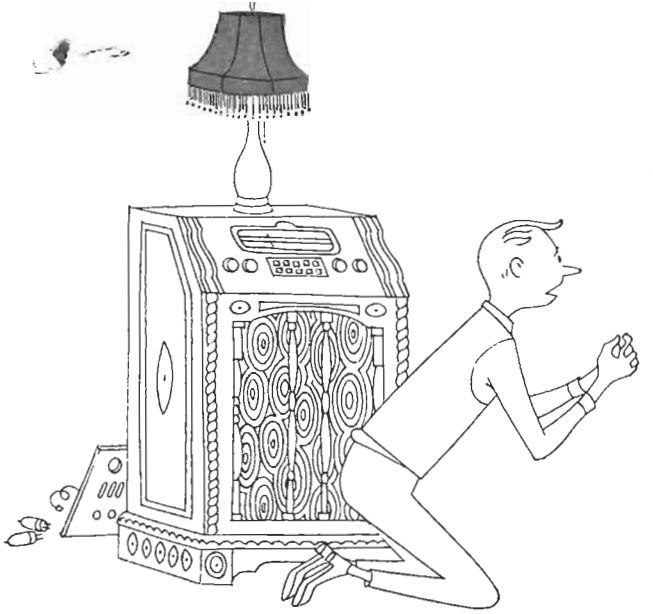
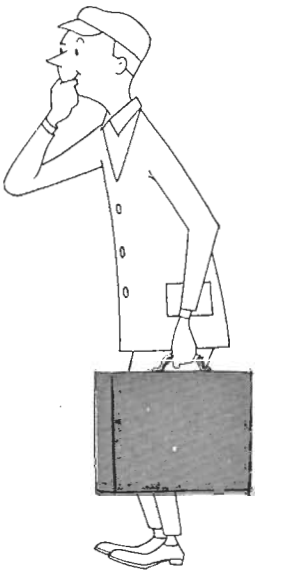


RESTORING OLD RADIOS



Knowing how to get those old Stromberg-Carlsons and other quality receivers back in shape will endear you to many!

By JACK DARR SERVICE EDITOR

ALL OF US GET THIS QUESTION ONCE IN a while: "I've got an old radio at home. Beautiful cabinet, and my wife won't throw it away. It hasn't worked for a long time. Can you fix it?"

Truthfully, a lot of these jobs aren't too profitable, but they're almost always good "prestige" jobs: other men have probably tried to fix them, without results! If you can straighten them out and make them play again, you have made a friend. Of course, don't make any rash promises until you've *seen* the radio!

It will usually be one of the large console types, possibly FM–AM, with a record changer. Here is one possibility: after the radio is repaired, you have a good opportunity to sell him a modern 4-speed changer to replace the original 78-rpm unit.

Little radios usually aren't worth the effort. However, the old RCA's, Stromberg-Carlsons, Capeharts and so on, are very well designed chassis capable of amazingly good reproduction if they're in good shape.

We'll give you a list of all the things which cause trouble in these sets. By checking them out methodically, you can restore the sets to full performance in a very short time, and gain a reputation as an electronic whiz!

First, check all the tubes. As a rough guess, any that are more than 50% "down" will give trouble. However, you'll find that weak tubes have surprisingly little effect on performance in some circuits, because of the very conservative design of first audio amplifiers, some i.f. stages, etc. Some tubes have prohibitively high prices: the Loktal series, for example, and some of the older types. A well stocked junk box can be very helpful indeed! Some tubes may be so old that your distributor will give you a bargain, just to get rid of them! In a few cases, substitution will be possible. Sets using octal-base tubes will be the easiest to restore, since there are so *many* octals around.

Next, check the filters. Age is the worst enemy of electrolytic capacitors; they dry up. Electrolytics are universal, and you'll have no trouble at all in finding suitable single-unit replacements. You may even be able to find duplicates of the original multiple-unit filter capacitors. There will usually be ample room in the chassis to install separate-unit filters (Fig. 1).

Watch out for unusual (to us, that is) filter networks. A lot of these sets used a "floating B-minus" circuit, with a voltage divider in the negative return for bias voltages. This is always filtered, as in Fig. 2. If this capacitor is included in the original filter block, its polarity will be *reversed*. Standard practice: re-

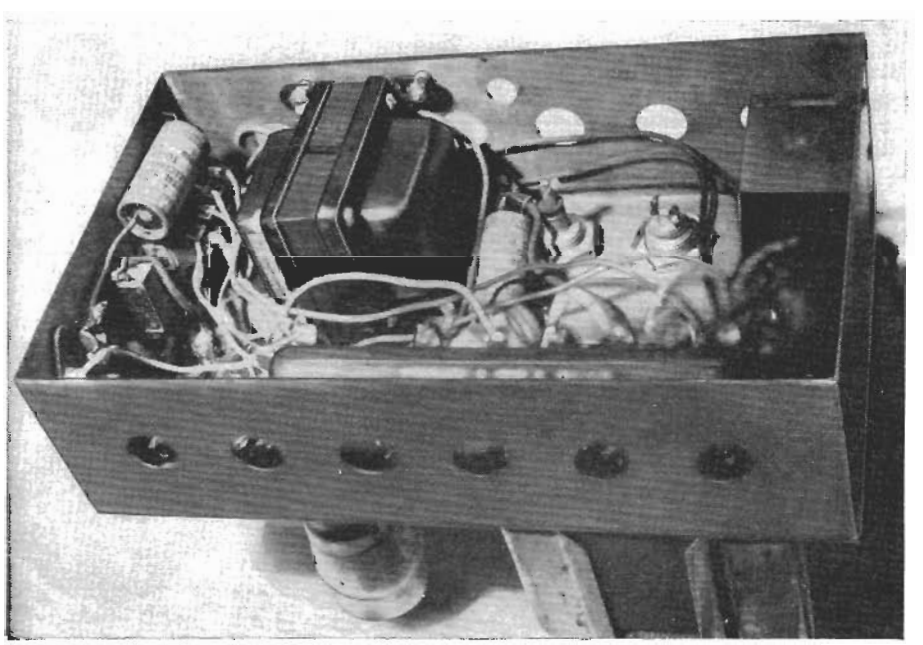


Fig. 1—Original wet electrolytics can be replaced with smaller modern dry units. Leave the old cans on the chassis for appearance's sake.

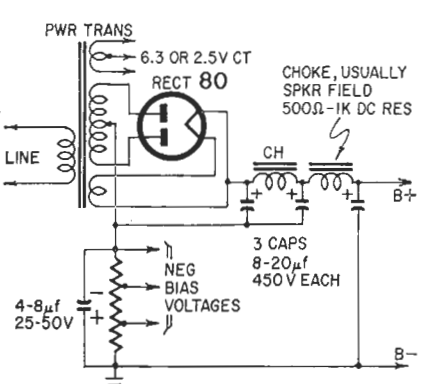


Fig. 2—Typical floating-negative power supply circuit common in older sets. Watch electrolytic polarity!

place main filters with an ordinary multiple unit, and the bias filter with a separate unit. Since these are always low-voltage, you can get a comparatively large capacitor in a small case, and there will be plenty of room for it. Omit this bias filter, and you'll get a "mysterious" hum that bridging the main filters won't affect at all!

Notice in Fig. 2 that the negative connections of the main filter capacitors do *not* go to chassis, but to the center tap of the high-voltage winding on the power transformer! When making your initial checks on the radio, be sure that some technician unfamiliar with the circuit hasn't connected a replacement filter capacitor directly to ground! A quite common occurrence, and I've found that it often causes a severe hum.

After checking out the power supply, check out the resistors in the bias voltage divider. If these open, there will be no B-plus. If they should short to chassis, or be deliberately shorted to chassis by the aforementioned inexperienced technician, the bias voltages will be upset, and you'll probably have a mysterious distortion and hum. You'll need complete service data on all of these sets. Rider's old Radio Manuals, Beitman's Supreme manuals and factory service data are essential. Most of the sets we're talking about were built before Sams started printing Photofacts Folders! You need service data to check the value of the bias voltages.

Check the speaker and output transformer. Older transformers were prone to damage from electrolysis, which ate up the fine wire, causing an open circuit or high-resistance joint. A dc resistance check will catch it. The resistance of each half of push-pull transformers should be within 10% of the other, and speaker field coils should be within 10% of rated resistance.

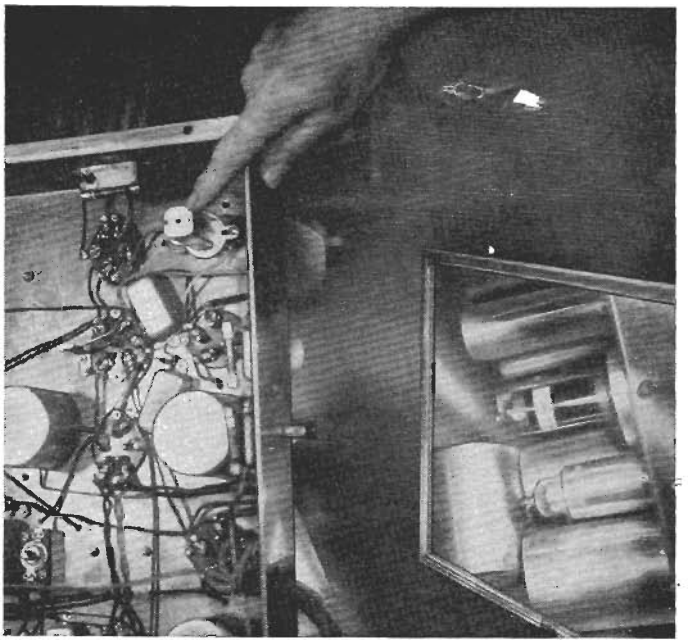
Bad transformers must be replaced. Defective speaker field coils can sometimes be repaired, since the joint which causes most of the trouble is the connection between the fine-wire winding and the flexible lead on the outside of the coil. Carefully lift off the wrapping and look for the end of the lead; it will be sitting on a square of "empire cloth" (a yellow plastic-coated fabric) and will usually have a bright green spot at the end. This indicates corrosion. Clean away all traces of green, resolder the joint and check for correct dc resistance. If OK, spray clear plastic or coil dope on the winding, and replace the outer covering.

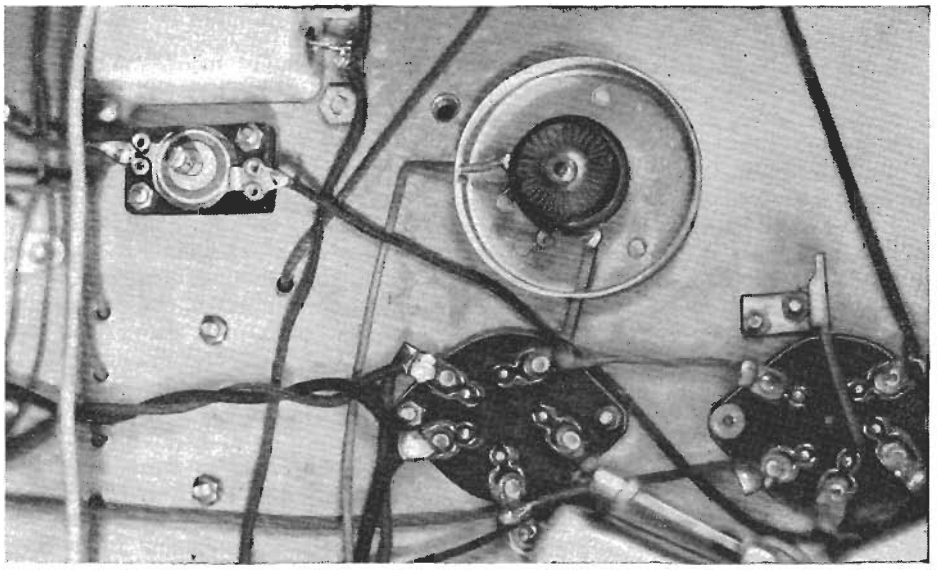
Check audio voltage-amplifier stages (there were often two or three), i.f. stages, mixer and oscillator for correct voltages. You will probably find dropping resistors changed in value, lowering the operating voltages. Check the screen-grid voltages especially, since

(Right) Original i.f. transformer can be replaced with modern small one. Mounting it below deck shortens leads, though top mounting would probably have done as well.

Mirror at right shows original transformer and shield can (removed) on top of chassis.

Underchassis view (below) of old radio. Round dish-like object is coil shield base. This one contains an rf choke. Wires corroded at point where they join terminals can often be repaired. Be sure to replace shields.





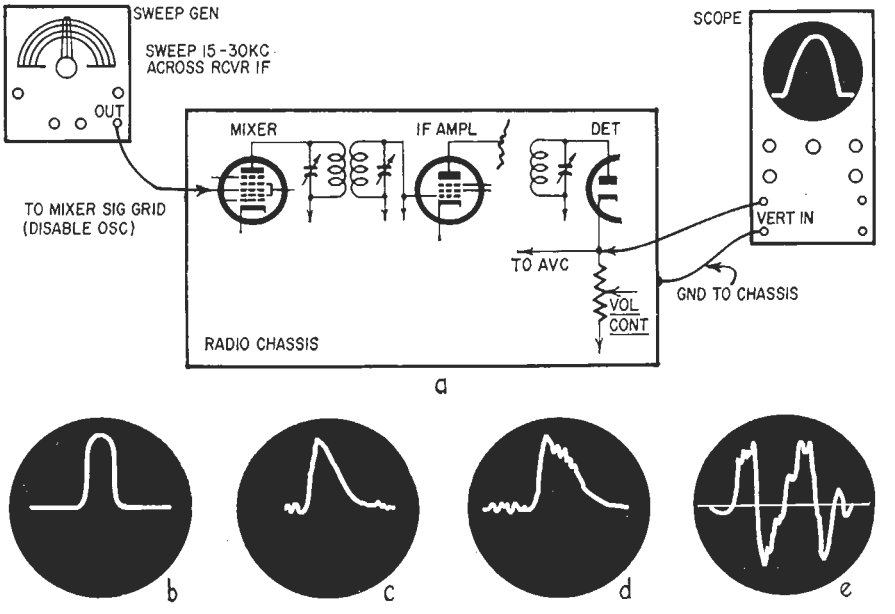


Fig. 3-a—Hookup for checking alignment and stability of i.f. stages. In b, an approximately normal response curve; c—incipient oscillation (note "triangular" shape); d—actual oscillation, squeals in audio; e—severe oscillation, probably enough to block receiver completely.

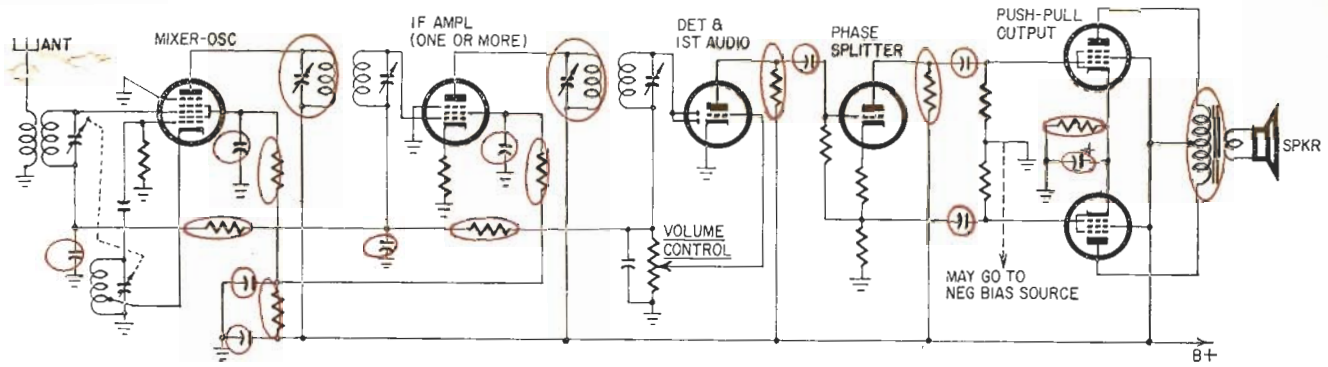


Fig. 4—Things to check, systematically, from speaker to antenna. This schematic is only a skeleton, showing basic parts.

low screen voltage will affect the gain of the stage a lot. You'll often find tetrodes or pentodes in first audio amplifier stages—watch out for low screen voltages here. Common practice was to use a 2.2-megohm or even larger resistor as a screen dropper, and a drift in this resistor can cause loss of screen voltage and a severe loss of gain, plus distortion.

Check mixer and oscillator supply voltages. Trouble with the signal-to-noise ratio can come from low oscillator injection voltage. Loss of sensitivity or selectivity or both can be due to low plate or screen voltages on rf or i.f. stages.

Watch out for leakage in coupling capacitors. Quick test: disconnect the grid end of the capacitor, or pull the tube, since these are all parallel-heater sets. Measure the dc voltage on the open end of the capacitor. If you find a steady positive voltage, replace the capacitor. Bypass capacitors in plate and screen supply circuits can leak and cause voltage loss there.

You may find i.f. transformers and oscillator coils open, too, from electrolytic corrosion. I.f. transformers can be replaced by the newer small ones. Watch out for too much gain in the transformer. If you run into oscillation, you may have to reduce the gain of the stage by reducing plate voltage, increasing bias, etc. Best check: hook up sweep generator and scope to make an i.f. response curve (Fig. 3). Look for traces of oscillation on the curve. If it's there, you'll be able to see it without any trouble at all. Fig. 4 is the basic circuit of a superhet with parts to be checked.

Novelty: I replaced an i.f. transformer in a very old chrome-plated-chassis job. To retain the appearance of the chassis, I put the original i.f. can (empty, of course) back over the new miniature transformer!

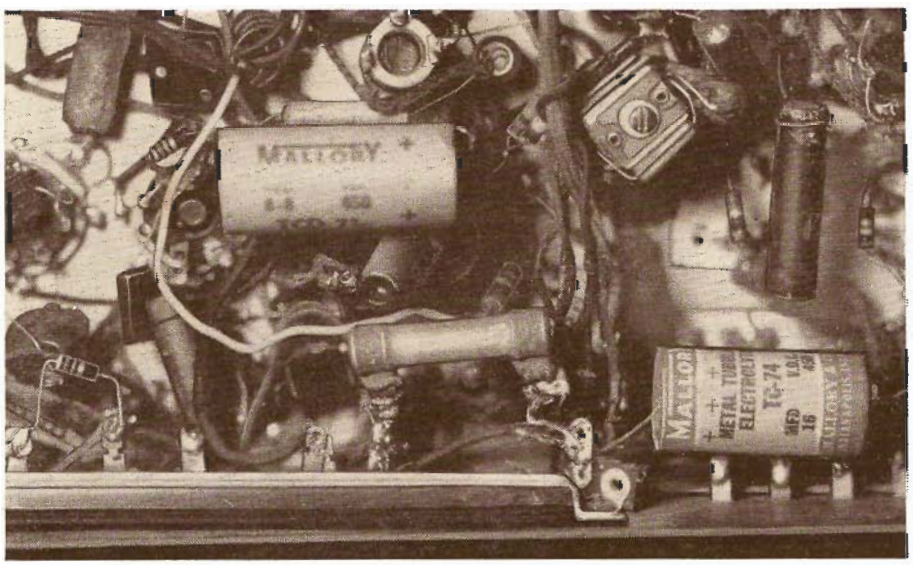
Band switches, volume controls, pushbutton tuners and any kind of control will probably be very dirty and noisy. A liberal application of spray cleaner will usually fix them up. Volume controls can be replaced by standard units, and band switches can be cleaned and the contacts tightened up by a careful working over with the slotted tip of a soldering aid, if they're worn too badly.

Hint: if the band switch is worn very badly, on a multiband set (one having several short-wave bands, as many of these did), the owner will probably allow you to cut out the short-wave parts, leaving only the broadcast band. Simply solder the band switch contacts together! Because of the complexity and time needed, I wouldn't recommend trying to *replace* a band switch, except in very unusual cases, and with the owner's knowledge that it's going to cost him *plenty!*

Wiring can be one of the worst problems. Rubber-covered wire deteriorates badly with age. So, don't *move any* of the wiring unless it is absolutely necessary. Cables that must be moved, speaker wiring, etc., should be replaced with new flexible wire. However, as long as the original wiring is left in place, it is usually safe enough. Sometimes you can lift one end of a wire, slip a piece of soft spaghetti over it and tack it back in place. This is a good way to cope with mouse damage. Mickey *loves* insulation!

This must be a "method" job: start at the power supply and work your way back toward the antenna, checking out every part as you go. It sounds like a two-week job, but it isn't. After a little practice, you'll be surprised how rapidly you can make a complete overhaul on one of these old crocks. I checked the time on my last one and it took just over 2 hours of actual bench time. I replaced four filter capacitors, seven resistors and 6 capacitors.

The final step should be a thorough cleanup of the chassis. Blow out the dust and wipe off wax, grease and less sanitary accumulations, and, most of all, clean up the dial glass until it shines! Also, be very sure that the dial cable, if any, is in good shape, not slipping. Clean up the cabinet, if it is not already clean (as many are), and you've got yourself a restoration all completed. END



Here's a set that's been worked on many times by many people, and shows its scars. Good idea to tie down large lead-mounting electrolytics. Flat "Candohm" divider resistor (bottom of photo) can be replaced in parts with 5-watt or bigger single resistors, if necessary.

...ngs, CA

ANTIQUE RADIOS

I enjoyed reading Mr. Richard Fitch's recent article about restoring antique radios (**Radio-Electronics,** March 1983). Having repaired many pre-war radios, and some early TV sets, I know the feeling of accomplishment that results from getting one of those treasures playing again.

I'd like to offer a hint that might make troubleshooting an old chassis a bit easier.

When smaller tube-radios became available (and later, when television appeared on the scene), many an old model was retired while still in good working order. But alas, 40 years later, when the old unit is dusted off and plugged in, all that issues from the speaker is a thin, garbled audio strongly overriden by a loud AC hum.

Here's the problem in almost every case that I've come across: The electrolytic capacitor in the power-supply circuit has dried out. Unlike the paper/foil and mica capacitors in the set, the electrolytics *do not* have an unlimited shelf life. The liquid electrolytic can evaporate away, leaving the caps virtually ineffective.

Two things result: First, the filtering of the pulsating DC from the vacuum-tube rectifier becomes very poor. All that's left to provide a modicum of filtering is the field coil on the electrodynamic speaker (which does double-duty as a choke in most of the old circuits). That isn't enough to prevent a loud hum in the speaker. Second, there's usually an electrolytic capacitor used to bypass the cathode resistor in the audio-output stage. When that goes, the AC gain of the stage is reduced to a fraction of its former level.

Solution? Replace *all* the old electrolytics. The values are almost always marked clearly, and modern equivalents are readily available. Some early electrolytics are rectangular in shape, like a matchbox covered with wax; others are enclosed in metal cans attached to the chassis, so keep that in mind when hunting for them in your old set. When replacing, just be sure to use capacitors of equal or higher voltage, and watch out for polarity. The exact capacitance value is usually not critical, and deviations of 25 or even 50 percent will often work satisfactorily.

So if you have an old set with those symptoms, try my suggestions first; they may save you a lot of time and trouble.

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