intermittent reception on these models is caused by loose nuts that hold the receiver cable strip to the power-pack terminal strip.

A cause for noisy and intermittent reception lies with the volume control. The resistance element in this volume control is a flat, tapered, wire-wound affair bent to fit within the volume-control housing. In cases of noisy reception, if the resistance wire has not been broken or has not shifted too much, it can be repaired with the aid of a piece of fine sandpaper. The movable contact arm should also be carefully cleaned and freed from oil and grease. An application of Nujol to the resistance strip will assist matters greatly.

Atwater Kent 37, 38, 40, 42

Hum. Use of a 1-mf. 400-volt condenser between the filament of the 80 where it connects to the first choke and ground increases power and reduces hum. Try it the next time it is necessary to rip open one of the cans.

Wire on Flatstrip Volume Control Breaks. Remove control, solder at the break, and bend flat strip in opposite to original direction so that contact arm rides on unused surface.

Distortion. These receivers sometimes develop a very low, distorted, mushy output. There are high grid voltage and low plate voltage on the 71A. Every one of nearly 40 of the sets that have come in with these symptoms showed a shorted condenser. A 25-mf. replacement may be used.

Better All-round Performance. By connecting a 1-mf. 600-volt capacitor between the filament of the 80 tube and the chassis, all B voltages will be increased, together with a decrease in hum. This results in greater sensitivity and better all-round performance.

Atwater Kent 37, 38, 40, 42, 46

Fading is often caused by a fluctuation of the filament current supplied to the 26 tubes. In the power-supply box there are two terminal boards, held down by nuts. The nuts on the top board may be tight, while those on the lower board may be loose. This is possibly caused by brass bolts stretching. In any case, tightening these nuts will usually correct this difficulty. In these same models, occasionally the volume control will "peak" at other than the position of maximum volume. The antenna transformer, which is located just under the tuning condenser, will usually be found to have the section that is connected across the volume control shorted. A new transformer remedies this trouble.

Atwater Kent 37, 40

Broad tuning found in the lower end of the dial. The situation stood thus: No trimmer condenser, tuning condensers lined up as perfectly as possible, but interference bad. In the grid circuit of the second and third r.f. tubes are 800-ohm resistances, which, if cut down perhaps half, produce a certain amount of oscillation in that part of the wave band. This gives greater selectivity and solves the problem.

Intermittent Reception and Rasping. Press rear of chassis. If this causes noise, insulate shielded antenna cable leading from rear of metal cabinet to front of chassis. It frequently touches the bare ends of the power cable.

Speaker Trouble and Lack of Volume Control. A complaint was made that the volume control did not control the volume. Upon examination, we found that the speaker also rattled, and a few tubes were needed. We removed that volume control, and after tightening it up and putting on some Nujol, we

replaced it; but this did not help. Upon testing the volume-control resistor, we found that it did not have the correct resistance. We next disconnected the wires from this volume control and connected them to an external 5,000-ohm potentiometer. It worked, and the speaker trouble was gone, too. The next thing to do was to get the potentiometer to fit inside the volume-control housing. We took a 5/16-in. drill and redrilled the housing for the new potentiometer. After sawing off the shaft to fit, we put on a knob, and the set was perfect again.

To Increase Selectivity. Mount three-gang trimmer on top of tuning gang, and rebalance with these trimmers connected in the circuit. Make sure that the rotor section is well grounded.

Atwater Kent 37 to 60

When dial belts are not obtainable, use heavy dial cable. Anchor to pulley pins. Spot with drop of solder. Move condenser to take up slack.

Atwater Kent 40

Erratic Operation. When the volume-control strip in the Atwater Kent 40 is replaced, it is very often erratic in operation. This is due to the set having gain that cannot be practically controlled by a single unit or to the fact that, at certain volume-control positions, tube distortion, cross talk, or oscillation occurs. This can be corrected by the addition of a switch and several turns of wire around the coil of the first tuned stage.

The switch is mounted on the rear of the cabinet and is used as a local-distance switch, closed for local and open for distance.

A preferable method for sets where the coils are shielded is to use a switch and a fixed wire resistance. The resistance should have a nominal value of 50 ohms. For high gain, a 25-ohm resistor should be used.

Oscillation during Warming-up Period. Shunt the secondary of the first a.f. transformer with a 250,000-ohm resistor.

When biasing resistor strip under terminal board is defective and original replacements cannot be obtained, use one 750- and one 3,500-ohm type.

One Station Only and Weak Too. A complaint on this model was that the customer could get only WOR, a local, faintly. All the tubes were tested and found to be o.k. All voltages were tested and found to be correct. Then a circuit-to-circuit test was made.

First the antenna circuit was checked and the small flat-type coil tested "open." It was found that one of the connections had come loose from the lug. That was repaired. Still the set did not respond as it should. All locals now came in, but, excepting WOR, lacked volume. The detector grid lead was touched with the finger, and it was noted that the usual loud hum was not present, indicating that the trouble must be from the detector stage on. The r.f. coil was tested and found to be o.k.; in fact, the whole

circuit was found to test o.k. The tuning condenser was looked over and found to be all right, but the grid condenser that connects to the tuning condenser and hangs down alongside it was found to be shorted by being too close to the tuning condenser. The free end was

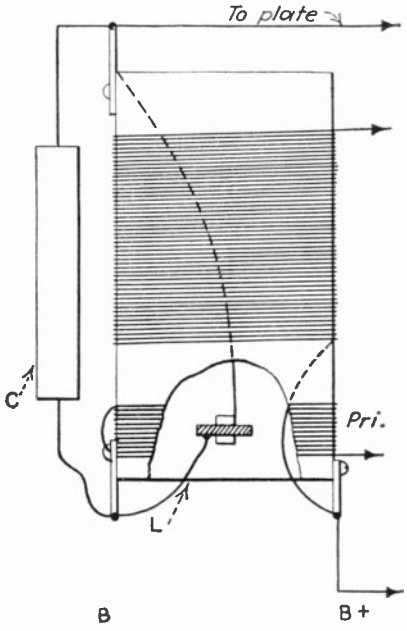

Fig. 5.

pushed out so that no contact was made there, whereupon the locals roared in with volume to spare. Finally the condensers were lined up, and distant stations then came through. See Fig. 5.

Weak or Dead. Where the complaint is no reception or very weak volume, take a look at the grid leak. The original leak is a glass tube resistor with metal ends for slip mounting. Often these metal ends crystallize and come loose, causing the trouble. Replace with a 1-megohm leak with pigtail connections, soldering in place. This will bring it back.

Fading and low volume, especially where 26's are old. Put on additional filament leads from power pack through a hole drilled in side of pack case to filament lugs of first r.f. socket. This will lower drop in leads, raise voltage on 26's and improve performance.

Atwater Kent 40, 42, 52

Distortion. A leaky speaker output condenser in these models, as in the case of Models 37, 38, is often the cause of choky and distorted reception. In some cases, where the condenser is short-circuited, no reception will be obtained.

The volume control in these models is the same as that used in the 37 and 38 models and will cause the same complaint. The treatment described for the latter models also applies to the unit employed in the models under discussion.

Atwater Kent 41, 51 (D.C.)

Low Sensitivity. The most common complaint with this model is poor selectivity and low sensitivity. Generally this is due to poor alignment of the tuning condensers, which may be aligned by loosening the two setscrews holding the shaft to the belt pulleys. Extreme care must be taken in following this procedure, for, of course, while this is being done the receiver is operating, and if any of the stator plates are accidentally grounded

with the screw driver, one or more tubes may burn out and possibly a grid suppressor.

If after the receiver is placed in perfect alignment the sensitivity or selectivity of the receiver still does not meet with expectations, the small resistor in the plate circuit of the first r.f. amplifier, which is located near the tube and the antenna coil, should be shorted out of the circuit. This resistor is of the grid-leak type and fits into clips provided for it. Removal of the resistor from the plate circuit of the r.f. tube increases the plate current, bringing the receiver close to the point of oscillation.

Dead. Should the tubes in this model fail to light up, the first thought is that a tube has burned out because of the series filament circuit. Although this is usually tested correctly and although the current supply is available at the receiver, the probability is that one or both of the r.f. chokes in series with either side of the line has open-circuited. These chokes are wound on small composition bobbins and are located beneath the terminal strip in the power pack. They may be easily repaired by rewinding the bobbins with No. 22 cotton-covered or enameled wire.

Hum upon resonance in these models is caused by an open-circuited detector or r.f. filament by-pass condenser. This condition may be checked by shunting each of these units with 0.1-mf. or a 0.25 by-pass condenser.

Atwater Kent 43, 46, 47, 53

Intermittent reception is a complaint often received against these models. Trouble of this nature may be caused by any part in the receiver and is therefore difficult to trace. However, the difficulty has been found to be due most often to an open-circuiting voice coil of the dynamic speaker. The open circuit will be found in most cases in the leads running from the frame of the speaker to the coil. These leads are soldered to the ends of the voice coil and are glued to the cone, being held more solidly by a strip of transparent adhesive tape covering the soldered connection. Vibration of the cone causes the soldered joint to break, resulting in an open circuit and producing the effect of intermittent reception. The remedy, of course, is obvious.

Dead. If the tubes do not light, it will almost always be found that the voltage-regulating resistor is burned out. Servicemen should always see if this resistor is burned out before coming to the conclusion that the primary of the power pack is open.

Atwater Kent 46

Loud Crackling. Recently we encountered a very interesting and rather unusual problem in tracing down and locating the cause for loud crackling and snapping noises heard in an Atwater Kent Model 46 receiver. The unusual thing was that this noise lasted for only about 5 min. After the noise had subsided, the receiver switch could be turned off and on within

short periods of time and the reception was still normal and free from noise. It was noticed, however, that if this period of turning the receiver off and on was extended to, say, ten min., this unbearable noise would start in anew. From this peculiar behavior of the receiver the conclusion was drawn that this action was due to a loose or defective part, which, in turn, was subjected to the influence of generated heat somewhere in the set. The tubes were suspected, but complete replacement with new tubes proved that these were not at fault.

The trouble was finally located by pressing down the top of the flat, wire-wound cathode series and r.f. plate-circuit resistors. Broken-off wires in the resistor strips were suspected, but again we were fooled. Replacements definitely proved these to be free from any defects. The leads from these resistors were then traced to their respective terminating points one by one, the soldering iron was applied, and the result noted. The cause of the trouble was thus located in the joint where the lead from the resistor was grounded to the chassis.

The peculiar action of the receiver can best be explained as follows. The flat wire-wound resistor strips are rigidly held down at two points; when they get warmed up, they will expand to an upward-curved position, pulling with them the lead connected from the resistor to the chassis. The end of the wire at the chassis was encased with solder, but inside it the wire was evidently only loosely held in a wedge-shaped manner, and the slight pull was sufficient to make this a temporary tight connection. When the resistors cooled off, the process was reversed, and the wire pushed loose again.

Atwater Kent 55

Echo Effect. A number of these models have given a peculiar kind of trouble.

The owners complained that the set "echoed" or "talked double." However, on musical reception it seemed to be o.k. We have always found the trouble to be in an open second audio bias resistor (colored yellow). We have always made replacement of this resistor with a 2-watt 15,000-ohm resistor. Results were always satisfactory after this change had been made.

A common cause of poor tone is a change in either of the two resistors shunting the speaker field. The resistors supply the *C* bias to the power tubes.

No Reception. Look for open voice-coil lead; common discovery.

A great improvement in this model, especially in those that are broad tuning at 1,500 kc. and weak at 550 kc., is to use type 35 tubes in place of 24's. The wiring is changed thus: Disconnect the cathodes of the 24's from the original bias resistor, but leave the low end of the volume control connected so as to ground through the bias resistor. Connect the cathodes of the 24's sockets together, and connect a 100-ohm resistor from this lead

to the chassis. Disconnect the lead from the old bias resistor, and connect it to the cathode of the r.f. tube. Install the 35's in the 24 sockets. The selectivity is much better with 35's.

Intermittent operation after a few minutes of use, reception gradually fading out completely with a buzz. Open secondary in second r.f. transformer. Plate lead of 24 comes through this coil and since fault is intermittent, it is usually difficult to hit the open period in checking socket voltages. Application of heat from a 60-watt lamp will hasten the opening if this condition exists.

Fading. In this model, loose rivets on wire-wound resistor cause poor tone, overloading, and distortion. Also check the two resistors across speaker field and detector bias resistor for changing values.

Installation of Tone Control. We believe this will help some of the engineers who have attempted to get a satisfactory installation of a tone control in this receiver. The local and distance switch of this model is seldom used, so remove it (connect the wires together under the chassis) and put a 50,000-ohm potentiometer in its place. Ground the center terminal, and run a connection from one side of it through a 0.002 mf. (or up to 0.008 mf., depending on the amount you wish to vary the tone) to the grid of the first audio tube instead of putting the tone control in the plates of the output tubes. This setup gives you all the tone control you want and doesn't change the outward appearance of the set by the addition of another control.

Intermittent Operation. We have found the following trouble to be very common in the Atwater Kent Model 55. The trouble shows up when the radio cuts in and out and is very hard to trace because the radio will at times work satisfactorily for hours while tests are being made. The leads from the voice coil are brought out to a terminal strip on the speaker frame and are also cemented onto the speaker cone. One of these leads has a soldered splice where it is cemented near the center of the cone.

When in operation, the vibration of the speaker cone causes the soldered splice to open and give intermittent reception. This break must be repaired and the lead cemented to the cone.

Atwater Kent 55, 55C

Should the condition of distorted reproduction be observed, with the symptoms of unusually high grid bias, usually about twice its normal value, impressed upon the output tubes, the trouble may be traced to one of the two resistors connected in series across the field coil, dividing the voltage drop across the field to obtain the proper grid bias for the output. Most often the open resistor will be found to be that connected from the control grid-bias tap to ground. In the early models the value of this resistor was 10,000 ohms, while in the later models a 65,000-ohm unit is employed. This

failure may be checked without removing the chassis from the cabinet by means of a point-to-point resistance test, but in order to accomplish this, it is necessary to remove the speaker plug or else an erroneous indication will be obtained.

Dead. Look at the leads to voice coil and check very carefully, since these have a tendency to get high-resistance joints. They are soldered at about the middle of the distance from rim to apex of the cone.

Atwater Kent 55, 55C, 55F, 55FC

The symptoms of choky and weak reception on these models are usually caused by an open-detector cathode-bias resistor. An early model used a 100,000-ohm resistor as the cathode bias, but later models employed a unit of approximately 50,000 ohms.

Where the condition of oscillation is encountered that is not a result of either bad tubes or open-circuited by-pass condensers, poor alignment of the tuning condensers may be the cause. These condensers may be rebalanced by loosening the setscrews holding the shafts to the belt pulleys. In cases where even this will not help, try placing a metal howl arrester over the 27 detector tube, connecting the arrester to the stator plates of the detector tuning condenser.

Atwater Kent 55, 60

Fading can often be traced to loose rivets on wire-wound resisters. In most cases, reclamping them with pliers effects a repair. Check particularly bleeder 1, r.f. bias, and first a.f. bias units, since these work loose more often than other units at the rivets.

Cuts Out. The set would play very well for a few moments and then cut out. Snapping the power switch off and on would usually bring the set back to operation, but it would always stop again. A continuity check on the speaker revealed an open voice coil. A careful inspection showed that one of the leads running along the speaker cone from the output transformer lug to the voice coil was spliced. Vibration had loosened this splice enough to cause a poor contact, and a little volume sufficed to cause it to cut out. A drop of solder remedied the matter.

Atwater Kent 55, 60, 60C

Loss of volume and sensitivity in these popular models is a common occurrence, and in some cases the trouble does not show up on an analyzer or continuity test. The above-mentioned tests failing, the shield of the first r.f. stage should be removed and the r.f. transformer primary very carefully inspected, preferably by removing from chassis and applying continuity tests. In many cases this winding will be found to be open, caused in some cases by lightning, climatic changes, etc. The remedy, of course, is either to substitute a transformer or to rewind the primary with slightly heavier wire, about No. 28 or No. 26 enamel-covered. Primaries rewound thus will seldom if ever develop trouble again. After replacing

the r.f. amplifier and detector stage with the aid of a good oscillator, follow usual practice.

Low Plate Voltage, Noisy Reception, Little Volume. Check two a.f. grid resistors. One should be 40,000 ohms, the other 65,000. They have a habit of dropping in value.

Atwater Kent 55 to 67

Fading, Intermittent Reception. Often due to poor connections at various tubular condensers. Also, resistors are mounted on insulating strips, the connecting lugs being integral parts of these strips. Resistors of metalized variety with solder ends are soldered rather gingerly by the factory to avoid melting, and poor connections frequently develop. Test all resistor connections mechanically and electrically, moving them while ohmmeter is attached. Connect ohmmeter prods to lugs rather than to resistors.

Atwater Kent 100

Changes. The first early type of Model 60—see "Atwater Kent," page 29 in Rider's Vol. III and page 167 in the Rider *Combination Manual*—has a single volume control, and the second or late type—see "Atwater Kent" page 31 in Rider's Vol. III and page 169 in the Rider *Combination Manual*—has a dual volume control made up of combined wire-wound and carbon resistors.

First or Early Type. When replacing the bleeder resistor, use wire-wound resistor, 4,000 ohms. When replacing the first r.f. bias resistor, use wire-wound resistor, 1,500 ohms, and replace the r.f. bias resistor with 160 ohms.

Second or Late Type. The bleeder resistor 1 is made in two types. The first type consists of two 3,000-ohm wire-wound resistors riveted together and connected in series. The second type is a single 6,000-ohm wire-wound resistor with a tap at the center.

In early production of the second-type Model 60, the bleeder resistor was wound on the same fiber base as the first r.f. bias resistor. If either section of this combined unit is defective, remove the unit and use a 1,500-ohm resistor as r.f. bias, and 1,500 ohms as bleeder 2. Later production of the second-type Model 60 used a separate resistor as bleeder 2.

Atwater Kent 61

The Atwater Kent 61 *gets very noisy* after about 2,000 hr. of service. This is due to the three filament resistors overheating and burning away the insulating material between the wire and the iron strip on which they are wound, causing a short. If the center strip burns out, the first two 22 type tubes will not light.

A slipping dial is caused by the rubber friction drive being worn out. For a temporary repair, take out the screw on the dial knob, tear a strip about ⅛ in. wide from a length of tape, and wind the strip tightly around the grooved portion of the rubber.

Atwater Kent 70 Series

Stations 10–30 Kc. Off. Where one of these models is encountered with the dial about 10 to 30 kc. off the correct frequency, particularly at the higher frequencies, no amount of aligning will correct the condition. It is necessary that the control-grid leads to the three screen-grid tubes should be as far apart as possible and parallel to one another.

Atwater Kent 80

When volume controls become noisy, raise the end of the contact with long-nosed pliers and bend in toward the winding slightly. Then clean the strip with alcohol.

Hum and distortion not due to condensers or resistors. Replace grid resistor in 47 input; also coupling condenser to detector plate.

Atwater Kent 80, 82, 85, and 89

Volume Control Not Functioning. Several of these models were brought in for repairs recently, the complaint being "volume control not functioning." We went over the sets, completely checking the voltages, volume control, etc., but found everything o.k. We then checked the circuit and found that the volume control varied the cathode potential of the a.v.c. tube. On inspection, we found a high-resistance connection between the oscillator-tube cathode prong and the socket. The defect was remedied by cleaning and tightening the socket prong.

Poor Sensitivity. Another complaint in Models 82, 85, and 89 was poor sensitivity, which was traced to the a.v.c. tube, a type 24. To test this, remove the type 24 a.v.c. tube from its socket, with the set tuned to a station and with the volume control set at maximum; if the volume increases when this tube is removed, then the tube needs replacing.

Noise. The next trouble was found in an Atwater Kent 89. The complaint was noise. An inspection of the set proved that the noise was developed in the set itself. It took us three hours to find this trouble, which was a noisy type 35 variable-mu tube.

Atwater Kent 82, 85, 86, 90, 92, 94

The complaint of low volume and poor tone and especially little response when the tone control is set at the bass position will be found to be caused by an open r.f. choke in the output pentode control grid circuit. This failure will not be disclosed by the use of a set analyzer, since all voltages will be intact when this choke open-circuits, resulting only in breaking the coupling between the plate of the second detector and the grid of the pentode tube. In some cases, the open circuit in this choke will consist of a break in one of the leads that may easily be repaired as it emerges from the bobbin winding, although shorting out the choke entirely has produced no noticeably ill effects. Where it is desired, however, a new unit may be installed.

Because the i.f. alignment condensers are located on top of the coils beneath the coil shields, it is necessary to remove the shields in order to make any adjustments. Replacement of these shields will often have an effect upon the alignment. To eliminate this condition, a duplicate can should be secured with several holes in the top to permit the entrance of the adjusting screw driver. When it becomes necessary to realign the i.f. transformer, this shield may be substituted for the one ordinarily used.

Atwater Kent 83, 85

Poor tone, low volume, and little response with tone control turned to bass. Look for open r.f. choke in pentode-control grid circuit. Analyzers miss this one.

Atwater Kent 84, 84F

Weak Reception over Entire Dial. This was our first experience in finding the r.f. choke open, connected between one end of the volume control and i.f. coupling condenser connected to a tap of the primary of the first i.f. transformer. With this r.f. choke open, you will still get plate voltage on the tube to which the i.f. is connected in the plate circuit.

Watch out for this trouble, and cure by replacing the choke with another one of about 85 ohms d.c. resistance.

Atwater Kent 85, 86, 89

Unusually sharp volume-control cutoff in Model 85 can generally be remedied by trying several 24's in the a.v.c. socket.

"Choppy" reception in Model 38 is commonly traceable to shorting of the audio output condenser. Unsolder green wire with yellow tracer from bottom terminal strip, and connect a new condenser in series. Noisy volume-control operation in the same model is often due to a broken lead of the r.f. coil primary near the lug.

A great improvement may be had in the operation of the volume control by making a careful selection of tubes to be used in the a.v.c. socket. With some tubes the control is critical, the volume falling to nothing within a fraction of a turn of the knob.

Atwater Kent 89

If glow in neon tuning light gradually disappears while set is tuned to a local station, remove first i.f. shield and carefully scrape away the black sealing compound between the plate and grid i.f. coil. Scrape compound clear down to the cardboard tube on which i.f. coils are wound.

Atwater Kent 96

The complaint of an inoperative receiver with the symptom of nearly 400 volts of the control-grid bias on the r.f. first-detector and i.f. tubes is caused by a primary-secondary short of the first i.f. transformer. The short is due to a carbon resistor shunted across the secondary winding that is shorting to the primary coil. This resistor is imbedded in the pitch that is used to impregnate the primary winding. To remedy this defect it is necessary only

to work the resistor out of the pitch, moving it a slight distance from the primary winding after a layer of tape has been wrapped around the unit. A further indication of this defect is that the tone-beam light will climb to the top when the receiver is switched on, then quickly fall out of sight as the tubes heat. The transformer in question is located at the back right-hand corner of the chassis in front of the neon-light adjustment.

Atwater Kent 99

Dead. High potential on one control-grid cap. Remove i.f. cans; insulate resistors that touch coil forms. Trouble causes neon light to be inoperative and kills all signals.

When this receiver is found inoperative, with exactly the same symptoms as described in the preceding paragraph with Model 96—namely, very high control-grid voltages on the r.f. first-detector and i.f. tubes and the rapid falling of the neon-tube glow as the tubes become heated—the trouble will be found to be due to the i.f. secondary shunt resistor shorting to the primary winding in the first i.f. transformer. The remedy has been discussed in connection with Model 96. This transformer is located in the front right-hand corner of the chassis to the right of the a.v.c. 24.

Inoperative. A tube checker was plugged into the line and the chassis pulled out of the cabinet to test all the tubes as the first step toward clearing up the trouble. The set switch was snapped on to preheat the tubes.

Balancing the end of the chassis with one hand, we made an attempt to remove the control-grid cap of the first-detector 35 tube with the free hand. An attempt was made but failed, for when this was done, the author became the unfortunate donee of such a vicious "jolt" that any idea of further tube checking was abandoned for the time being. The terminals of a voltmeter were placed from chassis to control grid of this tube, and a reading of nearly 400 volts was obtained. The voltmeter disclosed a similar voltage from the control grids of the r.f. and i.f. tubes to chassis. This unusual situation caused no little conjecture, and the first thought was a primary-secondary short of either the r.f. or i.f. coils. However, if this were so, then it was thought that some breakdown would result, since the plate voltage impressed on the primary would be short-circuited to ground or chassis through the secondary; but when the schematic was consulted, it was found that this condition of high voltage on the control grids of these three tubes was possible without further breakdown. The control-grid returns were connected in the a.v.c. circuit together with the a.v.c. plate resistor; because of its high resistance, the amount of current was limited, thereby preventing a short circuit of the entire voltage output.

The fact that there was no further breakdown evidenced an unimpaired a.v.c. plate resistor, and, proceeding on this

theory, with the aid of a low-range ohmmeter, we found the short by the process of elimination within the shield can of the first i.f. transformer. This unit is located in the extreme front right corner of the chassis to the right of the control tube, a 24. When the shield of the transformer is removed (this may be easily done by pressing in the bottom of the can on two sides and then raising it), a carbon resistor will be seen imbedded in the pitch that is used to impregnate the primary of the i.f. coil. This resistor is shunted across the secondary winding, also impregnated, in the same unit. Whether because of vibration or for other causes, the resistor short-circuits to the primary winding, resulting in the aforementioned condition of the control grids that "kick."

To eliminate this defect, all that is necessary is to work the resistor out of the pitch and move it a fraction of an inch away, after wrapping a layer of tape around the unit. Another indication of this trouble is that the neon-tube glow will climb to the top when the receiver is first switched on, then quickly fall to the bottom of the tube as the receiver tubes heat.

Atwater Kent 155

The main complaint is lack of volume. The set gets out of alignment, and the screen-grid resistor in the oscillator-detector circuit goes off value. We have often put twice as much power in the 155 Model by replacing the 85 tube with a 75 type.

There is a special way to line up the intermediate frequency on these sets, for which a coupler is needed. The condenser gang should be set at about 540 kc. Peak the trimmers A_6, A_5, A_4 (see *Rider's Manual*, Vol. III, page 70) in order listed for maximum signal strength. Use the weakest oscillator signal possible, and turn the volume control on full. The intermediate frequency is 262.5 kc.

Atwater Kent 165

On using loud volume, a heavy vibration is noticed. Tightening up adjustment on end of rotor plates will cure it. Just a little more tension is enough.

Atwater Kent 246

Whistles When Volume Control Is in Third-quarter Position. This set operates normally in every respect as long as the volume control is either in the first third or the last third of the volume control, but if the control is set along the middle third of the arc, the set whistles. It will be found that the 500,000-ohm control has increased very appreciably and in our experience was found to be 3 megohms. Replacement of this control was all that was necessary to restore full operation of the entire arc of the volume control.

Set stops playing suddenly. Check for poor contact on filter choke where it connects to plate of first detector 58. The brads that hold the connection on both sides of the coil loosen and corrode.

Atwater Kent 277, 427, 667

Weak, distorted reception and oscillation have been encountered on several of these receivers. A socket analysis test will reveal a high first-detector cathode bias. If such is the case, check the cathode bias resistor, a long flexible-type resistor connected to chassis from an insulated terminal on the small r.f. choke located near the oscillator-tube socket for an open-circuited condition and a leaky 0.1-mf. condenser by-passing this unit. The correct value of the resistor, which is connected in series with the cathode pickup coil of the first-detector tube, is 550 ohms. Both the resistor and the condenser must be replaced.

Cross Talk. Where an extremely long aerial is employed with these receivers, it is necessary that the red antenna lead of the receiver be used in order to reduce cross talk or interference between stations. When this is the case, try grounding the blue antenna lead to the chassis. A number of instances have been found where this procedure increased the sensitivity, still retaining the advantages of the smaller antenna coil when a long antenna was connected to the receiver.

Atwater Kent 310, 510

Dead. Where the symptom of a "glowing" or red-hot screen-grid element of one of the 2A5 tubes is observed, check the output transformer located on the dynamic reproducer. The set analyzer will reveal the cause of the symptom by a lack of plate voltage on that tube, which is due to an open-circuited portion of the primary winding of the output transformer.

Sizzling or Frying. One of the most frequent complaints with this model is the "sizzling" or "frying" noise that is heard in the reproducer for a few seconds after the receiver has been switched on. This condition is caused by the breakdown of the wet electrolytic filter condensers occasioned by the no-load peak voltages, since all amplifier tubes are of the indirect heater type. Although several remedies may be devised, a simple solution to the problem is to employ an indirect heater-type rectifier tube of the same filament or heater rating. In this case, the output voltage of the rectifier will rise to its normal value as the cathode of the tube becomes heated, thus preventing the output voltage from becoming dangerously high before the amplifier tubes are fully heated, and so avoiding condenser failures.

This receiver employs a noise-suppressor control in the cathode circuit of the 58 i.f. amplifier, as shown in *Rider's Manual*, Vol. IV, page 8. The purpose of this control is to reduce the sensitivity of the receiver so that a minimum of interference will be present when the dial is rotated from station to station. Where little or no effect is obtained when this control is adjusted, the trouble has been found to be caused by the variable resistance. The remedy is replacement.

In this model, the complaint of intermittent reception is often encountered. This

condition in many instances is reproduced by tapping the front of the cabinet. At other times reception can be made to stop and start merely by some one walking across the room or upon vibration of the chassis set up by the movement of the loudspeaker. In almost every case the trouble has been traced to small splashed particles of solder that have lodged between the contacts or terminals of the wave-band switch. The remedy is fairly obvious.

Atwater Kent 465Q

Distortion sounds as if speaker were out of adjustment. Caused by an open eight-mike electrolytic connected from B+ at speaker cord to ground. This open also causes howling at times and is almost always diagnosed at first as speaker trouble.

Atwater Kent Midget 500

To Eliminate Slipping of the Tuning-gang Assembly. Remove the flange that holds and bears on the three ball bearings that gear the rotor. Place on bench. Then place washer from a snap switch over same, and tap evenly with a socket wrench of the correct size. Assemble, and gang will not slip.

Atwater Kent 511W (Tun-o-matic)

Automatic features won't shut off, tuning condenser swings to 1,600 kc. o.k., but line is not cut. Look at nine-point normal, off, and automatic switch at right on front of panel. Switching blades are a little too wide and sometimes contact two points at once, preventing opening of the circuit. File blades down a little or replace with later type switch available from factory.

No reception. Look for leads soldered to tone-control switch touching housing of volume control and grounding out. These two are mounted so close together on front panel that sometimes the rubber-insulated pieces on the tone-control leads slip off from vibration. Slide them back in place or bend leads back.

Hum not due to circuit faults. May be due to reversal of antenna and ground connections. The 5Z3 rectifier and 2A3 tubes also are critical. Change them while looking for hum.

Atwater Kent 559

Increasing the volume causes motorboating as well as distortion. Be very careful that the 2A5's match in their readings of emission, since when they are unevenly matched there will be a certain amount of motorboating. The principal cause of motorboating, however, is an open-output filter condenser.

Atwater Kent 612, 812

Blows Line Fuses. These models have the notorious reputation of "blowing" line fuses. Because of a pair of 83 mercury-vapor rectifiers, small buffer condensers are connected across the high-voltage windings to filter out noise caused by these rectifiers. These rectifiers break down or become leaky and short that portion of the high-voltage winding across which it is connected, thus increasing the

load upon the primary and causing the fuse to blow. Since there are two power transformers, four filter condensers are necessary. All four condensers are contained in a single block located on the side wall of the chassis near the 83 sockets. Although the value specified is 0.07 mf., the capacity is not critical and 0.1-mf. condensers may be used to replace the leaky or short-circuited section, providing that its working voltage is over 400 volts.

Hum. When the condition of hum upon resonance is encountered, which may also be of an intermittent nature, look for an open-circuited section of the same by-pass block mentioned in the preceding paragraph.

Noisy and Intermittent. The connection to the 1,450-mmf. oscillator tracking condenser has often been traced as the cause of noisy and intermittent reception on these models. This condenser is located within the oscillator coil shield.

Spasmodic and irregular operation of the silent tuning control is due to a loose-element 57 tube used in this stage in most cases. This tube plays an important part in the correct operation of the receiver, and it is necessary that the tube used be a perfect one.

Atwater Kent 627

Low-frequency end is dead. In several of these sets we have found the low-frequency end of the dial to be "dead." The trouble is not, as one would suppose, shorted tuning-condenser plates but is to be found inside the oscillator coil can. The 1,450-mmf. condenser located at the side of the coil can is grounded with two small rivets which have loosened. Oscillation and inaccurate dial settings are indicative of this fault. The best remedy is to run a special lead (grounded) to mounting of this condenser, unless the condenser either leaks or is open.

In this model oscillation and erratic operation are encountered that are not caused by open-circuited condensers or incorrect alignment of the tuned circuits. The difficulty has been overcome by connecting a small r.f. 85 millihenry choke in the r.f.-stage cathode circuit. In these receivers, a common bias resistor is employed for both the r.f. and i.f. 58 tubes. Later models have incorporated this unit.

Weak Reception and Stations Not Tracking. The trouble was found to be in the oscillator trimmer of the oscillator grid circuit. We disconnected the wires to this trimmer condenser and, checking it, found a very high resistance reading that was caused by moisture between the mica and ground side of the trimmer. We replaced the condenser.

Atwater Kent 636

Flutter When Car Is Pulling. The set was satisfactory while the car was motionless, or even with the motor running, but when the car was pulling, regardless of its speed, a very noticeable flutter appeared. This disappeared the moment the accelerator was released.

With one of the type 41 tubes in the analyzer, the car was put in motion, and we noticed the voltage fluctuate with the motion of the car, exactly in time with the flutter of the signal. Upon removing the B unit, which is a motor generator, we found that the commutator on the generator side had a high spot, which, with the vibration of the car when pulling, was causing the trouble. Turning down the commutator (and it is also a good idea to turn down the commutator on the motor side while the unit is out) cured the trouble.

Atwater Kent 665

Oscillation. See that screen-grid stage control-lead spring, which serves as a shield, is kept away from the 2A5.

Atwater Kent 812

Erratic Tonebeam Operation. Frequently the tonebeam employed in this model is the cause of many complaints, the operation of the beam being very erratic, with the light column slowly falling, disappearing, and then suddenly climbing. This occurrence repeats several times. The condition is caused by the shorting of the 40,000- and 6,000-ohm carbon resistors in the tonebeam voltage-divider circuit. The two resistors, together with a third resistor in the second-detector cathode circuit, are mounted in an insulating paper container and separated by small wads of pitch. Because of the fact that the Wood's metal ends are pointed, vibration causes the two resistors to work their way through the pitch and short one another. The shorting of these two resistors shorts the tonebeam potentiometer out of circuit, disturbing the biasing arrangement, and the tonebeam does not function.

At times it may be found that the neon column in the tonebeam has no action when the receiver is tuned from station to station, indicating resonance. This may be caused by the fact that the tonebeam potentiometer has been set too high and the initial bias voltage on the long electrode is too great, resulting in the neon column climbing to the top of the long electrode. If satisfactory operation cannot be obtained by reducing the setting of the tonebeam potentiometer adjustment, check the white 40,000-ohm bleeder resistor for an open-circuited condition. This resistor is mounted in an insulating paper container, together with another bleeder resistor in the tonebeam circuit and a resistor in the detector cathode circuit. Each resistor is separated by small wads of pitch. The open circuit in every case has been due to bad contact of the Wood's metal ends of the resistor, which have worked loose. Replacement of the unit is essential. If a resistor of 40,000 ohms cannot be obtained, a 50,000-ohm unit may be substituted, since the tonebeam potentiometer will compensate for this difference.

A few cases of noisy and intermittent reception have been reported with this

model. This receiver is a new one, utilizing two type 83 rectifying tubes and type 46 tubes in the output stage, with another 46 as a driver. In all these few cases the trouble has been traced to a loose connection beneath the sleeving of the wires connected to one end of the 1,450-mmf. condenser within the oscillator coil shield.

Erratic Silent Tuning Control. In this same model, erratic operation of the silent tuning control has been found to be caused by a loose element in one of the 57 tubes in the silent-tuning-control stage. A few sharp taps on the glass envelope will soon disclose this condition; or to ascertain this fact more readily, place the tube into one of the 58 sockets and repeat the tapping.

Intermittent reception has often been traced to the lugs on the light coil forms short-circuiting to the chassis within the coil shields, or to the ends of the coils snapping directly at the lug and making contact intermittently. In correcting the first failure, a strip of cardboard or other insulating material, cut to size, should be placed under the coils to prevent a possible recurrence.

An insensitive condition on the higher frequencies or the inability to tune the receiver below 650 kc., where the porcelain insulators on the turret condenser gang are not broken, may be rectified by replacing the 24A oscillator tube, although this tube may test perfectly on any tube tester.

Noisy reception while tuning from station to station is frequently due to the presence of tiny burrs on the plates of the tuning condensers. This condition may be easily eliminated by disconnecting the leads to the condensers and applying the high voltage of the receiver directly across each section. As the condensers are rotated, the high voltage impressed across the plates will produce an arc at the shorting points and burn away the offending burrs.

Overheating Power Transformers. Because the power transformers on these receivers burn out frequently, from overheating, overload, and other causes, many servicemen use a high-grade transformer for replacement purposes. These transformers usually have center-tapped heater windings. These center-tapped connections should not be used for either winding. In the first case, the filament winding supplying the two type 47 output tubes is center-tapped by means of a center-tapped resistor. Should the center tap of the other heater winding be connected to ground as per usual procedure, almost certain damage will occur to the power transformer. This center-tapped connection should be left open. Although one side of the heater winding of the original transformer is grounded, this connection may be removed without any apparent ill effects.

A slipping condenser friction drive of these receivers is a complaint easily remedied. The dial and dial frame should be removed by loosening and removing

the nut holding the dial and frame to the turret condenser shaft. The two screws holding the volume control-tone control assembly in place should be removed next. Two fiber or metal washers, approximately ⅛ to 1/16 in. thick should be inserted on the screws under the assembly so that the assembly will be raised by that amount when it is reinstalled in position by tightening the two screws. This procedure will raise the friction gear so that when the dial and frame are replaced on the turret condenser shaft the gear will more firmly engage the edge of the dial frame.

Atwater Kent 816, 926, and 936

Note. Models 816, 926, and 936 receivers utilize 6D6 tubes instead of type 39 tubes for the r.f. and i.f. positions.

❖ ❖

Audiola

Oscillation when tone control is in treble position. Replace 0.01-mf. condenser from plate to filament.

Oscillation on every part of the dial after alignment of the set, testing of the tubes, and general going over. It was found that the trouble was caused by a loose rivet holding the r.f. by-pass condenser (dual 0.1-mf. metal can condenser). The rivet was tightened, and a heavy wire was soldered to the condenser can and the chassis. This rivet held the second r.f. socket down too.

Hum. Also, an annoying hum was cured in same set by placing a 1-mf. condenser between 0.5-megohm yellow resistor and the chassis.

Audiola 31

Fading. We were recently called upon to service an Audiola Model 81 t.r.f. receiver. We found that it had plenty of volume at 1,070 or higher frequencies, but WOR, at 710 kc., would come in with fair volume for a few minutes and then gradually die away to a whisper, which is certainly not right for a district so close to that station.

A careful check showed that tubes and voltages were o.k., with no variations. Contact springs on variable-condenser shaft were polished, with no improvement in results. The set was kept on bench for 2 days with no tangible change in voltages, and still it would die away as before. The variable-condenser assembly was covered with a metal shield, which was taken off and replaced several times. Finally, in the course of replacing the shield, we accidentally pushed against one of the leads from control-grid cap to the lug attached to stator plates by means of a machine screw that first passed through a bakelite or micarta insulator; the lug shifted easily and, upon inspection, we found that the other three lugs were also loose, resulting in high-resistance contacts in the grid circuits. Obviously, tightening these four screws resulted in normal volume on the lower frequencies.

Whether the insulating material shrank or the machine screws stretched, we are

unable to say, but loose they were, and the question arises how many times these have been overlooked by all of us. Stupid though it may sound, it's always the last thing you try that finds the trouble.

❖ ❖

Autocrat

Autocrat 80

Weak Reception. The trouble was traced to the dual electrolytic condenser. There was a leakage between each section, causing a short circuit across the field of the speaker.

❖ ❖

Balkite

Balkite 60, 70

Alignment Data. Remove cap of 6A7 and place output wire from oscillator on this cap through 0.01 condenser. Ground other oscillator terminal to frame of variable condenser. Set dial at 550 kc. with switch in broadcast position. Set oscillator at 456 kc. and, with volume control of set on full, using output meter, align first and second intermediates in the order named. Repeat this for accuracy. Remove oscillator lead from 6A7 and connect it to the antenna post. Set test oscillator frequency at 1,400 kc. and align trimmers on variable condensers. Set dial and oscillator at 600 kc. and adjust 600-kc. padder located at side of set for maximum output indication. Repeat high-frequency alignment for accuracy. Best results are obtained on short-wave alignment by experimentation. Adjust front coil trimmer at about 15,000 kc. and rear at 6 mc.

❖ ❖

Belmont

Belmont 71C

Audio-frequency Modulation of Oscillator, Audible over Entire Dial. Replace 56 grid leak with proper size. It has probably increased in value.

❖ ❖

B. O. P.

Strain on speaker cable breaks connection inside female plug. Connections usually broken are either 89 plate lead or B+ center tap of output transformer. Indicated by lack of plate voltage on one or both 89's. To repair, slip back shielding over cable about 1 in., turn the plug cover, and slip it back, exposing the lugs and the broken connection. Chevrolet set and some United Motors models require connection from speaker frame to radio chassis when placed on bench; similar in this respect to older Sparton multiunit models of home radios. The two wires carrying A current in the cable are "hot" A and switch leads. The A return is made through the metal fire wall of the car.

B. O. P. Chevrolet

Pronounced Vibrator Buzz. Remove 75 tube. If noise stops, replace tube and short screw driver across grid to ground. If buzz continues equally loud, place four-

mike condenser across B+ to ground. Trouble is due to opening up of filter output condenser.

Motorboating, or Steady Whistle, in Buick, Oldsmobile, Pontiac, Chevrolet, or United Motors Sets of 1934. Generally due to breaking of an r.f. cathode by-pass condenser lead. Look for largest condenser of cluster of three, jammed between lid and the other two.

❖ ❖

Bosch

Bosch 5A, 205, 206, 205A

Persistent distortion in these small t.r.f. sets using two 35, one 24, one 47, and an 80 can generally be cleared up when everything else tests o.k. by installing a 20-ohm center-tap resistor across the 2.5-volt heater winding. Then place a 100-ohm resistor from center tap to ground.

Bosch 16, 17, 18, 48, 49

Noisy tuning and oscillation as the station selector is rotated are invariably caused by a dirty variometer rotor contact. This variometer, enclosed in a metal shield, is attached and geared directly to one end of the condenser gang to obtain equal sensitivity at both high and low frequencies. In order to clean this copper contact, it is necessary to remove the variometer. This may be done by removing the shield and then the nuts and insulated washers holding the variometer in place. After the copper-spring contact is thoroughly polished, it should be bent slightly to increase its tension.

A frequent cause for weak reception at either the high or low-frequency portions of the tuning band is due to the same variometer being out of phase in relation to the position of the tuning gang. The setting of the variometer is correct when the rotor is at right angles to the stator when the condenser gang is set to approximately 50 on the dial.

When the chassis in these models is installed in the cabinet from which it had been removed for purposes of repair, it is important that the shafts of the volume control, tuning condenser, or "clarifier" should not short to the escutcheon plate. The tuning-condenser shaft is at ground potential, and if the volume-control shaft touches the escutcheon plate, it will cause the antenna to be grounded, resulting in weak or no reception. Should both the shafts of the tuning gang and the "clarifier" or antenna trimmer touch the escutcheon plate at the same time, a similar condition will be noted, since the rotor of the antenna trimmer is connected to the high side of the antenna volume control.

Weak. Some of the later models of these receivers come equipped with small 500-ohm carbon resistors in the grid circuit of the second and third r.f. tubes. When these receivers are serviced because of weak reception and a set analyzer reveals excessive plate current drawn by the second and third r.f. tubes, these resistors will be found open and should be replaced.

The complaint of noisy reception that has definitely been determined as caused by some internal condition in the receiver has often been traced to either one or both 0.001-mf. by-pass condensers in the detector plate circuit that have become noisy. Although these condensers may respond to every test, they should be disconnected or replaced to ascertain the origin of the noise.

In replacing tuning-drive cables in these receivers, it is best that the tuning-gang shield and dial scale be removed so that free access may be gained to the drum and pulleys. If the cable is started at the rear pulley, the job will be much easier.

Hum is a frequent complaint with these models, and the cause may often be determined without removing the chassis from the cabinet. Usually the condensers connected before and after the speaker field, which is used as a choke, are at fault. If the speaker-field plug is moved out slightly from its socket, a 2- or 4-mf. filter condenser may be connected first to one side of the field and then the other, to chassis, shunting the original capacities. A diminishing or disappearance of the hum will point to the trouble. Should the condition still exist, a 0.05- or 0.1-mf. condenser should be connected across the field. This checks the "tuning" condenser.

Bosch 20

Oscillation. Several of these sets have been found with the oscillator-plate dropping resistor, a 40,000-ohm 1-watt unit, shorted. Replace with a 3- or 5-watt unit, as the 1-watt will not stand up.

Better control of volume is secured by removing the lead from antenna to control and by using the control only on the cathode of the i.f. tube. A minimum bias resistor of about 1,000 ohms should be added to the 200-ohm unit used in the set.

Bosch 28

Easy Volume-control Replacement. Remove all old drive gear. Install standard 250,000-ohm unit and hook in circuit so that it will vary B+ voltage to r.f. plates. B+ lead from pack is the one going to open end of the resistor in clips near 26. Hook 1,500-ohm grid-suppressor resistor from grid of first radio frequency to stator of first variable gang condenser in place of original control. Result: greater sensitivity, easier to neutralize.

Bosch 28, 29

In replacing volume control, it will be noticed that it is located in the extreme left end of the chassis, controlled by a pulley arrangement to the control knob in center of the chassis. This original Bosch wire-wound control is placed at the end of the chassis instead of at the rear of the point of control to eliminate oscillation. To replace this is impossible in some towns without sending to the factory, with consequent delay.

A standard 25,000-ohm volume control can be used instead, to be placed at the

point of the chassis where the former control knob was located. This does away with the necessity for control cables and pulleys. Oscillation will not take place if the metal cover on the rear of the replacement unit is grounded to the frame of the chassis.

Bosch 28, 29, 38

Poor volume and distorted reproduction in these models will often be found due to an open 50,000-ohm resistor in the detector-plate circuit. This resistor serves to supply the voltage required for correct operation of the detector tube. It is of the grid-leak type, mounted in clips located directly in front of the first audio socket.

This same resistor is the cause of noisy reception. The original unit employed in this receiver has its resistance element coated upon the inner surface of the glass, and after the receiver has been in use for some length of time, a noisy condition often results.

The condition of motorboating and oscillation when all r.f. and bias-resistor bypasses have been checked can often be rectified by connecting an additional 1-mf. condenser from either side of this 50,000-ohm resistor to chassis, the best position being determined by trial. In some cases this oscillation will be observed only upon certain portions of the broadcast band and may be more or less of the nature of audio oscillation. In late models of these receivers, the detector-plate by-pass condenser, a 0.002-mf. unit, was connected after the r.f. choke in the detector plate circuit, to chassis. To overcome this oscillation, the condenser should be moved back to its original position and tied directly to the plate, or an additional condenser may be installed from detector plate to ground without disturbing the condensers connected after the choke.

Cases of resonance hum have often been found to be caused by an open-circuited condenser or condensers connected in series across the a.c. line with their junction point grounded. The remedy, of course, is replacement with another unit with a capacity of 0.1 mf. However, it is sometimes necessary to employ a higher capacity, usually a 0.5-mf. condenser, to overcome an unusually strong hum upon resonance.

The symptoms of intermittent reception and low volume are often due to a loose lug fastened at the front of the stator plates of the first section of the condenser gang. Instead of connecting one side of the volume control directly to the antenna connection, in order to save wiring the manufacturer connects this end of the volume control to the aforementioned lug on the front of the first variable-condenser stator plates. These are already connected to the antenna connection from the rear. To tighten this loose lug properly it is necessary to remove the chassis to tighten the condenser bolt.

If for any reason the chassis is removed or the volume control replaced, care

should be taken that the shaft of the volume control, which protrudes slightly, does not short to the chassis or become grounded, since this will cause the grid of the first r.f. tube to ground, resulting in weak reception, if any at all.

When new tubes or tubes with slightly different characteristics are installed in these receivers, it sometimes becomes necessary for the r.f. stages to be re-neutralized. Shifting of the condenser-gang compensating condensers after the set has been in service over a period of time may necessitate readjustment. Both the neutralizing and compensating condensers, the position of which is often confusing, are located in front of the r.f. and detector sockets.

Noise. The audio transformers used in these models are frequently sources of noisy reception. This noisy condition, which will be apparent even after the r.f. tubes have been removed, may be quickly checked. Unsolder the plate lead of the audio transformer from the plate of the tube to the B+ terminal of the audio transformer. A 0.1-mf. condenser connected from the plate of the tube to the grid of the following stage will complete the arrangement. Should the primary of the push-pull input transformer be suspected, the coupling condenser is connected to either one of the output tube grids.

Intermittent reception has been traced in many instances to the rubber-covered lead connecting the stator of the variometer to the first variable-condenser section. This lead passes through a hole in the chassis, and vibration causes the chassis to bite through the insulation, producing the complaint stated.

Bosch 31

Fading. When fading occurs, suspect a faulty 300,000-ohm resistor in the i.f. stage.

Bosch 31, 32

Complaints of fading in these models are in most cases due to an intermittently open-circuiting 30,000-ohm screen resistor, a 1-watt unit. Because of the current passing through the unit, since it is part of the voltage-divider system and supplies screen voltage to both first-detector and i.f. tubes, it breaks down, at first intermittently. Remedy is replacement with a 2- or 5-watt resistor of the same value.

Another cause for fading, with the additional symptom of muffled or mushy reproduction, lies with an open-circuiting 2-megohm resistor in the second-detector screen-grid circuit. Because of the high resistance of this unit, the actual voltage impressed upon the screen being about 4 or 5 volts, it is difficult to check for an open circuit.

When the condition of hum is encountered on these models, the usual cause is open-circuiting filter condensers. These filter condensers are contained in a metal block together with the line by-pass condenser and the condenser which is connected across the speaker field coil. To

check the first filter condenser, measurements must be made across the black and green leads and across the red lead and chassis for the second filter condenser.

On some occasions, the symptoms of very low reception will be observed, with the additional circumstance of no voltage drop across the speaker field coil. If the speaker plug is removed and the field coil is measured, its resistance will be found correct, but if the ohmmeter is connected across the field terminals of the speaker plug socket, a direct short will be indicated. This is due to the short-circuited by-pass condenser used to tune the field coil. Replacement of this condenser presents its own problem, for it is located within the filter-condenser block and connected internally. However, it is not necessary to replace the entire filter block, which is sometimes done, to effect a repair.

One of the most frequent causes for an inoperative receiver in these models is a shorted second i.f. transformer. In order to obtain maximum coupling, the primary and secondary are wound together, the primary with enameled wire and the secondary with cotton-covered enameled wire. The insulation breaks down at some point and results in a shorted unit. This shorted condition is best checked by removing three of the leads connected to the transformer.

Bosch 46, 126, 146, 166, 176

Dead. In this model, usually referred to as the "Little Six," a frequent cause for annoyance lies with the compensating condensers. These compensating condensers are aluminum plates located in front of each tuning-condenser section. Banging of the condenser gang causes these compensating plates to shift and short that particular section of the gang. The plates are not noticeable, and many servicemen pass them up, not knowing of their existence.

Where symptoms of weak and unbalanced reception are encountered in this model, the most probable cause is an open-circuited condition of one or both of the 226 bias-resistor by-pass condensers.

Bosch 48 Series

A cause of fading in the Bosch 48 series is the aerial tuning variometer. This part is keyed to the rotor of the tuning condenser and turns when the gang rotor is rotated. It will be necessary to remove the variometer from the chassis and then to remove the variometer rotor to clean the bronze-spring "wiper" that causes the fading.

Bosch 54 DC.

Noisy Tuning. In many respects this model is similar to the Bosch 48, 49. The condition of noisy tuning is caused by a corroded variometer rotor contact, the repair of which has already been described with Model 48. If the variometer is out of phase, weak reception and oscillation will result.

Distorted reproduction is most frequently due to a weak or exhausted C battery, which is used to supply the necessary grid potential for the output tubes. The fact that the output tubes are drawing excessive plate current, readily disclosed by the set analyzer, will be an indication of the failure. When a new C battery is installed, the positive terminal must be connected to the chassis.

Symptoms of weak reception with the additional observation of slightly higher plate current drawn by either the second or third r.f. tubes will be found caused by an open 500-ohm grid suppressor in that stage. These grid suppressors are located within the condenser-gang compartment, mounted upon the compensating-condenser brackets.

A word of caution regarding the ground wire will not be amiss. Under no circumstances should this lead be connected to any part of the receiver chassis but only to the binding post provided for it. Failure to observe this precaution will result in certain damage. In most cases one of the tubes will "blow."

Inoperative. Three wire-wound vitreous-enameled Edison-base-type resistors are employed in this model as filament resistors. These units are located in the speaker compartment of the cabinet and are subject to the usual jars and vibrations set up by the speaker. Because of this vibration, they often crack, usually at the middle.

A loud and insistent resonance hum and sometimes weak and distorted reception have often been traced to an open-circuited detector cathode by-pass condenser. The value of this unit is 1 mf. Improved quality of reproduction may be obtained, however, if a unit of higher capacity is used at this point.

Bosch 58–60

Loss of volume and distortion may often be traced to poor contact at the phono switch, which is supposed to cut out the radio frequency when the tuning-condenser plates are disengaged.

Weak Reception. In this model, as well as in the 58, when the local-distance switch is in local position, the aerial is disconnected and a 500-ohm yellow carbon resistor is placed in series between the antenna tuning condenser and ground. If vibration causes the ends of this resistor to loosen and cause an "open" signal, pickup in local position will be greatly decreased or lost entirely.

In both these models, hum or resonance will be caused by open circuits in the 1-mf. condensers connected between one side of the line and chassis.

Bosch 58, 60, 61

The rather unusual condition of two-spot tuning is often encountered in these models, where any given station will be received at 10 kc. on either side of the proper frequency. In other words, a station that ordinarily is received at 660

kc. on the dial will come in equally well at 650 and 670 kc., with a dead spot between these two points. This puzzling situation is caused by an open-circuited ½-watt detector-screen resistor, whose value is 1 megohm. This resistor, which has never been shown in any published schematic of this receiver, is a small black-and-white carbon unit located under the a.v.c. socket. Attendant symptoms when this resistor open-circuits will be weak, distorted, and choky reception, with erratic operation of the resonance tuning meter.

Station "hiss" in these models, as in the 48, 49, is often caused by an open-circuited third r.f. decoupling-resistor by-pass condenser, a 0.04-mf. unit.

Weak and intermittent reception in many instances is due to an open-circuited or open-circuiting first r.f. coupling condenser or the second r.f. secondary-return by-pass condenser. Should either of the above units become leaky, the condition of fading will be experienced. The capacity of the first r.f. coupling condenser is 0.04 mf., while the second r.f. secondary-return by-pass condenser is a 0.5-mf. unit.

A.v.c. Action Defective. Where it is found that the receiver is operating with little or no a.v.c. action, it is probable that the 24 tube in the a.v.c. stage is at fault, and a tube with the correct characteristics must be selected. With the receiver in operating condition, but with tuned-off resonance, several tubes should be tried in the a.v.c. stage. The tube that will not swing the tuning-meter needle one way or the other when it is inserted and heats is satisfactory as the a.v.c.

No Reception. Check 1,500-ohm (approx.) resistor between terminals 1 and 3.

Bosch 73

No Reception. Upon the report that something had burned, this model was examined. The set was turned on and found to be in playing order. The chassis was removed from the cabinet and a black-with-yellow-tip resistor was found to be burned. This resistor had a value of 5,000 ohms and fed the plate of the second r.f. screen-grid tube. All associated circuits and parts were checked and found o.k.; so were all the tubes. At last the customer was questioned regarding the set. He revealed that he had had the tubes tested and switched the tubes around and in so doing had inserted a 27 tube in a 24 socket but that he had corrected this before the serviceman arrived.

Volume Gradually Increases to Normal. The set played at low volume with the volume control turned on full and then took about 10 min. before it would play normally. This trouble was found to be caused by an open third r.f. screen-grid resistor.

Bosch 80

Weak reception in this model has been found to be caused by entire condenser gang being out of line. The rotor plates

should be accurately spaced between the stator plates and then the alignment made. The speaker may cause weak reception or poor quality or both if it is out of adjustment. There are two adjustments on this speaker. They should be loosened and the armature centered to allow 0.009 in. on each side.

Bosch 140

Audio Feedback. See if grid lead for 75 brought up from below between this tube and the 41 is too close to the latter. Make it hug the 75 by twisting the grid clip or shield, and ground it under one of the feet of an adjacent i.f. can.

Failure of plug-in-type vibrator, indicated by continuity between two or more of the five prongs at base (except between those corresponding to grid and cathode of a 27). Due to shorted 0.01-mf. condenser inside unit. Open by removing three screws at base and slipping off sponge rubber casing. Replace with Mallory A18237-1 oil condenser.

Intermittent reception in this set was found to be caused by a defective coupling condenser connected between the plate of the 75 tube and the grid of the 41 tube. Replace this condenser with a 0.001- or 0.005-mf. This condenser is in a case with seven others and can be cut out of the circuit when the new unit is installed.

Bosch 150

Dead around Middle of the Dial. This machine would play perfectly for a time and then fail to tune in stations around 700 kc. Then again it would tune perfectly over the entire dial only to tune suddenly no higher than about the middle of the dial. Upon removal of the set, it was found the screws holding the lower side of the oscillator-stator-plate assembly permanently cured the trouble.

Bosch 242, 243

To Improve Tone and Volume. Remove the 0.05 audio coupling condenser between detector and first audio. Remove the 1-megohm resistor (R_{11}) in the plate circuit of the 56 detector. This leaves two open leads, one from the volume control and one from the 56 plate. Connect them together.

Bosch 250

Set doesn't play when cold. Touching almost any part of the set or tapping any tube—in fact, almost any vibration to chassis will start radio playing. Trouble 99 times out of 100 is due to defective tube or tubes ahead of a.f. circuit. Upon turning set on with milliammeter registering, we find that it may play on all stations—however, very low. Ordinary tube test will not show up the trouble. Replace all these tubes with new ones; then turn set on. It should play just as soon as needle gets into proper position. We ascertained just which tube was defective by replacing the old ones, one at a time. Change all 56's in the set.

Bosch 350, 360, 360M

Dead. Commonly caused by either filter condenser C_{39} or C_{40} shorting from high side to ground, or possibly an open section of R_3 resistor will be found, the values of which are not given in all diagrams and are in their order as follows: 1,000, 12,000, 8,000, and 6,000 ohms.

Oscillation. Several American Bosch All-Wave Receivers, Model 360, would oscillate severely after being used a few minutes. As soon as they were touched on the bench, they began to work for a few minutes. Then off they went to a violent squeal. The grounding of condensers and resistors, particularly in the cathode of tubes, was to a lug held by a rivet through the tube shield, chassis plate, tube socket, and lug. This is apparently a good ground, but it is not good all of the time. We drilled a hole in the chassis and bolted a lug to the chassis, then soldered a jumper to the old ground of the socket. We did this with each ground. This eliminated a chance of future trouble. This remedy applies to other sets of similar construction.

❖ ❖

Brunswick

When sets have limited output-transformer space, burn these units out. Try a General Electric output unit. Melt it out of its can and insert it in the original container.

Brunswick 2KR6, 5KR, 5DRO

See data on Radiola 17, 18.

Brunswick 2NC8, 5NC8

See data on Radiola 62.

Brunswick Panatrope 3KR8

Low volume from phono pickup may be due to a poor contact at phono switch points.

Brunswick 3NW8

See data on Radiola 64.

Brunswick 5NO

See data on Radiola 60.

Brunswick 11, 12, 16, 18, 33

Distortion. When the symptoms of distorted reproduction, a slight hum, and oscillation are observed, the capacity of the 6-mf. wet electrolytic filter condenser should be checked. This unit often loses much of its effective capacity and will result in the above complaint because of insufficient filtering and by-passing of the r.f. circuit.

650 Kc. to 1,300 Kc. Dead. If it is found that the receiver will not tune above 650 kc. or below 1,300 kc. and the porcelain insulators on the "turret" type tuning gang are not broken, which fact will cause the stators to shift, then the 24A oscillator should be changed.

Phonograph Combination Trouble. On Model 33, a phono-radio combination, when radio reception can be heard while a record is reproduced, one of the wires connecting to the phono-radio transfer switch on the phonograph volume-con-

trol switch will be found torn from the connecting lug. It should be resoldered.

An inoperative receiver with the attendant circumstance of a high positive voltage upon the grid of the first-detector tube is due to a short-circuited 100-mmf. mica coupling condenser mounted upon one end of the first-detector stator.

Intermittent reception on these models is often caused by the lugs on the light coil forms shorting to the chassis within the cold shields or the ends of the coils snapping directly at the lug and making contact intermittently.

A slipping condenser friction drive of these receivers is a complaint easily remedied. The dial and dial frame should be removed by loosening and removing the nut holding the dial and frame to the turret condenser shaft. The two screws holding the volume control-tone control assembly in place should be removed next. Two fiber or metal washers, approximately ⅛ to 1/16 in. thick, should be inserted on the screws under the assembly so that the assembly will be raised by that amount when it is reinstalled in position by tightening the two screws. This procedure will raise the friction gear so that when the dial and frame are replaced on the turret condenser shaft the gear will more firmly engage the edge of the dial frame.

Brunswick 14

This model has a rather high hum level. The purple 0.1-megohm grid resistor located in the power unit directly above the 27 tube must be changed to a 0.25-megohm resistor. The by-pass for the detector screen grid should be changed from 0.1 mf. to 0.5 mf. (This condenser is located along the side of the detector socket and is tubular in shape.)

Burned-out primary of the push-pull input transformer. Two resistors are placed across the now defunct primary. In this way we get the voltage to the plate of the preceding tube. One resistor is only to impress a signal voltage on the remaining output tube or tubes through it. The values of the setup are R_1 and R_2, 25,000 ohms; C_1 and C_2, 0.02 to 0.1 mf.

Abrupt fading and return of signal were experienced with this set. Whenever the analyzer was plugged into a socket, the set would perform perfectly, and all voltages appeared correct. Pulling out one of the 45 type push-pull tubes also would bring its power back. After many continuity tests, the first a.f. transformer secondary was caught open-circuited. It had previously tested closed several times.

Brunswick 14, 21, 31

Weak reception was obtained with all voltages and resistances checking o.k. on two different machines of this type. The condensers connected across the two grid terminals of the 45 power tubes have developed leakage, shorting the two grids. In these particular instances, resistance measurements would not show this trouble, since the condensers shorted

to ground and the leakage was such that it wasn't a total short. Checking from grid to grid showed the usual resistance for a push-pull transformer, and grid to ground showed about normal resistance also!

This condenser is a 0.00025-mf. and is not absolutely necessary for satisfactory operation; however, it does make the tone a little more mellow, and its use is recommended.

Brunswick 14, 21, 31, 81, 82

Loud hum or oscillation upon strong signals is usually caused by a receiver that is out of neutralization. The method used to reneutralize is the same for that of any receiver utilizing the neutrodyne circuit—the use of a dummy tube in the stage to be neutralized and the adjustment of the neutralized condenser for minimum output, with the receiver tuned to a good signal at approximately 1,400 kc.

Brunswick S14, S21, S31, S81, S82

Insufficient Sensitivity or Volume on Weak Signals. If the circuit diagram of the r.f. portion of this receiver is scrutinized, it will be noted that the r.f. stages are coupled by means of small 2.5-mmf. fixed condensers. These condensers consist of tiny metal tabs separated by a strip of insulating material. In this instance, where additional sensitivity is desired or required, it may be accomplished by removing these three small coupling condensers and winding a three- to five-turn coil at the grid end of the secondary coil for obtaining a transference of energy. One end of this coil is connected to the plate of the preceding tube, and the other end is left free. The number of turns to be wound depends upon the desired increase in sensitivity and will vary in each individual case and each different set.

Noisy reception on these models is a complaint frequently due to bad contacts on the local-distance switch. The contact points should be carefully cleaned and the springs bent slightly to secure increased tension. The two screws holding the switch assembly together should be tightened after this is done.

Uncontrollable Volume. As with Models 14, 21, 31, etc., if it is found that the volume level cannot be varied and the receiver operates at full volume, check the insulation between the volume-control shaft and the chassis. Should the shaft be found short-circuited to the chassis, the volume control will be shorted out of the circuit, thus enabling the receiver to operate with a low, fixed-control grid bias on the three r.f. tubes.

Slipping of the Tuning Drive. Another cause for complaint is a slipping tuning drive, which is easily remedied. The trouble may be due to a loose drive cord. To take up the slack in the drive cord, the tension of the spring attached to one end of the cord must be increased by moving the screw to which this spring is attached forward in the slotted hole provided for

the purpose. The screw should be securely tightened after this is done. A drop of oil applied with a toothpick to the bearing of the tuning-gang shaft and pulleys will ease the action of these components and relieve the strain upon the drive cable. The procedure in any case would be that of removing all possible causes for friction or binding that might contribute to the slipping of the tuning drive.

Hum and Oscillation. A frequent failure with these models lies in an open-circuited section of the condenser block in the power pack. An open-circuited section will produce the symptoms of hum and oscillation in some instances. The open-circuited section is most easily checked by shunting each section of the condenser block with a 1- or 2-mf. unit in turn.

A single common terminal is not employed in the filter block with Models 12, 21, 31, and 82, thus making the arrangement of the terminal lugs confusing.

Brunswick 15

Full reception when set is first turned on, gradually fading out. Look for open 25,000-ohm orange resistor in screen-grid supply circuit.

Reduced volume accompanied by low screen voltages and abnormally high plate can be corrected by replacing the 35,000-ohm orange resistor in the front of the chassis.

Cuts Off. The detector is resistance-coupled to a pair of parallel 45's. In the circuit there is a detector-plate resistor that apparently has no coupling condenser to the parallel grids of the power tubes, but this is where the trick comes in. The coupling condenser is concealed under the fiber mounting panel, and the lead from this condenser is brought through this fiber and the end of the lead connected and hidden by a drop of solder on the plate-resistor soldering lug. Enough heat to make the solder at this junction run will remedy a bad connection and eliminate the complaint of "cutting off." In fact, we always heat this joint when working on the Brunswick 15 or 22 chassis.

To remedy the hum, see Brunswick 22.

To remedy motorboating and oscillation, see Brunswick 22.

Brunswick 15, 22, 32, 42

The symptoms of low volume and choky reproduction with a reading of approximately 100 volts obtained on the plates of the output tubes are caused almost invariably by a short-circuited speaker output condenser. This condenser is located within the condenser block and is connected to the output circuit by the two green leads emerging from the block.

After these receivers have been in service for some time, the volume control will be found to have a noisy action. This volume control is different from that used in most sets, for it is of the condenser type and employed as a variable coupling

between the first and second r.f. stages. A long, flat copper strip is used to connect the plunger of the volume control to the stator plates of the second r.f. tuning condenser. The connection of the strip to the plunger will be found loose or corroded beneath the rubber sleeving and should be resoldered.

The condition of background noise with the local-distance switch in the local position may be reduced or eliminated in most cases by removing the 0.0002-mf. condenser connected from one side of the switch to chassis. After this is done, it is best that the first r.f. variable-condenser compensator be readjusted.

Fading or a sharp drop in volume has often been traced to open-circuited screen or cathode by-pass condensers in the r.f. stages. Where this complaint is encountered, these condensers should be bridged, in turn, with a good 0.25-mf. unit to determine the faulty member.

The r.f. coils employed in these receivers are wound on very light forms, and many inoperative receivers may be traced to this fact. The terminal lugs of the secondary windings often short to the metal shield or chassis. When the shields are removed to check the coils, it is necessary that care be exercised so that the coil forms are not broken or the connecting lugs torn away. It is well to insulate the bottom of coil from the chassis by a strip of cardboard cut to size.

Where it is found that the receiver is inoperative, with the additional observation of a high positive potential impressed upon the grids of the second r.f. stage, third r.f. stage, and detector stage, the coupling condensers may be found short-circuited or leaky. These condensers are located on the side of the third r.f. and detector tuning condensers.

Noisy tuning of these models is due to corroded condenser-gang rotor contacts. These double copper springs fit snugly over the shaft of the gang and are fastened to the side of the gang-section shields by screws that may be removed so that both sides of the contact may be easily cleaned. An off-set screw driver will be of great assistance in removing these screws.

Weak reception has several times been found due to poor connections to the 4-megohm carbon resistor in the detector secondary-return circuit. The usual test, that of removing the control-grid cap of the detector tube and placing a finger upon the control grid, producing a loud characteristic hum, is used to advantage at this point to determine an open-circuited condition of this resistor.

A rushing sound, like steam, particularly noticeable on the lower end of the dial, may be eliminated by removing the shunt condenser from the local-distance push-pull-type switch.

Brunswick 15, 22, 42

Noisy Volume Controls. Unsolder the pigtail from the second r.f. variable condenser stator, remove the rubber sleeve, and blow out the powder-like substance

found in it. Wipe powder off pigtail and replace sleeve, resoldering.

Brunswick 16

High-resistance joints will cause considerable trouble in this model. The 47 was "lit," but the screen grids were "dead," although both were on the same circuit and all sockets showed 2.5 volts. The poor joint was a heater wire from the pentode to the screen grids.

Brunswick 17

Inoperative. The most common complaint received about these sets is that they become inoperative. The tubes light up, and yet the sets do not work. This trouble has been traced to several causes.

Usually, after the set has been operating for several months, the heat forces the resistor toward one side until it shorts against one of these shields. It is always found that it is necessary to change two 5,000-ohm resistors in the oscillator stage, because these resistors also change in value.

Inoperation is caused by a shorted 0.5-mf. condenser in the plate circuit of the oscillator stage.

Intermittent reception is caused by a defective turret condition. Burrs are found between variable-condenser plates. These are eliminated by "flashing" the variable condenser (a high voltage connected across the unit). This actually burns these burrs away.

Weak operation was traced to either open r.f. and i.f. control-grid return circuits or open by-pass condensers in various positions.

Weak reception and distortion were traced to an intermittent cathode-to-heater short in a 51 tube in the second-detector stage. Replace the tube and the set will play perfectly.

Gradual Rise and Fall of Volume. A complaint was once received that the intensity of the signal rose to a high level when the set was turned on. Then it would fade away to a mere whisper, and within a few more seconds it would operate normally. This always happened when the set was heating up. This condition was traced to a slow heater in the automatic volume-control stage and fast heaters throughout the rest of the set. A fast heater in the automatic volume-control stage eliminated this condition.

Brunswick 17, 24, 25

No control of volume is the principal and most common complaint about these models. Usually the condition is due to leakage of the Fish paper insulating the can of the first wet electrolytic condenser from the chassis. The insulation is placed between the mounting clamp and the condenser. In other cases, the same condition has been traced to a leaky 0.02-mf. secondary-return by-pass condenser in the r.f. or first-detector stages: or to a leaky 0.1-mf. i.f. secondary-return by-pass condenser, the latter unit being

mounted directly upon the i.f. transformer with the 0.02-mf. condensers contained in the common by-pass block fastened to the back side of the chassis. A good high-range ohmmeter capable of measuring up to 10 megohms should be used to check these condensers for leakage. Where the condition of the receiver bursting into full volume and fading gradually to normal volume level is encountered, the aforementioned Fish paper insulation on the first electrolytic condenser will again be found at fault, vibration causing the resistance of the defective insulation to vary. Should the blue or green leads or the lugs to which they connect on the speaker terminal cover, the condition of no control of volume or distortion will result.

The symptoms of distortion at any volume level accompanied by the condition of poor control of volume and a speaker field that overheats considerably are due to a carbonized voltage-divider system. The large 14,000-ohm brown carbon resistor, located between the first and second i.f. transformers, serves to reduce the high voltage to the proper screen potential required for correct operation of the screen-grid tubes. Because of its position in the circuit and inadequate ventilation, this unit carbonizes and reduces in value, usually to approximately 3,000 ohms. When this occurs, the two ¼-watt, 5,000-ohm carbon resistors completing the voltage dividing circuit will also be found charred or carbonized and much lowered in value. All three resistors should be replaced, the 14,000-ohm carbon unit with a 10- or 25-watt wire-wound resistor.

An inoperative condition not infrequently encountered in these models, with the attendant circumstance of an abnormally high positive control-grid bias on the first-detector 24A tube and consequent increased plate current, has been invariably traced to a short-circuited condenser, coupling the plate of the r.f. tube to the grid of the first-detector tube. This condenser consists of two tiny metal disks insulated by a mica strip and is fastened to the stator frame of the first-detector tuning condenser.

Fading, Intermittent. Where the complaint of fading or intermittent reception is received, the trouble has almost always been traced to an open-circuiting 0.5-mf. oscillator plate by-pass condenser. The open circuit consists of a broken connection within the shield-can housing of the condenser. In some instances the symptoms can be reproduced by striking the chassis smartly. Since the condenser is pitched into the metal housing, replacement is the quickest and most effective remedy. The same symptoms will also be experienced when the porcelain insulators of the "turret" type condenser gang are broken, causing the stators to short and in many instances to short-circuit to the rotors.

Brunswick 21

See Brunswick 14 for complaints of burning out of the primary of the push-pull input transformer, and remedy for hum.

Brunswick 22

In this model, hum may be eliminated by removing the small 0.00025-mf. condenser that is soldered to the local-distance switch; it will be found also that the performance of the receiver has been improved by this change. Cases of fading have been caused by short-circuiting of the small, black oblong by-pass condensers located next to each UY socket. The symptoms are rapid changes in volume under vibration; and the condensers are easily checked by bridging them with ¼-mf. capacities.

Inoperation, with lowered plate voltages, as often said before, may be caused by a short in the 1-mf. condenser across the filter output; this is identified by two green wires, emerging from the filter-block assembly and connecting to the last two lugs of the terminal block.

The most common complaint is oscillation. This is due to open r.f. by-pass condensers, which are located between the tube sockets. The casings are of black bakelite. To check, move the connecting lugs on each condenser in turn; if there is a click and the oscillation ceases, a weak signal is found, accompanied by distortion, due to an open coupling condenser between the detector and first alternating frequency. This condenser is located right under the bakelite subpanel at the right-hand corner of the set.

This model will motorboat if the 4½-volt C battery is at all weak. (The voltage of the 22½-volt battery is not at all critical.) This is the model using the types 71A, 30, and 32 tubes.

Brunswick 31 A.C.

Hum. In this model the components seldom break down or short; but their opening results in abnormal hum; bridging the filter condensers successively with a unit of 1 or 2 mf. will soon determine the section at fault. Erratic reception can usually be traced to the contacts of the local-distance switch; the switch screws should be tightened and the blades bent until contact can be made only upon closing the switch.

Brunswick S31

Intermittent phonograph reproduction is sometimes due to a loose terminal of the 0.01- or 0.02-tubular condenser connected from one of the phono-radio transfer-switch terminals to the secondary of the phono input transformer.

Brunswick 42

This model employs an automatic phono mechanism in conjunction with a Model 15 chassis. Data for the radio chassis are the same as those described for Models 15, 22, 32. Troubles arising with the auto-

matic mechanism are relatively few, and adjustments are simple.

Where it is found that the motor will stop after a few revolutions, the trouble will lie with the cycle switch, whose contacts open slightly as soon as the master gear starts to revolve. If the off-on switch fails to stop the motor or the mechanism rejects the record as soon as the pickup head is lowered upon the record, failure of the contacts of the cycle switch to open at the right moment will cause this condition. This cycle switch is located below the mechanism panel, so that the trigger actuating the switch contacts fits into a slot in the master gear cam at the proper instant. To adjust the position of the cycle switch, the two screws which are found on the top of the mechanism panel may be loosened and the switch shifted so that the contacts open at the correct time. This adjustment is best made while the mechanism is going through its cycle of operation.

Should the mechanism slow down or stop while records are being changed or rejected, the motor brushes and commutator should be carefully cleaned with very fine sandpaper.

The condition of records being rejected continuously as soon as a record is deposited upon the turntable is usually caused by either a jammed solenoid plunger or the spring on the stop lever attached to the solenoid plunger having lost its tension. This trouble may be corrected in the first case by loosening the two screws that mount the solenoid to the base and shifting the solenoid position so that the plunger works freely in and out of the solenoid. Either a new stop-lever spring with more tension should be installed in the second instance, or several coils of the spring used should be removed to supply the necessary tension.

If this spring is too strong, however, the solenoid will not have sufficient power to operate the stop lever, thus preventing the operation of the mechanism.

If the motor operates but the record-changing mechanism does not respond, the most usual cause lies with a burned-out or open-circuited solenoid that must be replaced or with a stop-lever spring that is too strong, as discussed above.

The appearance of a strong vibration or mechanical hum during the record-changing cycle has been traced to an improperly centered solenoid, or the rubber damper that is used to smooth out a.c. vibrations may be found to have hardened, thus losing its elasticity. The solenoid should be recentered by loosening the two mounting screws, or the rubber bumper replaced, to effect a repair.

If the cabinet is not installed in a level position that may be determined with a spirit level or gauge, the needle in the pickup may lower ½ in. or more from the beginning of the record, or in some cases fail to engage with the record at all. Should the needle jump past several grooves in the record after it has been lowered instead of falling into the first

groove, the tension of the spring attached to the locating lever must be reduced. In the later models the tension of the spring may be decreased by adjusting the bracket to which the spring is fastened, while on the earlier models the spring must be stretched, since no adjustable bracket has been provided. If the needle does not move into the first record groove, the tension of this spring should be increased.

Jamming of the mechanism is sometimes due to a warped record that will stick under the record-hopper crossbar, thus preventing the feeder rod from functioning. If standard records are not used, the jamming may be caused by an incorrectly adjusted record gate. If the records are thick, the spring clip in the center of the crossbar should be moved up; or if the records are thin, it should be moved down to prevent two records from passing through.

On some occasions, the mechanism will not reject the record after it has been reproduced. Generally, this defect will be found caused by the suspension arm switch whose floating contact fails to close at the end of a record because the distance between the two contacts is too great. An adjustable stop is provided for adjustment of this clearance. Should the record be rejected before the selection is completed, the contacts of this switch may be too close, and the adjustable stop should be adjusted to increase the distance between the floating and stationary contacts.

Brunswick 83

Hum and Reduced B Voltage. Either shorted 45 *C* bias resistor or charred braided tubing on push-pull transformer leads to resistor strip, forming high resistance shorts to chassis.

Lack of Sensitivity. Found principally in sets with serial numbers below 80,000, especially those with brown crackle finish. Voltages check o.k. Signal can be built up by reducing the screen-grid cathode 100-ohm wire-wound resistor to 25 or 50 ohms, by heating wax off and reversing r.f. choke and antenna loading coil leads to position of maximum signal strength or by realigning condenser gang.

Motorboating. Caused by open circuit in small 0.1-mf. tubular condenser mounted under r.f. section.

Oscillation. Caused by an open-circuited ½-mf. unit. Well over 50 per cent of the trouble in the 83 Model is due to shorted or grounded pigtailed carbon resistors.

❖ ❖

Buick

Brake Static. Cotter pin in front wheels is usually loose. Place a lock washer under each pin to hold it tight.

❖ ❖

Championette

Championette Five-tube Midget

Fading. After being turned on, the receiver would bring in a station as soon as the tubes were warmed up and then

would fade away completely and remain dead. All voltages checked o.k. except that of the detector-tube screen grid, which read 150 volts (a value that was too high). Everything else checked o.k., so we measured the carbon resistor that is connected between the high-voltage lead and the screen grid of the detector tube. This resistor, which, according to the color code, should have been 25,000 ohms, measured only 8,000 ohms. When that resistor was replaced with a new one of 25,000 ohms, the radio set worked normally.

❖ ❖

Chevrolet

When set lights but will not play and the vibrator does not work, look for broken leads to vibrator and broken leads of the tuning condenser. In working on this machine, it is a good plan to put longer leads on the tuning condenser. (This is the small Chevrolet set.)

Dead. When a Chevrolet motor radio comes in completely dead and all but one filament lights, don't waste time dismantling and checking power-supply wiring. Replace fuse under the end of the tuning condenser nearest the power supply; then listen to the set work.

No Signals. In this auto radio, all voltages and circuits o.k. Replace small, blue Sprague 0.002 condenser across the lower end of the voltage divider.

Continuous blowing of fuse between switch and vibrator is due to the insulation between the contact arms in the vibrator becoming burned off on the end next to the points. These sets will sometimes operate for 2 or 3 days when the fuse is replaced. Care should be taken in using insulation of the proper thickness, since it will affect the spacing of the points.

Interference from the high-tension circuit in this model is practically unavoidable when the radio is mounted on the bulkhead on the right side of the car. The ignition coil with associated electrolock cable mounted on the motor side of the bulkhead is so closely coupled that despite all the shielding and tuned filtering, there is still bound to be coupling. We have found that the only sure remedy is to mount the radio on the left side of the bulkhead and keep the battery leads as far removed from the coil leads as possible. Changing the radio position rather than the coil electrolock cable is more practical and satisfactory.

Remove ignition coil from bulkhead and fasten to motor, using valve-inspection plate bolt.

To Eliminate Generator Interference Completely. Connect condenser to second field wire of the generator.

Stop Light Noise. Bridge switch with a 1-mf. condenser connecting from terminal to terminal instead of from terminal to ground, the usual method.

Cuts Off and On. The common trouble with this model is "cutting off" and "on." When you run across this trouble and the

tubes are o.k., remove the set and take the i.f. condensers off. You will find the trouble in 90 per cent of them.

Intermittent Spark; Noise, Not Traceable to Faulty Suppression. After a year or so in use, especially in 1931 and 1932 models, the beading along the top pulls away where the side beading connects with the beading across the front. Electrically, make a good connection between the open ends with a piece of copper braid, and ground to the top of the doorpost on each side of the car. This should be tried when noise disappears with the antenna disconnected, dome light is cut loose, and antenna shield is well grounded to the instrument panel bolt.

Obstinate Cases of Ignition Interference. Bond the body to the frame, or chassis, at both sides, in the front. Somewhere close to the bulkhead is a good spot to do this. This is particularly effective when the car has run up a lot of mileage. Use a piece of heavy shielding and self-tapping screws both in body and in frame. In extreme cases of noise, move the electrolock cable, and wire up ignition like later model, with one switch in hot lead.

No Signals in This Auto-radio, All Voltages and Circuits O.K. Replace small, blue Sprague 0.002 condenser across the lower end of the voltage divider.

Chevrolet 1933

Noise When Passenger Is Seated in Front. Place shield plate of tin beneath floor boards where feet rest, and ground to frame.

Noise Disappearing When Antenna Is Disconnected from Set. Generally picked up by shielded antenna lead that runs behind instrument panel and is frequently in inductive field of cable running from key to coil. Run antenna lead at right angles.

Chevrolet 60049

Severe Chassis Pickup of Noise. See if the ground lead is connected to the lighting switch. If so, move it to one of the doorjamb bolts, or bond the dash to the doorjamb bolts and to the fire wall with heavy conductor. The dash is generally a poor ground without this bonding.

Chevrolet 364441 (1933)

Oscillator Dead on All or Part of Dial. First section of candohm strip, 4,200 ohms, 0.002 condenser across this resistor and tubes all o.k. Replace oscillator coil even though continuity test reads perfect.

❖ ❖

Chrysler

Static discharge due to drag emergency brake on drive shaft occurring whenever motor is not actually driving the car. Mount holder for small carbon brushes so that it makes contact with the emergency-brake drums; insert a brush and ground the holder.

Chrysler "Airflow"

Failure to Find Built-in Antenna Lead. Lead is brought down the right-front

corner post, as usual, but is then carried several inches farther, down toward the floor inside the post, and then brought out. Necessary to remove screws holding leatherette covering post, reaching behind it for wire. Sets are easily mounted on upper part of bulkhead. Care should be taken that mounting bolts do not extend over ½ in. beyond engine side of fire wall, since this will prevent opening and closing of hood. In most cases no bond between motor block and frame is necessary. Shield antenna lead up to 1 in. within corner post.

❖ ❖

Clarion

Clarion Kylectron Speaker Repair

The owner complained of crackles and loud bangs. Very little music could be received. We found the set had a Kylectron condenser-type electrostatic speaker. Further inspection revealed numerous sparks shooting all over the movable section of the speaker. We also found that the rubber-sheet insulation between the foil on the side and the stationary grid on the other side was broken in many places.

There was only one way to repair the set, and that was to replace all six sections of the speaker. This, we found, would cost far more than the customer wished to pay. So the speaker was repaired in the following way:

Disassemble the speaker and remove the foil-covered rubber sheets on each of the six sections; clean and save the cord that is inserted in the ridge around the frame to hold the rubber in place.

Next, procure six rubber baby pants similar to those in Fig. 6B and cut them the size of units, as in Fig. 6C. Then place the rubber sheets on the frames and use the cord to fasten them to the frame, as in Fig. 6D, stretching it at the same time. Make sure that the rubber is stretched evenly all around. If this caution is not heeded, the speaker will rattle considerably.

If the rubber is placed in this manner, the edges can be folded over and vulcanized with rubber cement. Then coat the entire surface of the rubber with rubber cement. Also, coat the foil sheets with the same cement. The foil should be of the soft type that does not crackle when handled. (We got ours from the large-sized candy bars.)

After the cement dries, the foil will stick like an inner-tube patch, Fig. 6A; it can be smoothed out with the palm of the hand. You are now ready to connect the speaker and make a test. If the volume of the set is too great and the heavy notes produce too much volume, it can be remedied by placing a 1- to 2-megohm resistor across the speaker terminals. This will prevent the speaker from a repeated disaster.

Clarion 40

Loud "Pop" While Set Is Warming Up. Replace grid resistor of the 47 with a

½-megohm instead of the 1-megohm unit originally used.

Clarion AC 40

Oscillation. Place 0.002 from one side of power line to chassis.

Clarion AC 51, 53, 55

The principal failure of these receivers is an open-circuited or leaky r.f. cathode by-pass condenser. In some instances, the symptoms are oscillation and intermittent reception; in others, a peculiar noisy condition will be experienced that is difficult to locate because of the fact that the receiver will not operate noisily when the aerial and ground wires are disconnected to determine the source of the interference.

Clarion 52, 53

Squeals. Clean wipers on condensers, or put them in if they are not already there to facilitate balancing.

Clarion 60, 61

No Reception. Check a.f. transformer primary. Replace with factory original to ensure good tone.

Noise, Intermittent Signals. Examine local-distance switch for loose contacts.

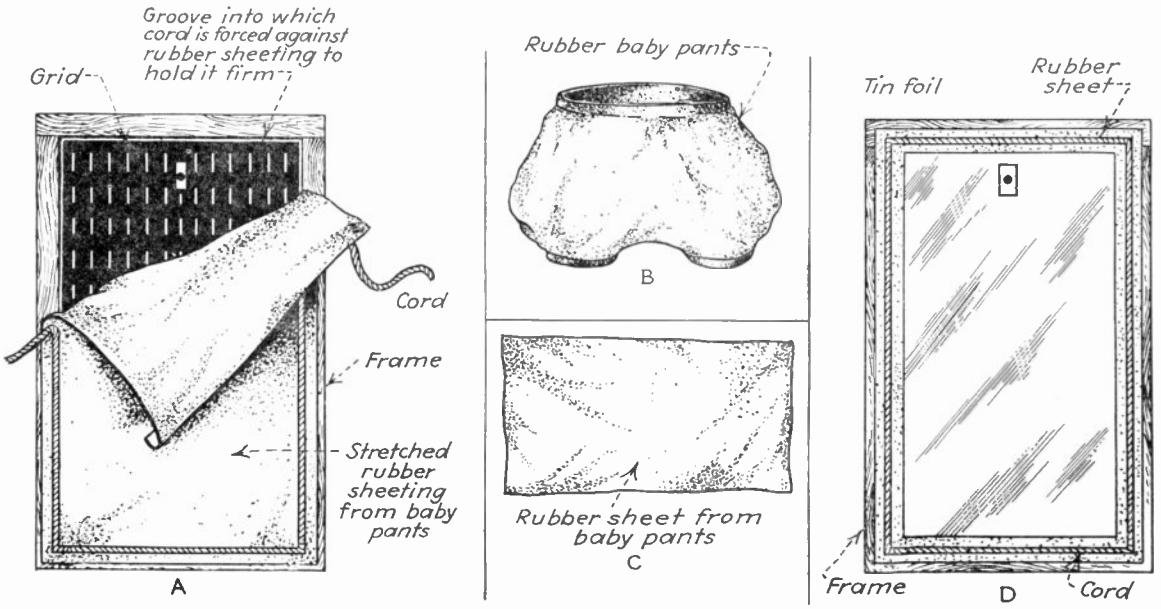

FIG. 6.

Clarion 61

No Detector-plate Voltage. Usually due to open push-pull input transformer. Take off the wrapper. Corrosion generally breaks lead from winding.

Clarion 100 Series

Failure to tune down to 1,500 *kc.* after few months' use. Substitute 2,000-ohm

resistor for 4,000-ohm unit in cathode circuit of oscillator first detector.

Clarion 220

The complaint was no reception. This trouble was finally traced to the control-grid lead of the detector-oscillator tube (a 24A). The wire connecting the clip to the tuning condenser is really a 1,000-ohm hair-size wire resistor inside the sheath and cannot be noticed or found except by complete analysis of the receiver. The trouble can be remedied by using a 1,000-ohm metalized resistor in series with the grid lead to the tuning condenser.

The break is caused, no doubt, by the removal and replacement of the tube during testing or servicing.

Clarion 240

Insufficient Volume on Short Waves. Shunt the 200-ohm fixed i.f. bias resistor with a 75-ohm unit. At police-band position on selector switch, one contact is not used. Run a wire from this terminal to the terminal of the detector coil next to the antenna. This shorts out the antenna choke.

Clarion AC 300

Hum. The most frequent cause for complaint on this model is hum. In some cases, the condition has been traced to loose laminations of the filter choke that vibrate and produce a hum of a mechanical nature. In other instances, the filter-choke coil winding has been found short-circuited or partly short-circuited, or the position of the air gap in the filter-choke laminated core has been disturbed. The remedy in both cases is replacement of the unit or tightening the laminations of the core securely. In a few cases, the condition has been eliminated by tapping the laminated core with a light hammer in an effort to respace the gap.

Oscillation and Motorboating. These receivers are frequently serviced for the complaint of oscillation and motorboating, which condition may be present at either the high or low frequencies or over the entire band. On some occasions, the trouble is of an intermittent nature that will clear up when the chassis is removed from the cabinet and inverted to permit a point-to-point test. In some instances, the oscillation and motorboating were traced to open-circuited 0.01-mf. condensers by-passing the r.f. first detector and first and second i.f. secondary returns to ground. Replacing these defective units usually rectified the difficulty, but few cases were found where it was necessary to substitute a 1-mf. condenser for the 0.01-mf. units. For some reason, the 0.01-mf. condenser in the r.f. stage seems to be the most frequent offender and most often must be substituted for a larger capacity.

In replacing the type 58 and 57 tubes in this receiver, the top part of the shield should not be forced down too far, since this will result in grounding the control-grid caps of these tubes. Where it is

found that a strip of insulating material has not been inserted into the top shield to prevent this occurrence, a short piece of adhesive plaster or ordinary friction tape will do the trick.

If the twin speakers on this model are disconnected at any time for the purposes of repair, it is important that the voice coils be properly phased. Unless this is done, poor tone quality will result. The color-coded lead should be carefully observed before the wires are disconnected.

Clarion 320

If motorboating develops in these models, connect the suppressor grid of the 58 i.f. tube to the cathode instead of (in early models) to ground.

Intermittent Reception. Replace fixed condenser in 57 oscillator-detector cathode lead with 0.0008 mica.

Clarion 360

Excessive Bass Response. Remove permanent tone-control condenser and resistor from across output circuit. Use variable tone control only.

Clarion 480

Loud Hum. As with Model 300, the Clarion 480 receiver has been serviced on a number of occasions for a loud hum seriously interfering with reception. In each instance the condition has been traced to a defective filter choke. This unit has been found totally or partly short-circuited. In checking this unit, it may be well to remember that the normal d.c. resistance of the filter choke is approximately 150 ohms.

Weak Short-wave Signal Reception. Several of these receivers have been found to operate normally on the broadcast band, but weakly, if at all, on the short-wave range. The cause of this condition has been traced to the use of a "flat" type 56 oscillator tube that will not function on the higher frequencies, although it will operate perfectly when employed in any other stage as an amplifier or detector.

❖ ❖

Colonial

Colonial 28

If set is dead, the screen-grid resistor (165,000 ohms tapped) may be open. In replacing the resistor, make return direct to chassis to avoid long leads. This will also reduce couplings and improve performance.

Colonial 31

If the receiver fuse "blows" on this model when the line switch is snapped on, the two 0.1-mf. condensers connected in series across the line with their junction point grounded will be the cause. These condensers become leaky, short-circuited, or grounded to the condenser case.

The condition of weak reception not attributed to defective tubes or faulty component parts may often be remedied by readjustment of the variable condensers, tuned by means of pulleys and copper belts. Loosening the nuts and

holding the condenser shafts to the pulley and adjusting the condenser with the set tuned at the high-frequency end of the scale will remedy this fault.

Resonance Hum and Oscillation. Often caused by either or both of the 0.5-mf. condensers by-passing the 226 filament.

Colonial 31 D.C.

Set plays with switch off. The condition may be encountered where the receiver cannot be switched off with the line switch until the ground wire is disconnected from the ground binding post.

The cause for this situation lies with a short-circuited 0.5-mf. condenser in the ground circuit. This condenser is one of three contained in a common block. Although it is good procedure to replace the entire block, a good 0.5-mf condenser may be connected in series with the ground-post lead, in the event that a replacement cannot be secured easily.

Colonial 32

Fading is frequently caused by an open section of the four-section by-pass unit in the first can and loose lugs on the outside of volume control.

Colonial 32 A.C.

Fading. This model has been and still is serviced more frequently for fading than any other receiver. As a matter of fact, fading and the Colonial 32 have long been nearly synonymous. The causes for this fading complaint are many and varied, and for this reason only the most common will be discussed here. This fading may consist of either a gradual decrease or a marked drop in volume, reception in some cases ceasing completely.

The 0.1-mf. Sprague condensers mounted upon the detector-plate choke terminal strip on the side wall of the chassis are the cause of many cases of fading. These units, identified by the code number 4404-P, open-circuit intermittently and produce the fading condition. One of these units is employed as an audio coupling condenser, and upon open-circuiting, reception will cease entirely. The other 0.1-mf. unit is used to by-pass the 750,000-ohm red carbon resistor in the detector secondary-return circuit. When this unit open-circuits, a sharp decrease in volume will be noted.

Should the condition of fading still exist after these two condensers have been replaced, or checked and found correct, the most probable and usual cause is open-circuited or leaky sections of the by-pass condenser blocks in the first, second, and third r.f. and detector stages. The blocks in the second and third r.f. stages are each composed of four condensers, by-passing the plate circuit, the cathode circuit, one side of the filament to chassis, and the fourth condenser by-passing the screen circuit connecting from screen to cathode, the latter connection made within the block. The condensers of the block in the first r.f. also by-pass the cathode, filament, and screen circuits in like manner, but the first

condenser by-passes the 750,000-ohm red carbon resistor in the secondary-return circuit instead of the plate circuit, as in the case with the blocks in second and third r.f. stages. These units can be recognized by the code number 1728. The unit in the detector stage, on the other hand, contains only three condensers by-passing the plate, cathode, and screen circuits. It is coded 1748. The condenser blocks are so situated in the receiver that they are more or less affected by the heat rising from the power transformer that is mounted in an inverted position. The wax compound used to seal the units melts out, and the rubber-covered leads emerging from the block become soft and spongy, peeling at the slightest touch. Because of the damage resulting from this heat and for other reasons, the condensers open-circuit or become leaky, producing the fading. Although the parts may be replaced with a new superior type supplied by the manufacturer or with good replacement blocks, it is recommended that individual condensers be installed in each circuit with a sealing compound whose melting point is much higher than that of the wax in the original blocks.

Another frequent cause for the same condition will be found to be an open-circuited 750-000-ohm red carbon resistor in the first r.f. secondary-return circuit. Although this failure will be readily disclosed by a set analyzer in the shape of a high plate-current reading, the open-circuiting resistor is difficult to check because the defect is of an intermittent nature.

The condenser block connected in the first audio circuit, identified by the code number 4407-P, is another common cause for fading in this receiver. The open-circuiting of the 0.5-mf. condenser connected from the cathode of the first audio tube to one side of the audio-transformer primary is the chief offender, although the 0.2-mf. condenser connected from the cathode of this tube to the high side of the 750,000-ohm carbon resistor in the grid-return circuit is often the cause of a sudden drop in volume when the unit open-circuits.

Because of the heavy monotype construction of this receiver, it is handled with great difficulty. A sudden jar in removing or replacing the chassis in the cabinet will often crack the porcelain tuning-condenser mounting brackets. Vibration causes these brackets to shift, disturbing the setting of the variable condenser and producing the effect of fading. This condition is easily checked, because removing the condenser coil shields will disclose the defect in most cases.

Fading and intermittent reception have often been traced to a poor or unsoldered connection to the carbon-resistor pigtails. Because of the fact that the pigtails of the resistors are not of sufficient length to reach from one connecting point to the other, extensions are employed that are or

should be soldered to the carbon-resistor pigtails, the entire length encased in black spaghetti tubing that covers the connection. A loose or broken carbon-resistor element in either section of the dual volume control will cause the same condition upon vibration or when the shaft is touched slightly. Where the volume control is found faulty in this respect, the unit should be replaced.

The chief causes for an inoperative receiver on this model are either a broken porcelain condenser mounting bracket, in which the stator plates short to the rotor plates, or the lead connecting to the arm of the antenna potentiometer from the antenna binding post shorted to the metal braid with which it is covered for shielding purposes.

Noisy reception is often caused by loose fuse clips that are riveted to the insulated mounting bracket. These rivets corrode and loosen and, upon vibration, will cause noise. The volume control is also a frequent cause for this complaint. The carbon resistance element cakes or cracks, making this unit a source of much noise.

Where the condition of weak and distorted reception is encountered that can be cleared up by throwing the phono-radio switch to the phono position, the detector-cathode bias resistor will be found at fault. This resistor is a black 50,000-ohm carbon unit.

Signal Weak and Distorted. When all tubes, circuits, and voltages have checked perfectly and the cause for the complaints of poor tone and low volume cannot be traced, look for an open-circuited or burned-out field coil of the dynamic speaker. Because of the fact that the field coil is not connected in the usual manner (as a series choke in the power supply or part of a series voltage-divider system) but is connected across the d.c. voltage supply after the first filter choke, it is often left out of all calculation. Although it is necessary to disconnect one of the leads to check the winding properly, a screw driver or other iron or steel object may be held near the pole piece. If the field coil is intact, a strong magnetic attraction will be present.

When a new volume control is installed in this receiver, it is important that the long screw holding the two controls together should not short to the chassis, since this will ground the arm of the antenna portion of the control to the chassis. The screw passes through the connecting link of the arm.

Noisy and unstable operation has been traced often to the orange 65,000-ohm carbon resistor connected from one of the Mershon condenser lugs to the plate of the first audio tube. In some instances, this unit will be found carbonized to a much lower value, reducing the gain of the first audio amplifier.

The symptoms of choky, distorted, and weak reception have often been found due to an open-circuited 100,000-ohm green carbon resistor in the secondary-return circuit of the push-pull input transformer.

This failure will manifest itself by an excessive plate-current reading and lack of grid bias obtained with a set analyzer in checking the output stage.

Oscillation and general instability, particularly at the higher frequencies, have been traced to an open 35,000-ohm pink carbon resistor connecting from the screen of the first r.f. tube to chassis. This failure disturbs the voltage-divider system and slightly increased screen and plate voltages result.

Should the uncommon situation be encountered in which one or two stations will be received almost over the entire dial, look for a tuning-condenser shaft that has loosened from its pulley or a broken tuning-belt drive. The variable condenser will remain in a fixed position when the station selector is rotated, and broad tuning will result. The remedy in either case is obvious. The complaint of weak reception at the higher frequencies may be often corrected by realignment of the tuning condensers. With the receiver tuned to a weak station at the extreme high-frequency portion of the dial, the nuts holding the condenser shafts to the pulleys should be loosened and the condensers adjusted for best reception or maximum output.

In some receivers, adjusting the tuning condensers at or near the point of resonance will result in a highly microphonic condition that cannot be eliminated unless one of the condensers is thrown slightly out of alignment. This is not considered good practice, however, and should be attempted only as a last resort. If the detector 24 tube is not microphonic, the 24 tubes should be interchanged to secure one that is least affected by the vibration for the detector. Then the condition is due to vibration of the variable condenser plates. This fact can be determined by holding an insulated object firmly against each one of the four tuning condensers in turn. An ordinary lead pencil with an eraser at one end will do. When the guilty condenser is located, small felt washers may be placed between the stator plates in such manner that they will not interfere with the action of the rotor plates.

Colonial 32 D.C.

Fading. This model, like its a.c. brother, is notorious for fading, and almost the same failure that produces the condition on the Model 32 a.c. will be found to be the cause of fading for this model. The 0.1-mf. audio coupling condenser and the 1728 condenser blocks in the r.f. stages and the 1780 block in the detector stage are the chief offenders, as well as the detector-screen by-pass condenser, a 4404-P unit. Connecting the latter condenser from screen to cathode of the detector tube instead of from screen to chassis will show marked increase in volume.

Where it is desired to increase the selectivity of the receiver, the 750,000-ohm red carbon resistor in the third r.f.

secondary-return circuit may be shorted out. In some instances, this procedure may result in a slight hum, and to overcome this difficulty a 10,000-ohm resistor should be inserted in place of the original unit.

Poor quality as well as weak reception on some of these sets was found to be due to an open first a.f. bias resistor. This resistor is of the flexible type.

Colonial 33 A.C.

The condition of weak reception and poor quality of this receiver is often caused by an open-circuited 100,000-ohm resistor in the secondary-return circuits of either the first or second r.f. stages. These resistors make up one unit that is mounted upon an insulating strip on the side of the push-pull input transformer. The failure will be made evident only by a slightly higher plate current drawn by the first and second r.f. tubes and not by a lack of control-grid voltage, which in any case cannot be measured correctly, even with a 1,000-ohms-per-volt meter, because of the high resistance in the secondary circuit.

One of the most frequent causes for an inoperative receiver is an open 60,000-ohm section of the three-section voltage divider. This will be known by the lack of screen voltage on the screen-grid tubes. In one particular instance, as reception from two nearby powerful broadcasters was obtained, this failure was not suspected at first, and a good deal of time was lost before we found the section open. Should the 11,000-ohm section of this divider open, no plate voltage will be obtained upon any of the r.f. tubes. Open-circuiting of the 50,000-ohm section will result in oscillation and slightly higher voltages upon the plates and screens of all tubes.

Oscillation and intermittent reception are commonly caused by an open-circuited 0.5-mf. screen by-pass section or 0.2-mf. plate by-pass section of the r.f. condenser block located near the r.f. tube sockets.

Where oscillation is encountered on either the high or low frequencies or where the low frequencies are received weakly when the receiver is aligned at the high frequencies, and vice versa, the trouble will be found due to an open-circuited 0.02-mf. secondary-return by-pass condenser in the r.f. circuits. These condensers are located within the coil shields, soldered directly to one of the coil terminals.

Distortion with the absence of grid bias on the output tubes has often been traced to an open 100,000-ohm carbon resistor in the grid return.

An inoperative receiver is often caused by an open 210-ohm section of the 420-ohm wire-wound resistor in the high-voltage secondary-return circuit. Usually, the low side of the section connected to chassis is the one first to go.

Weak reception when all voltages and tubes are correct has several times been traced to an open band-selector coupling coil. Two such coils are used to couple

the two portions of the band selector, and since these coils are not part of the electrical circuit of the receiver, they are often overlooked. They are located within the first and second band-selector coils and connected to one another, one side being grounded. The open circuit often consists of a break in the coil lead, usually at the lug, which can easily be repaired.

The method of controlling volume in this model is rather novel. This is done by varying the distance and consequently the coupling between the primary and secondary of all r.f. coils. Should it be found that the volume level cannot be changed, the condition is probably due to a broken cable used to vary these inductances or to a cable that has slipped from its pulley.

The simplest course to follow when the complaint of uncontrolled volume is reported is to connect a high-resistance voltmeter across the tube and to shunt the voltage-divider sections with small carbon pigtailed resistors of sufficient current-carrying capacity until the proper voltages have been obtained. It is well to check all the voltages again after tentative resistance values have been selected, since a change of resistance in one section is apt to change the voltages across all sections. This cure is preferable to changing any resistor whose value has changed, since unless a complete open is encountered, the parallel resistors will have a greater current-carrying capacity.

Colonial 33, 34

Failure of the tapped 121,000-ohm resistor, comprising an 11,000-ohm section supplying r.f. plate voltage, a 60,000-ohm section supplying screens, and a 50,000-ohm section, is the chief cause of trouble. Replace it with a resistor of higher wattage.

Oscillates Very Weakly. Occasionally one of these models will be found to oscillate very weakly. Aligning the set on the higher frequencies will give poor reception on the lower frequencies, and vice versa. This condition may be due to one or more open 0.2-mf. condensers, located beneath the condenser-gang shield; these are by-passes in the secondary returns of the first, second, and detector stages. One terminal is soldered directly to each coil.

Distortion and lack of grid bias on the 45 amplifiers is seldom due to an open biasing resistor in these models; it is much more likely to be due to an open 100,000-ohm (green) carbon resistor that connects from the center tap of the input push-pull transformer secondary to the chassis and is mounted directly on the transformer.

If volume is not good on the high frequencies, although resistors and condensers test perfect, tube voltages are o.k., etc., the cause may be traced to two small bobbin coils that are mounted in the antenna and first r.f. units of the band-pass filter; but these are electrically unconnected to the circuit. The bottom

shield must be removed and a continuity test made of each coil. Since these are used to couple the tuning unit more effectively, an open in either coil will cause reduced volume; it will probably occur at the lug, from which the lead breaks away.

Colonial 35 A.C.

Failure of this model to tune between 550 and 500 kc. is due to shorting out of the phono switch by the dial itself. Loosen the nuts holding the switch and push it farther back.

Colonial 36 A.C.

In table cabinets the dial must be turned to the arrow before the chassis can be removed from the cabinet.

Colonial 47

Hum. This receiver is serviced frequently because of a continuous hum during operation that could not be traced to any defective component part. A great deal of time spent in attempting to eliminate this condition disclosed the fact that the hum was inherent and probably due to improper design and shielding.

Colonial C995

Interstation Noise. A high-low sensitivity switch that will cut down interstation noise in tuning locals with this a.v.c. model may be added by removing wire lead between lugs 1 and 2 of the candohm resistors, connecting a 100-ohm type between the lugs cutting the ground connection to lug 1 and grounding lug 2. Drill a hole in the right side of the cabinet to receive a switch and connect the switch across the new 100-ohm resistor so that it may be either shorted out or placed in the circuit.

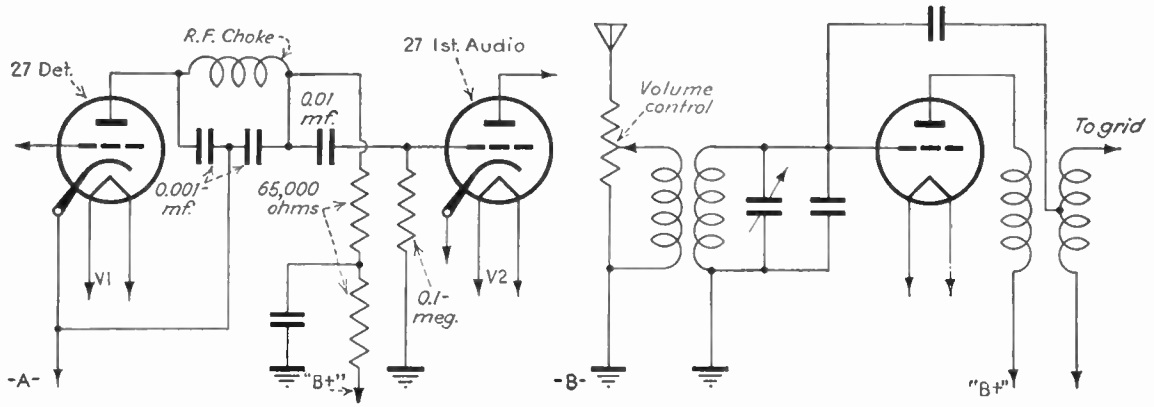

FIG. 7.—*A* shows a trouble in the Columbia S. G. 9. *B*, volume-control trouble.

Columbia

Columbia Phonograph C80A

Distortion. The correct resistance of the grid coupling resistor of the 47 tube is 300,000 ohms. The audio coupling con-

denser should be checked for a high-resistance short.

Columbia Radio Columbia S.G.8 (Nickname Temple)

Fading or intermittent operation is often due to an open r.f. choke in the first r.f. stage. It is a good policy to check all chokes in this set, since this trouble is quite often encountered.

Crackling Noise. When reception performs o.k. but very loud crackling noise takes place during operation, check the lugs and connections on the three r.f. chokes. An open will cause much of the annoyance.

Columbia S.G.9

A weak, frying noise was heard at all times and was very difficult to locate. It did not change at any control setting. All voltages checked o.k., but on continuity tests the detector-plate choke was found to be open. The broken ends must have been barely touching to give voltage at the tube socket. The circuit is shown at Fig. 7.

❖ ❖

Courier

Courier 65

Oscillation. All usual remedies fail. Connect 0.1 condenser from contact of volume control (opposite the grounded contact) to ground on chassis.

❖ ❖

Crane

Crane 5

Distortion, Intermittent Reception. Check 500,000-ohm ½-watt resistor in first a.f. and output stage. Replace with same value but in 2-watt size.

❖ ❖

Crosley

All Models with Crosley's Own Dynamic Speaker

Rattling sound as if the tube is working at wrong C bias may be caused by a loose voice-coil winding. To cure, remove diaphragm assembly and dip voice-coil winding in thinned shellac (good grade). Thin sufficiently so that shellac will penetrate into the bottom layer of winding. Allow to harden completely; then repeat for second coat.

Slipping of dial on lower priced models using friction drive. Remove dial and note if tension spring is held by washer headed onto shaft. Knock off washer and remove spring and backpiece of brass. Note whether or not a shoulder has been worn in the brass. If so, file or grind this off, replace, and rehead the washer onto the shaft. If impossible to rehead, push washer down tight on spring hold, and solder. If it seems impossible to remove spring and brass piece, take the friction part and fit a piece of stove-pipe wire into the slot into which the dial edge fits. Be

sure it is cut in a length that will fit snugly, and force it in tightly.

Crosley. All 1933 Models

Set stopped after being worked for half an hour. All resistance values and voltages checked correctly, these checks being made both when the set was playing and after it had stopped. The set performed perfectly after a new second i.f. transformer was installed. This transformer became excessively hot because of close proximity to the tubes.

Crosley Auto Expressionator

Again the familiar Wheatstone bridge circuit turns up in a radio set. This time Crosley is using it in its auto expressionator circuit, which is an automatic volume expander and tone compensator combined.

This circuit serves to increase the loud passages and diminish the low ones. The inductance-capacitance combination shown is the tone-compensator section that boosts the bass response of the set at low values of volume.

In the Wheatstone bridge, if a voltage is applied to opposite points—in this case A and C—no voltage will exist across the other terminals—B and D—when the bridge is balanced. In Crosley's application, the bridge is always slightly out of balance because the resistors R_1 and R_2 are somewhat less than the old resistance of the bulbs. SW_3 and SW_4 are closed for expressionator operation.

At most frequencies the impedance of L_1 and L_2 is so low that they may be considered to be short-circuited. The expressionator bulbs B_1 and B_2 have filaments of such a nature that when the current (power output of the set) in them increases, their resistance increases extremely fast.

At low values of output, a small amount of the total power from the output transformer is delivered to the speaker. As the power increases, the bridge becomes more and more unbalanced and a greater portion of the power is delivered to the speaker.

At frequencies around 40 cycles, the combination of L and C resonate, producing a high impedance. This high impedance at low volumes has the same effect upon the low frequencies (only) as an increase in the resistance of the bulbs has on all frequencies. In other words, the bridge is thrown out of balance for low frequencies, and a larger-portion low-frequency power is delivered to the loud-speaker. Thus, automatic tone compensation for low frequencies at low-volume levels is obtained as well as automatic volume expansion.

When the auto expressionator is not desired, SW_1 and SW_2 are closed and SW_3 and SW_4 are opened. Should any of the parts in the circuit become defective, the set can be operated with the expressionator in the "off" position. The switches are ganged together (see Fig. 8).

If the bulbs need to be replaced, identical ones should be used, since the filament has special characteristics. At

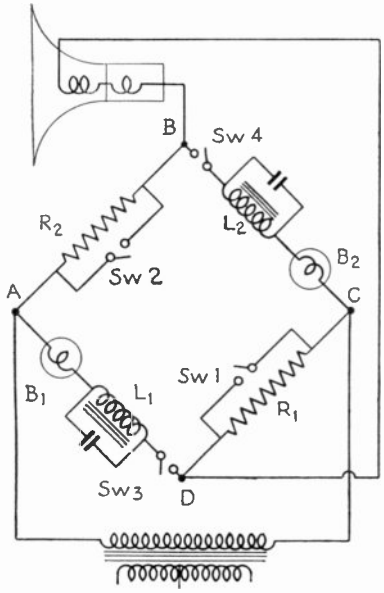

Fig. 8.

high-volume levels the bulbs will become illuminated.

Crosley. Dynacone Speakers

Speaker Rattle. We have found the following service kinks very effective in taking the rattle out of Crosley dynacone and similar speakers besides providing a new use for old inner tubes.

Upon investigating the cause of the rattle, we found that the outer cone clamp had a tendency to flatten through the tightening of the outer clamp nut. This allowed the cone to vibrate in the small space between the outer and inner cone clamps.

Make up two rubber washers from an old inner tube. (Felt will serve the same purpose.) Insert the washers. To do this, remove the outer cone nut, outer cone clamp, cone, inner cone clamp, and run the inner nut a few threads on the screw. Reassemble in the following order: Inner cone clamp, one rubber washer, cone, the other rubber washer, outer cone clamp, and outer cone nut. Make the necessary adjustment on the speaker adjustment screw.

Crosley Roamio

When condensers do not track, make sure the first-detector, antenna, and grid coils are not reversed. Also check the tuning condensers for mechanical alignment.

Crosley Showbox

Cutting Off. The installation of a 27 tube cures cutting off only temporarily. A thorough check shows no defective resistors, condensers, tubes, or bad connections. However, a further examination will reveal that the field-supply wires of the speaker cable are shorted onto the output of the set (dynamic speaker). If this is replaced, the set will play well for a while, but later on will cause trouble again. Examine the tension spring on the rotor shaft of the tuning condenser that is adjusted by a collar and setscrew on the back of the shaft. Shaking the rotor shaft causes the set to cut off. Loosen this collar, clean the contact points, and then force the collar back against the tension spring and tighten the

setscrew. Then a drop of Nujol on the contact bearing, and the Crosley stays fixed this time.

In this model, intermittent reception was the complaint when lights anywhere in the house were switched on and off. After condensers were changed, it would play perhaps several days without cutting off. All voltages, when checked, were nearly correct. Parts all checked o.k. When the model cut out, the moment a meter touched any part, it began playing. We found the power choke had settled down in its tar container so it had intermittent ground. This choke was melted out, can insulated, choke returned and the set has not caused trouble for more than six months.

Crosley Roamio 5A1

If poor pickup and low volume are obtained in the Crosley 5A1 Romio, check the control-grid lead from condenser to control grid of 78 tube in the first r.f. stage. This lead usually breaks off inside the insulation because of jars. Substitute this lead with flexible wire and leave a little slack, since the condenser is mounted on rubber and moves considerably when jarred.

Crosley 8H1

Excessive Hissing between Stations. Change 6F7 cathode resistor, a small, flexible type mounted on the back of the chassis, from 500 to 250 ohms. Also, shunt a 2,000-ohm resistor across the cathode bias resistor of the 6D6, nearest the power transformer.

Common Trouble. Balancing condensers located on top of i.f. coil cans short out to mounting screws, because of plates of condensers being out of line. Thus, when moved out of their original position, they touch the grounded mounting pillars.

Crosley 30S

Failure of replacement volume control to permit reduction of level to minimum required. Short 3,500-ohm resistor in series, with the control completely out of the circuit.

Crosley 30S, 31S, 32S, 33S, 34S

Low Volume and Poor Tone Quality. These receivers have to be serviced frequently. New tubes, realignment, and the addition of a few new plate-circuit resistors usually make the set as good as new.

However, if a 15,000-ohm resistor is added between the positive side of the 55,000-ohm detector-plate resistor and ground, the increase in volume and tone quality will be surprising.

Crosley 40S3

Cut-off When Shaken by Passing Traffic. Set checked o.k. Shaking the bathtub, tuning condensers caused the set to stop. On second check, touching the control-grid bias resistor of the screen-grid tubes caused set to resume playing. Further tests showed the trouble to lie in this

resistor, which is wound on a bakelite strip with resistance wire clamped to soldering lug by rivets. Loosening two turns of this wire and soldering the ends directly to the lugs remedied the trouble.

When tone is bad, pep lacking, and an analyzer check shows positive bias on the first audio tube, replace the by-pass condenser connected between the detector and the first audio grid.

Crosley 40

Distortion. The trouble here was found to be distortion after a few minutes' operation. After questioning the owner, we found that a type 45 tube had burned out and another tube had been placed in the socket, but instead of a type 45 it was an 80. Before she realized her mistake, the owner smelled smoke coming from the set. That was when the trouble referred to started. The 750-ohm resistor on the resistor strip was found burned completely off the wire and was hanging between the two terminals. This wire would heat up, expand, and short against the chassis, causing little or no bias on the 45's.

Crosley 42 and 33

Low volume and poor-quality reception are often caused by defective coupling condensers between detectors and first audio tube. These condensers develop a high resistance when in operation and will invariably test o.k. when removed from the chassis.

Crosley 42S

Low-bias Voltage on the Detector, Distortion. Frequently due to leakage between sections of the dual 0.5 condenser by passing detector and first a.f. bias resistor.

Distortion. A dual by-pass unit is used for the detector and first audio cathode bias resistors. Sometimes a leakage will develop between these units, causing distortion. Simply replace both these condensers. Values are 0.5 mf.

Crosley 42S and 33S

Excessive hum is due to defective Mershon condenser.

Crosley 53, 54, 58, 59

These sets can be improved in volume and somewhat in selectivity if the screen of the 24 detector is removed from the junction of the two 10,000-ohm resistors and is connected through a 2-megohm resistor to the high plate voltage at the filter choke. A 1-megohm resistor from screen to ground will sometimes be necessary to stabilize the set. Of course, it will also be necessary to add a 0.5-mf. condenser from screen to ground. Type 35 tubes can be used successfully in the r.f. stages of this set without any circuit changes and will add a little to the sensitivity of distant stations.

Dead. In Model 58 the complaint was that the switch had to be thrown a half dozen times before the set would play, although tubes and pilot would

light. With the "innards" exposed, the placing of the test prods on any part of the B voltage system would start the set.

On a separate test all condensers and resistors showed o.k. We then placed the voltmeter across each condenser, with the set off, and then snapped it on. After a few trials, the trouble was found in the condenser by-passing the detector grid-bias resistor. This condenser was shorted, but the least change of voltage would clear it up.

Crosley 54

No Quality and Insensitivity. In going through the set with a Jewell tester, we noticed that the detector voltage of the plate circuit was 90 volts. In going further with the tests, however, the voltage of the 45 power tube was found to measure 350, with a grid bias of only slightly better than 12 volts.

Finally we plugged the analyzer connection into the power-tube socket in order to observe voltage variations as the set went into and out of oscillation, and, with a strong local station coming in and with the volume control retarded, we discovered a voltage of 300 on the plate of the power tube.

The receiver was checked thoroughly for leaky condensers, resin joints, in fact, for everything one might think of that might have some bearing on the existing conditions, but without any noticeable improvement; we checked even the resistors of the various circuits in the belief that the ohmmeter would lead to the trouble, but it proved nothing except that as the resistors became warm they changed value to the extent of about 30 per cent.

When the difference in the resistors was finally proved, the resistor R_1, was replaced with one from the Crosley stock; then the resistor R_2 was shunted with a stock Durham unit of 0.1 megohm. This procedure raised the control-grid potential on the power tube to 55 volts, and, with the Crosley replacement for R_1, the plate voltage held steadily at 270 volts.

After these changes were made, the tone quality and sensitivity were so greatly improved that the set was able to pick up many distant stations that had not been picked up before the set was fixed.

Crosley 95

Weak Reception with Distortion. Speaker field leads leading to the receiver may be reversed.

Crosley Roamio 98

Inoperative. The tone control may be short-circuited.

Crosley 102

When circuit oscillates and loads up, test the 6B7 second-detector tube, which will usually be found to have low emission.

When this same set goes entirely dead, the 0.1-mf. condenser across the power-

transformer secondary will often be found shorted.

Crosley 120 (Eight-tube Superheterodyne)

A very loud cracking, similar to static, and a building up of volume, then cutting off sharply and clearing up can be traced to a small midget 0.02 condenser placed between the 24 and 27 tubes, shoved under the resistor strip. This trouble is quite frequent in these models and hard to find.

A tunable hum that is very bad in midget receivers, particularly in the "gyp" make and in the Crosley 120 series, can easily be stopped by adding a 0.01 condenser from the a.c. plate of the rectifier to the ground. Precaution must be observed to use a condenser of high-voltage rating; otherwise it will break down. It may also be connected from the a.c. plate of the rectifier to one side of the filament to stop this annoying hum, which in some cases modulates the signal so badly that it entirely ruins reception.

Crosley 122

Type 24 oscillator fails to oscillate at low-frequency end of dial, and new 24A won't work at all in this dynatron circuit. Shunt a 1-watt, 750-ohm resistor across 650-ohm volume control, and 24A will work.

Weak and Erratic Reception. On six receivers of this model that have been in the shop within the past several months, we have traced the trouble to the by-pass condenser in the B+ lead to the 35 i.f. tube. These condensers weren't totally shorted out but had developed leakage of from 65,000 to 25,000 ohms to ground, and on one particular machine, this leakage would occur only when the receiver was placed in operation.

In these instances, this condenser was cut out of the circuit, a new 0.1-mf. unit was connected in, and the receivers worked like new.

Two other receivers of this model would cut out at times and remain inoperative for long periods. All voltages and resistances would check normal. One receiver was totally dead, with all voltage and resistance measurements normal. The trouble was found in the 0.1-mf. by-pass condenser in the B+ lead to the 24 oscillator. This condenser was either totally open or opening at times, causing the receiver to cut out or be totally dead.

Crosley 124

A dead set oscillated when a finger was placed on the grid of the first i.f. tube (35). This was an indication that the first-detector 24 tube was defective.

Fading. Look for cold-soldered joint on i.f. transformer lug.

Intermittent reception, temporarily cured by touching by-pass condensers or resistors, is the fault of an intermittent open in the 0.1-mf. condenser connected between screens and ground. While the set is inoperative, a small increase in first r.f. plate current will be noted.

Fading signal returns to normal volume if set is switched off, then on again, or if tube is pulled out and then reinserted. Replace condenser block W22412, which contains four 0.1 condensers. Do not make the mistake of replacing only one or two condensers that seem to be giving trouble. Replace seven—four in one can and three in another. This also applies to all sets that have more than one condenser in the same can. If one is defective, replace the whole part. It will save trouble in the long run.

Crosley 125

No Plate Voltage on the Oscillator Detector Plate. Check the mica separators in the i.f. trimmer condensers for a possible short circuit.

Crosley 127

Sudden drop in volume accompanied by failure of the tuning meter. Partial short in the i.f. transformers.

Crosley 129

Oscillation at high frequencies after usual tests have shown up nothing. Check value of fixed portion of volume control. It should be 200 ohms and is critical. If necessary, put in a 25-ohm resistor in series, raising the value of the fixed unit to 225 ohms.

Crosley 130

Dial off frequency, or frequency settings "drift." Do not adjust oscillator trimmer until you are sure the dual filter and screen-grid 8- and 4-mf. condenser is not leaky or open. Original unit breakdown voltage is 300 for the filter section, 150 for the screen. Replace with 450-volt and 200-volt sections (if 181.5 kc.).

Crosley 146

Local stations received weakly, voltages o.k. Look for open 12-mike condenser section of dual filter and cathode 6-mike cardboard-encased unit. Replace, if "out," with 12-mike 400-volt job. Lower breakdown units will not last.

Crosley 148

Intermittent Reception. High-resistance short often develops in the padding condenser because of entry of dust and dirt. Clean with carbon tetrachloride.

Periodic drop in volume and distortion. See if the twin cub condenser in resistance-coupling network between detector and alternating frequency is reversed. The 0.03 should be the coupling condenser between 57 plate and 42 output grid. One terminal of the 0.001 should be grounded and the other connected to the detector plate. Some condensers have wrong markings, and the 0.001 is incorrectly connected between ground and a.f. tube grid.

If set cuts out or works poorly on low line voltage replace the 2.5-volt pilot with a 6-volt bulb. The pilot is wired across the 6.3-volt tube circuit and sometimes reduces heater voltage to below normal.

Crosley 148-Fiver

Set dead below 1,200 *kc.*, volume control inoperative after half revolution, oscilla-

tion over entire band. Suspect the six-to-eight electrolytic and substitute another for test, since it sometimes shows up o.k. with respect to leakage and still causes trouble. Use a higher breakdown type.

Crosley 160

Weak Reception. The oscillator cathode resistor should read 5,000 ohms, no more.

Crosley 167

Intermittent Operation. This set has three 2.5-volt tubes in series across the same winding that supplies filament voltage to the 42 output tube. Intermittent reception in this case is caused by the oscillator going out of oscillation and is characterized by the fact that the set will work only on the high-frequency end of the band. Several methods may be used to make the tube oscillate more vigorously, but replacing the power transformer with one having 2.5- and 6.3-volt windings or with a tapped winding is the only satisfactory repair.

Inoperative. One 58 heater too bright, the other 58 heater does not light at all. Remove the lead from the dial lamp socket that runs through the chassis; insulate with spaghetti. The original lead often grounds to the chassis.

Set works on high-frequency end but dies out on low or cuts in and out. The 0.1-mf. condenser across the 3,500-ohm resistor in the cathode circuit of the first 58, the first-detector oscillator, shorts out and sometimes partly shorts.

Low Volume and Distortion. Frequently traceable to leak between filter condensers and cathode by-pass section for the 2A5.

Crosley 169

Distortion. The set would operate perfectly at times, and then gradually a very bad distortion would set in. Measurements revealed that this distortion was accompanied by a rising voltage on the cathode of the 2A6 tube. Upon inserting a milliammeter in the cathode current, we found that the cathode current rose as the voltage on it rose. We finally discovered that the cathode-resistor by-pass condenser was acting as a battery, actually sending a current of 1 ma. through the cathode resistor, raising the bias on the tube, causing distortion as a result. This condenser was taken from the circuit and connected across a meter and maintained a voltage constantly that gradually rose and fell with the meter continually across it.

Crosley 170—Dual Ten

Inoperative. The set came in with the complaint that there was a steady circuit oscillation and no reception except by placing a finger on the cap of the first 58 tube. The cause of these symptoms was found to be open in the r.f. oscillator coil (located behind the band switch).

Crosley 170, 171

Loss of Volume and Noisy Operation. Examine 0.0005 tubular condenser in series with antenna coil.

Crosley 171

Q.A.V.C. won't work, poor volume. Bad section in candohm resistor, part number W28471.

Crosley 173

Cause of intermittent operation in the Crosley 173 can usually be traced to an open 16-mf. section in the filter pack.

Dead. For receivers that use a tapped primary power transformer where the primary checks open, look for a broken wire in the tap lead.

Crosley 175

Inoperative. If the set drops out as the dial is tuned to the lower frequencies, replace the 7,000-ohm cathode resistor in the oscillator circuit with one of 5,000 ohms.

Crosley 178

Dead. This operating note, we assert, has them all beaten. This set, which is a 2-volt model, came in "dead," with all tubes burned out. We phoned the owner, who swore the battery connections had not been tampered with. Everything checked o.k., so we installed new tubes, hooked the set up, and it played satisfactorily. We mentally called the owner a liar and turned the set off, when suddenly the tubes burned out. We had seen the tubes burn out when the set was turned on, but never when it was turned off. On some of these sets, safety resistor R_1 0.1 megohm has been omitted, which was the case in this instance. Condenser C (0.5 mf.) we found shorting intermittently, which put the 22½-volt C battery across the filaments when the volume control was in the off position.

Crosley 425

Intermittent Reception. An unusual case was encountered recently in servicing one of these receivers. Reception was intermittent. Moving the last r.f. tube would bring it back. Investigation showed that the plate voltage on all r.f. tubes would drop when the tube was moved. The trouble was soon traced to internal shorting in the untuned r.f. transformer, one leg of which was soldered to the plate prong of the last r.f. tube.

Sensitivity Control Noisy. These models are equipped with a range switch, or sensitivity control, that often becomes noisy after several months of service. The remedy for this trouble is to solder a flexible wire from the wiper on the switch to the ground. This eliminates the wiper contact, and no more trouble will be had. It is a positive fact that wiper contacts give the serviceman more trouble than he ever thinks.

Crosley 425-33S-42S

Speaker Rattle. The speakers of this model will often rattle and sound as if the

voice coil were not centered properly. Examination will show that it is o.k., but the rattle still persists. The remedy for this is to remove the cone from the speaker and paint the joints (inside and out) where the voice coil is fastened to the cone with Sticks All, a glue that can be bought at any Grant store. This same glue is used in the building of model airplanes and sold under various other trade names. At the same time, notice if the windings for the voice coil are loose. If they are, paint the whole voice coil with a thin coat of glue also. This glue can be used to repair a break in the cone, such as might come from sticking a screw driver through it, which can happen and often does.

Crosley 515

Weak, or Intermittently Weak. Section 7Z (0.02, 200-volt, 6D6 cathode by-pass) of part W28623 dual tubular condenser is probably at fault, regardless of how the set may test. Snip leads and substitute a single replacement unit.

Crosley 601

Filament rheostat shaft shorts to metal panel, heating wire and destroying fiber insulation without damaging wire itself. Equip shaft with insulating bushing; fill in between wire turns where charred with heat-resisting cement and pulverized asbestos, smearing mixture on wire to hold it firmly. When dry, scrape mixture from contact surface with knife.

When ganging the main tuning condensers of this set, be sure to have the shields in place and, using a hack saw, saw a screw-driver slot in the ends of the above condenser shafts. Use a screw driver to line up these after loosening the setscrews of the belt drums, which sometimes slip out of line.

Crosley 609, 610

Oscillation. The most frequent complaint with this receiver is oscillation at some point in the broadcast band, usually at the high or low frequencies. This oscillation, on the assumption that the tubes are good and all by-pass condensers intact, may be eliminated by readjusting the angles or position of the three r.f. coils in relation to one another, the most critical being the detector coil, which is the first toward the front of the coil.

Lack of sensitivity or selectivity can often be remedied by employing the procedure outlined above, since this will tend to bring the circuits closer to the point of oscillation, resulting in an amazing improvement. Unlike other Crosley receivers, this model is not equipped with any compensating or neutralizing condensers, good operation depending upon the adjustment of the coils.

The condition of distorted reproduction with the lack of grid bias and excessive plate current drawn by the power tube is often caused by an open-circuited 10,000-ohm blue carbon resistor in the secondary-return circuit of that stage.

Noisy tuning on this model is due to a corroded flat tension spring at the end of the variable-condenser rotor shaft. This contact should be carefully cleaned and its tension increased by moving the collar on the shaft holding it in position still further toward the front of the set. In a short time, however, this contact may again prove faulty, and to obviate any possibility of a repeat call, it is best to solder or secure a flexible pigtail, such as a length of phosphor-bronze drive cable, to the condenser shaft, the other end being fastened to the chassis. This pigtail will make possible a perfect electrical connection between the rotor and chassis instead of merely a mechanical one.

Crosley 706

Noisy tuning on this model is also caused by a corroded flat tension spring at the end of the condenser-gang rotor shaft and should be remedied without delay by cleaning and by the installation of a pigtail as described with Models 609, 610.

Where it is found that the voltage output is shorted to chassis, look for shorting filter-choke leads. These leads are brought out through an opening in the chassis through rubber sleeving that dries and cracks, often exposing the choke leads to the chassis. The defect may be corrected by removing the filter choke and renewing the insulation. Another cause for the same condition lies with the speaker-field pin jacks shorting to the chassis through the insulation. The easiest and quickest remedy for this failure is replacement of the pin jack assembly. Where the reproducer employed is of the magnetic type, the two leads soldered to the pin jacks may be removed and connected together by wrapping the splice with tape.

Noisy operation of the volume control may be remedied by an application of Nujol after the contact arm and the portion of the resistance over which it passes have been cleaned carefully, so as not to cause any breaks, with emery board, procurable at any five- and ten-cent store.

Oscillation and general instability have been traced on several occasions to an open-circuited 226 filament by-pass condenser. The capacity of this unit is 0.5 mf., although better results will be obtained if replacement is made with a 1-mf. by-pass condenser.

Crosley 706–60

Excessive hum despite o.k. circuit check. Replace 27 detector with a 56 and connect $\frac{1}{10}$-mf., 200-volt condenser from chassis to detector heater at fourth terminal from front of chassis on brass strip connecting pack with chassis.

Crosley ShowBox 706

Open Circuit in Input Transformer. There are a great many of these machines in service throughout the country, and under ordinary conditions they give very

reliable service. Our experience with this machine has been that a good deal of the trouble is confined to an open circuit of the primary of the input transformer. The trouble here is that the two a.f. transformers are in one can and there is hardly room in the set to put in a replacement. The transformer assembly for this job nets for $3.85, and by the time the profit for the part and the labor charge are added, the cost is about as much as the value of the set. We have used the connection to advantage, and it takes only a short while to change the set from push-pull to parallel operation. The loss in volume is so small that it is not objectionable.

The procedure is as follows: Disconnect the secondary center tap from ground and tape it over. Parallel the grids, connect them to one end of the secondary, and ground the other end. Parallel the plates and connect them to one end of the transformer primary; the other end goes to the post formerly used by the output-choke center tap. The voice coil connects across the choke instead of to the plates, as it formerly did. A 0.1-megohm resistor is used in place of the open primary and a 0.01-mf. condenser used for coupling from grid to plate. This method may also be applied to other receivers using "hard-to-get" transformers.

Crosley 814

Distortion, poor volume, and sometimes no signal. Open 10,000-ohm Candohm resistor section. This is from screens to ground.

Crosley 815

Autotransformer Coupling. If you run across trouble in an audio transformer between the 30 first audio stage and a 30 driver in Crosley's 815 battery job, the connections may be puzzling. The first a.f. tube receives plate current through a resistor, and only audio reaches the transformer through a coupling condenser. And the unit is used as an autotransformer rather than a straight two-winding unit, giving some transformer action, some impedance coupling action.

❖ ❖

Dayton Navigator

Dayton Navigator A.C.

No Volume. One of the most baffling cases we have ever had was an a.c. Dayton Navigator. This set had excellent selectivity but hardly any volume. The voltages and current measurements were normal, and no defective parts could be found in the circuit. The owner had mentioned something about "special bulbs," and this led us to investigate what kind of tubes the set had originally used. Sure enough, the set had come equipped with Speed tubes, which have a very high mu. The repair was effected by replacing all of the 27 tubes in the set with 56 tubes, after which the set had plenty of volume.

Delco

Delco 630, 500

Common complaint is lack of reception on stations that are not local but that should nevertheless be within range. Due to blocking of weak signals by noise-suppression circuit. To correct, make the following simple wiring change: Remove the wire connecting the ground end of the volume control to the chassis ground. Connect this ground lug of control to cathode of 6D6 tube. In some instances it is found that the above-mentioned change results in the appearance of vibrator noise not bothersome before. To eliminate it, after making the suggested change, connect a 100-ohm resistor in series with the 275-ohm common bias resistor for the 6D6 and 6B7 tubes. Put it between the cathodes and the old resistor, reconnecting the by-pass condenser across both the old and new resistors. Connect the lead from the volume control to the junction between the resistors.

Delco R1119

Set Inoperative. The 6L7 had no plate voltage. Look for a shorted 0.01 by-pass condenser across the 15,000-ohm resistor.

De Wald

De Wald 632 D.C.

This receiver will become inoperative if the ground wire should momentarily touch any part of the receiver chassis through failure of the 6-volt pilot light, which is connected in series with the filaments of the type 30, 31, 32 2-volt tubes employed in this model. Should the pilot light burn out, the filament circuit is open. Because of the inconsistent quality and the fluctuating nature of German- or Japanese-made bulbs, the pilot light should be replaced only with an American Mazda.

Duo

Needle Chatter. Complaints from Duo owners that sound coming from the pickup itself was objectionable when the instrument lid was either up or down have been eliminated by lining the pickup cover with turntable felt that prevents the mechanical transmission of sound through or by the pickup cover. As an additional precaution, a small pad of turntable felt was used to fill the pocket between the sides of the horseshoe magnet.

Earl

Earl 21, 22-D.C.

In replacing or repairing the variometer tuning the antenna circuit in these receivers, it is important that the shaft is carefully insulated and cannot short to the chassis. A burned-out coil and most likely a "shot" tube will be the result if this should occur.

The unusual situation is often encountered in these models where a reversed plate

reading on the r.f. detector and first audio tubes will be obtained, although the polarity of the voltage on the output tube plates will be correct. This condition is caused by the short-circuiting of the 2-mf. filter condenser connected from the negative side of the line supply to the receiver side of the B filter choke. This condenser is identified by the blue lead emerging from the condenser block. An explanation for this reversed polarity obtained on the r.f. detector and first audio tubes lies in the fact that the high voltage impressed on the output tubes is not filtered by the choke but is obtained directly from the positive side of the line.

Oscillation or a low whistle on these receivers is often caused by a leaky detector-plate 0.001-mf. by-pass condenser. In cases where replacement of this unit does not entirely eliminate the condition, an r.f. choke should be inserted in the detector-plate circuit and another 0.001 condenser connected between the choke and the negative detector filament.

In reneutralizing or adjusting the gang compensators, only an insulated neutralizing tool should be employed, since an accidental shorting of the condenser adjusting nut to the chassis by a metallic socket wrench or "Spintite" will cause one or more tubes to "go."

❖ ❖

Echophone

Noisy Tuning. The complaint was of terrific noise while tuning and at times of weak reception, more noticeable on deep tones. (Note: the line switch is on the tone control.)

An analyzer test disclosed nothing at first, but when reception "blocked" and the tone-control shaft became hot it was because of a defective tone-control condenser, with resultant lack of plate voltage. Bending plates out of tuning condenser cleared up the tuning noise. They had been touching in certain positions.

❖ ❖

Edison

Where 24's and 27's have subnormal plate voltages, check back from them to resistor terminals and remove the r.f. amplifier can with its associated resistors. Open can and isolate shorted by-pass condenser. Reassemble unit and rewire. Connect a tubular 0.1- or 0.5-mf. condenser from the high side of the resistor to ground.

In the model using five 27's and two 45's, the push-pull input transformer has a fixed condenser built inside the case. This condenser is used to keep the B current out of the primary, and the resistor that feeds the plate of the first a.f. tube is located at the rear of the multiplug. We have had several of these sets in which the fixed condenser has either shorted or opened; in either case the plate reading on the first a.f. plate was normal. Our remedy is to cut out the primary of the transformer and connect a condenser

of about 1 mf. from the plate side of the resistor mentioned to either of the grids of the type 45 output tubes. This gives as good tone and volume as the original hookup.

Edison, Splitdorf

When double-section carbon volume controls connected across two plate coils fail, a good replacement repair can be made by grounding the center arm of a 10,000-ohm variable-taper potentiometer, connecting the off-side point to the antenna post through a shielded lead and the on-side point to the end of the 600-ohm bias resistance on the 226's that formerly went directly to ground. The leads to the plate coils from the original controls should be cut off and taped. Then the regeneration switch control should be converted into a local-distance switch throwing a 0.003 condenser across antenna and ground to provide control on loud locals.

Edison C1, C2, R1, R2

Three Major Weaknesses. 12,500-ohm series plate, 1,500-ohm center tap, 50 bias and 25,000-ohm loss resistor. The first two have asbestos washers at the ends. These absorb moisture and transmit dampness to resistors, shortening life. Replace with bakelite washers. The third resistor should be replaced with a 10-watt job whether it tests o.k. or not.

Weak Reception. Set will not regenerate around 550 kc., even though regeneration switch is in proper "up" position, with all voltages, tubes, and circuit parts checking o.k. Look for poor ground from two 1.5-mike plate by-passes located in center part of chassis near volume-control coupling shaft. Solder flexible lead from their common ground to chassis. Also pigtail rotor of tuning gang, tighten antenna binding post (or solder it directly to the post itself), tighten all bolts in single-turn voice coil under speaker. When drawing up bolts in gang, use extreme care not to move stator sections out of alignment.

Intermittent Operation and Distortion. This tip applies to the Edison instrument that uses a Peerless speaker with a single-turn voice coil.

The set would play o.k. for a time and then gradually lose volume and become mushy. Receiver had been overhauled and was o.k. Speaker cone was free and feeler gauge showed voice-coil clearance correct.

We dismantled the speaker and found a growth (either fungus or electrolytic) coming from the copper disk inside field plot. This would recede, and speaker would work o.k. until current had been on for some time. Then this gummy growth would spread until it almost stopped the motion of the cone. Cleaned this up thoroughly and coated all parts with thin collodion. After 30 days, the speaker was dismantled, and no growth was present.

Edison R4

Installing Dial Cable. Remove two gang condensers on the left, also tuning mechanism and dial. Tearing of the cable is often due to insufficient turns on drum shaft. Drum should have four or five turns on it.

No reception. Aluminum wires on cone sometimes open up.

Edison R4, R5

In cases of lack of volume and distances, look for one or two open r.f. by-pass condensers. A three-terminal unit can be located in the rear of the set underneath the chassis.

Edison R6, R7

Rumbling. Pronounced rumbling or drumming when very low-frequency bass is being reproduced. Voice-coil strikes field housing at bottom of voice-coil passage. Remove speaker head assembly and insert thick cardboard washer to give the coil more travel distance.

❖ ❖

Emerson

Emerson B Eliminator for Auto Radios

Low Volume. Many radios using Emerson motor-generator or dynamotor B eliminators for power supply have a tendency to have low volume after several months' use. The trouble is generally due to reduced B voltage, caused usually by *failure to oil bearings of the generator.* This results in reduced speed and hence low voltage. In three recent cases, a couple of drops of oil on each bearing made the set work like new, by increasing the r.p.m.

Emerson Mickey Mouse

Hum. This receiver is a very small compact midget that sometimes develops an annoying hum when in service for a short time. This hum can be greatly reduced if not entirely eliminated by connecting a condenser of high capacity between one side of the line and the chassis. Another way to reduce this hum is to change the position of the 100-mmf. coupling condenser. The best position for this condenser can be ascertained only while the receiver is in operation.

Emerson U6D

Frequency drift requiring constant retuning in the broadcast range. Frequently trouble will not appear when chassis is removed from cabinet and placed on bench but will reappear again in the cabinet. Trouble is in midget-type compensating condenser in series with broadcast oscillator coil. Drill 5/8-in. holes in the cabinet base near this condenser to ventilate it, and drift, due to heating, will disappear.

In case of high oscillation on all frequencies, low amplification on higher frequencies, suspect open filter condenser. Looking at set facing toward you, ground one side of filter. High-voltage lead of

filter to first connection on terminal strip to the right of the volume-control switch.

Emerson MAC7

Hum after being in service several months, not due to open filter or other common causes. Check high-voltage winding of power transformer with an ohmmeter. The winding sometimes partially shorts, throwing the center tap off.

Emerson 250 (A.C.-D.C.)

A loud hum in this model is often caused by the filament resistor that is mounted on the chassis and by the pilot-light tap being shorted against the metal container.

For a perfect repair job, the resistor should be replaced. Attempts to repair it will usually bring a repetition of the trouble.

❖ ❖

Erla (Brandes)

Cutting out often caused by defective local-distance switch. Contact material becomes loose in spring. Put contact in tapered hole and center punch around edge to retighten.

❖ ❖

Eveready

Eveready 1, 2, 3

No Voltage on R.F. Tubes. Look at large Pyrohm in B lead. Volume controls may be replaced without using the old pulley-and-cable arrangement by placing the new control where the old control arm was fastened, lengthening the leads and reneutralizing.

See data on Bosch 28, 29.

Eveready Series 30

Intermittent reception in this set was traced to a broken wire on the voice coil of the speaker and would open and close the voice-coil circuit with the vibration of the speaker. The wire was not a loose break but was partly held by solder.

Eveready 50

Volume Control. A very satisfactory and economical repair can be made on this receiver, whenever the high-resistance section of the dual volume control is burned out or mechanical defects occur, by removing this section and placing a 50,000- to 75,000-ohm 2-watt fixed resistor in the same circuit. The other section of the dual control regulates the grid bias and provides ample control of the volume under all conditions.

Eveready Series 50

If it becomes necessary to align the tuning-condenser gang on the Eveready Series 50 model, you may have a difficult time locating the adjusting condensers. These condensers cannot be reached from the back of the chassis, but if the receiver is removed from the console, the three trimmer condensers are accessible at the front of the chassis.

Weak or Inoperative. The phonograph switch is on the gang condenser (rotor of the detector-gang section) and can

be reached from the back of the chassis. The arm of the switch is actuated when the tuning-condenser dial is turned to the *phono* position at the low-frequency end of the dial. A case of weak or no reception might be due to dirty switch contacts or to failure of the contacts to close properly. Clean the contacts and bend the switch blades until the contacts are opening and closing properly.

The speaker output transformer is located in the chassis and the 2,500-ohm field coil is used as a filter choke in the positive side of the plate power supply.

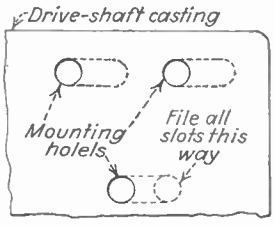

FIG. 9.

The setscrew located at the back of the chassis is the hum-control adjustment, a variable center-tap resistor across the type 24 and 27 heaters.

The by-pass condenser for the type 24 tube seems to go bad. The top terminal (of the three-section condenser) connects to B+ and one side of the primary of the r.f. coils. It is advisable to disconnect all three and replace them with a 0.5-mf. unit, rated at 300 volts, to eliminate second calls.

Eveready 52

Intermittent or Continuous A.C. Hum. Poor contact between common ground return of filter-condenser block and its can. Wire is found just inside end of can where cover is soldered to tin box.

Eveready 52, 53, 54

See data on Bosch 48, 49.

Fada

Slipping dials are the pet weakness of some of the older models. Another cure would be to remove the drum from the condenser shaft and lay it flat on its wide side. File about $\frac{1}{16}$ in. of metal off the flat side of the dial "neck" that normally rests against the spacing collar. When replacing it, push it hard against the spacing collar before tightening the setscrews. This causes the edge of the drum to be firmly wedged in between the plates of the drive assembly.

Fada, Old Sets

On those models using a friction-driven dial, the casting that acts as a bearing for the driving cam gets out of shape just enough so that tuning becomes annoyingly difficult. An effective means of repair is to dismount this casting by unscrewing three mounting screws from underside and slotting their holes with a round file toward the flange, as shown in Fig. 9. When remounting, press the casting toward the flange before tightening the screws.

Fada KU

The complaint was intermittent distortion. We finally caught the plate current on one of the push-pull type 47 tubes increasing to about 48 ma. and replaced it. In about 15 min., more distortion. We checked the input a.f. transformer, which seemed o.k. We checked the transformer again, this time with 300 volts d.c. between primary and secondary. In a few minutes a high-resistance short between primary and secondary showed up. Replacement proved this to have been the trouble.

Fada 10

If the power transformer heats up and the pitch melts out, don't blame a defective transformer right away. Since the 280 is only ⅜ in. away from the transformer, the heat from this tube thus heats up the pitch, and it runs out. When this condition occurs, you get a bad a.c. hum in the receiver. The remedy for this is to unsolder all the connections from transformer and melt the pitch back—by putting the transformer in a slow oven. Then allow it to cool for at least 5 hr. Put the transformer back and solder all connections to their proper places. Make an asbestos case between the transformer and the type 80. This will end your trouble.

Fada 10, 11, 30, 31

These sets are frequently serviced because of noisy reception that cannot be cleared by replacement of tubes and is definitely determined as originating within the receiver itself. Before much time and effort are expended, the first and second audio-transformer primaries should be checked. Because of defective-insulation electrolysis or moisture, the primary winding becomes noisy which conditions may be remedied by removing the unit and heating. This fact can be readily ascertained by disconnecting the questionable primary winding and substituting a 50,000-ohm carbon resistor in its place, coupling the two stages by means of a 0.01-mf. condenser.

An inoperative receiver or one that functions weakly is often due to shorted or grounded lugs on the r.f. coils. These lugs, to which the coil ends are soldered and connections are made, are riveted to the bottom of the coil forms and upon vibration will shift and short to one another or to the chassis. To rectify this condition, the lug rivets should be compressed tightly with strong pliers to prevent them from altering their position. When replacing the volume control on this receiver, the red lead should never be soldered to the center terminal of the potentiometer, since this connects to the variable arm and shaft, which is grounded. The error in connecting this lead will result in grounding the grid of the second r.f.

Poor selectivity of this receiver is often due to an open-circuited or "shorted" secondary coil in the wave-trap or rejector

circuit. This coil, which is tuned by a midget variable condenser, cannot be checked by a socket analysis, for it is in no way connected in the electrical circuit of the receiver, being inductively coupled to a small primary winding that is in series with the primary of the antenna coil. Hum and distorted reproduction are caused by the pilot light shorting to the chassis. This grounds the second audio bias resistor and disturbs the center-tapping arrangement.

Fada 16, 17, 20, 32

The condition of weak or no reception encountered in these models is caused by the lugs on the r.f. coils shifting and shorting to one another or to the chassis upon vibration, as described with Model 10.

Noisy reception, not caused by any external source has often been traced to a faulty first audio-transformer primary winding. Applying the full d.c. output of the receiver across the primary with all leads disconnected from it for a second or two or heating the unit to remove any possible moisture has often cleared up the condition. This obviates the necessity of replacing the transformer, although the latter may be preferable.

A sharp drop in volume accompanied by oscillation has been traced on many occasions to an open-circuiting cathode or plate by-pass condenser. Both these 0.25-mf. condensers are contained in a single unit, the plate by-pass return being connected to the cathode internally.

Model 20 is in all respects similar to Models 16 and 17 except for the fact that the first filter choke has been omitted and a receptacle provided to connect the field coil (which is used as the filter choke) of a d.c. dynamic speaker. The output transformer employed in Models 20 and 32 has a secondary winding whose impedance properly matches the voice-coil impedance of the dynamic speaker, whereas the secondary of the output transformer used in Models 16 and 17 is of the high-impedance type, to match a magnetic speaker.

Fada 25

All symptoms and failures and their causes and remedies described with Model 10 regarding *shorting coil lugs*, *noisy audio-transformer primaries*, *and "shorted" pilot light* apply to Model 25.

Intermittent reception that has been traced to the output stage by a process of elimination has often been found to be caused by faulty connection of the phone tips to the tinsel cord connecting the output transformer on the speaker. Although the phone tips may be heated and sweated with a soldering iron, the best repair will be made if the tinsel cord, which is a constant source of trouble, is removed and well-insulated, stranded copper leads are installed.

The condition of a loud hum in this model, which may be caused by an open-circuited filter condenser but more often is not, has been traced to either one of two defects. The condenser block is grounded

to the chassis by means of a screw and nut, which loosens under vibration. The faulty contact results in an abnormal hum. Because of the heat generated by the 80 rectifier, the adjacent rubber-covered leads emerging from the top of the condenser block crack and peel or become spongy, and the leads short to one another. The red and yellow leads short to one another, shorting the filter choke out of the circuit, and the effect of a shorted filter choke is obtained.

A sharp decrease in volume and circuit oscillation is often caused by open-circuiting plate or cathode by-pass condensers that are contained in the same metal case.

Fada 35

The symptoms or troubles and their cause, as discussed with the Fada 25, will also apply to this model, the same conditions having been encountered and rectified in like manner.

Intermittent or noisy reception has often been traced to the double volume control caused by corrosion of the movable contact arms, which should be carefully cleaned and bent slightly to increase their tension.

Loud hum slowly increasing in volume may be caused by defective 0.15-mf. condenser across field coil (condenser located in power pack)

Fada 41, 43, 44, 46, 47

Hum. A common complaint with these receivers is that of hum, which is more or less often caused by the 27 tubes in the detector amplifier and first audio stages, with poor cathode-heater insulation. In this respect, the old slow-heating tube is better than the newer quick-heating 27 with thinner cathode-heater insulation. Where it is found, however, that replacement or interchanging the 27 tubes will not eliminate the hum, look for an open-circuited 0.5-mf. condenser by-passing the detector-amplifier cathode. This condenser is one of two in a block mounted at the front of the chassis. Should both tubes and condenser prove perfect, the condition may be overcome almost invariably by shunting the 0.5-mf. unit with a small 10-mf. electrolytic condenser whose working voltage need not be more than 25 volts.

The cause of a weak and insensitive receiver has often been traced to an open 50,000 blue carbon resistor in the diode detector-plate circuit. This failure will not be disclosed by a set analyzer, for a plate-voltage reading cannot be obtained on the two-element detector tube in any event.

The complaint of intermittent reception on these models has been traced to one of either two circuit failures, although the condition may be caused by the failure of any component part. The most common cause and the one found more often is open-circuited secondary windings of the r.f. coils. Because of vibration or contraction of the wire, the coil leads snap directly at the lug and make the contact

intermittently. It is advisable in checking these receivers for this complaint to resolder all coil connections and not be satisfied with a continuity check only. The open-circuiting of the 0.01-mf. condenser coupling the detector amplifier and first audio stages, is frequently the cause for the same condition and should be replaced where it is so found. Incidentally, this condenser will be found leaky on some occasions, resulting in distorted reproduction or no reception, depending upon the change in impedence. Where the unit has a high-resistance leak, a zero grid-bias reading may be obtained on the first audio tube, since the positive charge leaking through the condenser will neutralize the negative bias impressed upon the grid.

It is not necessary to remove the chassis when replacing a burned-out pilot or flashograph light in this receiver. If the escutcheon plate is removed, the celluloid dial may be taken off after the screw and washer holding it in place are removed. Because of the small cutout in the wood panel, the celluloid dial must be bent in order to remove it. This may be done without fear of breakage because of the flexibility of the celluloid. The pilots are now easily accessible. To prevent these bulbs from loosening under vibration and lighting intermittently, a drop of solder may be placed on the base of the bulbs to assure good contact. In replacing the dial, it is important that the small hole in the dial should line up with the pin on the cast-iron dial frame. The escutcheon plate should be reinstalled so that the key used to slot the celluloid dial may be inserted freely into the opening provided for it.

In replacing any one of the three filter condensers employed in this receiver, the mistake often made is in disconnecting the "shot" section and installing a 2- or 4-mf. unit from that point to ground. This will result in a loud hum, since the second terminal of the condenser should be connected to the high-voltage secondary-return circuit and not directly to ground.

Fada 42 ("Flashograph")

Fading or cutting off may be due to 0.01 coupling condensers between plate of detector amplifier and first audio grid, or detector a.v.c. plate and detector-amplifier grid. Also, check phono switch contacts. Local-distance switch connected through 0.005 condenser to ANT. and GND. binding posts sometimes develops poor contact and causes fading. Replace switch. Flickering "flashograph" pilot can be cured by cleaning the contacts of the spring switch located behind the small panel, below the small panel below the tuning dial.

Fada 42 (Ka60)

The set would cut off at very infrequent intervals. All voltages checked normal, and all condensers were o.k. Trouble was finally isolated in the 0.005-mf. coupling

condenser between the grid of the detector-amplifier tube and the output of the 24 detector. Pushing or pulling or prying on this condenser caused the set to cut off and on very erratically. Remedy: Replace with good condenser. This is a round tubular condenser mounted on a bakelite panel in the front right-hand corner of the set, just to the right of the dial.

Fada 43, 761, 762, 764, 766

Fading or intermittent reception on these models has been traced in most instances to an open-circuiting section of the cathode-plate r.f. by-pass condenser block, or to an open-circuited 0.5-mf. screen by-pass condenser, the latter unit generally causing the trouble.

The complaint of oscillation and especially of distortion at any volume level is often due to a faulty carbon resistor connected from detector screen to chassis. Where this condition is encountered, the resistor may be found to have open-circuited or changed to a higher value from the specified 125,000 ohms. Although the difference in detector-screen voltage is negligible with a higher resistance or an open-circuited unit, it is essential that the value be correct or circuit oscillation and distortion will result.

Fada 45, 48, 49

Alignment of these receivers is often confusing because of the different location or position of the alignment condensers. The i.f. trimmers in Model 45 are located in the rear right-hand, corner of the chassis. Because of the fact that the primary of the second intermediate transformer is not tuned, there are only three condensers to be adjusted at the intermediate frequency, the fourth trimmer being the oscillator series condenser which is aligned at 600 kc. The Model 48 and 49 receivers have four i.f. compensating condensers located at the rear of the chassis. The oscillator-series condenser that is adjusted at 600 kc. while "rocking" the tuning gang is accessible from the top of the chassis and is located to the right of the second-detector socket. The tuning gang is aligned by adjustment of the compensators on top of each section.

Fada 48

Flash-o-graph indicator tube gives a good deal of trouble. The tube would light only on very strong signals.

Shunting the 1-mf. condenser from the one side of the flash-o-graph permitted the control to be turned to the end, and the flash-o-graph would then work on all signals, even on the very weak ones, without interfering with the operation of the set.

Oscillator drifting, especially on the higher frequencies, was completely cured by substituting the 27 oscillator for a 24A, using the electron-coupled circuit. This idea can be adapted to all superheterodynes.

Fada 51C

The volume control of this set was very noisy. Since new controls for these machines have to be ordered from the United States, the following method was used as a temporary repair.

Install a 5,000-ohm unit and insulate the shaft. Connect a 1,400-ohm fixed resistor in series with it and increase by-passing with a 0.25-mf. condenser. The best size is determined by experiment, choosing a size that will offset oscillation. The set thus repaired worked as well as new.

Fada 66

Oscillation on One or More Short-wave Bands. Connect 300-ohm, noninductive resistor in series with the control-grid lead to the 24A first-detector oscillator.

Fada W452X

Overloads. We have been able to find no circuit diagram for this set, but it will be found to correspond with that of the Westinghouse Model 70. The set overloads in the r.f. section and will be found to give distorted signals in the low-volume position. The cure is to detune the first r.f. stage slightly.

❖ ❖

Fairbanks-Morse

Fairbanks-Morse B6, 346

The schematic diagram for the chassis used in these two models will be found on page 12 in Rider's Vol. V. The sections of the gang condenser, starting from the front of set, are oscillator, radio frequency, and antenna.

Alignment. Set the gang condenser to minimum capacity, with the dial pointer exactly on 1,600 kc.

With the signal generator at 1,200 kc., adjust the oscillator trimmer to maximum output, with minimum signal from the generator and with the volume control of the set on full. Adjust antenna and radio frequency trimmers in the same way. The gang will then track properly throughout its range if plates have not been tampered with and the intermediate frequency is exactly 177.5 kc. If gang does not track, then adjust the i.f. transformers.

To realign i.f. transformers, connect the output of the signal generator, set to 177.5 kc., to the grid of the 6A7 through a condenser not larger than 50 mmf. Short oscillator section of the gang condenser and align the first i.f. transformer and then the second. The center screw will peak the grid side, and the hex nut takes care of the plate circuit. Repeat the process so that you will have maximum sensitivity.

Howling. This model has a tendency to howl, the gang condenser is binding in some way; it should be free to float on the rubber mounting. Note that when the drive cable is pushed too tightly against the gang condenser, howls will result on all stations.

Remove the tuning-control cable from the bushing on the set. Look through the

hole in the bushing and see that the condenser shaft is lined up with this hole.

The bakelite-tube flexible shaft couplings must fit freely over the tuning condenser and volume-control shafts.

❖ ❖

Ford Motor Car Co.

See also Philco Radio & Television Corp.

Ford N

No signal, voltages and tubes o.k. See if padding-condenser soldering lugs mounted on tuning-condenser frame have punctured through insulating paper glued to fixed condenser can beneath, grounding out intermediate frequency. Slip new piece of heavy insulating fiber under the lugs if this is the trouble, and bend the lugs up.

Ford 1935

Inability to quiet ignition noise, despite standard suppression. A one-mike condenser from the hot storage-battery connection on the gasoline gauge to ground is essential. Other filtering tricks suggested are: Complete shielding of hot A lead from resistor connection on instrument panel to distributor, removing old wire. Ground shield to cowl, engine, and body.

Ford 35

Low volume, sensitivity o.k. cuts on and off. Header speaker cone leads often short to steel spring used as their support. Remove leads from support to remedy.

Noise from ignition after all usual methods of clearing it up in these cars fail. Scrape paint off underside of hood where it fits on the cloth head of the body. Wrap bare copper wire around head, and ground it at each speed screw, fastening the head in place. The hood will then make good electrical contact with the body and frequently clears up radiation of the racket to the antenna.

Ford-Majestic

Persistent Motor Noise When Antenna Is Off. Due to leakage through ventilating louvers in back of case. Cut piece of copper screen same size as back of chassis and fasten to case over louvers with self-threading screws holding the case together.

Set performs o.k. on bench, but when lid is pressed down, in car, set cuts in and out while riding. Put paper disks in top of tube caps so that these cannot short to shields.

In Types Using Separator Vibrator, Blown Fuse or Heavy A Drain. Probably due to blown 0.01, 1,000-volt condenser located across power-transformer secondary. Replace with 0.01, 1,600-volt condenser or Mallory No. A-18237-1 oil condenser. Insulate the case with tape. Can containing transformer, rectifier tube, and vibrator unit easily removed by unscrewing nut and lock washer holding down unit and lifting out. Before replac-

ing, check contacts for burned wires. Excessive current sometimes melts solder and burns two vibrator wires. File points, resolder, and remount.

Failure of 6Y5 in Models Using This Type. Replace with 84, changing socket to five-pin type and discarding wire originally connected to spray shield. If excessive noise is heard, connect 0.25- or 0.5-mf. low-voltage paper capacitor directly across filament of rectifier. If filter blows, replace with dual 4, 4–6, or 4–8-mf. dual since value is not critical.

Set Completely Dead. Plug in and note ammeter drain. If abnormally high, remove transformer pack and replace small vibrator condenser at side of transformer. If screen voltage is absent, remove speaker and plate cover to right of speaker and then replace the brown resistor.

Power-supply Noise. Some of the Ford V8 cars have Ford-Majestic radios installed as standard equipment. After these have been in use for a short time, there develops a continuous power-supply noise. This is caused by the vibrator. The best way to eliminate is by replacing the vibrator with a new high-grade unit. Do not mistake the Majestic for the Zenith that is now used in the new-model Fords.

Double-hump tuning was experienced in one of these models, accompanied by extreme distortion. This condition was present only on strong local stations, and we at first attributed the trouble to overloading the diode circuit. Upon removing the chassis and checking the circuit, we found the difficulty to be the result of a grounded filter resistor used in conjunction with the a.v.c. circuit in the grid return of the 6E7 tube of the r.f. stage. This is a 300,000-ohm unit. The long leads permit this resistor to bend so that it comes in contact with the metal chassis.

Repeated Breaking or Fraying of Cable Where Set Is Mounted in Floor. Use No. 10 spring-steel piano wire, fishing this through from control head of end of sleeve to replace old stranded cable. With this new wire, slack, a troublesome feature of the stranded stuff, disappears.

The blowing of fuses on the Ford-Majestic Auto Radio is often caused by the vibrator unit sticking. These units will often stick if the pivot pins become worn. They are adjustable.

Ford-Majestic 40

Stopped. The fuse clips on this set are apt to work loose, stopping the set. Use a drop of solder or a wedge of some sort. Note that there are two fuses, supplying different parts of the set, but both in the "hot" lead.

The set will work much better if the variable-condenser gang and the vibrator-unit shield are bonded more completely to the rest of the chassis.

A rubber band placed lightly around the voice-coil lead wires will take out a rasping rattle when the volume is turned up.

A few ventilation holes drilled so as to cool the area under the vibrator unit will

add to the life of the condensers located there. Shellac some loose-woven cloth over the holes to keep out dust.

Ford-Majestic 118

The reason for a blown fuse in the heater circuit of this model can very often be traced to the lug on the pilot-light socket being grounded.

If reception should stop, especially when the set is tuned to a station at the low-frequency end of the dial, look for a defective 6A7 tube. It has been found that some of these tubes have a tendency to stop oscillating at the lower frequencies. Replace with a new 6A7.

Ford-Philco 1934

Periodic Drop in Volume Accompanied by Sharp Click. Look for wires to terminals on inside of i.f. coils touching trimmer rivets and changing condenser capacities (intermediate frequency 260 kc.).

Distinct vibrator buzz that is hard to correct. Take out 75 second-detector a.v.c. tube. If noise stops, suspect shaft collar holding volume control to case. Another check for this trouble is to find low settings of volume control more noisy than higher settings. Give collar another hard turn with a wrench to dig through paint and slight corrosion and also run a heavy, short piece of braid from low point of volume control to case and solder well. This will eliminate all buzz from this source.

Ford-Philco 3

Lack of Sensitivity at High-frequency End. Replace 8,000-ohm cathode resistor in 38 autodyne circuit with 6,000 ohms.

Ford V8

Motor Interference. The following kink when applied to the coil and distributor of the Ford V8 will invariably cure the worst case of motor interference encountered with this make of car.

The coil and distributor are mounted together just below the radiator fan. The coil is fastened on top of the distributor by three screws. Remove these three screws and disconnect the only wire, which is the A wire going to the switch. The coil with the distributor condenser attached can now be lifted off.

Remove the high-tension brush from its spring. Obtain a 50,000-ohm, 1-watt carbon resistor and file it down to the exact dimensions of the original brush. The final resistance of this suppressor will be around 20,000 ohms. Put it back in place of the brush. This is the only way a suppressor can be applied to this distributor.

With this coil, the low side of the secondary winding is connected to the high side of the primary, inside the housing, which is o.k. as far as ignition work is concerned, but no good for radio work. To remedy this, file off the tops of the rivets holding the coil housing together, being careful not to break the wires. Next, carefully disconnect the

fine secondary wire from the binding post and solder it to the heavier wire leading to the strong spring that contacts the "hot" side of the two breaker points. Replace the housing; then replace the coil. The wire from the coil to the switch and the wire from the generator to the ammeter are both run in the same metal casing with the high-tension wires. These wires should be shielded. The above method will usually eliminate the need for spark-plug suppressors.

Another help is to remove the two rubber plugs in the holes through which the two breaker points are adjusted. Clip a piece of shielding to each screw with small alligator clips. Ground the other end of the shields to the frame. If the shields help, they should be permanently soldered in place.

❖ ❖

Freed Eisemann

Freed Eisemann NR60

Noise, a frequent complaint with this model, has been traced in most instances to either the variometer tap switch or the volume control. The contacts and contact arm of the variometer corrode and upon a slight vibration will produce noisy reception. After all contact parts have been cleaned, the switch arm should be bent to increase its tension. The volume control, being of the carbon type, becomes noisy because of loose carbon particles and uneven wear after the unit has been in service for some time.

Freed Eisemann NR80

The volume control used in this receiver is somewhat different from those used in any other, and because of its construction is more liable to mechanical difficulties. If the volume drum is forced slightly beyond the limits of the resistance strip, the contact arm will bend and twist out of shape, usually snapping the resistance winding in several places. Should the complaint of "no control of volume" be received, look for a volume-control contact arm that is not riding upon the resistor strip.

Hum and distortion on these models can usually be traced to either one of the hum controls shorting to the chassis at some point. This shorts the biasing resistor out of circuit and disturbs the center-tapping arrangement.

❖ ❖

Freshman

Freshman Clarion

Use of certain 57's and 58's on some models frequently causes trouble, since these tubes are slightly higher than other makes and the caps ground to shields. Glue a piece of blotting paper to the inside of the shields.

Freshman N

Fading or an inoperative condition of this model is frequently caused by loose terminals on the power-pack connection strip. Usually the 226 filament leads are found loose under the terminal screws.

Since these tubes take a second or so to heat or cool, a poor terminal connection will result in fading.

The r.f. and first audio tubes are heated separately by two 1½-volt windings in this model. Where one of these windings is found open-circuited, the other may be used to carry the other tube or tubes. If the first audio winding is at fault, the two filament leads should be shunted across the r.f. winding, and vice versa. In the latter case, however, the first audio bias resistor is removed and r.f. bias resistor (500 ohms) is installed in its place.

Freshman Equaphase

The condition of oscillation or broad tuning with this receiver is almost always caused by incorrect adjustment of the equalizing condensers in the r.f. stages, assuming all tubes are in perfect condition. The adjusting screws for these equalizing or stabilizing condensers are located to the right of the first, second, and third r.f. tube sockets. To overcome oscillation, one or more of these screws should be turned slightly counterclockwise until the oscillation ceases. This is done with the receiver tuned to some station at approximately 1,200 kc. In most cases it has been found that it is necessary only to adjust the second or third stabilizer to correct the condition. Broad tuning may also be eliminated, more or less, by adjusting the same condensers. Tighten (clockwise) each of the three adjusting screws. This will cause the receiver to oscillate strongly. Then loosen the screws slowly until the oscillation ceases, leaving the receiver adjusted just beyond the point of oscillation.

An inoperative receiver is often due to the trimmer condenser that is shunted across the first section of the tuning gang. The mounting nut loosens, and the condenser shifts enough to permit the stator plates or connecting lug to short to the chassis. The difficulty is easily rectified. In other cases, the inoperative condition is due to the fact that the hum-control contact arm is not making contact to this resistance. This opens the r.f. and first audio bias resistor circuit and is recognized by the lack of plate voltages on these tubes when checked with a set analyzer.

The Model G60S power pack used with this receiver uses the following arrangement of its numbered terminals:

No. 1, No. 2	1½	volts a.c.
No. 3, No. 4	2½	volts a.c.
No. 5, No. 6	5	volts a.c.
No. 7	45	volts d.c.
No. 8	145	volts d.c.
No. 9	225	volts d.c.
No. 10	B−	volts d.c.

Freshman Masterpiece

Burned-out Tube. Two receivers were released under this name, one using 15-volt tubes. Power packs intended for one model were often interchanged mistakenly with the other, resulting in burned-out tubes and other damage. To clear up any possible difficulties, the

terminal arrangement of the two power packs is given. The Model FRAC power-pack terminals are as follows:

No. 1, No. 8	2½ volts a.c.
No. 2, No. 6	5 volts a.c.
No. 3, No. 4	1½ volts a.c.
No. 5	135 volts d.c.
No. 7	50 volts d.c.
No. 9	B— volts d.c.

For the 15-volt model:

No. 1, No. 2	5 volts a.c.
No. 3, No. 4	15 volts a.c.
No. 5	165 volts d.c.
No. 6	90 volts d.c.
No. 7	30 volts d.c.
No. 8	9 volts d.c. for detector tube
No. 9	B— volts d.c.

Freshman Q15, 3Q15, Q16, 3Q16, QD16S

Noisy and intermittent reception on these models has invariably been traced to defective flexible pigtail resistors. The best procedure for ascertaining this fault is to pull or move the resistors while the set is operating.

A bad resonance hum is caused by a poor 222 tube in the r.f. stage or an open-circuited 0.25-mf. condenser by-passing the filament circuit of this tube. Even though the 222 tube may be perfect, a certain amount of resonance hum is always present with these receivers, which can be eliminated by substituting an indirect heater-type screen-grid tube, such as the 24 or 57 for the 222 tube. This necessitates changing the socket for one that will accommodate the tube selected. The filament supply leads for the 222 should be removed and taped up separately, the heater supply for the new tube being obtained from the same filament winding supplying the 227 detector tube. The only other change necessary is to remove the 222 bias resistor from the center tap of the 3.1-volt winding and connecting it to the cathode of the tube used, by-passing the resistor with both the 222 filament by-pass condensers. If a type 57 tube is used, the suppressor grid is tied to the cathode.

Broad tuning or oscillation, as the case may be, may be corrected by readjustment of the regeneration condenser connected from the plate of the detector tube to the antenna connection.

The hum may be removed from the Model Q15 Freshman radio, the reception will be greatly improved, and the life of the screen-grid tube will be increased by replacing the type 22 with an RCA type 35. To remodel this set, simply replace the four-prong socket with a five-prong socket, connect the filament to the type 27 detector, and remove the 3-volt wires running to the transformer. Bias the cathode with a 1,500-ohm resistor and by-pass this resistor with a 0.5-mf. condenser. The results will be astounding, and the cost should not be over $1.25.

❖ ❖

General Electric and RCA

Howling. General Electric service note advises that shipping bolts should always be removed when putting set into opera-

tion. On other makes of sets it may be necessary only to loosen these bolts. Failure to do so may produce microphonics and howls. Shipping bolts are colored copper.

General Electric and Victor All-wave Sets

The complaint of inoperation on either the *C* (20-meter) or *X* (2,000-meter) band is fairly common in these sets (and may occur in other makes of all-wave sets). Sometimes the sets will operate if the switch is snapped hard against the stop. No amount of cleaning or tightening of the contacts will give any improvement. Trouble of this sort has been traced to warping of the 7-in. shaft on the wave-change switch. The twist results in the rear switch arm not turning far enough, so that the wrong contact, or in some cases no contact, is made in this section.

General Electric and RCA

In a.v.c.-equipped models, locals sometimes snap in and out as they are tuned-through. Substitute a new 35 for those in r.f. and i.f. stages until the trouble is found.

General Electric H31

See data on Radiola 80.

A temporary repair that gave the customer the use of his set while waiting for a new first i.f. transformer was made by hooking up the set to work without it. The procedure is: First, remove the tuner chassis; second, remove the first i.f. transformer and can completely; third, remove the 24 i.f. tube and leave it out until the new transformer is installed; next, connect the blue lead (which normally goes to the plate of the now removed first i.f. 24 tube) to the plate of the 24 first detector. Leave all else as it is. The original and revised hookups are shown at *A* and *B* respectively in Fig. 2.

The set has two instead of three i.f. transformers now, the local-distance switch is inoperative, and it may be found that even if the volume control is completely turned off, stations will still be heard faintly. Barring these temporary disadvantages, the set works splendidly. The same procedure may be applied with discretion to similar supers when it is necessary to wait for parts not at hand or readily obtainable.

Intermittent Reception. Check primary of i.f. transformers. Trouble is usually in the second. Distortion at low-volume settings of the volume control on locals. Usually caused by drop in value of 110,000-ohm unit on resistor strip.

General Electric H32

See data on RCA-Victor R50

General Electric 40 and RCA 40 Auto Sets

Cleaning Up Motor Interference. The triangular plate that is mounted on rubber, to which the tuning-control sheath is attached, should be grounded to the side of the set by a piece of flexible copper sheath. The cable sheath picks up the

interference and passes it to the tuning cable that is connected to the variable-condenser rotors.

General Electric B40

When music is distorted at full volume and every bias resistor and condenser tests o.k., look for volume-control connection touching metal control box.

General Electric K40A

If there is fading, dive first for the coupling condenser between the plate of the detector and grid of the output tubes. If this condenser is at fault, replace with 0.01-mf. capacitor. This set is a.c.-d.c. and employs a 25Z5 as a voltage doubler. There is a switch in the rear of the set that should be thrown to the right (as you face the back of the set) when operating on alternating current and to the left for direct current.

General Electric T41

See data on Radiola 48.

General Electric K43

A.c. hum, especially noticeable on stations in the early models. Connect 500-ohm resistor from set side of 0.01 antenna condenser to chassis. Later models came through with an r.f. choke in this position.

General Electric K50P, K54P, K60P, K65P

Short-wave switch does not fall in place when knob is turned. Due to falling out of clip that fits into slot on shaft, holding the shaft in place. Leave out clip, and, instead, cut a slot in the end of the shaft so that a floor nail can be fitted into the slot. Solder the nail to the shaft. When the switch is turned, the nail will fall against either one side or the other side of the protruding bakelite wall, holding the switch in place in either position.

General Electric H51

See data on Radiola 82.

See section of General Electric H31 for information as to how to make a set work without a first i.f. transformer. This is a temporary repair.

General Electric K52, K53

Hum. We have been called to service several of these models in which considerable hum was present. The receivers were operating without a ground connection, and the simple procedure of affixing a ground stopped the hum, whereas other methods had failed.

General Electric A54

Oscillation or distortion at low-frequency end of broadcast band when tone control is in high, counterclockwise position and not when it is in low. May be due to open in capacitor C_{27} or high-resistance solder joint to this condenser.

General Electric K62

See data on RCA-Victor R-11.

General Electric K62 and S132

Oscillation in these models is regularly caused by gassy 35 tubes used in r.f. and i.f. stages. The reverse current flowing through the decoupling resistors causes the grid bias on these tubes to be reduced to so low a value that oscillation sets in. These sets usually oscillate when turned from station to station. When the set is tuned to a station, the a.v.c. tube increases the grid bias on these 35's, and they do not oscillate, but as soon as the set is turned off the station, the grid bias is removed, and the set again oscillates.

Tests of gas in tubes may be made in several ways. A micrometer placed in the control-grid leads of the 35 will show current if the tube is gassy. (Note: This is done with the set operating off a station.)

Another cause of oscillation in these sets is dirty contact wipers on the variable condensers. This kind of oscillation is usually accompanied by a noise when the dial is turned, but not always; so be sure that these wipers are clean. Take them out, bend them so that they will make a better contact, and clean them with fine sandpaper and alcohol at the point where they contact the rotors.

General Electric A63, A65

Distortion. Open or partly open 6F5 plate resistor, R_8 in diagram, 250,000 ohms.

Low sensitivity on all bands on numerous occasions is due to an open C_{26} 4-mf. 450-volt section in the dry electrolytic capacitor pack (Stock No. RC-507). This is the section connected to red-wire lead that connects to oscillator-coil primary-winding B+ lug and chassis.

General Electric A64, A66, A67

Severe A.C. Hum. Accidental contact between high-voltage a.c. terminal of the 5Z4 tube socket and the electrostatic shield of the cartridge by-pass condenser C_{23} causes a hum unlike the hum of poor filtering.

General Electric K64

The cause of intermittent reception in several of these models proved very hard to find. After replacing almost every condenser in the circuit, the 0.05-mf. between short wave antenna coil and ground was replaced with a new one. This proved to be the faulty one. Since the first one was found, many other like models have been repaired in this manner.

On every model K64 radio received, we have had the trouble of reception cutting off and on as the tuning dial was rotated. As soon as the chassis was removed from the cabinet, the trouble would correct itself.

We have found the cause to lie in a bare wire that connects the stator plates of the condenser gang to the wave-band switch and that runs close to another bare and grounded wire. The condenser

gang is movable, inasmuch as it rests on rubber cushions. Now, when the chassis is inserted in the cabinet, downward pressure is put on the condenser by way of the shaft that protrudes through the hole in the cabinet and that rubs against the upper sides of it. This forces the two wires very close together, and the least movement of the condenser gang will short them entirely. To correct this trouble, simply separate the wires about twice the distance they were originally.

General Electric A65's

Excessive hum in the General Electric A65 receiver can usually be corrected by

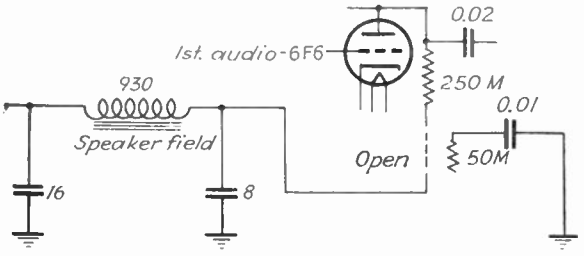

Fig. 10.

making the additions indicated in the diagram shown herewith. Lead between plate coupling resistor and plate supply is opened and a 50,000-ohm resistor inserted. By-pass the resistor with a 0.01 or larger condenser.

The increase in voltage drop is negligible. The additional elements serve as a capacitance-resistance filter circuit, thereby reducing the a.c. ripple present in the d.c. voltage applied to the plate of the first audio stage. This same circuit can be applied to other receivers with resistance coupling (see Fig. 10).

General Electric K65

See data on RCA-Victor 38.

General Electric M65

The radio set was "dead" on signals in the broadcast band, with exception of a beacon signal that covered the entire dial. The tube voltages were found to be correct. The trouble was due to an open electrolytic 4-mf. condenser in the screen-grid circuit, located in the condenser pack. This trouble was corrected by installing a single 4-mf. 500-volt electrolytic condenser in the circuit.

There was ample room under the chassis for mounting the condenser.

General Electric A67

Noise Resembling Interference Gradually Becoming Distortion. Defective 500,000-ohm, 6F6 grid resistor. Sometimes hard to locate, since it measures correct value when set is turned off.

General Electric H71

See data on Radiola 86.

General Electric H72

See data on RCA-Victor RAE-59.

General Electric J75, J79

The machine will tune very badly, with much noise, when the condensers are turned and will also tend to oscillate.

The remedy is to solder a wire from the contact spring on the condenser to the chassis of the set.

General Electric A83 and A85

Accompanying chassis layout of General Electric's A83 and A85 models shows location of antenna, r.f., and oscillator trimmers. Letters refer to band, condenser numbers refer to trimmers shown in schematic in Fig. 11, and the frequencies shown are those at which trimmers should be aligned.

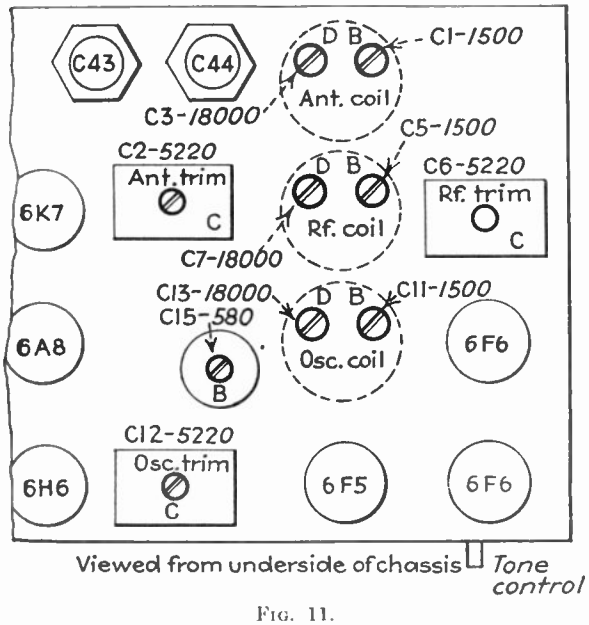

Fig. 11.

General Electric recommends alignment in the following order: 465 kc., intermediate frequency—band B, 1,500 kc., (C_{11}, C_5, C_1); 580 kc., (C_{15})—band C, 5,220 kc., (C_{12}, C_6, C_2)—band D, 18,000 (C_{13}, C_7, C_3).

Note should be made of the speech-clarifier system controlled by switch S_7. Switch is closed for speech, rendering it very understandable. Of interest is the tone compensator that is operated by the wave-band switch and gives better response on the broadcast band.

General Electric J83

Fading. Replace 50,000-ohm resistor under r.f. coil with a 60,000-ohm unit and resolder all oscillator-coil connections.

General Electric J88

Intermittent or fading reception on this model is frequently caused by open-circuiting by-passing to ground, the r.f. first-detector and i.f. secondary returns, which are in the a.v.c. circuit. Where these condensers remain open-circuited, the symptoms of station hiss and oscillation may be encountered.

General Electric J100, J105

Oscillation. Ten-mike capacitor with yellow lead to lug on volume control opens, causing oscillation. When replacing, watch polarity, since ground is positive in this circuit.

Interference set up by mercury-vapor rectifier is troublesome when receiving weak signals in the daytime. This interference may be mitigated by installing a short lead to a good ground, but the use of a 5Z3 rectifier will overcome it entirely. The necessary filament voltage may be obtained by connecting the 2.5-

volt rectifier filament winding that "lights" the a.v.c. tube. The a.v.c. tube is then connected on the filament winding that supplies all other tubes. The jumper wire that connects the a.v.c. heater terminal to the cathode terminal is removed. If the old a.v.c. tube shows any cathode-heater leakage, it should be replaced with a new Radiotron. The receiver thus altered retains its original performance, minus "hash" from the rectifier.

General Electric J100, J105, J107

See data on RCA-Victor 74, 76, 77.

General Electric M106

Sensitivity poor on short waves all or part of time. Check r.f. and detector condensers by-passing coil returns to ground. Dial slips on fast-speed knob setting. Remove chassis and bend down three contact springs on tuning-knob shaft.

General Electric J107

Stuttering, Volume Same as When A.V.C. Tube Is Pulled Out. Replace C_{38}, C_{21}, C_{19}, C_{36}, C_{35}. These are, in the same order, 10 mikes at 200 volts, 15 at 600, 0.1 at 600, 10 at 400, and 10 at 400. Trouble is due to high-resistance short between capacitors.

General Electric J109

See data on RCA-Victor RAE-81.

General Electric 118

Continual frying noise with volume control either at minimum or at maximum. Frequently due to induction from the a.c. transformer leads running under the resistors. Using an insulated screw driver, move the leads down or out until the noise stops.

General Electric J125

Excessive A.C. Hum. Twist dial-light wires together and remove from vicinity of r.f. choke located on top of chassis.

General Electric J125

See data on RCA-Victor R-78.

❖ ❖

General Motors

When hum is encountered in this receiver and everything apparently checks o.k., it will pay to short out the fuse in the chassis.

Where tone quality of models using horizontal tuning dials is bad in spite of the fact that plate potentials on final 45's checks o.k., do not condemn the push-pull transformer. Look for a defective tone-control variable resistor. Replace it with a 500,000-ohm unit.

When oscillation troubles are experienced in General Motors Models A and B chassis, inspect all connections to the frame of the chassis. Resolder all "cold" or poorly soldered joints. Solder a pigtail from the condenser rotor shaft in the middle section of the gang to the chassis

frame. Solder a pigtail from the brass hub from each rotor section to the corresponding wiper. If not already connected, solder a piece of bare wire from the bottom of each wiper to the base of the chassis. In extreme cases of excessive regeneration, connect a 25,000-ohm resistor from the screen-grid terminal of the third r.f. tube to the frame of the chassis. The last-named remedy applies only to Models 120, 130, and 140 receivers, chassis Models A and B, with serial numbers below 62, 100-A and 1964-B.

Generals Motors 50

Volume Weak, Plate Voltage Low. Look for leaking or shorted r.f. plate condenser. It is generally the top one in the three-pile assembly that goes bad; so don't unsolder the others until the top one is tested.

General Motors 129, 130, 140

Intermittent drop in volume, but set does not go dead. Tighten screws holding stator plates on gang condenser. Both top and bottom screws should be tightened. Or solder wire lead between top and bottom lugs. Same trouble common in other sets, such as U.S. Radio 27, where grid lead is connected to one side of stator plates and coil is connected to opposite side.

General Motors 120, 130, 140, 150, 160

The condition of oscillation and noisy tuning is more frequently the cause for complaint in these models than any other symptom. In some cases, tuning is so erratic or difficult that the station cannot be tuned in. Invariably the trouble has been found due to corroded or faulty condenser-gang rotor ground contacts, to which the secondary-return leads of all r.f. coils are brought out and soldered. Not only will this defect occasion noisy tuning and oscillation but it will often result in an inoperative receiver. The contacts should be carefully cleaned and bent to secure more tension. To make the job a more complete and satisfactory one, the secondary-return leads should be removed from these contacts and soldered or fastened in some way to make good electrical connection to the chassis. An open-circuiting screen by-pass section in any one of the three condenser blocks in the r.f. stages, will produce and has often produced the same condition.

Where the symptoms of fading or a sharp cutting off of reception are encountered, which effect can be reproduced by striking the chassis, the trouble has often been traced to an open-circuiting 0.01-mf. audio coupling condenser or to a defective antenna section of the dual volume control. This unit is of the carbon type and cannot readily be taken apart for the purpose of repair. The remedy in both instances is replacement of the defective component.

In these receivers, the complaint is often received that the *control of volume is not gradual or is too sharp.* This fault can be rectified by replacing the 24 in the first

r.f. stage with a type 35 tube in receivers bearing the serial numbers above 29,100, these chassis having a variable-cathode-bias type of volume control.

Where it is found that stations are not received at the proper frequency on the dial, it will be necessary to realign the receiver or reallocate the dial scale, or both. If the low frequencies are received at the proper setting, then the receiver should be tuned to some station at approximately 1,400 kc.; oscillator signal should come in at 1,400 kc. on the dial scale. If neither the high nor low frequencies are received at the correct dial setting, then the dial scale should be shifted so that a low-frequency station or signal is received at the exact dial-scale frequency. The receiver is then tuned and aligned by adjusting the compensating condensers in the same manner as described above.

Should the receiver fuse blow when the line switch is snapped on, check for short-circuited or leaky 0.1-mf. buffer condensers connected across the line supply with their mid-point grounded.

The condition of an abnormal hum has often been found caused by a short-circuited 0.1-mf. "tuning" condenser connected across the filter choke. This condenser is connected across two lugs on the a.c. terminal strip and located beneath the strip.

General Motors 220

Maximum volume regardless of volume-control setting. Replace the 27 a.v.c. tube. This tube may check o.k. in a tube checker but will not function as an a.v.c. tube.

General Motors 252, 253, 254, 255, 256, 257, 258

Inoperative. When the unusual situation is encountered on this model where the receiver is inoperative until the a.v.c. 27 tube is withdrawn from its socket, check the 2-megohm carbon resistor in the grid circuit of the a.v.c. tube. Failure of this resistor removes the negative bias upon the grid of the a.v.c. tube, thus increasing the negative voltage of the a.v.c. tube and consequently the control-grid bias upon the r.f. and i.f. tubes to such a high degree that the amplification of these tubes is greatly reduced, resulting in an inoperative receiver.

The symptoms of distortion and almost twice the grid voltage on the output tubes as disclosed by a set analyzer are due to a burnt-out 100,000-ohm section of the voltage return of the high-voltage winding. This arrangement is the same as that used in the Atwater Kent 55.

The annoying condition of a loud buzz that rides in above broadcast reception at regular or irregular intervals has been traced to the 24 tube in the first-detector stage. Although this tube may test perfectly in several tube checkers, some internal defect (loose elements) will cause this noise complaint. Several type 24

tubes should be tried to secure one that will operate satisfactorily in this stage.

❖ ❖

Gilfillan

Gilfillan 25 AV-UV Super

In almost inaudible reception this manufacturer hides a 1,000-ohm resistor in the control-grid lead of the 57 tube, generally the maroon-covered wire nearest the control-grid cap. Check it.

❖ ❖

Gloritone

Oscillation at high frequencies despite cleaning of tuning condensers and wipers and check-up of by-passes, voltages, etc. Put two turns of wire around control-grid lead of tube not shielded, and ground to frame.

Gloritone 26

A set analysis showed the lack of screen-grid voltage on the three 24 tubes This voltage is obtained by a 2,460-ohm tap on the 11,500-ohm speaker-field winding. The ohmmeter showed the field coil to be o.k., but the 2,460-ohm tap open. A 25,000-ohm resistor connected from the field coil to the screen-grid circuit made it unnecessary to rewind the coil.

Cutting in and out accompanied by oscillation or howling. Usually caused by open screen-grid or cathode-resistor by-passes. These are all in one can beneath r.f. coil shields. Cut old leads off to condensers and mount separate 0.25-mf. unit between r.f. cathodes and screen to frame. In making this repair, it will be necessary to run a new wire directly between cathode terminals on the sockets and another wire between screens on sockets.

Open-speaker field coil presents one of the most difficult problems to a serviceman. This set has an 11,000-ohm field tapped at 2,640 ohms and wound with very small wire. Naturally, the first point at which to expect trouble in a coil of this type would be the joints where the heavy-wire output leads are connected to the fine wire of the coil. However, examination of a number of defunct coils before had proved this rarely to be the case. Since the wire was very small, the thought occurred that it might be possible to burn through the break, and this was quickly and easily done, though it required a 200-volt supply to break through the gap.

A word about removing the coil might not be amiss. In this particular set, the speaker, a Utah, is not assembled with bolts or screws but is cemented together in a way to make reassembly difficult. However, the field coil can be easily removed and replaced by carefully observing the following procedure.

Remove the cone-centering screw. Then carefully pry the cone-centering spider loose from the cone excepting at the point where it is riveted. Hold the speaker in a vise and loosen the jam nut that holds the center pole in place.

A few quick blows with a hammer and chisel are usually the best way of doing this. The pole piece can be pushed straight through the center of the cone by holding the spider to one side. Reassembly is very simple if this method is followed. The spider is then cemented into place with a bit of film cement or nail polish, the cone centered, and the job is neatly completed.

Howling or Whistling. See that lead from antenna post to volume control runs from post to corner of chassis and from this point to next corner, thence to control. Slide it under all other wires so that it rests directly on the metal chassis all the way around.

Set Cuts Out. This set would play quite well for a while, then suddenly and quietly it would completely cut out. When cut out, the 2,640-ohm resistor would heat up to the boiling point in a few seconds. This resistor was originally a candohm, but in three out of four of these sets, the candohm was replaced with a carbon-type resistor.

After searching over the set for a couple of hours, we found the trouble in the speaker field that is tapped to act as a bleeder to supply the screen-grid voltages. When it shorts, it shorts across the hot side to ground through the above-noted resistor; hence the heat. The short can be proved by connecting a voltmeter (330 volts) from the red wire to the white wire of the speaker. If shorted, this will drop to zero when the set cuts out. The speaker is easy to dismantle, and after the paper cover of the field is taken off, it will be seen that some of the insulation is worn from the enameled wire under a lead connection. Placing a piece of heavy paper of cambric under the soldered connections of the leads will cure the trouble. It is better to dope the coil and re-cover it. The resistor must be replaced, for it is sure to be damaged.

Gloritone 27

If set oscillates and condensers test o.k., the trouble sometimes may be remedied by regrounding the r.f. coils to the chassis instead of to the shield cans, since poor contact is often made between cans and chassis.

Installing Pilot Light. Remove chassis from cabinet and note small opening just below volume control and just over the dial. In this opening solder a pilot-light socket to the chassis so that the bulb will rest over the dial. The chassis furnishes one current lead. Carry the other to the proper filament prong of the 45 and install a 1.25-volt bulb.

Low Volume. Frequently due to defective speaker field. Coil may test o.k. with an ohmmeter but opens under load. Test by touching metal screw driver to core with set in operation; note magnetism.

Gloritone 99

Distorts at High Volume Level. Usually due to open four-mike electrolytic. Also

check 400,000-ohm resistor from 47 grid to voltage divider for change in value or open circuit causing high-pentode plate current. If 47 is weak and other tubes are o.k., this may be the cause.

❖ ❖

Graybar

Graybar GB9

See data on RCA-Victor R-11.

Graybar GC10–69, 10–88, 10–99

See data on RCA-Victor R-74, R-76, R-77.

Graybar GB 100

See data on RCA-Victor R-50, R-55.

Graybar 500

The volume was very poor in this set, and only a few locals could be received. The trouble was found to be due to tuning-condenser rotors being sprung out of line. Since these rotors are nonadjustable, the stator plates must be reset and the set rebalanced (by adjusting the three trimmers, which look like part of the chassis assembly, located on the front of the chassis).

Graybar GB 700

See data on Radiola 80.

Graybar GB 770

See data on Radiola 82.

Graybar GB 900

See data on Radiola 86.

❖ ❖

Grebe

Grebe SK-4

If these sets fade on locals and are brought back by turning up the volume control, or vice versa (if the station comes in very loud and the volume control has to be turned down) during the first few minutes the set is turned on, the trouble is gassy 24 tubes. Such tubes will often check o.k. in a tube tester, but new tubes will remedy the trouble.

Oscillation between 550 and 750 Kc. Tighten all contact clips on variable-condenser rotor shaft all the way. If this cures the trouble, release them enough to permit easy operation of the dial. Clean with pipe cleaner dipped in alcohol, and align.

❖ ❖

Grunow

Grunow 7A

Volume drops intermittently, but set does not go completely dead. Check two 0.1 mike condensers connected between lower end of r.f. coils, and ground. Located in small can fastened to bottom of coil shields. Lugs on the can are blanks. Connections made by wire leads inside shield.

Intermittent or No Reception. Common cause is defective 0.1 condenser in block

back of tuning gang, identified by green lead that, with two red leads, is connected to a common terminal at the left rear of the short-wave switch. Use a 600-volt replacement. Also replace 1,000-ohm resistor located nearest filter condensers on resistor bank, since this is usually ruined by failure of the condenser described above.

Grunow 500

No Voltage. Although not shown in the factory diagram, some of these sets have a hum-bucking coil in the speaker. If the sets show no voltage, check the speaker windings, since a flash sometimes occurs between the two coils and destroys the leads to the field coil.

Grunow 501

Hum in these sets is often caused by a faulty filter coil. The laminations come loose and hum badly. Replace with a new coil.

It was found that set would still draw current with the switch off. The dial lights would glow slightly as an indication. The trouble was found in the fairly large condenser jammed in behind the speaker. Replace with a smaller sized unit.

Grunow 750, 751

A loss of volume, a common trouble in these sets, can generally be traced to a defective volume control.

Grunow 801

Hum and a general failure to reproduce properly can generally be traced to a faulty 6B7 tube.

❖ ❖

Gulbransen

Gulbransen. Nine-Tube Receiver

Fading on this receiver is usually caused by loose rivets on the terminal board on top of the power transformer.

Gulbransen 9

Fading is usually due to defective local-distance switch. Move the wires leading to it, and if fading occurs replace switch.

Gulbransen 23 (Wells-Gardner 20)

Failure of 40,000-ohm yellow resistor mounted on voltage divider. Due to overload. Substitute 2-watt unit. The resistor goes from first a.f. plate transformer B+ to B+ of power pack or to low-voltage end of field used as choke, and is a filter unit.

Gulbransen 75

Static on all stations, tubes and voltages o.k. Traceable, as a rule, to defective plate-choke coil in 24 detector circuit.

Gulbransen 92, 93

Tubes Burned Out for No Apparent Reason. Note position of B− limiting resistor connected from socket of 33 to filament prong of second detector. Arcs occur between this resistor and a nearby

filament wire. Intermediate frequency: 175.

❖ ❖

Hallicrafters

Hallicrafters. Sky Buddy (Earlier Model)

When excessive frequency drift is encountered (sometimes as much as 10 or 15 kc.) in this model receiver, it can usually be traced to the resistance of the screen-dropping resistor for the 6A7 (oscillator and first detector) and the 6F7 (intermediate frequency and beat-frequency oscillator) rapidly changing value.

Replace the original 25,000 ½-watt resistor with a 25,000 5- or 10- watt resistor, and your problem is generally solved.

❖ ❖

Halson

Halson A.C.-D.C. Midget

Dial Lamps. Halson A.C.-D.C. Midget and other sets make use of odd-sized dial bulbs in series with tube filaments that are very difficult to obtain. We suggest shunting a resistor across the dial-bulb socket and using a standard-sized 6- to 8-volt (brown bead) bulb. Also, with this hookup, the set will operate even though the dial light has burned out.

❖ ❖

Howard Highwayman

This auto receiver is nonpolarizing, and no precautions need be taken as to whether the car battery has positive or negative terminal grounded.

If the fuse in this receiver blows out frequently and the insulating sleeve has been properly placed over fuse, the trouble probably is in the vibrator. In such a case, the vibrator should be replaced; *Never attempt to adjust the vibrator points.*

❖ ❖

Hudson

1934 Hudson

Noise Suppression. Install a dual condenser on the generator, one directly on the temperature indicator at the radiator, another directly on the oil-gauge connection at the bottom of the motor pan, and one on the gas gauge directly on the top of the tank. This can be reached after removing the rear seat, since there is a door for access. Also, use condensers in the dome-light lead and coil-supply lead right at the coil. It is also frequently necessary to shield the high-tension lead from the coil right up to the fire wall. And the low-tension lead from coil to distributor should be removed from the spark-plug duct and shielded.

❖ ❖

Jackson Bell

Jackson Bell Peter Pan

The coils of these sets should be inspected as they come in for servicing. The tape used to hold down the windings

on the ends of the coils seems to be conducive to chemical reaction; as a result, the wire sometimes is completely eaten through.

Jackson Bell 62

Power Transformer Heated Up to a Dangerous Temperature. Upon examination, it was found that the chassis had holes in the sides for ventilation but that when the chassis was in the cabinet, these holes would let no air pass through the chassis simply because the ventilating holes were tight against the side of the cabinet. The best remedy for this is to drill several holes in the bottom of the cabinet to let air circulate around the transformer.

❖ ❖

Kadette

Kadette 66 and 666

In Models 66 and 666, Kadette employs an unusually simple circuit for short-wave reception. In the short-wave position an inductance is shunted across the oscillator coil to reduce the effective inductance, and tuning condenser in the grid section of the 6D6 first detector is removed. The coil alone serves to make the stage broadly resonant over the short-wave band.

On the broadcast band, the manufacturer recommends alignment at 1,400, 1,000, and 600 in the order named. Intermediate frequency is 448 kc. Note that the plate supply for 6D6 detector-oscillator first feeds through the oscillator tickler coil.

❖ ❖

Kellogg

Kellogg 533–536

Sudden or gradual decline in volume, returning to normal with sharp click. Check small blocking condensers mounted on variable-condenser gang. Replace with identical values.

❖ ❖

Kennedy

Kennedy 4 A.C.-D.C.

Trouble on 25-cycle Lines. Always use a voltage regulator and set it on the lowest voltage tap provided. Without this, the set will almost always develop hum ripple, completely blurring out reception.

The receiver cut out and was very noisy. A thorough check of the chassis revealed all components to be o.k. Finally each tube was jiggled in its socket, whereupon the trouble was localized in the socket of the 6B7 tube. A loose connection was found at the plate terminal of the socket. This was resoldered, and the receiver gave no further trouble.

Kennedy 20B

The complaint in this set was of distortion and no volume. Upon checking all voltages with the analyzer, we found 275 volts on the plates of the push-pull 45's, the other voltages being normal. Removing the chassis, we checked the

voltage divider (each section of which is marked in ohms). The 755-ohm section at one end of the voltage divider was open, and after we had replaced it with a new 750-ohm, 10-watt enameled resistor, the voltage on the 45's became 250 volts, and the radio set worked fine.

Kennedy 26, 526

A frequent cause for an inoperative receiver or a noisy one is found in a shorted or shorting condenser-gang compensating condenser. The condition is due to the cracking of the insulation between the compensator plates. In order to repair this difficulty, it is necessary to remove the condenser-gang shield. Adjusting the compensating condensers requires the removal of the tube shields; or an off-set screw driver may be used.

Kennedy 30, 32, 632

Fading is the principal cause for complaint in these models and is due to various portions of the receiver. Only the most common frequent failures will be discussed herein. The fading is intermittent and may clear up as soon as the chassis or tubes are disturbed to make a test, making repair difficult.

Where this condition is encountered and the symptom of low detector-plate voltage is found, with a proportionate decrease in all other plate voltages, check the detector-plate filter assembly, which consists of an r.f. choke and two 0.005-mf. by-pass condensers connected. These two condensers break down intermittently and become leaky. If the detector tube is withdrawn or reinserted into its socket, the leaky condition and the fading will disappear. Since one side of each of these condensers is connected internally to the metal case of the filter assembly, it is not necessary to replace the entire unit. Insulate the can from the chassis and connect two 0.005-mf. condensers externally from both sides of the r.f. choke to chassis.

The 0.06-mf. Sprague audio coupling condenser will produce a similar condition, although in this case all voltages will be intact. Because of the poor electrical contact of the connecting tabs, which depend almost solely upon pressure for contact, the condenser open-circuits upon vibration of the chassis caused by strong signals.

If the intermittently operating receivers can be made to perform after reception has ceased by withdrawing and reinserting either of the two 45 power tubes, invariably the trouble will be found to lie in an intermittently open-circuiting voice coil of the dynamic speaker. This voice coil, presumably for the purpose of obtaining a light-weight unit, is wound with wire resembling aluminum, to which the connecting leads cannot be soldered, connection being secured by mechanical means. Vibration of the cone causes the contacts to open-circuit, resulting in the fading. Should pinching the connection with strong pliers fail to eliminate the defect, a

new cone not employing the same type voice coil should be installed.

Kennedy 52

Low Voltage on the 47. The detector is resistance-coupled to the 47. Coupling condenser 0.006-mf. opens after being in operation for a few minutes.

❖ ❖

King

King 6J

Increasing the Volume. Since a great number of these sets are still in use, the servicemen cannot quite get a substantial profit by revamping them. The antenna clarifier is done away with, and a tone control is substituted in its place. The volume control, which fortunately has a value of 10,000 ohms, is shunted across the antenna and ground, and the center arm connected to the control grid of the first tube, thus making that tube an untuned input unit. This system greatly increases the volume and eliminates one tuning control. We have remodeled a number of these sets in this manner, and the owners have been more than satisfied with the results.

King 94, 98

Distortion. Several complaints have been received against King receivers, Models 94 and 98. The complaints concerned distortion in the form of fuzzy notes. This was usually due to an open choke in the first stage connecting the grid to the ground. This choke provides the grid-bias voltage for the first r.f. tube. With the choke open, the tube acts like a detector because of the lack of bias.

❖ ❖

Knight Superhet

Complete fading of signals, traced, after many hours of work, to the intermediate transformers. The first two intermediate transformers were the faulty ones. Riveted connections to one side of the trimmers being corroded caused the capacity of the trimmer condenser to change, thereby shifting the frequency of the i.f. transformer. Hence the fading.

❖ ❖

Kolster International

If the receiver fades after a few minutes of operation, look for the resistor located near the volume control shorting to one of the volume-control terminals.

Kolster 6F, 6J, 6K, 6L, 6M, 6R

Fading on these receivers is caused by poor contact of the movable arm of the volume control that controls the filament voltage of all four type 26 tubes. Because of the heavy current passing through this control, the contact arm and resistance strip become corroded. This may be remedied by cleaning the resistance with steel wool or fine sandpaper. After the contact arm has been cleaned, it should be bent to increase its tension.

A howl that is heard when the receiver is first switched on is caused by unequal heating of the 26 and 27 tubes. The condition may be rectified in most cases by shunting a 100,000-ohm carbon resistor across the secondary of the first audio transformer. Although this will result in a slight drop in volume, it will also lower the hum level.

An annoying buzz can often be eliminated by shielding the 227 detector tube and grounding the shield.

Choked and weak reception has been traced on several occasions to a short-circuited 2-mf. speaker output condenser located in the power unit, an integral part of the condenser block.

A slight but annoying distortion was the complaint. Tubes were perfect, voltages all o.k. excepting that the filament of the 71 tube had about 5½ volts. The 6-volt pilot that lights from same winding as type 71 tube is mounted with the push-pull a.c. switch, and its circuit comes in electrical contact with the frame of this switch. When disassembled, this switch revealed a resistance of about 10,000 ohms between line connections and frame. A direct short will cause the type 71 tube to blow if the a.c. line plug connection is right, and there is a ground on the set. We replaced the switch with a long-necked toggle.

Kolster K20, 21

Lack of volume and weak reception caused by a shorted trimmer condenser that cuts out one r.f. stage in effect. The condenser is located at end of the condenser gang near the 27 detector tube. The trouble is caused by the mica falling out, thus allowing the plates to short.

Kolster K20, K21, K22, K23, K24, K25, K27, K28

The presence of a high-pitched whistle on some of these receivers is a complaint frequently received. When it is not caused by the speaker cord being too near the 27 detector tube, the trouble may be remedied by placing a grounded shield over the 171A power tube and not over the detector tube, as would seem more logical.

Howl. Because of the unequal heating of the 27 and 26 tubes, a loud howl will be heard when the receiver is switched on. The length of time taken for this howl to subside depends upon how long the detector tube takes to heat. Although replacing the 27 tube with a quick-heating type will sometimes eliminate or reduce the duration of the starting howl, it is possible to rectify the condition in almost every instance by connecting a 100,000-ohm carbon resistor across the secondary of the first audio transformer. This will not affect volume to any appreciable degree and will have a marked effect upon reduction in the hum level, besides emphasizing low-frequency response.

Fading and Noise. These models are serviced frequently for *fading and noise*, the latter condition caused by some

defect within the receiver. One of the causes of both these symptoms lies with the carbon-type volume control that is connected across the primary of the third r.f. coil. The vibration will cause noise or fading. In some cases the unit has been repaired by wiping the surface of the carbon strip with a soft cloth that has been dampened with alcohol and cleaning the dirt and corrosion from the roller and connecting arm. A majority of the noise complaints have been found due to noisy audio-transformer primary windings. Since both these audio transformers are contained in one unit, replacement becomes a somewhat expensive proposition. Disconnecting the primary winding from the rest of the circuit and applying high voltage for a brief moment have often cleared up the defect. Where this does not help, the unit should be removed and heated in an oven to dry up any moisture that may be present.

A frequent cause for noise in this receiver, characterized by a sputtering and crackling, has been traced to the voltage divider. Imperfections of a metallic nature in the vitreous enamel covering the resistor and blistering of the enamel permit moisture to be absorbed. Arcing at these points produces the interference.

A strong microphonic condition often found when the receiver is tuned to resonance is due to vibration of the tuning-condenser plates. The insertion of small felt washers between the plates of the condensers to dampen the vibration is impractical because of close spacing. One solution to the problem is to adjust the r.f. circuits farther from the point of oscillation. Although this may be done by increasing the value of the grid suppressors, it is accomplished more satisfactorily by removing the small fixed condensers that are connected across the three grid suppressors, removing the condenser across the third suppressor first. This method is preferable to that of increasing the grid-suppressor value, for the latter will tend to introduce broad tuning and insensitivity. Under no circumstances is it advisable to correct the condition by throwing off the alignment of the condenser gang, which, incidentally, is aligned by bending the slotted-end rotor plates of the tuning condensers.

The cause for an inoperative receiver or intermittent reception has often been traced to a shorted detector tuning-condenser compensator that is located on the side of the condenser-gang housing. The mica insulation falls out, permitting the outside plate to short to the gang housing. Since this condenser is usually of little consequence, it may be disconnected from the circuit, or another strip of mica may be installed if it is so desired.

Oscillation. On many of the later production receivers, an adjustable condenser is connected across the last grid suppressor instead of the usual fixed condenser. When the condition of oscillation is encountered that is not caused by open-circuiting condensers or poor tubes,

this regeneration control should be adjusted by turning the adjusting screw slightly counterclockwise. Turning this screw to the right will bring the r.f. circuit closer to the point of oscillation and will improve reception of weak signals.

The adjusting screw is accessible through a hole to the left of the r.f. tube socket.

Noisy and intermittent reception has often been found caused by loose nuts holding the power-pack cable terminal strip to the terminal screws on the tuning chassis.

Kolster 20, 23, 25

Oscillation is a common trouble in this model. These receivers have no adjustable neutralizing condensers and sometimes doing away with oscillation becomes a problem, especially after the set has been tampered with.

Reversing the antenna coil will sometimes effect a cure. Bending the corners of the small 75-mmf. condensers that shunt the grid suppressor is sometimes helpful. Another method is to increase the resistance value of the grid suppressors.

If these methods are unsatisfactory, however, try adding a 50,000-ohm resistor in the control-grid circuit of the second r.f. tube, placing the resistor between the control-grid suppressor and the secondary and chassis. This method will stop circuit oscillation without reducing the sensitivity or affecting the r.f. tuning.

Kolster K21

It is possible to receive a shock in installing a ground wire in these sets if the line plug is inserted the "wrong way" in the outlet so that the ungrounded side of the line is connected to the chassis through the extraordinarily large line-grounding condenser in the set. Since the other side of the line is grounded, almost the full line voltage exists between the chassis and the ground pipe. To preclude all chance of receiving a shock, the line-grounding condenser should be disconnected by clipping and taping the orange lead emerging from the condenser block. (It is best to replace the large condenser with one of about 0.01 mf.)

If the receiver howls for about 10 sec. after the power is turned on, it is due to the extra piece of green wire that is connected to the first a.f. tube grid in addition to the connection to the transformer secondary. This short piece of wire is laced in for a way with the power-supply wires for the tuner, but its other end is not connected anywhere, and it serves no useful purpose. Its removal will stop the howl.

Lastly, to improve the sensitivity greatly, the grid suppressor in the grid of the third r.f. tube may be removed. We found this was the only suppressor that could be removed without causing oscillation at the high-frequency end of the dial.

Kolster 21, 23, 24, 25

If these sets oscillate after new tubes have been inserted, replace all grid sup-

pressors. The first r.f. grid suppressor should be replaced with a 3,000-ohm resistor, and the other suppressors should be replaced with 2,500-ohm resistors.

Kolster 43

Fading is generally traceable to an open 0.6-mf. by-pass in the screen-grid circuit.

No Reception. Check 1,500-ohm (approximately) resistor between terminals 1 and 3.

The condition of hum is one of the most common causes for complaint in this model. In most instances it has been traced to vibration of the shield enclosing the power transformer, due to loose laminations of the latter unit. This situation may be rectified after the laminations have been tightened by stuffing the air spaces between the shield and the power transformer, which greatly amplifies the hum from the transformer, with noninflammable material to damp the vibration. If it is permissible, the shield may be removed and discarded.

An unbalanced condition of the push-pull input-transformer secondary will also cause hum. This may be checked by measuring the d.c. resistance of each section of the tapped winding. The only remedy in this case is replacement of the transformer.

Fading in this model has almost always been traced to an open-circuiting screen by-pass condenser whose capacity is 0.6 mf. Should the drop in volume be gradual, check the same condenser for leakage. The antenna portion of the dual volume control employs a carbon resistance element, which, if broken in one or more places, will produce the symptoms of intermittent, noisy, or fading reception upon vibration. Loose r.f. coils within the metal shields are frequently the source of a fading condition. The coils "float" to the side of the shield upon vibration of the chassis, thus changing their inductance.

Kolster K45

Distortion at high-volume level is sometimes due to loosened voice-coil windings rubbing against the field-coil core.

Kolster 70, 72, 75, 80, 82, 90, 92

Fading. All these models have one complaint in common: that of fading or a gradual decrease of volume each time the volume control is advanced to offset the decrease. In almost every instance, the fading has been eliminated by replacement of the a.v.c. 24A tube, although this tube will check perfectly. Several good 24A tubes must be tried in some cases before a satisfactory one is found. Weak reception at the high frequencies is also due in many instances to a poor a.v.c. tube.

Kolster K140

Weak Reception, Fading. R_{19}, a 1-watt resistor of 25,000 ohms in screen circuit located at the end of chassis farthest from power transformer and R_{21}, a 10,000-ohm

10-watt unit located near it, change value. Replace both with 10-watt units. Difficulty in aligning receiver due to unstable i.f. amplifier. Align all transformers exactly to 175 kc., find the one that seems to be least stable, and turn its trimmer all the way in. This seems to give better selectivity and stability than staggering. To locate unstable stage, place screw driver near each, noting the one in which most change is introduced.

❖ ❖

Lyric

Lyric D

A temporary repair for these receivers when the push-pull transformer between the 27 audio tube and the two 45's goes "dead." An ordinary audio transformer is connected with its primary between the plate and B supply of the 27 tube and its secondary between the two grids of the 45's. A 2,000-ohm resistor is connected from one 45 tube grid to the chassis.

While the action resulting from this wiring is not equal to the original circuit, because of the fact that push-pull action is not obtained, the results are very satisfactory for a temporary repair.

The owner complained of rising and falling volume. Also, turning on a light in the house would cause volume to be deafening. Oscillation was sometimes apparent. An analyzer test disclosed correct voltages. Tubes tested o.k. Nor did substituting new ones give different reception. The remedy was a new volume control. We also added 0.25 mf. to screen-grid and cathode by-pass units, which cures oscillation in all these models.

Lyric S6

Tone distorted, everything appears to check o.k. Replace 200,000-ohm resistor in circuit of unshielded tube on rear of chassis if value is materially higher than this. Plate voltage will appear normal on an analyzer.

Lyric S7

The set was dead, and the pentode output tube was red hot. The output transformer was open, which left no voltage on the plate, and the screen grid had to carry the full load.

Lyric S8

The customer complained of noisy reception, saying that the set would sometimes play well for five minutes or so, then get noisy again. A shorted condenser, C_1, was found and replaced, but the noise continued. Finally the a.f. input transformer was replaced, and this cured the trouble. This transformer had checked o.k. on a resistance test.

Lyric U55

Oscillator refuses to work consistently. Shunt the 4,000-ohm resistor in the center of the chassis underside, with 7,500 ohms, raising the oscillator plate voltage.

the small orange wire leads into the filter pack and connects to a 2-mf. filter condenser (see Fig. 13). This condenser was shorted, causing the 80 filament to burn out. The lead to the condenser should be cut and taped, and a 2-mf., 600-volt condenser mounted on the outside of the can.

Because these receivers were small and light as compared with previous larger models, they were not accorded the same treatment during shipment and handling. For this reason, it is often necessary to realign the r.f. circuits whose adjustments have shifted because of rough handling. This condition is made apparent by poor sensitivity and the fact that stations are received at an incorrect dial frequency. The i.f. trimmers seldom require adjustment. The oscillator trimmer condenser (1,400 kc.) is accessible from the bottom of the chassis and is the first compensator on the condenser gang on the dial side. The oscillator tracking condenser (600 kc.) is accessible from the rear of the chassis, below the r.f. 24 tube.

A loud hum is often caused by an open-circuited filter-choke "tuning" condenser, which is used to resonate the filter choke. The same condition has resulted when this condenser has been found short-circuiting.

The symptoms of reception fading out or cutting off after the receiver has been operating a few minutes, have frequently been traced to a leaky 0.04-mf. oscillator coupling condenser, connected from the first-detector cathode to the tap on the oscillator coil.

Replacing dial bulb without removing two knobs, screws, and other miscellaneous parts. Remove dial escutcheon held by four small nails. Turn dial to 1,500 and remove end screw that holds dial strip. Insert bulb and backtrap process.

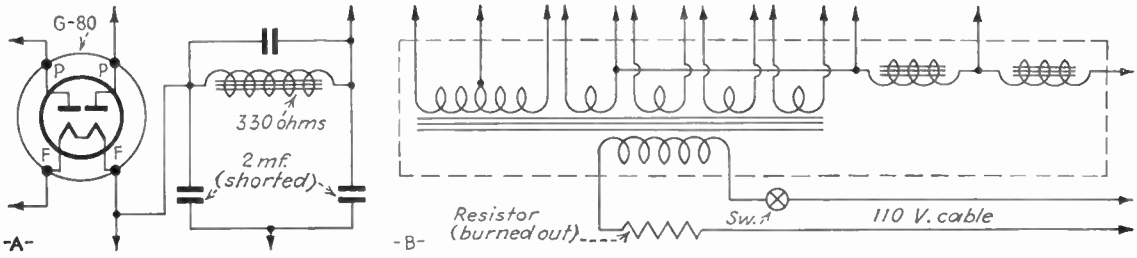

Fig. 13.

Majestic 52

This model would cut in and out of operation frequently. The tube-socket voltages and unit values were normal at all times. It was discovered, however, that putting a certain amount of pressure on the rear end of the chassis near the right side of the chassis would cause the radio to cut in and out, at will, just as it did in operation. The chassis was turned over to expose the wiring and units underneath. Probing among the tube contacts brought no results, but it was discovered

that usually the 0.04-mf. condenser between the cathode of the first detector and the top of the grid coil of the oscillator was defective.

A Decided Improvement. This model came out before the advent of the multi-mu tubes, but circuit constants are such that the G-24 tubes can be replaced with the multi-mu G-51's and will show vast improvement as to noise level and cross talk. This change improves the set so that it compares favorably with the new Model 21 series.

Inoperative. When you see the complaint on this model does not work, check the second-detector plate voltage. If there isn't any, you can be sure the trouble is the 25,000-ohm resistor enclosed in the can holding the sockets of the two 45's and the 80. This resistor is accessible by removing one screw and taking off the back plate. Another common failure is the 0.1-megohm grid resistor in the oscillator circuit. (This resistor is directly at the oscillator socket.)

Majestic 60, 61, 62, 160, 163

Inoperative. Where one of these receivers is encountered in an inoperative condition and no plate voltage is obtained upon any of the tubes, the trouble is probably due to a short-circuited 0.1-mf. by-pass condenser located within the first or second i.f. transformers. It is impossible to repair this defect by removing the transformers in question and cutting or chopping out the rivets holding the shield assembly of the transformer together. If the unit is carefully heated, the wax compound will become softened and the defective condenser may be worked loose. As in the case with Model 20, a new condenser may be installed and the transformer reassembled or the condenser connected externally. A repair may also be effected by insulating the shield of the first i.f. transformer from the chassis by means of insulated straps and fish paper. The ground connection of each trimmer may be connected to the B+ side of the primary and the grid return of the secondary, respectively. Where it is found that the defective unit is located in the second i.f. transformer and a repair is being made by insulating the shield of the i.f. transformer by following the procedure outlined above, it will be necessary to disconnect the secondary-return lead from the shield can and bring a lead out to the chassis.

When the situation is found where the receiver is inoperative until the a.v.c., tube is withdrawn from its socket, look for a "floating" connection to the lug on the small terminal strip located alongside of the a.v.c. socket that connects to the control-grid lead of the a.v.c. tube. This open circuit causes the a.v.c. tube to draw such high plate current that an excessive control-grid bias is impressed upon the r.f. and first and second i.f. tubes, rendering the receiver inoperative.

Majestic 60, 70, 80

To Increase Sensitivity and Volume. Place a 250-mmf. mica condenser between the contact arm of the 10,000-ohm volume control and the low end of the variable r.f. coil in the first r.f. stage. Noise will also be reduced by this addition.

Majestic 60 and 160 Series

Fading and Poor Sensitivity. In the Majestic 60 and 160 series sets (61–62–163), fading and poor sensitivity are caused by the 5,700-ohm carbon resistor mounted on the resistor stick and the two 0.067-mf. condenser acting as grid returns to the r.f. tube and the first detector and some to the set wiring. To cure, replace the resistor with a wire-wound, replace the condenser acting as grid return to the first r.f. tube on a 0.22 condenser and one acting as grid return for the detector with a 0.067. These condensers must be the finest obtainable and have rubber-covered leads. These condensers replace the orange wire running from a.v.c. tube plate to the small terminal board near the second-detector socket (there is an r.f. choke on this terminal board) with a rubber-covered wire. Replace the leads from the coils to condenser gang (except the oscillator section) with rubber-covered wire. These can be found by looking under condenser gang. Replace leads from the condenser gang to tube caps with rubber-covered wire. Replace with rubber-covered wire the black lead connected from the first i.f. transformer to the same lug on the small terminal board, mentioned before, to which the orange wire was connected. Replace the grid lead connecting the first i.f. transformer to grid i.f. tube with rubber wire. On the two grid leads coming from the chassis, remove the shielding or push it down as far as it will go. Only the finest rubber-covered leads may be used, since the leakage through the insulation of the old braid-covered leads was the chief cause of the lack of sensitivity. A complete alignment of condenser-gang and i.f. transformers is necessary after this is done. In some of these sets the changes were made by distributors, but in many they were not.

Majestic 66

Cut In and Out. Some Majestic Model 66 receivers cut in and out or stop altogether at times. In such cases, replace the G-6A7-S tube, even though the old one may test o.k.

The i.f. peak of this receiver is 175 kc.

Installation Hints. To reduce greatly motor-noise pickup conducted to chassis by pilot-light lead, make it easier to remove the set, permit the use of the set without the pilot light burning in daylight, proceed as follows: Before making the installation, remove the remote-control pilot-light feed wire from the chassis by unsoldering it inside or cutting it off just outside the case. When the remote-control unit has been mounted, connect the pilot-lamp wire to the tail-lamp post

on the lighting switch by holding wire to each post and snapping switch through its various positions.

No Screen Voltages. Check 10,000-ohm resistor just below 6E7 and 6C7 and if burned out, replace with one having higher wattage rating. Plate and screen voltages below normal. Check center-tapped filter choke (underneath set about an in. away from the A-battery female cable connector). If grounded side is open or partially open, there is no grid return to ground, for the output tube and lack of bias boost plate current to point where drop through choke becomes abnormally great.

Intermittent operation when car is operated over rough roads. Look for broken-shielded ground wire leading inside of plug at rear of set. Take off plug and unscrew, soldering wire.

An intermittent condition existing in this model of auto-radio can be attributed to leakage in the high-frequency leads as they pass from the pack through the chassis to the rectifier socket. A condition of this type is indicated by the low voltage and faulty vibrator action due to the increased load.

Weak, Noisy, or No Reception. If receiver has become weak, check rectifier socket for carbonization or breakdown. Remove shield of i.f. coil and insulate it from the frame with mica or fish paper.

A source of trouble is a peculiar electrolysis that takes place on the red-colored lead, going into the B choke. This opens the soldered joint of the choke where the lead connects to the fine wire of the choke winding. The symptom of this is a high voltage on the control grid of the 89 output tube. By placing the fingers across the control grid and chassis of the set, one may feel a slight shock that is due to this condition. The choke need not be replaced, for the winding itself is not open. Just cut into the first layer of insulating paper around the choke until the two leads are exposed. The choke winding going to the lead will be found disconnected, and resoldering will repair it.

Next time fuse blows, cut hole in cover plate at point where fuses are accessible, and make a cover of heavy-gauge material, holding it in place with two machine screws. After this is done, it will take only about 3 min. to change fuses.

Power-supply Noise. In Majestic 66 auto-radios there sometimes occurs noise that seems to come from the power pack. If the vibrator, condensers, and choke are in condition, a 0.25-mf. condenser from ground to one of the B+ leads should eliminate the trouble.

Blows Fuses. As the set warmed up and started to work, the vibrator points would stick, shorting one side of the transformer and blowing the 15-ampere fuse every time. After carefully checking the B and C supply (vibrator included) and not finding anything wrong in that part, we replaced the 6Y5 rectifying tube, and the set worked fine. (Intermediate frequency: 175 kc.)

Inoperative. Normal voltages, vibrator o.k., but set does not play. Try removing shield of i.f. coil, placing insulating paper around coil frame.

Excessive Noise. Look for loose or broken connection on metal covering on aerial lead. Resolder where it goes through eyelet on metal case.

When volume is low or fades, inspect the 0.03 by-pass condensers that couple the grid-return ends of first and second r.f. coils to ground and serve as coupling condenser between diode and triode section of the 6C7. The pigtail leads of these units are wound in a flat spiral, within cartridge, and make contact to the foil by means of a butt joint. If the case has not been completely filled with insulating compounds, it will make a bad contact.

Majestic 70

Hum. By substituting a 56 tube for the 27, the annoying hum in this receiver is greatly reduced.

High Frequencies Unstable. When new tubes are placed in this model, they may cause the set to oscillate on the high frequencies. This is natural, because the new Majestic tubes have a slightly lower grid-plate capacity than the set was originally balanced for. If a balancing wrench is handy this can be quickly remedied by backing up about an eighth of a turn on the three balancing condensers located between the r.f. and detector tubes. Even though this usually clears up the trouble, it is best to use the regular balancing procedure.

No Plate Voltage on First A.F. Tube. In this model one often finds that the first a.f. tube (a type 26) is getting no plate voltage. It is usual to suspect the primary of the input transformer. However, most of the time the trouble is due to an open 1,400-ohm resistor, mounted back of the subpanel inside the set.

It is very easy to make a repair here without removing the chassis at all, and it is a good idea to try the following trick first.

Remove the hum-control knob and place a Majestic 1,400-ohm resistor from the hum-control shaft to the chassis frame (ground). If music comes in o.k., ream out one end of the resistor to fit the shaft, place it on the back of the chassis and the bottom of the chassis. A good tight fit can be had by striking the flange of the bottom with a hammer. This is not a temporary job but can be made a permanent one by ordinary care.

When aligning this model, you will notice aligning condensers upon the side of each r.f. condenser as well as between each tube. First align each of these side condensers "in" before using your dummy tube and aligning the others "out."

In other words, align each of these side condensers for maximum output and then use your balancing tube to align the other condensers (between tubes) to minimum.

Fading. This set would play for about 5 min. and then die away. A snap of the

switch, off and on again, would bring the signal back again, but it would die out in about a minute. After a great deal of fussing around, the fault was located in the filament winding of the type 26 tubes. The voltage would show 1.3 volts when first turned on, then would gradually drop to 0.5 volt.

Majestic 70, 71, 72, 181

Broken Condenser Drive Cable. The most frequent cause for complaint in these models is a broken condenser drive cable. The quickest and easiest way for replacing these cables is to remove the gang assembly.

Remove the condenser-gang shield and unsolder the four leads from the condenser stators and the bare wire soldered to the end of the condenser frame. The leads to the pilot-light lugs are then unsoldered, and the three bolts holding the tuning gang to the chassis are removed. The condenser-gang assembly may then be lifted out from the chassis. After the cable is restrung, the gang is assembled in reverse order, as outlined. Total time on the whole job is 15 min.

Fading or intermittent reception of these models is often due to loose terminal nuts on the power-pack terminal strip. They should be tightened with strong automobile pliers.

Majestic 70, 90

Frying Noise. Sounds like noisy audio transformer but is not. Often due to corroded and loose leads in the ballast unit. Take cover off, loosen resistance wire leads, clean them well, and replace, tightening contacts well.

Majestic 70B

No Grid Reading on 71's. Check pilot-light socket. It frequently shorts to ground.

Set crackles and howls when first turned on. Check r.f. circuit 26's. Filaments sometimes expand when hot, shorting to grid, opening up again when permitted to cool. Tube testers do not show up the defect.

Majestic 90 Series

Loss of volume and extreme distortion often indicate an open in the r.f. choke in the antenna stage. Indicated further by the absence of grid bias on the first r.f. tube (a 27), with resulting high plate current. The antenna trimmer functions normally.

Carrier Hum. Remove receptacle plate on floor outlet from which set gets power and fasten ground lead to Gem B box by means of mounting screw. Such a ground is a positive remedy where iron conduit is well grounded.

Inoperative. Made during production, a 2,000-ohm choke was built into the condenser bank, one side of which connected to the junction of the second filter choke and speaker field, the other, to the positive B lead feeding the detector plate. The condenser-bank lugs to which this

choke is connected are the ones next to the bottom and the one next to the top, the one next to the top being the lug connecting the detector positive B. After this set was out of production, it was found advisable to change this choke to a resistor of about 35,000 ohms. The chances of the detector B section of the filter condenser blowing are lessened quite a bit if the resistor is used. To make the change, disconnect the wire from the next to the top lug, third from the top. The detector B lead is left connected to this third lug from the top also. All replacement condenser banks made by Grigsby-Grunow Co. now contain the resistor instead of the choke.

Inoperative. Some time ago a set was brought in about which there was a complaint, and upon examining it we discovered that the connecting lug was biting into the core of the transformer, beneath the cardboard terminal strip. Since that time many primaries have been found shorted in the same manner.

It is not necessary to discard the supposedly "shorted" unit (that of the lug biting into the core of the transformer), but only to disregard the lug terminal. Unsolder the transformer lead that connects to the lug and connect it directly to the proper circuit lead. This can be done conveniently, since the transformer lead is not soldered to the underside of the lug but emerges a short distance from it, the lug being used only as a means for coupling the two leads.

Set Oscillates. If an aerial on this model is excessively long, it will cause oscillation and sometimes a set that will not whistle without an aerial will whistle with one. The remedy is to shorten the aerial.

Inoperative. In the Majestic 90 series, trouble has been experienced with the 0.004 detector-plate by-pass condenser. In nearly every case where these condensers have broken down, it will be noticed that two 0.002 condensers of like manufacture have been riveted together. In replacing, be sure to use two rivets together of different makes. It seems that they stand up better if that precaution is taken.

Intermittent Reception. If a complete set of new tubes does not cure intermittent reception, replace 2 — 0.5 = mf. condensers located on inside of chassis wall. These open intermittently.

When weak signal on any part of the dial and scratchy noise are experienced when the knob is turned, remove four screws, lift off condenser shield, and replace sensitivity control on the end of the condenser shaft. For temporary repair, scratch some pencil lead on the control. The lid from the control is easily pried off with a screw driver.

Majestic 90B

Intermittent operation in this model is often caused by a defective choke coil in their r.f. plate leads. Simply shorting across this choke cures the trouble, and

the performance of the set is not hindered by doing this.

See Majestic 90B, 100B (1–9) for *motorboating*.

Fading. Replace detector cathode by-pass condenser. Check 27's.

Majestic 90, 90B

Hum, Sounding Like Noise from Small Motor. See that antenna and ground wires have not been reversed or that ground connection has not gone bad.

Majestic 90B, 100B

Noise, Motorboating. Generally traceable to defective 0.5-mf. r.f. by-pass condensers.

Continual motorboating at about half volume that would stop only when a.c. switch was turned off and on again at low volume. Voltages, condensers, tubes, and volume control o.k. This was caused by broken and shorted voice coil making contact on iron field core at high volume or low frequencies of sound.

Majestic 90, 91, 92

If analysis shows no detector-plate voltage, clip the wire between the second and third lugs from the top of the condenser block for a temporary repair with slightly reduced volume.

Violent oscillation, especially on high frequencies, when volume is turned up on station. Shunt a ¼- to ½-mike condenser across each of the r.f. by-passes located beneath the chassis.

Majestic 90, 91, 92, 93, 101–103

Noisy tuning in these models is usually caused by either one of two failures. In the first instance, the plating will be found to have peeled from the plates of the condenser gang. The secondary coil leads to each stator of the gang should be disconnected and high voltage applied across each condenser while the rotor plates are turned. Arcing at the shorted points will burn away the plating. The other cause for the same condition lies within the equalizer, a small variable carbon resistor that is in series with the volume control, mounted on the rotor shaft of the tuning condensers. These two units vary the cathode voltage of the first, second, and third r.f. tubes. The carbon element of the equalizer becomes worn and produces a noisy condition while tuning. It is very important that the connection between the equalizer shaft and the gang condenser shaft is a perfect one, electrically.

Intermittent Inoperative. A frequent cause for an inoperative receiver or for intermittent reception lies with a shorted or shorting audio or phono input transformer. The terminal lugs to which the transformer leads are connected have been found to bite into the core of the transformer. This defect may be remedied by disconnecting the transformer lead from the faulty lug and connecting it directly

or by straightening the end flanges of the shield so that the terminal board may be lifted and the bottoms of the lugs cut or insulated from the core. On the phono combination models, a cause for inoperation is due to a shorted lug on the phono input transformer and is remedied as described above.

Intermittent reception has often been traced to loose power-pack terminal-strip nuts.

Weak reception, if any at all, with the attendant circumstance of low plate voltages on all tubes, is often due to a leaky or short-circuited detector-plate voltage-supply filter condenser in the condenser block. Although a new condenser or block may be installed, a repair may be easily accomplished without any disturbance in voltage distribution or increase in hum level by disconnecting and taping the lead to the top terminal lug of the condenser block and connecting this lug to the second lug, after removing the jumper between the second and third terminal lugs. If no detector-plate voltage is obtained and the detector-plate voltage-supply filter condenser checks satisfactorily, look for an open-circuited 2,000-ohm choke in the condenser block, connected between the second and fifth lugs. The later production-power units employed a condenser block with a resistor of approximately 25,000 ohms, in place of the choke, connected between the same lugs.

Majestic 91, 92

Motorboating. Inspect flexible lead soldered to sliding arm attached to trimmer cup. After a time this wire wears, breaks.

Fading. Using the 90 chassis, 90, 91, 92, 93 using the 90B chassis, 101 using the 100 chassis, and 102–103 using the 100B chassis: Fading is often due to the volume compensator on the end of the tuning-condenser shaft being defective. This can easily be checked by setting the volume control at maximum, connecting an ohmmeter between the cathode hole in any of the first three r.f. sockets and chassis. Erratic motion of the ohmmeter needle as the tuning knob is turned shows the volume compensator defective.

Majestic 100B

Cutting In and Out. Check by-pass condensers across cathode resistors to ground. There are two in metal containers. Replace defectives with 1-mf. units.

O.k. on Phonograph Side of Switch but N.G. on Radio. Bare, twisted wire that connects inside the switch to chassis for ground, breaks. Caused by continuous use of switch. Solder lead from terminal 1 to ground. Switch is numbered 1 to 12.

See Majestic 90B, 100B for *motorboating.*

Majestic 110

Set Dead. No B voltages. Check 50-ohm resistance in the cathode circuit of

the 37 a.v.c. tube. This resistance completes the negative supply to the chassis and quite often burns out. Replace with 2-watt resistor.

The condensing of water (commonly called sweat) is a trouble frequently encountered in this receiver. This usually results in a short in the wires, causing the batteries to run down and burning the resistors and connections. The easiest and best way to remedy this trouble, when boring holes in the case does not help, is to dispose of the lead cover of the set. In its place use a piece of cloth so that plenty of air and no dust can get to the set. This idea gives wonderful results.

Majestic 118 (Ford 40)

When all voltages are seemingly low or swinging over a range of 50 volts on amplifier tubes, inspect vibrator armature for side play. Adjust pivot screws at side to take up this play. This will bring armature up to proper speed. Proper plate voltage on the 6E7, 6A7, and 6F7 is 182 for a filament voltage of 5.5 and 215 for filament voltage of 6.3 volts.

Majestic 130 Series

A common fault is fading, slight faltering of the signal, and poor sensitivity. All these faults are invariably caused by failure of the 0.04-mf. condensers furnishing the coupling for the band-pass tuner. There are three of these condensers mounted on the vertical upright on which the condenser gang is mounted. Look close or you won't find them. The only satisfactory repair is to replace all three of these condensers at once, for the work is worth a whole lot more than the condensers. The whole r.f. unit must be removed to make this replacement, but this isn't such a job as it appears at first. Nothing but a neon oscillator condenser tester will show the faulty condensers; so don't bother to test them.

Majestic 130A

Inoperative. Considerable profanity was spent to no advantage upon a set completely dead, even to local stations, even though all voltages and condensers were perfect. Tubes all o.k., everything o.k. except that the set would not play. Trouble finally located in a shorted 0.002-mf. condenser connected in series with a 100,000-ohm resistor from plate to detector to cathode. In this machine the condenser was connected to the cathode of the detector tube instead of the grounded, as shown in Rider's *Manual*, and about 60 volts on the cathode of the detector. Remedy: replace with a good 400-volt 0.002 condenser.

Oscillation from 900 to 550 Kc. Balancing did no good. Voltages were o.k. Condensers tested o.k. Poking among the wires in the bottom of the set, we moved the ground lead of the 0.04-mf. condenser in the grid circuit of the first r.f. tube and noticed a change in the pitch of the oscillation. We disconnected the lead, and the oscillation disappeared. A

new condenser was tried, and the oscillation returned. After trying a couple more with no better results, we were informed that the set worked better than ever before. (There is no explanation to offer for the cause of this fault or its cure.)

Majestic 130, 131, 132, 233

Noisy tuning on this model is caused by a corroded condenser-gang copper friction contact located at the front end of the condenser gang behind the dial. This condition is corrected by removing the dial assembly and loosening the collar on the gang shaft so that the copper contact may be cleaned and bent to increase its tension. When the contact is replaced, the friction collar should be forced back against the contact and its screw tightened.

An inoperative receiver or one that operates intermittently is frequently caused by the terminal lugs of the push-pull input transformer shorting to the core of the transformer beneath the terminal strip. The remedy is the same as that described for the Majestic 90, where the same condition was first encountered.

A high cathode voltage of over 300 volts, obtained on the first and second r.f. tubes, will be found due to the tearing away of the blue wire connecting to one of the end terminals of the volume control. Loosening of the volume-control mounting nut will cause the volume control to shift and snap this blue lead because of little or no slack in the lead.

Majestic 132

Intermittent and Noisy Operation. One complaint against this model was that it operated intermittently, with some noise and fading. The trouble was finally located in the rotor contact of the tuning-condenser gang. The rotor of the gang is not electrically connected to the chassis, but relies only upon a mechanical friction for its connection. To get at the trouble, the shield must be removed from the tuning gang. At the front end of the shaft in back of the dial and directly outside the bathtub will be seen the friction collar upon which the copper contact rides. The contact will be found to be corroded and most of its tension gone. This contact should be removed by loosening and taking out the two screws that hold it. Polish it with steel wool and clean well. The friction collar should then be taken off by loosening the setscrew, and the side which the contact arm rides on should be thoroughly cleaned of all oil and polished with sandpaper or steel wool. Before the shield is replaced, use a pipe cleaner on all the plates of the variable condensers and make certain that the plates are not too close to each other, since they may short, a not infrequent complaint with these sets.

Majestic 200

Generally Poor Reception. R_1, a 15,000-ohm and R_2, a 20,000-ohm resistor, both in the voltage divider, connected from plates to screens and from screens to

cathode coil of the first detector, change value. Replace with 10-watt type. Also replace entire can containing C_5 0.03 coupling condenser, 0.04, a 0.1-mike first-detector cathode by-pass and C_3, a 0.25-mike r.f. cathode by-pass. Leakage is common between these units and is sometimes of the order of 2 to 3 megohms.

Majestic 201

Oscillation or sharp whistle when the volume control is being adjusted near its low position is traceable to the bolt holding the speaker to the baffle. The bolt extends too near the spray shield of the first a.f. 35. Cut it off close to the nut, and, if necessary, pull the tube away with a rubber band. Trouble does not occur when the chassis is out of the cabinet.

Majestic 210

The complaint that the set would not work even though the tube got hot was caused by a broken filter condenser. (This model uses two 8-mf. dry electrolytic condensers.) Because of the lights fluctuating, however, it was necessary to put on a voltage regulator.

Majestic 290 Series

Erratic operation and extreme distortion are usually caused by leakage between the 7-mf. and 10-mf. electrolytic condensers that are built in to the same case. This is the small dual condenser. Disconnect the lead to the 10-mf. section and replace with a good-quality 10-mf. tubular condenser by connecting one end to the common lug on the old dual condenser and the other end to the lug on the resistor mounting board to which the old lead you removed was connected. This simply separates the two condensers and cures the fault. Watch polarity when connecting the new condenser.

Volume cannot be cut down sufficiently. Look for defective 10-mike condenser from cathode of 57 to plate of 58 noise-suppressor tube. Open-circuiting is common.

Majestic. All 300 Models and Superheterodynes

When installing a dial cable on Majestics, we find that the simplest and best way to hold the shaft while fastening the cable is to use a ¾-in. rubber cork, cut off so as to be about ⅝ in. long, between the shaft and the chassis. Time for installation and adjustment about 5 min. Who hasn't worked an hour or more?

Inoperative or Distorted. Models using pilot as resonance indicator. Set dead or distorted. Look for open or shorted winding on center leg of indicator transformer in r.f. and i.f. plate circuits. Replace. For temporary repair, short out winding by bridging two outside terminals and using 3.2-volt pilot.

(*All supers*) *gradual fade-out* is sometimes caused by the oscillator tube operating at too high a heater voltage. Reduce heater voltage, to this tube only, to 2.35 volts at a line voltage of 120.

Poor Volume. This model has dual speakers which had been repaired previously. The set lacked the proper power output and had poor volume, although everything tested satisfactorily. Upon examination, it was found that the speakers were improperly phased. By reversing the voice-coil leads of one speaker, proper phasing was obtained and the tone quality and volume were restored.

Majestic 303, 304, 307, 324, 344, 363

Resonance is indicated by tuning the station selector to the station until the pilot light is dim. This action is secured by means of a three-legged triple-winding iron-core reactor. The center winding is in the plate supply circuit of the r.f. first-detector and i.f. tubes. The two outside windings are in series with the pilot light. Because of the a.v.c. action, when the set is switched on and the station selector is not tuned to a station, a relatively large plate current will flow through the center winding, saturating the iron core so that the reactance of the two outer windings is low and the pilot light will light up brightly because of the added current passing through the outer windings. When the station selector is tuned to resonance, the a.v.c. tube increases the control-grid bias of the r.f. first-detector and i.f. tubes, resulting in a decreased plate current being drawn by these tubes. The plate current flowing through the central winding is reduced and reactance of the outer windings increases, limiting the current flowing through the pilot light, which will dim upon resonance. This center winding, however, is the cause of many service calls. This winding open-circuits, and the set becomes inoperative, necessitating replacement of the reactance unit.

Majestic 307, 344

When the complaint of low and distorted reproduction is received on these models, with the volume control effective only at the very beginning of its range, the 0.1-mf. condenser coupling the G-57 first audio tube to the output of the diode detector should be checked for a leaky or short-circuited condition. One terminal of this condenser is tied directly to one end of the volume control.

Poor Tone and Low Volume. Poor tone and low volume are often caused by a weak G-58 tube employed in the phase rotating stage.

Majestic 381

Poor Selectivity, Volume. Many men remove the metal shield on the bottom of the chassis. Oscillation is kept under control by proper use of volume adjustment.

Majestic 440, 460

Oscillation. Almost invariably due to defective 6F7, which is critical in this set.

Motorboating. Open 1-megohm resistor located in grid return of 6F7 triode section and shown on diagram as R_9.

High plate voltage on all tubes; no signal. Look for open 41 cathode resistor, which should be 500 ohms.

Failure of oscillator to work generally caused by poor soldered joint at third grid-return 150,000-ohm resistor associated with 6A7.

Midget 500

To Eliminate Slipping of the Tuning-gang Assembly. Remove the flange that holds and bears on the three ball bearings that gear the rotor. Place on bench, then place washer from a snap switch over same, and tap evenly with a socket wrench of the correct size. Assemble, and gang will not slip.

❖ ❖

Marconi

Marconi 1930 Models, Standard, Junior, and Senior

No Reception. The Canadian serviceman will come across these sets quite frequently, and unless pointers are given to him, he will probably be baffled for a while. In all these models the complaint of "no reception" when everything apparently checks o.k. is most likely due to compensators going out of adjustment. The remedy, of course, is to realign the circuits. This defect in the Junior Models may also be due to a dirty variable resistor that tracks with the tuning gang. Cleaning the resistor with graphite will at once restore the volume.

Marconi 35

Crackling Noise. The complaint against this set was that it had a crackling noise and a bubbling sound. Two weak 56 tubes were found and replaced. This did not correct the trouble, however. After the chassis was turned over several times, oscillation started and could not be stopped. It was found that one tuning-condenser section had no direct ground lead, and repairing this defect and cleaning the rotor contacts cleared up the trouble.

❖ ❖

Midwest

Midwest 12

The complaint was of excessive hum, and after the replacement of 5-mf. condenser that was found to be open in the cathode of the 58 second transformer circuit the hum was considerably reduced, but still there existed an unusually loud hum. After several hours of unsuccessful testing, we decided to tighten the bolts that held the core of the power transformer together. In attempting to tighten this bolt, we first removed a lug that was grounded to the bolt; when this was done the hum disappeared completely.

In tracing this circuit out, we found this lug was soldered to a shield that shielded the lead from the last i.f. transformer secondary to the volume control. This lug was grounded to the chassis, completing the job.

Midwest 16

A very great noise, as if cloth is being torn, may be traced to a shorted trimmer condenser under the chassis. A new trimmer will make the set work quietly again.

Midwest 16-tube

Distortion at Resonance. Realign the a.v.c.—i.f. transformer; if this stage is not peaked, the a.v.c. voltage will be insufficient.

Poor quality, especially on phonograph: Replace the cathode by-pass condensers on all the audio tubes with 5-mf. 25-volt units of some well-known manufacturer.

Midwest 16-34

Poor Selectivity and Weak Reception. This model does not hold its alignment, because of shifting of windings on coils. Coat all coils with wax or liquid cement and realign all trimmers. Go over all trimmers a number of times to uncover interaction between circuits. Before realigning, install a 3- or 4-plate variable midget condenser in place of the tone-control assembly. Tone-control assembly can be mounted on the side of the cabinet. Parallel this variable condenser to C_{19}, which is an adjustable coupling unit between oscillator circuit and mixer grid. This condenser affects tuning of various bands, and by having it variable from the outside, efficiency will be considerably increased. While aligning set at 450 kc., have the newly installed condenser set at about ¼ mesh, and screw C_{19} to minimum.

Unstable operation. Ground more thoroughly all shielded cables of this receiver. Double-ground the three coil and trimmer frames. Do not depend on rivets. Realign.

❖ ❖

Mission Bell

Mission Bell 17A

Failure of KR_1 Rectifier to Light Up. Often caused by shorting of elements by mercury. Place the tube in a tester and apply 6 volts d.c. to its filament.

❖ ❖

Motorola

Motorola 1935

Installation in 29, 30, and 31 Chevrolets. Bond all metal in overhead frame of car, such as the windshield adjustment and corner braces. Run antenna lead in shield to within 6 in. of antenna. Bond antenna lead to dash and dash to bulkhead. Run bond from fire wall up right front post to border on top members. Place grounded screen on floor boards, and bond motor and all choke and throttle rods running from motor to driver's compartment. If care is taken, no suppressors are needed.

Motorola. Golden Voice

Intermittent Operation. Should you encounter a Golden Voice set that cuts out intermittently or at times fails to come up

to full-power output, the trouble will be found due to low battery voltage delivered to the radio. Check all connections between the car battery and the radio set to avoid undue voltage drop in the car wiring, since the OZ4 rectifier tube will fail to start and fail to operate on a battery voltage of less than 5½ volts.

The OZ4 tube requires 15 ma. or more of drain to produce ionization and proper rectification in this tube, and on battery voltage of less than 5½ volts the plate-current drain of the receiver is insufficient to provide the 15-ma. starting current. Should the car wiring and the condition of the car battery indicate that at times the voltage may fall below 5½ volts, replace the OZ4 rectifier tube with a 6X5 metal filament-type rectifier.

With the exception of a few Golden Voice sets, the filament contacts of the rectifier socket have been wired at the factory and the 6X5 rectifier may be plugged into the socket in place of the OZ4. This will completely eliminate the difficulty due to low battery voltage.

In those Golden Voice sets not having the filament contacts of the rectifier socket wired, this wiring can be inserted by inverting the chassis and removing the cover from the "hash" compartment and connecting the filament contacts of the rectifier socket.

Motorola (Early Models)

Continual Breakage or Shorting of 201A's and 112's. Wind a few layers of tape around top of tubes to take up vibration jar that causes trouble.

Motorola Car Radios

Erratic Signal and Voltage. In most of the Motorola B eliminator packs and in those of the Mallory Company, you will find a condenser shunted across the high-voltage winding of the transformer. This is a 0.02-mf. condenser, rated at 1,600 volts. An erratic voltage output, that is, a variation from 25 to 60 volts, is a symptom of trouble with this capacitor. Also, one set of points may spark excessively.

Motorolas in Ford V8's

Motor Noise. On Motorola radios installed in Ford V8 cars, there is a motor noise that cannot be taken out with the ordinary methods. This can be cured by putting a piece of shield over battery lead wire from battery side of ammeter to the set. This shielding can be held in place by taking out the screw through the shielding, more grounding not being necessary.

Motorola Twin 8

Excess Vibrator Hash. Screw in bottom of set holding pack in place should first be tightened well. If this fails to remedy noise, put a 0.5-mf. automotive-type condenser on the hot A lead where it fastens on terminal lug, and ground to case of set.

Motorola 10Y. Chassis 10-1

A very annoying noise noticed only on the broadcast tuning range can be traced to the r.f. broadcast coil, which has a 47,000-ohm resistor across the primary. The primary will eventually open. However, the noise can be eliminated by replacing the coil with part No. 13-H.-37235.

Motorola 44

Power-supply unit hums, but set does not play. Take vibrator unit apart. Find two small flat condensers on top of reed unit. The reeds may be identified from the outside by tracing red and green rubber-covered wires. Remove original condensers. Replace with Mallory 16611-A oil condenser.

Installing in 1933 *Plymouth.* By placing a Motorola dome-lite filter in series with the dome-light lead that is on the left-hand front post, all interference is readily eliminated, and spark-plug suppressors are not necessary. Distributor suppressor is needed, however.

Motorola 55

Improve Life of Vibrator Unit. Connect 50,000-ohm resistor across output of filter condenser to improve life of vibrator unit.

Motorola 77A

Noise. In this model, the a.v.c. network is fastened to lugs on a bakelite strip and grounded to the end lug, which is riveted to the chassis. This rivet is not always tight and causes bad noise. Soldering this lug to the chassis eliminates the noise.

Loud whistle and distorted reception in early models. Generally caused by breaking of solid wire connection between tone control and small fixed condenser mounted on chassis directly behind control. The wire is covered with cotton braid and frequently appears to be o.k. Continuity test shows up defect. Replace with flexible wire such as is used in later models.

Dead Set. Suspect the vibrator first. Remove from housing and check the two 0.007 condensers shunted across the rectifying vibrator points. They frequently short. Replace with 1,600-volt, 0.007 oil-filled units.

Static when car is in motion. Sometimes caused by broken soldered joint between antenna coil shield and chassis, or by corrosion of spring contact grounding the variables. Bond rotors to chassis for permanent repair.

Motorola 88

Failure to Oscillate over Part of Range. Try several new tubes in critical autodyne detector-oscillator circuit. If this fails to remedy trouble, try 4,500-ohm cathode resistor or resolder all oscillator circuit connections, including coil wires to terminal lugs and connecting leads.

Music Master

Dial Shifting. The 6A7 tube refused to oscillate over the entire dial, or cut out of oscillation at low frequencies. This made it necessary to tune to high frequencies first and "creep up" on the low-frequency stations. Alignment, voltage, and resistance analysis checked o.k. The remedy was to increase the oscillator grid-to-cathode resistor from 25,000 to 40,000 or 50,000 ohms.

National Pfanstiel

Trouble in the Dynatron Oscillator Circuit. When trouble is encountered in this circuit, change the socket to a six-prong one and use the circuit shown. Dynatrons are easily spotted because the control grids are grounded (see Fig. 14).

Oldsmobile

Oldsmobile 1933

Noise Pickup, after Standard Suppression Is Completed. Run shielded antenna down left front doorpost to floor and under mat to set; shield high-tension and battery-supply wires and coil. Keep control cables away from ignition coil and use a battery-supply filter condenser and dome-light filter.

Philco

Philco Auto Radio

Loosening of Auto-radio Control Head Strap on Steering Column. Place stationary nut on strap directly against column instead of away from the post. This makes the strap "bulge," but will prevent the nut from being torn loose.

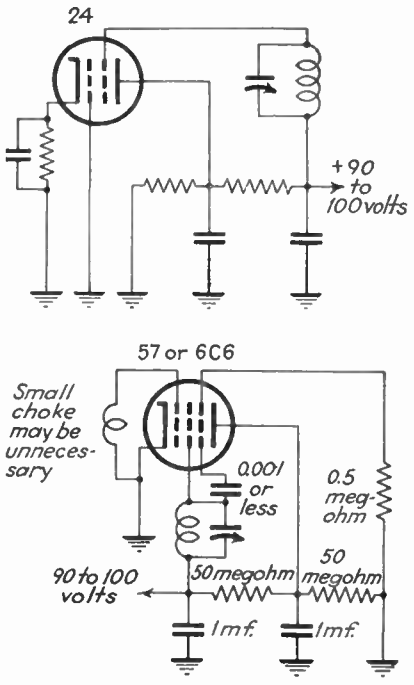

FIG. 14.

Intermittent Operation. This set was installed in a Dodge car, and the complaint was intermittent operation. The trouble seemed to indicate a bad tube, but upon checking the tubes, we found none defective. A hard jar would cause the radio to play temporarily. All parts checked perfectly, and no loose wires

could be found. Eventually the trouble was found in the i.f. coil. Two small nuts on the top were slightly loose, and when they were tightened the set gave no further trouble.

Philco Transitone

When installing set in 1934 *Chevrolet*, do not mount on right side near coil if this is avoidable, since it is practically impossible to remove motor noise due to chassis pickup. The battery lead on Model 10, cut to fasten to the ammeter or starter, is the guilty wire. Shielding does not help. Lengthen the lead, shield it, and then run it directly to the battery, connecting the lead to the negative and the shield to the positive post.

Philco Transitone 5

Oscillation and Distortion. Generally due to defective by-pass condenser between secondary of antenna coil and ground. Replace with 0.05.

No Volume. Check for defective by-pass between secondary of second i.f. transformer and one terminal of the volume control.

Philco 5

Frying or crackling in early serial numbers. If not in eliminator, remove grid clip from 6A7 cap and remove lead from clip. Using same-sized stranded wire with good insulation, wind r.f. choke for five turns on clip; reconnect lead. For obstinate cases, wind 30 turns No. 16 solid copper-covered wire around pencil. Withdraw pencil and place choke so formed in A lead between low-voltage r.f. choke and heater terminal of 84. Keep choke in the vibrator section of base. Solder and tape splices. Late serial numbers have these chokes.

Philco 5, 10

Motor Noise. In late Dodge and Plymouth cars, move freewheeling control cable at least 6 in. from distributor head to eliminate considerable motor noise. Bonding of oil and temperature line to fire wall should clear the remaining interference.

Philco 7

When you fail to get signals at some frequencies, try a new 36 tube in the oscillator circuit. Because of the critical oscillator circuit employed, not every 36 tube will function in this circuit.

Philco 10

Intermittent reception is often caused by high resistance through the oscillator coil of the 6A7 tube due to rosin joints on the coil lugs. On all Philco Model 10 sets, where the complaint is fading or intermittent reception, resolder all the joints carefully.

Philco 17 and Others

Hum. This tip applies to all Philco receivers using a condenser across the speaker field. When a strong 120-cycle hum is heard in these receivers, before disconnecting and testing other con-

densers, check the condenser connected across the speaker field for open circuit. This is quickly done by shunting a good condenser of the correct value across the terminals of the suspected condenser and noting the effect upon the hum. If the old condenser is open, remove it entirely, installing a new one in its place. This trouble is quite common in these receivers.

Philco 39-24, 39-30

Inserting Station Tabs When the Tab Windows in the Bezel Are Tight. The separation between the front and back frames of the bezel windows can be increased by inserting the blade of a hack saw on which the teeth at one end have been ground away. This thickness and width are just right for spreading the space in the dial windows. If one set of tabs is inserted and the tabs are ruined because of the scratching that results from a tight fit, the windows should be opened in the manner described above before an attempt is made to insert additional tabs. Never use a screw driver for this purpose, because it will ruin the bezel.

Philco 39-25

Lack of High Notes When the Volume Control Is at Low Setting. A few of the early-production sets of this model had the base compensating condenser improperly wired. The adjacent diagram shows the incorrect and correct wiring.

Radio played when using "instant tuning" but was dead when switched to manual tuning. We have had two jobs like this, and each time the trouble was broken lead between tuning-condenser stator section and chassis. A quick visual check of this connector before testing otherwise may save time on similar jobs.

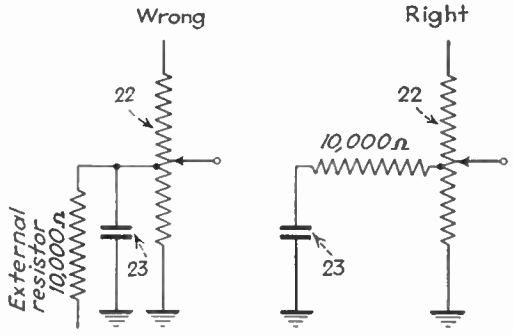

FIG. 15.

Philco 39-40

Noisy Reception Sometimes Accompanied by a Hum. This difficulty is usually caused by the spaghetti insulation wearing through on the plate wire from the 6J5 tube. This insulation on some of the earlier productions crossed a grounded point, and in a few cases leakage occurred.

Philco 39-55

Mystery Control Receiver. The set would change stations by itself without the controlling impulse from the local oscillator contained in the mystery control box. By adjusting the sensitivity control on the rear chassis apron to a point where sufficient response to the mystery control was attained so that random static surges from the antenna by impact and excitation had no disturbing effect, a degree of satisfactory opera-

tion was achieved. Some difficulty was experienced in manually turning on and off the radio. The fault lay in the bakelite gear that serves as the volume-control knob projecting through the front panel. The gear teeth were chipped, and the bakelite knob gear had to be replaced.

Philco 39–71T

Audible Oscillation Squeal. This condition is caused by feedback from the grid wire of the 1H5G tube. This wire, coming from the control grid at the top of the tube, should go down on the chassis side of the tube shield rather than on the dry-battery side. If the wire is adjacent to the dry-battery leads, this oscillation will occur.

Microphonics. Microphonic condition in this model will usually be traced to the 1H5G tube. Changing this tube will ordinarily correct the difficulty.

Philco 70

Microphonic Howl. If this condition occurs when the tone control is turned all the way to the left, check the 0.00025-mf. phone condenser connected to the plate of the second detector. This condenser (which has a yellow dot on one side) causes the trouble because of changes in its value or because it becomes open.

Philco 71T

Oscillation at the Low-frequency End of the Broadcast Band. This condition is sometimes caused by a loose shield over the i.f. or oscillator coils. In case this type of trouble is experienced, both the i.f. and oscillator shields should be soldered between the rivet and the chassis so as to assure a good electrical ground connection.

Philco 80

Noisy Volume Controls. This set shows frequent trouble through noisy volume controls that seem almost impossible to fix without a more or less costly replacement. The carbon strip is curved so that with the riveted contact arm over it there is little possibility of using the old "pencil eraser" cure. However, it will be noted that the end of the contact arm is a tiny disk with a hole, in which a tongue from the arm is snapped. When the arm is raised a trifle, this disk slips out and may be turned over. A few turns of the arm, with this disk reversed, will cure most of the trouble. What remains may be removed by rubbing the carbon strip with a piece of hard-finish paper over the end of a screw driver. Leave the disk in the new position. While you are at the set, check the condenser from line to chassis. Quite often this is a trifle leaky and can cause trouble. (This method of resistor repair can be applied to other sets, since quite a few use the type of volume control described above.)

Philco 90

Stopping. Several of these sets have come in with the same trouble. Reception would be satisfactory for a while, then suddenly stop. If the a.c. switch

was turned off for a short time and then on again, the set would repeat the procedure. The trouble was traced in all cases to an intermittent open in condenser C_1. Replacement was made with a 0.01-mf. unit.

Philco Midgets 500

To Eliminate Slipping of the Tuning-gang Assembly. Remove the flange that holds and bears on the three ball bearings that gear the rotor. Place on bench, then place washer from a snap switch over same, and tap evenly with a socket wrench of the correct size. Assemble, and gang will not slip.

❖ ❖

Pierce-Arrow

The factory has made a change in lead-in placement. It is now carried down the left-hand door windlass to a point just under the instrument board, the excess being coiled and tucked back of the kick pad.

❖ ❖

Plymouth

Plymouth 6

Persistent generator noise despite installation of cutout condenser. Eliminated by making sure that the condenser is fastened under the cutout screw next to the engine rather than under the one next to the hood.

❖ ❖

Pontiac

Pontiac 1933

Motor Noise. In this and in all other cars having shielded lead down right-side post and requiring set installation on driver's side, carry extended antenna lead in shielding under floor boards rather than under dash to complete noise suppression.

❖ ❖

Pilot

Pilot 10 A.C., Superheterodyne

A.C. Hum Level Abnormally High. Look for ground at the reflector mounted behind the pilot light. Sharp corner of this reflector frequently pierces the small piece of fiber insulation included to prevent shorting of filaments to ground.

❖ ❖

RCA

Victor 1928 (Chassis by Bosch)

These models may be greatly improved by simply replacing the grid leak with a 1-megohm unit. The volume in some cases has been increased 100 per cent.

General Electric and RCA

Low Volume. In the new General Electric and RCA models, the coupling condensers open between the 2B7 and the 2A5, resulting in lack of volume. In all models of sets using a pentode for output these condensers may be suspected when the complaint is lack of volume.

Slipping dial on rubber-friction-type dial models. Slip ¼-inch bushing from an old knob over shaft. Solder it to shaft where rubber gasket originally appeared. Now slip Atwater Kent 55 dial-drive rubber over bushing.

RCA-Victor

Fading. All models using a 27 as a.v.c. Fading away of signals after set has been turned on indicates failure of the a.v.c. to function. It has been suggested that low filament voltage of the a.v.c. tubes may cause this trouble. Check this, and try a 56 tube in place of the 27. We have found that in some instances certain 27 tubes will not function in this socket for any length of time, even though the filament voltages are correct. The only thing to do is to install a new 27. One that has been used in any other socket will not do, so don't try to switch tubes around.

Many of these models use Bradleyometer variable resistors. If these become noisy, remove the covers, then apply vaseline with cloth.

RCA-Victor All-wave

See General Electric all-wave.

RCA Superheterodyne

Set Dead. This was a case where everything tested o.k., but still the set would not play. After all voltages and resistance tests were made, the oscillator was put to use, and here we found that our signal could not get through the second detector.

This circuit has a 7,000-ohm resistor connected in parallel with the primary coil, and for this reason the fault could not be found with an analyzer, the trouble being an open primary coil.

This was found after taking the coil out and shield off and testing the coil and resistor separately.

RCA-Victor R-4, R-6, R-7, R-7A, R-9

Distorted reproduction at any setting of the volume control is caused by voltage-divider resistors that carbonize and reduce greatly in value. This condition will be made evident by the excessive screen voltage obtained on the r.f., first-detector and i.f. tubes and lower plate voltages on all other tubes. To determine this fact more accurately, a point-to-point resistance check may be made between plate and screen and from screen to cathode at the i.f. tube socket. Readings of approximately 16,000 and 8,000 ohms, respectively, should be obtained. The 16,000-ohm unit connected between the high voltage and screen should be replaced, if found defective, with a wire-wound resistor capable of dissipating at least 10 watts. The value of the resistor used in Models R-7 and R-9 is 14,300 ohms. A 15,000-ohm unit may be used as a standard replacement for all models.

Noisy tuning and oscillation at the higher frequencies are caused by corroded and dirty tuning-condenser rotor con-

tacts. Although these contacts may be cleaned and reshaped to increase their tension, it is advisable to pigtail the rotor shaft to the chassis. This pigtail should be well insulated so that it cannot short to any of the stator plates.

The set will lose its volume, and the circuit will oscillate. The trouble is usually found in the 14,300-ohm resistor between high-voltage and screen grids. This resistor often gets as low as 5,000 ohms, causing high voltage on the screen grids, and the 8,000-ohm resistor between the screen grids and cathodes increases resistance. Renew these resistors and clean the springs on the condenser rotor. Rebalance the set and it works like new.

Crackling. Frequently due to eyelet in chassis through which grid lead to 24 is brought up. The eyelet is not in any electrical circuit, but when it works loose the capacity of the grid lead passing through it varies with respect to ground. Remove or solder the eyelet.

RCA-Victor R-5

Often in this receiver, it is impossible to control volume, even with aerial disconnected. The volume control in this model is across the antenna and ground with the center arm coupled to the primary of the r.f. transformer. The pickup of the coil is sufficient to nullify the effect of the volume control. Shielding the r.f. coil assembly will assist greatly.

RCA-Victor 5T8, 5Q2, 7T1, and 5Q1

Mushy. The reception on the 13-meter band in the above-mentioned models is very mushy, and it was found that this was due to the oscillator frequency being modulated by the power-supply frequency. The trouble was put to an end by the addition of a condenser

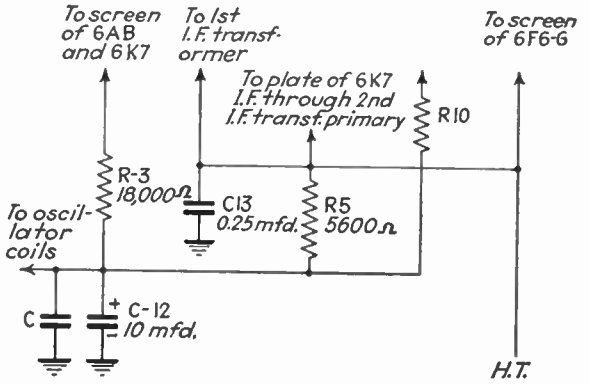

Fig. 16.

of value between 0.002 to 0.005 mf. from the terminal on the oscillator coil where the plate voltage enters the oscillator coil to earth, as shown schematically in the diagram.

Victor 7–25

See data on Radiola 17.

RCA-Victor R-8, R-12

Should the condition be found where the receiver is insensitive and volume is low and removing the a.v.c. tube brings the volume level up considerably, the two 0.1-mf. condensers by-passing the a.v.c. grid return to cathode and chassis respectively should be checked for high-resistance leakage. An ordinary ohmmeter whose

scale reads only to 100,000 ohms will not suffice here, since the leakage to these condensers is often over 2 megohms. This defect increases the negative control-grid bias impressed upon the r.f. and i.f. tubes.

The complaint of distorted reproduction at any setting of the volume control is caused by a carbonized voltage-divider system as described with Models R-8, R-6, etc. The value of these two carbonized resistors is 16,000 and 8,000 ohms, respectively, and may be checked in the same manner discussed under Model R-4.

Noisy tuning and oscillation at the high frequencies on these models are also caused by corroded and dirty tuning-condenser rotor contacts. The rotor shaft should be pigtailed to the chassis for a perfect repair.

This set was motorboating badly. The pack condenser 4-mf. unit in the plate-to-ground circuit of the r.f. and detector-oscillator plate-voltage filter was found to be faulty. Replacing this on the outside of the pack cured the condition. (The condenser in question has a maroon lead out of the pack.)

Victor 9–18, 9–54

See data on Radiola 64.

RCA T10-1

The general trouble has been found in the a.f. transformers in these models. When replacing transformers, we have found a parallel feed by using a 30,000-ohm resistor and a 0.25-mf. capacitor, eliminates further failures from open circuits.

RCA-Victor C11, C13

Intermittent Reception, Volume Periodically Rising Sharply to Nearly Full Output and Then Dropping Back to Normal. This is "cutin" rather than "cutout" trouble. To cure it, replace audio coupling unit at the front right of dial, looking at the top of chassis. Tone-compensation condensers open up. Be sure to get the improved unit for replacement, since an original would probably have the same trouble eventually. Do not cut the leads. New leads come with replacement. Unsolder old leads at volume control and tone switch arms.

RCA-Victor D7-7, D8-28

The RCA-Victor D7-7 and D8-28 combinations employ the same radio chassis respectively as Models C7-6 and C8-19. The seven-tube model does not have the 6E5 magic eye and uses 80 rectifier.

The radio set is disabled during phono operation by opening the cathode of the 6K7 i.f. tubes (SW-5).

For radio operation, SW-5 is closed and variable tap on phone volume resistor rides onto a stud, completing circuit from R_{11} to 6F5 audio tube.

A universal transformer is employed only on the eight-tube model. Turntable motor is permanently connected to 110-volt tap.

RCA-Victor R-11, RE-18, R-21, RAE26

These models are frequently serviced for the complaint of fading. When the receiver is switched on, reception will fall gradually to a whisper, and the tone will become distorted. This condition is caused by the failure of the 5-megohm resistor in the a.v.c. grid circuit. In Model R-21 the value of this unit is 2 megohms. A certain indication of this defect is the return to normal volume when the a.v.c. tube is withdrawn from its socket, although the tone may be slightly muffled. The open-circuiting of this resistor removes the negative bias from the a.v.c. tube, which will pass more current and impress a greater control-grid voltage upon the r.f. and i.f. tubes, thus reducing their amplifications.

Where the symptoms of low volume and poor sensitivity are encountered, check the two 0.1-mf. condensers by-passing the grid return of the a.v.c. tube for high-resistance leakage. A high-range ohmmeter will be necessary to test these condensers. If the volume increases when the a.v.c. tube is withdrawn, it is a fairly good sign of faulty condensers.

Very weak and distorted reception is frequently due to an open-circuited coupling winding in the second i.f. transformer. This winding is used to couple the primary and secondary of the i.f. transformer, which are shielded from one another. An analyzer will not check the winding by means of a low-range ohmmeter. In order to obtain a correct indication, however, the volume control that is shunted across the coil must be disconnected. Usually the open circuit will be found to consist of a break in the pigtails of the coil.

Fading, noisy, and intermittent reception is often caused by a faulty volume control. Connection to the volume-control arm is made by a copper contact spring attached to the arm that rises upon the terminal lug in the center of the fiber cover. By bending back the three tabs, the cover may be removed and the contact spring cleaned of corrosion and grease. However, a better job may be made by pigtailing the volume-control arm to the terminal lug, care being taken that the pigtail cannot short to the resistance element by encasing the pigtail within spaghetti tubing. Pushing in or pulling upon the shaft of the volume control will usually disclose this faulty condition. The trouble may also be due to a loose resistance winding. In this case, the unit should be replaced.

The symptoms of badly distorted reproduction and low volume, which can be cleared by removing one of the 47 tubes, can usually be traced to a short circuit between the primary and secondary winding of the push-pull input transformer. The condition will be disclosed by the high positive grid-bias reading obtained when analyzing this stage. Replacement of the transformer is the only remedy, since the short circuit is internal.

The problem of insufficient volume may be encountered in one of these models, with stations being tuned in with a "plop" although the receiver and tubes check satisfactorily. This condition has been found due, in most cases, to excessive heater voltage on the a.v.c. tube, which should be reduced by the insertion of a ½-ohm resistor in the heater circuit. This should be done even though the heater voltage on the a.v.c. tube is found to be 2.5 volts.

Distorted reproduction regardless of the volume-control setting in almost every instance is caused by carbonized resistors forming part of the voltage-divider system. This situation is revealed by the abnormally high screen voltages obtained on the r.f. first-detector and i.f. tubes and lower plate voltages on all tubes. A check made with an ohmmeter from plate to screen and screen to cathode at the i.f. tube socket should obtain readings of approximately 15,000 and 18,000 ohms, respectively. In the case of Model RE-19, this latter reading should be approximately 8,000 ohms. When these two resistors are found carbonized on the RE-19, the 8,000-ohm resistor connected from terminal 3 on the phono terminal strip to chassis should also be checked for a carbonized condition. The 2-watt carbon screen resistor should be replaced with a wire-wound unit of 10 watts capacity.

A slipping tuning dial on Model 21 may be repaired by taking another turn or two around the tuning shaft with the drive cable. To accomplish this, the tension spring must be released so that the turn may be made with the loose cable. When the dial is removed to gain access to the tension spring, its position should be carefully noted so that it may be reinstalled without disturbing the dial settings.

A low, insistent hum accompanied by the symptom of a strong motorboating when the 47 tube behind the 80 rectifier is withdrawn from its socket is caused invariably by the one megohm connected from terminal 3 on the phono terminal strip to chassis shorting to terminal 4. This condition may be readily checked by shorting terminals 3 and 4 quickly with a screw driver. If the hum level does not increase, the shorting resistor is the trouble.

Noisy tuning, motorboating between stations, and oscillation at the higher frequencies are caused by corroded and dirty tuning-condenser rotor contacts. This condition should be corrected by pigtailing the rotor shaft to the chassis.

Low volume on the phonograph in the RAE-26 model has frequently been traced as caused by the shielded cable connected to the phono input transformer shorting to terminal 3. This terminal, although connecting to an unused portion of the input winding of this transformer, if shorted to the grounded cable will result in weak record reproduction. The trouble may be eliminated by either in-

sulating the shielded cable or taping up the terminal.

Failures and adjustments of the automatic phonograph mechanism used in the RAE-26 receiver, which is the same as that used in models RAE-59 and RAE-79, will be found discussed under the latter model.

When one finds this particular set inoperative until the a.v.c. tube is withdrawn, the cause is usually a leaky 0.1-mf. grid-return resistor on the a.v.c. lead. Also very weak, distorted reception is caused by an open-circuit winding in the second intermediate transformer.

RCA-Victor R-12

Motorboating. Replace type 47 tubes and connect a 5,000-ohm resistor in series with the screens to prevent recurrence of the trouble.

Victor 14

Distortion. In this model, the conditions may be met where one of the 45 amplifiers is ineffective or where the removal of one 45 tube will clear up an otherwise muffled and distorted reproduction. These sets employ a modified audio design different from those usually met in standard commercial receivers. A tapped high-impedance audio choke acting as an auto transformer and coupling condensers are utilized to couple more effectively the 24 detector to the 45 tubes in the push-pull. In addition, two leaks, each 430,000 ohms, secure the necessary grid bias for proper operation of the 45 amplifiers. Should one of the 0.025-mf. coupling condensers short, a very high plate-current reading will be obtained on the 45 tube, with consequent distortions and poor quality. Likewise, if one of the 430,000-ohm leaks should open, the same effect will ensue. Most often, however, these coupling condensers open-circuit, causing one 45 tube to become inoperative. When one of the leaks opens, repair is easily effected, for these carbon resistors are readily accessible.

A defective coupling condenser, either shorted or open-circuited, presents quite another problem, for these units are incorporated in the so-called (RCA) capacitor and coupling reactor pack. It stands without question that the complete reactor pack can be changed, but this is unnecessary, although many of these units, most likely, have already been replaced. The only change necessary is the addition of the new 0.025-mf. condenser to the grid circuit of the 45 stage containing the shorted condenser.

Two green wires emerge from the capacitor reactor block that go to the grids of the 45 tubes. Place the new unit in series with the lead that comes from the defective unit (shorted), and that job is done. However, when either of the two coupling condensers open-circuits, the change is slightly more complicated. Here we must determine which of the two in the pack or block is open. This can be done by the discharge method, testing

from one grid of the 45 to terminal 5 on the block or to the lump of solder located in one corner of the block between terminals 3 and 4. The new unit should be connected in series between terminal 5 and the grid of one 45 or in series with the lump of solder to the grid of the other 45.

Victor 14, 15

See data on R-48.

Victor R-15

Oscillation and Intermittent Reception. The volume control is the greatest cause of oscillation and intermittent reception. When using the regular RCA replacement control, reserve the two wires that go to the outside terminals of screen connections; also remove the gray 12,000-ohm resistor connected across the screen portion of the control. (Note: The screen section on the new control has a different value from that of the original.)

Radiola R15

Unstable, Intermittent, Low Volume. Trouble is frequently met in lack of volume, intermittent reception, and inability to neutralize. The trouble will be found to be in the shield cans covering the four 224 tubes and the four coils. After a time, the part of the shield making contact with the chassis becomes oxidized, resulting in a poor contact, and one poor contact anywhere in the shielding of this set will throw the entire set out of balance. The remedy is to remove the shield cans, thoroughly clean the contact surfaces with emery cloth, and coat with a very thin layer of vaseline. Also, inspect the wiping contacts to the rotors of the tuning condensers, and if trouble is suspected there, apply the same remedy. This one point is imperative. The shield cans must make good contact for proper performance of Model R15.

RCA-Victor R-17-M

Weak and Distorted Reproduction. This model, a small, compact four-tube midget, has been frequently serviced because of the complaint of weak and distorted reproduction. This condition has usually been found due to improper spacing of the armature of the magnetic-type reproducer employed in the receiver, caused by warping or contraction of the paper cone. A simple remedy is to unsolder the drive pin from the apex of the cone, thus relieving the "pull" of the cone and readjusting the armature. The drive pin may then be resoldered to the apex of the cone.

A frequent cause for an inoperative receiver or intermittent reception lies with the antenna lead short-circuiting to the eyelet of the lug through which it passes. If an outside antenna is employed and the aerial lead wire is rolled or coiled too near the receiver or within the metal cabinet, excessive regeneration may result.

It may be good policy to replace the detector-plate resistor, which often open-circuits and results in inoperation of the

receiver, with a ½- or 1-watt unit to avoid the possibility of recurrence.

Low Volume. All voltages check o.k. after twin cathode condenser unit and double 5-mf. had been replaced. Magnet and speaker become weak. Replace with another speaker.

RCA-Victor 17 and 18

A scratching noise is a complaint often received against this set. Taking out the type 26 tubes one at a time and replacing them will stop the noise.

After spending plenty of time testing for the trouble, we traced it to one of the choke coils inside one of the tuning coils. The bad coil giving this trouble can be located by connecting in series successively with each choke coil a battery and a headset. The noisy choke will cause noise in the headset. Since this coil is not sold separately (it is sold only with a complete set of tuning coils), a good repair can often be effected by taking off a few turns of wire; or by using as replacement an r.f. choke, such as the larger type RCA uses in other models, and removing turns of wire until there is about as much wire on the new choke as on the old one.

Improving the Tonal Quality. In Model 17, by replacing the 0.004-mf. condenser connected across the primary of the output or speaker transformer with a 0.01-mf. condenser of the tubular variety, the tone quality is greatly improved.

❖ ❖

Radiola

Radiolas 17, 50

The symptoms of hum and weak reception with lack of grid bias obtainable on the first r.f. tube are frequently caused by poor contacts of the volume-control arm. Since this arm is connected to the grid of the first r.f. tube, poor contact at this point will open the grid circuit and disconnect the aerial from the receiver.

The selectivity and the sensitivity of these receivers may be increased by reducing the value of the grid suppressors connected in second and third r.f. stages so as to bring the circuits closer to the point of oscillation.

Oscillation is often caused by the open-circuiting of either or both of the by-pass condensers connected across the 1½-volt filament supply with the junction point grounded. This by-pass block is located in the tuning chassis.

Radiolas 18, 33, 51

Where the condition of oscillation over the entire dial is encountered, check for an open-circuited by-pass condenser connected across one section of the split primary winding of the second and third r.f. stages. Poor contact of these condensers is often the cause of noisy or intermittent reception.

Oscillation at either the high or low frequencies may be corrected by readjustment of the r.f. compensating condenser,

whose adjusting screw is accessible through the hole in the tuning-condenser bathtub, between the first and second tuning condensers. This condenser may be adjusted by using the following procedure. Tighten the adjusting screw clockwise and tune in some station between 1,400 and 1,500 kc. Since the receiver will oscillate strongly, turn the screw slightly counterclockwise until the oscillation ceases. Poor selectivity in these models may be corrected to some extent by adjusting the r.f. compensating-condenser screw slightly clockwise to bring the circuit closer to the oscillating point.

Where the complaint of distorted reproduction is received and a slightly higher detector plate voltage is noted, check the voltage-limiting resistor connected from the B+ side of the first audio-transformer primary to chassis for an open-circuited condition.

Connecting a phono pickup to these receivers often prevents a number of difficulties. If a high-impedance pickup is connected from the grid to cathode of the detector tube, the long leads will cause unstable operation and an audio howl. In order to obtain the added amplification of the detector tube and resulting greater volume, the pickup should be inserted in the cathode circuit of the detector tube.

The trouble in this set was reported as an intermittent crackling, spitting noise not unlike natural static except that it was sometimes very loud, with no antenna or ground connected and with the volume control turned completely off. The machine would play perfectly for hours and then work so badly that it was almost impossible to listen to local stations. The set was then taken to a shop but was returned with the report that it was in perfect condition and that the noise must be due to local interference. Practically all the noise stopped when the second r.f. tube was removed. The trouble finally was localized to a little coil that eventually opened in series with the primary.

The first stage has the same type of coil, but the connections are slightly different. The detector stage is like the second stage. It may seem impossible that this coil could make all the noise and still not show any variations in the plate voltage, but such was the case. The set played perfectly as soon as the coil was shorted out and continued to do so after it was replaced with a small choke coil of similar design.

RCA-Victor 21

Fading. An interesting situation was recently encountered in an RCA-Victor Model 21 receiver. The complaint in this instance was fading. Following the usual procedure, the serviceman assigned to the job made a complete analysis of the receiver, checking the tubes at the same time and a thorough inspection of the antenna system for possible breaks, grounds, or corroded connections. All

was found shipshape. The lady of the house offered the information that the fading usually occurred after the set had been operating for about 15 min. The serviceman then made a "listening test."

The fact that no fading occurred when the dial was turned to a powerful station but that there was fading immediately if it was turned to a high frequency showed that something was wrong with the volume control, which had to be turned up on the high frequencies. When the control was turned on the highest point, the slightest touch or vibration would cause the arm to shift from one turn on the resistor to the next. It was near the end of the resistor, where the winding was least firmly moored, that this shift became noticeable, resulting in the fading. Replacement of this unit will remedy the fading.

Another complaint against this model is the slipping of drive cables. A very simple arrangement is utilized on this receiver, and although the trouble may be caused by a stretched tension spring that does not take up sufficient slack in the cable, it has been found that by taking another turn around that gang shaft, sufficient friction is obtained to clear up the difficulty. This may be done by releasing the spring beneath the dial so that the turn may be made with the loose cable. The spring is then fastened into position and the dial restored to its place. Some repairmen use melted tallow on the string, but this soon wears away.

Another common complaint is distortion at low volume. Although this condition has been caused by an open 500,000-ohm resistor in the first r.f. secondary return (which fact will be evidenced by a lack of control-grid voltage, which, in any case, is very small because of the high resistance in the circuit), this distortion has been cleared by the insertion of suitable resistors to reduce the heater voltage of the a.v.c. tube to 1.5 volts, which, at the same time, will render the receiver more stable.

In order to repair a volume control, the bakelite must be removed by lifting three small lugs holding it to the casing. When this is removed, you will find a spring in the center of the unit that has a coat of grease and grime. By merely wiping this off and cleaning it with very smooth sandpaper the trouble is eliminated. When reassembled, the volume control will operate like a new one.

A simple remedy for shifty dial cable is to take a small piece of friction tape, which can be inserted through the front by removing the selector knob, and placing it on the pulley over which the dial cable rides. By rotating the selector dial from one end to the other several times, this piece of tape locates itself on the pulley and stops the dial cable from slipping.

Distortion on low volume is quite a usual complaint. This distortion may easily be overcome by merely interchanging the three 27 tubes located in the chassis. One 27 tube is used as an oscillator, an-

other as an automatic volume control, and the third, in the first r.f. stage.

Distortion on strong signals may easily be remedied by slightly detuning either or any combination of the trimmers located underneath the chassis. Three holes will be found in the wooden board just beneath the bottom of the chassis. With the aid of a neutralizing wrench that can be inserted through these holes, the trimmers are easily adjusted. These three trimmers tune the r.f. mixer and oscillator stages respectively. The r.f. trimmer is located toward the front of the chassis, the mixer in the center, and the oscillator trimmer toward the rear of the chassis. In many cases there is distortion on strong signals, and regardless of how much the above circuits are detuned, the distortion is still in evidence because of insufficient a.v.c. action. This condition may be due to the various leaks in the grid circuit of the a.v.c. circuit or to gassy 35 tubes.

A complaint that stations could not be tuned on properly because of "poops" heard on and around the station setting. In some cases it was found that the filament voltage of the a.v.c. tube was too low, about 1.2 volts (the power transformer has a separate filament winding for the a.v.c.), and it was necessary to replace the power transformer. In other cases the filament was too high, about 2.8 volts, and was cut down with variable resistors until this trouble was overcome. Where the filament voltage was lower but not low enough to require replacement of the power transformer, a 27 tube in the a.v.c. circuit replaced a 56, and the action of the a.v.c. then became normal.

Distortion. In a recent case, it was found that the set distorted badly. By removing one of the 47 tubes in the output stages, the signal intensity increased at least five times, and distortion cleared up at least 80 per cent. This trouble was traced to an input push-pull transformer shorted from primary to secondary, internally.

If a clicking noise is heard in this model, it can be remedied by filtering the line.

If the leads going to the speaker prove inconvenient for the serviceman, the leads should be unsoldered each time the chassis is removed, because they are so short. In soldering and unsoldering these leads, one must be careful not to let the voice-coil leads touch any of the closely associated lugs to which wires going to the field are connected. If a couple of strands innocently lean over the adjoining lug, it will be found that several tubes will be blown instantaneously.

Radiolas 21, 22

Apparent Short between Red and Maroon B+ Lead and Chassis. If short develops when tube is inserted and disappears when the tube is removed from 22 sockets, look at plate prongs to see if these touch chassis. Screws holding sockets down loosen because of speaker vibration, and sockets shift.

These models are made for use with 6-volt tubes. To convert these models in order to use 2-volt tubes is a simple matter. There are three resistors at the back bottom of the chassis. These are the filament resistors used for 6-volt operations. Short each of these resistors with a piece of wire. Do not unsolder any connections. Insert a 5512-75-multiampere pilot light in the dial socket. Use 232 tubes in place of 222 tubes. Use 230 tubes in place of 112A tubes. Use 231 tubes in place of 121A tubes. Use a small 2.2-ohm resistor in series with the 2-volt A positive lead. Special kits can be obtained.

RCA D22-1

Intermittent, Low Sensitivity, Lack of Magic Eye Deflection. Several instances have been discovered recently where trouble in the D22-1 radio chassis resulted from intermittency, low sensitivity, lack of Magic Eye deflection, and distorted tone quality. The seat of such trouble can usually be traced to the third i.f. transformer. The alignment of this transformer varies during operation (also between "on" and "off") from heat generated by resistor *R*44–45 which, on some instruments of early production, is mounted directly below the transformer-trimmer base on the rear apron of the chassis.

To correct the above condition, remove the resistor (*R*44–45) from its mounting on the rear of the chassis and remount it on the front apron of the chassis adjacent to the power transformer. This relocation will remove possibility of heat affecting the i.f. alignment. The chassis should be allowed to assume normal temperature after the resistor and the alignment are changed and corrected in the usual manner.

RCA-Victor RAE-26

A frequent cause for low volume on the phonograph of the RCA-Victor RAE-26 phonograph combination has been traced to a shorted portion of the phono input transformer primary. There are five terminals on this unit, of which only four are used. The shielded conductor connecting to the terminal 2 is often found resting against the unused terminal 3, shorting a section of the primary that is not used and resulting in the complaint of poor record output. It is a simple matter to tape up either the terminal or the shielded cable to prevent a recurrence.

RCA R-27

A case of low volume in this a.c.-d.c. set was traced to the double 5-mf. electrolytic condenser by-passing the cathode bias resistor in the detector and output stages, as shown in the figure on page 154. The condenser had decreased in capacity and when opened, seemed to have dried out, possibly owing to the heat from the heater-series dropping resistor that is mounted in the chassis near the condenser. However, the same trouble was

later found in a DeWald set of similar design having the resistor in the power cord. In this case, the decrease in capacity had not been so great.

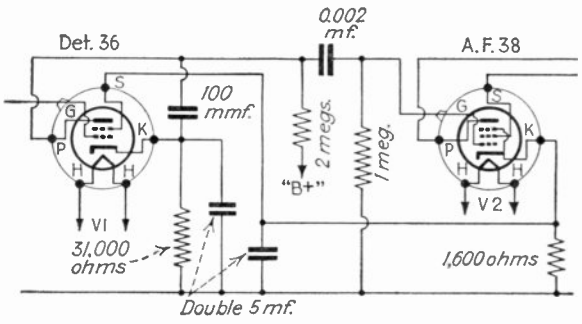

FIG. 17.

RCA R-28

Speaker rattle, sounds like voice coil striking pole, but is rarely this. Cone is screwed to speaker frame only at bottom, allowing top part to vibrate against frame on loud signals. Screw top edge of cone to frame with short 1/32 machine screws and nuts. Holes are already in frame, and no drilling is required.

RCA R-28P

Set operates o.k. on broadcast but is dead on short-wave band. Look for shorted trimmer condensers on band-change switch. Mica frequently breaks.

RCA-Victor R-28, R-35, R-37, R-38, R-39, RE-40, RE-57

Cutting Reception Accompanied by Noise. A common complaint against all these models is that of reception suddenly cutting off and the receiver operating noisily, as it would if it were tuned off resonance with the volume control turned full. This condition has always been traced to a defective 2A7 detector-oscillator tube that will test perfectly on any tube checker. By snapping the line switch several times operation can be made to resume.

An inoperative receiver is often caused by a short-circuited section of the double electrolytic condenser filter unit. Almost invariably the 4-mf. second section is at fault because of its low working voltage. In order to prevent future trouble on this score, a higher rating unit should be installed.

No Reception. Detector-plate resistor under tuner chassis. No detector-plate voltage.

Very Feeble Signal. Look for detector-plate resistor open ½ megohm. Connect to two red leads on resistor strip under tuner chassis or look for open 70,000-ohm resistor, green and red tip.

RCA M30

Broken Antenna Lead-in Wire. The antenna wire in this model is brought out through a hole in the end of the set and clamped to the outside. Frequent removal of the set for servicing results in severing the small stranded antenna lead wire inside the shield. If the small end of the antenna connector is fastened under the clamp on the end of the connector to the antenna, all trouble of this nature will be eliminated. This also applies to police radio model AR-4160A.

RCA-Victor M30

When the receiver plays without any control of volume, often the green wire in the cable that runs from the set to the control unit will be broken inside the cable. This disconnects the cathode of the a.v.c. tube.

If the set has lost most of its volume because of dead C batteries, a good way to check this hurriedly is to remove the a.v.c. tube from the socket. If dead batteries are the cause, the volume will jump up to its normal value regardless of the setting of the manual volume control. This quick test saves time and trouble in taking down the battery box from underneath the car to make the test, and it is quicker than using an analyzer at the socket.

Radiola 30A

Where an extremely noisy condition is encountered, especially upon the slightest vibration, the trouble has been found to lie with the rheostats. The chassis should be removed from the cabinet so that these components are accessible. The resistance strips should be cleaned with a small wad of steel wool. The sliding contact arms, which should be bent slightly to secure greater tension, should also be cleaned.

Fading and intermittent reception has almost always been traced to poorly soldered connections to the voltage dividers in the power pack. An indication of the trouble will be made evident by fluctuating voltages readily disclosed by a set analyzer.

Where the receiver is found to be insensitive and tuning is off scale, check the antenna coupler connections. The black lead of the coupler should be connected to terminal 9 (reading from right to left, facing the back of the set) of the catacomb terminal strip. The two black and green tracer leads connect to terminals 6 and 8. These latter leads may be interchanged.

Oscillation over the entire scale that cannot be controlled by either one of the rheostats may be corrected by readjusting the r.f. neutralizing condenser. This condenser is adjusted in the usual manner by removing the r.f. tube and inserting a dummy tube. Provision must be made, however, for inserting a suitable resistance of approximately 55 ohms across the filament terminals of this stage to compensate for the removal of the r.f. tube, since the filaments of all the 99 tubes are wired in a series shunt circuit.

RCA 30, 30A

Burned-out 876 Ballast Tube. When customers refuse to spend money to replace it, wire two lamp sockets in parallel in its place. Place a 75-watt electric bulb in one and a 100-watt size in the other or replace 876 with 300-watt mogul-base Mazda lamp.

RCA M30, AR 4160A

Defective Switch. The double-pole single-throw lock switch on this receiver

causes a great deal of trouble by failure to make contact when turned to the "on" position. This is caused by the loss of tension on the contact springs after they have been used a short time. We have found that by tinning the springs and backing them up with solder we can increase their strength to the point where satisfactory operation can be obtained.

Victor R-32

If Filter Condenser Breaks Down. When the second filter condenser breaks down, replacement may not be necessary. With the reproducer mounted in a large baffle, the difference in hum level with or without the condenser was hardly noticeable, and in several cases this unit when broken down has been left out. (This is on 25-cycle line.)

Distortion and Poor Tone Quality. Look for speaker cone broken close to the voice coil.

Set Dead. We have had several sets in service recently because of shorted filter condensers. By removing the extra a.c. line-connection plug in power-pack chassis, which is not used in most cases, an opening is left in which an inverted electrolytic condenser can be installed. This makes a first-class repair job with little work and the remedy is applicable to other models and makes as well.

Noisy, yet everything checks o.k. Resolder all 26 filament connections at sockets. We have cleared two complaints of this nature in this set in the last month. Trouble is, of course, in resin joints. Also, clean the socket contacts.

Victor R-32–RE-45

A.c. hum can often be traced to a loose arm on the hum control.

Victor R-32, RE-45, R-52, RE-75

Hum. Some of these models have an unusual amount of hum that evidently is picked up by the first a.f. transformer. No amount of additional filtering capacity helps. A 0.1- or 0.15-megohm 1-watt resistor connected between the grids of the push-pull output stage kills the hum every time. It has no appreciable effect on the bass response. At least, no customer has noticed it.

Noisy and intermittent reception is a common trouble in these models and is usually due to a defective volume-control unit, wherein the wire-wound resistance strips become loose and unanchored. In replacing the volume control, care should be taken in connecting the leads to the proper section of the dual unit. The contact arm of one section that is shunted across the absorption circuit of the second r.f coil is connected to the metal frame of the volume control and therefore grounded. If the lead from the grid of the first r.f. tube is connected to the movable arm of this section instead of to the insulated arm, an inoperative receiver will result.

A frequent and common cause of intermittent reception lies with an open-cir-

cuiting voice coil on this dynamic speaker, usually due to a broken connection to one of the voice-coil pigtails.

Hum. Some of the earlier production models did not employ a tuning condenser across the first filter choke in the power unit. Where this 0.1-mf. unit is lacking, a noticeable hum will be present.

An inoperative receiver with the symptoms of no plate voltage on the detector tube has been traced to corroded or faulty contacts on the radio-phono transfer switch. A slight hum and, at times, intermittent reception have been found caused by a loose transfer-switch assembly.

Distorted and unstable operation is sometimes due to the detector grid leak working loose from its wire terminals.

RCA R-32, RE-45, R-52

Intermittent Reception, Little Volume, Voltage o.k. See if cone has become torn around fiber washer at center. It will be necessary to remove the speaker to discover such a break.

Some of these models have an unusual amount of hum that evidently is picked up by the first a.f. transformer. No amount of additional filtering capacity helps. A 0.1- or 0.15-megohm 1-watt resistor connected between the grids of the push-pull output stage kills the hum every time. It has no appreciable effect on the bass response—at least, no customer has noticed it.

When the second filter condenser breaks down, replacement may not be necessary. With the reproducer mounted in a large baffle, the difference in hum level with or without the condenser is hardly noticeable, and in several cases this unit, when broken down, has been left out. (This is a 25-cycle line.)

Neutralizing Adjustments. Some of these sets do not have holes in the top of the chassis to permit entry of insulated screw driver. Sets frequently neutralize perfectly without plate but oscillate all over the place when it is replaced, especially when new tubes have been installed. Most trouble is at high-frequency end of dial. Grasp the rear 26 nearest the 27 detector while the metal plate is off, and oscillation will occur. Neutralize while holding this tube, carefully adjusting the neutralizing screw nearest detector, and the set will operate o.k. when the plate is put in place.

RCA M34

Vibrator Noise in Speaker. Look for defective 78 or cathode-to-heater shorts in any other tubes, particularly those in r.f. stages. Metallic vibration at certain musical frequencies. Tighten light sheet-iron strip covering trimmer condenser adjusting holes, or use light cork gasket between plate and case.

When volume control seems ineffective, check for an open wire in the main control cable. We experienced this trouble frequently, and in one instance two leads,

the red and the green from the control unit, were found open. Indication of this defect is that stations may be heard, but at low volume.

Vibration Loosens Mounting. Secure two pieces of rubber or felt about ½ in. thick. Place these behind set on bolt, one each side of bulkhead, compressing tightly with nut. On Chevrolets and other cars having light bulkheads that permit shimmying of chassis, place 6- by 8-in. steel plate under smaller one furnished by manufacturer, holding it in place with $\frac{3}{32}$-in. bolts passed through holes drilled in four corners.

In an M34 *car radio that was cutting on and off when hitting a bump,* the trouble was found in an i.f. transformer. The primary leads were rather long and touched the can, a burned spot inside the can showing the location of the trouble. Clearing the lead remedied the trouble.

Vibrator noise in RCA auto-radio receiver may be caused by the breaking away of the soldered bond between the chassis and the partition separating the power transformer from the rest of the set. Resoldering this partition will permanently remedy this condition.

Dead. This receiver is an automotive radio set, and this particular instrument was "dead" as far as signals were concerned, only vibrator noise being heard in the loud-speaker. Upon checking every part of the receiver out of the car, tubes and voltages checked o.k., and stations could be tuned in when a finger was placed upon the aerial plug of the receiver. We decided to put the radio set back in the car, and upon so doing found that it was dead again. The aerial plug was then disconnected from its socket, which is fastened to the aerial lead-in, and a finger was placed on the plug, after which stations came in fine. The trouble had been in the poor connection between the plug and socket that connect the aerial to the receiver. After this connection was repaired by cleaning the contacts and pressing them tightly together and then tightening the band that holds the two parts together, the receiver worked like new.

RCA-Victor R-34, R-35, RE-57

One of the weak spots of these models is the 70,000-*ohm resistor* in the plate circuit of the 27 first a.f. tube that may open or change value. In these series of the Victor sets, the plate current is fed to the plate of the 27 through the resistor rather than through the primary of the a.f. transformer. A condenser serves to keep direct current from the winding and to couple the alternating frequency to it. The 70,000-ohm resistor is located under the power-supply unit on the lower shelf and is colored red and green. It is desirable to replace it with a somewhat heavier duty unit if a recurrence of the trouble is not wanted.

Another weak spot in these sets is the 1½-*megohm resistor* used to drop the high voltage to the 3.5 volts (approximately)

used on the screen grid of the detector tube. An open resistor here may prove rather baffling to the serviceman not familiar with the symptoms of this trouble, since the voltage concerned is small and the open resistor will cause no noticeable change in the voltage of the other circuits. The symptoms are: (1) inability to carry any volume, choking up on even medium volumes; and (2) general instability and perhaps oscillation. This resistor is located underneath the resistor board inside the receiver chassis and may be found after the chassis is turned upside down so that the controls are toward you. The resistor (red and white) under discussion connects between the second and third lugs, counting from back to front on the right-hand row of lugs. Remember that the Victor chassis will not work satisfactorily in this position and must be tested in its correct, right-side-up position. Incidentally, a slightly higher screen-grid voltage afforded by a 1-megohm resistor in this position seems to help the performance of the set; so the latter size should be used in the 2-watt type for replacements. It is not easy to see why this resistor would give any trouble since it is worked nowhere near its power rating.

The speaker cones of these sets cannot be centered by eye or with gauges. It is necessary to have a strong 60-cycle hum; the cone is then centered until the note is clear and musical, with no rattle at all. This hum is best obtained by disconnecting the control-grid lead to the detector tube.

Another complaint difficult to find the remedy for is intermittent or noisy reception. Check by wiggling each terminal and connection as well as wires that lead through shields, etc., with the set in operation, because connections may have only the appearance of being soldered. Remove dust and examine the plates of the tuning condensers for burrs or flake aluminum.

RCA M34, General Electric B40

Set starts late or only after racing motor. Replace 6A7. Cuts out permanently after starting o.k. or no reception though set sounds alive; resolder connections on oscillator coil farthest from antenna lead, being careful not to overheat or short lug to frame.

Volume o.k. on high-frequency end but poor on low. Replace antenna coil if trimmers seem o.k.

No sensitivity on high end; if trimmers are o.k. Check 0.5-mf. condenser across cathodes of 78 and 6A7, which also causes intermittent noise pickup from vibrator when poorly connected.

Howl on strong carriers similar to microphonic tube. If replacing 6A7 causes no change, replace 400,000-ohm yellow resistor on resistor board with 500,000 ohms and connect 0.0001 condenser across this resistor if set lacks punch.

Extreme lack of sensitivity; replace 400,000-ohm resistor with 250,000 ohms.

Lack of audio power; replace 60,000-ohm resistor across a.f. transformer secondary with 100,000 ohms. *Pronounced buzz from vibrator and no signal;* see if oscillator-tube filament prong is shorting on diode prong of 6B7.

To mount set on Model A Ford, where no heater is used, mount between choke rod and accelerator rest with speaker facing seat, "cutting off" extension gas cutoff lever. This is a tight but neat fit. Do not mount this set in any but vertical position, since vibrator unit will bear against container, causing unstable operation and contact sparking.

Speaker Rattle or Sizzle. Try centering cone. Remove from case and look for filings at pole pieces. If there is no hole in screen for centering, punch a hole ⅜ in. before reinstalling, since drawing speaker up with nuts on face of chassis may twist frame and throw cone off center. If voice-coil glue loosens, don't try repair. Replace.

Vibrator works o.k., but set is dead. Place paper scraps between all contacts, and check from each side to ground on chassis. Shorts indicate blown condensers across to contacts. If found, replace vibrator base. If no blown condensers, check for one between B + lead on speaker (second from right, looking into back of set) and chassis ground. If dead short is found, trouble is usually in intermediate cans shorting to coils or blown 4 mike in pack. To insulate cans, glue cardboard disks inside covers.

Speaker Rattle. Tighten eyelet in center of speaker screen.

Unstable Vibrator Operation. Check small rivets holding armature to channel section of springs and tighten by pounding if they are loose but tubes don't light. Poor soldered joint between small r.f. choke L_{12} and field-wire lead.

Victor 35

Low volume or no reception. Turn on set and permit tubes to warm up, setting dial on strong local. Remove detector and then replace quickly. If set plays for few seconds and then fades out replace detector-screen resistor.

See Victor 57 for complaint that the set gets plenty of stations but no volume.

RCA 35, 39, and 57

Very Feeble Signal. Look for detector-plate resistor open ½ megohm. Connect to two red leads on resistor strip under tuner chassis or look for open 70,000-ohm resistor (green and red tip).

Victor R-35, R-39, RE-57

Set Weak, Distortion. Where these receivers are encountered with the complaint of weak and distorted reception that momentarily clears up when a finger is placed upon the control grid of the detector tube or reception fades out after a few seconds, replace the 1.5-megohm white and red carbon resistor located under the resistor strip in the tuning chassis. This resistor in the detector-screen voltage-supply circuit, because of

its high resistance and the fact that reading of only approximately 2 volts can be obtained when a socket analysis is made, is difficult to check.

Common causes for an inoperative condition have been traced to open-circuited detector or audio plate resistors with values of 0.5 megohm and 70,000 ohms respectively. The detector-plate resistor is located on the resistor strip in the tuner chassis while the 70,000-ohm red and green first audio plate resistor is found in the power unit. Open-circuiting r.f. screen-cathode and plate chokes are other common causes for an inoperative receiver. These chokes, when found open-circuited, should not be removed from the circuit to obtain reception, since oscillation and general instability will result.

Intermittent radio or phono operation in Model RE-57 has been traced to corroded contact segments of the master transfer switch. These segments should be cleaned with a strip of fine sandpaper.

When these receivers act peculiarly, become mushy and husky, and then clear up if the control-grid cap of the detector is touched, test the detector's screen-grid voltage. If there is none, then the 1½-megohm carbon resistor, also mounted under the bakelite bracket, is open. The value is not very critical, and the substitution of a ½- or 1-megohm leak will not noticeably affect the operation.

It is advisable to replace these units when open with some standard unit that will stand up under the current. It is not advisable to short out these open chokes, because oscillation will be introduced on most models.

RCA R-37, R-38

Motorboating between Stations. Leave by-passes alone until antenna lead is moved to the 2A5 side and away from the 2B7 tube.

Radiola 41

One of the most common troubles in this receiver is distorted and choked reproduction, which in almost every instance is due to a short-circuited 0.1-mf. condenser by-passing the bias resistor of the output tube.

Blows Fuses. When the condition is found where the house line fuse "blows" every time the receiver switch is snapped on, check for short-circuited rectifier "stacks" of the dynamic speaker.

A loud hum is often due to a partly shorted section or sections of the rectifier "stacks" that are connected in a bridge circuit to secure the operating potential for the d.c. field of the dynamic speaker. Loose contact of the volume-control arm will also cause the same complaint, since this arm is connected to the grid of the first r.f. tube. Lack of grid voltage in this stage will point to this defect.

The selectivity of the receiver may be greatly improved by reducing the value of the grid suppressors in the second and third r.f. circuits. Should oscillation exist, the smaller suppressors across the

primary of the third r.f. coil will remedy the condition.

Radiolas 42, 48

Defective Volume Control. Check r.f. 24's for plate to screen short to avoid repetition of the trouble. Such shorts put abnormal current through the controls but otherwise affect reception very little.

Radiola 44

If set oscillates as station selector is turned, take off the two copper shields and clean the edges with fine sandpaper. When replacing, make sure the shields make good contact with the condenser shaft.

Radiolas 44, 46

Loss of volume, selectivity, sensitivity after several years of use. If voltages and tubes check o.k., trouble is usually caused by wear in the gang condenser, permitting the rotor sections to shift. Realign these by means of the adjusting screws at each end of the stator sections. Select a station between 600 and 650 kc. and adjust for maximum volume. Then adjust the trimmers at the 1,500-kc. end and repeat both operations once again. A 235 in the second r.f. stage will improve tone on local stations and low-volume settings.

Signal shift and loss of volume. These machines have only five tubes and are sensitive considering this fact. But usually after a year or so they gradually shift off scale and suffer a loss of volume until they finally bring in only the most powerful local stations. This condition is due, as a rule, to the chassis expanding and causing the tuning condensers to be forced out of line. The chassis is made of cast metal. The best method to repair the set is to ream the holes in the bakelite plates that hold the stators. The latter can then be lined up exactly, and the original sensitivity restored.

In the RCA 46, oscillation is experienced, identified as too small antenna load. Make sure all shields and grounds are o.k. Then connect a 0.001 or 0.005 condenser from antenna to ground and realign antenna stage. Tighten up entire condenser while set is open, since shifting of either rotor or stator plates is quite common.

Low, or No Plate Voltage. Often due to grounded coupling reactor in detector plate circuit. This is in small brown housing beneath tuning unit and is insulated by thin pitch coating. Slip insulation between choke and chassis.

Oscillation and noisy tuning in these models are invariably caused by corroded seats of the three shield cans. The bottom edges, as well as the small contact clips that fit over the roter shaft, should be thoroughly cleaned and polished with fine sandpaper or a wad of steel wool. These latter clips should be bent and shaped so that they make better contact to the rotor shaft.

Where an insensitive receiver or oscillation at the low frequencies is encountered, check the adjustment of the compensating condensers, whose adjusting screws are located in front of the chassis. They are flat head screws flush with the chassis.

The symptoms of low or no detector plate voltage as well as lowered voltages on all other tubes are caused by a grounded audio choke in the detector plate circuit. This choke is mounted below the tuning chassis in a brown metal housing. Vibration causes the coil to work through the thin pitch coating and short to the chassis. A repair may be effected by placing some insulated material between the choke and the chassis.

The cause of intermittent reception has often been traced to an open-circuiting 0.01-mf. audio coupling condenser. This condenser is located upon the center-tapped resistor terminal strip under the power unit. It is part of the double-unit block that also contains the 0.006-mf. condenser.

Where no screen voltage is obtained on either of the r.f. tubes, check for a shorted volume-control shaft. In some instances the fiber washers insulating this shaft from the chassis have been found to have shifted.

If difficulty in aligning these receivers is experienced, the cause may be found due to shorted turns on the small universal-wound plate coil. Replacing this coil cures the difficulty.

Radiola 44, 46, and 47

To make these receivers practically humless, remove the detector-cathode wire running to the power pack, and ground the cathode through a 10,000-ohm resistor. This should be by-passed with a 4-mf. capacitor.

Victor RE-45

Noise While Tuning. The Victor RE-45 is an old 10-tube set using 26's. Complaints of noise while tuning are quite common and can be traced to the copper strips used for rotor contacts. Loosening and turning the dial cause strips to make a better connection, resulting in noise. *Faulty record reproduction* together with noticeable blasting (on bass notes in particular) is usually caused by a worn-out rubber damper in the pickup head. This damper can be replaced at a cost of three cents; it is Victor Part No. A605. This damper is made of sponge rubber ⅛ in. thick and is ⅜ by 9/16 in. long.

Low volume on phonograph can also be traced to a poor contact in a radio-phono switch. In the same model the filter block breaks down. If the customer wants a cheap repair or has been given a lower estimate and you want to cut your own, disconnect the lead from terminal 3 on the filter block and put this lead on the positive side of a 2-mf. electrolytic condenser. The negative lead of the electrolytic condenser goes to terminal 4 on the filter block. A temporary repair can be effected by just disconnecting this

lead from terminal 3 and taping the end; the receiver will then function with only a slight increase in the hum.

Victor RE-45, 52, 75

Chassis Shorts. Often caused by steel needles falling down from phonograph compartment and shorting socket lugs to ground.

Radiola 46

High Frequencies with Low Volume. A complaint against this model was that the set played at low volume everywhere except at the extreme lower end of the dial.

After examination, we attributed the trouble to the balancing of the three tuned stages. By changing the balancing screws, we found that if we set the dial on some station such as WOR, we could bring in the station with good volume but could not receive any other station with any volume. The detecting stage seemed to be the offending one. As long as we set the dial on a weak station and then turned the balancing screw, we could get the station perfectly. The screw had to be turned until it was very tight. After many trials and failures, we loosened the screws holding the stator plates and moved the whole section of stator plates slightly to one side. When the balancing screw was loosened and adjusted on a station, we found that all troubles were over and the set worked o.k.

In this same model, if the station comes in better when the shield can is shifted slightly from its socket, it is a pretty sure sign that the set is out of balance. The balancing screws are located in the front of the chassis.

Radiola 47

Intermittent Reception. This receiver employs a Model 46 chassis, and all data pertaining to the latter chassis will apply equally to Model 47. The condition of intermittent reception on this model, however, with the symptoms of no screen or plate voltages obtained on the r.f. tubes, has been traced to badly corroded contacts of the radio-phone transfer switch. These contacts may be easily cleaned by the insertion of a small strip of fine sandpaper or a small magneto file after the switch has been removed.

Radiola 48

Cutting in and out of reception is sometimes caused by sloughing off of the plating on tuning condensers. Hum, noticeable only when records are played, is cured by a 5,000-ohm resistor shunted across the secondary of the pickup input transformer.

Fading, intermittent signals are most often caused either by a burned-out section of the volume control or corroded variable-condenser clips.

See Victor 48 for other complaints.

The symptoms of muffled, distorted reproduction and hum, which will clear up when one of the 45 tubes is removed, have invariably been traced to a shorted 0.025-

mf. condenser coupling the detector tube to the power amplifiers. This condition will be made evident by the high plate-current and positive grid-bias reading obtained on the 45 in whose grid circuit the shorted condenser is connected. Although these condensers are located in the capacitor and coupling reactor block, it is not necessary to replace the entire unit when one of these condensers short-circuits. A new condenser may be installed in series with the green lead connecting to the grid of the 45, or the green lead may be disconnected and the new unit installed.

Noisy tuning and intermittent reception are often caused by the plating, peeling from the variable-condenser plates. This condition may be eliminated by disconnecting the leads to the tuning condensers and applying high voltage across their terminals while the rotor plates are rotated. Arcing at the shorted points will burn away the plating. Oscillation is frequently caused by corroded tuning-condenser rotor-shaft clips. They may be cleaned and reshaped to increase their tension.

Fading, intermittent, and noisy reception has frequently been traced to the dual carbon volume control. This unit is subject to the usual defects associated with carbon controls, but cannot be easily repaired because the two sections are riveted together. The simplest and best procedure is replacement.

When it is found that no screen voltage is obtained on any of the r.f. tubes, check for an open-circuited r.f. choke in the screen circuit.

Hum in this receiver is often due to the 24 tube in the detector stage. Try interchanging all of the 24 tubes until one is secured that will operate satisfactorily in the detector stage without hum.

Muffled and Distorted Reproduction. See Victor 14 for conditions met when one of the 45 amplifiers is ineffective or when the removal of one 45 tube will clear up a muffled and distorted reproduction.

Victor 48

When the volume rises and falls with the vibration of the set, the volume control will be found at fault; grasping the knob and rotating it back and forth will determine this. A new type of control is now being supplied for replacement in these models, and it is important that it should be used.

The other cause of complaint is an open secondary on an r.f. coil, invariably at the lug where the wire passes through the eyelet and is soldered to the lug. This break will cause similar rise and fall of volume.

RCA-Victor 50

Fading is a common complaint in this model. With all operating voltages correct, tubes perfect, and all component parts tested, this condition had persisted

in spite of all efforts to locate the source. After a good deal of trial and experimentation, it was found that by reducing the heater voltage of the a.v.c. 27 tube, the fading was eliminated. The heater voltage is reduced to 1.5 volts by means of filament resistors.

If the high heater voltage on the a.v.c. tube caused the fading in this model (it must be remembered that fading may be due to any number of reasons), a certain and definite test may be made to establish this fact. When the receiver has been switched off for a minute or so after operation at moderate volume on a weak station and then switched on again, a sharp increase or decrease in volume without any change in the volume-control setting will mean that a reduction in the a.v.c. heater voltage must be made to eliminate, or clear up, the difficulty.

Balancing. To balance:

1. Adjust the oscillator for 175-kc. signal.

2. Connect output signal to grid and ground 24 tube.

3. From left looking from the rear, adjust i.f. condensers for highest-output meter reading, starting from the intermediate frequency nearest the dial; then adjust trimmers on variable condensers to 1,400 kc. with the oscillator at 1,400; then adjust oscillator for 600. Adjust lone trimmer in back of variable condenser in chassis for output signal; then return to 1,400 and retrim.

RCA 50, 55

To Improve the Tone on This Model.

1. Be sure to test the primary of the push-pull audio transformer. *This is important!*

2. Take out the resistor and condenser that are shunted across the plates of the 47's.

3. Shunt a 20,000-ohm resistor across the plates of the 47's.

4. Take out the ¼-watt R_{13}, 30,000-ohm resistor in the plate circuit, and in its place put in series a 20,000-ohm resistor with a 0.05 condenser in the power detector.

5. Starting from the cable drum, cut the yellow lead that comes out from between the first and second i.f. transformers and place a 2,000-ohm resistor to ground.

Radiola 50 and 55

This slight operation improves the tone quality. The suggestion is made to remove the series combination of the 18,000-ohm resistor and 0.005-mf. fixed condenser connected between the plates of the two push-pull pentodes in the Radiolas 50 and 55.

RCA-Victor R-50, R-55, RAE-59, RE-20

These models are serviced more frequently for fading than for any other complaint. Reception will be normal and then gradually decrease. By snapping the switch several times, the volume level can be made to return to the former setting. The trouble has always been found due to

a leaky 0.1-mf. condenser by-passing the 1-megohm resistor in the a.v.c. grid circuit. This condenser is located in the power pack—a section of the condenser block—and is identified by the blue lead that connects to the 1-megohm resistor fourth on the resistor terminal strip. The condenser should be removed from the circuit by disconnecting the lead and an external by-pass condenser installed.

Should the condition be encountered where the receiver is inoperative unless the a.v.c. grid-return resistors are shorted out of the circuit. There are two such resistors employed in this circuit, but the unit to be replaced is located in the power unit upon the resistor strip. This failure will be made evident by the high negative control-grid bias of approximately 45 volts impressed upon the r.f. and i.f. tubes.

A sharp decrease in volume accompanied by oscillation and unstable operation has frequently been traced to an open-circuited 0.1-mf. screen by-pass condenser.

The tone quality of these models may be improved to some extent by operating the pentode output tubes as triodes. This is done by tying the screen grid to the plate of each tube.

The automatic phonograph mechanism employed in Model RAE-59 has necessitated numerous service calls because of numerous failures. The treatment is discussed under the RCA-Victor RAE-79, which employs a similar mechanism.

Intermittent operation on either the radio or phonograph and low record volume have often been traced to corroded contact segments of the master switch on Models RAE-59 and RE-20. By straightening the two tabs on the frame, the cover of this switch may be removed. A strip of No. 00 sandpaper (this may be wrapped around the blade of a small screw driver) should be used to clean properly the corrosion from these segments. Care should be exercised in performing this operation that the copper contact arms are not bent or twisted, for it is difficult to reshape these contacts or increase their tension without the possibility of loosening the mounting rivets.

RCA-Victor R-50

Motorboating and Very High State of Oscillation. Cure: Check for open-plate by-pass condenser in the second detector. Replace with 002-mf. Second detector in this set is 27, tube to the extreme right. This condenser is by-passing radio frequency directly at the plate prong.

Distortion at Low Volume. A common difficulty in these models is excessive distortion at low volume unless the aerial is disconnected. A good remedy is to delay the a.v.c. action in order to increase the filtering in the r.f. grid-return circuit. Disconnect the grid-return lead from the coil above the chassis and insert a 250,000-ohm resistor in series with it. Connect a 0.1-mf. capacitor from the coil connection to ground. With this change, it will be found that the aerial no longer affects the tone quality.

RCA R-50, General Electric H-32, R-55, RAE-59

Set plays only when 27 a.v.c. tube is removed. Look for open resistor in a.v.c. return, also for high negative bias on r.f. and i.f. control grids. Oscillation. Usually caused by open circuit in 0.1-mike screen by-pass condenser.

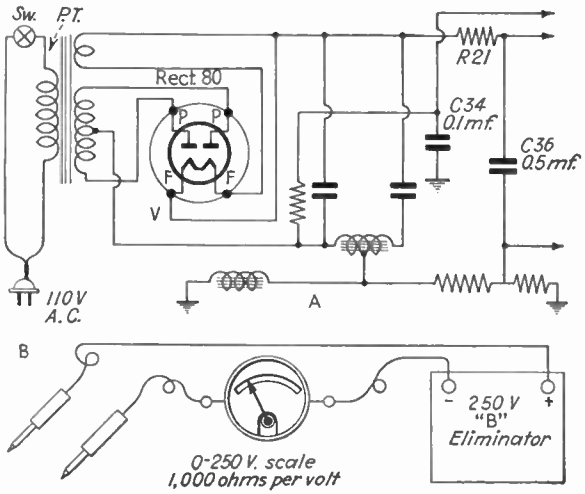

FIG. 18.

Fading. Look for open or leaky 0.1 by-pass across resistor in a.v.c. circuit, usually found in the power pack connected to the blue lead from the condenser block.

Fading. In Models R-50 and R-55, sometimes the set plays o.k. for 20 to 30 min., then slowly fades down. We must realize that condensers that have been in service for about two years or more often develop leakage although they may not break down and short.

We have been using a simple test circuit for condenser-leakage test that has proven very satisfactory. Naturally, this is applied to paper-type condensers only. By applying test prods to the suspected condenser after condenser leads have been disconnected from the circuit, a full-scale deflection of the meter is obtained, after which the meter hand returns to zero if there is no leakage in the condenser. Should a complete zero reading not be obtained, a leakage of some extent is present.

By applying this test to condenser C_{34}, a reading equal to the 30-volt position on the meter was the lowest obtained. Likewise a reading of 40 volts on C_{36}.

These were replaced with external units, and the set worked o.k. We have used this test on condensers for some time with complete satisfaction, and it is surprising to note the number of condensers that show a good deal of leakage, while at the same time voltage readings on the set are not affected.

The average B eliminator has adjustable voltage output so that you may control voltage for those condensers rated below 250 volts, while at the same time 250 volts are high enough to test condensers rated at even higher voltages.

RCA-Victor R-55

This set made a low cracking, static noise with the volume off. The trouble was found to be in the a.f. input transformer, which was replaced. This seemed to remedy the trouble until the volume was turned up. Then it was as bad as before.

We then replaced the first i.f. coil, which corrected the trouble. Our method in testing these coils is as follows: Disconnect the primary from the original coil, put a flat choke coil in its place close to the secondary of the i.f. coil, and change it to each coil until you find the noisy one.

Victor 57

Failure or burn-out of one of the many r.f. chokes may occur on this model. These are used in the plate and screen-grid leads of the r.f. tubes. The temptation to restore operation by shorting the defective part should be resisted. The removal of the choke makes possible circuit oscillation that will ruin tone quality and make tuning difficult.

RCA-Victor RE-57, 39-35

A very loud and annoying noise in these receivers occurs with jarring of the receiver. We found the cause to be in the second r.f. condenser and coil-shield can under the chassis. There is a fixed condenser connected to the end of the coil, and the coil is fastened to a plate; this plate is riveted to the chassis, but the end of the plate does not make good contact with the chassis, and any jarring of the receiver will cause this fixed condenser to touch the shield can, causing a loud noise. By merely drilling a hole through plate and chassis near the end of the plate and inserting a screw and nut, making sure that the fixed condenser does not strike the shield can, this trouble will be overcome permanently.

Amateur Phone Interference. The complaint in Model RE-57 was extremely strong amateur phone interference. The interference came in on all stations at ordinary volume level and could be eliminated only by turning up the volume control. The amateur transmitter was in the same apartment house as the set. We tried the conventional wave-trap combination without effect. Also, removing the aerial failed to stop the trouble. However, disconnecting the ground from the radiator and connecting it to a cold-water pipe with a national r.f. choke in series with the set and ground overcame this trouble satisfactorily.

RCA RAE59

Poor Tone Quality. These sets, when in the vicinity of high-powered stations, sometimes develop bad cases of flat tone quality.

The trouble lies in the a.v.c. action being too great under the very strong signals of locals. One finds a 500,000-ohm resistor from plate to ground on the a.v.c. tube, the ground end of which is open; a 300,000-ohm resistor is inserted in series with it to ground. Now release the r.f. and i.f. leads from the plate of the a.v.c. tube, place them at the junction of the two resistors, and by-pass this point to ground with ¼-mf. condenser. This will retard a.v.c. action and cure the trouble, with plenty of a.v.c. action left.

Radiola 60

If this set acts as though the variable condensers were shorting to each other, examine the pilot-light bracket. It may have dropped down against the drum dial.

Radiolas 60, 62

Low Volume. Check for decline in value of the 20,000-ohm bleeder resistor located beneath the pack.

Radiolas 60, 62

The symptoms of distorted tone and low volume, which often may be of an intermittent nature, have frequently been traced to an open-circuited audio-transformer primary. This condition will not readily be disclosed with a set analyzer except for a slightly lower plate-voltage reading, which is usually disregarded because of the 40,000-ohm carbon resistor connected across the audio-transformer primary. Although the transformer may be replaced, which is advisable, a satisfactory repair may be made by coupling the plate of the second-detector tube to the grid of the output tube with a 0.01-mf. condenser.

Improving Sensitivity. Although these receivers, when operating properly, are extremely sensitive, the sensitivity may be improved to a great extent by shunting the 400-ohm section of the flat wire-wound voltage divider located near the volume control with a 500-ohm resistor. This reduces the grid bias impressed upon the first-detector tube, thus increasing its amplifications. With strong signals, however, the volume control will be found to be ineffective. To avoid this difficulty, a switch should be installed in series with the shunt resistor so that the resistor may be cut in and out at will.

Weak reception, although all tubes have checked satisfactorily, has almost invariably been traced to the 20,000-ohm carbon bleeder resistor in the power pack, which carbonizes to a lower value. The only discrepancy resulting from this defect is a lower plate-voltage reading obtained on the r.f. first-detector and i.f. tubes. This bleeder resistor is connected across the supply circuit at the 135-volt tap and is employed to prevent any excessive rise in voltage that would otherwise occur upon removal of the tubes or until the tubes have fully heated. Even the loss or decrease of a few thousand ohms in this resistor will cause the trouble.

Poor sensitivity at either the high or low frequencies may be due to the oscillator trimmers being out of adjustment. These trimmers are located on the right of the chassis facing the rear, which should be adjusted in the following manner. Tighten the adjusting screw clockwise until the tuning of any station will produce a whistle or oscillation. With the receiver tuned to some station at approximately 1,000 kc., turn the adjusting screw back beyond the point of oscillation. Now tune the set at different points on the dial to observe the presence of oscillation.

If this is found, turn the compensating condenser screw back slightly.

Where stations are received at 40 to 50 kc. from the original dial settings, and stations below 600 kc. cannot be tuned in, check the oscillator series condenser that is connected across the two oscillator trimmers. This condition is caused by the snapping of one or more of the copper tabs emerging from the condenser, thus lowering its effective capacity. In some instances, repair is possible if the break in the copper tab is not too close to the condenser, and may be soldered. Usually it will be necessary to replace the unit.

Unstable operation and oscillation in some cases have been traced to an open-oscillator grid leak. The value of this unit is 40,000 ohms, but a 50,000-ohm unit may be substituted, since the value is not critical.

Distorted reproduction at low volume and a distinct rattle when the volume control is turned up on Model 62 are caused by a broken cone spider of the dynamic speaker. The only remedy here is replacement of the cone and the voice coil.

The complaint of hum on Model 62 is almost always caused by partially shorted rectifier "stacks" supplying d.c. voltage for the field coil of the dynamic speaker. This condition may be checked by removing the output tube with the set in operating order and noting the amount of hum. If the hum does not decrease to any marked extent, the rectifier "stacks" are at fault, or else the hum is due to high-resistance soldered connections to the rectifier. The rectifiers may be checked by measuring the output voltage delivered to the dynamic speaker field coil. With the field coil disconnected, a reading of approximately 140 volts should be obtained, which should not drop under 100 volts when the field is connected. *If the house line fuse should "blow" when the receiver is switched on*, check for shorted rectifier "stacks."

The values of the tapped resistor strip and the volume control of the Radiola 62 were omitted from the manufacturer's schematic. These values are shown in the accompanying illustration. The part No. of the tapped resistor is 5810 and that of the volume control is 5811.

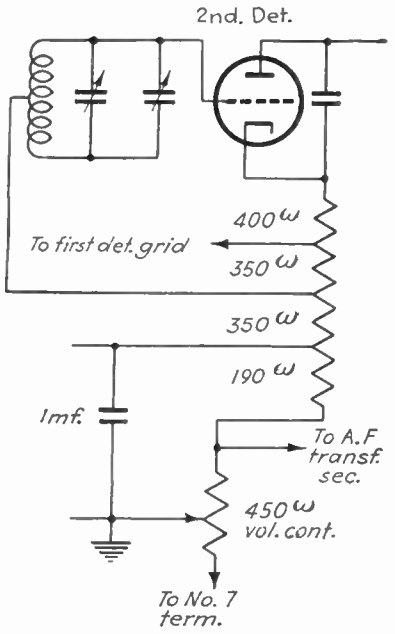

FIG. 19.

The schematic for this receiver will be found on RCA, Vol. I, page 40 in the revised edition, page 497 in the early edition, and on page 1878 of the Rider's *Combination Manual.*

Radiola 64

In a few cases where fluctuation of the tuning-meter needle was encountered, the condition was corrected by shunting a 0.0001-mf. condenser across the terminals of the meter.

Distorted and weak reception is frequently caused by an open-circuited audio-transformer primary. Because of the fact that a 40,000-ohm resistor is connected across this primary, the set analyzer will not disclose the condition. As in the case of the Radiolas 60, 62, a repair may be accomplished by coupling the plate terminal of the audio-transformer primary to the grid of the 50 tube with a 0.01-mf. condenser.

Very weak reception, if any at all, without any control of volume is caused by an open-circuited 1-megohm carbon resistor in the grid circuit of the a.v.c. tube. This resistor is located on the terminal strip fastened to the right wall of the chassis. The defective resistor removes the negative grid bias from the a.v.c. tube and increases the negative grid bias impressed upon the r.f. and i.f. tubes, thus lowering their amplification. This condition is made evident by greater or full volume when the a.v.c. tube is withdrawn from its socket.

Fading and intermittent reception and the condition where stations are received below their original dial setting are caused by the snapping of the connecting tabs of the oscillator series condenser, which is connected across the two oscillator trimmers. In some cases, the change in capacity is so great that stations below 600 kc. cannot be tuned in. If the break can be seen and is not too close to the condenser jacket, it may be soldered, or a new unit should be installed.

If the receiver is insensitive at either the high or low frequencies, the most probable cause lies with the oscillator trimmer condensers. These, as well as the r.f. compensator, should be adjusted as described with the Radiolas 60, 62.

Radiola 66

Distortion. In these models, some trouble may be had with the condenser that connects the secondary with the center tap of the filament resistor. A high positive on the grid of the 171A results when this condenser shorts out.

Radiola 66

If this receiver is completely dead except for a loud hum, usually the by-pass condenser across the plate and cathode lugs underneath the socket of the second-detector tube is shorted. This should be replaced with a 0.0024-mf. condenser.

Where the condition of distorted reproduction is encountered, look for an open 250,000-ohm carbon resistor connected in

the secondary-return circuit of the audio transformer. This condition will be evidenced by the lack of grid voltage and a high plate-current reading obtained with a set analyzer.

The symptoms of fading, intermittent reception, shifting of station-dial settings, and insensitivity in this model are caused by the same defects and failures as described with the Radiolas 60, 62, and should be corrected by following the same procedure outlined under these models.

Radiola 67

The complaint of no control of volume in this model has always been traced to an open 310-ohm end section of the voltage divider located in the tuning chassis. This open circuit is difficult to check because of the fact that when an ohmmeter is placed across the section, a reading will be obtained, since one side of this section is grounded and the other side is only about 4,000 ohms above ground. A 25-watt resistor should be used to replace the open-circuited section.

The most frequent cause for an inoperative receiver is an open-circuited 115-ohm section of the voltage divider located in the power pack.

If it is found that the receiver is inoperative and the tuning-meter needle swings off scale, check for an open-circuited 100-ohm section of the voltage divider in the power unit across which the meter is shunted.

Where fading or an inoperative condition is encountered that can be cleared by removing the a.v.c. tube and the symptom of a high negative grid bias of 90 volts on the r.f. and i.f. tubes instead of the normal 9 volts is observed, check the contacts of the phono-radio transfer switch. The grid return of the a.v.c. tube is connected to one of the terminals of this switch, and if positive contact is not maintained, the a.v.c. grid circuit will be opened. This removes the bias upon the a.v.c. tube, causing it to pass more current and impress an abnormally high bias upon the grids of the r.f. and i.f. tubes. A similar condition may be due to the open-circuiting of the 1-megohm resistor in the grid circuit of the a.v.c. tube. This resistor is located on the terminal strip mounted upon the wall of the chassis near the a.v.c. tube socket.

No Control of Volume. When the a.v.c. 27 tube was withdrawn, the receiver would function, but without any control of volume. In another similar case, however, the withdrawal of the a.v.c. tube made little or no difference. The contacts of the transfer switch were found in proper working order. The latter fact definitely pointed toward some defect in the a.v.c. system. Proceeding on this theory, we removed the chassis from the cabinet.

As the first step toward solving the problem, the voltage divider and associated resistors in the a.v.c. system were checked for continuity in the usual man-

ner by placing the continuity tester or ohmmeter across each section of the voltage-divider resistors. This method was the cause of a good deal of trouble in locating the defective unit, an open 310-ohm section of the voltage divider. One end of this section is grounded and because the entire divider is only several thousand ohms above ground, an erroneous effect was obtained when the continuity meter was placed across the open section. Little thought was at first given to the high reading of the open section for the reason that the middle section is only about twice the physical size of the large one, although more than ten times larger, electrically. Again a careful analysis of the schematic brought the error to light. A repair was effected by replacement with a 300-ohm 25-watt wire-wound resistor.

RCA-Victor RAE-68

This receiver is an automatic phonograph combination employing a Radiola 82 chassis. Service data on this chassis will be found discussed under Radiolas 80, 82, 86.

The automatic phonograph mechanism employed in this model is similar to the mechanisms used in Models RAE-26, RAE-59, and RAE-79. Many of the mechanism failures described with these models under the RAE-79 will also apply to the RAE-68.

Remote-control Trouble. Most of the trouble experienced with this receiver is due to the remote-control off-on switching mechanism. The complaint that the receiver cannot be switched "on" and "off" is the most common. Because of the current drawn by this model, especially when the automatic phonograph has been in operation, the strong arc created by the engagement of the relay armature with the two copper contacts soon corrodes or burns away the ends of the contacts, resulting in the condition in which the receiver cannot be switched "on." On most occasions, when depressing the "off" button will not switch the receiver off, the relay armature will be found spot-welded to the contacts. If the copper contacts are not burned away, necessitating replacement, they should be carefully cleaned with fine sandpaper and tinned. As a measure to prevent recurrences, connect a 0.5-mf. condenser or 0.1-mf. condenser across the two contacts.

When lengthening the cable of the remote-control box, check the extension cable before installation. In many instances, the fanned terminals at one end of the cable do not correspond with the fanned terminals at the other. The right-side terminal 1 may be found to correspond with the right-side terminal 5 at the other end.

Chattering of the tuning control when one of the station-selector buttons is pressed may be eliminated by adjustment of the friction screw. It should not be adjusted too loosely.

RCA-Victor R-71, R-72

The complaint of reception cutting off sharply, oscillation, "station hiss" and unstable operation have, in most cases, all been traced to open-circuiting or open-circuited 0.05-mf. condensers by-passing the r.f. first-detector and i.f. secondary-return circuits. When one of these units open-circuits intermittently, a fading condition will result. An open-circuited condenser will produce the symptoms of weak reception accompanied by "station hiss" and oscillation. Because of the possibility of either or both of the two remaining units causing similar trouble, necessitating a repair, it is advisable to replace all three at once.

RCA-Victor R-73, R-75

Reception cutting off sharply at low volume-control settings is usually due to a break or failure in the antenna system. This defect will not be apparent with the volume control advanced because of the a.v.c. action of the 55 second-detector tube.

Where the complaint of weak and distorted reception is received and the usual loud hum cannot be obtained by placing a finger upon the control grid of the 55 tube with the cap connection removed, check for an open-circuited 0.2-mf. audio coupling condenser. This unit is located beneath the resistor terminal strip.

The symptoms of distorted reproduction with an indication of excessive plate current drawn by the power-output tubes, as disclosed by a set analyzer, have been traced in several cases to an open-circuited 60,000-ohm resistor in the push-pull input secondary-return circuit. This unit is also located under the resistor terminal strip.

RCA-Victor R-74, R-76, R-77

Fading or a sharp drop in volume in these models is due to open-circuited 0.05-mf. by-pass condensers in the r.f. first-detector and i.f. secondary-return circuits. Weak reception, oscillation, or resonance "hiss" is caused by an open-circuited condition or a decrease in the impedance or capacity of these same units. Connection to the condensers which rely to a great extent upon pressure for their contact. Vibration, heat, and entrance of the wax sealing compound cause these tabs to make faulty internal contact, soon resulting in a high-resistance connection that may materially alter the capacity of the unit.

Motorboating between stations, oscillation, and extremely noisy tuning are caused by corroded or dirty condenser-gang rotor contacts. Although these springs may be cleaned and reshaped, a more satisfactory repair may be made by pigtailing the rotor shaft to the chassis.

Intermittent reception and often an inoperative receiver are frequently caused by an open-circuited 0.1-mf. audio coupling condenser, which is mounted upon the metal shield of the 82 rectifier socket.

Where the condition of distorted reproduction at station resonance is encountered in

these models, check the 0.05-mf. by-pass condensers in the r.f. first-detector and i.f. secondary-return circuits. Since these condensers are in the a.v.c. circuit, any leakage in the condensers will remove or "cancel out" the negative bias applied to the control grids of these tubes and produce the complaint stated. On some occasions these condensers may check satisfactorily with an ohmmeter test, since the leakage occurs when the receiver is in operation. In this case, each condenser should be disconnected in turn and a perfect unit substituted to determine the defective component.

Interference set up by mercury-vapor rectifier (82) in Radiolas R-74, R-76, and General Electric Models J-100 and J-105 is troublesome when weak signals are received in the daytime. This interference may be mitigated by installing a short lead to a good ground, but the use of a 5Z3 rectifier will overcome it entirely. The necessary filament voltage may be obtained by connecting the 2.5-volt rectifier filament in series with the 2.5-volt filament winding that "lights" the a.v.c. tube.

The a.v.c. tube is then connected on the filament winding that supplies all other tubes. The jumper wire that connects the a.v.c. heater terminal is removed. If the old a.v.c. tube shows any cathode-heater leakage, it should be replaced with a new Radiotron. The receiver thus altered retains its original performance minus "hash" from the rectifier.

RCA-Victor 73, 75

Fading is a complaint received in these models. At a very low volume, any change or break in the antenna is readily discerned, but with the volume control advanced, this variation in the antenna is not noticeable because of the a.v.c. action of the 55 tube used in this model as combination second detector and a.v.c.

Every condenser in the receiver capable of producing this effect was checked in an effort to find the cause of this fading. It was found that even the removal of the screen or cathode by-pass condensers in the r.f. cathode by-pass condensers in the r.f. and first-detector stages to obtain the same condition occasioned by an open-circuited condenser failed to produce the condition complained of, although ordinarily an open-circuited unit in either of these circuits would cause a drop in volume. On the other hand, when either of these condensers connected in the secondary-return circuits of the first-detector or intermediate amplifier were removed, the volume dropped considerably.

Although, as with carbon resistors, it is well known that condensers used in radio receivers often vary more or less from their rated capacity, experiments carried on from time to time indicate that condensers that had open-circuited intermittently, when measured with a capacity meter, would show a wide deviation from their rated value. It is true that the procedure of bridging the suspected unit

with any other of known value is both speedy and efficacious; but this method is valuable only when the condenser has open-circuited and remains in that condition at the moment of test. The capacity meter, however, has many times revealed the faulty condenser, even though the receiver was in operating condition.

With this fact in mind, we checked all 0.05-mf. units in the secondary-return circuits of the r.f. first-detector and intermediate stages, and we found that the condenser in the first-detector circuit was low, producing a reading of less than 0.01 mf. on the capacity meter. A new unit was installed, and the receiver was returned after several days to the customer, who reported that fading had never reoccurred.

RCA-Victor 77

This model was recently serviced for hiss. After an entirely new aerial system was erected, this noise was still present.

Attention was then turned to the receiver. The chassis was removed from the cabinet to facilitate free access to all component parts. Before a point-to-point resistance check was made, the by-pass condensers in the r.f. portion of the receiver were tested by bridging all units with 0.1-mf. condensers, this size being sufficient, since the values used ranged from 0.05 to 0.5 mf. When the condenser in the secondary-return circuit of the i.f. stage that is in the a.v.c. circuit was shunted, the "shushing" resonance noise cleared up. Its value, when checked, proved to be approximately 0.008 mf. A new 0.05-mf. unit was installed, and the job was done.

High Frequencies Accompanied by Noise. In this same model, a frequent cause for complaint is noisy reception on the higher frequencies, especially when tuning from station to station. Because of the a.v.c. action, an input signal, fairly large because of a long antenna, will cause a very high negative bias to be impressed upon the grids of the r.f. first-detector and i.f. tubes, thus decreasing the plate-current flow. Consequently the sensitivity of the receiver will jump to maximum as the receiver is tuned off resonance. With a low setting of the volume control, very little or no a.v.c. action is secured, resulting in very little interstation pickup, and only the powerful stations will be heard. As the control is advanced, interstation noises increase, as well as the noise on the high-frequency low-powered stations, because of this a.v.c. action.

The only way to remedy this is to limit the a.v.c. action. This can be done quite readily by reducing the heater voltage of the 56 a.v.c. tube by the insertion of a small filament resistor in one leg of the heater circuit, thereby preventing any action except on really strong signals or with a high setting of the manual volume control.

Another method of reducing this form of interference lies in cutting down the effective length of the aerial to decrease

the signal input; but this method has the disadvantage of making the receiver less sensitive to weak signals. One customer, not desiring any changes in the chassis, was pacified by installing a single-pole single-throw knife switch at the window so that the aerial could be disconnected at will, using as the aerial the wire, about 20 ft. long, from the window to the set. This method proved very effective.

The correct length of the aerial depends upon both the location of the receiver and the a.v.c. action.

RCA 78

Hum and noise are reported on low volume and have been traced to a poor ground or to no ground connection to the yellow lead.

Set Inoperative. The complaint that the tubes would light up but that the set would not play has been found due to an "open" 1,100-ohm carbon resistor on the type 56 tubes which drive the 46 tubes in the output stages.

Hum was traced to defective 56 tubes.

Oscillation was traced in many cases to the various by-pass condensers opening up. The simple method of bridging the various suspicious condensers will locate the defective unit in a very short time.

RCA 78 (General Electric 125)

Defective detector reactor choke in square can fastened to chassis side. Replace with 5,000-ohm audio transformer, wiring primary and secondary in series aiding. Or use the secondary alone.

RCA-Victor R-78, R-78A

Fading, oscillation, weak volume, and "station hiss," as in Models 74, 76, 77 are caused by open-circuiting r.f. first-detector and i.f. secondary-return by-pass condensers. In this case, however, the capacity of the units is 0.1 mf. A fairly good indication of this open-circuited condition is an improvement or increase in volume when a finger is placed upon the control-grid cap of the 58 tubes in the r.f. first-detector and i.f. circuits.

Noisy tuning, motorboating, and oscillation at the higher frequencies are due to corroded tuning-condenser rotor contacts. The rotor shaft should be pigtailed to the chassis by means of a length of flexible insulated wire.

Hum of a mechanical nature on a number of occasions has been found to be caused by loose, vibrating laminations of the filter choke. Since this unit is contained within a metal housing and sealed with insulating compound, the condition is not easily rectified. Remove the choke, and heat carefully in an inverted position so that the pitch does not spill over. If the hum is still present after the unit has been reconnected, strike the metal case smartly several times with a light hammer.

Intermittent and noisy reception has frequently been traced to a faulty volume control. In some instances, the trouble may be corrected by bending the movable contact arm to secure more tension and

applying a thin film of chemically pure vaseline upon the resistance strip.

Resonant Distortion. As stated with Models R-74, R-76, etc., the complaint of distortion upon resonance at any volume level that may be cleared by slightly shifting the dial settings has been traced to leaky 0.05-mf. secondary by-pass condensers in the r.f. first-detector and i.f. circuits. Since this condition is often not revealed by an ohmmeter test, the condensers must be checked for leakage by some high-voltage method or disconnected while the receiver is operating and a new unit substituted.

Intermittent Reception and Distortion. This receiver has been serviced on a number of occasions for the complaint of intermittent reception and distortion. In this case, the complaint was associated with the fact that it was possible, when reception ceased or became distorted, to clear up the difficulty by shifting the station-selector dial 10 or 20 kc. on either side of the station frequency. The condition was traced to the oscillator-series condenser. This unit, mounted across two terminals on the side of the first detector-oscillator coil, is composed of a number of plates whose ends are soldered together. One or more of these tabs were found to have snapped between the soldered terminal and the point at which the tab emerges, thus reducing the effective capacity of that condenser. In some instances, a repair has been effected by resoldering the snapped tabs when the break has not been too close to the condenser case.

RCA-Victor RAE-79

Set will play only with a.v.c. tube out of socket. Possibilities of trouble in the order named:

1. Shorted C_{34}, refer to *Rider's Manual*, page 504-9-A, the part located in capacitor pack. Wire color green connected to brown, black, green resistor. Pack speaker up, resistor fourth from top. Replace with new point 1 resistor to ground.
2. Look for leaky C_{17}.
3. Check L_{18} for possible short.
4. Check R_{15}. Be sure it is 110,000 ohms only.
5. In all probability you will find a shorted C_{34}.
6. First disconnect wires on C_{34} and see if it plays.

Should you find last-mentioned condition true, install your new 0.1 live side to original connection and grounded side to nearest ground point—that is, to grounded side of red, black, orange resistor located first front in power pack.

The tuning chassis employed in this model is identical with that of the Model R-50 but for the remote-control unit, which is similar in many respects to that used with Model RAE-68. Service data on the tuning chassis will be found under the data on Model R-50.

As described with Model RAE-68, failure of the off-on switching mechanism is

due to one or both of the copper contacts being burned away. Where pressing the "off" button will not switch off the receiver, the copper contacts of the relay will be found spot-welded to the armature of the relay.

The phono-radio. Home-and-radio-recording remote change-over mechanism will not respond if the small 17-ohm wire-wound resistor connected across the socket of the pilot light burns out. This defect results in an open motor circuit.

Intermittent and noisy phonograph operation is due to a corroded friction contact on the movable arm of the phonograph volume control. This contact is a flat copper spring riveted to the movable arm and rides upon an insulated terminal lug in the center of the volume-control cover. The cover may be pried off and both the wiping contact and lug carefully cleaned of grease and corrosion. An insulated pigtail installed between these two points will make a more permanent and satisfactory repair.

Where the remote control fails to respond when the different buttons are pressed unless the control box is held in certain positions, check for a break in one or more wires in the cable. This defect is almost always found at the point where the cable enters the control box. A repair may be effected by cutting away the cable at the break after the insulation has been removed so that each lead can be marked and reconnected to the proper terminal.

Servicing of the automatic phonograph mechanism has been made necessary by several major failures that will be discussed in turn.

When the bottom record or records are dislodged as the record magazine returns to position after a record has been deposited upon the turntable, check the adjustment of the magazine roller. This roller should be placed in such position that it is at right angles to the record-magazine shaft and just touches the magazine when the latter is empty and passing through its cycles.

If the record is carried back with the magazine and is not deposited upon the turntable, the position of the record-transfer lever will be found at fault. This lever should be adjusted by loosening the two mounting screws and shifting its position so that when a 10-in. record is placed against both pins on the lever, the record hole is above the spindle. A weak spring in the turntable spindle that holds up the spindle nose will also cause this trouble. By lifting off the turntable, the spring may be removed and stretched to increase its tension.

If the pickup lowers upon the record and does not slip into the first groove of the record or slides across several grooves, incorrect tension of the flat copper spring that presses against the locating lever of the tone arm will be found at fault. In the first instance, the spring must be bent to increase its tension against the tone-arm locating lever. Where the pickup

slides across several grooves, the tension of the spring must be decreased.

Where the record is rejected and the record-changing mechanism repeats its cycle as soon as the pickup lowers upon the record, the four-finger lever will be found at fault. This lever operates on a riveted joint that loosens and disturbs the lever, preventing it from engaging with the clutch pawl. The rivet may be "peened" (hammered) down, but not so much as to interfere with the action of the lever. Insufficient tension of the small four-finger lever spring will also cause the same condition. The purpose of the spring is to hold the long arm of the four-finger lever in position against the clutch pawl. Part of the spring may be removed to increase its tension. In some cases, the long arm of the four-finger lever may be found bent out of shape so that it does not engage properly with the clutch pawl. This may be easily corrected by bending the arm either up or down so that it is at an even plane with the clutch pawl.

If the condition is encountered where the mechanism continually trips and cannot be stopped by pressing the "off" button, check the timing of the gears. The side of the cam gear should be parallel with the side of the slide, and the long arm of the four-finger lever should be engaged with the end of the clutch pawl. It is necessary to remove the clutch wheel by loosening its setscrew and lifting the clutch-pawl plate so that adjustments can be made. When the clutch-pawl plate is replaced, it is important that the cable-lever roller be engaged in the slot on the side on the side of the clutch-pawl plate and the long arm of the pawl. The same condition may also be due to improper adjustment of the secondary switch, whose contacts should open after a cycle is completed. The switch may be adjusted by loosening the two mounting screws and shifting the switch into position.

Another frequent cause for intermittent operation of the phonograph lies with corroded contact segments on the master transfer switch. This condition is easily remedied by removing the cover of the switch and cleaning each segment with a strip of fine sandpaper, which may be wound around the blade of a small screw driver.

Radiola 80

Distorted Reproduction. A number of RCA Model 80 receivers have had a great deal of distortion on low volume; however, when the volume is increased, the tone clears up. This is caused by a drop in resistance of the 110,000-ohm carbon resistor that is between the second-detector cathode and the high-voltage plate-supply circuit. This drop in resistance greatly increases the grid bias on the second detector.

Cracking Noise and Cutting Out. In this same receiver, a steady cracking sound and an occasional cutting out, regardless of the position of the volume control, are generally due to a defective push-pull input audio transformer.

RCA-Victor RE-80

Oscillation, no a.v.c. action, loud volume, and motorboating most frequently on the higher frequencies. The trouble is this: The pilot-light socket almost touches the shield on the front panel that is used to shield the antenna coil from the controls on the panel. The vibration of the set causes the socket lugs to short to the shield. The shorted pilot-light socket will short out the power-amplifier bias resistor as well as remove the negative potential from the cathode of the −55 tube. This will result in distorted reproduction, no a.v.c. action, oscillation, and loud volume. It is simple to twist the lugs back in place and to wrap tape around the lug to prevent the same trouble again.

Radiola 80

Distortion. Due generally to lowering in value of 110,000-ohm resistor in detector cathode circuit. Lack of sensitivity. Lowering in value of 14,300- and 8,000-ohm resistances in the screen circuits. Noisy operation that stops when either the first-detector or an i.f. tube is removed. Partial open in plate circuit of an i.f. transformer. If noise persists, however, when the tubes mentioned are removed, test push-pull input transformer by resistance method.

Radiolas 80–82

Loss of Volume and Poor Tone. Examine black enameled bias resistor for 45's under chassis for bad soldered joint.

Radiolas 80, 82, 86

The complaint of distorted reproduction and hum in these models is often caused by an open-circuited 60,000-ohm resistor in the push-pull input-transformer secondary return. A set analyzer will readily disclose this fault by high plate-current reading and lack of grid bias obtained on the output tubes.

Fading, intermittent reception, and shifting of station-dial settings are caused by the snapping of the oscillator series condenser tabs, as described with Models 60, 62, 64. The value of this condenser is 745 mmf.

Where poor control of volume is found on powerful signals, even when the local-distance switch is in the local position, remove the 60,000-ohm carbon resistor shunted across the volume control. Replacement of the 24 tube in the r.f. stage with a type 35 will often eliminate the same condition.

Distortion and low volume have sometimes been traced to an open audio-transformer primary. As described with Models 60, 62, 64, and 67, this open circuit cannot be checked with a set analyzer because of a 40,000-ohm resistor connected across it.

Service data on the remote tuning employed with some 82 and 86 receivers will be found under RCA-Victor RAE-68.

Poor Quality, Voltages Apparently O.K. May be due to open in input transformer, since the primary is paralleled by a 60,000-ohm resistor that passes plate

current to the 27 second detector, despite the opened transformer.

RCA-Victor RE-81

The chassis employed in this receiver is the same as that used with Models R-76 and R-77, and additional service data on the RE-81 will be found under those models.

Intermittent radio or phono operation of this receiver is due to corroded contact segments of the master change-over switch and should be remedied in the same manner as described with Model RAE-79.

If no screen is obtained upon the first-detector and i.f. tubes and no oscillator plate-voltage, check for an open-circuited speaker field in this circuit. The dynamic speaker in this receiver employs two field coils.

RCA-Victor RAE-84

Phonograph Trouble. Service data for this model will be found discussed under Model R-78A, the chassis of both models being identical except for the phonograph terminal strip. Causes for inoperation and adjustments of the automatic phonograph mechanism have been treated under Model RAE-79. An added complaint against this model, however, lies with the manual operation lever. Although an arrangement has been provided so that the manual lever cannot be moved while the mechanism is in cycle, an attempt to do so will bend the lever in such a way that it cannot be pushed into the manual position. With the lever in the manual position, the latch trip is made to ride upon the smooth surface of the manual lever and to clear the latch plate. The only remedy for this condition is to bend the manual lever so that it will pass under the latch plate.

RCA-Victor R-90

Weak and Distorted Reception. This receiver has been serviced thus far for one major complaint, namely that of weak and distorted reception. Where this condition is encountered, check the small a.v.c. coupling condenser and grid resistor located within the first r.f. transformer shield.

RCA Superheterodyne 100, 101

No Reception. Disconnect the red lead to plate of I-V and replace with 4 mf.

RCA 102

Line Cord Burned Out. When replacing with new cord, be sure to roll a piece of mica over the resistance asbestos and tape, allowing mica to be ½ in. larger than the resistance wire. This wire runs to the socket of the 37 and when set is moved around, the socket lug frequently cuts into the asbestos, shorting the wire. Mica goes into the set under the socket. Tape or tie line cord so that it stays fastened to the chassis.

RCA 106 Speaker

Tone Improvement. The a.c. model can be used with single pentode-output-

tube models with considerable improvement in tone. The field is about 450 ohms. Use it as the bias resistor.

RCA-Victor 121

This model brought in the complaint of violent noise and very weak reception on the most powerful stations.

On the top of the 58 tube shield can there is a small cap about 1 in. in diameter, with slot on one side. Through this slot runs the grid wire to top of 58 tube. There is a small piece of cambric tubing over this wire that is intended to be up close to the grid cap on end of wire. This tubing slips down, allowing portion of grid cap soldered to wire to touch shield cap, thereby causing all the trouble.

Servicemen should see that this tubing is forced up to grid cap as far as possible and that there is no chance of its slipping. The better idea would be for RCA to use soft rubber that would not slip or a bakelite top for the grid wire.

Motorboating. Open 4-mike section of capacitor pack. Intermediate frequency: 175 kc).

RCA-Victor 140, 141, 240, and AVR-1

A low, insistent hum in these models that increases slightly as the receiver is tuned to resonance has been traced in some instances to the type 2B7 second-detector tube, despite the fact that no defect could be disclosed when the tube was tested in a tube checker.

When the complaint of noisy and intermittent reception is received, check the type 2A7 pentagrid converter tube. Because of many elements, it seems that this tube is particularly affected by the jolts and vibration to which the receiver is subjected during shipment and installation. In the majority of cases, this defect will not show up with a set analyzer. Where leakage or short circuits develop between the cathode or heater of this tube, the receiver may be found inoperative.

A carrier hum is sometimes caused by one or more of the type 58 tubes. In some instances the condition may be eliminated by interchanging the positions of all the 58 tubes.

It will be noted that tuning on the broadcast band is exceptionally broad for a superheterodyne receiver of this type, stations often being received 20 to 30 kc. on either side of the allocated frequency. The same tuning-condenser gang is employed for the short-wave bands as for the broadcast band, and because of the wide band of frequencies covered by the short-wave ranges attempts made to improve the selectivity will cause the set to be too critical or sharp. The condition is normal.

Interference from 600-meter code stations on these receivers may be attributed to the fact that the intermediate frequency is 445 kc. According to the manufacturer, the use of this frequency gives an especially good image-frequency ratio and makes easier alignment of the oscillator at the higher frequency bands. One method

of eliminating or reducing this type of interference is to employ a wave trap whose secondary circuit is tuned to 445 kc. An ordinary i.f. transformer of the frequency specified may be used as the wave trap. The primary of the transformer may be inserted in series with the antenna as close to the receiver as possible. Although the primary of the i.f. coil is of the high-impedance type, it will have little or no effect upon broadcast or short-wave signals, since these signals are not within the frequency of the wave-trap tuned circuit. Another method is to shunt the primary of the i.f. transformer serving as the wave trap across the aerial and ground as closely to the receiver as possible, in series with a fixed condenser. In the case of the highest frequency band of the receiver, an additional r.f. stage is utilized to reduce code interference.

RCA 140

Distortion, Muffled Reception at High Volume Levels. Shunt a 40,000-ohm resistor across R_{13}, a 2-megohm carbon-type ½-watt unit located in the grid circuit of the 2B7 second-detector-a.v.c. tube.

RCA 241B

Intermittent Reception. Corrosion where leads are welded to coils, both input and output transformers.

RCA 321

Phonograph plays, but radio doesn't. Check for short in condenser having blue lead to terminal near oscillator padding condenser. When replacing, be sure to include 30,000-ohm resistor in original position. Use four-mike unit with 500-volt rating.

RCA-Victor 330

The complaint of wavering, vibrating record reproduction accompanied by a strong hum in these models has been traced in several cases to the shipping blocks under the sides of the phono panel that have not been removed. These wood blocks are intended to keep the phono panel from vibrating during shipment and upon installation of the receiver. So that the phono panel may "float" upon the spring suspension, the blocks should be removed to prevent the transmission of any vibration to the record and pickup during record reproduction.

When the condition of intermittent phono operation is encountered or when the mechanism is inoperative, check the radio-phono transfer switch. The small tumblers within the switch housing often become disengaged from the shorting contacts of the switch. Because of its construction, it is inadvisable to attempt the repair of this switch, and a new unit should be installed. An inoperative condition of the radio portion of the receiver has also been found to be due to failure of this switch. When a set analyzer discloses the lack of plate voltage on the r.f. 58 tube and a point-to-point resistance measurement indicates this failure to be due to an open cathode circuit in that

stage, the phono transfer switch should be checked at once, since the cathode return of that stage is grounded when the switch is snapped to the "radio" position and is open-circuited in the "phono" position. When this defect occurs, usually the switch cannot be snapped to either the "radio" or "phono" position.

A common complaint with this model is poor control of record volume. A sharp drop in volume is usually obtained when the phono volume control is turned to the middle of its range. This trouble may be remedied by disconnecting the lead to the center tap on the volume-control resistance element. This center tap on the volume control is employed in conjunction with a choke-condenser resistor combination, as shown in Rider's *Manual*, Vol. IV, page, 108, to reduce the high-frequency response so as to reduce "needle scratch." In all cases, however, where the center tap has been disconnected, the increase in "needle scratch" has been negligible, not interfering with the quality of record reproduction. In the event that such condition results, the tone control of the receiver may be used to lower the high-frequency response.

RCA-Victor 331

Phonograph Trouble. The RCA-Victor Model 331 is a radio-phono combination employing an automatic phono mechanism. This phono mechanism is comparatively simple, but has provided two major causes for complaint. Where the pickup lowers upon the record and the needle does not slip into the first filter groove, or the needle skips several grooves, it is necessary to readjust the switch-lever locating screw. A 10- or 12-in. record should be placed upon the turntable and the index lever set to the proper position. It will be noticed that when the index lever is set for automatic operation, the switch lever (whose position is determined by the position of the tone arm, since they both operate together) will strike against a small screw, preventing the pickup from being returned to its rubber rest. If it is found that the needle does not slip into the first groove when the pickup lowers upon the record, the lock nut on the screw in question should be loosened and the screw adjusted counterclockwise (looking at the slot in the screw). Should the pickup lower the record and the needle skip over several grooves, this screw should be adjusted clockwise and the lock nut securely tightened.

When the mechanism fails to trip at the completion of a selection and reject the record, it will become necessary to readjust the tension of the pawl trip. The adjustment may be made only by removing the mechanism cover on top of phono panel. A small forked lever will be seen here that engages a pin attached to the pickup arm. The screw directly behind the forked lever varies the tension upon the pawl-trip finger. The screw should

be adjusted for enough friction so that sufficient force is exerted to cause the pawl-trip finger to trip the pawl under the phono panel.

Intermittent phono operation is often due to a defective radio-phono transfer switch. The small tumblers within the switch housing become disengaged from the shorting elements and cause the switch to become inoperative. Since switches of this type cannot easily be disassembled for the purpose of repair, they are best replaced. An inoperative condition of the radio portion of the receiver has also been found to be due to failure of this switch. When one of these receivers is encountered in an inoperative condition and the set analyzer discloses the lack of plate voltage on the r.f. 58 tube, check this switch immediately, since the cathode return to that stage is open-circuited when the switch is snapped to the "radio" position. Usually, however, this failure can be easily noted for the reason that the switch cannot be snapped or is difficult to snap into the "radio" or "phono" position.

If the phono (or record) volume control becomes noisy at the center of its range and a sharp cutoff or drop in volume is obtained at this point, the condition may be overcome by disconnecting the lead to the center tap on the volume-control resistance element. The only function of the center tap is to reduce the high-frequency response so as to minimize "needle scratch."

❖ ❖

Remler

Remler 40

Improving the Over-all Performance. Beginning with serial No. 66,746, several changes have been made in the Remler Model 40, which is described under "Remler," page 3 of Rider's Vol. VI.

Only one antenna coil is used in the revised chassis, the one marked "long" (see schematic on Vol. VI, page 3) having been eliminated. Resistor 12 in the cathode circuit of the 6A7 tube has also been removed, and now the junction of the cathode of this tube and resistor 18 is directly connected to the lower end of the volume control in the antenna circuit. A 400-ohm 1-watt resistor has been substituted for the 450-ohm resistor 14 in the power-supply circuit. The resistance of volume control 16 has been changed from 12,000 ohms to 1,000 ohms, and the upper connection of shunt resistor 22 goes now to the movable arm of the volume control instead of to the upper end of the resistor element of that unit. The resistance of 22 resistor remains the same. The resistance of 18 resistor in the cathode circuit of the second i.f. transformer has been decreased from 1 megohm to 500,000 ohms. Resistor 24 has been changed from 90,000 to 100,000 ohms.

Remler 42

Several changes have been made in the Remler Model 42, starting with serial

No. 57061. The schematic diagram of the earlier model is shown under "Remler," page 4 in Vol. VI of Rider's *Manual*.

If a double antenna is used, the lead-in wires are connected to the blue and yellow leads. The antenna and r.f. coils are in the can nearest the front of the chassis, and the mixer coil is in the shield within the chassis. The first i.f. transformer is mounted in the shield between the 6A7 and 6D6 tubes, while the second i.f. transformer is located between the 6D6 and 75 tubes. The oscillator padder for the broadcast position is at the right end of the chassis. Trimmers for the i.f. transformers can be reached through holes in the shield cans.

The i.f. peak is 450 kc. In removing the chassis from the cabinet, pry off the knobs with a wooden screw driver with a piece of cardboard against the cabinet and pull off the pointer from the condenser shaft.

The voltage readings are the same for this revised model as those given on page 4, Vol. VI in Rider's *Manual*.

❖ ❖

Rogers

Rogers 725A–740A–755A

Noisy Volume Control (using spray-shield tubes). One common complaint in these sets using the spray-shield tubes was a noisy volume control. Replacement did not cure the trouble, however, which was found to be due to gassy tubes. This condition was cured by the addition of a 0.05-mf. condenser and 0.3-megohm resistor in the grid circuit of the first a.f. audio tube.

Another complaint was intermittent reception on all wave lengths. This occurred at the rate of about 60 per minute. The trouble was located in the two 0.05-mf. condensers located under the tuning-condenser shield and connecting the low end of the r.f. coils to the condenser.

❖ ❖

Royal

Royal A.C.-D.C.

Mushy Quality and Mushy Tone. Set uses a 25Z5 43, 77, and a 78. Quality was mushy, tone distorted. Tubes were o.k., but although the voltages were slightly low in 43, they were o.k. on 77 and 78. All condensers, resistors, and coils were tested at better than rated voltages, and no shorts, opens, or leaks were found. Acid flux had been used on many joints and on all grounds to chassis. A No. 16 insulated wire was soldered to the two tuning-condenser rotor-wiper contacts and then in turn to all grounds to chassis, thus eliminating the chassis as a common return, although no grounds to it were removed. This gave a fine-acting set and brought all voltages to normal. In any number of short-wave receivers the writer has restored and often bettered performance by using a one-piece copper lead securely fastened to the chassis

instead of relying on the chassis alone as a common return.

❖ ❖

Scott

Scott 1931 and 1932

Nonoscillation of Oscillator. When the oscillator (type 27) refuses to oscillate over portions of any of the various short-wave bands and all voltages and tubes check o.k., replace the 27 with a 56. Realign the oscillator tuning condenser. This trouble is often found on older models of Silver-Marshall supers, and the remedy is the same.

❖ ❖

Sentinel

Sentinel, Six-tube

Intermittent snapping, buzzing, and cracking in this receiver are an indication that a light adjustment of the vibrator-spring tension is necessary.

Sentinel A.C.-D.C. 560

No Signal. Check for open 8-mike section in 8-8-4 block connected as follows: Black, common negative. Eight-mike positive to one side of filter choke. Eight-mike positive to other side of choke. Four-mike positive to cathode of 25Z5. All negative connections are, incidentally, independent of chassis.

❖ ❖

Silver Marshall

To make replacement of dial cable a half-hour job. Remove all tubes; then remove shield around r.f. section. Now unsolder all connections to gang condenser. Remove three screws holding down condenser and remove entire gang with the drum. String on new cable, time about 5 min., and replace the assembly. Any other way takes about three times as long.

Silver Marshall A

Incorrect Voltages. This set was found with three resistors so changed in value that the voltages were all "haywire." Replacement cleared this up, but the receiver didn't have the power a set of this type should have. A study of the diagram revealed an 0.1-mf. condenser across the 47 tube bias resistor. We tried a 10-mf., 25-volt electrolytic condenser across this resistor, the volume increased considerably, and the tone quality was improved.

Silver Marshall A18

When set squeals with volume wide open on distant stations, try changing oscillator tube. Also check for too high screen-grid voltage.

Silver Marshall 5T; All World Midget

Reception, Slight Hum in Speaker. Sizzling of electrolytic at times. Check 0.1 mf. across screen condenser of 6D6.

Silver Marshall Q

Don't mistake the i.f. frequency for 175 *kc.* It is 465 kc., and the set will not work properly with any other adjustments.

Silver Marshall 30

When there is no reception, look for a punctured filter condenser, usually the green lead coming out of the can.

Silver Marshall 36A

No control of volume in this model can be traced to one of the 0.1-mf. condensers in the triple bank. This condenser bypasses the first r.f. and first i.f. cathodes. It may have a high-resistance leak as high as 12 megohms and still affect the volume control.

Breaks into oscillation after operating satisfactorily for a short time. Insertion of analyzer cable in any socket clears up trouble and makes test difficult. Trouble is defective r.f. choke in series with cathode of first i.f. amplifier.

Silver Marshall 37, 38, 39, 782

Distortion at low volume level on local signals. Replace second 24 from front of set with 35 or 51, change minimum resistor to 100 ohms (on Bakelite strip with one end grounded and other connected to volume control), and connect a 25,000-ohm resistor between screen of 35 and high-voltage side of volume control.

Silver Marshall 724

A common cause of fading or cutting off is found to be due to a defective mica tuning condenser in the last i.f. transformer. Pressure on it with a small screw will show it up.

❖ ❖

Silvertone

Silvertone J

If hum on this receiver cannot be eliminated by adjusting the 20-ohm filament center-tap resistor and it is not due to a defective tube or to an open section in the filter-condenser block, it is well to check the two 0.1-mf. condensers connected from each side of the type 26 filament wiring to ground. These condensers are of the cartridge type and will be found next to the second and third r.f. sockets.

This chassis incorporates a "hum-reducing" unit consisting of the 3,000-ohm (green) resistor and the 1.-mf. condenser connected from the arm of the center-tap resistor to the B+ end of the push-pull input transformer. A defect in either the resistor or the condenser will increase the amount of hum in the receiver output.

This hum-reducing system can be applied with favorable results to receivers using the same basic circuit (Bosch 28 and Majestic 72) as this Silvertone receiver.

Silvertone 36, 37, 41, 172

To increase pep in these sets, volume controlled by primary-coil movement into secondaries. Loosen setscrew on volume-control shaft on rear of condenser gang and move primaries ⅛ to ¼ farther into secondaries. Tighten screw, align trimmers on gang to cut out oscillation, and

insert 35 type tubes in r.f. sockets instead of 24's.

Silvertone 41

Failure of Condenser. This receiver, sometimes listed as Model 1152, is beginning to have numerous failures of condensers, particularly in the bank of the front power-pack side of the chassis. Be sure to check all of these and replace if possible. One of these sets came in with the field of the speaker open. The speaker has a 1,450-ohm field that acts as the bias resistor. The open was located, as most such opens are, in the soldered joint under the speaker-field winding cover. Don't try to take the speaker apart, for it won't come. The cover, however, can be worked loose, and around, sufficiently to make the repair.

Silvertone 42

Unsatisfactory reception between 540 and 950 kc. due to noise and whistling on distant signals. Ground one side of the antenna coil to the chassis. This coil is not originally grounded. An external ground to the chassis, also, takes out hum.

Silvertone 110, 111

Defective Volume Control. Replace with 10,000-ohm unit and ground through 5- or 10-watt 500-ohm resistor in series with the cathode circuit to give better control on locals.

Silvertone 117

See Colonial 36 A.C.

Silvertone 1171

Audio Howl. Trouble in the Silvertone Exposition Model 1171 six-tube super is sometimes audio howl, which sounds like a microphonic tube. Looking from the rear of the self-contained cabinet, you will find the coil shield on the right front of the chassis touching a nut holding the speaker to the front of the grill. Enlarging the chassis bolt holes on the back side and floating the speaker to the front of the cabinet on a concentric circle of cardboard have cured the most stubborn cases.

Silvertone 1506

No Reception. Look first for a shorted 0.01-mf. by-pass between the 47 plate and grid. This is a common ailment.

Volume control acts erratically after shot second i.f. transformer is replaced. Change circuit associated with volume control as follows: Remove all old wires from the control. Connect center arm to ground. Connect terminal formerly running to ground through 150,000-ohm resistor to the cathodes of the first-detector and i.f. stages, including original resistor in this new lead. Connect arm formerly connected to one end of the voltage divider to the antenna coil. Ground the end of the divider. Leave the screen lead, tapped on the divider, as it was originally.

Silvertone 1570, 1574

Electrolysis in Output Transformer. Commonly encountered through use of paper winding form that evidently con-

tained some chemical, heightening this effect. Use a bakelite form when repairing or place Empire cloth between winding and paper form. Preheating and sealing in some moisture-proof compound is also recommended.

Silvertone 1584

Continual blowing of 0.003, 600-*volt condenser* connected across primary of power transformer. Due to surge built up in primary winding when line switch is opened. Use an 800-volt condenser as a replacement, connecting it between the line side of the on-off switch and the chassis.

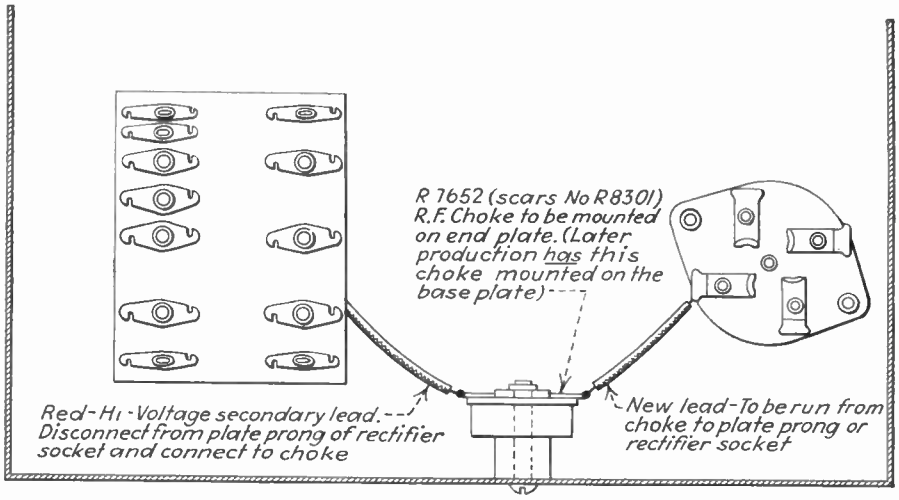

FIG. 20.—Illustration for installing h. f. choke in Model 1640 to prevent rectifier interference viewed from the bottom.

Silvertone 1640

Improving Tone and Reducing Hum. Use 0.001 condenser in place of original 0.003 tone-control unit. Replace 100,000-ohm resistor and 0.1-mike condenser in lead to mid-point of driver tube's grid leak with 0.5-mike condenser from grid leak mid-point to ground. Use 0.003 condenser instead of 0.02 from one leg of power-transformer primary to ground. Use grounded electrostatic shield between primary and secondary of power transformer if set operates on 25 cycles. The 60-cycle jobs do not need such shields, and if shields are provided, they should be disconnected. Replace 8-mike 475-volt electrolytic condensers with 14-mike 440-volt unit. In replacing power transformer, use one with a separate filament winding having a 20-ohm adjustable center-tap resistor across it for one of the 46 driver tubes. The adjustment is quite critical. To impart greater brilliancy to tone, replace auto transformer found mounted on 12-in. speaker with a new auto transformer having fewer laminated core sections. Failure of volume control to reduce volume to zero is due to coupling between second i.f. and detector grid leads

under the chassis. The i.f. lead connects from coupling choke and detector grid lead from tuning condenser. Spread these leads far apart.

"*Blurping*" *at High Volume Levels.* Reverse transformer secondary leads to grids of 46's.

Reception can often be improved by the insertion of a choke (Part No. R-8301) in the red-plate lead of the 283 rectifier. This will reduce the hiss or feedback. In some instances this tube may cause interference within the set, as well as within other sets in the vicinity. If the use of one choke does not eliminate the trouble, a similar choke can be inserted in the other plate of the 283. See accompanying illustration for installation of this choke. For schematic diagram, see Rider's Vol. III, Sears, page 12, and page 2098 in Rider's *Combination Manual.*

Silvertone 1711

When changing to standard tube types, replace 951's with 32's. Replace 950's with 49's, not with 33's, since the latter draw excessive filament current and will blow ballast tube.

Silvertone 1801 A.C.-D.C.

Undue hum after regular filter replacement. Tie the cathodes of the 25Z5 together. The filter arrangement of this set is identical with that of a Sparton 57, so that a filter block for this latter make will work quite satisfactorily if the original replacement is not obtainable. Care must be exercised because the color coding of the leads supplied with the two blocks is not identical. Both schematics must be on hand to avoid wiring error.

Silvertone 1822, 1831

Speaker Rattle. In some receivers carrying these model numbers, a felt ring between the small speaker and the baffle is omitted, with a rattling of the speaker resulting. This is due to the fact that when the mounting screws of the speaker draw the speaker tightly against the baffle, the speaker frame may become slightly bent, throwing the cone off center. The felt ring acts as a cushion mounting to prevent this bending. Do not tighten the mounting screws any more than is necessary. If this felt ring is missing, one should be inserted (Part No. R9959).

❖ ❖

Simplex

Simplex PA

Dial slips in this dual-band Aircell battery type. Quickest permanent cure is to slip a 7/16- by 3/16-in. rubber grommet over the shaft and wind cord around this grommet instead of the bare shaft, as originally equipped.

❖ ❖

Sonora

Avoiding High Price of Replacing Special Tubes. Rewire for 27's in the r.f.

detector and first a.f. and a 45 in the output. Place five-prong wafer sockets over regular four-prong types in r.f. sections. Fasten with small bolts. Bring up connections. Carry cathode leads from chassis through holes in rivets holding coils. Make cathode return to power pack through one side of unused filament wiring. Install new transformer with following specifications: 700-volt center-tapped secondary, 2.5-volt center-tapped filament secondary and 5-volt secondary. Change bias for 27's to 500 ohms and place grid return to 45 in filament center tap. Discard ballast tube. Job costs less than half the price of new special tubes.

Sonora A30, A32, A36, A40, A44, A46

Fading and weak reception on all these models is most often due to leaky 0.1-mf. Sprague condensers coupling each r.f. stage. This condition will be indicated by the rising plate current of the tube in the r.f. stage, in whose circuit the defective unit lies. This symptom is caused by the positive bias upon the grid resulting from the leaky condenser. These Sprague condensers, similar to those used on the Colonial 32, are of the waxed-paper type whose connecting tabs are inserted into the unit, the electrical connection depending upon pressure. The complaint of intermittent reception has also been traced to these condensers, which open-circuit because of poor internal contact.

Oscillation at any frequency may be caused by insufficient by-passing in the r.f. amplifier. This condition may be remedied by connecting a 0.1-mf. or 2-mf. condenser across terminals 7 and 8 (counting from left to right) on the audio-unit terminal strip. In some instances it will be found that the manufacturer has already added this unit externally by strapping it under the shelf of the tuner and audio unit.

Where the r.f. tubes are found to become continually weak and an analysis discloses an extremely high plate voltage on these tubes, check the 135-volt bleeder resistor in the power unit. This resistor, in most cases, will be found of much higher value than specified, and, in others, open-circuited. On Models A36, A44, A46, the value of the unit should be 14,500 ohms. The replacement resistor must have a rating of at least 25 watts.

Hum and distortion are most frequently due to unmatched power tubes, one of which draws much less plate current than the other.

Lack of detector-plate voltage is usually caused by an open 50,000-ohm carbon resistor located under the audio amplifier. This resistor may be checked by placing the ohmmeter terminals from the detector plate to the first audio plate.

Sonora A40, A44, A46

Weak and Distorted Phonograph Reproduction. A common complaint against these models is weak and distorted phono-

graph reproduction. The principal cause of this condition lies with high-resistance coupling between the heavy copper single-turn coil and the copper output transformer secondary. These copper bands should be disassembled by removing the bolts, nuts, and insulating strips holding them together. The contact portions of the bands should be cleaned of all corrosion and carefully tinned before reassembling. If the condition should still persist, the contact blades of the phono-radio transfer switch are probably at fault. The contact points may be cleaned with a small magneto file. In order to gain access to the switch, it is necessary to raise the motor board. While the contact points are cleaned, it is advisable to clean the movable arm of the phonograph volume control, which may also cause weak phonograph reproduction if a high-resistance contact exists at this point.

The unusual phonograph motor-stopping arrangement employed with these models is frequently the cause for complaint. If the motor does not stop after the completion of the selection or stops before the selection is completed, it is necessary to readjust the position of the motor in respect to the pickup mounting screw. The distance between the center of the turntable spindle and the center of the screw should be exactly 9 in. The alignment is made by loosening the motor mounting bolts and shifting the motor in the slotted mounting holes until the correct distance is obtained. The accuracy of this measurement is extremely important, for a discrepancy of even a fraction of an inch will defeat the alignment.

❖ ❖

Sparton

Lack of volume in Sparton models that use six 484 or 485 tubes may be caused by poor contacts. The easiest way to check this trouble is to shunt the 0.01-mf. capacitor across the test prods and connect from plate to grid of each socket.

Sparton Receivers

Hum and Distortion. These sets using type 484 tubes and an untuned r.f. amplifying unit have troubles all their own. If you come across one that sounds as though the filter bank were defective, with hum and distortion that disappear with volume full on but come in again with low volume, don't start to tear the set apart. You will probably find that one of the r.f. secondaries is open in the tube can, usually right at the terminals. These coils are wound with very fine wire, and the primary and secondary are wound together.

Sparton 485

It is a common fault for these models to oscillate, howl, and motorboat when first turned on. This continues for about a

minute and then clears up. A check-up will reveal that the trouble lies chiefly in the r.f. and detector stages. Replace tubes with new ones. If trouble still persists, pull out chassis. Leave the cover on, power on maximum, and tap tubes gently. Change with other tubes or replace any tubes that oscillate or howl under this treatment.

Noise in the older Sparton receivers using the untuned amplifier can usually be traced to one of these causes: (1) Bad 484 tubes. (2) Corroded joints where the fine wire of the untuned transformers is soldered to the lugs. (3) The fact that there is no connection grounding the three "cans" together except a metal plate under their mounting screws. Poor grounding of the preselector can will show up as a loud a.c. hum or buzz, with the high-frequency end of the dial "dead." If the r.f. amplifier can is poorly grounded, there will be erratic voltage readings and frying and crackling in the speaker. Occasionally a "high background noise" may be traced to leaking of one of the plates of the by-pass condensers of the detector tube. Dirt on the rotor contacts of the variable condenser will cause noise while tuning.

Sparton Equasonne A.C.

Routine Trouble Tests from Notebook. Temporarily short terminals 1 and 2 with tip of screw driver. If pronounced click is not heard from speaker, check speaker connections and main filter-condenser block. If power unit is o.k., loosen and remove terminal screw on 0.25-mf. condenser shown in diagram. If set continues to operate after removal of screw, replace it. On some models in which original condenser is still in place, the following test may be used instead of above. This older style condenser has metal top with screw through center. Momentarily short top of condenser to side of amplifier. If spark occurs, the unit is o.k. If not, replace. This may usually be done without removing amplifier from cabinet by removing bottom screw going through terminal on side of condenser and bending terminal up against side of condenser, then turning condenser counterclockwise. To install unit, reverse this procedure.

Turn volume control completely off. If noise similar to static results, check detector-plate choke before suspecting control. If new choke cannot be obtained, remove all wire from old choke form and scramble-wind the form full of No. 36 enameled wire. Solder ends to terminals and do not use anything but pure rosin flux. Impregnate choke with commercial r.f. coil "dope" or something similar. If set operates but volume is low and decreases after passing halfway point on control, trouble is usually due to open in 110-ohm wire-wound resistor connected between terminals 5 and 7.

By placing volume control full on (if set does not operate) and touching antenna to coupling pin between selector can

and r.f. amplifier can, the set should pick up some signals. If so, trouble is indicated in selector can, either a defect or bad alignment. The pin referred to is directly under the back of the drum dial. Without the selector, stations will naturally be jumbled together.

1,000 kc., about 1,300 is preferable. With oscillator connected to antenna posts, adjust trimmers as follows: No. 3 first, then No. 2, and finally No. 1. Check back second time. Now connect antenna to selector unit, tune in some station around 1,300, and adjust antenna

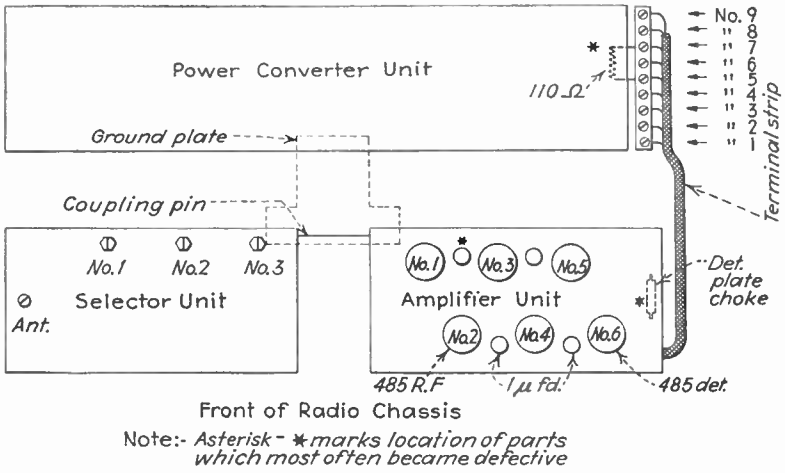

FIG. 21

After above routine tests and with volume control full on, pull extra 485 tube used on selector can as amplifier almost out of socket and work it up and down so that it makes and breaks contact with the socket terminals. There should be loud clicks. If not, check for open plate choke or condenser beneath socket.

Location of tubes in amplifier unit for best reception and freedom from oscillation at 900 kc. After testing tubes, place best one in first r.f. position, next in second r.f., third in detector socket, then, in order, third r.f., fourth r.f., and, finally, the poorest tube in fifth r.f. When aligning, select some frequency above trimmer. If antennas are changed, readjust this trimmer each time.

Sparton 12

The owner said that this set would cut off and on, and that it would not play at the low-frequency end of the dial.

After the usual tests, it was found that all voltages were correct but that when the chassis was jarred, the set would play well over the entire band. The trouble was located in the variable-condenser bank. It was found that the plates of several of the sections of the condenser could be moved slightly. A test revealed that there was a high resistance between

the plates and the shaft. Since it was difficult to get a new unit, a repair was made by drilling holes in each rotor section and through the shaft and inserting copper dowel pins. This cleared the trouble, and a realignment put the set in fine condition again.

Sparton 13

Set Inoperative. This model may be located by looking in Rider's *Manual;* it is somewhat like Model 14. First be sure that the grid leads are on the proper tubes. The very long lead extending from the rear of the set goes to the screen-grid tube alongside the 56. The screen grid protruding through the tube of the copper can in front goes to the screen-grid tube near the 80. Screen resistor for 58's should be 25,000 ohms, wire-wound, 10-watt.

Sparton 14

The symptoms of hum and distorted reproduction in this model, which may be of an intermittent nature, are caused by a partially shorted dynamic speaker-field coil. An indication of this condition is seen in the pentode-output tube grids becoming brightly red because of the lack of grid bias, which reading cannot be obtained directly at the tube socket because of the high resistance in the grid circuit. Where the trouble is encountered, the voltage drop across the field coil should be measured. The d.c. resistance of the field coil is 2,500 ohms, tapped at approximately 400 ohms for the output-tube grid bias.

Where the condition of unstable and weak reception is encountered, especially at the high frequencies, check the 3,000-ohm carbon resistor in the first detector-oscillator cathode circuit. This component is shunted across the coil coupling the cathode to the frequency-changing coil in series with the primary of the first i.f. transformer. Because of this fact, an open-circuited resistor will not be disclosed with a set analyzer but must be checked by a point-to-point resistance measurement. An open-circuited 0.002-mf. first detector-oscillator cathode bypass condenser will frequently cause the same condition.

Many cases of fading and intermittent operation in this model have been traced to shorting condensers and resistors mounted upon the terminal strip beneath the output-tube socket. The quickest method of locating or determining the cause is to press down upon the terminal strip at several points and pull upon the connecting wires.

Sparton 16

Extreme Motorboating. Insert a static shield between the oscillator stator on the tuning-condenser gang. This in no way impairs performance as far as selectivity and sensitivity are concerned. The undesirable condition is due to radio frequency from the oscillator getting to the

second detector, blocking the set through a.v.c. action and releasing periodically.

Sparton 18

The complaint of intermittent reception where volume will decrease abruptly to a lower level has invariably been traced to shorting components mounted upon the terminal strip located under the a.v.c. tube socket. In most cases, however, the trouble will be found to lie with unsoldered or poorly soldered connections to the wire-wound resistors on this strip.

No control of volume is usually caused by a 56 tube in the a.v.c. stage with cathode-heater leakage. The same condition and distortion may be caused by grounded connecting lugs of the interstation noise-suppressor control.

Weak and unstable operation particularly noticeable at the higher frequencies may be attributable to an open-circuited 3,000-ohm resistor in the cathode circuit of the first detector-oscillator tube. As with Model 14, this resistor is connected in shunt with the coil that couples the cathode of the first detector-oscillator to the frequency-changing coil in series with the primary of the first i.f. transformer. The same symptoms may be due to an open-circuited 0.002-mf. cathode by-pass condenser.

Sparton 25 and 26 Super

Dead. A trouble difficult to locate was encountered in the Sparton 25. The set was dead, although plate and screen-grid voltages checked o.k. The strange thing about the set was that there was a voltage of 100 volts between the control grid and ground of the first detector, yet the secondary coil in this particular circuit, which is shielded under the chassis with other coils and is wound on a separate form from the plate coil, tested perfectly, still shorting the coil out and causing the set to play. A new coil was installed, and the set then worked splendidly. (The defective coil had also stopped the a.v.c. tube from working.)

Sparton 25, 26, 30

An inoperative receiver with lack of plate voltage on the second i.f. and oscillator tubes and low plate voltage on all others is frequently caused by a short-circuited 1-mf. metal-clad cartridge condenser located behind the push-pull input transformer. The same condition may be due to the fact that the condenser has shifted and its center terminal, which is insulated from the chassis as it passes through the opening provided for it, is shorting to the chassis. The terminal mounting screw may be loosened and the condenser reallocated to clear the short. When this same unit open-circuits, the symptoms of oscillation, motorboating, and weak reception will be encountered.

A high emission or gassy 27 tube in the a.v.c. stage will often be the cause of weak reception and the situation in which reception will fade out gradually after a few minutes of operation. During this

time it will be noted that the volume control will have little or no effect.

Fading and poor control on these receivers is frequently due to leaky 0.2-mf. condensers by-passing the first r.f. first-detector and i.f. secondary-return circuits to ground. These units are of the paper cartridge type more or less affected by vibration and heat.

A mechanical hum that may be heard even after all tubes have been withdrawn from their sockets is caused by one or more bent laminations of the power transformer.

Tightening the lamination bolts and nuts has not alleviated the condition. In some cases a repair has been effected by removing the power transformer and placing the laminated core between the jaws of a strong vise. The transformer must be removed from the shield in order to perform this operation. Tightening the vise will flatten any bent laminations and remove any air gaps that may be the cause of the vibration. When this procedure does not remedy matters, a new power transformer must be installed.

The complaint of oscillation and motorboating may be received about these models after the set has been in operation for some time. If these symptoms are not caused by open-circuited by-pass condensers, poor tubes, or incorrect alignment, it may be necessary to employ an r.f. choke in the first i.f. cathode circuit with a 0.5-mf. condenser connected from the cathode side of the choke to chassis to overcome the condition. In the event that this change does not remedy the trouble, a separate cathode bias resistor and by-pass condenser must be provided for the first i.f. stage to overcome the coupling effects of the common biasing resistor. Since the value of this latter resistor is 250 ohms, altering the circuit so that the first i.f. tube is separately biased would require the removal of this resistor and the addition of two 500-ohm cathode bias resistors, each by-passed separately.

In Model 26 fading, caused by mechanical contacts, all shields and obvious parts apparently tight. Die-cast rotors of condenser gang frequently make high-resistance contact to shaft, this resistance showing up only on Wheatstone bridge analysis. Drill and tap holes in each rotor through to shaft and insert setscrews.

Sparton 30

Phonograph Trouble. This model employs an automatic phonograph mechanism that requires service because of several minor complaints. One of the most common troubles is the failure of the indicating mechanism to adjust itself for 10- or 12-in. operation so that the pickup is placed in the proper position for the playing of these records. Usually the fault may be traced to the switch within the kick-off arm compartment not making contact. This switch, whose contacts should close when their rollers pass over

the surface of a 12-in. record, energizes the solenoid, whose plunger actuates the change-over mechanism. In some instances, the same condition may be due to the shifting of the solenoid so that the plunger arm binds. The mounting screws of the solenoid may be loosened and the solenoid adjusted so that the plunger works freely. Insufficient tension of the plunger-arm spring is another cause for the same complaint. The purpose of this spring is to return the cam that is actuated by the plunger arm to its former position. The condition may be corrected by removing part of the spring to increase its tension.

If the receiver fuse should "blow" every time a record is rejected, check the indicating switch within the kick-off arm compartment. This may be done by removing the kick-off arm. It is possible that the switch shorts to the kick-off arm shaft as it lowers or to the side of the kick-off arm compartment, enclosing the switch. In either case, operation should be observed and the proper insulating precautions taken.

Sparton 36

Short-lived Vibration. Connect a Mallory A-18237-1 0.01-mf. oil condenser across secondary winding of power transformer in the eliminator unit. Insulate condenser case with tape. As precautionary measure, install the condenser in all sets serviced.

Sparton 40

B- Battery Dead, or Heavy Current Drain on Eliminator. Replace shorted 1-mf. condenser used to by-pass screen of 438 power tube.

Sparton 53, 57, 65, 65-T, 66, 66-T, 655

Repairing Sparton Speakers. The following instructions are for repairing speakers used in Sparton Models 53, 57, 65, 65-T, 66, 66-T, and 655. The tools needed are a plug gauge for centering the pole piece, a celluloid spacer for centering the voice coil around the pole piece, cement for fastening the cones to the housing, and a wrench fitting the nuts holding the voice-coil spider.

Preparation for Cone Installation. Cut around the outer edge of the paper cone with knife. Remove the two $\frac{6}{32}$ nuts that hold the spider in position. Unsolder the voice-coil leads and lift out cone. Remove cone ring and scrape off all particles of old cone and cement, making sure that none of the scrapings fall near the pole piece or into the voice-coil space. Clean the speaker thoroughly, being sure to remove all dust and loose particles that might get into the voice coil and cause rattles. An air hose may be used to advantage in this procedure. At this point, a careful check should be made of the field coil for short circuits, open windings, or grounds. The normal field-coil resistance is 3,000 ohms for Models 53 and 57 speakers, and 2,400 ohms for

Models 65, 65-T, 66, 66-T, and 655 speakers.

Installing Cone Head. Note: Do not attempt to install a new cone head on a speaker with loose welds between cone frame and field-coil housings, since proper voice-coil clearance is impossible under such conditions.

Spread a heavy coat of cement around the edge of the cone head. Drop the cone into position so that the voice-coil leads fall in the correct place and so that the holes in the spider will center on the brass studs without binding. Place the celluloid spacing strip around the pole piece so as to assure the proper voice-coil spacing. Press, and smooth the rim of the cone down on the cement. Spread another coat of cement on the rim of the cone and put on the cone ring, pressing down firmly. Tighten nuts gently but firmly on the spider. Lay the speaker face down on some level surface, and allow the cement to dry for at least 30 min., after which, remove the celluloid spacer, solder the voice-coil and transformer connections, and test. This speaker should now be ready for use and should not rattle. If it still has a tendency to rattle, it indicates that the voice coil probably rubs. To readjust, loosen the two nuts holding the voice coil and move over slightly to a position where it works up and down freely; then tighten nuts. Particles of steel filings or other foreign matter will also cause rattles and must be removed.

Caution: The cement furnished dries quickly. Be sure it is still wet when the cone and ring are put on; otherwise they may not be held tight and may cause rattles.

Field-coil Replacement. Note: It is impossible to install a new field coil correctly without first removing the cone and voice coil; it is therefore recommended that the cone and voice coil be removed before attempting this operation.

The pole piece is tight-press fit in the field-coil housing but can be driven out easily from the back end by using a hammer and a bolt or a short piece of rod as a punch. After the pole piece is driven out, remove the old field coil and put in a new one, taking care that the side of the coil having the recess for the voice-coil space is turned towards the front. Place the centering gauge in the voice-coil opening. Drop in the pole piece and drive home with hammer and punch, being careful to keep the punch on the center of the pole piece so as not to mar or burr the edge. Care must also be taken to prevent damage to the assembly and gauge.

If the pole piece is centered properly, the gauge will be loose and come out easily. If not, hold the punch at an angle and tap pole piece over to its proper position. Remove gauge and install the new cone head.

Sparton 79

Set would suddenly burst into full volume, with volume control turned low and

would play so with the volume control removed from the circuit. We finally figured that the cathode by-pass condenser was leaking and providing just the needed bias for full volume. A new condenser did the trick.

Sparton 79A, 89A

R.f. oscillation in serial numbers using 485 tubes. Readjust trimmers to exact resonance. If trouble persists, replace 0.5-mf. B by-pass in r.f. amplifier with 0.25-mf. 400-volt tubular unit. Some late chassis have it.

Sparton 80, 83, 84, 85X, 86X, 104X, 835

Improving Tone of Cabinet Models. Remove screws holding speaker baffle in place. Insert ⅜-in. spacers under screws, replacing only those at four corners.

Sparton 99

When an inoperative receiver is encountered and the plates of the 81 rectifier tubes become red, resulting in the "blowing" of one of the fuses, check the rubber-covered leads passing in and out of openings in the bottom of the power unit that have become soft and spongy and "short" to the chassis. New substantial heavily insulated leads should be installed.

Sparton 99, 101, 103, 109, 110, 111, 235, 301, 564, 570, 574, 578, 589, 591, 593, 600, 610, 620, 737, 740, 750, 871, 930, 931

The models listed above employ the same or similar r.f. amplifier and band-pass tuning units. Because of this fact, and to avoid repetition of the same symptoms and failures common to these units for each model, they will be discussed under one heading. Troubles peculiar to each receiver will be treated and listed under that model number.

The complaint of weak and distorted reception is often due to a leaky tubular 0.25-mf. plate by-pass condenser in the r.f. amplifier unit. This fact may be determined by removing the screw connecting the outside terminal of the condenser to chassis or ground. It is not necessary to disassemble the entire r.f. amplifier to remove this leaky or short-circuited unit. With the end-terminal screw removed, raise the terminal and turn the condenser in a counterclockwise direction until it may be lifted out. In most of these models, the replacement condenser may be installed externally as close to the r.f. amplifier as possible without any noticeable ill effects. It may be connected in most cases from the sixth terminal on the r.f. terminal strip to chassis.

An inoperative receiver with the symptoms of no plate voltage on any of the r.f. tubes and lower plate voltage on the output tubes is frequently caused by a short-circuited fifth r.f. transformer. To secure a higher degree of coupling, the primary and secondary windings are wound together. The short circuit consists of a breakdown of the insulation at some point in the winding. The easiest

and quickest remedy is replacement, although the coil may be repaired by unwinding the entire bobbin and locating the shorted point. This is too tedious and not worth the trouble.

Where the complaint of weak reception is received and an analysis discloses lack of grid voltage on the detector tube, look for an open-circuited detector grid choke. This unit, located under the amplifier near the detector-tube socket and identified by a red dot on the bobbin, is almost certain to open-circuit when the fifth r.f. transformer is found with the primary winding short-circuited to the secondary.

Noisy tuning is invariably due to the plating on the tuning-condenser plates peeling. This condition is rectified by disconnecting all coil leads from the tuning condensers and applying high voltage across the terminals of the condensers while rotating the tuning selector. Arcing at the shorted points will burn away the plating and effect a repair.

Intermittent reception and fading are caused by the snapping of the r.f. coil leads at their terminals because of vibration. This condition is of an intermittent kind and sometimes difficult to locate. The open connection may not be seen because of the wax compound with which the coils are treated. Extreme care must be exercised when resoldering these leads to the terminals, for the wire is very fine, and the heat of the soldering iron may melt away the wire. The same complaint may be due to poor connection between the band-pass and r.f. amplifier units, which is made through a bayonet pin attached to the band-pass unit that is engaged by a spring clip on the r.f. amplifier. This clip must be tight and the bayonet pin free from corrosion.

When the condition is encountered in which the volume level increases until the volume control has no effect and then reception gradually returns to normal, look for a leaky 1-mf. cathode by-pass condenser in the r.f. assembly. This fact may be determined by disconnecting the volume-control leads at the terminal strip. If the condensers are satisfactory, the receiver should be inoperative. Any reception obtained with the volume control disconnected will point to leaky condensers, providing, of course, that none of the 484 or 485 tubes in the amplifier are found with leaky-cathode heaters. The 485 is more susceptible to this fault, since it is a quick heater and the cathode-heater insulation is thinner.

After either the band-pass or r.f. amplifier units are removed for the purposes of repair, it is extremely important that the mounting nuts holding these units to the chassis board are securely tightened, or the receiver will become inoperative.

Sparton 101

The symptoms of blasting, oscillation, and poor tone quality are caused by an open-circuited 7,000-ohm bleeder resistor in the power unit. An analysis will disclose an extremely high plate voltage on

the r.f. tubes that should be approximately 125 volts. This resistor, which sometimes increases in value and causes the same trouble, is connected across the plate supply for the r.f. tubes.

Hum in these models may often be traced to a short-circuited 0.1-mf. condenser connected across the first filter choke in the power unit.

Sparton 193

Set Dead. This set is in three sections, the selector, the r.f. amplifier, and the alternating frequency and power. It was found that the signal of local stations would come through by placing the aerial on the stator of the fourth stage, but nothing came in through the regular aerial coil or through the third stage. At first the trouble seemed to be in the third selector coil, but the coils were all tested for resistance, and all four tested o.k. Then each section of the gang condenser was tested for a short circuit, but without avail. After a great deal of work, the trouble was traced to an open grid on one of the band-pass coils in the r.f. amplifier unit. These coils are wound in pies on wooden spools, the primary and secondary being wound together. The open connection was at the soldering lug; so it was easily repaired, and the set worked perfectly.

Sparton 301

If this model plays with a steady hum, look for poor contact in the phonograph pickup jack A-4136. Replacing the jack will generally cure the trouble.

The symptoms of low volume and distorted reproduction are sometimes due to reversed connections to the dynamic speaker-field coil. This condition will be disclosed with a set analyzer by low plate voltages obtained on the output tubes. Since the center tap of the output-transformer primary is tied to one side of the field coil, reversal will cause this trouble.

Sparton 301, 931

Hum is generally caused by nothing more serious than poorly matched push-pull 182's.

Sparton 410

No Plate Voltage on I.F. Tubes and Oscillator. Replace tubular condenser attached to front panel with 0.5- or 1-mf. 400-volt capacity.

Set breaks into oscillation after warming up, although all voltages, by-passes and ground connections are o.k. Try two new 183 type tubes.

Sparton 410 and 9A

Can be stepped up in volume considerably by substituting a 0.002 of similar condenser volume for the 0.006 between the power-transformer primary and the ground. In these push-pull two-power tube models, a very agreeable tone control can be effected by connecting the plates of the power tubes through a 0.002

condenser. Of course, cut into this and bring out the two insulated wires to an outside switch (insulated from the chassis) and mount on the back of the chassis.

Sparton 410 and 420 D.C. Sets

Intermittent operation, sometimes stops and starts by jarring. Trouble was found in loose connections on resistor block holding parts A-4363 or A-5889. The wire connections are worn away from the screws because of heat. Solder for permanent job.

An inoperative receiver with an r.f. plate-chassis short circuit is due to several defects. Vibration may cause the common B+ terminal that is insulated from the chassis by means of insulating washers to shift and short to chassis. Another cause for the same condition lies with the shorting of the shielding leads connecting the plates of the r.f. 24 tubes to the r.f. coils. The rubber insulation of the leads becomes spongy and shorts to the ground shielding.

Noisy tuning and noisy reception will be found caused by the peeling of the plating on the plates of the tuning condensers. This condition may be rectified by disconnecting the leads to the tuning condensers and applying high voltage across the condenser terminals while rotating the station selector. The peeled plating will burn away at the shorted points. Small foreign particles and dust between the plates will produce the same condition.

Sparton 591

Noisy reception that is definitely determined to originate within the receiver itself may be traced by withdrawing each of the r.f. tubes, thus eliminating stage by stage until the cause or offending circuit is located. Almost invariably the audio transformer in the intermediate audio amplifier stage mounted in an inverted position under the chassis baseboard will be found at fault.

Sparton 600, 610, 620, 737

Weak reception and broad tuning on the lower frequencies in this model are often caused by a leaky by-pass condenser in the cathode circuit of the first 484. If its terminal resistance is less than 10 megohms, replace; value, 0.2 mf.

Sparton 600, 612, 620, 737

Cuts Off with Noise. A frequent complaint against these models is that reception cuts off and a noisy condition remains. In most cases the trouble has been traced to the audio transformer whose primary intermittently short-circuits to the core. Tapping the unit with a light hammer or the handle of a screw driver will usually disclose the defect by producing the same effect. The transformer must be replaced.

The symptom of weak reception on all but some of the more powerful broadcasters has often been found due to an open-circuited coil in the band-pass unit. These coils may be quickly checked with

some continuity device connected from the stator of each tuning condenser to chassis. Almost always the open circuit is caused by the snapping of the coil lead at the connecting lug.

Where the receiver suddenly bursts into full volume, look for leaky 0.2-mf. by-pass cathode condenser in the preselector stage. Frequently the same condition will result when this unit, upon vibration, intermittently shorts to the shield of the band-pass unit. The remedy in either case is obvious.

A strong resonance hum is eliminated in some instances by substituting the 0.006-mf. condenser connected from one side of the power-transformer primary to chassis with a 0.5- or 1-mf. condenser. It is important, however, that this condenser be of the noninductive type.

The symptoms of oscillation and distorted reproduction that is not caused by open-circuited by-pass condensers are often attributable to a defective 15,000-ohm bleeder resistor in the power unit. Often this resistor may increase in value, and the same effect is obtained.

A common cause for loud hum and distorted, muffled reproduction has been traced to a partially shorted dynamic speaker-field coil whose d.c. resistance should measure 5,000 ohms. The annoying circumstance attached to this complaint is the fact that the partially shorted condition may clear up as soon as the receiver is switched off for the purpose of test. For this reason the field coil can be checked only by measuring the voltage drop across it.

Hum and distortion are sometimes due to a weak 183 tube. When both these tubes check satisfactorily, the trouble may be due to an unbalanced condition of the push-pull input-transformer secondary. Resistance measurements taken from the grids of the 183 tubes to chassis will disclose this defect. Remedy is replacement.

When the symptom of the sudden cutting off of reception is encountered and when reception can be brought back by quickly withdrawing one of the output tubes and reinserting it into its socket, check for an open voice-coil pigtail connection.

Sparton 620

Lack of sensitivity in the Sparton 620 and other sets using button-type sockets in the r.f. and detector stages is often caused by the tube prongs not making contact with the socket prongs. This is generally due to the customer rocking the tube around while withdrawing it, thus bending the socket prongs out of shape. Since these sockets are held together only by one bolt through the center it is an easy matter to take them apart and bend the prongs back. The customer should be instructed to pull the tube straight out when changing it.

Sparton 737 (Above Serial No. 6502)

An inoperative receiver is often caused by an open 1,300-ohm wire-wound resis-

tor located alongside the 80 rectifier socket. This unit serves to reduce the voltage output of the larger power transformer that was originally intended and designed for use in the Model 301 receiver.

When no filament voltage can be obtained at either the 80 or 183 tube sockets, look for burned-out filament resistors. These resistors are employed to cut down the 7½ volts supplied by the secondary filament windings to the necessary 5 volts.

The complaint of the constant "blowing" of fuses by the receiver is often due to the power transformer breaking down. For some reason this transformer, which was designed for heavier use, does not stand up.

Sparton 740

Fading. A pin fitting into a small socket connects the band-pass unit to the r.f. amplifier. Corrosion at this point is a common cause of fading.

Hum and No Control of Volume. In this model, the type 485 tubes may be the cause of hum and lack of control over volume; seven of these are used in the set. The number of shorted, loose-element, and microphonic tubes of this type found upon installation is probably increased by the method of shipping them along with the set.

With the great number of sets of this make in use, service calls due to fading are increasing. The complaint is usually of "a continuous cutting in and out of volume."

So far, three kinds of causes have been found. The first is in poor contact between the band-pass preselector unit and the r.f. amplifier proper. The connection is made by a bayonet pin sliding into a special spring socket or clip; the spring must be tight and the pin guided correctly into its receptacle.

The r.f. unit, with five stages of amplification and a detector, is untuned. The coils are wound on small wooden bobbins fastened both above and below the subpanel carrying the tube sockets; the wire is very fine and may readily snap at the soldering lug or where it emerges from the hole. While a make-and-break connection may not interrupt reception altogether (since the primary and secondary are wound together, giving very close coupling), the intermittent increase and decrease of the signal transfer are very marked. Sometimes intermittent shorts of a coil cause similar complaints. The usual remedy is replacement, though sometimes the loose end can be fished out and resoldered into place.

Intermittent. A third trouble is less frequently experienced: If the nuts work loose from the bolts that ground together the units of these sets (by metal strips passing under them), intermittent connection is produced.

Sparton 740, 750

The symptoms of loud hum, oscillation, and distorted reception have often been traced to a loose common-terminal connection of the three-section condenser block. To rectify this fault, the con-

denser block must be removed. This is done by removing the two mounting nuts and resoldering the loose terminal at the base of the block.

Blasting and oscillation accompanied by the symptom of unusually high plate voltages on the r.f. tubes have been found due to an open-circuited 7,000-ohm bleeder resistor. This unit is located in the power unit and should be replaced with a resistor of a higher wattage rating.

A fading condition may be caused by a leaky or short-circuited cathode by-pass condenser in the preselector stage. The quickest method of determining this failure is to disconnect the volume-control leads from the terminal strip. If the receiver operates with these leads removed, the condenser must be replaced.

Sparton 870

Where noisy reception of an arcing kind is encountered in this model, examine the outlet at the side of the power unit provided for the connection of the external filter choke. The insulation between the contacts of the outlet breaks down, and arcing takes place across the terminals. If the contacts of the outlet are checked, one or both may be found blackened and charred because of the arcing. Replacement is the only remedy.

Sparton 930

Hum and noisy reception have been traced to poor contact between the "can" of the electrolytic condenser and chassis. Corrosion of the copper can and paint on the flanges of the opening in which the electrolytic condenser is inserted will set up the poor contact and cause the complaint.

Sparton 931

Intermittent reception, loud hum, fading, and low volume are often due to the 0.6-ohm balancing control located between the 182B power tubes having high resistance (6 to 7 ohms). This cuts down the filament current to the power tubes, decreasing volume. The control may be left out entirely or a new one substituted.

Thin tone and oscillation accompanied by high plate-voltage readings and low speaker-field current. Fifteen-thousand-ohm bleeder has increased in value because of age. Replace with 10- to 25-watt unit.

No plate voltage in these models is usually due to a shorted-plate by-pass condenser. In replacing this condenser, always replace with a 400-volt working condenser, since the ordinary ones frequently break down after being installed a few days.

Wishing to use type 45 tubes in place of 183 push-pull, we changed filament wiring to series (from 5-volt winding) and 1,250-ohm bias to 750-ohm that figured and checked o.k. But there was the same heavy hum that started shortly after owner placed 183's in place of 182B's.

The plate emission of the 183's checked well within percentage of difference recommended by *Sparton Service Manual.* Also, the 45's were exactly alike in emission; in fact, everything checked o.k. We tried all known methods of substitution and balancing for faulty circuits in all parts of power unit and audio. (Hum there with radio frequency disconnected.) No hum with storage battery to light 45's, but hum with outside 5-volt a.c. source. Thought tubes at fault, but a change to different makes found same results. Found outside source of 2-volt a.c. with tube filament in parallel o.k. Then suddenly thought to use one side of 5-volt winding with center tap and leave the other side open. Results o.k. Used center-tap 20-ohm resistor across 2-volt and center-tap bias.

❖ ❖

Sterling

Increasing or decreasing of volume as a light in the house was turned on or off was found to be caused by the poor contact between the stator of the tuning condenser and the lug by means of which it was attached. The connecting lug was secured to the stator by means of a brass 6/32 machine screw. The brass screws had oxidized because of the contact with the aluminum, thereby partially insulating the joint. Replacing the brass screws with nickel-plated ones cured the intermittent operation.

Sterling F

Cutting off of signals and erratic signals have been traced very often to defective volume control.

Sterling F

Broad Tuning. After replacing a tube in a Sterling Model F, we turned the set on. Turning the dial, we found the set tuning very broadly between 900 and 950 kc. We then aligned the condensers, but with no success. We noticed a setscrew in the rear of the condenser gang. After the setscrew was adjusted, it tuned perfectly over the entire band.

❖ ❖

Stewart-Warner

Weak and Insensitive. In these models the r.f. by-pass condenser value is very critical. On a set that is weak in volume and sensitivity, try different capacities. When the right condenser is placed in the circuit, the set will "jump" at you. Sets like these are fiber-enclosed condensers (fire crackers). If a metal-cased condenser is used, it must be well taped or insulated.

A speaker-cone dragging in this model presents an unusually difficult problem, because there is no arrangement made for centering. However, dampening one side of the cone where the speaker drags and letting it stand and dry until a wrinkle appears will pull the cone back in place. Carefully shellac the wrinkle, and the

cone will stay in this position. We have done this a number of times, with only one failure that required a new cone.

Stewart-Warner Auto Radios

Some models of auto radios have loud hum when volume control is at low setting. Loosen the r.f. coils and shield wire from volume control to a coupling condenser located under these coil cans on the bottom of the chassis. The shield should be soldered to the grounded terminal of the volume control. Hum is caused by inductive pickup from the *A* wire to the vibrator being alongside the wire to be shielded.

Loud Hum and Chattering of Relay; Weak, Distorted Reception. Open plate circuit to one plate of 84. May be bad socket contact.

Stewart-Warner. Short-wave Broadcast

Stewart-Warner increases the sensitivity of its receiver Models 1341 to 1349 on short waves by utilizing segments of range-change switches 34A and 35C to alter bias and screen-grid voltages.

On the broadcast range, a bleeder resistor is cut into the screen circuits, reducing voltage and sensitivity. When the switches are thrown to short-wave position, this resistor is removed and, in addition, portions of the cathode resistors in both the 6D6 i.f. stage and the 6D6 r.f. stage are shorted out, reducing bias and further increasing gain.

Stewart-Warner S.W. Converter

The s.w. converter may be found very insensitive, even though all circuits and tubes check o.k. Converts of this type may be made to operate satisfactorily by "resoldering every soldered connection in the converter, though they may seem o.k." A poorly soldered connection may have sufficiently high resistance to affect materially performance on short waves yet not high enough to show up on a simple continuity test.

Stewart-Warner R-102-A, B and E

Intermittent Operation. Condenser cut in and out in a Stewart-Warner R-102-A, B and E. We found 100,000-ohm resistor, color code, brown, black, and yellow, which would cut in and out of the circuit. This didn't show up with a voltmeter, since anything we touched in the radio would result in the reception returning to normal again for a few days.

The best way to find this trouble is to keep the radio playing. When the resistor starts breaking, it will make a buzzing sound, and the reproduction will get mushy.

Stewart-Warner 102

To improve pentode-tube performance of these receivers, make the following changes: (1) Cut the connection made by the small green 500,000-ohm resistor to the control grid of the pentode at the grid terminal. (2) Cut the connection made by the No. 67299 0.02-mf. coupling con-

denser to the corner lug of the terminal strip (this being the same lug to which the other connection of the green resistor is made). (3) Connect loose end of the resistor to the loose end of the 0.02 condenser; connect the control grid of the pentode to lug on mentioned resistor terminal strip. This change removes the 500,000 ohms from the grid circuit of the pentode tube and at the same time retains the r.f. suppressing action for which the resistor was used.

The complaint of distorted reproduction, regardless of the volume-control setting, may be eliminated and the volume materially increased by connecting a 500,000-ohm resistor from detector screen to chassis. This datum applies to chassis bearing a serial number above 34,000. When the same complaint is encountered on receivers below this serial number, check for an open-circuited 2-megohm resistor in the screen circuit. Lack of screen voltage on the detector tube will evidence this defect.

The symptoms of slight motorboating and distortion in the models bearing the serial number below 34,000 are caused by too high a resistance in the grid circuit of the pentode output tube. The 500,000-ohm resistor should be removed entirely from the circuit or connected directly behind blocking condensers.

Stewart-Warner 102A

Slipping Dial. When the dial refuses to drive properly from 0 to 100, reverse rubber bushing. Dial should work properly then.

Stewart-Warner 105 Series

1,400 *Kc. to* 1,500 *Kc. Signal Interference on All Short-wave Dial Settings.* One of the most common complaints about this model is of interference on all the short-wave bands from broadcasting at 1,400, 1,450, or 1,500 kc., generally the last. This condition may be rectified by slightly detuning the middle short-wave i.f. trimmer (counterclockwise) located to the right of the condenser gang.

Weak reception with the local-distance switch in the local position may be cleared up by realigning the broadcast r.f. circuits for maximum response at 1,400 kc. This may be done by readjusting the last three trimmers on the condenser gang. In some instances it will be necessary to change the 57 tube in the a.v.c. stage for one drawing less plate current.

Fading. These models are not infrequently serviced for the complaint of fading when the receiver is switched on. Reception will disappear gradually until total inoperation results. On some occasions it is possible to restore reception by removing the a.v.c. tube. This condition is due to the failure of the 2-megohm carbon resistor in the a.v.c. grid circuit. This unit is located together with the a.v.c. grid coupling condenser within the second i.f. coil. Removal of the negative bias impressed upon the grid of the a.v.c. tube will cause the tube to draw more

current and produce a greater voltage drop across the resistor in the plate circuit that is also in the control-grid circuits of the r.f. first-detector and i.f. stages, resulting in an abnormally high control-grid bias impressed upon the tubes of these stages. This high bias reduces the plate current drawn by these tubes, thereby decreasing the sensitivity of the receiver.

Very noisy and intermittent reception obtained when the chassis is disturbed by moving the cabinet or from vibration of the loud-speaker or from vibration caused by passing vehicles has in almost every instance been traced to loose or corroded contacts and contact arms of the wave-band transfer switch. One or two of the sections of this ganged switch are easily accessible, but because of the crowded quarters and metal shields, the inside sections of the switch are difficult to clean. A very thin flexible file or an emery board such as those commonly used by manicurists, obtainable at any Five and Ten, are better suited for the task of cleaning the corrosion from switch contacts than any other tool, unless the switch gang is disassembled.

Microphonic Condition. In these receivers, unless the chassis mounting bolts are loosened so that the chassis floats on the soft rubber cushions provided for the purpose, a strong microphonic condition will develop when short-wave signals are tuned in. At the same time, the chassis should be moved back slightly to prevent the flat portion of the dial-pointer arm from binding against the cabinet. Unless this is done, it may be necessary to replace the rubber friction-tuning gears, that become excessively worn within a short time because of the increased friction resulting from the binding of the dial-pointer arm.

Stewart-Warner R112

Annoying Pickup. On a Stewart-Warner Model R112, one should completely shield in the two control cables and dial-light wires from the set to the remote control, grounding shield at both ends. This will eliminate a very annoying pickup.

Stewart-Warner 112

A continued buzzing and rattling on local stations was cured by glueing the paper within the chassis from which it had loosened itself.

Stewart-Warner R117 Chassis

Intensity of Illumination. An occasional customer may complain that the intensity of illumination of the dial of the Model 1171 auto radio interferes with night driving.

For complaints of this sort, the 15-ohm pilot-light resistor should be removed and a new 35-ohm resistor (Stewart-Warner Part No. 84197) be submitted in its place.

The use of the 35-ohm resistor will materially reduce the voltage on the dial pilot light, thus reducing the illumination considerably.

Stewart-Warner R136, R137, R138

Insensitive above 12 Megacycles. You may occasionally come across a Model R136, R137, or R138 Ferrodyne chassis that is relatively insensitive in the high-frequency range above 12 megacycles, although the set is in good alignment and seems to be perfect in every respect. An invariable symptom of this trouble with Models R137 and R138 is that the shadow of the station-register meter contracts as though a station is coming in when the set is tuned in this range, although no signals come in.

We have found that when this loss of sensitivity in the high-frequency range occurs, it is because of stray coupling in the wiring of the set. This stray coupling sets up spurious oscillation of the 6A8, causing the control grid to draw current. Since this control grid is tied into the a.v.c. system, the grid current sets up an a.v.c. voltage and reduces sensitivity, just as though a signal were going through. In Models R-137 and R-138, this also causes the shadow of the station register to narrow, since the a.v.c. voltage applied to the grid bias reduces plate current.

To eliminate this condition in any set in which it occurs, it is necessary only to isolate the grid return of the short-wave coil of the 6A8 tube from the a.v.c. system by returning it directly to ground. By referring to the pages concerning these three models in Rider's Vol. VI, you will see that in the chassis illustrations, the coil in question is tuned by trimmer condenser 11 in Model R136, by trimmer 15 in Model R137, and trimmer 16 in Model R138. If you look at the coil itself, you will see that the short-wave section is the one wound with heavy, bare copper wire, and the grid-return side is at the top of the coil, the lead wire running down the full length of the coil before it is soldered to its terminal lug.

The simplest way to isolate the grid-return circuit is to cut the heavy coil wire as close to the lug as possible. In doing so, be careful that you do not cut the fine wire from another winding that is soldered to this same terminal. This fine wire may be wound around the heavy one to prevent breakage. After the heavy wire is cut, merely resolder it to the grounded, threaded support lug of the coil.

When this change has been made the set should be realigned.

I.F. Alignment. Turn volume control to maximum and keep it there for entire alignment procedure. Set test oscillator to 456 kc., the i.f. peak, and connect to the 6A8 control grid and the chassis. Adjust the four i.f. trimmers (shown at 1 and 2 on the chassis layout on page 18 of Rider's Vol. VI) for maximum output deflection. Recheck the adjustments.

Broadcast-band Calibration. Check position of dial pointer on shaft by turning the rotor plates to full mesh. The pointer should indicate 540 kc. Turn the range switch to extreme clockwise position. Connect the output of the test oscillator

to the set's *A* and *G* terminals, and ground both set and oscillator. Adjust test oscillator and dial to 1,400 kc. Adjust trimmer 3 for maximum output without changing the setting of the condenser gang.

Broadcast-band Alignment. Connect a 500-ohm carbon resistor in series with the test oscillator output and the set's antenna terminal and let it remain connected for the rest of the adjustments that are outlined below. Set oscillator at 1,400 kc. and tune the receiver to the signal for maximum output. Adjust trimmers 4 and 5 for maximum output. Do not touch trimmer 3, because this will change calibration.

Adjust test oscillator to 600 kc. and tune set to this signal. Adjust trimmer 6 for maximum output. Retune gang condenser to a peak and readjust trimmer 6 for maximum output. Retune gang condenser to a peak and readjust trimmer 6 for maximum output. Continue to do this until maximum output is obtained.

First S.W. Band Calibration. Turn range switch to center position. Adjust test oscillator to 5.5. mc. and set the set's dial to the same frequency. Adjust trimmer 7 for maximum output. If there are two peaks, the proper one is that with the trimmer screw farthest out.

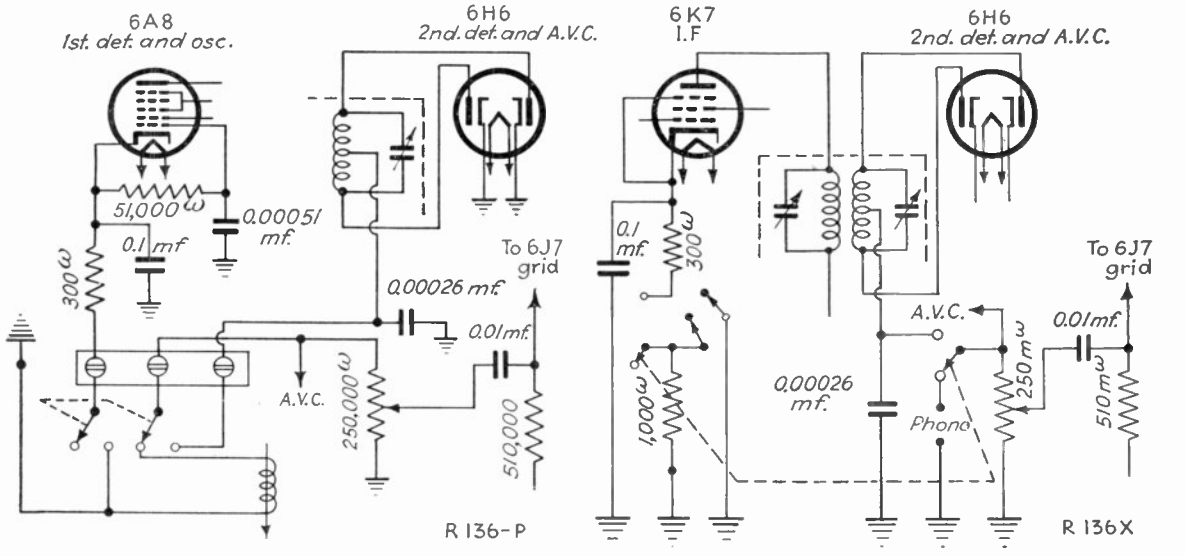

FIG. 22.

First S.W. Band Alignment. Adjust test oscillator to 16 mc. and tune set for maximum output. Adjust trimmers 11 and 12 for maximum output. Check to see if these trimmers are adjusted to the proper signal, approximately, 15.1 mc. If the repeat signal is equal to or stronger than that at 16 mc., return to 16 mc. and readjust 11 and 12 to the proper peak, with the trimmer screws farther in.

Poor sensitivity at low-frequency end of broadcast band, inability to align or cali-

brate at 600 kc., oscillation at low-frequency end of broadcast band. Almost always due to large change in capacity of small bakelite fixed condenser connected across oscillator-shunt padding trimmer. Units colored brown, brown, black. Replace with 0.000011 original replacement, No. 85434.

1. *Poor sensitivity* at the low-frequency end of the broadcast band.

2. *Inability to align* or calibrate at 600 kc.

3. *Oscillation* at the low-frequency end of the broadcast band.

Stewart-Warner suggest the following: The trouble is almost certain to be due to a large change in capacity of the small bakelite fixed condenser connected across the oscillator-shunt padding trimmer. This condenser (Part No. 85454) is color-coded; brown, brown, black.

Since the capacity of this condenser is only 11 mmf. (0.000011 mmf.), its value cannot be tested with the equipment usually available in a service department. Replacing this condenser will almost invariably remedy the trouble described above.

The schematic diagrams for chassis R136, R137, and R138 will be found in Rider's Vol. VI on "Stewart-Warner," pages 18, 19, and 20 respectively.

Stewart Warner R220A

Low Volume. No speaker-field pull. Look for 0.1 tubular across two electrolytic filters.

Motorboating, Oscillation. Look for poor connection or open-circuited 0.1 tubular across the two electrolytics.

Stewart-Warner 950

Burned-out Volume Control. The screen voltage in this set is bled through a 20,000-ohm 2-watt purple resistor and is controlled by the volume control. Almost invariably, the purple resistor drops gradually to about 2,000 ohms and burns out the volume control. When replacing the volume control, replace the purple resistor also or the new volume control will go the way of the old.

Oscillation at Low Frequencies. Clean variable-condenser contact clips and bend them to increase pressure. *Oscillation* at high frequencies. Look for open 0.25-mf. r.f. by-pass condenser located close to r.f. coils. *Tone distorted;* set oscillates. Try replacing 0.25-mf. r.f. grid by-pass condenser. If set oscillates when quick-heater tubes are used, replace 0.25-mf. screen-grid by-pass with 0.5 mf. or more.

If the plate voltage is slightly low and the screen voltage on the three r.f. tubes is high, this is usually caused by failure of the 3-watt 20,000-ohm purple resistor.

Stewart-Warner 950, R100

Poor Sensitivity and Low Volume. Check red resistor 66326 for low value or charring. This resistor shunts r.f. plates to minimize effect of variation in plate current when different tubes are used and,

if low, increases load and reduces screen voltages.

In replacing the 24's in these models with the new quick-heater tubes (type 24A), the circuits will oscillate at the higher frequencies. This condition may be remedied by adding more capacity across the source of screen-grid voltage.

These sets have a tendency to oscillate badly and tune broadly. After the usual methods, such as increasing the condenser capacity, have been tried and soldered pigtails to the rotor shaft also have failed, remove the second r.f. 24 tube and substitute a 35. This will remove all oscillation and so sharpen up the tuning that it will be possible to bring in a Canadian station at 720 kc. without interference.

Stewart-Warner 1121, Chassis 112

Intermittent reception in this set was caused by a defective output transformer. The primary would open and close the circuit at intervals. In this set the 6A7 is the first detector and oscillator; 78, the intermediate frequency; 75, the second detector; 41, the power tube; and 6Z4 or 84, the rectifier. The intermediate frequency is 456 kc.

Stewart-Warner 1171

To Reduce Brilliancy of Pilot Light. Replace 15-ohm pilot-light resistor with 35 ohms.

Stewart-Warner 1181, 1182

Bell-like Rattle. Traceable to tubular condensers inside power-transformer cover. These units break off and strike against cover. Remove four screws, pry off cover, resolder, tape condensers to transformer, and replace cover. Set inoperative except for faint response on powerful locals. Look for broken lead on coupling condenser connected to movable arm of volume control. Mounting hint: Sets are equipped so that speaker may be pointed outward, but trouble will be experienced in this position because of the horizontal position of the vibrator and tubes. Use side or end mounting, with speaker downward.

Stewart-Warner 1181, 1182, 1183

Set won't play unless local switch is clicked on and off. Change 50,000-ohm resistor on 6A7 socket to 60,000 ohms. If set goes into oscillation, put a 0.25-mike condenser from cathode to ground on the 6A7.

Stewart-Firestone-Warner R1322

The alignment data for this set, whose schematic on Stewart-Warner appears on page 15 in Rider's Vol. VI, will be found below. Keep the output of the test oscillator low so that it will not actuate the a.v.c. The output indicator can be connected at the two terminals of the speaker socket to which the yellow leads are attached.

I.F. Alignment. The i.f. trimmers are on top of the i.f. transformers, which may be reached by removing the front cover. Set the test oscillator to 177.5 kc., the

i.f. peak, and connect its output to the 77 control grid and ground. Adjust the three i.f. trimmers for maximum output indication. Recheck the adjustments.

Dial Calibration. If set is badly out of calibration, the oscillator-shunt trimmer must be adjusted as described below. The gang-condenser trimmers can be reached by removing the back cover. Connect a 0.00025-mf. condenser in series with the output of the test oscillator and the antenna lead of the set.

Set the test oscillator to 600 kc. Tune the set to maximum volume. Calibrate the dial at the low-frequency end by setting the pointer to 6.0 (600 kc.). Set the test oscillator to 1,400 kc. Turn the tuning knob until the dial pointer indicates 14.0 (1,400 kc.) and then adjust the oscillator-shunt trimmer (third one from the shaft end of the variable condenser) until the signal produces maximum output. Then adjust the other two gang-condenser trimmers as directed under "R.F. Alignment."

R.F. Alignment. Set test oscillator to 1,400 kc. Tune set for maximum output. Adjust output of test oscillator to the minimum value that will give sufficient output deflection. Adjust the two condensers nearest the shaft end of the gang condenser to give maximum output indication.

The schematic diagram of this receiver will be found under "Stewart-Warner," page 16 of Rider's Vol. VI. During all adjustments, keep the volume control full on.

I.F. Alignment. Set test oscillator to 456 kc., the i.f. peak of the set, and connect its output between the 6A7 control grid and ground.

Adjust the four i.f. trimmers located on top of the i.f. transformers to give maximum output deflection. After aligning the trimmers once, recheck the settings.

Dial Calibration. If set is badly out of calibration, the oscillator-shunt trimmer must be adjusted. In order to reach this, the chassis will have to be removed from the case, as follows:

1. Remove the flexible shafts and dismount the receiver.
2. Remove the four terminals of the speaker cable from the speaker.
3. Remove the black antenna lead from the coil and unsolder the coil-shield grounding braid.
4. Remove the blue dial-light lead from the socket terminal.
5. Remove the yellow tone-control lead from the tone-control switch.
6. Remove the six slotted chassis fastening screws and slide the chassis from the case.
7. Reconnect the red and yellow leads of the speaker cable to the speaker.
8. Insert the tuning shaft in the gang-condenser fitting and reconnect the battery lead.
9. Set the chassis on a flat metal plate and adjust the set as follows:

Connect a 0.00025-mf. condenser in series with the output lead of the test oscillator and the antenna-lead lug on the

antenna coil and the ground lead of the test oscillator to the chassis. Set the test oscillator to 600 kc. Tune the set to maximum volume and set the dial to read exactly 6.0 (600 kc.). Then set the test oscillator to 1,400 kc. and adjust the tuning knob of the set until the pointer indicates 14.0 (1,400 kc.). Adjust the oscillator-shunt trimmer (on the gang-condenser second from the control end) until the output indicator shows maximum output. Then adjust the other gang-condenser trimmer as directed below.

R.F. Alignment. Set test oscillator to 1,400 kc. and tune the set for maximum output. Adjust the setting of the test oscillator to the minimum value that will give sufficient output deflection. Adjust the trimmer nearest to the shaft end of the gang condenser to give maximum output indication.

❖ ❖

Stromberg

Stromberg 10, 11

Fading, making it necessary to operate volume control well up. Seven hundred-ohm section of voltage divider opens commonly. Replace with 10-watt unit.

Stromberg-Carlson 10, 11

An inoperative receiver has often been found to be caused by the screws connected to the stators of the first and third tuning condensers grounding. They pass through the condenser section shields and are insulated from the shield by beeswax compound. They may be disconnected from the circuit without any ill effects whatever.

No control of volume may be due to an open-circuited 100,000-ohm black carbon resistor connected from the second r.f. secondary return to the arm of the volume-control potentiometer. The same condition may be obtained with one of the 0.3-mf. secondary-return by-pass condensers in the second and third r.f. stages becoming leaky or short-circuited.

Fading and intermittent reception has been traced in many instances to open-circuiting 0.04-mf. bi-resonator condensers, located within the tuning-condenser gang shield.

The symptoms of weak and distorted reception that can be cleared to some extent by the removal of one of the 45 output tubes have invariably been found to be caused by a shorted push-pull input transformer wherein the primary short-circuits to the secondary winding at some point. The transformer must be replaced.

Where the complaint of noisy reception is received that has been definitely determined as originating within the receiver itself, check the primary of the push-pull input transformer by disconnecting the primary from the circuit and using the 250,000-ohm shunt resistor and a 0.1-mf. condenser to couple the detector plate to one of the output grids.

Stromberg-Carlson 12, 14

Poor swing of the tuning meter may be due to insufficient antenna or to a poor 24 tube in the second r.f. stage. In some instances, replacing the a.v.c. 27 tube will clear up the difficulty.

Fading and intermittent reception, as in Models 10 and 11, has been frequently traced to open-circuited 0.04-mf. bi-resonator condensers in the first and third r.f. amplifier circuits.

Stromberg-Carlson 19, 20

The difficulty of hum has been traced to an open-circuited 3-ohm center-tapped filament resistor located near the first i.f. tube socket.

Intermittent reception on these models is often caused by open-circuiting oscillator-coil connections. Because of a tightly wound coil, the contraction of the wire or vibration causes the leads to snap directly at the lug and make contact intermittently, producing the complaint. The same condition has been found in an open-circuiting 0.04-mf. bi-resonator condenser in the r.f. stage.

A stubborn case of hum in the Stromberg-Carlson Models 19 and 20 receivers recently caused some bewilderment on the part of several servicemen. Every circuit would check properly. Condensers were checked for open circuit by bridging with others and by discharge test. The hum would appear and then disappear. It was finally traced to an open 3-ohm center-tap resistor located a few inches away from the first i.f. socket on the under side of the chassis. The open was probably caused by the operation of the set without the several heater tubes in their proper respective sockets.

In this model, fading is due to a 0.001-mf. fixed condenser in the grid return of the demodulator stage. This condenser is shunted with a 10-megohm resistor; it also has a tendency to open, causing fading and slight distortion. Replacing this condenser in every case has eliminated the fading.

Stromberg-Carlson 22, 22A

An inoperative receiver with an analysis revealing a lack of plate voltage on the second i.f. tube has been traced to a short-circuited 0.0001-mf. mica condenser, coupling the plate of the second i.f. tube to the cathode of the diode detector. This unit is located at the base of the i.f. transformer within the shield.

If the tuning meter of the model has insufficient swing, a 30-ohm resistor may be shunted across the meter terminals, providing the antenna is of sufficient length.

Intermittent reception or an inoperative condition has been traced on several occasions to an intermittently shorting trimmer condenser in the i.f. transformer. A socket analysis will not reveal this condition.

Stromberg-Carlson 25, 26

Intermittent Reception. A common complaint against these receivers is intermittent

reception where operation can be made to return by snapping the line switch several times. When an analysis is made, no plate voltage will be obtained upon the second detector. Further tests will disclose the fact that the primary of the push-pull input transformer breaks down and shorts either to the core of the transformer or to some portion of the secondary winding. In the latter instance, it is possible to obtain distorted, weak reception that may be cleared by withdrawing one of the 45 output tubes. An indication of this failure can seldom be obtained, with the receiver turned off, by means of resistance measurements between the second-detector plate and chassis because the transformer breaks down under load.

The condition of noisy reception that evidences itself even with the second-detector tube removed from its socket has been found due to a noisy primary winding of the push-pull input transformer. This may be checked by disconnecting the primary winding and substituting a form of impedance coupling by means of the 250,000-ohm shunt resistor and a 0.1-mf. coupling condenser. A similar complaint has frequently been traced to a leaky 0.0001-mf. detector-plate by-pass condenser located within the shield of the second-detector plate choke. Although a new unit may be installed, a satisfactory repair can be made by insulating the shield of the choke-condenser combination from the chassis and connecting a 0.0001-mf. condenser externally.

Intermittent reception has been traced to open-circuiting 0.04-mf. bi-resonator condensers due to a poor internal connection in the r.f. and first-detector stages. Usually this symptom may be made to appear by rapping against the right side of the condenser-gang shield, inside of which the bi-resonators are mounted. The same complaint has been found caused by the shield cans cutting into the connecting leads of the coils where they pass through openings at the base of the shields.

The symptom of no control of volume may be caused by several failures. Leaky bi-resonators or 0.3-mf. grid-circuit by-pass condensers in the r.f. first-detector and i.f. stages are the main causes of this trouble, although leakage in any part of the secondary-return circuits of these tubes will produce the same complaint. The quickest method of determining this fact is to measure the resistance between the control grids of the r.f. first-detector and i.f. stages to chassis with a good ohmmeter. A reading of approximately 100,000 ohms should be obtained from the r.f. control grid and approximately 200,000 ohms from the first-detector and i.f. control grids to chassis. In the 25-cycle models these readings are about 60,000 ohms less. Shorting of the 100,000-ohm black carbon resistor in the control-grid secondary-return circuit to chassis will produce the same condition of no control of volume. This resistor, connecting to the movable arm of the volume control, is mounted in a bakelite bracket near the

volume control. The bracket loosens upon vibration and permits the resistor to short to the front wall of the chassis.

Distortion at any volume level is usually due to a leaky section of the second-detector cathode by-pass condenser unit which is composed of two 0.3-mf. sections. Where this condition is encountered only at low volume-control settings the 24A tube in the second-detector stage should be replaced or interchanged with the other 24A tubes.

The symptoms of "two-spot" tuning, fading, and poor control of volume have been traced to an intermittently shorting screw passing through the third tuning-condenser shield. This screw is connected to the stator shield by means of a wax compound. When the screw short-circuits to the shield, volume will suddenly lower and reproduction will become distorted. It will be necessary to retune the receiver about 20 to 30 kc. from the usual setting of the dial, powerful stations being received at two points on the dial about 20 kc. apart. This screw should be disconnected from the circuit.

A stubborn case of fading and very erratic operation was encountered on a Stromberg-Carlson 25 receiver. The symptoms in this instance were peculiar. After some minutes of normal reception, volume would suddenly lower, control of volume would become poor, and it would become necessary to readjust the station selector about 20 to 30 kc. from the regular band setting; some of the more powerful broadcastors being received on two points on the dial some 20 kc. apart. This setting would vary every few seconds.

Although the bi-resonator condensers are a common cause for *fading and no control of volume* in this model, it was highly improbable that failure of these 0.04-mf. units would result in the erratic two-spot tuning that was experienced. The resistance of the r.f., i.f. and first-detector secondary circuits was measured with an ohmmeter connected respectively from the control grids of the r.f., i.f., and first-detector tubes to chassis. The reading obtained from the control grid of the r.f. tube to chassis was correct—approximately 100,000 ohms. But reading well under 100 ohms obtained from the first-detector and i.f. control grids to chassis designated trouble in the secondary return of these circuits.

Ordinarily this low reading is indicative of leaky or partially shorted bi-resonator or 0.3-mf. by-pass condensers that would have produced the complaint of poor control of volume more than of any other condition. After these units were tested and found perfect, the 100,000-ohm carbon resistor in the same circuit, located under the volume control, a circuit that has often been found shorted to chassis, resulting in no control of volume, and the second 100,000-ohm resistor were checked, despite the fact that this latter resistor had checked satisfactorily because it was

also in the secondary-return circuit of the r.f. tube.

With the aid of a low-range ohmmeter, the difficulty was finally found within the condenser-gang housing shield. A close inspection revealed a screw that passed through the third gang-section shield and that had been insulated from the shield by means of some wax or compound. This screw was connected to the stator in the wax and was shorted to the shield, obtaining the strange effect outlined. The wire to the screw from the condenser was disconnected, and the problem was solved.

This receiver employs another such screw passing through the first-gang section shield and connected to the stator of the first tuning condenser. This screw cannot easily be seen because of the location of the trimmer condenser, which is mounted directly above the screw. The same shorted condition has been encountered on several occasions.

Although the manufacturer may have intended some use for these screws, their removal from the circuit does not impair the operation of the receiver. To substantiate this fact, both screws were disconnected in a set that was operating satisfactorily, and no apparent difference was noted.

We have run into many complaints of *starting and stopping* that have been traced to their source by visual inspection.

1. Many of these troubles have been found due to loose wires in the variable-condenser compartment that are usually in place but unsoldered. This has been such a common occurrence that it is one of the first steps taken in locating this type of trouble. The remedy, of course, is simply soldering.

2. It has been found that stopping and starting are also due to the 100,000-ohm fixed resistor that is in series with the center lug of the volume control shorting to the chassis intermittently. This resistor is black, with a blue end, and is supported by a brown bakelite casing. A small hexagon nut holds this assembly together; on loosening, the resistor that is located just below the volume control starts its mischievous work. Retighten this hexagon nut.

3. Again starting and stopping have been found to be caused by the coil shields cutting the leads going to the coils.

4. Another frequent cause of this trouble has been traced to the lug on the oscillator coil that receives the two wires from the center of the secondary coil. These wires have quite often been found unsoldered.

Cases have been found where the volume increases gradually to a point where the volume cannot be controlled at all. This trouble has been traced to:

1. Gassy 24 tubes. Some servicemen, in checking a 24 tube, find that the tube draws 10 ma. of plate current; they merely evaluate it as a perfect tube and attribute the high plate current to a high voltage. They do not stop to consider the fact that

the tube has an appreciable amount of gas in it, causing this high plate current.

2. This same trouble is also caused by defective bi-resonator condensers that have been previously discussed. Any leak in the volume-control circuit to the chassis will cause the same trouble.

3. It has been found on numerous occasions that, because of a 24 tube in the demodulator stage having a short from cathode to heater, the control of volume is poor although the set works.

Many cases of microphonic howls have been received. It has been found that removing the bolts holding the chassis to the cabinet has not cured the trouble. However, it was found that by taking four rubber washers (those located beneath the Philco chassis that servicemen seem never to replace) and placing them between the four corners of the speaker and the cabinet, the howl was eliminated at once. This device has been tried in every case where the set was found in a microphonic condition and has never failed to eliminate the howl.

Weak. On numerous occasions it was found that these models were very weak and that a considerable hiss could be heard in the background of the station. This condition was traced either to an open coil in the preselector stage or to the lack of an antenna.

We recently came across a case that baffled a few men. The set was very weak and distorted. A low plate voltage was found on the demodulator tube and one 45 output push-pull tube was operating hot while the other was cold, though both plate voltages appeared normal. This trouble was traced to a shorted input push-pull transformer; the short was internal from the primary to the secondary.

Another common complaint against these sets is of a peculiar noise that seems to irritate owners very much. This noise is due to a defective 0.0001-mf. fixed condenser located in a choke-condenser assembly in series with the plate of the demodulator tube. It is easier to replace the entire assembly rather than to dig into the casing containing these units. This noise sounds like the sputtering of a defective tube.

Set Dead. Another common complaint against these sets is that it is inoperative. This is due to the series grid resistor of the oscillator changing in value. This resistor is located between the center tap of the secondary of the oscillator coil and the grid of the 27 tube. The value of the resistor is 500 ohms. It is located in the same can with the oscillator coil.

Distortion at low volume has continually been traced to a rapid-heating tube in the demodulator stage. Replacement of the 24A tube by the 24 slow-heating tube clears up this trouble immediately.

Stromberg-Carlson 27

Poor swing of the tuning meter may be due to an open 30-ohm shunt across the meter or to the fact that an antenna of insufficient length is employed.

No Control of Volume. If it is found that the volume level cannot be turned down low or the receiver momentarily bursts forth with full volume at a low setting of the volume control, change the volume control. Sometimes the first condition may be caused by leakage of the insulation of the phono pickup switch.

Fading, intermittent, and weak reception is frequently caused by an intermittently open-circuiting 0.04-mf. bi-resonator condenser.

Weak response and poor swing on the tuning meter, accompanied by the symptom of "station hiss" that can be cleared by placing the fingers lightly upon the control grid of the r.f. tube and chassis, has been traced to an open-circuited primary winding of the preselector coil or to an open-circuited bi-resonator in the r.f. stage.

An inoperative receiver has sometimes been found caused by the breaking down of the 0.0001-mf. mica condenser coupling the primary to the secondary of the second i.f. transformer. This unit is located within the shield of the transformer.

Stromberg-Carlson 29

Line Switch Defective. The line switch in this model, incorporated with the tone-control unit, is a frequent offender. Failure of the switch spring will prevent the receiver from being turned on or off. Since the phonograph switch in the volume control is seldom used, the two controls may be interchanged, because the units are identical.

Where the condition of weak and distorted reception is encountered that clears up when a finger is placed upon the control grid of the r.f. tube or when the receiver is slightly detuned, check for coil leads shorting to the shield can in the r.f. stage, an open-circuited primary winding of the preselector coil, or an open-circuited 0.04-mf. bi-resonator, all of which have been found at different times to cause this complaint.

An inoperative receiver is often caused by the burning out of the tuning meter. When this occurs, the 0.3-mf. section of the condenser block by-passing the r.f. and first-detector plate circuits should be replaced.

Noisy and intermittent operation is often due to poor contact of the volume-control slider arm. The arm should be cleaned and bent to increase its tension upon the resistance strip. The latter may be coated with a thin film of vaseline.

Fading is one of the complaints about the Stromberg-Carlson 29. Because of poor contact between the slider and the resistor, the volume control becomes noisy. Replacement of the volume control is then essential.

Noisy tone controls have been found almost as often as noisy volume and also require replacement.

Inoperative. Sometimes it is found that all the tubes light, yet the set is inoperative. This condition has been traced to either a shorted trimmer condenser, usually located across the pre-

selector tuning condenser, or to an open choke in series with the plate leads of the i.f. stages. This choke is located in the rear of the chassis.

Quite often complaints of hum have been encountered. The simplest remedy in this case is merely to connect an 8-mf. condenser between the "high side" of the field of the speaker and the chassis. It has been tried in several cases and invariably eliminated the hum.

Stromberg-Carlson 38, 39, 40

Faint and Distorted Reception. These receivers are frequently serviced because of the complaint of very faint and distorted reception, with the tuning meter operating normally as the dial is turned from station to station. Reception may be obtained by removing the first audio 56 tube. This condition has been traced to the lead connected to the grid terminal of the first audio socket shorting to the sharp edge of the plate prong. The further indication of this defect lies in the series of very loud clicks that are heard when the volume control is rotated because of the high voltage impressed upon this unit.

Noisy action of the volume controls used in these models may sometimes be cleared up by replacing the 56 tube in the first audio stage that is gassy and draws too much plate current.

Cathode-heater leakage of the type 58 tubes may result in strong hum upon resonance.

Where the receiver is inoperative and the tuning-meter needle does not swing, check either for an open-circuited or burned-out meter or a shorted 0.3-mf. meter and r.f. first-detector-plate by-pass unit and clip the original condenser out of circuit, because temporary breakdown or leakage of this section will cause the meter to "go."

Weak reception, with the added symptom of "station hiss" that may be cleared somewhat by placing the finger upon the control grid of the r.f. 58 tube, has been found caused by an open-circuited preselector coil primary or the primary of this coil grounded to the metal braid of the antenna binding-post lead.

Distortion upon resonance that may also be cleared by placing a finger upon the control grid of either the r.f. or first-detector tubes has been traced to the shield can biting into and grounding the secondary-return lead of that stage.

Where reception was found weak and distorted, the trouble has been traced to a defective 600-ohm cathode resistor in the first r.f. stage (58 tube). This resistor changes in value. By shorting this resistor entirely, the volume and ease of operation of the set are increased greatly.

Resonant hums, fading, and steady hums can usually be traced to cathode-to-heater shorts in type 56 tubes. We have found that the 56 tube gives trouble continually, and whenever a hum is found, the type 56 tubes should be checked carefully.

Stromberg-Carlson 38–41 (Second Type)

A noisy volume-control condition may sometimes be eliminated by interchanging or replacing the 55 tubes that are gassy and draw too much plate current.

The symptoms of distortion upon resonance, weak reception accompanied by "station hiss" conditions that can be cleared by placing a finger upon the control grid of the r.f. or first-detector tubes, as described with the first production of these models, have been traced to an open or grounded preselector primary coil or a grounded secondary-return lead.

Intermittent and fading reception has frequently been found caused by rattling of one of the leads to the oscillator-tracking condenser, in the eyelet of the terminal lug, which connection has never been soldered. In some instances, the same trouble has been traced to the loose connection of the lead to the terminal lug on the second i.f. primary trimmer condenser.

Inoperative. As with the first type 38 model, where the receiver is found inoperative and the tuning-meter needle does not swing, check for an open-circuited meter or short-circuited 0.3-mf. by-pass condenser. This condenser should be replaced in any event.

Set Weak. Where the tuning meter is found to operate normally and the receiver performs very weakly, check the voltage on the plate of the demodulator tube. If a much lower reading than approximately 100 volts is obtained, replace the 1-mf. by-pass condenser connected from the chassis to the junction point of the 10,000- and 4,000-ohm carbon resistors in the demodulator plate circuit.

Stromberg-Carlson 48–51

The symptoms, failures, and remedies described with the second type 38 model have substantially been found the same in these models, with the exception of the volume-control data. When a *loud crackling noise or series of crackles* is heard when the receiver is first switched on, check one or both of the 2A3 output tubes for loose or shorting elements.

A slipping tuning dial has been traced to the fact that the U-washer on the friction drive is binding to the opening in the cabinet. This condition may be rectified by loosening the mounting bolts so that the front of the chassis may be raised slightly enough to free the action of the friction drive to permit insertion of small rubber strips between the chassis and mounting board.

Hum. These receivers are frequently serviced for a continuous hum that is sometimes heard above low volume levels. In most cases, this condition may be remedied by replacing the type 55 tube. When this does not assist matters, the small audio choke located on the front side wall of the chassis between the volume control and voltage divider may be short-circuited. This choke is employed in conjunction with the rear section of the

volume control in a response as the volume level is reduced. Shorting the choke out of the circuit does not seem to impair the quality of reproduction but has, in many instances, corrected the hum condition.

The symptoms of distorted reproduction at low volume levels when the receiver is tuned to resonance have each time been traced to the volume control. Since the unit employed in these models is a double volume control whose sections are riveted, the quickest and best remedy is immediate replacement.

A microphonic condition is due in large measure to the type 55 tubes because of vibrating elements when the volume control is advanced beyond a certain level. The remedy is to loosen the chassis mounting bolts so that the chassis may float on the soft rubber under the front and rear of the chassis and provide additional "floating power."

When removal of the chassis is necessary and the bottom shield plate has been removed, care should be exercised in setting the phono-radio transfer switch in the center or base position before replacing the bottom shield plate. If the front center screw is replaced with the transfer switch in either the "phono" or "radio" position, it may be found that the switch cannot be rotated from that position. Some servicemen have adopted the practice of omitting this screw when the bottom plate is replaced. Since the screw serves as a stop and the switch may be overturned (thus causing considerable damage), it is best that the screw be used.

Where an inoperative receiver is encountered with the symptoms of excessive plate current drawn by the 2A3 power-output tubes, check the two small 600-ohm carbon resistors connected to the hum-control potentiometer in the secondary-return circuits of the push-pull input transformer. A number of cases have been found where these resistors have been badly burned and carbonized.

Automatic Phonograph Complaint. Some of these models are equipped with an automatic phonograph mechanism that has provided several causes for complaint. During the operation cycle, when the record is released by the record-carrying-arm transfer finger about ½ in. or so from the turntable spindle, it is usually due to an incorrectly adjusted pickup shoe and pickup tongue or to the fact that the pickup head is too high or too low. In the first instance, the pickup shoe and tongue should be adjusted so that a record will pass below the pickup and on the pickup tongue and be held in position by the shoe attached to the front of the pickup. If the pickup shoe is too high, the record will not be held in a horizontal position and will fall away from the record transfer finger before the record reaches the turntable spindle. If the pickup shoe is too low, the record will not pass underneath the shoe, resulting in the same complaint. If the pickup head is too high or too low, the record will not slide

into position under the shoe and over the pickup tongue. The height of the pickup is controlled by the small screw and lock nut at the end of the tone-arm height-adjusting lever under the tone arm. This screw is easily accessible by raising the pickup arm.

Should the record be released by the carrying-arm transfer lever while carrying the record to the turntable, the trouble may most often be remedied by adjusting the height of the rail upon which the record-carrying-arm roller rides. The height of the turntable spindle may also be at fault. If either too high or too low, it may cause the record to fall away from the record-carrying-arm transfer finger. The height of the turntable spindle is varied by means of the large screw under the spindle shaft. If the spindle is too low, the lock nut should be loosened and the screw turned in, or if the spindle is too high, the screw should be turned out until the top of the turntable spindle is approximately $\frac{1}{32}$ in. below the top of the record slides.

Another complaint received on the phono mechanism is the failure of the needle to slip into the first groove when the pickup head lowers onto the record. In some cases the needle may lower onto the record but does not slip into the first groove, and in others the needle lowers outside of the record or skips over several grooves on the record. If the needle lowers outside the record or falls into the first or second groove, a simple adjustment may be made by loosening the large screw holding the pickup head to the tone arm and shifting the position of the pickup either in or out as the case may be, so that the needle will lower properly onto the edge of the record. If the needle lowers onto the edge of the record but does not slip into the first groove or skips over several grooves, the tension of the groove springs must be varied. There are two such springs provided (coil type) one for 10-in. and the other for 12-in. record operation, located under the pickup-positioning cam wheel. The tension of these springs is varied by means of small screws to which one end of the springs is fastened. Failure of the needle to slip into the first groove is caused by insufficient tension of these springs and is corrected by turning the adjusting screws clockwise (looking at the slot in the screw). Too much tension will result in the needle skipping past several grooves as the pickup lowers and is remedied by turning the adjusting screw in a counterclockwise motion.

In order to make some of the adjustments described and to observe the operation of the mechanism to determine causes for other failures, it is often necessary to remove the phono mechanism from the cabinet. Since the mechanism must be level to function properly and raised from the object upon which it is placed to permit the free action of all moving parts, some means must be provided to accomplish this. Four bolts about 12 in. long

and nuts may be secured to serve as legs for the phono panel and are fastened to the corner mounting holes of the panel. If these bolts or testing legs supplied by the manufacturer are not available when the phono mechanism must be removed in the field, two straight-backed chairs may be placed back to back and the panel suspended between the tops of the chairs. Of course, this is an emergency measure, and unless the panel is handled carefully, considerable damage will result.

Set will not play. All voltages check right. Continuity tests from all socket prongs test perfect. Good audio signal from second detector up, with all tubes in socket. Light grid click when aerial is applied to grids of both r.f. and mixer tubes. Suspect and look for defective 56 oscillator. Applying antenna to aerial post, no click; replace 56 oscillator tube.

Important! Testing 56 oscillator tube on ordinary tube checker will not suffice. Merely replace with a very good tube. Resistance of tuning meter should be about 600 ohms.

Stromberg-Carlson 55, 56

In these models, the complaint of distorted reproduction has been traced to leakage of and between sections of the filter-condenser block. This block is fastened to the chassis by four screws and is equipped with an eight-prong plug that fits into an eight-hole socket on the chassis. At times the leakage will show up only during operation of the receiver and for this reason is difficult to check with an ordinary ohmmeter of limited range. If a voltmeter is employed in conjunction with a source of high voltage, locating the leaky section is made easier. Another method commonly employed by most servicemen is to disconnect each condenser in turn and substitute a unit of similar characteristics. Replacement of the entire block is unnecessary once the path of leakage is found. Those sections causing the trouble may be disconnected from the circuit and new condensers installed beneath the chassis.

In making tests on Model 55, it should be remembered that a resistance reading will be obtained across the line-supply plug although the receiver is turned off. This indication is that of the primary of the step-down transformer that operates the off-on relay switch. The transformer is connected across the line supply at all times.

The increased brilliance and frequent burn-outs of the dial light when either the type 78 or 6A7 tube in the remote-control unit is removed with the receiver "on" may be traced to the series-heater arrangement of these tubes. The dial light is connected across the heater supply in series with a 47-ohm resistor.

Stromberg 150L

Insufficient Bass Response. Complaints have been received now and then about there being too little bass response in this receiver. If more bass is desired,

the following changes in the bass control circuit can be made:

Remove the 10,000-ohm resistor, No. 189 in the schematic on Vol. VIII, pages 7, 8 in Rider's *Manual*, and replace it with a 47,000-ohm unit, Part No. 26353. Also replace the 0.04-mf. condenser, No. 110 in the volume-control circuit, with one having a capacity of 0.01 mf., Part No. 25149.

Note that these changes are not essential except when more bass response in this model is requested.

Stromberg-Carlson 635, 636

The symptoms of mushy and choked reception have frequently been traced to the pilot-light socket shorting to the chassis or to a short-circuited 2-mf. speaker output condenser.

Where the house fuse "blows" when the receiver is turned on, check the 0.01-mf. buffer condensers connected across the primary of the power transformer with their junction point grounded.

Stromberg-Carlson 636

Volume Control. Owners of sets of this general type may object to the relatively high cost of the special dual-volume controls. Also, servicemen who are located some distance from a supply house may not be able to secure new controls at short notice. A single 10,000-ohm control can be made to work very satisfactorily by using one end as a cathode bias and the other end as an antenna attenuator.

Stromberg, 641

Intermittent Reception or Fading. Often caused by loose lugs on 800-ohm volume control.

Stromberg-Carlson 641, 642, 652, 654

Noisy, Intermittent, and Fading. A common complaint against these models is of noisy, intermittent, and fading reception. In the majority of cases, these symptoms are caused by a defective volume control in the antenna circuit. This unit is located in the rear of the receiver and is of the carbon type. Although the unit may be repaired, it is advisable to install a new volume control, preferably of the wire-wound type. The same condition is often caused by leaky 0.0005-mf. detector-plate by-pass condensers located within the housing of the detector-plate choke. If the fault lies in these condensers, the noise will remain even after the detector tube is withdrawn.

Noisy reception that has been determined as originating within the receiver and is characterized by a sputtering usually attributable to arcing has been found to be due to blistering portions on the voltage dividers. Replacement is the only remedy.

Installing a Dynamic Speaker. Provision has been made on Model 641 for the use of a dynamic speaker with a high-resistance field coil that is connected across the output of the rectifier tube. To accomplish this change it is necessary

to increase the a.c. potential upon the rectifier plates. This is done by removing the present connections to the 80-socket plate prongs and taping the leads up separately. The two taped brown leads emerging from the same cable are soldered to the plate prongs of the 80 socket. The a.c. leads of the outlet on the back of the chassis are removed and taped up singly. Two leads, one from a filament prong of the 80 rectifier and the other from the chassis, are now brought out and soldered to the outlet. To complete the rewiring, the blue leads connected to one of the speaker tip jacks should be removed and soldered to terminal 7 on the output-transformer assembly after the leads to terminals 7 and 3 have been removed from their respective terminals and soldered to terminal 5. The final move is to connect a lead to the empty tip-jack terminal from terminal 4 on the output-transformer block.

The complaint of "wow" on Model 654 or variation in the speed of the record reproduction, which is usually apparent upon sustained notes, may be eliminated by changing the felt washers on the spindle upon which the turntable rests to one made of rubber. In many instances it is necessary to overhaul the entire motor to correct the condition.

Stromberg-Carlson 642

Fading. On a Stromberg Model 642, the complaint was of fading, with volume coming back with a roar when a light in the house was turned on or off. We have cured this trouble in several sets of this model by replacing the 0.0005 condenser in the audio coupling unit between the detector and first audio tubes. This unit is located near the front volume control and contains a 10-MH r.f. choke and two 0.0005-mf. condensers. The old choke may be used with the new condenser.

Stromberg 654

Set Fades. A leaky 0.3-mf. cathode bypass section in the first r.f. stage is often at the bottom of fading trouble.

Stromberg-Carlson 846

Inoperative. If the condition is encountered where reception is obtained only upon the removal of one of the 45 output tubes and an analysis reveals a negative grid bias of 25 volts upon one of the 45 tubes and a positive bias of 160 volts on the other, look for a shorted primary secondary of the push-pull input transformer.

The symptoms of motorboating between stations and strong oscillation have invariably been traced to corroded variable-condenser rotor contacts. Although the spring contacts may be cleaned, the rotor shaft should be pigtailed to the chassis for a permanent repair.

Stromberg-Carlson 846

In the Stromberg-Carlson 846, *we encountered a lack of volume.* This was finally traced to an open antenna coil.

After the replacement of this coil and the sensitivity control, which changed from 20,000 to 35,000 or 40,000 ohms, the set worked normally again. This difficulty was located after considerable trouble. Rebalance tuning condensers at 1,400 kc.

❖ ❖

Sun-Glow

Sun-Glow Melody Chest

This set had no volume, even on local stations. The voltages of the tube sockets of the set checked correct, tubes checked o.k., balancing condensers checked o.k., and nothing was wrong with the aerial and ground system. Finally we told the owner that we had to take the set to the shop for further investigation.

We laid the chassis upside down on the workbench, made the necessary connections, turned on the switch, and to our surprise it worked wonderfully well, with plenty of volume. We checked all the connections carefully, especially those riveted to the chassis, but failed to find any loose or high-resistance connections. We turned the chassis over (bottom side down); in this position the set lost its volume again. Turning the chassis over slowly, we noticed that it would regain its volume gradually, just as we were turning it over. This gave us a good clue to the trouble.

We removed the shield can from one of the r.f. transformers and found that the primary coil, supported by its two leads, was hanging downward into the can.

The displacement of this coil was causing loose coupling. This coil, being inverted when the set was turned upside down, would come closer to the secondary coil, consequently causing a change in the characteristics that resulted in an increase in volume. We noticed that originally the coil was placed inside the secondary coil, secured only by a tight fit and a little wax composition. The heat within the set caused the wax to melt away, and vibration had worked it loose and completely out. (In fact, it was hanging down inside the shield can about 1½ in. away from the secondary coil.)

We replaced the coil and secured it with a long screw in the center of the wooden form on which the coil was wound.

❖ ❖

Temple

Temple 80 A.C.

Intermittent reception occurring very irregularly and accompanied by a drop in voltage on all plates (from 250 to 180 volts). Replacing the 47 tube cured the symptoms but not the cause. Trouble was finally traced to a bad coupling condenser in grid circuit of 47. In this Temple model, the coupling condenser and resistor for plate of preceding condenser are built into a small can on back of chassis; if the resistor checks o.k., it

can be left in, so all that has to be done is to clip the wire from can going to the 47 grid and wire in a 0.001- to 400-volt condenser from the 47 grid to the plate of preceding tube.

❖ ❖

Truetone

Truetone 052 Series

Weak Reception. Check 0.1-mike condenser from 35 screen to ground. Replace 250,000-ohm, ⅛-watt resistor from second-detector 57 plate to 80 filament, even if it tests o.k. On load, it sometimes drops plate volts from 180 to 100. Use a 1-watt carbon replacement. (Intermediate frequency: 262 kc.)

❖ ❖

United Motors

United Motors 2035

Vibrator Test. Connect 8 volts to battery leads, remove 5-ampere fuse in filament lead, and shunt an ammeter across the fuse terminals. Place a good 84 in the rectifier socket. The meter should jump to 10 amperes and then drop back to 4.5 if unit is normal. Voltage from plate of 84 to ground is 300 a.c.

United Motors 2036, 4036

If the set does not bring in anything from 550 to 860 kc., look for an open in the 3,600-ohm cathode bias resistor. If the set is intermittent in operation, try resoldering the antenna coil.

United Motors 4038 (Chevrolet 600249, 600565, B.O.P. 980459)

Low or Intermittently Low Volume, Accompanied by Poor Quality and Missing Bass Notes. Check primary of push-pull input transformer carefully. Trouble is deceptive, because voltages are not affected.

❖ ❖

United States Radio and Television Corporation

8 Series

An annoying case of fading had developed and was traced to a defective 0.04-mf. coupling condenser between the plate of the type 27 second-detector and the 47 output tube. A new condenser restored the set to full operation.

10 Series

Jumpy Volume Control. Look for gassy 27 in first a.f. socket.

Hum; volume control will not reduce volume to zero. Replace the 8-mike condenser under the resistance strip in the center of the chassis. It frequently opens, causing this trouble.

25, Chassis 500 (Two Types)

Short-wave Code-signal Interference. This broadcast superheterodyne had a very annoying habit of mixing in short-wave code signals with the broadcast programs.

It occurred to us that the trouble was due to an overproduction of harmonics by the oscillator, and these harmonics were heterodyning strong short-wave code signals. The broadcast stations heterodyned the signal at audio frequency and made them audible, since the only time they could be heard was when a station was tuned in. (We have noticed the same trouble in several other makes of small supers.) The remedy lies in increasing the value of the cathode bias resistor of the type 57 oscillator and first detector. By putting a variable resistor in this circuit, one can increase the bias to a point where all the code signals disappear without affecting the regular signals. When the proper value is found, a fixed resistor can be installed in place of the variable. We found that about 4,000 ohms was right, although the exact number is not especially critical.

26-P

Except for a faint whisper from a local station, the set was dead. A check revealed a lack of screen-grid voltage on the 24 tubes in the r.f. stages, due to a shorted 0.4-mf. screen-grid by-pass. The leads to the screen grid were clipped, the screen grid tied together and by-passed with a 0.5-mf. tubular condenser, and no further trouble was experienced. This condenser has been found defective in several of these sets.

Oscillation Evidenced by Extremely High Screen Voltages. This condition is due to an open-screen bleeder resistor (2,560 ohms). Replace with a 25,000-ohm value.

34 (Washington)

Intermittent Reception. Change 200,000-ohm grid filter resistor between 35 grid and a.v.c. tube plate to 100,000 ohms.

United States Radio and Television Corp.
80

Abnormal hum accompanied by crackling and sputtering, with no apparent loss of volume, and poor tone quality were encountered in this receiver.

This trouble was intermittent and we had to wait a long time for it to occur. The trouble was caused by grounding of pilot-light bracket to chassis. The bracket is normally insulated from the chassis by small fiber washers. The screws holding the bracket loosen and allow the washers to shift and ground the bracket to the chassis.

Remedy: Shift washers to proper position, and tighten screws.

❖ ❖

Wells-Gardner

Wells-Gardner 07A

No Reception. Here is a hint about the Wells-Gardner and Airline 07A Series. We find that nine times out of ten the trouble is an 18,000-ohm section of the voltage divider.

The tone-control condenser had broken down when this occurs, the output plate voltage is applied across the tone-control resistor, and in many cases the resulting high current burns it up. For this reason, if it is necessary to replace either the condenser or resistor in this model, connect the side of the condenser that formerly went to the ground to the B+ end of the output-transformer primary. This connects the tone-control condenser and resistor across the primary of the output transformer. In this method of connection, should the tone-control condenser break down, no damage will be done to the tone control.

Wells-Gardner 7K Series

Dual Volume Control. A dual manual volume control is employed. In one section, the audio section of the 6B7 tube is varied (R_{10}). In the other section, the r.f. and i.f. bias is varied (R_2). The purpose of the latter section is to reduce the sensitivity of the receiver at the low-volume settings in order to cut down noise pickup between stations. The variable section R_2 is shorted out through contact 4 of the interstage section of the band-selector switch when in the short-wave position.

Alignment Procedure. Correct alignment is extremely important in connection with all-wave high-fidelity receivers.

If a station is tuned in with the selectivity control in the broad position and this control is then turned to the sharp position, the station may disappear. This is not an indication that the receiver is out of alignment.

Use a nonmetallic screw driver for the adjustments. The complete procedure is as follows:

I.F. Adjustment. Set the signal generator for a signal of 456 kc.

Connect the output of the signal generator through a 0.1-mf. condenser to the grid of the first detector.

Connect the ground lead of the receiver to the ground post of the signal generator.

Turn the band selector to the range *B* position (medium waveband, green dial color).

Turn the selectivity control to the sharp position and keep it in this position for all adjustments.

Turn the volume control to the maximum position.

Attenuate the signal from the signal generator to prevent the levelling-off action of the a.v.c.

Then adjust the four i.f. trimmers until maximum output is obtained. The adjusting screws for these condensers are reached from the top of the chassis.

Range A Alignment:

380-kc. adjustment.

Set the signal generator for 380 kc.

Turn the rotor of the tuning condenser to the full open position.

Turn the band selector to the range *A* position (long waveband, purple dial color).

Connect the antenna lead of the receiver through a 200-mmf. condenser to the output of the signal generator.

For this and all subsequent adjustments, keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent a.v.c. action.

Adjust the oscillator range *A* trimmer (C_{30}) until maximum output is obtained.

350-kc. adjustment.

Set the signal generator for 165 kc.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage range *A* trimmer (C_{10}) and antenna range *A* trimmer (C_3) to maximum.

Do not change the setting of the oscillator range *A* trimmer.

165-kc. adjustment.

Set the signal generator for 165 kc.

Turn the tuning-condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth, at the same time adjusting the 165-kc. trimmer until the peak of greatest intensity is obtained. See Vol. VII, page 30 in Rider's *Manual* for location of this trimmer.

Range B Alignment:

1,730-kc. adjustment.

Set the signal generator for 1,730 kc.

Turn the rotor of the tuning condenser to the full open position.

Turn the band selector to the range *B* position (medium waveband, green dial color).

Keep the antenna lead of the receiver connected through the 200-mmf. condenser to the output of the signal generator.

Adjust the oscillator range *B* trimmer (C_{34}) until maximum output is obtained.

1,500-kc. adjustment.

Set the signal generator for 1,500 kc.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Loosen the pointer setscrew and set the large pointer at the 1,500-kc. mark on the medium-waveband scale. Retighten the setscrew.

Adjust the interstage range *B* trimmer (C_{34}) and antenna range *B* trimmer (C_5) to maximum.

Do not change the setting of the oscillator range *B* trimmer.

600-kc. adjustment.

Set the signal generator for 600 kc.

Turn the tuning-condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth, at the same time adjusting the 600-kc. trimmer until the peak of greatest intensity is obtained.

Range D Alignment:

18,300-kc. adjustment.

Set the signal generator for 18,300 kc.

Connect the antenna lead of the receiver through a 400-ohm resistor to the output of the signal generator.

Turn the rotor of the tuning condenser to the full open position.

Turn the band selector to the range *D* position (short-wave band, red dial color).

Adjust the oscillator range *D* trimmer (C_{35}) until maximum output is obtained.

Set the signal generator for 15,000 kc.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the interstage range *D* trimmer (C_{12}) and antenna range *D* trimmer (C_6) to maximum.

In adjusting the interstage range *D* trimmer, it will be necessary at the same time to turn the tuning-condenser rotor slowly back and forth until the peak of greatest intensity is obtained.

Then go back and repeat the procedure as given for the 18,300-kc. adjustment. If it is found necessary to make any appreciable change in the setting of the oscillator range *D* trimmer, the 15,000-kc. adjustment must be repeated.

Do not make any further change in the setting of the oscillator range *D* trimmer.

6,000-kc. adjustment.

Set the signal generator for 6,000 kc.

Turn the tuning-condenser rotor until maximum output is obtained.

Turn the rotor slowly back and forth, at the same time adjusting the 6,000-kc. trimmer until the peak of greatest intensity is obtained.

Phonograph Connections:

Phonograph connections can be made easily in this receiver. Knockouts are provided in the back panel of the chassis for mounting the phono jack and phono switch.

❖ ❖

Westinghouse

Westinghouse WR5

See data on Radiola 80.

A complaint came in of a roaring noise in this model. No noise was apparent at the time of examination; so the tube socket voltages were read, and each tube was tapped to locate possible loose elements within. The screen-grid caps were cleaned; also the prongs and the aerial and ground. However, the noise stopped only for a few weeks. Following a definite plan, the serviceman discovered that tipping the radio a little to one side would cause a short, popping noise similar to the arcing of a loose connection. Rapping smartly with a screw-driver handle on the r.f. chassis that is separate from the a.f. and power-pack chassis produced nothing. However, rapping on the a.f. chassis resulted in the reproduction of a popping noise in the speaker, a sure sign that there was a loose connection within the chassis. Turning this over so as to expose the wiring with the set still playing and pulling on the primary wires of the power transformer caused this same popping noise in the speaker. This, of course, centered the trouble in the power transformer.

Another complaint with this set was popping noise only at resonance, so much like interference that the serviceman was mistaken for a few minutes. The fact that the interference appeared only at

resonance point was very peculiar and unusual. By adjusting the voice coil of the dynamic speaker, the trouble was remedied.

Westinghouse WR5, WR6

Noisy reception in this model is often caused by a poor connection of the electrostatic shield in the power transformer to the chassis. The lead to this shield (which usually consists of an extra layer of winding between the primary and the secondaries) should be scraped free from the tar surrounding the transformer and grounded to the frame and the receiver chassis.

Westinghouse WR6

See data on Radiola 82.

Westinghouse WR7

See data on Radiola 86.

Westinghouse WR10

See data on RCA-Victor R-7.

Westinghouse WR12

See data on RCA-Victor R-9.

Westinghouse WR14

See data on RCA-Victor R-5.

Westinghouse WR15

See data on RCA-Victor R-11.

Westinghouse W24

If the receiver develops noise at the slightest vibration, suspect the tube sockets. These may be tightened in the usual manner with long-nose pliers.

Westinghouse (Canadian) 71

The set was "dead" upon arrival at the shop. Since no diagram was at hand for this particular set, a start was made by checking for voltages. All were low, and there was a negative potential on the plate of the detector (caused by a shorted 2-mf. filter condenser).

❖ ❖

Zenith

Zenette A, B, C, D

Erratic Operation, Squeals, Overall Efficiency Loss. Replace 25,000-ohm series plate resistor with same value in 10-watt size. Check all high-value resistors in detector-plate circuits for 25 per cent change in value; also 1-megohm resistor in first r.f. grid return. If set is a radio-phono combination, keep wire from phono switch as far away from receiver circuits as possible. Put 0.00025 condenser from detector choke to ground for greater stability.

Several changes have been made in the improved chassis 2004, which is used in these models. These changes are shown in the accompanying schematic, only a portion of which is shown, since the remainder is the same as the early model.

If you will compare this with original schematic, see "Zenith," page 26 in the revised edition, 674-C in the early edi-

tion, and page 2722 of Rider's *Combination Manual*. It will be seen that the green wire connecting the long antenna coil now goes to a condenser (Part No. 22-104) having a value of 0.0001 mf. The other side of this condenser is connected now to one side of the volume control (Part No. 63-131) in the cathode circuit of the first 24, instead of to ground.

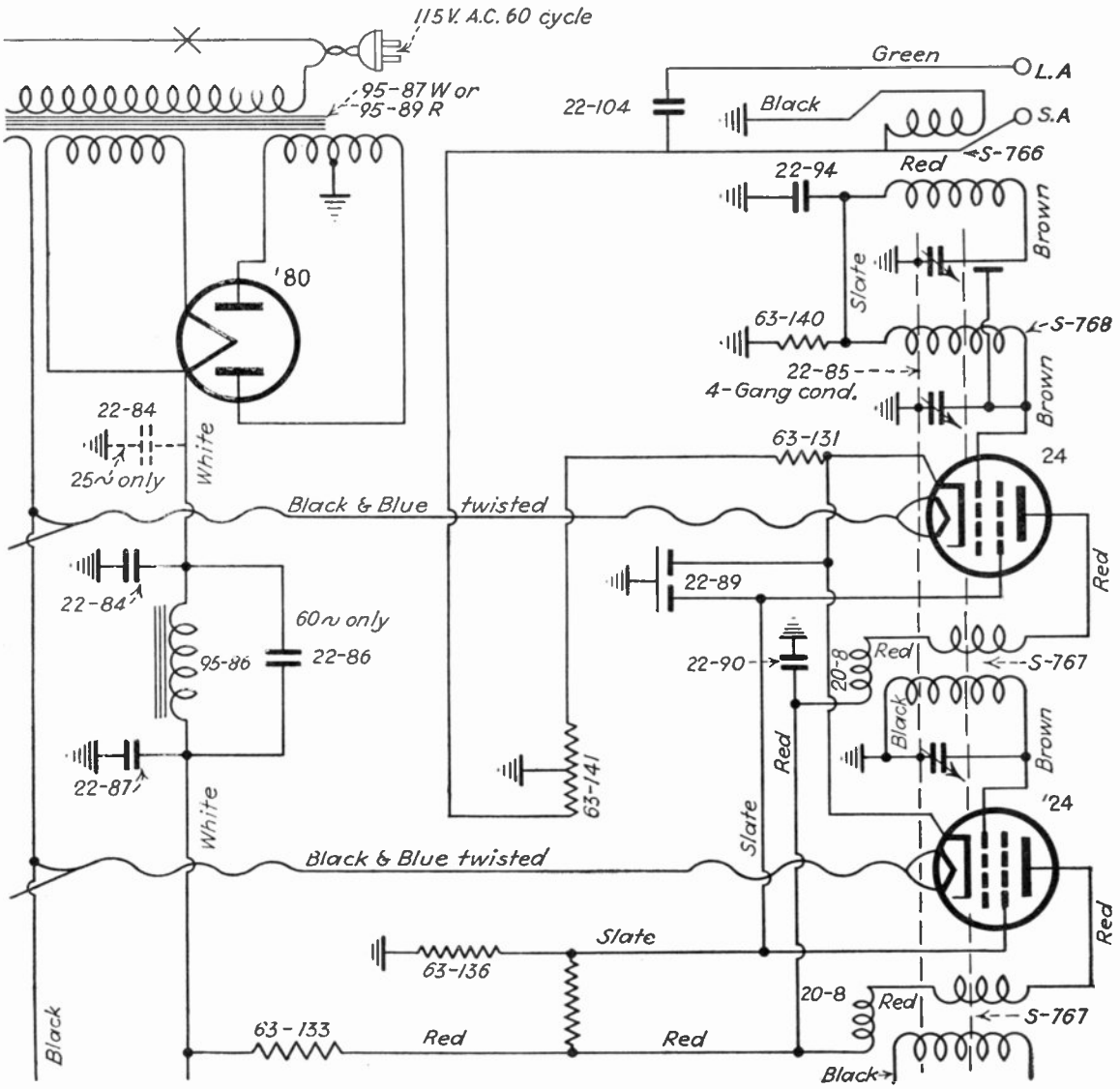

Fig. 23.

The 50,000-ohm resistor (Part No. 63-136) has been added in the screen-grid circuits of the first two tubes. Also, in the power-supply circuit, those receivers using 60-cycle supply have been added in.

This condenser is omitted in 25-cycle sets, and the condenser shown dotted is used instead; the value is 2 mf. (Part No. 22-84).

Poor Operation. Check the plate, screen, and bleeder resistances in these models. Generally some of the resistors will have increased to a much higher resistance than their correct value. The bias resistor of 900 ohms for the 45's should be replaced with a 10-watt resistance.

Zenith 1937 Auto Receivers

Intermittent. Complaints have been received that in some cases some of these receivers operate intermittently in the car, and yet when they are operated on a test bench, they perform satisfactorily.

Note that each r.f. coil shield is held to the chassis by a single rivet. If this rivet becomes loosened, the grounding of the shield is not effective entirely, the set will oscillate, chatter, or give rise to other complaints.

These shields may be easily grounded by removing the bottom cover and soldering them together and to the chassis base, as indicated in the accompanying illustration. This procedure has proved effective and ensures proper shielding of the coils (see Fig. 24).

Zenith Superheterodyne

The complaint of fading in this model is often received. It has been traced to either or both 0.1-mf. small tubular bypass condensers in the first-detector and i.f. grid returns. The remedy is obvious.

Where these receivers are found to be intensitive on the high-frequency end of the scale, it is necessary to rebalance the condenser gang that contains two compensators. These should be aligned at the 1,500 and 600 kc. respectively. In

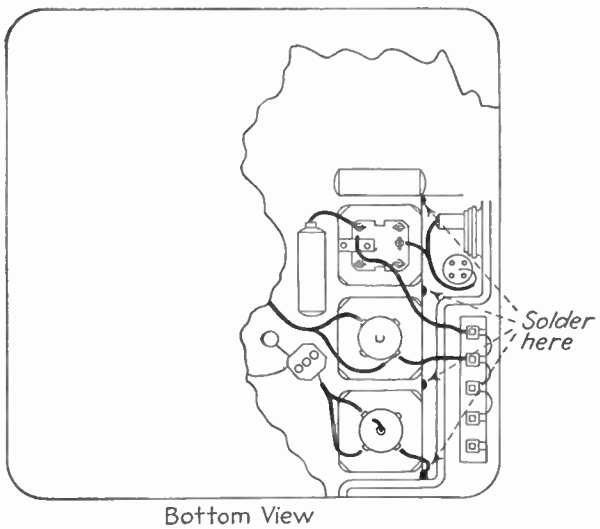

FIG. 24.—Points to be soldered in 1937 Zenith auto sets.

conjunction with these adjustments, the oscillator trimmer may also be adjusted with good results. This condenser adjustment is located on the side of the chassis below the r.f. coil and oscillator tube. The adjustment should be made at the low end of the scale. If the volume-control shaft should become grounded to the chassis, then no control will be obtained. Loosening the mounting nut and resetting the insulating-fiber washer will correct this condition.

Zenith CH Series

Excessive Regeneration and No Volume. Often due to defective electrolytic located in square can at far end of chassis (left side) by-passing choke located underneath chassis. Choking up when volume control is advanced or tuning dial shifted is

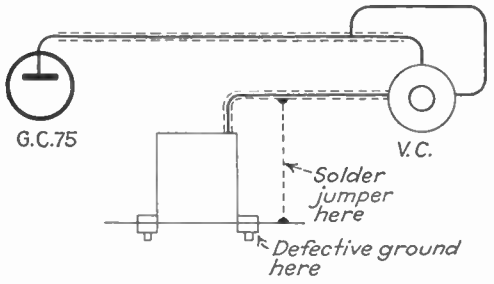

FIG. 25.

caused by 500,000-ohm plate resistor in a.v.c. tube dropping in value.

Zenith CH

Complaint—Very Weak and a Whistle on Every Station. This set is a superheterodyne, with a separate-type 24 tube for a.v.c. The r.f., oscillator and i.f. cathodes are directly grounded. A check on all by-pass condensers revealed no faults. A 0.5-mf. condenser connected from ground to second-detector cathode restored normal operation, although the original by-pass across the resistor was o.k. The bias resistor in this model does not go directly to ground, and no cathode-to-ground by-pass is shown in the manufacturer's diagram.

Zenith LH

To get rid of the hum in this receiver, we were compelled to replace the following parts: 0.05-mf. a.f. coupling condenser; 0.2-mf. 47-tube bias by-pass; 25,000-ohm detector cathode resistor; 0.5-megohm and 0.1-megohm power-tube grid coupling condenser; 10,000 ohm screen-grid supply resistor; and first-detector choke coil. Replacement of any of the old parts in the circuit would cause the hum to return.

Zenith Jr. Auto Radio 7

Constant or intermittent inability to control volume would indicate a defective volume control. However, this is not the case. One end of the volume control and the grid-lead shields are soldered to the top of the i.f. shield can, depending upon the can mounting bolts for a ground to the chassis. The can becomes loose and the ground imperfect, resulting in the symptoms given above. Remedy: Tighten the i.f. can mounting bolts and solder a piece of wire braid from the can to the chassis (see Fig. 25).

Zenith 9S54

Novel method eliminating hum in the push-pull amplifiers of Zenith 9S54, 9S55.

Circuit shows addition of a 50-ohm potentiometer between the cathodes of push-pull tubes. Bias resistor connects to tap on potentiometer. Hum is balanced out by adjusting tap on resistor. No other changes are made in existing circuit.

This same method can be used in other sets with push-pull cathode-type amplifier tubes—potentiometer allows for matching

of tubes by slight changes in bias. Additional resistance introduced in circuit is negligible.

Zenith 10, 11, 12, 102, 112, 122, 132

The voice coil of the Symington dynamic speaker used in these models cannot be adjusted in the manner usually employed with other types of reproducer. In order to adjust the voice coil, it is first necessary to dismantle the field coil and speaker stand. This is done by removing the large bolt on the back of the pot and the speaker-stand screws. The center pole piece is then turned and removed. Here three screws will be noticed that should be loosened so that the voice coil may be centered by inserting cardboard spacers between the frame and voice coil. Reverse the procedure for assembly.

The cause for intermittent and noisy reception lies with the three-point antenna switch employed in the first-production models, which should be replaced with the new type.

Intermittent reception is frequently due to a shorting 0.03-mf. audio coupling condenser that is riveted to the chassis. The lack of insulating pitch over part of the foil causes the condenser to short to the chassis upon vibration. A new unit may be installed, or the original component may be insulated and remounted.

The symptoms of oscillation and fading have been traced to open-circuiting 0.1-mf. screen and cathode by-pass condensers.

Where a microphonic condition and hum are encountered, interchange the 24A tubes until one is found that will operate satisfactorily in the detector stage.

The accompanying illustration shows the tube-socket layout of the chassis employed in these a.c. receivers. The schematic will be found on the following pages in Rider's *Manuals:* "Zenith," Vol. II, page 9 in the revised edition; 674-Q in the early edition; and page 2715 in the Rider *Combination*.

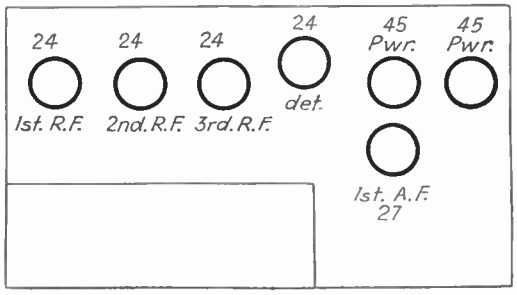

FIG. 26.

Zenith 11E, 14E

Intermittent reception and frequently an inoperative condition are usually caused by short-circuiting compensating condensers on the condenser gang. These compensating condensers, two plate units, are located in front of the second, third, and fourth tuning condensers. Since no insulating material is employed between the plates, small gummed papers should be pasted over the rear plate to prevent a recurrence.

Improving the Volume-control Circuit. A great many of these models employed a filament-type volume control that varied

the voltage on the r.f. filaments. Because of the thermal inertia of the type 26 tubes, this type of volume control is often objectionable. If the rheostat is removed and the two leads connected to it soldered together and taped, two different methods of controlling may be tried. A 50,000-ohm potentiometer may be installed in place of the rheostat, with its shaft carefully insulated from the chassis. It is then shunted across the second or third r.f. primary, the best position to be determined by trial. The second form of control is composed of a 10,000- or 50,000-ohm potentiometer connected in series with a condenser whose capacity is best determined by trial from the plate of the second r.f. tube to chassis.

Zenith 12L57, 12L58, 16A61, 16A63

Shadow Meter. Circuit for the shadowgraph tuning meter in the Zenith 12L57, 12L58, 16A61, 16A63, shown in *Radio Today* for July, 1936 on page 64, differs widely from the conventional circuit.

A separate tube is employed to operate the shadow-meter mechanism; a.v.c. control voltage is applied to grid of 6C5 tube. As a.v.c. voltage goes negative (as station is tuned in), the current in the plate circuit decreases, causing the shadow to narrow.

If tuning meter does not perform properly or is not sensitive enough, difficulty usually is with the control tube. Try a new 6C5 tube before looking for trouble elsewhere. Also, check meter for open circuit.

Zenith 15E, 15EP, 16E, 16EP

Weak and distorted reception on these models is often caused by an open-circuited 100,000-ohm "glastor" detector-plate resistor, which condition will be evidenced by the lack of detector-plate voltage. This resistor, of the grid-leak type, is located in the receiver chassis and not in the power unit.

Zenith 17

This Zenith set uses five 01A's, one 71A, and one B-A. rectifier. We have tried this change on own set and on two customers' sets, thus saving the three sets from being junked on account of the B-A. tube costing $7.50. Replace the B-A. with an 83 or 5Z3, but reverse the tube. Insert the two large pins into the two small holes and the two small pins into the two large holes. (First ream the two small pins into the small holes in socket so that the two large pins will fit properly.) The power pack has a transformer that will take care of the added filament drain of the 83 tube. After a year and a half, these three sets are still working o.k. It is suggested that the wires be reversed rather than forcing the large pins into the small holes.

Zenith 33X

Reception Faint, Audio O.K. Look under chassis near the antenna com-

pensating coil (movable). Here you will find a 2,000-ohm resistance from ground to coil. It is often open. It may usually be simply left out. Tone raspy. Change over 171 to 112 tube.

Zenith 35AP

Hum. This set would bring in only the two local stations, and there was some hum and circuit oscillation when the volume control was advanced. The trouble was located in the primary of the antenna coil, this winding being open between the "long antenna" tap and ground. The coil is located under the chassis in an inverted can that covers the underside of the first r.f. socket and also the three tip jacks shown in Fig. 27. Since there was no replacement coil at hand and very little room to get at this shield, it was decided to attempt a repair without removing the shield. After considerable experimentation, a flexible lead was soldered to terminal 1 of a 0.01-mf. condenser. A phone tip on the other end of the lead was plugged into the "long antenna" tip jack, and the other terminal of the condenser was grounded to the chassis, completing the r.f. circuit to ground. Cleaning and aligning completed the job (see Fig. 27).

Zenith 35P, 40P

Noisy Reception. Look for high-resistance ground on secondary of original a.f. transformer. Green corrosion is frequently found under the terminal lugs. Ohmmeter tests rarely show up this grief.

Zenith 41, 42, 422

The complaints of oscillation, intermittent and noisy reception have often been found to be caused by a loose or broken terminal lug of the r.f. plate-circuit bypass condenser located near the volume control.

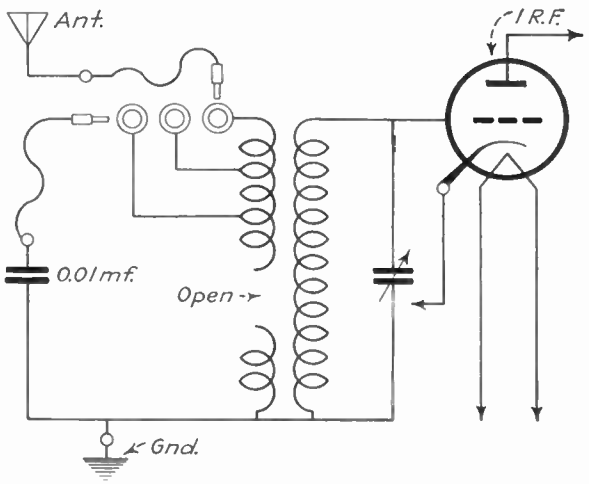

Fig. 27.

Poor internal contact of the local-distance toggle switch mounted on the panel that connects a 10.00025-mf. condenser in and out of the antenna circuit frequently causes the symptoms of noisy and fading operation.

Zenith 50

This model generally hums in spite of 36-mf. filter. This hum can be greatly reduced by filtering the 24 detector plate and screen with 100,000- and 500,000-ohm resistors respectively, and 0.1-mf. by-

passes. It can be further reduced by increasing the size of the plate coupling condenser in the first a.f. stage. The correct measurement seems about 0.05 to 0.1 mf. A larger condenser spoils the bass response.

Volume-control Repair. You are able to replace the dual volume control in this series with a single 1,000-ohm wire-wound control, center lead going to grid, one side to antenna lead, other side to the hot side of the r.f. condenser. The condenser must be removed and installed directly at one of the extreme ends of the volume control. Looking at control from the front, center goes to ground, right-end side goes to antenna post, left-hand end directly to the condenser mounted on coil chassis.

Zenith 50 and 60 Series

Low Volume. A very common complaint on the Zenith Models, 50 and 60 series, is a lack of volume with the control full on, yet everything checks o.k.

The trouble is the movable stator section in the five-gang condenser shifts toward the rotor, forcing the condenser out of alignment. The remedy is to loosen the lock nut on the end of the shaft, place a thin washer between end plate and jam nut, and tighten.

Zenith 52

The symptom was cutting off on a Zenith 52 chassis, which the turning of the volume control restored to normal operation.

After considerable testing, the trouble was found to be in the volume-control shaft. The shaft on the original control is hot, being connected to the center lug that goes to the screens of the r.f. tubes, and is insulated from the chassis by extruded fiber washers. In this case, the nut fastening the volume control to the chassis was loose, and the vibration from the speaker or someone walking across the floor caused the shaft to ground, thus cutting off the screen voltage. Centering the shaft and tightening it well cured the trouble.

RCA R-28P

Violent Oscillation All over Dial. Probably an open-circuited 4-mf. electrolytic screen by-pass condenser. It is mounted under the chassis in a common container with a second 4-mike unit. Change both to prevent a call back.

Should you find in balancing the machine that when you get the higher frequencies you lose the lower and when you get the lower frequencies you lose the higher, remove the shield over the variable-condenser gang and check to see if the rotory plates are centered exactly all along the line. The stationary plates are adjusted by loosening two screws on top of each gang. In calibrating, read your stations 5¾ in. above the top of the volume control.

Excessive Hum. A common trouble with Zenith Model 52 sets requires the replacing of the electrolytic condenser to stop hum. However, in many of these sets, after replacing condenser there is considerable objectionable hum left in

the set, which varies from zero to maximum as the volume control is turned. A very effective remedy for this follows.

Remove antenna and ground from set and adjust volume control for zero hum level. Then measure the voltage on the detector screen and remove said screen from the volume-control circuit, leaving the volume control to adjust the screen lead voltage on the r.f. tubes only. Set detector-screen voltage at exact voltage where no hum occurs by inserting a fixed resistor of the proper value in series with the high voltage to bring the detector screen to the voltage as measured previously, with the volume control at zero hum level.

This will clear up the most stubborn cases of hum as well as give perfect control of volume.

Zenith 52

The complaint was weak, intermittent reception and flickering of the pilot lamp. The trouble was found in the lamp itself. The two stems that support the filament were almost touching each other. In operation, the heating effect of the filament would cause the two stems to come into contact, thus shorting-out the pilot light and also the filament of the type 45 power tubes.

Zenith 52, 53, 54, 522, 532, 542

A low hum that is not attributable to faulty electrolytic condensers may be eliminated by connecting a 250,000 or 100,000-ohm carbon resistor across the grids of the push-pull 27 tubes.

Fading and intermittent reception has often been traced to cold-solder connections to the variable condensers that are disturbed by vibration of the chassis. A similar condition has been found to lie with open-circuiting r.f. coils whose connecting leads snap at the lug and make intermittent contact. The volume control will also produce the same symptoms when the carbon element becomes worn.

When operation of the vernier stator of the first r.f. tuning condenser produces a noisy condition, look for a break in the pigtail to the stator or corroded terminal connections.

The cause of 80 rectifier tubes burning out in those models utilizing automatic tuning lies with the pilot-light socket in the automatic tuner shorting to the metal frame or shield. As the pilot light is connected across the 45 filament supply a short circuit will place such load upon the power transformer that the 80 tube will "go."

A sharp rise and fall in volume is often caused by snapping of the fine wire leads of the r.f. choke fastened to the eyelets. These units are located under the chassis. Since the condition is intermittent, a set analyzer is of little assistance in localizing this trouble.

Where reception cannot be obtained above 650 kc., look for end rotor plates on the tuning condensers shorting to the stator plates.

Noisy tuning in these models is caused by a corroded copper contact and washer at the end of the condenser-gang rotor shaft. The contact spring and the washer should be cleaned and the tension of the spring increased by tightening the screw holding this contact against the collar on the rotor shaft.

Zenith 52, 62, and 72

Excessive Hum. Often, after replacing the electrolytic condenser on these models, a "hum" will be heard, and forming the plates of the electrolytic condenser will remove the "hum" for only a short time.

A sure-fire remedy is to disconnect the leads from the electrolytic condenser, one at a time. When the correct wire is removed, the hum will be lower in volume. This is the section shunting its resistance across the filter choke, allowing the hum content of the power supply to be passed through the resistance and not through the filter choke. To the wire that has been removed, connect an 8-mf. electrolytic condenser, thence to ground (chassis).

Zenith 70

Fading or intermittent reception. Look for open or shorted 0.25-mf. dual-plate by-pass condenser located on the first and second r.f. stages or 0.03-mf. by-pass condenser located between the plate of the first a.f. tube and the primary of the first a.f. transformer. If signals vary from weak to normal, suspect the first. If they are always weak, check the second.

These models have much in common with the 50 series receivers. Service data described under the latter receivers will apply equally to the 70 series.

Zenith 91–92

If this receiver is inoperative until the 24A tube used as the a.v.c. rectifier is removed from its socket, check the a.v.c. voltage divider connected between the cathode and screen. This section, if open, will stop reception. Replace with a 1-watt 15,000-ohm resistor.

Where the symptoms of fading, little or no meter action on the local side of the local-distance switch are encountered, check the 3,600- and 2,800-ohm carbon resistors in the voltage-divider circuit. These resistors, 2-watt units located upon the terminal strip fastened to the rear wall of the chassis, carbonize to a much lower value because of the stress placed upon them.

Should the condition be encountered in which reception cannot be obtained unless the a.v.c. 24 tube is withdrawn from its socket, the trouble will usually be found to lie with an open-circuited section of the a.v.c. screen-cathode voltage-divider resistor.

The symptoms of distorted reproduction upon resonance that can be cleared by detuning slightly have been traced to the a.v.c. screen-cathode voltage-divider resistor changing in value. In some

models, the screen section of this resistor has a value of 15,000 ohms and the cathode section, a value of 3,000 ohms, while in others the values are 10,000 and 25,000 ohms respectively.

In models employing a local-distance switch where no action is obtained with the switch in the local position, check the 4.5-megohm carbon resistor that is shunted from plate to cathode of the a.v.c. tube.

A great many of the troubles associated with these receivers originate in some portion of the a.v.c. circuit and are due to the failure of some component therein. The fact that these models appeared with three different versions of the a.v.c. circuit makes trouble-shooting more difficult and involves procedure. In the first, the volume control was placed in the voltage-divider system of the a.v.c. tube, which varied the cathode bias on this tube. A local-distance switch was also employed that shunted a resistor from the plate to the cathode of the a.v.c. tube when the switch was in the local position, thus impressing a constant bias on the r.f. first-detector and i.f. stages. This serves to retard the a.v.c. action and reduce interstation noise. A second revised circuit soon appeared, with the manual volume control in the grid circuit of the first a.f. stage. A tapped resistor was substituted in place of the volume control in the a.v.c. circuit. This revision permitted the reading of the tuning meter to remain constant regardless of the position of the volume control, because the a.v.c. tube operated at full efficiency. A further change was made wherein the local-distance switch and the 4½-megohm resistor in series with it were eliminated in favor of a variable sensitivity control connected in the cathode circuit of the 51 i.f. stage. The a.v.c. voltage-divider system remained without change. In this manner, the interstation noise usually associated with a.v.c. receivers could be reduced by the setting of the sensitivity control, which increased the cathode bias on the 51 i.f. tube, thereby lowering its sensitivity. The cathode of this stage in the original circuit and first revised circuit was tied directly to the chassis.

The small wire-wound screen-cathode voltage divider of the a.v.c. tube, as already mentioned, has been the cause of a number of unusual complaints. When one of the two sections open-circuits or changes in value, replacement requires a certain amount of "juggling" to obtain the correct resistance values to operate with the tube employed in the a.v.c. stage. It will be noted that although the manufacturer specifies most of the resistor values in these receivers, the value of the screen-cathode voltage divider is not given. The quickest method of determining the correct relationship between the two sections of the a.v.c. screen-cathode voltage divider is to use a 20,000- or a 15,000-ohm wire-wound resistor of the slider type so that these sliders or

taps may be adjusted to the necessary resistance value while the receiver is operating to obtain the most satisfactory combination. Although the values specified in a preceding paragraph are given as 15,000 and 3,000 ohms for the screen and cathode sections respectively, as well as 10,000 and 2,500 ohms, upon several occasions the only combination that would operate was 8,000 and 2,000 ohms. It may be well to mention at this point that the value of this voltage divider is exceedingly critical, and unless the proper values are employed, unsatisfactory receiver operation will result.

Zenith 92 Chassis, Serial Number above 302,000

Set is dead while 24A a.v.c. tube is in the set. To repair, remove brown tapped resistors connected on cathode of a.v.c. tubes and replace with two 20,000-ohm resistors.

Zenith 230, 240, 244, 245

The condition of distortion at a low volume level is usually caused by an improperly centered voice coil on either dynamic speaker. In most instances, it is the larger speaker.

Hum and Distortion. When this chassis is installed into custom-built cabinets and the mounting board is not so thick as that used in the manufacturers' cabinets, do not tighten the back left mounting bolt, for it will pass up too far and short to some component, often producing the symptoms of strong hum and distorted reception.

Hum in these models is almost invariably caused by electrolytic filter condensers that have lost their effective capacity. When the third filter condenser becomes bad, oscillation, weak and distorted reception will result.

Zenith 240

Stations were not received at the proper point on the dial. Although some sets were rectified by realignment of the oscillator trimmers, it was necessary to adjust the celluloid dial scale on most in order to obtain the proper frequency settings.

Distortion and Weak Reception. Where this chassis is installed in custom-built cabinets and the mounting board is not so thick as that used in the manufacturer's cabinet, the back left mounting bolt, if screwed too tightly, will pass up too far and short to the biasing resistor, causing distorted and weak reception.

Zenith 410, 411, 420, 430, 440

Hum in these models is also caused by faulty electrolytic filter condensers that have lost their effective capacity.

One of the causes for an inoperative receiver is an open-shadowgraph tuning meter.

When it is found that reception fades out a few minutes after the receiver has been switched on and can be brought back by removing the a.v.c. 57 tube, replace this tube.

Below will be found the voltage readings for these models, the schematic of which appears in Rider's Vol. III on "Zenith," page 7 and in the Rider *Combination Manual* on page 2737.

Tube	Position	Plate	Cathode	Screen	Suppressor	Plate current
Z58	First r.f.	175	2.2	75	2.2	5.7
Z58	First detector	190	4.5	75	4.5	2.3
Z56	Oscillator	100	0	...	.....	3.5
Z58	First i.f.	200	2.2	75	2.2	5.5
Z56	Second detector	110	10	...	.....	0.3
Z56	First a.f.	170	80	...	.....	0.8
Z57	A.v.c.	...	85	...	85	
Z57	Q.a.v.c.	30	13	75	13	
Z59	Driver	190	20	190	190	13
Z59	Power	195	70	195	195	22
Z80	Rectifier	360	....	...	.....	65

The filament voltage for all tubes, except the rectifier, is 2.5; that of the 80 is 5.0 volts.

Balance the i.f. stage at 175 kc., condenser gang at 1,500 kc., and oscillator padder at 600 kc.

Zenith 430 and 440

Noisy and weak reception on the above models is caused by poor connection of the i.f. transformer trimmer condensers.

The plates of these compression-type trimmers are riveted together at the ends, and they oxidize with time.

Remedy: Solder the ends and rebalance at 1.75 kc. Also, to improve tone quality, eliminate the choke and condenser tone-compensating assembly that is wired from tone tap of the volume control to the ground.

Zenith 474, 715, 755, 756

If the complaint of a "frying" noise at low volume levels is received and this condition exists after the aerial and ground have been disconnected and the antenna lead of the receiver is grounded to the chassis, replace the type 55 second-detector a.v.c. tube. In some instances, the same tube is the cause of a peculiar, irregular "popping" sound heard in the loud-speaker, which is often attributed to local disturbances or atmospheric conditions.

Where poor control or no control of volume is encountered by slightly distorted reproduction, check the r.f. and first-detector secondary-return by-pass condensers. Since these units are connected in the a.v.c. circuit, leakage will "neutralize" or "balance out" the control-grid bias impressed upon these tubes. The r.f. stage by-pass unit has usually been found at fault.

These receivers are often serviced because of an annoying hum that cannot be traced to the failure of any component part or faulty tubes. If the circuit diagram is studied, it will be noted that a single filter choke is employed in these receivers, which role is enacted by the speaker field. Shunting additional electrolytic condensers across the sections of the dual 6-mf. filter condenser sometimes reduces the hum condition to some extent. In

the majority of instances, however, it has been found necessary to connect an additional external choke and condenser into the filter circuit between the speaker field and the 80 rectifier filament. This circuit change is easily made by removing the black speaker lead from its clip on the speaker terminal strip and connecting one side of the choke to this clip. The black lead is connected to the other end of the choke. If the hum has not been materially reduced by this operation, the filter condenser may be connected into the circuit from the clip on the speaker terminal strip to which one side of the additional choke has been connected and to the chassis.

On Model 755, the oscillator fails to operate below 850 kc. Antenna coil frequently absorbs moisture and should be rewound or replaced, carefully doped with good coil dope to avoid repetition of trouble.

Zenith 475, 760, 765, 767

No Control of Volume. In these models, as mentioned in connection with the Zenith 715, 735, etc., poor control of volume or no control of volume and a certain amount of distortion have been traced to leaky or short-circuited secondary-return by-pass condensers. These condensers are in the a.v.c. circuit, and if leakage or a short circuit occurs, the negative control-grid bias impressed on the r.f. and i.f. tubes will be removed. Intermittent reception, fading, motorboating, and oscillation will also be occasioned by the open-circuiting of either of these units.

The complaint of hum may be eliminated in most instances by the addition of an 8-mf. electrolytic filter condenser connected after the first speaker field (both speaker fields used as chokes) to chassis. If this procedure proves ineffectual, then another filter choke must be provided, as described in connection with Models 715, 755, etc. between the 80 filament and the first speaker field. Further reduction in the hum level may be accomplished by connecting an 8-mf. filter condenser from the filament to chassis.

Zenith 705, 706, 707, 711, 750

The symptoms of an inoperative receiver with the grids of the i.f. 58 tube glowing red can be traced to a shorted primary-secondary i.f. transformer. The shorted condition may be easily rectified by disassembling the unit and clearing the leads of one winding from the other.

Interference from 600-meter code stations on these receivers is particularly strong over the entire tuning range and is attributable to the fact that the intermediate frequency employed is 485 kc., and no r.f. or preselector stage is provided to suppress or reduce this source of interference. One solution to the problem is to employ a wave trap whose circuits are tuned to 485 kc. This wave trap may consist of an ordinary i.f. transformer of the frequency specified. The primary of

the transformer is connected in series with the antenna as close to the receiver as possible, and the secondary winding is "tuned" by means of the usual semifixed condenser shunted across the winding to 485 kc. Another method is to shunt the primary of the i.f. transformer serving as the wave trap across the aerial and ground as closely to the receiver as possible, in series with a fixed condenser. In some cases it may be necessary to readjust the secondary tuning condenser if the code interference is not satisfactorily reduced.

Where the condition of intermittent oscillation and motorboating is encountered with the attendant widening of the shadow of the tuning meter correctly designating the trouble to lie within the r.f. portion of the receiver, check the 0.1-mf. condenser by-passing the i.f. 58 secondary-return circuit. This condenser is one section of a double unit also housing a 0.1-mf. condenser by-passing the grid return of the type 59 power tube. The difficulty attached to this complaint is the fact that the condition may clear up immediately upon the insertion of a set-analyzer plug or when a condenser is used to shunt a suspected unit in an attempt to locate the trouble.

Zenith 750

Motorboating. In this model, we have found that the early models of the 89 tube would be weak on low frequencies. This can usually be cured by reversing the primary of the i.f. transformer, later production having this change made at the factory.

Oscillation. The first trouble evident is that the set breaks into oscillation with a constant "put-put" sound. The remedy is to replace the double 5-mf. condensers across the cathodes of first-detector and intertransformer tubes.

WNY picked up over entire broadcast band. To eliminate, order direct from the Zenith Distributing Co., radio distributors, a wave trap for this particular model. Install this wave trap across aerial and ground, and tune the trap to i.f. frequency.

Zenith 760

Hum after regular values of filter condensers have been installed. May be reduced by by-passing the 0.5 by-pass condenser next to primary of input transformer with 8-mike electrolytic. Distortion. By-pass center tap of volume control to ground with 0.00015 mica unit. This removes the r.f. load on the grid of the first a.f. tube and allows greater a.f. amplification.

Zenith 805 (Chassis 5502)

Insensitive and Inoperative above 900 Kc. Shorted oscillator-plate condenser, 0.01, part 22-276.

Unbalanced. The writer has serviced a number of these machines on complaints that they were apparently unbalanced. After being balanced carefully, according to factory directions, the set would per-

form normally at the higher frequencies but would remain out of balance at the opposite end of the dial.

After the machines were carefully checked several times without locating the trouble, the second i.f. transformer was replaced as a matter of experiment, and the change immediately restored normal operation.

A careful examination was made of the unit both before and after removal from the chassis, without revealing any trace of a defect; nevertheless, the change effected a cure in each case.

Zenith 807

Recently we had a Zenith Model 807 sent to us because of an occasional distortion of sound. Two other servicemen had already worked on this receiver. One had installed a new power transformer; the other had replaced several tubes.

By the process of elimination, we found that a 0.005-mf. condenser connected the band switch to ground by one of the many terminals on the switch. There was an occasional arcing between the plates of the condenser, thereby causing a short, and the make and break of the condenser caused the distortion of sound.

Several receivers have shown this trouble.

Zenith 880

Distortion and A.V.C. Blocking. Shorted 0.0004 condenser in first r.f. coil can.

INDEX

INDEX

INDEX

INDEX

MARCONI

MIDWEST

MISSION BELL

MOTOROLA

(Galvin Mfg. Co., Mfg.)

MUSIC MASTER

NATIONAL PFANSTIEL

OLDSMOBILE

(*See* Buick 980393; United Motors)

PHILCO

(*See also* Chrysler; Ford)

INDEX

UNITED STATES RADIO AND TELEVISION CORPORATION

(*See also* Apex)

WASHINGTON

(*See* United States Radio and Television Corporation)

WELLS-GARDNER

WESTINGHOUSE

ZENITH

INDEX