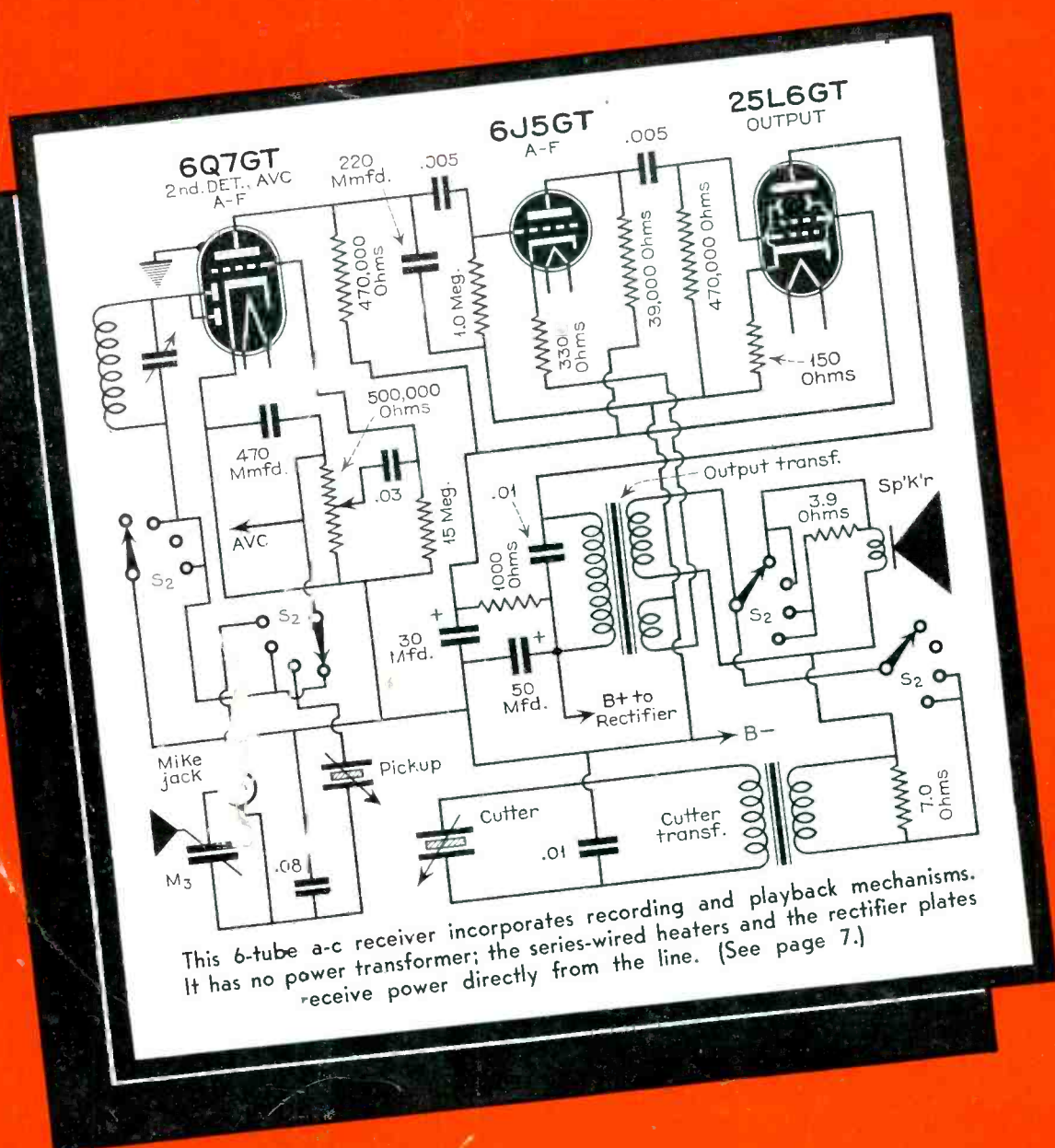


# SERVICE

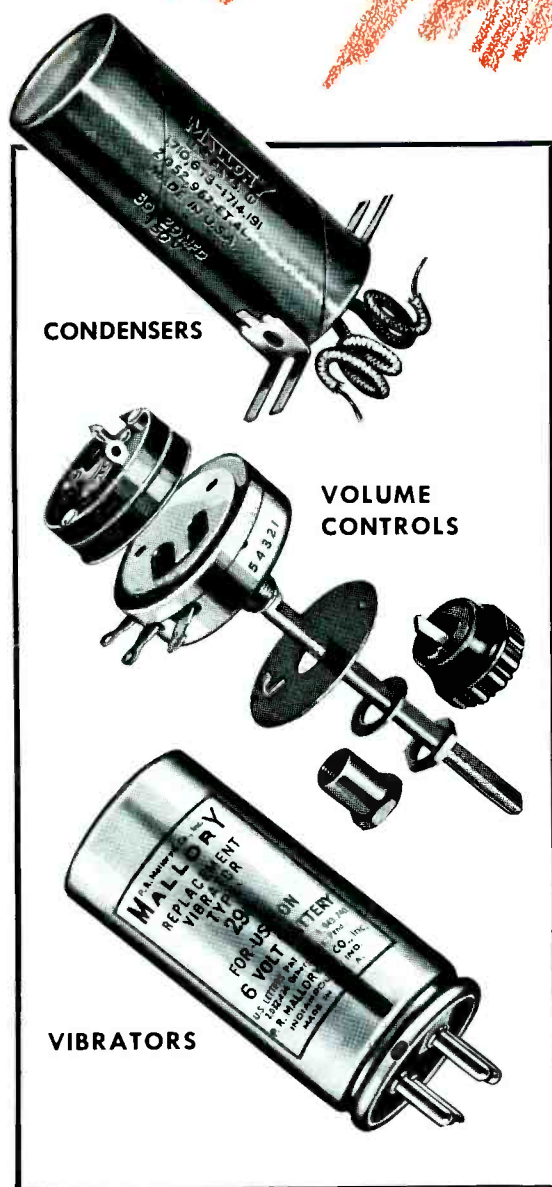


This 6-tube a-c receiver incorporates recording and playback mechanisms. It has no power transformer; the series-wired heaters and the rectifier plates receive power directly from the line. (See page 7.)

JANUARY  
1941

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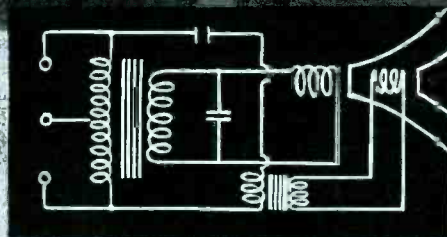
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**W**HAT an opportunity reallocation offers as an entree in a community-wide house-to-house campaign for new service customers! And, this in addition to the actual service calls that should come from the owners of the eight and a half million, or more, push-button operated receivers.

Between now and March 29, when 777 of the 862 broadcast stations will shift frequencies, newspapers and the stations themselves will continually mention the fact that frequencies are to be altered. Where will the ardent listener find her favorite program after the shift? You can bet your boots that she will have the welcome sign polished up for your arrival if you bring a new station log to her door!

Once inside need we remind you to take a look at the radio set, test the tubes and offer some constructive recommendations? Practically every home should yield some profitable and even much needed service work. For example, it is estimated that over 70 percent of the antennas now in use are inadequate or improperly installed. In any one of these cases a new one would improve reception and cut down noise interference. There are countless other defects which the set owner often disregards to save herself the trouble of calling a Service Man . . . Loose dials, broken grid clips, weak tubes, noisy controls, poor selectivity, speaker rattles, to mention but a few.

Don't sit around and wait for customers to call you up to adjust their receiver. Go right out, armed with the new station log and a good spiel and you will find the diggin's good.

Never before has such a chance been created for the Service Man. Don't let it slip by!

**T**HERE really is something new under the sun! You might have guessed that John F. Rider would be the creator.

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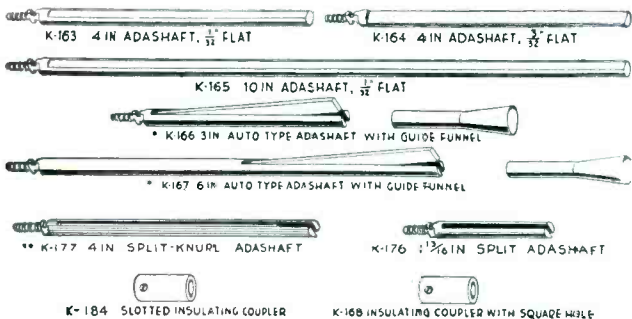
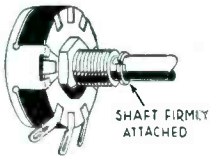
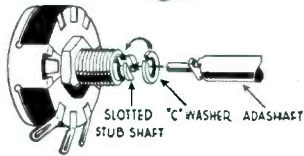
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250,000	ohms	6
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1 MEG	ohms	6
2 MEG	ohms	6
3 MEG	ohms	6
250,000	ohms	tapped
500,000	ohms	tapped
1 MEG	ohms	tapped
2 MEG	ohms	tapped

SHAFTS

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2	K164
1	K165
1	K166
1	K167
1	K176
3	K177

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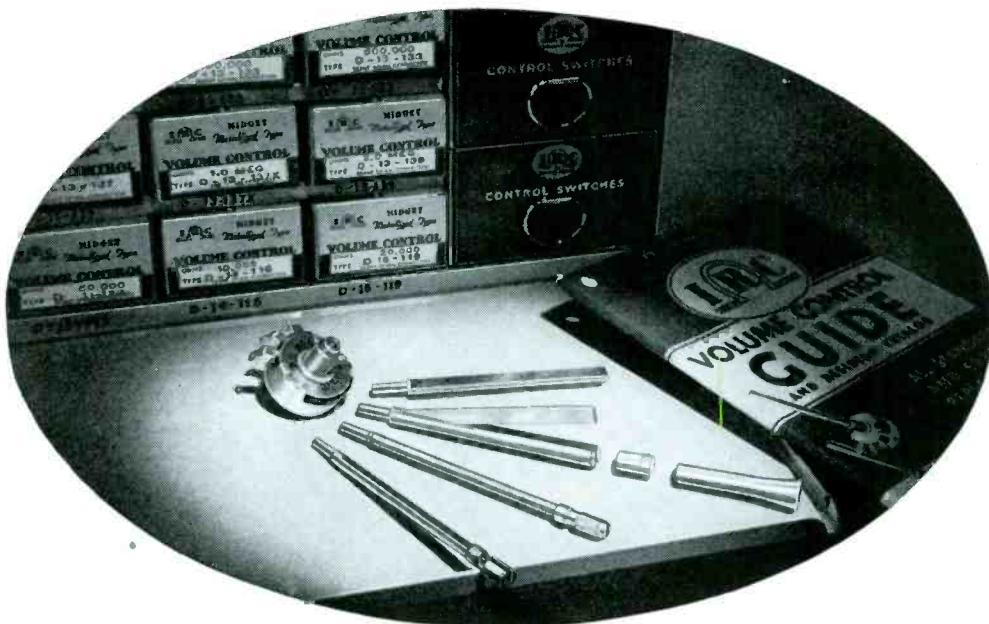
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# Centralab





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# TYPE D UNIVERSAL VOLUME CONTROLS

## WITH TAP-IN SHAFTS

# KILLING THE HUM-BUG

**T**HIS is not intended to be a complete thesis on hum but we do hope to point out many sources of hum and show what can be done about them as far as concerns your daily service work.

The causes of hum may be classified into three groups:

- (1) Hum introduced as ripple in the d-c plate and screen supply.
- (2) Hum introduced by using a-c on the filaments and heaters.
- (3) Hum due to induction, either magnetic or electrostatic.

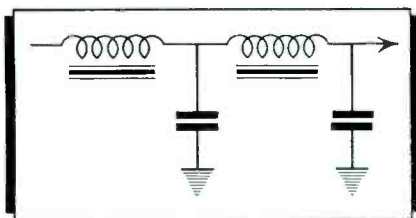
These divisions are not absolute; some sources of hum belong to two groups. The classification will, however, serve to clarify our story, and we will take them up in order.

## B Supply

In the early days of B eliminators, a number of paper condensers were used . . . and a number of chokes. A two-section pi-type filter, consisting of two series chokes (or a dual choke) and three shunt condensers, was generally standard and filters were built more or less according to true low-pass design. The first condenser of the filter network was usually a 1- or 2-mfd, three-paper job. Because of the design of the network, this small value did wonders in the reduction of hum, and frequencies above about 50 cycles were fairly well attenuated.

With the appearance of electrolytics, however, the formulae were tossed to the winds and a policy of brute force

Fig. 2. Choke input is used where good power supply regulation is essential for high quality.



By **MARK GLASER**

CHIEF ENGINEER  
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and

**EDWARD M. GLASER**

RESEARCH ENGINEER  
KOLLSMAN INSTRUMENT CO., INC.

adopted. This called for plenty of capacity and as much choke as could be afforded. Then came the business of cutting out chokes and using the speaker field coil as a choke. When the field replaced the first choke, there

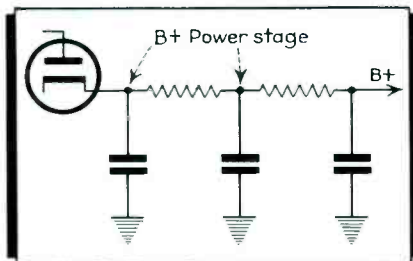


Fig. 3. A typical present day midget receiver employs a one or two section resistance-capacity filter.

was too much hum; when it replaced the second, there was too much voltage drop on the power stage. But that was when 8-mfd electrolytics constituted a large condenser and hum bucking had not appeared.

Practically speaking, there is always some ripple in the plate supply but the amount present is purely an economic consideration. Theoretically (at least) the ripple may be reduced to any desired degree.

## Tuned Filters

At one time, about ten years ago, tuned filters were much in vogue. These were tuned to a frequency of 120 cycles for a full-wave, 60-cycle rectifier and

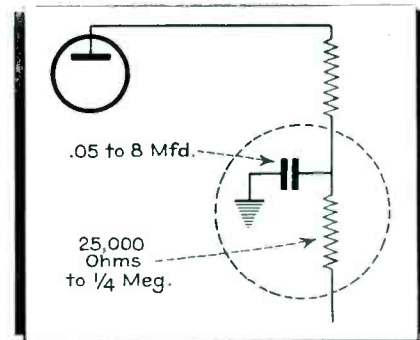


Fig. 4. Resistance-capacity filters are often used on individual stages to prevent coupling by a common impedance in the power supply.

for a given load, did a fine job. Fig. 1 shows two types of resonant filters having low-pass action as well. Where Class B or Class AB operation is used in the power stage, a power supply with good regulation is essential for high quality. This calls for a choke input filter with a minimum of resistance in the transformer and chokes. (See Fig. 2.) The input choke has a considerable amount of a-c flux in its core compared to a choke following a condenser. The a-c field set up may influence magnetically sensitive circuit elements thereby inducing hum while the a-c in the winding puts large stresses in the insulation.

## Resistance Filters

Because the market demanded smaller, cheaper and lighter sets, filter chokes were gradually replaced by resistors, in combination with some very clever stunts for minimizing or neutralizing hum. The condenser manufacturers helped this change considerably by introducing very high capacity electrolytics. A typical present-day midget set has a filter about like that in Fig. 3. More sections are often used to isolate an r-f, i-f or audio stage from other stages and, in this case, they are sometimes called decoupling filters as they prevent coupling by a common impedance (usually the last filter condenser)

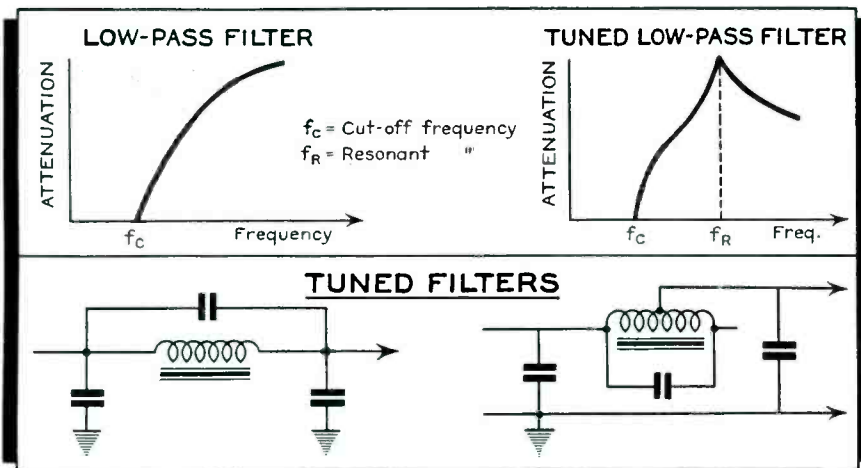


Fig. 1. Before the advent of electrolytic condensers, tuned filters were used extensively. The curve at the right (above) shows the attenuation provided.

in the plate supply. In high gain amplifiers of any type this is a necessity to prevent undesirable feedback. Values for the series resistor usually lie between 25,000 and 250,000 ohms while the shunt condensers range from 0.05 to 8 mfd. (See Fig. 4.)

#### Hum Bucking

Hum bucking consists of introducing at some point in the audio amplifier a voltage in magnitude and of opposite phase to every hum frequency present. These frequencies are usually 60 cycles and many harmonics. In most cases some trick giving partial hum bucking is used for reasons of economy. The most universal stunt is to use a hum-bucking coil wound around the field coil of the speaker and connected in series with the voice coil. (Note Fig. 5.) Another scheme uses a copper slug, or shading ring around the field coil, this being particularly effective against a-f ripple generated in the battery circuit of auto sets. (See Fig. 6.) A-c, d-c sets, using a half-wave rectifier which generates a 60-cycle ripple, have a greater hum problem. In small receivers the speaker doesn't reproduce bass notes so not much fundamental hum gets through. P-m speakers have the one disadvantage that a number of these hum reducing ideas cannot be used.

#### Hum Neutralization

Fig. 7 shows a method of hum neutralizing using a tapped choke or step-up autotransformer with a small trimmer condenser coupling the anti-hum voltage into the first a-f grid circuit. Fig. 8 shows a newer stunt that is particularly effective, delivering anti-hum voltage to the power tube cathode. Being extremely simple, Service Men should be able to apply it where costs must be kept down.

Degeneration offers a means of reduc-

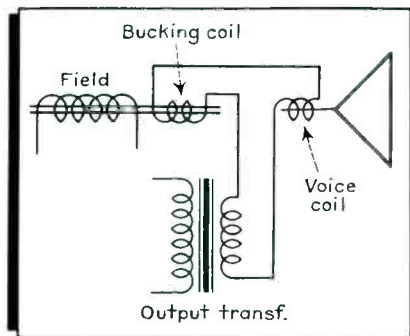


Fig. 5. (Above). A hum-bucking coil wound around the speaker field coil is a popular method used to neutralize hum voltages.

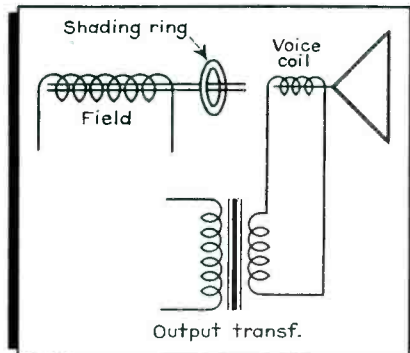


Fig. 6. A copper shading ring around the field coil of auto-set speakers is sometimes used to reduce a-f ripple.

ing hum from all sources as well as improving quality but substantial gain must be sacrificed to do a good job. This usually calls for an additional a-f stage. Degeneration circuits are shown almost every month in SERVICE so we

won't duplicate these here.

The hum output from a given filter is proportional to the load current or, conversely, larger filter components are required for a given amount of hum voltage as the load increases because more stored energy is demanded. This energy comes from the charge in the condensers and the magnetic field of the chokes, if any. A push-pull output stage can take a great deal more ripple than a single-ended stage because the hum is neutralized by the bucking action in the primary of the output transformer.

#### Filaments and Heaters

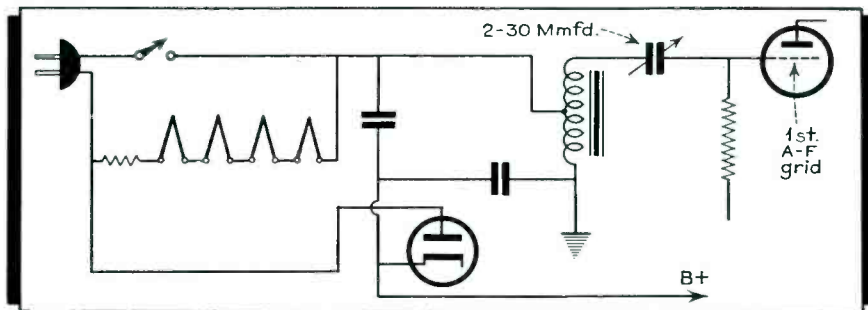
In filament type tubes the grid and plate returns must be brought to the electrical center of the filament by means of a center-tap on the filament transformer or a potentiometer. Early a-c sets all had adjustable potentiometers and these were often quite critical. Since substantial hum results from a-c on a filament type tube, only power tubes where the ratio of signal voltage to hum voltage is very large are of this type. In heater types, both the magnetic and electrostatic fields of the heater influence the plate current. In the manufacture of heater type tubes the heater is kept well below the cathode to give sufficient shielding to lick the static effect. The use of very narrow loops or a double spiral, wound non-inductive for the heater element, minimizes the external magnetic field.

Certain oscillator tubes when operating on short-wave bands tend to introduce hum on the carrier, modulating the signal with 60 cycles. This effect is proportional to frequency and is particularly noticeable when the cathode operates above ground, as in electron-coupled oscillators in communication receivers or cathode feedback circuits common in many new receivers. One cure is to by-pass both heater leads to ground. Another is to replace the tube!

One method of reducing heater hum in microphone preamplifiers is to run

(Continued on page 29)

Fig. 7. Hum neutralization may be accomplished through the introduction of anti-hum voltages, by means of an autotransformer and trimmer condenser, at the first a-f grid.





# CIRCUITS

See Front Cover

By HENRY HOWARD

Fig. 1. A trend toward the use of dual vertical dials, as shown in the Philco 41-788T to the right, is evidenced in the 1941 models. On all-wave sets the extra dial is used for band spread tuning; on f-m combinations one dial is used for a-m and the other for f-m.



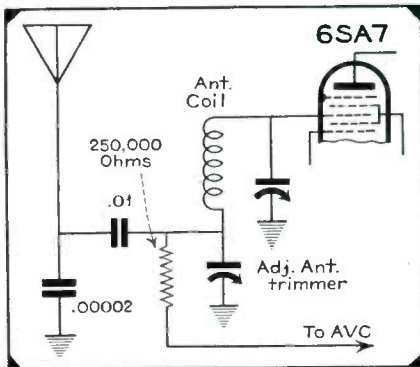
A NEW trend in dials is appearing, due probably to the growing popularity of band spread of the short-wave bands. Short wave performance alone has been selling many sets lately so it is natural that the manufacturers cater to these consumers. Band spreading adds so many new tuning ranges that it is expedient to use a double dial, one part being for band spread ranges alone. The Philco 41-788T is an 11-tube superheterodyne with eight tuning bands. Two vertical dials are used. (See Fig. 1.) The left group of three contain the broadcast and two short-wave bands in the usual manner. The five short-wave spread bands operate separately on the right side. The spreading ratio is 20 to 1.

Freed-Eiseman uses a similar double-dial arrangement (as do several other manufacturers) on their f-m, a-m receiver combinations. One dial is used for f-m and the other for a-m with separate tuning elements for each mode of operation, the band switch selects the one desired.

## G. E. J629

The G. E. Model J629 is a six tube a-c receiver incorporating a combination phonograph and recorder. No

Fig. 3. Capacity antenna coupling is used in the Belmont 579 auto-radio set.



power transformer is used; the set is wired like an a-c, d-c job, except for the phonograph motor. (See front cover.) The audio end consists of a 6Q7GT feeding a 6J5GT second stage which feeds the 25L6GT beam-power

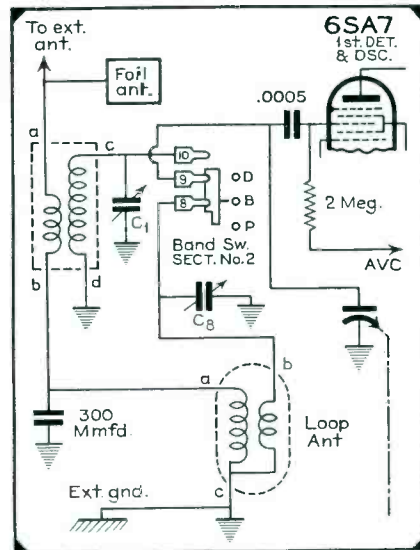


Fig. 2. Ward's Airline Model 04WG614 shorts the loop with a 300-mfd condenser for short-wave operation. An antenna coil with a foil antenna is used instead.

output stage. All four inputs (radio, phonograph, radio recording and microphone recording) are fed to the 6Q7GT grid by means of the audio switch. The full amplifying facilities are really only needed, however, in the case of microphone recording where the 6Q7GT functions as the usual pre-amplifier. The second stage is unusual in that cathode degeneration is furnished from a special winding on the output transformer. In both recording positions the speaker is muted and the voice-coil winding of the output transformer is connected to a second matching transformer which steps up the voice-coil voltage to drive the crystal cutter. A load resistor is shunted across the primary of this step-

up transformer for matching or equalizing.

## Airline 04WG614

Wards Airline Model 04WG614 is a 6-tube, 2-band, a-c set with record player and loop for broadcast reception. For short-wave reception the loop is inoperative because it is shunted with a 300-mmfld by-pass condenser. Instead, an antenna coil is switched in for use with a foil antenna plus an optional external antenna. With the band switch in phono position, the 6SA7 modulator grid is left disconnected from the input circuits to prevent signals leaking through. (See Fig. 2.)

## Silvertone 5771

Sear's Silvertone 5771 is a 7-tube a-c phonograph combination using 12- and 35-volt tubes running from a 35-volt filament winding on the power transformer. Although this set covers one band only, a loop loading coil of high Q is used. This causes some loss in input voltage but, because of the high Q, this isn't serious. The advantages gained are greater selectivity and greater frequency range for a given size tuning condenser.

## Auto Sets

Belmont Model 579 auto set shown in Fig. 3 has a novel antenna coupling system using capacity coupling. The antenna voltage appears across an adjustable antenna trimmer condenser, C<sub>3</sub> connected to the low side of the antenna or grid coil. Philco's Ford-Mercury Model F1840 has a roto-selector set up for five stations having permeability tuned antenna and oscillator circuits.

## Truetone D1090

Truetone Model D1090 6-tube auto receiver besides having an unusual tube lineup (6SK7, r-f; 6SA7, oscillator-





operation. A 9-volt A battery is required. With series operation using such low drain tubes it is always hard to properly proportion the filament voltage because of plate currents flowing in different amounts depending upon the position from ground which a tube occupies. The only real solution is to arrange shunts to even up matters after all filament returns have been placed in the best manner. Such shunts have been used in this receiver. An economizer is also provided which cuts the A voltage when the battery is new. (See Fig. 8.)

Sears Roebuck has two power units available for operating 6-volt battery sets with vibrator and 2- to 3-volt battery sets with B supply. The units operate from 50-60 cycle line. On account of different basic designs in vibrator sets, Sears has had to provide two separate 6-volt supplies, one well filtered for the tube heaters and the other with less filtering, for the vibrator only. Of course, a ripple in the vibrator supply doesn't do any harm. This supply is called a "Powr Shifter" and bears the Silvertone Model 4709. The other model, 4708, has a power transformer with a 25Z6GT rectifier and a voltage divider with four taps. Both models use full-wave copper sulfide rectifiers for the low voltages. The 3-volt supply is well filtered with two pi sections and is provided with a rheostat with slotted shaft for adjustment. Maximum drain is 670 ma. The high tap on the B supply is 135 volts at 28 ma max. An interesting feature of sulfide rectifiers is the fact that they become inactive if not used for long periods of time (4 months or more). They may be restored to normal operation by simply shorting their output for a few minutes. This apparently does no harm, the units be-

Fig. 5(b). Stromberg Carlson 520 connects the wave trap between modulator grid and ground.

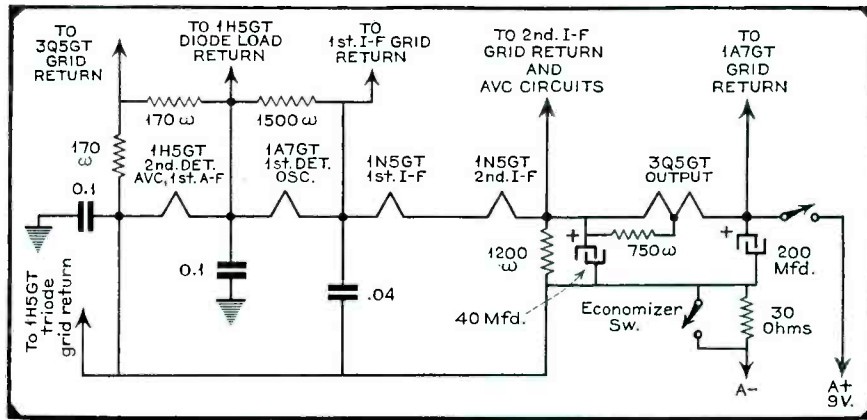
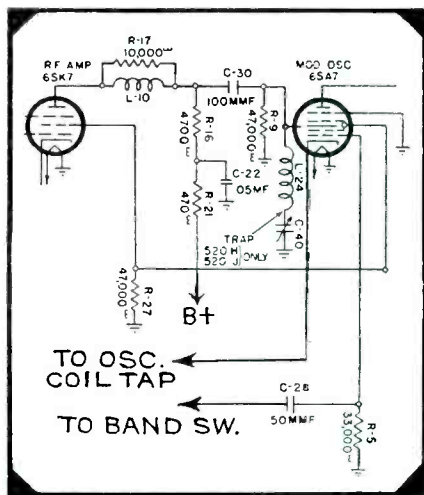


Fig. 8. Wiring filaments in series requires shunt resistors to take care of the plate currents which return through these paths.

having as good as new with no shortening of their life.

**LINCOLN ZEPHYR PHILCO L1760, L1761**

*Ignition interference:* (Also see Ford and Mercury Philco Model F1740.) If motor interference is experienced when using the rear deck lid aerial on Lincoln Zephyr radio installations, it can be greatly reduced by grounding the aerial lead further up the A pillar. This can be done as follows:

1) Remove the left hand sun visor from the car and fish the aerial lead out through the hole behind the visor mounting. Re-

by dressing the A lead straight out from the radio and parallel to the instrument board, so that the short end of the lead from the fuse block with the fuse housing in it, is at right angles to the dash.

5) On some cars where a hot air heater is used, it has been found helpful to remove and shield the low voltage wire or switch wires from the high tension manifolds.

Due to the characteristics of some cars, it may not be possible to reduce the motor interference to a minimum, using the rear deck lid aerial, and therefore it may be necessary to install a Lincoln Zephyr cowl aerial.

In some particular stubborn cases of motor interference it may be necessary to use spark plug resistors.

On the Lincoln Zephyr convertible, it may be necessary to ground the shield on the aerial lead, in the back of the car. The ground connection should be made on the floor, just in back of the front seat.

**RCA K62, K82, T56, T65**

*Service notes:* For schematic diagrams and alignment data, refer to service notes for corresponding previous models, as follows:

Model T56 (RC418), refer to Model T55.

Model K62 (RC415B), refer to loop-type K60.

Model T65 (RC416), refer to Model T64.

Model K82 (RC415C), refer to loop-type K80.

**WELLS GARDNER 1A29**

*Distortion:* Reference is made to a distortion in this model which manifests itself as a rasping sound and is heard on a signal of moderate volume. This may be an overload condition caused by a signal of high modulation.

It can be corrected by changing the signal diode-load resistor (R19) from 250,000 ohms.

**WELLS GARDNER 6A43-1, 6A43-3, 619, 621, 621NI, 04WG614**

*Hum due to reversed speaker plug connections:* In a few cases in the first shipments of this model, some of the speakers had reversed green lead and brown lead connections at the speaker plug. If hum is encountered, check these connections.

The brown lead should be connected to the plate and the green lead to the B plus.

J. K. Rose, Service Manager  
WELLS-GARDNER & COMPANY

move the cotton braid from the shielding and solder a short pigtail to the shielding. Pull the aerial lead as far back as it will go. This can be done by pulling the lead tight where it emerges from the body in the trunk compartment. Ground the pigtail under the visor mounting screw.

2) In some cases when the lead is grounded in this manner, it is advisable to remove both condensers from the distributor. Fasten one of these condensers under the same screw that holds the A lead condenser on the relay. Connect the lead to the center terminal of the coil resistor. Remove the A lead from the left terminal of the cut-out and connect it to the right terminal. The condenser lead remains in the same position.

3) It is usually advantageous to ground the muffler tail pipe to the frame of the car at a point back of the gas tank.

4) Interference can often be eliminated

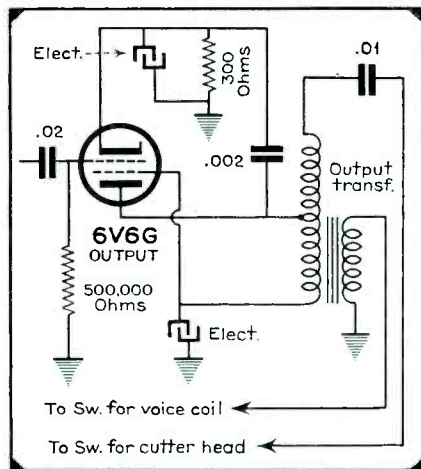


Fig. 6. The primary winding is extended to match the recorder in the Silvertone Models 5731 and 5761.

# SOUND IDEAS

By S. GORDON TAYLOR

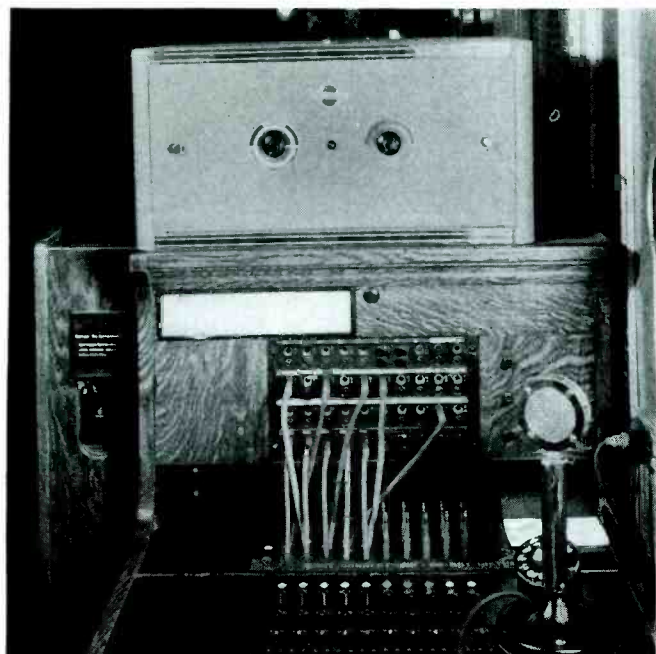


Fig. 1. Although this industrial installation seems quite ordinary, Soundman Sanford Miller of Brooklyn, N. Y., converted it to the "Specialty" class and made a handsome additional profit.

**A**LITTLE imagination can often go a long way in business and perhaps nowhere is this more true than in the p-a installation field. It is one thing to sell a conventional sound installation—but quite another to tincture the sale with the kind of imagination that converts it from the conventional to the "specialty" class—at a proportionately higher price.

## Industrial Sound

An excellent example of this sort of thinking is found in an installation made by sound specialist Sanford Miller of Brooklyn, N. Y., in the plant of the Acme Quilting Company of that same borough.

The requirement was for a paging system which would enable executives to be quickly located when away from their desks. In a plant the size of this one, and with the high noise level existing in many parts of it, such a system represents a sale of welcome proportions—even without imagination. It involves a large number of speakers and an amplifier of proportionate power.

But Miller's thoughts went beyond this. As a result he wound up with an installation that served as a call system, a factory whistle and a gong system, all in one. Moreover it was automatic to the extent that it turned itself on in the morning, off at night, and idled along with only filament voltage applied except when in actual service. This meant the addition of considerable extra equipment over and above that which would have been required for a conventional paging system. But this extra expense was fully justified in the eyes of the plant owner by the wider utility of the system, and by the savings in power as well as wear and tear

on the equipment which the automatic features provided.

In designing the system Miller had the collaboration of the Clarion engineers and was able to profit from their more extensive experience with automatic controls and other equipment and layout features. (And it might be added here that sound men in general could profit by taking fuller advantage of the engineering cooperation offered by the manufacturers of sound equipment.)

The system makes use of ten speakers; a Clarion Model A77K fifty-watt

to provide most efficient sound distribution. In the larger open areas chandelier type baffles were used to project sound in a flat, circular pattern, providing wide direct coverage at high level with minimum reflection from ceilings and walls. In other locations centrally placed 12-in dynamics, with 2-way flare baffles, provide forward and backward coverage appropriate for long narrow areas. In the relatively quiet and smaller shipping and receiving rooms 8-in dynamics in standard wall baffles were ample.

All speakers operate from a single 200-ohm line but instead of resorting to complicated and oftentimes wasteful pads to regulate the volume level in the different locations this is accomplished through the simple expedient of unbalanced loading. Because the group as a whole provides the proper 200-ohm load, this unbalance has no undesirable effect on the proper functioning of the amplifier but it does permit the delivery of different power values to the

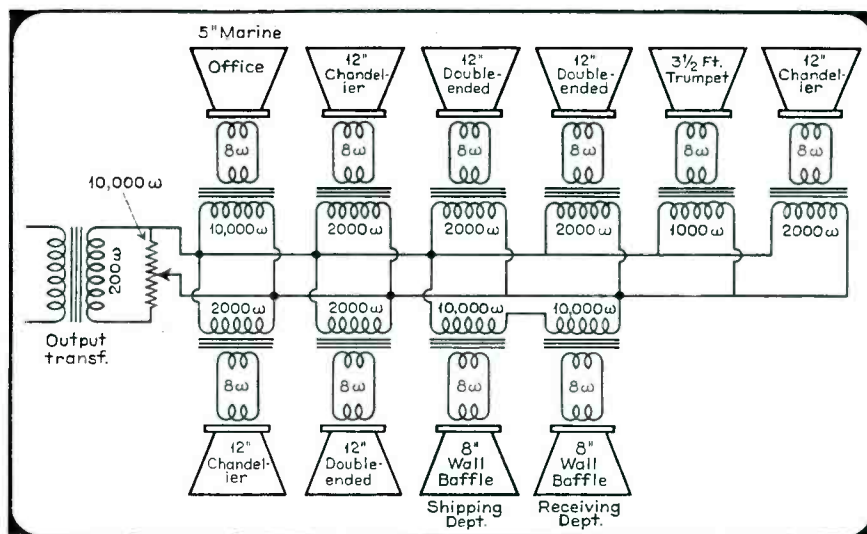


Fig. 2. Unbalanced impedances are used to obtain the desired volume level at each speaker. Since the overall impedance properly matches that of the line no distortion is introduced.

booster amplifier, with special dual-audio tone generator built in; an automatic control clock and relay system; and a high-level microphone with push-to-talk stand. (See Fig. 1.)

The wide variety of conditions encountered in different parts of the plant made the use of several different types of speaker mountings desirable in order

different speakers. The details of the speaker circuit are shown in Fig. 2.

Although the A77K amplifier is one of the booster type and is normally pre-



ceded by a preamplifier, such is not necessary in this instance. The microphone employed (American D6 crystal) has an output of -38 db and is therefore capable of working directly into the amplifier input. The audio oscillator output is likewise sufficiently high to do this.

The audio oscillator built into this amplifier is capable of supplying either of two tones. One of these, fed through the amplifier-speaker system serves the same purpose as the old-time factory whistle—a signal for starting and quitting work. The other serves as a preliminary warning and is sounded 5 minutes before the other. This second one is also used as the signal for fire drills, as a fire alarm and for any other emergency that may arise. For this latter purpose a code, known to all executives, is employed.

The automatic features of the system are sufficiently unusual to be of interest. An automatic time clock operates two relays. One of these trips on at 7.45 a.m., applying power to the filaments, leaving it on all day then automatically kicking out again in the evening. The other circuit controls the plate supply to the amplifier and the audio oscillator time signal. This is set to close the circuits momentarily at 8 a.m., noon, 1 p.m. and 5 p.m., allowing a 5-second blast of the "whistle."

Aside from these four intervals, the high-voltage supply to the amplifier is

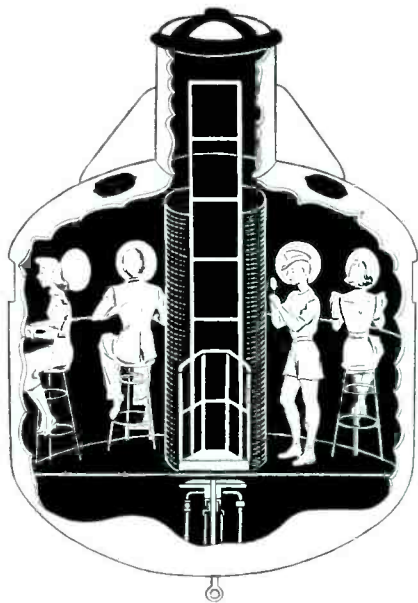


Fig. 4. The Nohl Diving Bell takes sightseers underneath the surface of the crystal-clear waters of Silver Springs, Florida.

applied only when the amplifier is in actual use. When the telephone operator desires to page someone in the plant she first presses the push-to-talk button

Fig. 3. Down the hatch! Looking down through the conning tower of the Nohl Diving Bell, Silver Springs, Florida. An attendant is seen with the microphone through which, with its associated amplifier, his voice is carried to loudspeakers mounted on the shore. The public can listen-in to the attendant's running description of the submarine scenery.



on the mike stand to close the plate supply circuit. Or when the fire alarm or emergency tone are to be sounded there is a special lock switch, the key for which is in the possession of the plant foreman, which must first be turned on to apply the plate voltage. Then the desired signal is sounded by means of a push-button, manually operated.

It could be argued that these automatic operations performed by the clock could be readily performed by someone assigned for that purpose. But where the human element is involved that is always the chance of a slip-up. A single slip at starting time might readily cost more than the entire investment represented by the automatic control system.

This was imagination applied by Miller—to his own profit and to the complete satisfaction of his client.

#### Submarine Sound

One of the most novel sound applications on record is found in the system installed in the Nohl submarine diving bell (see Fig. 3) at Silver Springs, Fla. Here the voice of the attendant is brought from the depths of a lake to speakers on shore where it is reproduced for the benefit of those who have gathered there to watch the diving operations, or are perhaps awaiting their turn to go down in the bell—for its purpose is to carry sightseers down

into what is said to be one of the clearest and scenically most beautiful bodies of water in the world.

With passengers stationed at its fourteen windows (See Fig. 4) the accompanying attendant describes the interesting points of the dive and it is this description that is picked up by a nearby microphone and carried up to those on shore. This bell is a huge affair, weighing some twenty tons and equipped with air conditioning, its own electric driving power, an elevator which lowers the boarding passengers down into the body of the device from the overhead conning tower, the sound equipment and even a telephone.

The most novel feature of the installation, aside from its unique purpose, is the means used for completing the sound system circuit to the shore, through hundreds of feet of intervening water.

A submarine cable, with sufficient slack to permit the necessary movement of the bell, was necessary anyway to provide the 110-volt a-c supply to drive the bell's electrical equipment, and a telephone circuit. To include the extra circuits for the speaker system when ordering this cable did not involve much additional difficulty or expense.

This cable is 500-feet long and consists of four pairs of wires—one for the a-c supply, one for the telephone, one



Fig. 5. Just a little old music box, but with its output picked up by a contact mike and reproduced through an amplifier outside the store it attracted a good deal of attention to this display window.

for the speaker voice currents and the fourth for the speaker-field supply. The dependability of this type of underwater connection is evidenced by the fact that to date the bell has made over 2000 dives in this location without a single failure of the electrical or sound systems.

The sound equipment itself consists of a Lafayette Model 261 amplifier, crystal microphone and separate record player unit, all located in the bell. This equipment dates back to the days when amplifiers supplied the field excitation for dynamic speakers, two of which, permanently mounted ashore, constitute the output equipment for this system. It is of incidental interest that although this equipment has been in this tropical submarine service for close to three years it is still going strong despite the climate and dampness.

#### Dollars in Music Boxes

With the public as sound conscious as it is today the problem of finding new advertising applications utilizing public address equipment is becoming a difficult one. But Temple Sound, of the Bronx, N. Y., an organization of sound specialists under the management of Al Gutmann, recently hit upon an idea that worked out very successfully and is suggestive of wide possibilities for both rental and sales applications.

The stunt, illustrated in Fig. 5, consisted of utilizing a tiny music box with a contact mike attached to reproduce the melodious tinkling of the instrument through speakers mounted both inside and outside the store where it was installed. There is definite attention-attracting novelty in the music of these boxes—especially as the public is unaccustomed to hearing it at anything but the very low volume as produced by the box itself. This was fully demonstrated in the large number of

passers-by who were attracted to the haberdashery display window where this installation was made.

Such installations are most practical on a rental basis because their novelty is likely to wear off after a week or two in one location. The equipment required will, of course, vary some with the location and purpose for which it is used. In this particular installation a little 6-watt amplifier with two speakers proved adequate, the Amperite Type SKH contact mike feeding directly into the high-impedance microphone input.

This music box idea offers another illustration of the versatility of contact mikes. Such a combination might well be made a part of the sound equipment of many bands and orchestras, injecting a few strains of its output here and there as a novelty effect during the regular program, occasionally during the intermissions between dances, and so on. Even to a traveling band the addition of this equipment to an existing sound system would introduce no complications as the music box, with contact mike attached, need not be more than a few inches square. If the music box is electrically operated its size will be somewhat greater, although still quite small.

Then, too, the combination can be worked into the phono input of radio sets to provide interesting variety in the broadcast or recorded programs used as a musical background in many restaurants. Even where the audio system of the radio set does not provide high gain it is still possible to use the music box by substituting a type KR

high-output contact unit for the SKH type.

It is true that the unit sale value of these accessories may not be very large, still every incidental item that can be sold as a part of a sound system, or as a follow-up on previous sound system sales, helps to swell the total income and is not to be overlooked.

## NOISY AMPLIFIERS

ALL high-gain amplifiers are inherently noisy; the amount of the noise produced being partially dependent upon the excellence of the components used in the amplifier.

One of the most prolific sources of noise is due to the high value of resistors employed in the input stage. All resistors of high value are potentially capable of producing noise, for it must be remembered that even a relatively small random motion of electrons will result in appreciable noise voltages in resistors of this large magnitude.

The next time that you have to service a high-gain amplifier it would be well to replace the resistors which are present with special noise-tested resistors. Although noise-tested resistors cost somewhat more than ordinary ones, the reduction in the output noise of the amplifier is usually sufficiently great as to make this price differential of relatively small significance. Since the input stage of a high-gain amplifier is usually a pentode, the resistors to be replaced, in order of decreasing importance, are the input grid-leak, the plate load resistor, and the screen-grid dropping resistor. Although all three of these locations require only fractional wattage resistors, it is advisable, nevertheless, to employ noise-tested resistors of the one-watt type, in order to minimize the effects of surface leakage, for we must remember that surface leakage, which is due to dust and moisture, is variable in character and is, therefore, also a potential source of noise. D. B.

## LOOP RECEIVERS

*Police and amateur interference:* The image frequency response of loop receivers is inherently somewhat greater than that of receivers employing conventional antenna circuits. In general, the difference does not account for abnormal interference from stations operating in the image range (1,450 kc—2,500 kc). It is likely, however, that occasional cases occur where this condition will cause complaint. It is recommended that the following treatment be used.

(1) See that loop circuit is precisely aligned, with chassis and loop in cabinet, as directed by service notes.

(2) Revolve loop to position which minimizes response from undesired or interfering signals.

(3) Shift i-f up or down by 10 kc, if interference is on one station only.

(4) Try using an external antenna. This provides considerable attenuation in the image range. Use a wave trap with this antenna, if found beneficial.

(5) Try grounding receiver, or installing a line filter, if interfering signals appear to be introduced by the power supply.

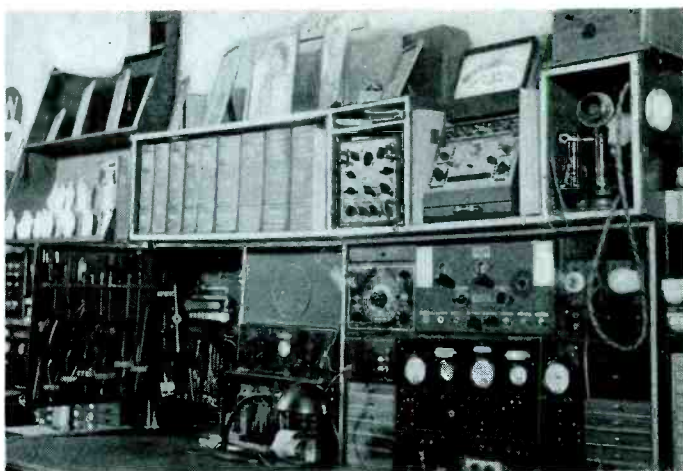
A wave trap associated with the loop or loop stage is not practical due to its effect on tracking.



# Formula for S U C C E S S

By D. H. THOMPSON

*D. H. Thompson's radio shop in Peconica, Illinois, provides him with a good living throughout the year. He has a regular formula to which he attributes his success. The steps are outlined below.*



I STARTED satisfying my thirst for a knowledge of radio fundamentals back in 1921 by building a crystal set. Much spare time in the next two years was spent in trying out practically every popular circuit of the day. A study of text books plus a correspondence course added greatly to my knowledge of basic radio theory. In 1924 I started installing and servicing sets for a friend who sold Atwater Kent and Crosley receivers. I also did whatever other repair work that I was able to obtain from friends and neighbors.

I established a shop in an out of the way place, over a garage. To increase the revenue in this unfrequented location, I planned newspaper advertising carefully and supplemented that with direct mail literature. This proved a great help and I remained for a time at the poor location where the rent was low.

Aided by knowledge, gained from a correspondence school course in advertising, I started 1928 with a very definite advertising plan:

1) All advertising was to emphasize reliability of merchandise sold and service rendered.

2) All service advertising was to emphasize the slogan "Experience Counts."

3) Timely advertisements were to be used prior to all major broadcasts of Political Conventions, World Series Games, Prize Fights, Elections, etc.; pointing out the advisability of having the set put in order before the last minute rush—insuring perfect reception of the event, etc.

The "Radiogram" was always a regular feature of Thompson's direct mail campaign for more business. He prints it himself on a small hand press.

My business policy, as set forth in a mimeographed direct-mail bulletin was:

*"To render prompt, reliable and efficient service to radio owners at a reasonable cost; and to sell only reliable merchandise of proven merit."*

That summer, I secured a small printing press and in my spare time issued a little four page bulletin as direct-mail advertising. It was a lot of work, but it was good training too.

In August 1929, I moved into my present location in the heart of the business district; with a well constructed service bench and test panel, right up front where it could be seen by all who entered the store.



From time to time, new equipment has been added and old equipment rearranged, as occasion demanded; but the bench still occupies its prominent place up front. I am a firm believer that it is good sales psychology to have it where it can be seen, and to keep it looking bright and shiny; also to let the public know that you are keeping abreast of the times, in rendering them the best possible service.

Selection of suitable side-lines can add materially to the profitable operation of the business. Those which produce repeat business are the most desirable.

I have found Kodaks, films and finishing (with the finishing done by a commercial finishing plant) a profitable side-line that reaches its peak in the summer months, when radio work is a bit more slack.

Appliances might be a good side-line for some, but in my locality; they turn-over too slowly for the amount of money invested. Therefore, I have dropped them in favor of lower priced, faster moving items.

(Continued on page 22)

 <p><b>EVEREADY Layerbilt Every Inch a Battery</b></p> <p>These batteries are fully guaranteed against defects in materials or in workmanship, and we make prompt adjustment or replacement on any that prove defective.</p> <p><b>D. H. THOMPSON</b> "Your Radio Doctor"</p>	<p><b>D. H. THOMPSON'S RADIOGRAM</b></p> <p>JANUARY - FEBRUARY - 1930</p>  <p><b>TIMES HAVE CHANGED</b></p> <p>BY DE WITTH. THOMPSON</p> <p>When the nights are crisp an' cold, When the winter winds are blowin', An' the snows a pillin' high— Is it not a "glorious feelin' " To sit at home, an' lis'n To programs from afar?</p> <p>Taint like the "good ol' days" We 've hear'd so much about. Them, were the days of isolation From all the world without, But now, there 's music in th' air, An' news, an' plays an' markets too, From almost everywhere.</p>
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# CHECKING CONDENSERS

By LEWIS WINNER

LOCATING trouble quickly and accurately is the aim of every Service Man, particularly today when service job turnover has become so essential an income factor in the busy service shop. Recognizing this all-important need, manufacturers have cooperated by developing and manufacturing quick service instruments. Condenser manufacturers have also been active in this respect, offering an interesting variety of instruments that serve many purposes. One of the most recent of these test units enables the Service Man to probe into an unusually wide assortment of difficulties. It is the Solar QCA condenser analyzer that indicates leakage, insulation resistance, radio frequency impedance, power factor, capacities, and in addition affords a dynamic check for shorts, opens and intermittents.

This novel unit, incorporating popular "quick-check" features, works equally well whether the condenser is fully connected in the circuit, or has one or both leads disconnected, or even if the condenser is shunted by an inductance or resistance.

A balanced oscillator circuit, actuat-

ing a 6E5, affords a history as to the quality of the condenser. This circuit is so tuned, that when disturbed by a capacitance across the test leads, the particular condition of the condenser desired, may be known.

As an example of operation, let us take a 0.02-mfd paper tubular condenser and test it for its effectiveness as to capacity, and its goodness as a condenser itself. With no capacitance connected across the test leads and the power on (110 volts, 50 to 60 cycles or 110, 165, 240 volts, 25 to 60 cycles), the eye shadow will be 90°. When we place the test leads across the condenser, the eye shadow will be reduced to practically closing, if it is okay. However, if the condenser were open, or had a high r-f impedance, the eye would remain in its 90° position. Therefore, we now know that the condenser is not open, and that it has a low r-f impedance. It still may have a short. To test for shorts, we slide a switch located next to the letter H. This is

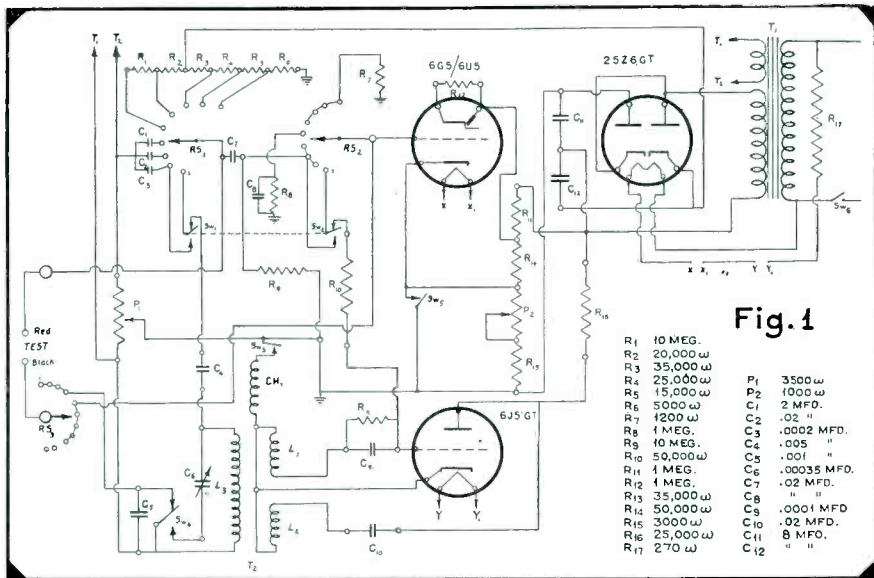
necessary because the condenser under test is above 0.003 mfd. If there is no short, the eye will close completely. If there is a short, the eye shadow will return to its 90° position.

The question of r-f impedance in condensers is quite important. As we know, a condenser, particularly an electrolytic with a high r-f impedance, when used in a filter circuit may cause oscillation. An accurate check with this new instrument will locate such difficulties and quickly indicate which condensers must be replaced.

For the quantitative determination of the capacity of a condenser, the Wien bridge portion of this analyzer is brought into play. To actually select a capacity value on the instrument, the selector knob in the multiplier portion of the circuit is rotated to, let us say, the first position. The large knob in the bridge circuit is also rotated to a selected position. If the condenser under test is 0.1 mfd, the eye will open at extreme left, showing that the capacitor under test is less than 0.1 mfd. Therefore, the next step is to turn the selector knob to 0.01, and again rotate the large bridge knob, until a balance is obtained. This balanced condition will become evident when the eye opens at a specific reading on the scale. If no balance is obtained, except at open, on positions 0.01 or 0.0001, the condenser under test is open. This instrument will test from 0.00002 mfd to 70 mfd, in three ranges from 0.00002 mfd to 0.002 mfd, 0.002 mfd to 0.2 mfd, and 0.2 mfd to 70 mfd.

Leakage tests, another important function of this new device, can be made for micas, silver micas, trimmers, electrolytics, wets, paper and oil condensers. In Fig. 3 is shown that portion of the circuit in the analyzer affording this measurement. The 6G5 is biased by R3. The eye is kept closed with a condenser across the input terminals. When a condenser is placed across the red and black terminals, observing polarity, the condenser is placed

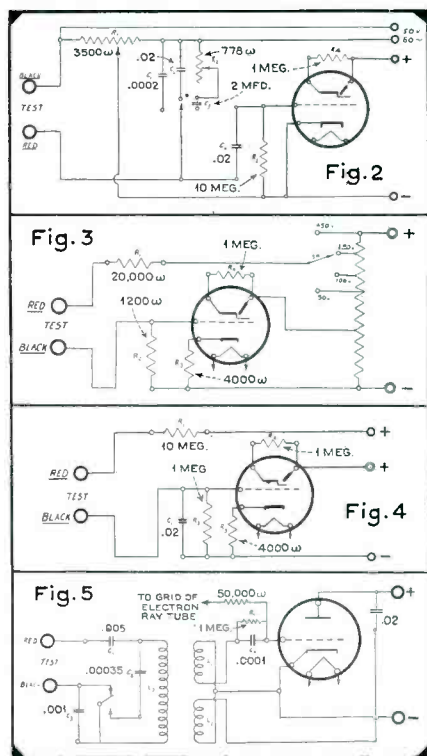
Fig. 1. Solar's QCA is an all around capacitor tester designed for quick checking.





across the voltages selected (working voltages of condenser only) and thus the circuit is completed. A current will pass through R2, placing a positive bias on the triode amplifier 6G5. This will cause the eye to open. The degree of the opening will depend on the degree of the leakage. For instance, if the eye closes, the leakage is less than 2.5 milliamperes. If the eye remains slightly open or from 1/16-in opening to the point where the eye just closes, the leakage current will be from 2.5 to 3.5 milliamperes. If the eye opens more than 1/16-in, then the leakage current is greater than 3.5 milliamperes and the condenser should be replaced. The time required for the leakage to drop within acceptance limits depends upon the length of time the capacitance has been out of service. Electrolytic condensers which have been out of service for long periods of time may require 20 to 30 minutes for the leakage to drop below the required value, or for the shadow angle to come to rest.

In Fig. 4 is illustrated the circuit of



Figs. 2, 3, 4 and 5 (from top to bottom). Illustrating the Wien bridge, the leakage test circuit, insulation test circuit and the quick-check circuit of the QCA analyzer.

the insulation resistance test portion of the QCA. The difference between this circuit and the leakage circuit lies in the difference of the value of R1 and R2. This change is necessary to adjust for the proper current limits. The indication of quality is given directly by the electron ray tube. On low capacity units, like mica condensers, the reading

can be taken almost immediately. On high capacity units, it will be necessary to wait until the condenser becomes charged before the results are taken. This takes about one minute for a 1-mfd condenser. All condensers are checked for insulation resistance at 500-volts d-c. If the eye closes completely on test, the insulation resistance is greater than 150 megohms. If the eye is slightly opened, or from 1/16-in to the point where the eye just closes, the insulation resistance will be somewhere between 100 to 150 megohms. If the eye opens more than 1/16-in, then the insulation resistance is less than 100 megohms, and the condenser should be replaced.

### STUDEBAKER PHILCO S1722, S1726

**Ignition interference:** If ignition interference persists after the methods usually employed for its elimination have been tried, the following additional operations may prove helpful:

Disconnect the aerial lead from the radio. All ignition interference which is heard is called "Radio Chassis Pickup".

1) Shield the A lead on the radio housing and ground the shielding near the point where the A lead enters the radio. Be sure the shielding does not touch other wiring in the car and that it is dressed on the side of the radio.

2) Dress all ignition wires as far away from the radio as possible.

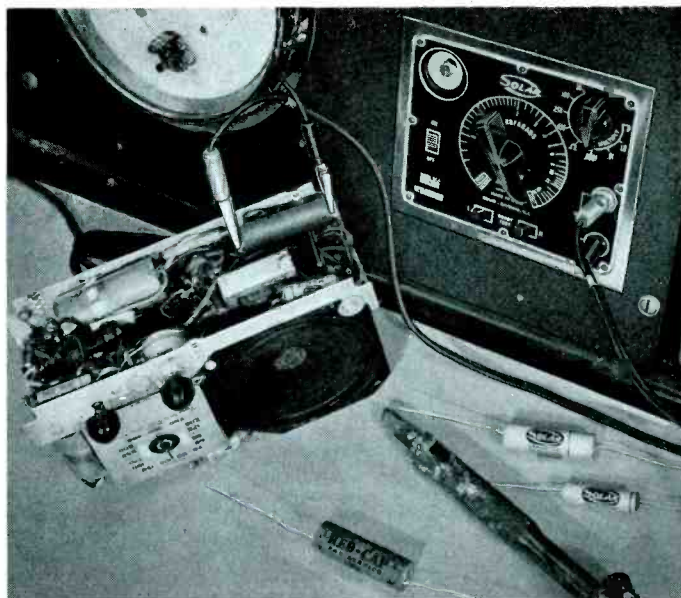
3) It may be necessary to add a 1/2-mfd condenser in the radio. One side of the condenser should be connected to the A terminal where it enters the radio and the other end of the condenser must be grounded to the radio housing.

4) Particular attention should be given to bonding all the controls which pass through the dash.

These operations should eliminate radio chassis pickup.

Connect the aerial lead to the radio. All ignition interference which is heard is called "Aerial Pickup".

1) Slide the clip of the aerial lead either



up or down on the rod and fasten in position where the least amount of interference is heard. Dress the aerial lead above the ignition lock.

2) An additional pigtail connected to the shield in the center of the aerial lead and grounding the pigtail may reduce the interference.

3) Connect a piece of copper braid from the ground side of the battery to the motor block. The right mounting bolt of the oil filter forms a convenient point to locate this ground to the block.

4) It may prove helpful to connect an additional 1/2-mfd condenser to the ignition switch.

5) In some stubborn cases it may be necessary to peen the rotor.

6) In many cases isolating the wire which is connected between the ignition coil and the terminal on the overdrive transmission has proven helpful. Disconnect and tape up both ends of this wire. Connect a shielded wire from the ignition coil to the terminal on the overdrive transmission.

The shielded wire should follow the speedometer cable all the way down to the terminal on the transmission. Ground one end of the shielding near the overdrive terminal and the other end of the shielding near the ignition coil terminal.

7) The side panel is fastened to the cowl to an angle bracket with one hex-head bolt and one round head screw. Raise the hood and remove the bolt and screw that fastens the left side panel. Clean all the paint from the bracket underneath the bolt and screw heads to insure good electrical contact and then replace the bolt and screw.

8) In some cases of severe motor interference, it may be necessary to ground the gear shift and steering columns in the motor compartment at the point where they enter the body. The ground strap should be made from heavy copper braid and should be 4 1/2 in. long. Solder one end of the strap to the both columns and the other end of the strap to the dash. There should be sufficient slack in the ground strap to permit free operation of the gear shift.

If these operations do not reduce the interference, it may be necessary to use spark plug resistors.

# S E R V I C E P L U S

By Lyman E. Greenlee

I STARTED in the radio service business back in 1922 when I was building and selling three-tube regenerative sets for my friends. My first service experience was in straightening out the haywire hook-ups of various novice friends who tried to make their own. I was really an old timer in '22, having been interested in amateur radio since 1917.

At the bottom of the depression in 1932 I found that a lot of people had sets that were unsatisfactory. They needed new sets but did not have the money with which to buy them. To merely repair the old set was no satisfactory answer to their problem. I worked out a reconditioning program that enabled me to firmly establish myself in the service business and to build that business up to the point where it was bringing in a gross income of \$1,000 a month by 1936.

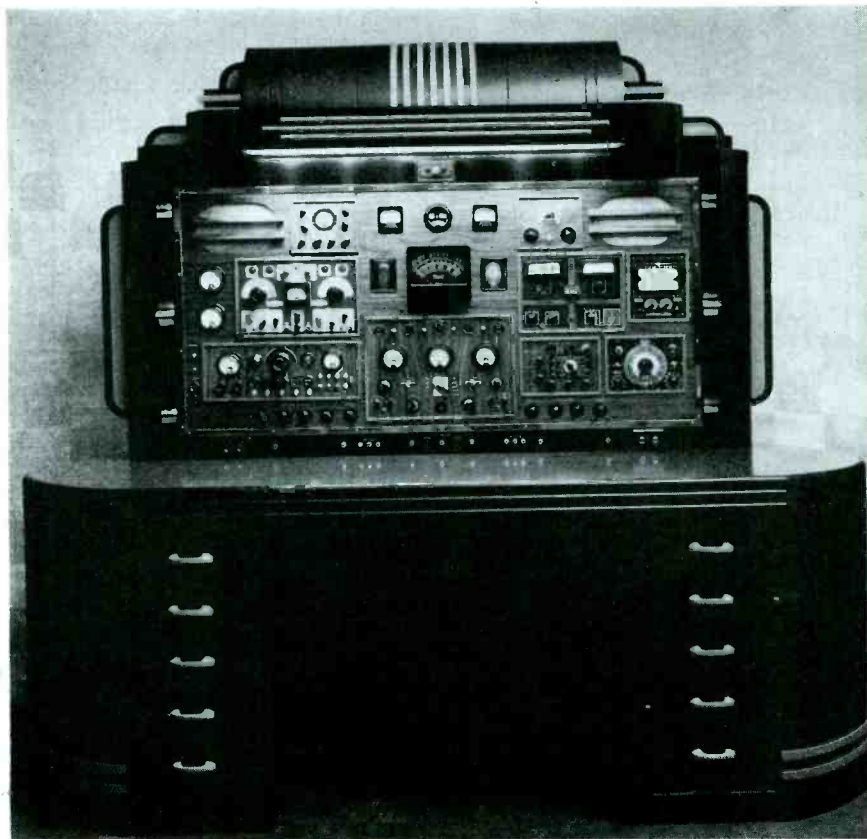
I knew from the start that I must sell something more than just repair service. The woods are literally full of good Service Men who were already established in business.

One of my first jobs in 1932 was an

older t-r-f set that used four 27s, two 45s and an 80. I replaced the 27s with 56s, put in new 45s and a new 80. After rebalancing the set, I shortened the antenna and repaired a speaker rattle. The addition of an electrolytic condenser to the filter and a thorough cleaning completed the job. That set is still in use. It was working when I started on it, and the owner allowed the work to be done only after considerable argument. We were both agreeably surprised at the results. I made up my mind then and there to go out and *sell service*, and by that I mean to try to get the customer to let me make his set as good and as nearly up-to-date as possible.

With that thought in mind, I started pushing doorbells. "Mrs. Jones," I would say, "is your radio set operating as well as it did when new? Would you like to

Olympic Radio & Television Corporation, Seattle, Wash., maintains this handsome test bench to impress their customers that they are capable of giving that little extra which means more than just service.



have a new set?" Then, if possible I got into the house and examined it. If I knew I could really improve it, I used a lot of argument and persuasion to get permission to put in a new set of tubes and make a few adjustments. It didn't always work, of course. But, I knew that by replacing the old 27s and similar types with newer, low-drain types, performance was usually enhanced and current drain reduced.

I persuaded customers to permit me to make certain changes in set wiring, and sold complete sets of tubes rather than replacing one or two defective ones. I applied the same reasoning to the conversion of old 6-volt battery sets, and sold literally hundreds of sets of 2-volt tubes for this purpose. Each of these sales meant a re-wiring job and usually the sale of new batteries. Some of these jobs ran up as high as \$25.00—on sets that were working and didn't need fixing! What did I do to these sets? First of all, I replaced as many tubes as possible, and I used a newer type of tube whenever this was desirable from the standpoint of performance or saving in operating cost. In the second place, I carefully checked all circuits and tube operating voltages to make sure nothing was overloaded. I replaced any parts that were obviously overloaded and adjusted tube voltages to the proper values, putting in the necessary bleeders or series resistor. I repaired all filters, speakers, volume controls, etc., and gave both set and cabinet a thorough cleaning and if necessary a refinishing. Needless to say, some of these sets operated for two or three years without a single service call. Things like that "sort of get noised around." Fellows started coming around with sets and they would say, "Fix her up like the one you fixed for John Smith last week." Sometimes I added a set, but for the most part I was content to leave the set pretty much like the manufacturer intended it, unless I was sure I could show an obvious improvement that could be sold to the customer. I was able to make sales because I could convince the customer the added satisfaction in improved performance of his radio and the reduced operating cost was well worth the expense involved. I tackled a few sets that I should have let alone, but in 99 cases out of 100 the results repaid the effort.

When business conditions improved, a lot of my customers wanted to trade their old sets for new ones. By following a similar modernization plan on my trade-ins, I was able to resell nearly all of them at a profit. Those that were obsolete or not worth repairing were salvaged for parts. Many of these sets were sold to farmers for use in barns, sheds, garages, workshops, etc. In some cases, the original owners were glad to keep the old set for a spare after it had been worked over. I have at one time or another purchased used sets from competitors to take care of the demand for these reconditioned jobs. So many radio dealers have a large percentage of their profit tied up in trade-in junk. I think this is partly due to a failure on the part of these shortsighted dealers to realize that there is a good market for this type of set if properly reconditioned and sold.

With the advent of rural-electrification, I found that a large number of farmers who were getting the high-line had recently purchased good 2-volt battery sets. Many of these sets were good all-wave jobs that

(Concluded on page 30)

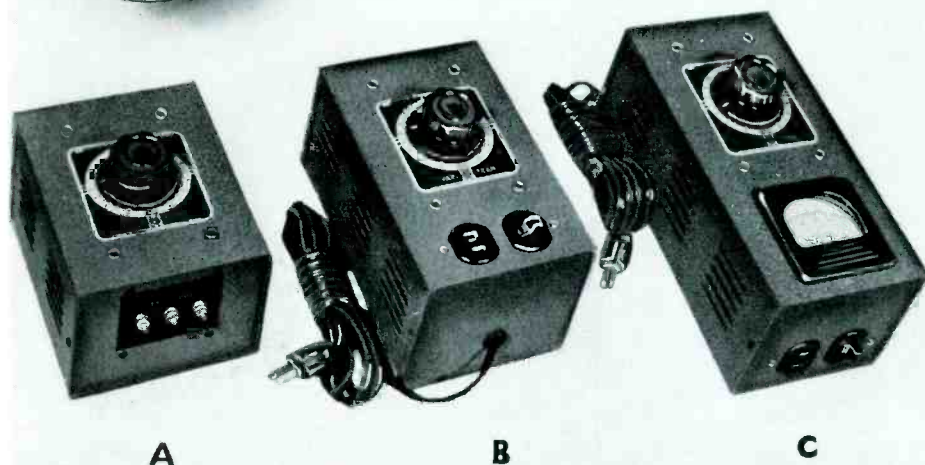


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Type	Input Voltage	Output Voltage	Watts	Max. Amps.	Figure	Net Price
V-0	115 volts	0-130	230	2	A	\$7.50
V-0-B	230 volts	0-260	230	1	A	9.50
V-1	115 volts	0-130	570	5	B	10.00
V-1-M	115 volts	0-130	570	5	C	15.00
V-2	115 volts	0-130	570	5	A	9.00
V-2-B	230 volts	0-260	570	2.5	A	11.50
V-3	115 volts	0-130	850	7.5	A	14.00
V-3-B	230 volts	0-260	850	3.75	A	18.00
V-4	115 volts	0-130	1250	11	A	20.00
V-4-B	230 volts	0-260	1250	5.5	A	25.00
V-5	115 volts	0-130	1950	17	A	32.00
V-5-B	230 volts	0-260	1950	8.5	A	37.00
V-6	115 volts	0-130	3500	30	A	60.00
V-6-B	230 volts	0-260	3500	15	A	70.00
V-7	115 volts	0-130	5000	44	A	87.00
V-7-B	230 volts	0-260	5000	22	A	95.00

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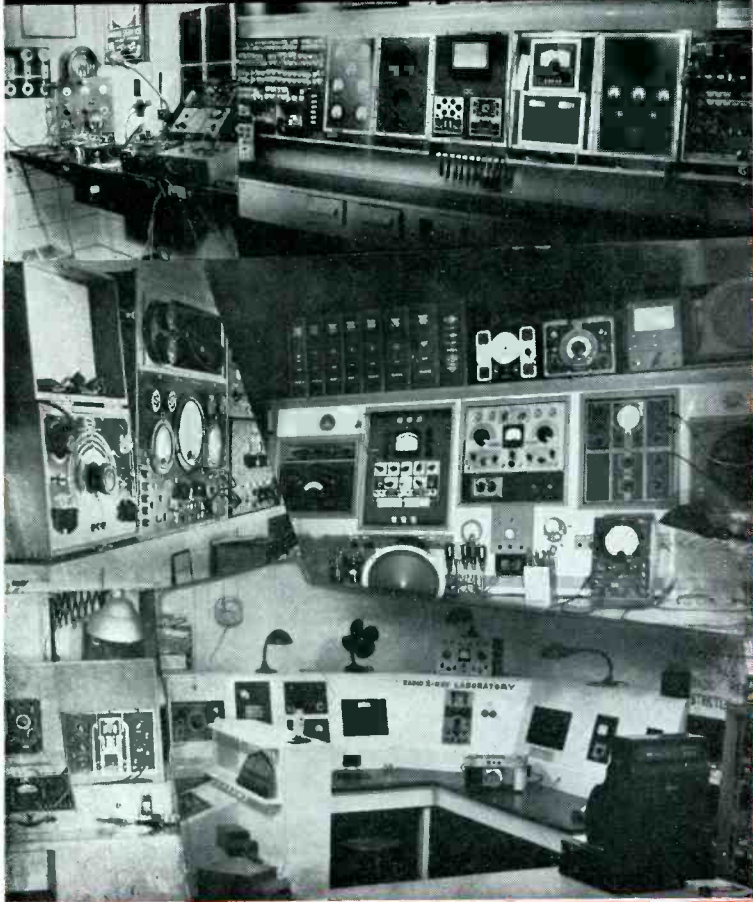
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# 10<sup>th</sup> Anniversary

Over 50,000 pieces of test equipment given away

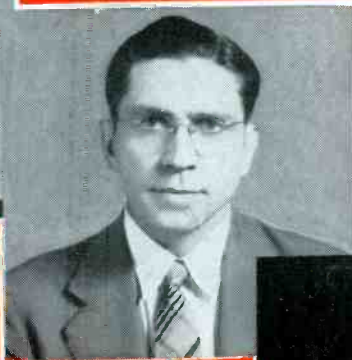
## A CROSS SECTION OF NATIONAL UNION'S Honor Roll of Service Dealers

RALPH N. BOLICK, Bolick Bat. & Elec., Hoocho, Mo.—Here had 20 equipment agreements during the past 7 years. I like to do business with N. U. for I and N. U. products and promotion helps outstandingly.

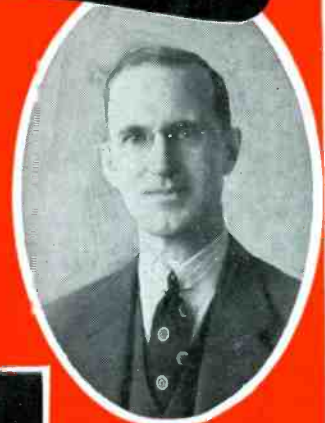
20  
Contracts



41  
Contracts



LOUIS E. CONNER Radio Serv. Manager, Piper & Taft, Seattle, Wash.—After using thousands of N. U. tubes during the past seven years we find that we have had fewer replacements than on any other make. Most of our equipment has been secured the N. U. way.



15  
Contracts

E. J. MAGINDT, Boston, Mass. In my opinion, and in the opinion of many other service engineers with whom I am associated, N. U. enjoys a prestige which needs no apology. Modern radio sets demand modern testing equipment. N. U. supplies it the easy way.



14  
Contracts

J. S. COONEY, Cooney Radio Co., St. Louis, Mo.—Thanks to N. U. Equipment Deals my shop is one of the most completely equipped testing laboratories in the city. I and N. U. products are the quality products in the industry and continually recommend them to other dealers.



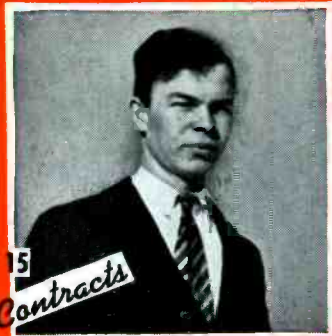
CLARENCE E. ESTELL, The Fixit Shop, Lima, Ohio—I believe N. U. equipment deals are the biggest contribution any manufacturer has ever offered to the radio service profession. In spite of cut-throat competition I sell at full list price because I can offer more for the money.

15  
Contracts



23  
Contracts

J. E. STAGE, Longview Radio Sales & Service Co., Longview, Wash.—Think your Free Equipment Plan great—Have signed 23 N. U. Equipment Deals—Have been using N. U. program 9 years. N. U. tubes all check alike—rarely have to make replacements.



15  
Contracts

VERNON H. HOOK, Barre, Vermont—N. U. has something in Free Equipment Deals that no other manufacturer can offer—One of the largest items of expense to the dealer is up-to-date test equipment—What way could be easier than selling N. U. products?



29  
Contracts

MATHEW J. BERLOWITZ, Juncos Radio Shop, Milwaukee, Wisconsin—I And in checking my records I signed 29 contracts. There is no better way for a serviceman to painlessly acquire good service equipment. In my 10 years of exclusive dealing with N. U. their products have always been satisfactory.

NATIONAL UNION, the Choice of Leading Technicians

# YOUR JOBBER

By **ARTHUR MOSS**

Executive Secretary

NATIONAL RADIO PARTS DISTRIBUTORS ASSOCIATION

**L**ET'S talk a little about the service behind the Service Man. By this we mean the real service rendered by the Parts Jobber to the service field at large.

Old timers will remember the early days of radio. There were few, if any, parts jobbers then. Service Men thus had to order dials, condensers, transformers, etc.—each item for the many sets they serviced from the individual set manufacturer, or his own authorized set distributors, who handled his make alone. This usually meant long waits, dissatisfied customers and frequently lost business. Few Service Men were, of course, in the position to invest large sums to maintain adequate stocks on hand.

The entrance of the Parts Jobber on this sorry scene changed all this. He has taken over the function of stocking the thousands of replacement parts, materials and equipment which the Service Man requires in his daily job, from the hundreds of manufacturers who produce them. He has undertaken the organization required to furnish the Service Man's needs immediately and the investment necessary to anticipate those needs.

Where formerly the Service Man was forced to establish his identity each time he made his widely scattered purchases, today he has made connections with his own Parts Jobber, and receives regularly and without difficulty the trade discounts, which the Parts Jobber passes on to him. The Jobber also protects his interests by giving these discounts to the trade only.

Of course many industries have their own parts jobbers, but I venture to say that few of them require such a degree of technical knowledge on the part of the latter as required in radio. In fact, many Parts Jobbers have developed from Service Men and radio engineers rather than from salesmen, as in other industries. They bring to their jobs this special technical knowledge, and the Service Man who consults and cooperates with them receives the benefit of their invaluable advice.



Arthur Moss

A good parts distributor knows his market. He buys only from reputable, nationally-known manufacturers, who are in a position to maintain adequate engineering staffs for research and development, and as a result, offer the Service Man a product which is guaranteed to stand up in a repair job. The

---

**"SHORTAGE**—that will be the greatest problem facing the radio parts trade in 1941, if I read all signs correctly. This will be a new and puzzling situation for most jobbers who have come into this field during the past decade or so, but it will simply be history repeating itself for those recalling the good old days when parts were scarce and prices were based on take-it-or-leave-it selling.

"A year ago I warned jobbers not to overstock. It was too early in our rearmament activities to worry about over-taxed production facilities. And the past twelve months showed no signs of a shortage. But now the picture is different. Many radio parts plants are already loaded up with Government orders. Still more orders can be anticipated as our nation prepares. . . .

"Already jobbers, here and there, are reporting shortages and delays. Certain large jobbers are buying a three-months' supply at a time, instead of the former thirty-days' supply. Of course there is also the price-increasing possibility, but that seems secondary at the moment. The main thought is an adequate stock on hand. Here at the Aerovox plant, we still maintain a huge jobber stock for prompt and complete shipments. However, in the face of increasing Government business, which must receive priority, our jobber stock may dwindle. Therefore, I say again, increase your orders and stock!"

*Charles Golenpaul*  
Aerovox Corporation

---

Jobber is in a position to know if some new line measures up to its claims, and so can save the Service Man much loss and grief. And since, unlike the itinerant vendor of "bargain" job lots, his existence depends upon the continued confidence of his established customers, his advice is sincere and honest. Therefore, by dealing with his local Parts Jobber, the Service Man is giving his own customers the best possible guarantee that the parts used in servicing his set are of standard make and of highest quality.

In addition to a knowledge of his market, the Parts Jobber possesses an intimate insight into the local needs and conditions of his Service Men. That is why he is able to anticipate their needs with what is sometimes such uncanny skill. And we don't have to tell a Service Man what it means to be able to call up and get a part immediately, because most Parts Jobbers maintain a fast and efficient delivery service.

Because most Parts Jobbers possess a staff of outside salesmen, the Service Man can do his shopping without leaving his bench. What that saves in time, money, exertion, we leave to the old timers to testify. It is no exaggeration to state that most of the daylight hours were once consumed in shopping for parts, with the actual work performed evenings. Yet the foregoing by no means exhausts the list of services which the Parts Jobber renders to the Service Man.

For the benefit of Service Men who cannot attend a large trade show like the one in Chicago, the Parts Jobber arranges local exhibitions to enable visiting Service Men to get a line on a large variety of items. To these he invites factory representatives, who give valuable and instructive technical talks.

Many Parts Jobbers sponsor local service groups, and supply meeting halls. A complete technical library is another service which most Parts Jobbers maintain for the benefit of

(Concluded on page 31)



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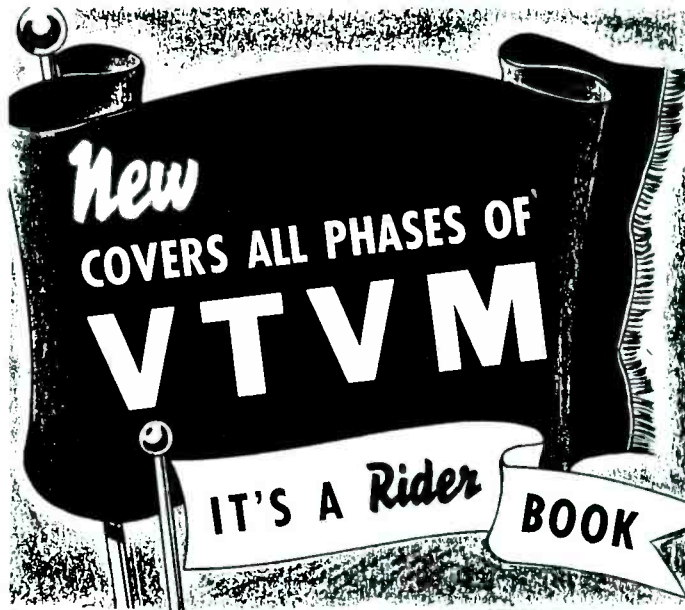
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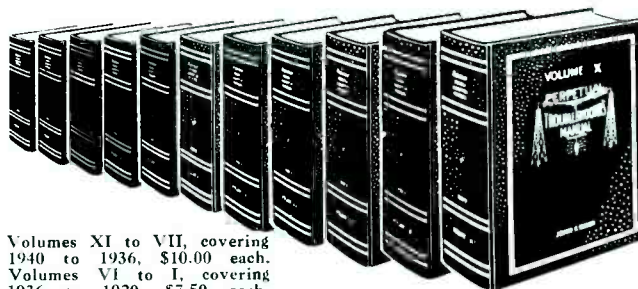
1. Fundamentals of V-T Voltmeters . . .
2. Diode VTVM . . . 3. Triode VTVM . . .
4. Slide-Back VTVM . . . 5. Tuned VTVM . . .
6. A-F and Logarithmic VTVM . . . 7. Electronic (D-C) Voltmeters, Microammeters, Ohmmeters . . .
8. Calibration of VTVM . . . 9. Applications of VTVM.



THE increasing use of vacuum-tube voltmeters in the servicing field has created a demand for a book that thoroughly explains the subject from the serviceman's viewpoint. The new Rider Book, "Vacuum-Tube Voltmeters", presents the practical aspects, as well as explaining the principles underlying the functioning of various classifications of v-t voltmeters.

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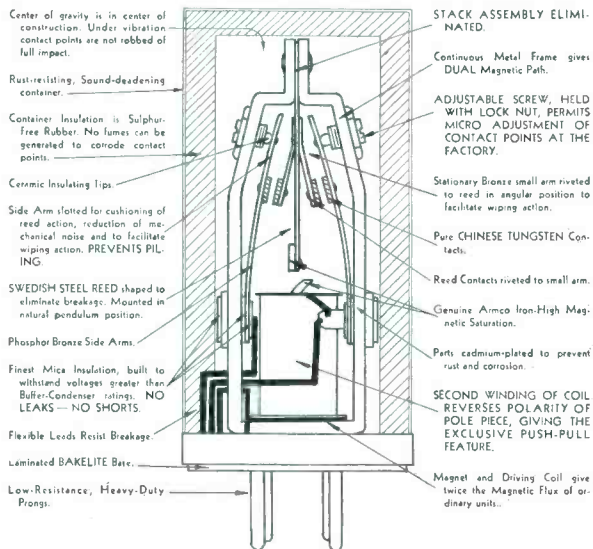
Turner Push-Pull isn't just another vibrator . . . it's a VIBRATOR WITH 10 advanced engineering developments that relieve you of customer's complaints and keep users happy with your service. They offer you and your customers more stable operation, longer life and fewer servicing headaches.

See for yourself in the diagram below, why Turner Push-Pull Vibrators can and will do a better job; see how they operate, on an entirely new engineering principle. WRITE FOR FREE MANUAL, and ask Your Jobber TODAY about Turner Vibrators.

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- 50% less R.F. Hash.
- Piling and Chattering Eliminated.
- Contact points are precision adjusted at factory.

### RCA LITTLE NIPPERS

*Smoke when operated for the first time:* The following comments pertain to 9TX30, 40X30 and 40X50 Little Nippers, and all similar chassis having the spun glass insulation type of ballast resistor in the filament circuit.

The resistors are wire wound on a spun glass core and covered with a woven glass braid. The fine strands of glass used in this braid are coated with oil and as the new resistor heats up to produce the ballast effect, the oil burns off causing some smoke to emit from the chassis.

The resistors used in later production have the oil burned out in the process of manufacture and the chassis are given a longer heating test to prevent the appearance of smoke when first used by the customer.

As a point of information, the new type of resistor has a current carrying capacity of 400 percent above its normal load and will only burn out when the circuit becomes shorted either through accident or a defective tube. These resistors have been subjected to extensive tests in both laboratory and the field and have been found extremely efficient.

*Hum with record players:* The circuit design of Little Nippers is such that the phono pickup plug must be removed when not in use, or when it is desired to operate as a radio. The Underwriters' Laboratories did not originally approve an isolating capacitor (between jack and chassis) larger than 0.01 mfd on the particular instruments involved. Subsequent approval has been obtained for use of values up to 0.1 mfd which will reduce hum pickup to an unobjectionable level.



### FORMULA FOR SUCCESS

(Concluded from page 13)

I consider my show window one of my best assets and firmly believe in keeping it clean and well trimmed. A clean, inviting show window can do much to attract the favorable attention of the passerby. I frequently work out original, animated displays with an element of mystery which adds greatly to effectiveness and attention getting power.

Another important and necessary factor in any successful service business, and this point can not be too strongly emphasized; is an adequate, though

simple system of bookkeeping, accurately kept; that will let you know where you are headed for and comply with state and federal tax requirements.

The successful Service Man must keep credit business to an absolute minimum. He must, necessarily, also pay his own bills promptly; building up a good credit rating. He will find this a most valuable asset, so long as he does not abuse it.

He must receive adequate pay for his services and in turn, must render value received in frank, honest service to his patrons.

He should cooperate willingly with



# COMMUNICATIONS RECEIVER

## HALLICRAFTERS SX25

By Holmes Webster



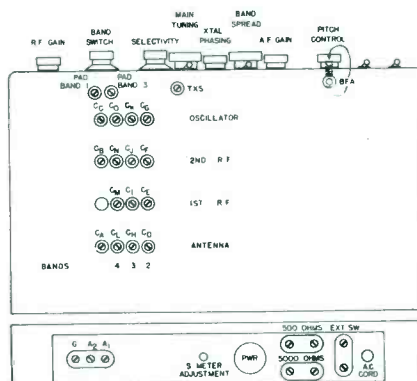
**B**ECAUSE many Service Men are for the first time becoming interested in communications type receivers, it is believed that the following description and discussion of the special features of this type of equipment will be of interest.

It is an important fact that a constantly increasing proportion of the communications receivers produced today is going into the homes of non-technical laymen whose primary interest is in obtaining the most dependable possible short-wave reception of war news direct from the foreign countries involved. This means that more than ever before Service Men are going to be called upon to service this type of equipment. Heretofore ownership of such receivers have been limited almost exclusively to hams and other technically trained operators who were for the most part capable of doing their own service work. For this reason the average Service Man has had little occasion to familiarize himself with these more complex and critical circuits.

The desire among many Service Men to learn more about such receivers is a wise one for several reasons. In the first place the average cost price of this type is higher than that of the average BCL receiver and owners can afford to pay legitimate service charges. Second, the owner of such a receiver doesn't wait until "my radio doesn't play any more." He wants top-notch performance at all times, which means that even a relatively small change in operating characteristics is likely to result in an S O S to his Service Man. Third, the growing demand among the lay public for receivers of this type is likely to result in some "communications" features being incorporated in the better all-wave broadcast receivers of future seasons and the Service Man who knows his communications receivers will be prepared. Finally, many of today's Service Men will be on Uncle Sam's payroll in the near future and familiarity with the type of equipment used extensively in the army, navy and air services

will more than likely prove to be an important asset.

The receiver described here serves as an excellent example for discussion because it includes an unusually wide variety of the special features which distinguish professional equipment from the general run of home receivers. Also it is in the medium price range (as com-



The sub-panel of the communications type receiver, too, is somewhat different from that of a home receiver. The former generally has more elbow room for the various components.

munications receiver prices go) and therefore fairly typical of the type that is now selling extensively. It is the Hallcrafters "Super Defiant," Model SX25, and sells just under a hundred dollars complete with a 10-inch heavy-duty p-m speaker in a separate matching cabinet.

The receiver is definitely a professional piece of equipment and the manufacturer makes no attempt to disguise this fact. The cabinet is of steel, neatly finished in durable, oven-baked, gray-crinkle lacquer. The design is such that removal of the steel bottom plate and raising the top cover make the chassis fully accessible for alignment or other servicing operations. Both cabinet and chassis are of heavy construction, welded and reinforced.

The chassis employs 11 tubes as shown in the schematic circuit of Fig. 1. Its tuning range is from 538 kc to

The front panel of a communications type receiver usually has a more imposing array of controls (plus a few meters) than is found on a typical short-wave receiver designed for the home.

42.1 mc, in four bands of 538 to 1700 kc, 1.7 to 5.13 mc, 5 to 15.6 mc and 15 to 42.1 mc.

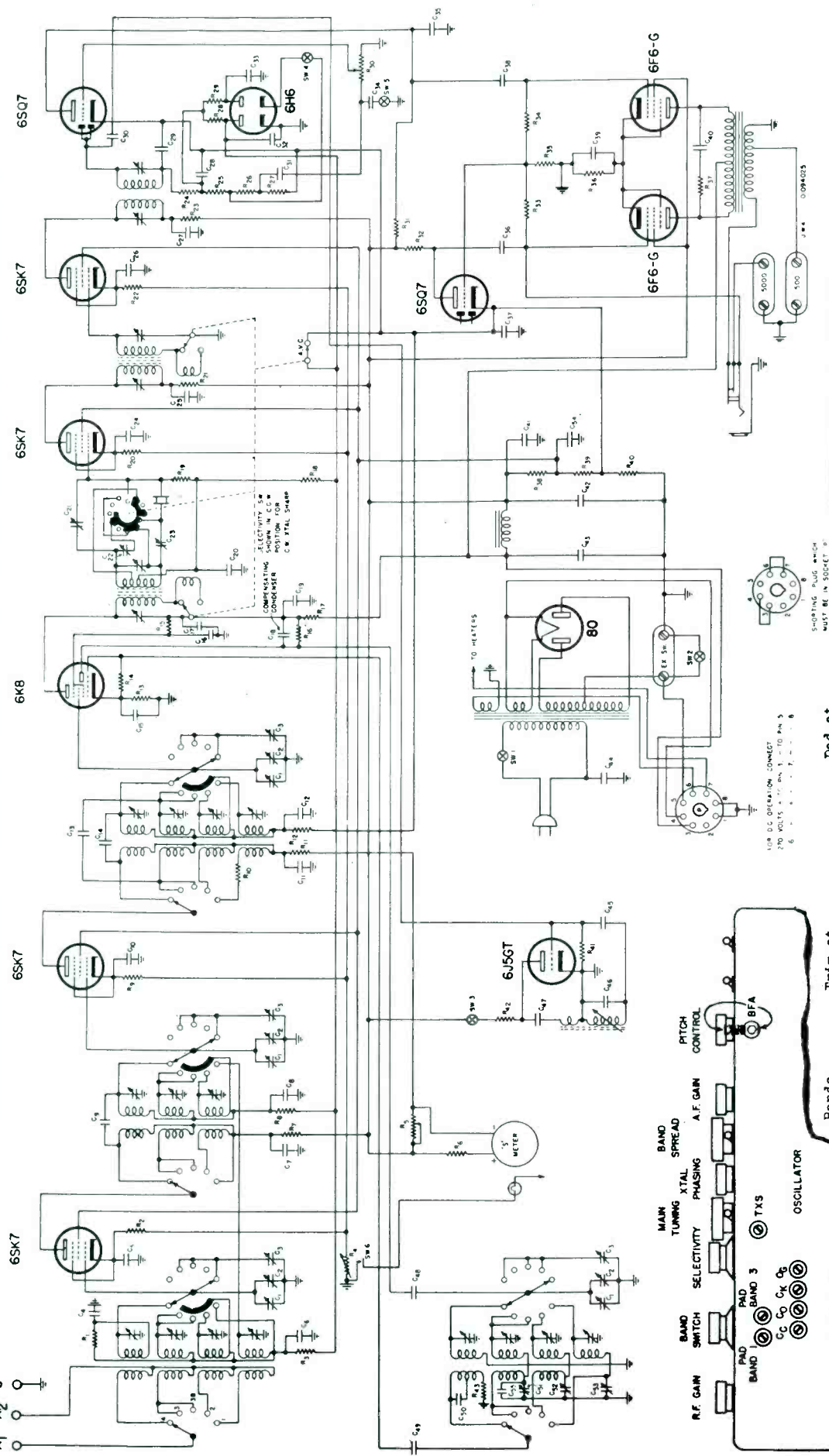
The tuning system includes the band switch, calibrated main-tuning dial, and a separately controlled electrical band-spread system with its own illuminated dial which is directly calibrated for the 10, 20, 40, and 80 meter ham bands—in addition to the conventional 0-100 logging scale for use in all other portions of the s-w ranges. Red reference lines on the main dial indicate its proper setting for use with each of these band-spread calibrations. There are two tuning gangs, one the main tuning and the other actuated by the band-spread control. This latter gang consists of four 2-plate and four 5-plate sections, the former always shunted across the main gang and the latter cut in automatically by the band switch in three of the ranges where it is needed.

The band-spread system is of vital importance if hair-trigger tuning is to be avoided on the lower wave lengths.

Reference to the circuit of Fig. 1 will show that two tuned preselector stages are employed. Their purpose is to improve the signal-to-noise ratio by providing high signal gain ahead of the mixer, and to reduce image interference by improving signal selectivity. They, of course, also add to the overall gain. Because one stage is adequate to serve these ends at the lower frequencies, the first stage is automatically shorted out in the standard broadcast range.

The 455-kc i-f amplifier employs two 6SK7 stages and, with its quartz-crystal filter, provides four degrees of selectivity ranging from the wide-pass or "Broad I-F" at one extreme to razor-sharp crystal selectivity for c-w reception at the other. Between these two degrees are the "Sharp I-F" and "X'tal Phone" positions which provide intermediate degrees of selectivity to meet

# HALLICRAFTERS "SUPER DEFIANT" MODEL SX-25



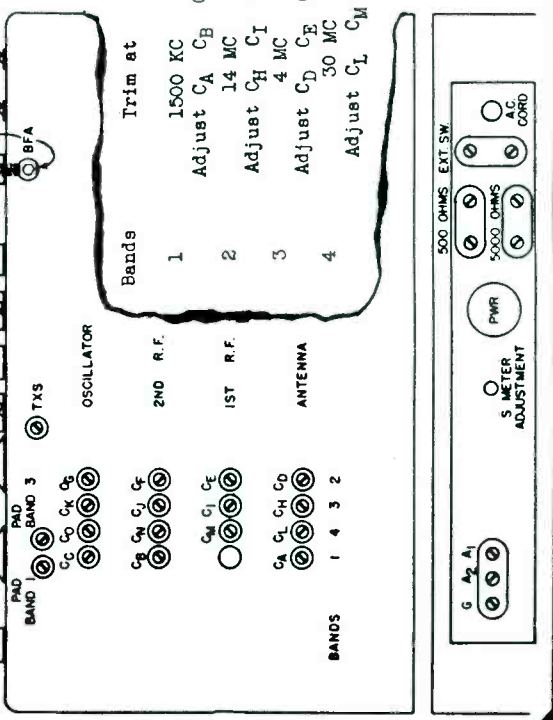
**CONDENSERS**

C1	Main Tuning Gang
2	PL. Bd. Spr. Sec.
3	" " " "
4	" " " "
5	.01 mfd
6	.05 mfd
7	.05 mfd
8	.05 mfd
9	.05 mfd
10	.05 mfd
11	.02 mfd
12	.05 mfd
13	.05 mfd
14	.05 mfd
15	.05 mfd
16	.05 mfd
17	.02 mfd
18	.02 mfd
19	4.5 mmfd
20	10 mmfd
21	.05 mfd
22	.05 mfd
23	1.5 to 18 mmfd
24	1.5 to 18 mmfd
25	.05 mfd
26	.05 mfd
27	.02 mfd
28	.02 mfd
29	100 mmfd
30	3 mmfd
31	.02 mfd
32	.02 mfd
33	.05 mfd
34	.05 mfd
35	.002 mfd
36	.05 mfd
37	.05 mfd
38	.05 mfd
39	.05 mfd
40	.002 mfd
41	.1 mfd
42	10 mfd
43	30 mfd
44	.01 mfd
45	100 mmfd
46	500 mmfd
47	.02 mfd
48	105 mmfd
49	.002 mfd
50	105 mmfd
51	2300 mmfd
52	1400 mmfd
53	450 mmfd
54	.1 mfd
55	700 mmfd

9	400	25	250,000
10	500	26	100,000
11	3,000	27	250,000
12	100,000	28	2,000,000
13	400	29	1,000,000
14	50,000	30	500,000 A.F. Gain
15	30,000	31	250,000
16	15,000	32	250,000
17	4,000	33	250,000
18	100,000	34	250,000
19	500,000	35	200,000
20	800	36	250
21	3,000	37	20,000
22	1,000	38	15,000
23	3,000	39	15,000
24	50,000		

**RESISTORS**

R1	100,000	4	10,000 Ω. F. Gain
2	400	5	500 S Meter
3	100,000	6	100
		7	3,000
		8	100,000





the different requirements of existing interference conditions. The choice of selectivity is provided by a 6-position switch on the front panel which also has provision for switching the avc system off or on. Its first three positions are for phone and broadcast service. These provide for expanded i-f, sharp i-f, and sharp i-f with the crystal in its broad position (to avoid selectivity so excessive as to prevent intelligible reception of speech). The last three positions are for c-w reception. In those positions the avc system is automatically shorted out to avoid the confusing "tails" which the slight time delay of the avc system would add to each dot and dash, and also the rising between-signal noise. Here the choice of sharp i-f, broad crystal and sharp crystal is offered.

The separate 6H6 diode serves as an automatic noise gate, adjusting itself to the normal variations of the signal but shorting out instantaneous impulses of greater amplitude than the signal, such, for instance, as those which constitute automobile ignition noise. A switch is provided to make this circuit inoperative when desired.

Provision is, of course, made for the use of headphones, the connection being made by means of a jack which automatically cuts out the speaker when the phones are plugged in.

An unusual feature of this particular receiver is the tuning stability provided by the oscillator circuit design. The use of a plate-tuned oscillator minimizes the effect of line voltage variations and the circuit components are temperature compensated to offset the frequency variations normally encountered as a receiver warms up. So effective is this that drift is substantially eliminated.

The beat-frequency oscillator is a conventional feature of every communications type receiver, making possible the reception of c-w code signals and also aiding in the location of unmodulated broadcast carriers or of very weak phone signals by the heterodyne-beat method. In this instance a 6J5GT is used for the purpose and is capacity coupled into the i-f output at the diode plates. A control on the front panel permits varying the pitch of the heterodyne note without the necessity for detuning the signal to accomplish a pleasing tone when copying c-w signals.

The "S" or carrier-level meter is another important part of better communications receivers. In this case it is a sensitive meter connected in the plate circuit of the second r-f tube to measure current variations resulting from changes in the avc voltage applied to this tube. A variable shunt resistor located at the outside rear of the chassis permits the meter sensitivity to be ad-

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G. Hamilton Beasley  
President



Peter L. Jensen  
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justed to provide full scale deflection (which is at the left end of its scale in this special meter) when (no signal) maximum plate current is flowing. Any signal tuned in then decreases the current, causing the pointer to back off to the right, the amount depending on the strength of the signal. This meter is calibrated according to the conventional "S" code up to S9, and in db for signals above the S9 level. Such a meter also provides an excellent check on the functioning of the r-f and i-f stages of the receiver because when used with the accustomed antenna any general falling off in the carrier level in-

dications on familiar local stations will be an indication of decreased receiver sensitivity.

Another special feature which will be noted in the circuit of Fig. 1 is the provision for plugging in battery supply in place of the internal line supply. This is a feature which adapts this receiver to mobile, marine and emergency applications and the external supply may consist of a 6-volt storage battery and either B batteries or a vibrator supply unit. An octal socket on the rear apron provides the necessary connections. For normal a-c line operation a  
(Concluded on page 27)



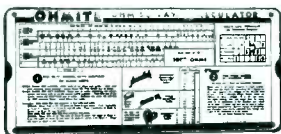
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## Book Reviews . . .

*THE METER AT WORK*, by John F. Rider, published by John F. Rider, Publisher, Inc., 404 Fourth Ave., New York City, 152 pages, illustrated, price \$1.25.

Don't wait to finish reading this review, rush right down to your jobber and get yourself a copy of this exceptional book.

The volume presents facts on the meter at work in the typical Rider manner. In it you find how each type of meter works, how it is used, how to get the most from the instruments you now own and what factors to take into consideration in the selection of new ones. With a knowledge of the principles underlying your present instruments, you can get the utmost help from them. "The Meter at Work" explains the theory upon which each type of meter is based while all the facts about each type are together. The practical applications are covered in the latter portion of the book.

In addition to the valuable text material, "The Meter at Work" features a new and novel physical make-up. The inside pages of this new book are split so that the top parts (containing the illustrations only) are separate from the bottom parts (containing the text). Thus the text pages can be turned without disturbing the illustrations, and vice versa. This revolutionary innovation in text-book make-up completely eliminates the necessity of constantly turning pages back and forth to consult illustrations while reading the text matter describing them. This undoubtedly makes reading simpler and quicker and remembering easier. R. H.

*HANDBOOK OF CHEMISTRY AND PHYSICS*, 24th edition; Chemical Rubber Publishing Co. of Cleveland, 1940; 2,564 pages. \$3.50.

Continuing to grow, the invaluable *Handbook of Chemistry and Physics* has been rearranged as well as enlarged. In the edition just released the listing of physical constants of organic compounds has been restored to the convenient tabular arrangement. More than 300 new compounds have been added to the listing.

Of special interest to manufacturers and engineers in the radio field is the new revision and enlargement of the listing of commercial plastics.

An entirely new tabulation, not found in previous editions, has been assigned 65 pages and entitled "Physical Constants of Industrial Organic Compounds."

The new volume retains all the well-known listings of fundamental quantities and units used in physics, chemistry and mechanics; its convenient conversion tables of temperature, lengths, transmission units and so on; has added the latest tube types to its listings of radio, telephone and industrial tubes, has improved its data on photography and retained its convenient tables of wire cross-section and resistivity.

Some 300 odd pages are devoted to mathematical tables and formulae. In addition to the usual log and trigonometric tables there are others giving squares and square roots and a complete listing of compound interest tables.

In the chapter on Units and Conversion Factors there are additional tables among which may be found some on temperature and on kilometers to miles.

The book is definitely a "best buy" even to those not particularly interested in the chemical content. T. H.

*PHOTO RELAYS, THEIR THEORY AND APPLICATION*, by F. H. Shepard, Jr., published by J. M. Coffeen, 227 Fulton St., New York City, 1940, 32 pages, 6 by 9 in. paper covers, 25c.

This compact booklet on Photo Relays is especially useful for the Service Man, interested in this subject. Mr. Shepard, former industrial electronic application engineer for RCA, explains photoelectric phenomena, amplifiers, glow discharge tubes, light sources, and a host of applications in five well filled chapters.

Among the 26 diagrams and illustrations are those showing the correct ways to use phototubes. In addition there are diagrams of single and two stage photo relay units with and without self-contained light sources; thyatron hookups; chime; counter; signal horn; water fountain; alarm and illumination circuits. Constants are supplied in many instances.

Mr. Shepard shows how the photoelectric unit, when used conservatively and with the same factors of safety that are generally used in other electrical and mechanical equipment, can offer a degree of reliability that will equal and even surpass that expected from the latter.

The booklet is easily worth many times the modest purchase price. L.W.

*HANDBOOK OF HEARING AIDS*, by A. F. Niemoeller, published by Harvest House, 70 Fifth Avenue, New York City, 156 pages, price \$3.00.

The Handbook of Hearing Aids is a completely frank volume designed to help the deafened to select the proper type of appliance at the lowest cost, explain how to use, test, and care for hearing aids. Thirty-one chapters give information describing all the known types and leading brands of aids.

As a buyer's guide for a person who is hard of hearing, this volume is priceless. It can also prove very useful for the Service Man who is interested in this field. We believe that the price of the book is too high considering the size and contents of the book, and taking into consideration that there are no illustrations. R. H.

*THE RADIO AMATEUR'S HANDBOOK*, 8th Edition, by Frederick Collins and E. L. Bragdon, published by Thomas Y. Crowell Co., New York City, 341 pages, illustrated, price \$2.00.

Written by experts, this book is decidedly for the amateur, presented to give information so that he may build, repair and operate his own set.

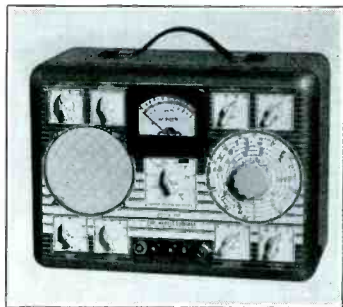
Ten chapters have been revised and corrected, and ten entirely new chapters have been added. There is new material on the latest topics, such as short wave, frequency modulation, facsimile, and television. Several typographical errors mar the excellence of an otherwise good book. R. H.



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## COMMUNICATIONS RECEIVER

(Concluded from page 25)

dummy shorting plug inserted in this socket completes connections between the receiver and its built-in supply system. But for battery operation this plug is removed and another, to which the external supply is connected, is plugged in in its place.

The presence of the sharply resonating quartz crystal in the i-f circuit makes i-f alignment considerably more critical than is the case with receivers not crystal equipped. A signal generator of good frequency stability and accurate i-f calibration is important because any appreciable drift in this instrument will prevent the precise alignment required. It is desirable, too, that this generator be capable of covering the full tuning range of the receiver at fundamental frequencies. In a pinch the harmonics of lower frequencies can be used provided care is taken to avoid the choice of the wrong harmonics.

No attempt will be made here to describe the details of the critical i-f alignment as these will vary with different makes and models of receivers and the various crystal circuits they employ. Specific instructions are usually obtainable directly from the individual manufacturers. In fact the instruction books supplied with many receivers contain all necessary alignment directions.

If the Service Man, who is interested in familiarizing himself with this type of receiver equipment, will spend an hour or so actually operating one of the receivers he will find the time so spent a highly profitable investment. He will then know better what to expect in the way of performance, and will gain clearer appreciation of its special features and characteristics. Neighboring dealers who stock communications receivers will usually be found willing to discuss details and allow the visiting Service Man to play with a model. Or if an acquaintance happens to be a ham it is more than likely that he will welcome an opportunity to demonstrate the operation of his receiver.

In any event, the Service Man who contemplates undertaking the servicing of this type of receiver will do well to get acquainted with the hams in his vicinity. In spite of their technical knowledge many hams either are not suitably equipped, or are hesitant about tackling the job of servicing such a relatively complicated piece of equipment. Not only do they offer reasonably good prospects for service jobs, but once a Service Man does a good job for a ham he can depend upon it that other neighboring hams (and short-wave listeners, who have a habit of consulting hams with their problems) will hear of it.

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|------------------------------|--|
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| 2. Counter displays          | 17. Tube base charts                         |
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| 4. Electric Window signs     | 19. Sylvania News Sheets                     |
| 5. Outdoor metal signs       | 20. Characteristics                          |
| 6. Window cards              | 21. Interchangeable tube charts              |
| 7. Personalized postal cards | 22. Tube complement books                    |
| 8. Imprinted match books     | 23. Floor model cabinet                      |
| 9. Imprinted tube stickers   | 24. Large and small service carrying kits    |
| 10. Business cards           | 25. Customer card index files                |
| 11. Door Knob Hangers        | 26. Service Garments                         |
| 12. Newspaper mats           | 27. 3-in-1 business forms                    |
| 13. Store stationery         | 28. Job record cards (with customer receipt) |
| 14. Bill heads               |  |
| 15. Service hint booklets    |  |

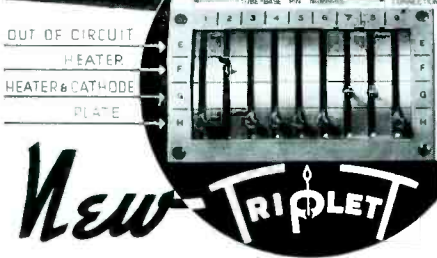
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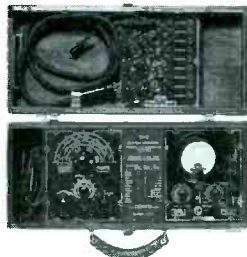
**MODEL  
1620**



## LEVER SWITCHING

Combining simplicity of operation with absolute flexibility, Triplett's new lever switching permits individual control for each tube element—yet test procedure is simple and quick. The switch setting shown above will permit tests of 45 commonly used different type tubes without change of positions of the levers. Many tubes require only two lever switch settings—more than half, only three settings.

Model 1620 also features four additional "quick change" non-obsolete features, including the above switching section. RED • DOT Lifetime Guaranteed Instrument panel may be returned for replacement or repairs, in case of accidental damage . . . Speed Roll Chart complete with mechanism can be replaced, in the case of new factory releases, by removing only four screws from front of panel . . . New socket panel to meet future radical tube changes which present spare socket cannot accommodate will be available at nominal charge upon return of old panel . . . Switching section with power supply also can be replaced should unanticipated changes make it necessary. Gracefully proportioned wood case, natural finish. Two-tone Brown-tan sloping panel; polished metal chrome trim with inlaid color. Model 1620 Counter Tube Tester . . . Dealer Net Price . . . \$37.84.



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## Sound News . . .

*Additional information on the products described below may be obtained, without obligation, directly from the respective manufacturers.*

### AUDAK PICKUP

Audak's Microdyne PRO5 is a light weight, sapphire jewelled magnetic pickup with an output of about -35 db and a



range, flat within 1½ db, to over 10,000 it is said. Point pressure is 25 grams. The PRO3 is a similar pickup with an output of about -30 db and a point pressure of 1¼ oz. Illustrative and descriptive literature from Audak Co., 500 Fifth Ave., New York City.

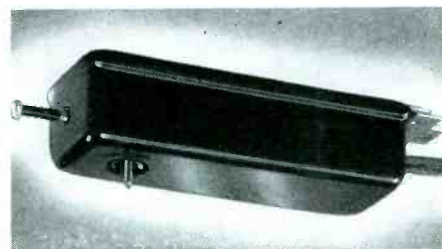
### RCA HORNS

Two metal reentrant speaker trumpets and three speaker mechanisms providing a variety of power have been announced by the RCA Commercial Sound Division, Camden, N. J. The larger of the two horns is the MI6303, a 5½-foot baffle folded back to a length of 31 inches. The bell diameter is 28½ in., frequency response is 0 to 7,000 cycles. The MI6302 is a 3½-foot baffle compressed into 19 in. Bell diameter is 21½ in., frequency response 200 to 7,000 cycles.

The three speaker assemblies, providing 15-, 12- and 10-watt power, are interchangeable with both horns.

### SHURE MAGNETIC RECORDING HEAD

The Shure 44A magnetic recording head is designed to operate directly from the voice coil winding of the output trans-



former. Stiff moving element permits recording on practically all recording materials, it is said. Shure Brothers, 225 W. Huron St., Chicago.

### CLARION AMPLIFIER

The Clarion A77K, 51-watt booster amplifier has been designed to convert low-power systems for broader coverage. Any desired output can be obtained by using the proper number of booster units. Full output is obtainable with an input of 0.15 volt; overall gain, 65 db; frequency response, 40 to 12,000 cycles. Transformer Corp. of America, 69 Wooster St., New York City.

### WILCOX-GAY RECORDING DISCS

Wilcox-Gay Corp., Charlotte, Mich., have introduced a line of metal-base, non-inflammable thread recording discs in 6-, 8- and 10-in. diameters. When held in a flame, thread cut from the blanks will melt rather than burn, it is said.

As an aid to selling the new blanks, Wilcox-Gay is offering record albums free with each quantity purchase. Holiday and seasonal labels for the finished records are also being introduced. A novel sample of the latter is the Valentine sticker sold to the trade this month.

### THORDARSON MOBILE AMPLIFIER

Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, have announced an 18-watt mobile amplifier which operates from either the 110-volt a-c lines or from a 6-volt d-c source, includes a phono motor and pickup and is designed for either 10



or 12-in. records. Constant motor speed is assured for either mode of operation. Separate controls are provided for phono and for microphone.

## Parts, etc. . . .

### TURNER VIBRATORS

The Turner Co., Cedar Rapids, Iowa, have added push-pull vibrators to their line. The manufacturer claims many advantages for this new type of vibrator unit, including adjustable contact points and push-pull operation.

### RADIOLA 515

Distributors handling the Radiola series of table model receivers first received a toy train, accompanied by a tiny banner reading "Here comes the 515." Few days later they received a special phonograph record which, with appropriate railroad sound effects, urged the distributor to "get aboard" the 515. Then came samples of the receiver timed to arrive the same day as a letter telling of the effective sales promotion aids prepared for it.





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ALL-PURPOSE  
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**MODEL A-5** — all five sections collapse below line of vision, to only 1 inch above the bracket.



Write for **Bulletin 197** or order now from your Radiart jobber

**THE RADIART CORP.**  
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## Airline SOUND SYSTEMS

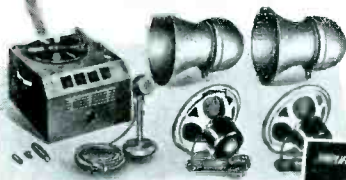
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**RUSH COUPON**

## KILLING THE HUM-BUG

(Concluded from page 6)

the heater from the d-c output of the plate supply. Some late sets are using a 12SQ7 or 12SF5 running at below-normal currents which reduces tube noises as well as hum. The tubes may be a bit critical in this application.

### Induction

In the days of audio transformers, magnetic induction was a very impor-

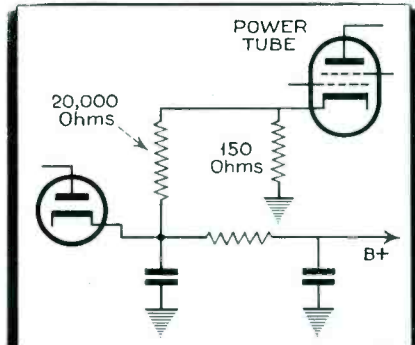


Fig. 8. An anti-hum voltage introduced at the cathode of the output stage is an effective means of reducing hum in the speaker.

tant consideration. Copper bands around the laminations of the power transformer as well as high permeability iron shields were used to minimize this induction. Most sets now using audio transformers (or audio chokes) are of the expensive variety where wide spacing may be used and all precautions taken. The elimination of audio transformers and chokes and the use of inverter stages for push-pull have almost allowed us to forget about magnetic fields in relation to hum. One exception to this is the high-gain audio amplifier where the heater leads must be watched for magnetic as well as static effects.

The parts of detectors and audio amplifiers that are at a high impedance to ground are always subject to hum pickup, the susceptibility being proportional to the impedance above ground. Tubes must therefore be shielded and grid leads must be either very short or shielded.

### Tunable Hum

R-f stages cannot amplify hum but can modulate the program at hum frequency which may be even worse. Hum on the carrier is minimized by using an electrostatic shield in the power transformer and by-passing one or both sides of the a-c line to ground. In replacing an output transformer, the phasing must be watched as considerable hum may be introduced by reversing a winding. Where high gain audio amplifiers are used don't forget the ground connection. A real ground is usually a major asset in reducing hum.

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## EITHER KIND...



## EXACT-DUPLICATE REPLACEMENTS

- Yes, AEROVOX and so many servicemen still insist that there's no substitute for an exact-duplicate replacement. Such a unit, as listed, stocked and supplied through AEROVOX jobbers, always *looks* right, *fits* right, *works* right. It restores the radio chassis to its original, "good as new" condition. And that's precisely what the fussy set-owner wants—and is willing to pay for. All of which accounts for page after page of exact-duplicate replacements still retained in the new 1941 AEROVOX catalog.

## GENERAL-PURPOSE REPLACEMENTS

- To simplify matters, however, particularly when a job is "in a hurry," AEROVOX offers the so-called general-purpose or universal replacements. Midget metal-can electrolytics, cardboard-case electrolytics, medium-sized and large can electrolytics, paper tubulars, uncased paper sections—AEROVOX provides everything and anything you want.

**Ask Your Jobber...**

- He'll gladly show you what's what in exact-duplicate replacements and general-purpose replacements. Ask for latest catalog—or write us direct.

# AEROVOX

CORPORATION  
NEW BEDFORD, MASS.

IN CANADA: AEROVOX CANADA, Limited, Hamilton, Ont.

**SERVICE PLUS**

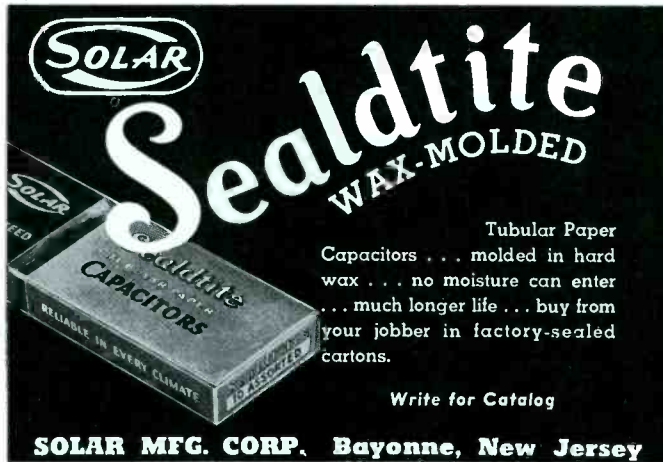
(Continued from page 16)

were only a year or two old. The trading-in of a large number of such sets is a problem for both the dealer and the customer. Since I had sold several hundred of these sets to good customer-friends of mine, I decided that I would see what could be done with them in the way of conversion to a-c operation. I finally decided a typical a-c, d-c circuit was the best for this purpose. About all that was necessary to convert one was to change filament connections and tubes, add rectifier and ballast tubes, small choke and a couple of electrolytic condensers. In this way the speaker and most of the other parts in the set could be

utilized. I found it inadvisable to convert battery sets to straight a-c operation because most of these sets used 200-volt bypass condensers and close-coupled coils and to try to adapt these parts to a plate voltage of 250-volts was just borrowing trouble. The average net cost for parts for making a conversion was about \$5.00. I was able to salvage an average of \$3.00 worth of good tubes, batteries, and accessories from each job. The average time for such a job was about three and a half hours actual work. The price charged the customer was usually about \$15.00, so you see I didn't exactly starve while doing this work. I had most of this work done by assistants and the average labor cost to me was \$2.50 per set. On many of these jobs, the resale of good tubes and batteries more

than repaid the total cost of rebuilding. I also rebuilt many 32-volt sets. I applied the same principle to the liquidation of my battery trade-ins. Farmers who had their sets made-over were greatly pleased. They had been to considerable expense in having buildings wired and certainly hated to junk a two-year-old radio that cost them \$80.00 to \$90.00 and spend that much more for an equally good new a-c set. Incidentally the money that would have been spent for the new a-c set was available for the purchase of other appliances such as a new washer, electric water system, etc.

The alert Service Man can earn his salt in more ways than one. As for me I sell complete reconditioning and not merely servicing . . . that is the way which I make a good living.



**SOLAR**  
**Sealtdite**  
WAX-MOLDED  
Tubular Paper Capacitors . . . molded in hard wax . . . no moisture can enter . . . much longer life . . . buy from your jobber in factory-sealed cartons.  
Write for Catalog  
**SOLAR MFG. CORP., Bayonne, New Jersey**



**KEN-RAD**  
DEPENDABLE  
RADIO TUBES  
Make 1941 a Ken-Rad year. Investigate the Ken-Rad selling story at once. You will profit by it.  
**KEN-RAD TUBE & LAMP CORPORATION**  
Owensboro, Kentucky

*Important Announcement To All Servicemen!*

**NOW YOU CAN JOIN THE NATIONAL RSA**  
**For Only \$1.00 a Year!**



Every Serviceman can have a voice in his destiny in his own industry! The RSA extends its services and makes it possible now for all Servicemen to enjoy the advantages of membership in this national organization

for only \$1.00 a year.

Yes—for as little as 2c a week you get the RSA Membership Certificate and receive the RSA House Organ. You have access to the RSA Technical Helps Bureau, and you are able to participate in all the

other functions and benefits which the RSA offers.

As rapidly as local chapters are formed, protected territories will be established for them. Applicants in present chapter areas will be referred to the local chapter.

This is your opportunity. Don't let it slip away. Join now with thousands of your fellow servicemen in this great organization—the organization that's doing things for you!

Fill out the coupon, attach a \$1.00 bill and mail it now!

**RADIO SERVICEMEN OF AMERICA, INC.**

*"Reliable Service Assured"*

JOE MARTY, JR., EXECUTIVE SECRETARY  
304 S. DEARBORN STREET, CHICAGO, ILL.

**RADIO SERVICEMEN OF AMERICA**  
304 S. Dearborn Street, Chicago, Illinois  
\$1.00 enclosed for 1941 National Dues in RSA

Name .....

Address .....

City ..... State .....

*Service-Jan.*



## YOUR JOBBER

(Concluded from page 20)

their Service Men. In fact, the number and variety of services varies with the size and ingenuity of the local parts jobber, and with the degree of cooperation he receives from his local Service Men.

It is obvious that unless the Parts Jobber receives the whole hearted support of the Service Men in his community on all standard purchases, he cannot carry an investment in the large stocks of the miscellaneous parts needed by these Service Men, since the turnover on many of these items is only once or twice a year.

Without proper support, the Parts Jobber cannot hire good technical countermen as well as outside salesmen to inform and instruct Service Men.

Without proper support, the Parts Jobber cannot absorb the enormous overhead incurred in maintaining a service, which in its myriad details is comparable to a retail business.

The question then naturally arises as to just how the Service Man can best support and cooperate with his Parts

Jobber. Obviously, the Service Man who makes all possible purchases from his Parts Jobber, instead of shopping around to save an apparent few pennies, is making it possible for that jobber to continue to serve him.

These troubled days are bringing in their wake a new era, the nature of which many of us cannot grasp, accustomed as we are to an economy of abundance, i.e.: a state of affairs where there are usually more goods on hand than the immediate needs of buyers require. It is hard for us to visualize another state of affairs, an economy of scarcity, but those who remember the first World War, should experience no difficulty in doing so.

With the country being geared to defense production, Priority Boards determine how much of needed materials non-defense industries may be allowed, and just when these industries may get those materials. What is more natural than that the Parts Jobber in allocating his rationed material will give preference to those Service Men who have loyally supported him in the past?

Every Service Man should give a thought to his future requirements. If possible, he should lay in a stock of staple items, and relieve somewhat the pressure on the Parts Jobber, now sorely harassed by defense shortages of material, Priority Board regulations, and defense preparations.

The Parts Jobber must be in a position to estimate the stock he must carry, the items of which it consists, so as to enter into the negotiations which may be required to obtain them.

For in a country in the throes of defense preparations, there is no room for haphazard, unplanned operations. Those whose duty it is to produce must know in advance, because every available machine will soon be grinding out arms in this "arsenal of democracy."

And let us hope that when this ugly business is over, and the swords of democracy shall be beaten into its plowshares, the benefits of the habit of planning, cooperation and mutual helpfulness which this era has produced, shall not disappear, but shall become part of our American way of life.

### RCA U10

*Push-Button tuning sticks:* If push-button tuning buttons stick, check for rubbing against metal plate between dial glass and tuning condenser. This plate can be moved slightly when its mounting screws are loosened so as to provide clearance for easy push-button action. The chassis must be removed from the cabinet to accomplish this.

Willard Moody

# 240

PAGES, LISTING

# 9,891

RECEIVER MODELS, MADE BY

# 224

SET MANUFACTURERS

In this New



No longer is it necessary to wonder what replacement I-F Transformer to use in any superhet! Just refer to this *first* complete I-F TRANSFORMER REPLACEMENT MANUAL and you'll have the answer in a jiffy!

Every superhet ever made, on which data could be obtained, is listed by manufacturer and model number; original part numbers on the transformers, original I-F peak frequency AND the number of the Meissner Transformer recommended for replacement—are all given in handy tabular form 210 pages of them! Special connections or service notes are given when necessary.

### AND MORE—

Fourteen pages of solid information give the most complete data ever published on the various types of I-F Transformers, their peculiarities of construction, problems met with in servicing and replacing them, elimination of undesirable oscillation and regeneration, and a thorough discussion of all kinds of service problems concerning the I-F Channel. Together with other pages of useful tables and data, this book contains 240 pages in all! It is truly a MANUAL of indispensable information for the serviceman—a tool no modern worker can afford to be without!

Get your copy from your Jobber at once—or send 25c directly to the address below. Your Manual will be mailed to you immediately, postpaid.

Write Today for Free General Catalog

Address Dept. S-1



The Outstanding Tube Tester Value . . . Checks all type tubes including Locals, Bantam Jr., 1.4 volt Miniatures, Gaseous Rectifier, Ballast, High Voltage Series, etc. Filament Voltages from 1.1 to 110 volts. Direct Reading GOOD-BAD Meter Scale. Professional-appearing case with accessory compartment large enough for carrying Model 739 AC-DC Pocket Volt-Ohm-Milliammeter, thereby giving the serviceman complete testing facilities for calls in the field. . . . Model 432-A with compartment, Dealer Net Price . . . \$18.85. Model 432-A in case less compartment. . . \$17.85. Model 739, Dealer Net Price. . . \$9.90.

WRITE FOR CATALOG—Section 117 College Avenue

READRITE METER WORKS, Bluffton, Ohio

**"HERE'S A  
BASICALLY  
NEW AUDIO  
OSCILLATOR"**

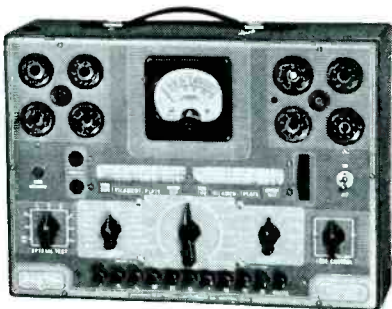


—Paul F. Jackson



MODEL 652

Here is all you could possibly ask for in an Audio Frequency Oscillator. It has everything! For example: A. F. Voltage is developed at its fundamental frequency . . . Model 652 is NOT a "beat frequency" oscillator and contains no RF circuits . . . Full range continuously variable from 20 to 20,000 cycles . . . 3 bands provide instant and exact settings . . . requires no zero adjustment . . . Five output impedance steps . . . 500 m. w. power output . . . constant output + or - 1 DB (30-15,000 cps) . . . Price \$64.50.



**DYNAMIC TUBE TESTER**

Proved to be more accurate! Jackson testers find "poor" tubes which might pass for "good" in ordinary testers. Model 636B, \$29.95.

Write for Free Catalog

**The Jackson Electrical  
Instrument Co.**  
Dayton, Ohio



**JACKSON**

*Associations . . .*

**Boston, RTG**

The RTG of Boston held its annual Shin Dig Jan. 6, 1941 and because the past secretary George Feldman was leaving us to give his services to good old U. S. A. The boys thought it an opportune time to present him with a pen and pencil set.

Members from outside chapters were also present at this presentation.

*J. R. Cabral, Secretary*

**Bowling Association**

The Radio Industries Bowling Association will hold their second annual handicap tournament at Bensingers, 131 S. Wabash Ave., Chicago, on Feb. 1, 2 and 8, 1941. The tournament is restricted to the radio industry. Additional details may be obtained from the Radio Industries Bowling Association, P. O. Box 11, St. Charles, Ill.

*Fred Sears, Chairman*

**Dallas, Texas**

The Texas Radio Service Association ran a special Dinner-Demonstration-Floor Show at the Chaparral, 1027 Elm St., Dallas, Texas, on Jan. 9, 1941. E. G. Perkins of the Supreme Instruments Corp., demonstrated and explained the "New Service Procedure for Today and Tomorrow." Door prizes were distributed.

**Lehigh Valley Radio Service Assn.**

The regular monthly meeting of the Lehigh Valley Radio Service Association was held at the Hotel Allen, Jan. 6, 1941. The following new officers were elected for 1941: H. H. Fillman, president; S. P. Gruit, vice president; R. P. Abbott, secretary; Russell Buss, fin.-secretary and J. A. Muthart, treasurer. Various committees were also appointed at this meeting and a board of directors elected.

Allentown will be the scene of big doings comes the night of Jan. 27. This is the time of our Third Annual Banquet at the Hotel Allen . . . be seeing you.

*Ray E. P. Abbott, Secy.*

**Local Union B1085 AFL**

Meetings of the Radio and Technicians Local B1085, IBEW, AF of L, are held the first Wednesday in each month at the Hotel Abbey in New York City.

Over 85% of all the sound work done during the past election campaign in New York City and vicinity was handled by contractors and technicians of the local. This local claims jurisdiction over all p-a, radio and television receiving equipment in Greater New York, Westchester and all of Long Island.

Members are eligible to receive a \$1,000 life insurance policy and pension benefits of \$42.00 per month. Initiation fee is \$10.00 and dues are \$3.00 per month.

*Jerry Newman, Business Manager*

**Sales Managers Club**

On Monday, Dec. 30, 1940, the Sales Managers Club, Eastern Division, held its regular meeting at the New Yorker Hotel,



**"Make mine an  
OXFORD, Joe"**

In the morning line-up at your jobber's counter speak right up and insist on OXFORD . . . the choice of thousands of servicemen who know what they are talking about. If you MUST get technical, these speakers have all the necessary response that makes them stand up "ace high" on the testing panel . . . but better still (from your standpoint) they enable you to make more money on every service job that calls for "Speaker repairs". It is easier and better to put in a new OXFORD than to "tinker" with the old one.

**Get wise to yourself  
the OXFORD way.**

**OXFORD-TARTAK**  
RADIO CORPORATION  
915 W. VAN BUREN ST. • CHICAGO, U. S. A.

in New York City. The club took occasion to invite members of the various trade papers as guests. Arthur Moss, executive secretary of the NRPDA was also present.

Dan Fairbanks, chairman, opened the meeting, welcomed and thanked the guests. Charley Golenpaul acted as master of ceremonies and presented gifts to Arthur Bernard, Paul Ellison and Walter Jablon in recognition of their efforts on behalf of the club.

At the last meeting of the club, held in New York City on Nov. 26, 1940, Dan Fairbanks of IRC was elected chairman; W. F. Osler, jr. of Cornish Wire, vice chairman; and Walter Jablon of Hammarlund, secretary.

*Walter Jablon, Secretary*

**Know Your Stuff Meetings**

Three more in the series of "Know Your Stuff" meetings being held by the RCA Tube and Equipment Division for parts jobbers and their salesmen were scheduled for the week of Jan. 6, in Cleveland, Detroit and Chicago. The latest scientific sales methods and the means developed by the RCA Manufacturing Company to assist jobbers in using them will be described in detail.

The meetings, which have been held in key cities of the Eastern seaboard, opened with a dinner at 6 p.m. and concluded before midnight with a period of entertainment. The Cleveland meeting was at the Hotel Carter on Jan. 6; the Detroit gathering in the Detroit-Leland Hotel, Jan. 8; and the Chicago meeting in the Drake, Jan. 10.



# Catalogs, Bulletins, etc. . .

Copies of the catalogs and bulletins discussed below may be obtained directly from the respective manufacturers mentioned. Write for them today!

Illustrated brochure covering their new line of low-pressure sapphire jeweled crystal pickups (Types FP) is available from Astatic Microphone Laboratory, Inc., Youngstown, Ohio.

Cornell-Dubilier Electric Corp., South Plainfield, N. J., have issued their 20-page, 1941 catalog (abridged) No. 185A. The catalog contains listings of capacitor test equipment, dry and wet electrolytics, tubular paper condensers, metal shell-cased paper and replacement capacitors, auto-radio condensers, Dykanol and mica transmitting condensers and Quietone interference filters.

Radio Inspection Co., radio jobbers at 227 Asylum St., Hartford, Conn., have released a 300-page general catalog of radio parts and equipment.

## Personnel . . .

The appointment of the Kennedy Sales Co., 2362 University Ave., St. Paul, Minn., as sales representatives, is announced by Clarostat Mfg. Co., Inc., of Brooklyn, N. Y. The Kennedy organization will cover the States of Minnesota, North and South Dakota, and a part of Wisconsin.

From his Pittsburgh residence where he has long been identified with Clarostat and other radio parts lines, John O. Olsen has moved to 1456 Waterbury Road, Lakewood, Ohio. Rep Olsen will henceforth represent the Clarostat line out of his new headquarters, covering Ohio and adjacent territory. The Virginia territory has been taken over for Clarostat by J. E. McKinley, working out of 519 North 33 St., Philadelphia.

Promotions of three executives at the RCA Harrison, N. J., plant has been announced by E. W. Ritter, vice-president in charge of production and engineering activities. John A. King has been named Harrison plant manager in charge of all operations, after having served nearly three years as manager of manufacturing. Arlan S. Kelley has been appointed manager of manufacturing, stepping up from assistant manager. Dr. G. R. Shaw, manager of research and engineering, has been named to assist Mr. King in engineering management.

Radio City Products Co., New York City, have appointed Ralph Gregory as sales representative for Mississippi and Tennessee. Richard A. Hyde, takes over the Mountain States area including Utah, Colorado, New Mexico and Arizona.

Commander E. F. McDonald, Jr., president of Zenith Radio Corp., Chicago, announces the appointment (pro-tem) of Edgar G. Herrmann as sales manager, replacing E. A. Tracey and J. H. Rasmussen who are no longer associated with the company. Mr. Herrmann will continue to carry his former duties as sales manager in addition to those of his new post.

## AS CHIEF CONDENSER BLOWER OUTER OTTO OOMPH WAS A FLOPPEROO

Ever since Otto Oomph was a boy, he suffered from a strange disease. Smashophobia, the doctor called it—the horror of breaking things—but there was nothing to be done about it. When he broke a Christmas tree ornament one year, poor Otto cried for two days. When he grew up, he wouldn't shoot as much as a clay pigeon and even the thought of denting the fender of his car would make him sick.

Eventually, however, Otto became an electrical expert. That got him a job in the Sprague laboratories and Otto was really happy for the first time—that is, until someone made him Chief Condenser Blower Outer in the Test Division.

Now, voltage in the electric chair at Sing Sing is 1,200 volts. In contrast, controllable AC voltages in the Sprague lab run as high as 7,200 (and much higher in the special high voltage lab) for here is where Sprague condensers really get "the works." They are torn apart, blown apart, tortured and blasted, not only to see how good they are, but how to make 'em even better.

WHAM! Poor Otto jumped six feet when a can condenser, deliberately loaded with supercharge to determine its breakdown point, exploded in a cage.

BAM! SNAPETY-CRACK. Otto shivered as another condenser gave its life under 4,000 volts of D. C.

CLICKETY-CLICK in monotonous regularity as AC refrigerator motor starting condensers were switched tortuously on and off 150 times an hour.

SIZZ-SIZZLE and SISS as vapor streams played on condensers to prove their moisture-proof ability.

In a massive oven, dozens of units were undergoing life tests at 200° F. Elsewhere, Television condensers were telling their story under 3,000 to 10,000 volts of DC; tiny electric razor condensers were getting the equivalent of 14 years of the hardest kind of use; and, almost every minute



some condenser gave up the ghost and another fact was added to the science of constructing condensers that excel in the rough and tumble usage of the field.

"I can't stand it—I can't stand it," wailed Otto at last, weeping over the remains of an 8 mfd. 450 V. Atom midget dry electrolytic.

"Gosh, Otto," consoled an engineer. "What you worrying about? That condenser is only rated at 450 V. We had to smack it with a surge of almost 700 V. before it went."

"Sure," sobbed Otto. "But I can't stand this business of busting things. It ain't fair to treat

such swell condensers so downright mean. It makes me sick. I—I wanna quit."

And quit Otto did.

'Twas a year before we heard from him again and then he wrote:

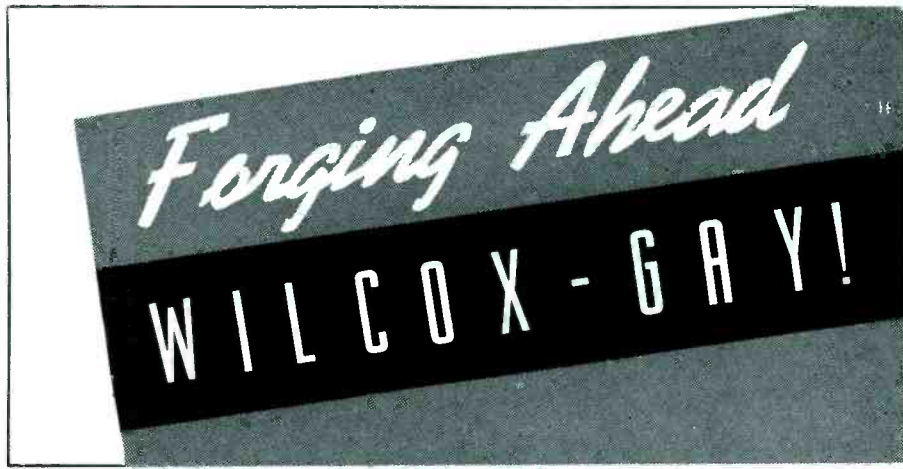
"Dear Boss: Maybe you think I was silly to quit my job, but it just isn't my nature to bust things up. I'd go home nights and dream about condensers on those torture racks—the finest condensers in the world just waiting to be blown up even if it took all the power in Massachusetts to do it.

"But all's well that ends well. I'm in the radio service business and doing fine. I use Sprague Condensers—and boy, are they real! Not a blow-out in a carload. No failures from moisture—or anything else in fact. I realize it's largely because of the work you guys are doing back there in the lab, but I still say blowing up condensers is a helluva job for a sensitive man like me.

Love and Kisses,  
OTTO OOMPH."

★ ★ ★

SPRAGUE PRODUCTS COMPANY  
North Adams, Mass.



## New Test Equipment

Additional information and prices of the equipment described below may be obtained, without obligation, from the respective manufacturers.

### IMPROVED TRACEOMETER

The Hickok Model 155 Traceometer has been improved by the addition of a self-contained speaker, connected for monitoring either the r-f, i-f or a-f channels. Hickok Electrical Instrument Co., 10308 DuPont Ave., Cleveland, Ohio.

### UTC STEADI-VOLT

United Transformer Corp., 150 Varick St., New York City, announces a new type of regulator for maintaining constant voltage for laboratory apparatus, production test and heating equipment, electronic instruments, etc. The output voltage is maintained within 1% accuracy, and there is negligible variation in output voltage from no load to full load, it is said.

### DAVENOIL

The Davenoil Co., 158 Summit St., Newark, N. J., announce a "Superfine" lubricating oil prepared for laboratory test equipment, watches, cameras, microscopes, etc.

# CASE HISTORIES

## CHRYSLER 1940 AERIALS

**Reduced sensitivity:** A number of instances of water leakage, at a point where the antenna rod passes through the upper stanchion, have been reported from the field. Such leakage dampens the connection of the bayonet plug at the top stanchion and, in severe cases, wets the cable itself for a considerable distance.

When this occurs the sensitivity and selectivity of the receiver are seriously impaired, to such an extent that only local stations can be received. This may either occur when the car is exposed to very severe rain or when the car is washed. A very simple corrective measure has been developed for such cases.

A rubber washer should be placed over the prong of the antenna lead cable and the entire top of the lead securely seated in the top stanchion in accordance with antenna installation instructions. As a protective measure, this washer should be inserted as described above on every Chrysler radio installation that comes to you for service.

In extreme cases where the antenna has been exposed to the weather for a long period of time it may be found that some of the internal parts are corroded, in which case it will be necessary to remove the antenna and disassemble the upper stanchion for a thorough cleaning of the metal parts. Before reassembling the rod connecting clips in the upper stanchion, apply a generous portion of lubricant.

When the antenna has been mounted on the cowl a small quantity of household cement, should be puddled around the rod where it enters the upper stanchion. In the event that the hole in the upper stanchion is slightly oversized, place a small amount

of household cement around the rod where it enters the stanchion to seal the opening.

## FORD AND MERCURY PHILCO F1740

**Ignition interference:** If ignition interference persists after the methods usually employed for its elimination have been tried, the following additional operations may prove helpful:

Disconnect the aerial lead from the radio. All ignition interference which is heard is called "Radio Chassis Pickup".

1) Connect a 1-mfd condenser to the terminal on the circuit breaker to which the radio A lead is connected. Fasten the condenser under a bolt on the emergency brake bracket. It is usually necessary to use this in all Mercury installations and only occasionally in Ford installations.

If the noise is caused by the gauges, connect this condenser to the hot terminal of the gas gauge and mount the condenser behind the instrument board. Be sure to shorten the lead as much as possible.

2) Be sure the aerial connector gland nut is tight and the nut makes a good electrical contact between the radio and instrument board.

These operations should eliminate radio chassis pickup.

Connect the aerial lead to the radio.

Several circuit revisions have been made necessary to the RCA Models 9TX31, 9TX32 and 9TX33 when the pilot lamp or line resistor burn out frequently. The revisions include a change in rectifier tube type and pilot lamp number.

All ignition interference which is heard is called "Aerial Pickup".

1) If ignition interference is picked up by the aerial, it is most likely due to a poor ground or complete lack of grounding on the windshield divider strip. In some cases it will be necessary to bond this strip to the instrument board at one end and the roof at the other, although usually a good ground at either end is sufficient.

2) Bond the body to the frame of the car.

3) Bond all rods to the cowl in the motor compartment which connect to the instrument board.

4) It may be necessary to bond the steering column to the dash.

## RCA 9TX31, 9TX32, 9TX33

**Circuit revisions when line resistor or pilot lamp burn out too frequently:** The following circuit modification is suggested on Model 9TX30 series receivers where repeated failure of the line resistor and pilot lamp has occurred:

1) Remove all connections from terminals No. 2 and No. 4 of terminal board and terminals No. 2, No. 5, and No. 6 of 35Z4GT socket.

2) Resolder pilot lamp lead, removed from terminal No. 4 of terminal board, and power lead removed from terminal No. 6 of rectifier socket, to terminal No. 2 of rectifier socket.

3) Resolder pilot lamp lead, removed from terminal No. 6 of rectifier socket, to terminal No. 3 of rectifier socket. Add jumper between No. 5 and No. 3 of rectifier socket.

4) Resolder 0.05-mfd capacitor, removed from terminal No. 6 of rectifier socket, to terminal No. 5 of rectifier socket.

5) Replace jumper between terminal No. 7 of rectifier socket and terminal No. 2 of 35L6GT socket, with an 86-ohm resistor.

6) Replace 35Z4GT rectifier tube with a 35Z5GT rectifier tube.

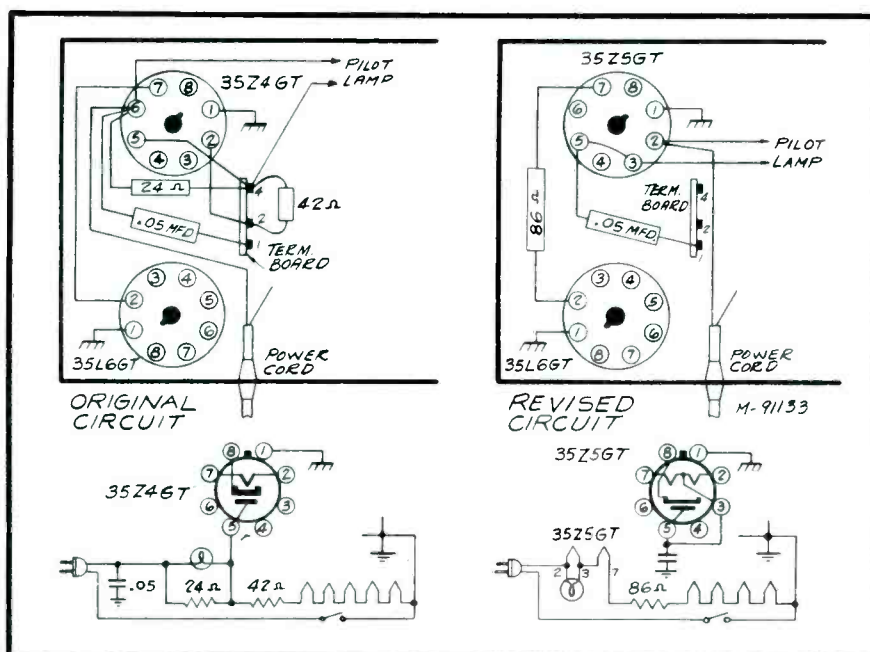
7) Replace No. 47 Mazda pilot lamp with a No. 51 Mazda pilot lamp.

## WELLS GARDNER 9A46-3, 9A46-4

**Dead spots on 13 to 16 meter band:** In some early models of this series, instability of operation on the D bands may be encountered. This condition manifests itself by the fact that the oscillator ceases to operate at the low frequency end of the D or 13-16 meter band.

The condition has been corrected in later production by the addition of an 8-ohm, 0.5-watt carbon resistor connected in series with G1 of the 6SA7 oscillator tube and the 50-mmfid condenser (C29).

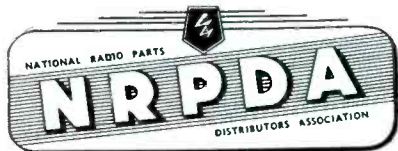
J. K. Rose, Service Manager,  
WELLS-GARDNER & COMPANY.





# PROFIT

## IS THE LIFE BLOOD OF YOUR BUSINESS



*This advertisement is sponsored by the following members of the Eastern Pennsylvania and Maryland chapter.*



Recognizing that no business can long survive without Profit to its owner, the NRPDA has already taken steps to stabilize the Radio Parts Business in order to give you the profits to which you are justly entitled.

It is the pledge of your Association Jobber to interest himself in problems of the Industry as they affect your pocketbook. For example, he desires to eliminate conditions which take away profits that are legitimately yours. He desires to sell you only recognized, advertised brands of radio parts at a price which gives him a normal profit and you the opportunity to make a decent livelihood. He intends to go the limit in removing destructive price competition.

We urge you, for your own protection, to deal with jobbers who display this emblem—"the mark of an ethical merchandiser of advertised brands."

**THE GEORGE D. BARBEY CO.**  
432 Walnut St., Reading, Pa.  
29 E. Vine St., Lancaster, Pa.

**J. R. S. DISTRIBUTORS**  
644 W. Market St., York, Pa.

**RADIO DISTRIBUTING CO.**  
1124-26 Market St., Harrisburg, Pa.

**RADIO ELECTRIC SERVICE CO., INC.**  
7th and Arch Sts., Philadelphia, Pa.  
3145 N. Broad St., Philadelphia, Pa.  
5133 Market St., Philadelphia, Pa.  
811 Federal St., Camden, N. J.  
1042 Hamilton St., Allentown, Pa.  
219 W. 8th St., Wilmington, Del.  
9 N. Second St., Easton, Pa.

**SCRANTON RADIO AND  
TELE. SUPPLY CO.**  
519 Mulberry St., Scranton, Pa.

**EUGENE G. WILE**  
10 S. Tenth St., Philadelphia, Pa.

**ZIMMERMAN WHOLESALERS**  
114 E. Washington St., Hagerstown, Md.  
75 Morgantown St., Uniontown, Pa.  
32 Bedford St., Cumberland, Md.

## BUY NATIONALLY ADVERTISED PRODUCTS

# Simplest

WAY TO REPLACE  
**BALLASTS**

- 4 STANDARD TYPES of Amperite Regulators replace over 200 types of AC-DC Ballast Tubes now in use.
- Not to be confused with ordinary dropping resistors. Amperite actually regulates.
- Amperite Regulators are equipped with a patented Automatic Starting Resistor which prevents initial surge and saves pilot lights.
- Amperite AC-DC Regulators; List \$1.00. Amperite Replacements for 2V Battery Set ballasts ..... List \$1.25

WRITE FOR REPLACEMENT CHART "S"

AMPERITE Co. 561 Broadway, N. Y. C.

## AMPERITE



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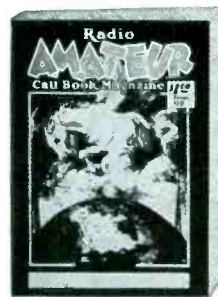
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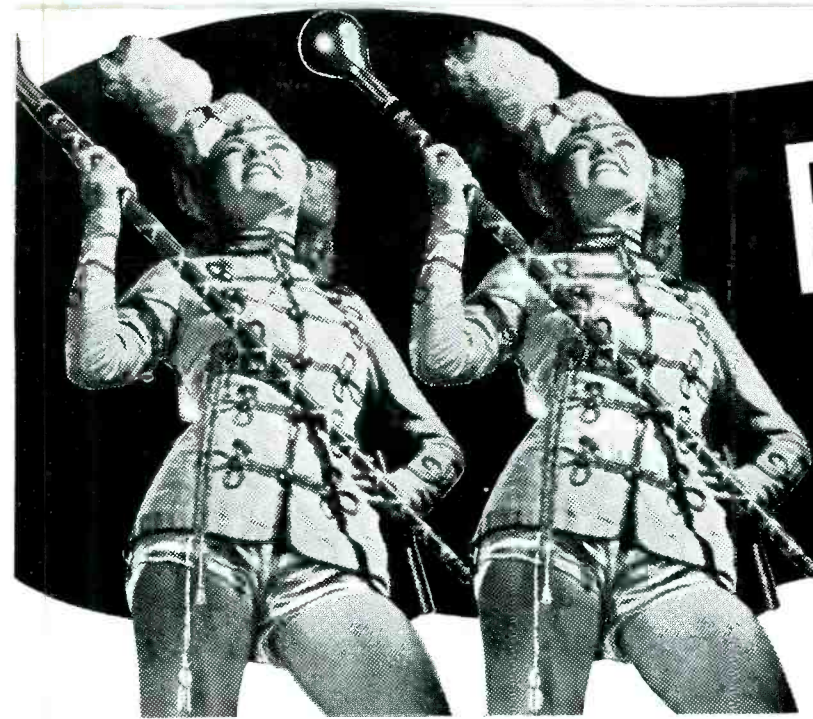
Mr. Van Dyck has served with the Marconi, Westinghouse, and General Electric Companies and is experienced in all aspects of radio-research, development, design, manufacturing and operating. He has taught electrical engineering at Carnegie Institute. He is a member of the Technical Advisory Board of RCA Institutes.

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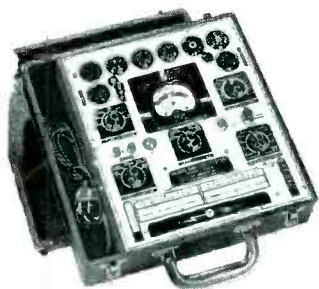
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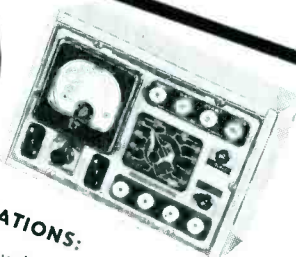
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