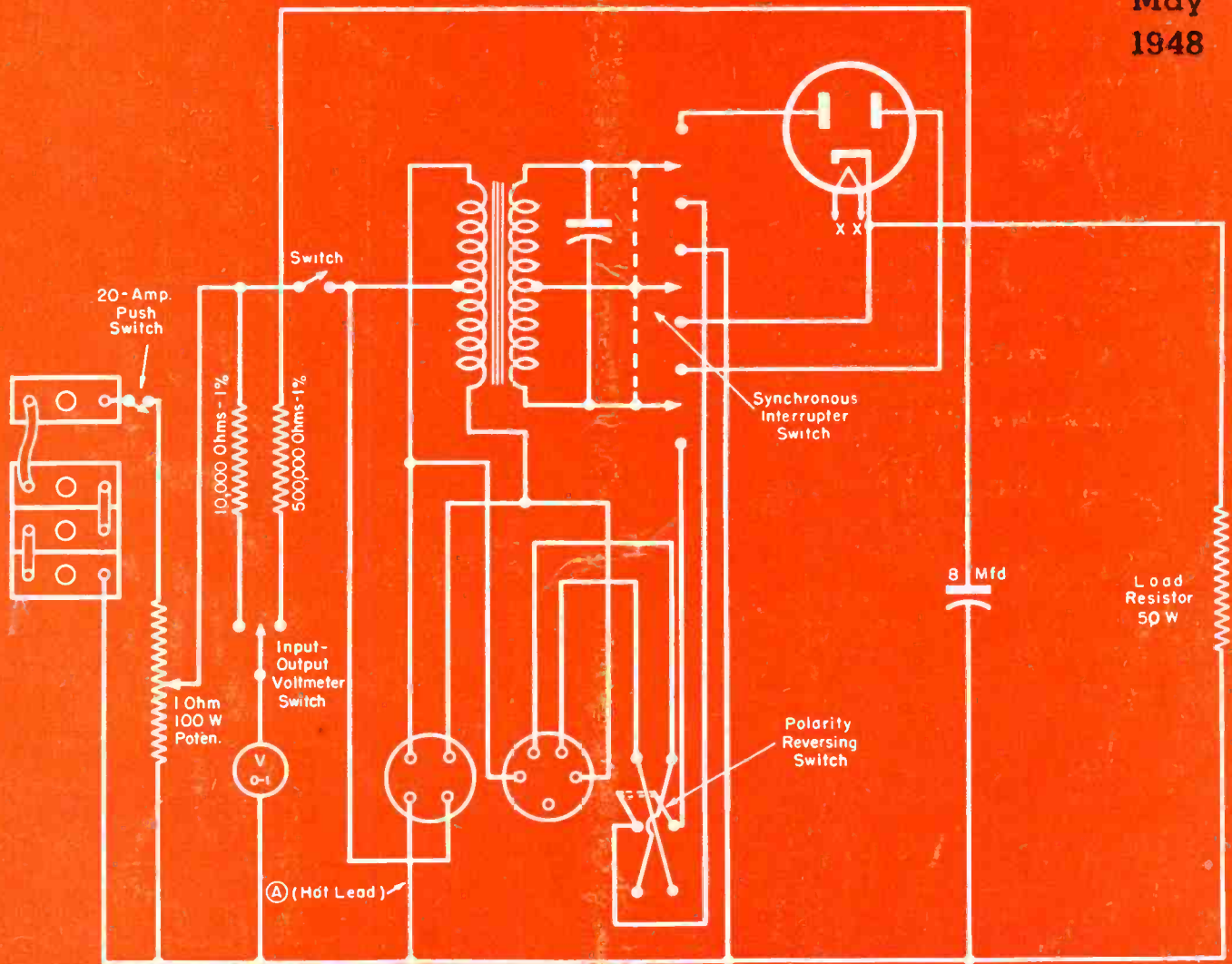


# SERVICE

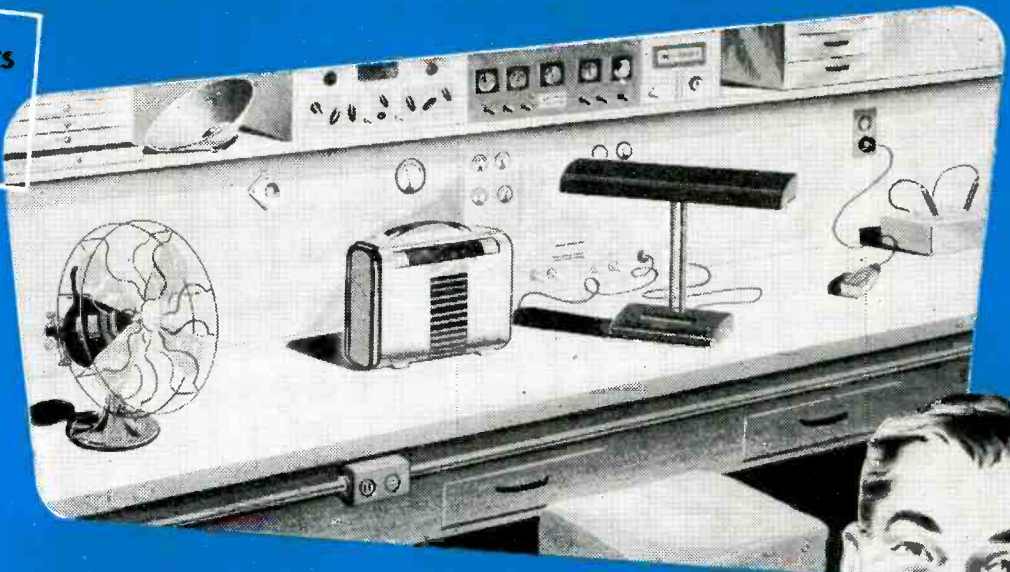
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1948



A vibrator test circuit.

[See page 2]

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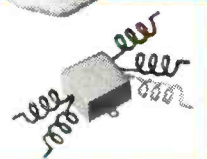
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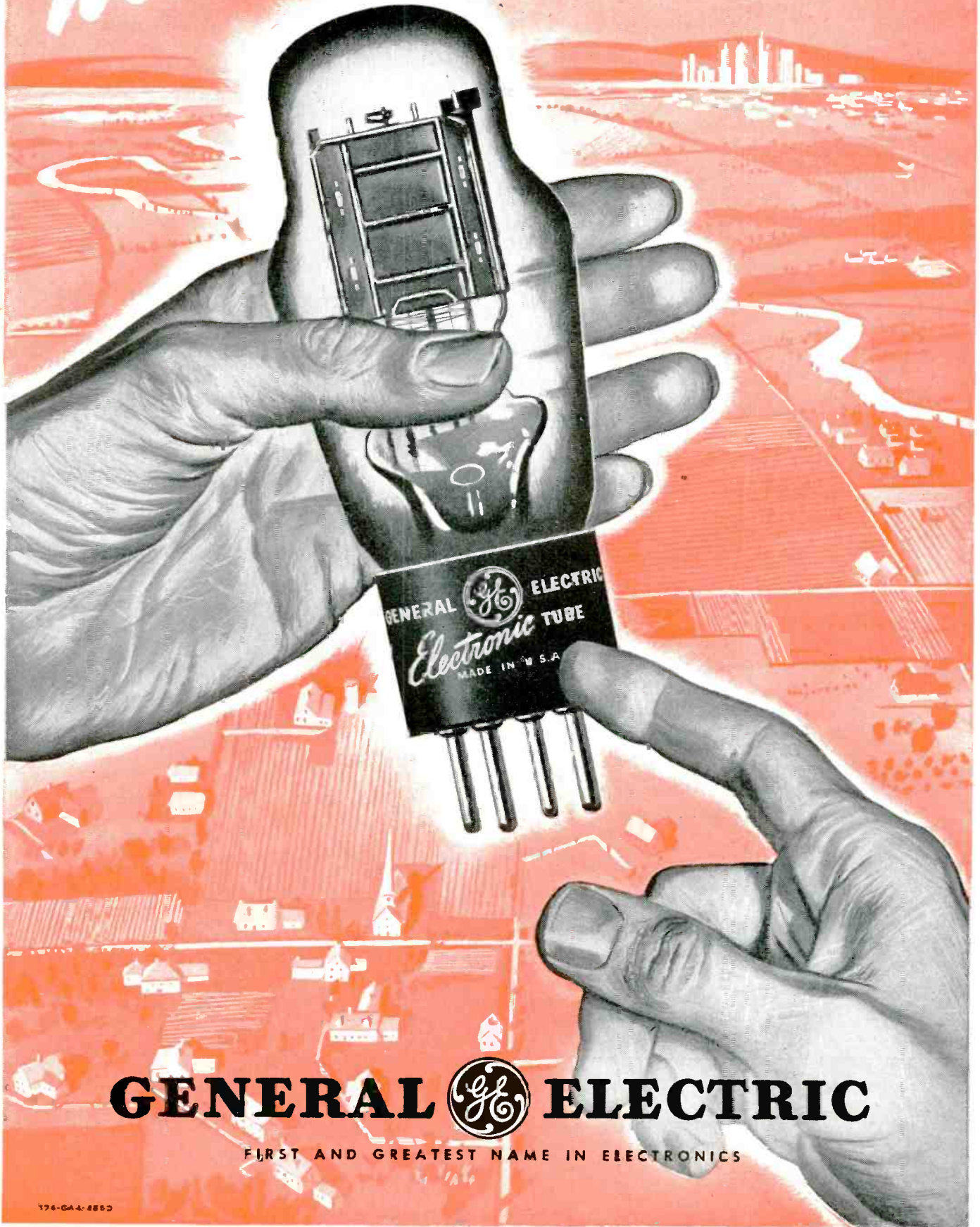
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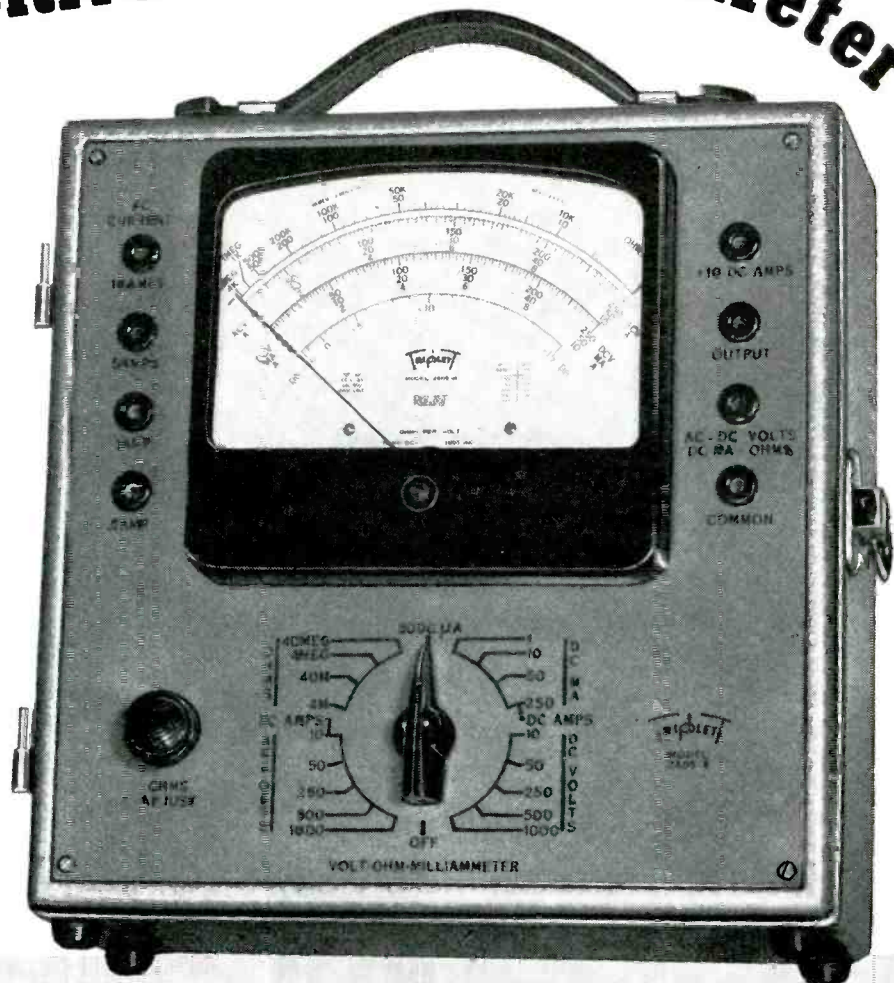
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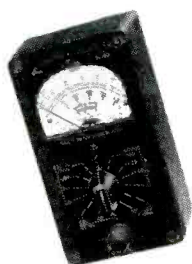
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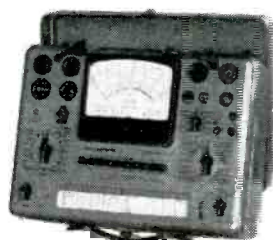


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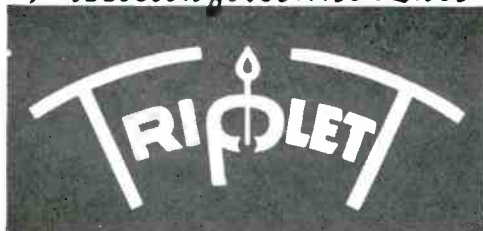
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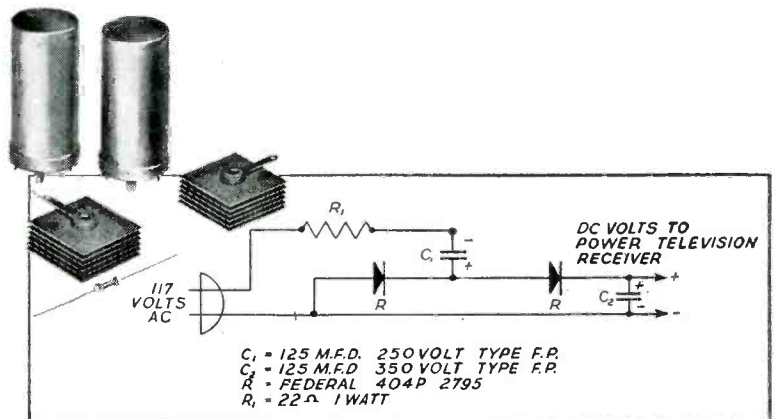


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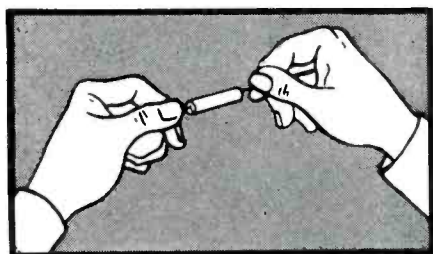
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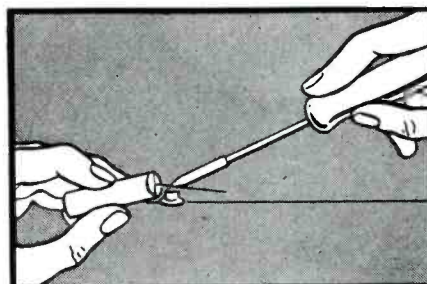
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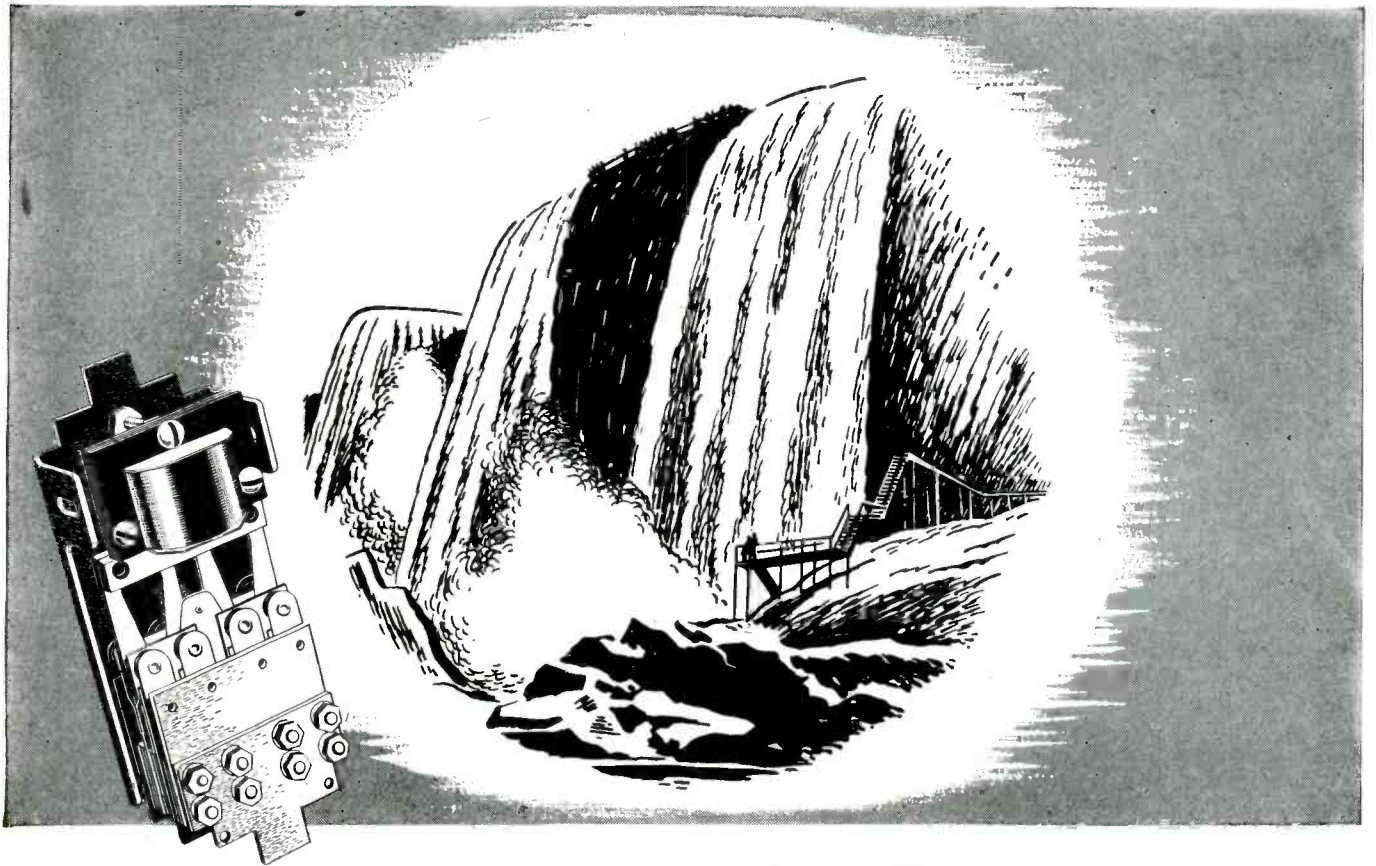
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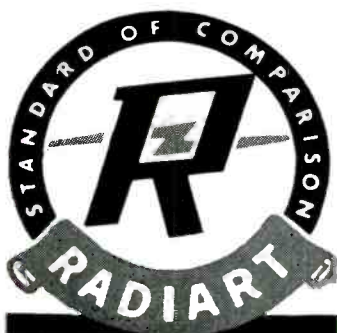
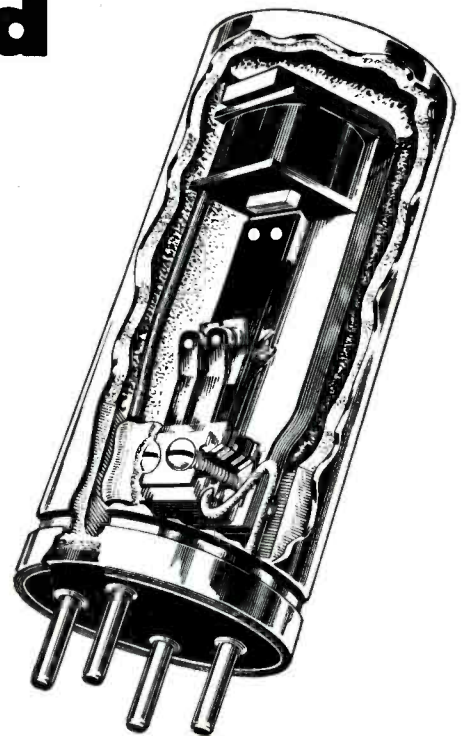




# Power Unveiled

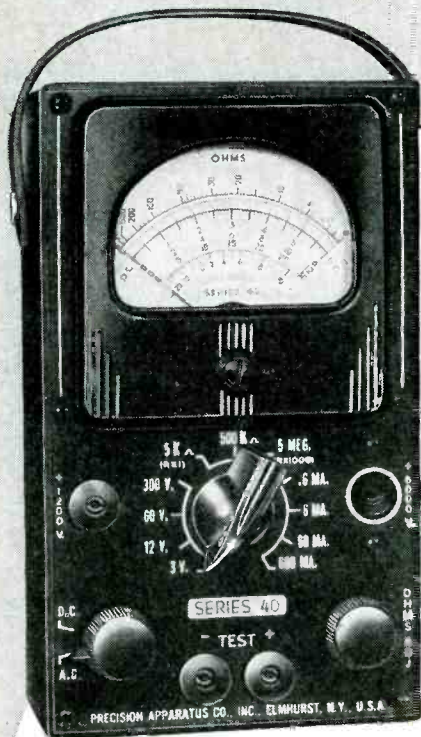
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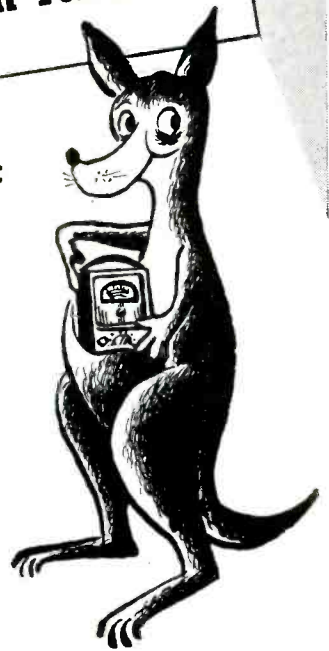
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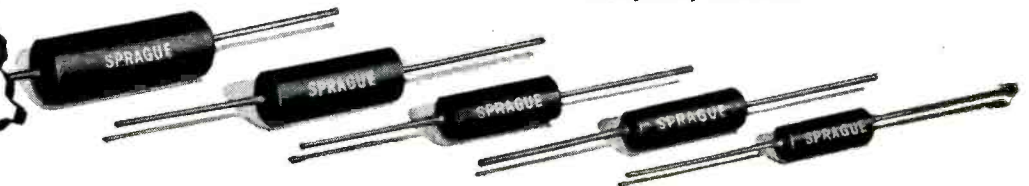
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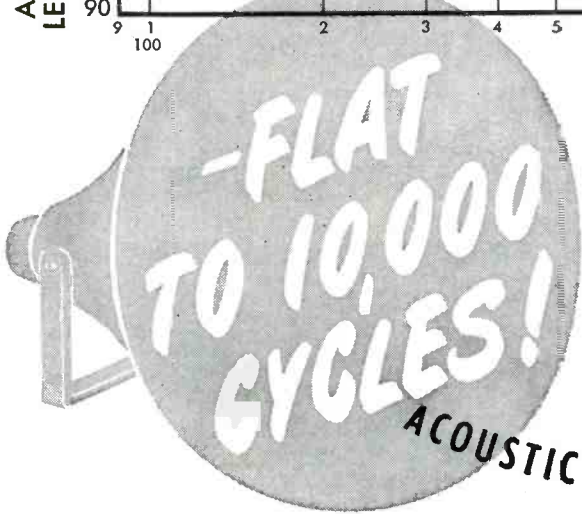
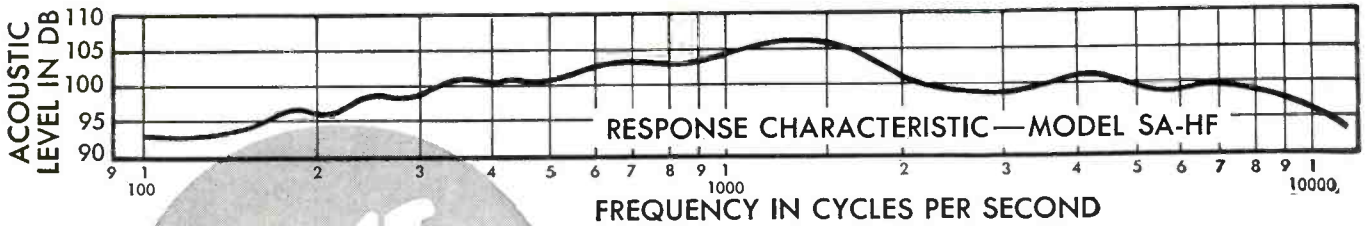
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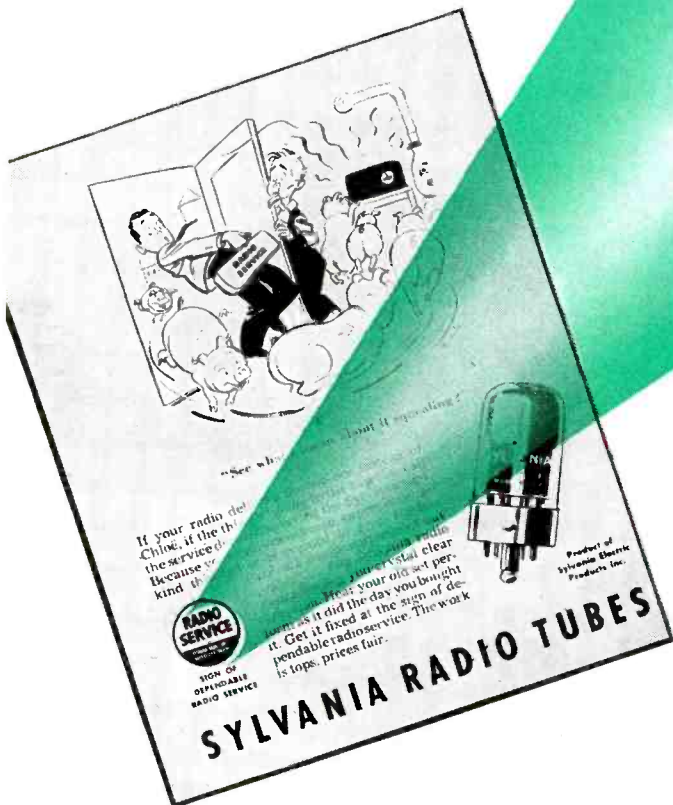
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**SERVICE**

### Auto Radio Servicing

WITH NEARLY 3,000,000 auto receivers in the field and at least a quarter-million more scheduled for installation before the year is out, there's quite an installation-servicing program in store for the Service Man.

Current auto-receiver design is no longer of the static type displayed prior to the war. Many unique circuit features are now used, power supply systems have been considerably revamped and improved, and a variety of new high-efficiency antenna systems devised.

Many Service Men have found that the new circuitry employed in this equipment are based on advanced engineering principles, and require exceptional close study for effective servicing. We've received many requests for analyses of some of these circuits, such as the Delco R705, which features an unusual method of automatic tuning. Accordingly, a comprehensive discussion of this circuit and other advanced auto receiver circuits used today was prepared and appears in this issue. Receivers discussed include the type used in the Oldsmobiles and Buicks and those made by Motorola and Truetone.

Since power-supply systems are major items in auto receivers, coverage on this phase was also planned and three articles were prepared for this issue on vibrator design and application, vibrator power supplies and a vibrator tester. In these discussions will be found a roundup of information on the bases of design of non-sync and sync forms of vibrators, and power supplies which can operate from 110 volts a-c and 6, 12 and 24 volt d-c inputs.

Some very useful auto servicing copy also appears in the *Servicing Helps* pages. Presented are nine types of buffer-capacitor reference circuits, an automobile battery ground chart and a detailed discussion on the use of the 'scope in auto servicing.

A description of high and low-capacity antennas also appears in this array of auto-servicing information.

### TV News

A REPORT ISSUED BY RMA reveals

that tv receivers were installed in 35 cities in 1947 and that about a 25% city-coverage increase is expected in 1948.

Cities listed in the report include Los Angeles and San Francisco, Calif.; Hartford, Conn.; Washington, D.C.; Wilmington, Del.; Miami, Florida; Chicago, Ill.; South Bend, Indiana; Baltimore, Md.; Boston, Mass.; Detroit, Michigan; Minneapolis, Minn.; St. Louis, Missouri; Newark and Trenton, N. J.; Albuquerque, New Mexico; Albany, Buffalo, Long Island, New York, Poughkeepsie, Schenectady, Westchester, N. Y.; Akron, Cincinnati, Cleveland, and Toledo, Ohio; Allentown, Philadelphia and Reading, Pa.; Providence, R. I.; Chattanooga, Tenn.; Dallas, Texas; Richmond, Va.; and Milwaukee, Wis.

Incidentally, at present there are 21 tv stations on the air: WRGB, Schenectady; WNBT, WABD and WCBS-TV, New York City; WPTZ, WFIL-TV and WCAU-TV, Philadelphia; WBAL-TV and WMAR-TV, Baltimore; WTTG, WNBW and WMAL-TV, Washington, D. C.; WLWT, Cincinnati; WEWS, Cleveland; WWJ - TV, Detroit; WBKB and WGN - TV, Chicago; WTMJ - TV, Milwaukee; KSD-TV, St. Louis; KSTP - TV, St. Paul, and KTLA, Los Angeles.

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### In This Issue

**TV.** Photo-story on what tools to use and how in installing tv antennas today; *page 14*. An analysis of aluminum-backed tv picture tubes appears on *page 34*.

**Management.** How to build sales with effective window settings; *page 35*.

**Tube News.** Tubes used in a-c/d-c a-m/f-m receivers, and how to use rectifiers properly in a-c/d-c receivers; *page 34*.

**Test Equipment.** A vibrator tester; *page 37*. Use of the 'scope in auto set testing; *page 26*.

**Auto Servicing.** Five timely articles on receivers (*page 20*); vibrator design and application (*page 30*); vibrator power supplies (*page 32*); auto service helps (*page 24*) and test equipment (*page 37*).

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And seventy-three more, who now have construction permits will probably be on the air before the year is out. In addition, 191 tv station applications are pending.

### Town Meetings

THE SECOND Town Meeting of Technicians has now been definitely scheduled for New York next fall. The meeting will be similar to the Philadelphia session, but will be particularly concerned with tv servicing.

At the conclusion of the New York meeting, dates will be set for meetings in Boston, Los Angeles, Chicago and Atlanta.

Watch for these all-important dates in SERVICE.

### Trend?

WE'VE RECEIVED a clipping from Frank H. Cross of Bakersfield, California, which merits careful study. The clipping shows a pair of Service Shop advertisements, side by side, with one advertisement stating: "\$3.50 plus cost of materials, will repair your table model radio regardless of make. . . . RMA 90-day guarantee." The other advertising message reads: "\$2.50 plus parts, will repair any table model radio *regardless of condition* . . . 3 months' guarantee . . . 2-day service . . . pickup and delivery."

Quite a combination of claims, which we don't believe add up to a very wise display of Service Shop merchandising. We hope it's not a trend!

### Next Month

THE ANNUAL SOUND ISSUE, next month, will include articles on electronic megaphones and their use in p-a-work; intercomm systems; audio test instruments; home-movie sound systems; repairing of wire recorders; microphone amplifiers; sound distribution systems for clubs, small hotels, etc.; electronic dictating machines; highlights of the latest in sound equipment, etc. It will be quite an issue which we believe you'll find a handy one to have around.—L. W.



Fig. 3. At left, appears a hole being made with an electric drill, and at right, a hole being made with a star drill and hammer.

Fig. 2. Making a hole in a brick wall with a rawl tool to facilitate drilling larger hole with an electric or star drill. Note the use of gloves to protect the hands and also keep them clean.



# TV Antenna- Installation Tools

## Basic Tools Required . . . Application of the Correct Tools for Specific Types of Installations.

SUCCESSFUL TV ANTENNA can only be completed by those who are well principled *mechanically*.

Applying the proper *know how* with the correct working tools, it is possible to install a tv antenna at low cost and still maintain high mechanical standards.

There are twenty working tools which are normally required; Fig. 1. These include:

- (1a) Electric drill (slow speed) for  $\frac{1}{2}$ " masonry (tungsten carbide) drill bit.
- (1b) Electric drill (high speed) for  $\frac{1}{4}$ " drill bit.
- (2)  $\frac{1}{2}$ " Star drill.
- (3) Hand tools (hammer, etc.)
- (4)  $\frac{1}{4}$ -20 Ackerman-Johnson lead expansion sleeves.
- (5) Ackerman-Johnson tool.
- (6) Antenna mast and ground clamps.
- (7) Soldering iron and rosin core solder.
- (8) Phosphor bronze guy wire and porcelain insulators.
- (9)  $\frac{1}{4}$ " bolts (galvanized or brass).
- (10) Coaxial cable.
- (11) 300-ohm twin lead.
- (12) Rawl plugs.
- (13) Rawl tool.
- (14) Nailit knobs.

by **IRA KAMEN**

Commercial Radio Sound Corp.  
New York City

- (15) Insulated screw eyes.
- (16) Wood brace and wood bit.
- (17) Tacks and staples.
- (18) Hack saw.
- (19) Friction and rubber tape.

The selection of these tools is based upon the specific type of roof involved in the installation; brick, wood, tile or slate. In addition, each location has its own problem and installation technique. Prior to making the installation, two factors must be considered.

First, it is necessary to conduct tests at the location where it is most practicable to mount the antenna. For example, in an apartment house, we have the parapet of the roof or elevator house structure where the antenna can be most easily fastened by the use of bracket supports.

In a private home, the brick chimney is the preferred location.

In the second instance, we have signal-area problem. In strong signal

areas, where the installation is in a private home and the private home has a slate roof, serious consideration should be given to installing the antenna in the attic, rather than defacing the customer's property. The losses in this type of installation are, of course, dependent upon the dielectric characteristic of the roof structure. Slate, wood and brick have proved to be relatively low-loss materials. Where it is believed that the television signal loss will be somewhat excessive due to indoor antenna installation, a higher gain antenna should be considered for installation within the confined space of the attic. The main deficiency of attic installations is that a snow drift or ice formation on the roof may seriously attenuate the tv signals until the snow and ice are cleared away.

### Using the Tools

*Electric drill with masonry bit:* When making an installation<sup>1</sup> in a brick structure, the holes to be drilled for the antenna bracket support should



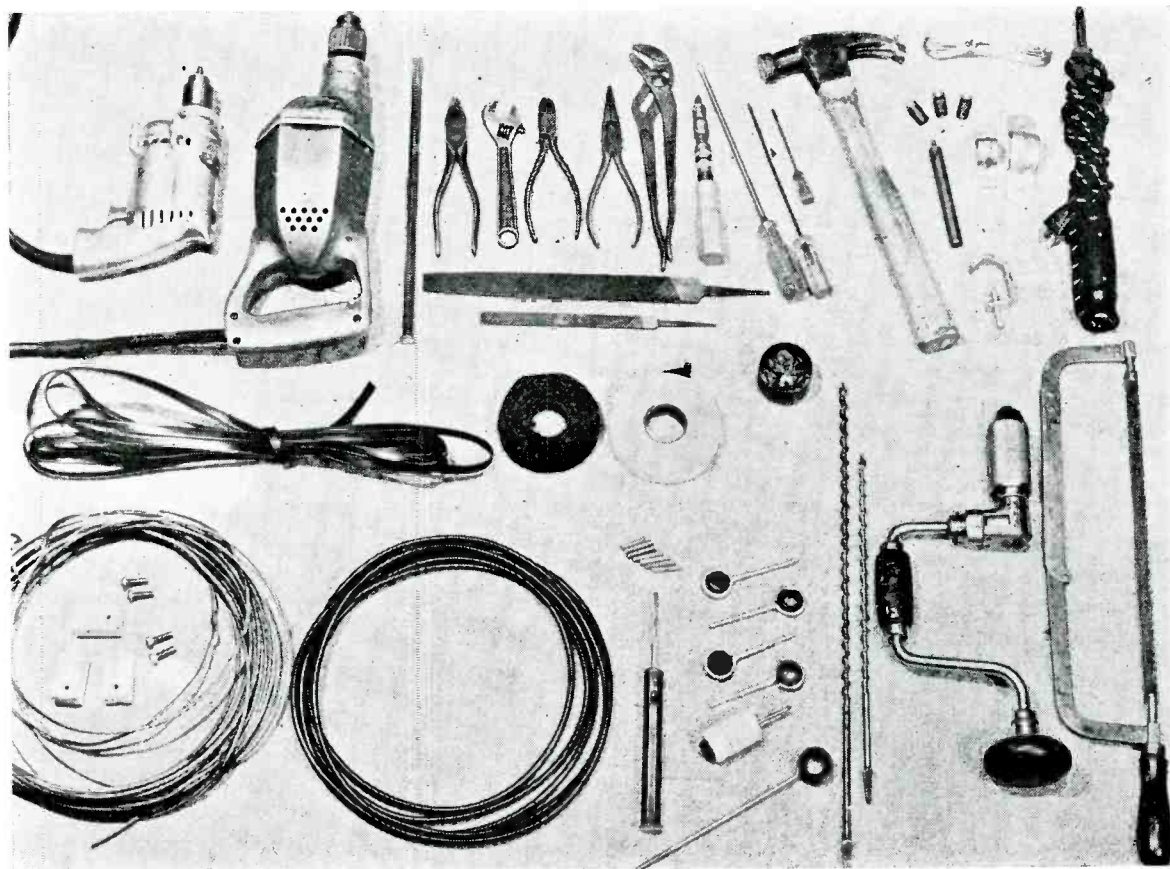


Fig. 1. Assortment of typical working tools used for tv antenna installation.

be drilled into the brick and not into the cement between the bricks (brick, of course, drills much harder than cement). Drilling into the cement will result in water leaks, and the subsequent expansion weakens this joint and finally the brackets pull free.

In using the electric drill at least a 100' extension cord should be available, so that it will be possible to use power outlets which, in many cases, are a floor below the roof level in a stairwell. To increase the life of the masonry drill bit, the hole in the brick should be drilled carefully, so that the heat of the drill bit does not reach a level where the temper of the bit is affected. The best way to save this expensive bit is to first make the hole with the rawl tool; Fig. 2. When this hole is drilled with the masonry bit it works easily and fast without overheating.

When electrical power is not available, a Star drill can be used to make the necessary holes. Experience at turning and hammering the Star drill will enable the installation man to make holes comparable to the electric drill bit, but the work will always be slower and rougher with the mechanical tool; Fig. 3.

When the hole is made, a 1/4-20 Ackerman-Johnson lead expansion fit-

ting should be inserted into the drilled hole; Fig. 4.

Then the Ackerman-Johnson tool should be applied and the lead expansion sleeve of the fitting hammered so that it becomes imbedded in the hole; Fig. 5. Experience at using the Ackerman-Johnson tool and the hammer will soon tell the user how much power he must apply to the hammer.

After the Ackerman-Johnson fittings are installed in the brick, the antenna mast clamps can be mounted with 1/4" bolts and the antenna pipe inserted through the clamps which should be designed to fit the masts. The mast can be finally held in place by tightening the 1/4" bolts on the clamps. Rubber tape can be used as a gasket between the clamp and the mast to assure a snug fit. The clamps may be fastened to a bracket where additional

<sup>1</sup>On all apartment-house installations, where the antenna must be located in the center of the roof, no attempt should ever be made to drill into the roof itself. A weighted or wide platform should be used to support the antenna base, the mast guyed to the parapet or fixed roof structures, with phosphor-bronze wire and porcelain insulators.

clearance is necessary; Figs. 6 and 12.

If it is necessary to extend the antenna mast, consideration should be given to the longevity of the installation. Aluminum conduit masts cost very little more than steel masts and have a much higher resistance to corrosion. All steel or aluminum antenna masts should be grounded by means of bus wire and ground clamp to a water pipe, or some other suitable earth ground, usually found at roof top level in apartment houses. This ground connection affords lightning protection.

The coaxial cable or twin-lead transmission lines must be properly supported in a permanent type installation. Some manufacturers who use twin-lead lines furnish their antennas with insulated supports attached to the antenna mast; Fig. 7. These insulated supports are essential to line balance and therefore the transmission line runs between the antenna terminals and the base of the antenna mast are fully supported. Other antenna suppliers whose units match coaxial cable also provide supports on the mast to protect the coaxial lead connections at the antenna terminals from being loaded mechanically by the weight of the coaxial cable. Friction tape can be used to fasten coaxial cable to the



Fig. 4 (above). A lead expansion fitting inserted into hole made by a star drill. The surface flaking around hole is common when the star drill is used to make holes in aged brick.

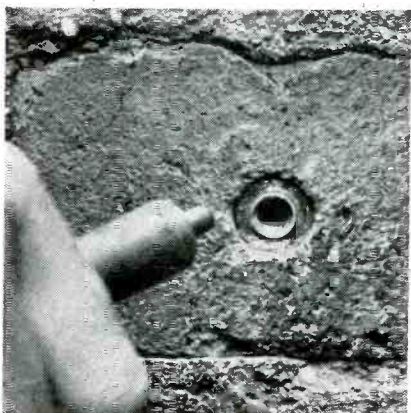


Fig. 5. A lead expansion fitting imbedded in brick by hitting a special tool which spreads the lead.

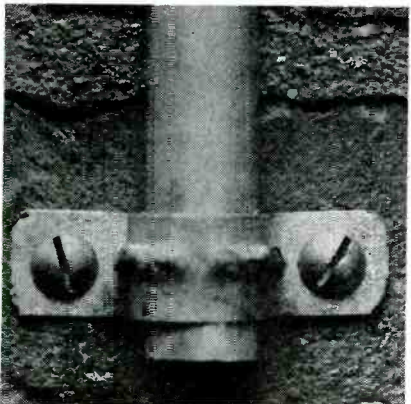


Fig. 6. Mast clamp which supports antenna pipe. This is fastened on two sides with 1/4" brass screws which fit into the threaded insert of the lead expansion fitting.

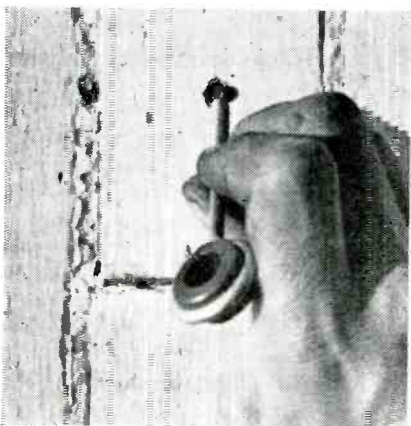


Fig. 8 (left.) Fitting insulated screw eye into rawl plug center.

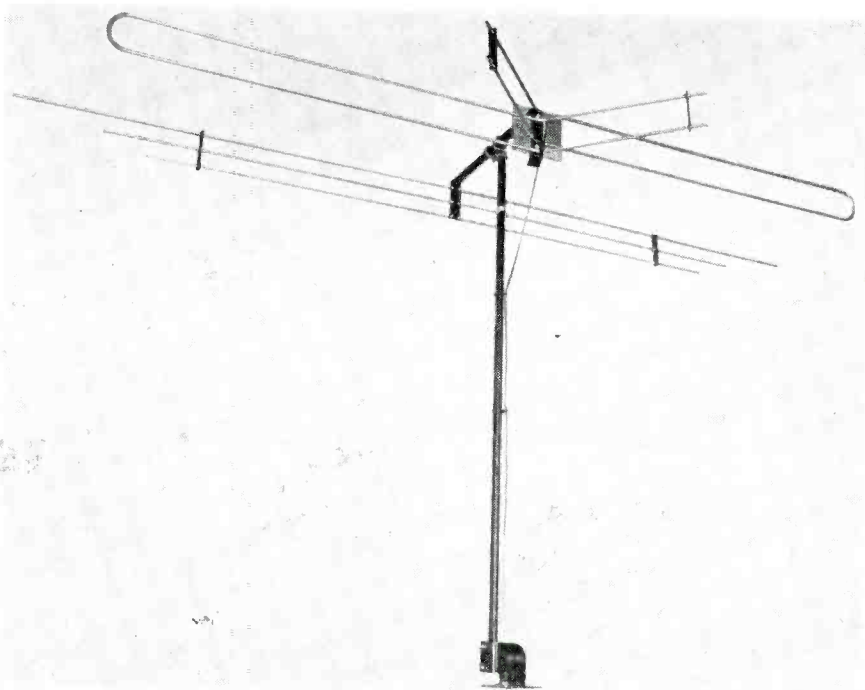


Fig. 7. A tv antenna with guide fittings to support transmission line. (Courtesy L. S. Brach Mfg. Corp.)

antenna mast where no fittings are provided.

Antenna connections made by means of soldering coax or twin lead to terminal lugs should be soldered with rosin core solder only and the flux residue carefully wiped away with *carbon tet* or alcohol. Incidentally, these connections combine a number of dissimilar materials which can develop the *battery effect* in the presence of moisture and salt air. For example, the brass screw of the antenna terminal may be connected to the transmission line by a cadmium plated steel lug which is soldered to the copper wire of the transmission line with solder which is composed of lead and tin. To protect this joint from corrosion, a thick coating of lacquer or glyptal should be applied to the mechanical and soldered joint after it is cleaned. This protective coating seals the connection and precludes electrolytic action at the terminal connections.

One of the services which can be offered by Service Men to their customers is a semi-yearly or yearly check-up of the antenna installation, whereby all fittings and joints are carefully checked, cleaned and recoated with lacquer to reestablish and maintain the efficiency of the installation.

The coaxial cable or twin lead may be guided along the roof structure by means of nailit knobs or insulated screw eyes which are installed in brick

structures in the following manner:

(a) A hole is pierced in the brick for rawl plug with the rawl tool, working the tool by hand and hammer (Fig. 2) until sufficient depth is obtained.

(b) The rawl plug is then inserted into the hole.

(c) Nailit knob is pushed or insulated screw eye twisted into rawl plug center; Fig. 8.

(d) Coaxial cable is then fitted through nailit knob and pushed down tight. In the case of the insulated screw eyes the coaxial cable or twin lead is pulled through the applicable fitting, as shown in Fig. 9.

The coaxial cable or twin lead from the antenna may be supported by nailit knobs or insulated screw eyes until it enters the living-room window. A hole should be drilled through window for cable. If hole is drilled through wood, applicable bit must be used for wood brace, if it is not practical to use the high speed electric drill. In drilling it is important that the hole be drilled from inside outward and at a downward angle. The downward angle prevents rain from running in living room. The holes should be caulked after the cable is passed through with caulking compound. The hacksaw is helpful in removing small sections of steel sills which cannot be easily drilled.

(In installation work it is extremely important that personal tidiness rules be enforced. For instance, in wet weather, rubbers should be removed before entering the customer's house, for

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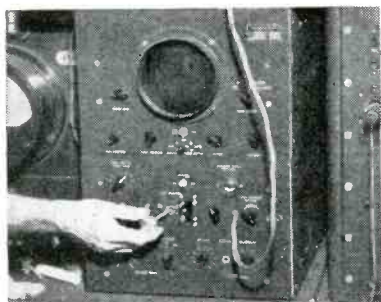
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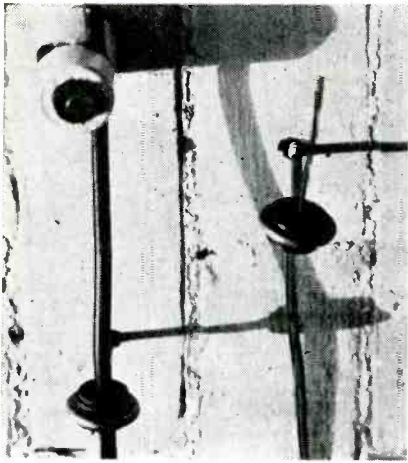


Fig. 9. Three transmission line guides. The nailit knob (upper right) requires an additional stub of cable to balance its dual cable grooves.



Fig. 10. Entering the home with clothes tidied up, hands clean and all grime removed from shoes.

Fig. 11. Tacking transmission line to baseboard. Note that the tool box rests on a protective cloth. Incidentally, small tack hammer is preferred over the heavy work hammer shown in this illustration.



the inside part of the installation job. All the good outside work will not be appreciated unless the installer establishes satisfactory customer relations by his clean appearance, good manners and care in not defacing his customer's property. Hands should be cleaned before working inside the house. Several dry hand-cleaning compounds are available, and it is thus unnecessary to use the customer's washroom and towels, which is an imposition.)

In tacking or stapling the transmission line or coaxial cable to the baseboard of the living room (Fig. 11), between the window where the cable entered and the television receiver, the Service Man should be extremely careful and perform a clean and neat job.

### Special Installations

It is not practical to mount antennas on tile roofs and therefore standoff supports must be used for side mounting; Fig. 12.

The most difficult type of installation is on a hard-surfaced shingle roof such as slate. The problem can be overcome with a special cast aluminum antenna mount which fits any 1" diameter antenna mast and can be custom-fitted to the apex or the sloping side of the roof; Figs. 13 and 14.

When installing an antenna mount to a slate roof, the following precautions should be taken:

Never use a centertap to locate drill holes. Slate is easily drilled and requires no starting point.

Light pressure should be used on drill, holding it steadily and firmly at all times.

Seal lube should be poured into all holes and all screws fully coated before engaging.

When no moulding is available on the roof peak two wood dowels or wood supports 2" x 1" x 6" should be fastened on roof peak. The wood supports should be secured on both sides of slope, exactly at the height necessary to support the platform; Figs. 1, 2 and 14.

Platform should be rested carefully on wood supports to preclude chipping of shingles. The platform should be adjusted and kept level.

Anchor arm (Figs. 4 and 14) should be secured with brace arms (Figs. 3 and 14) to shingle with cork gasket under the anchor arm to avoid fracturing the shingle when tightening. It is preferable to install the bolts completely through the roof when possible,

(Continued on page 40)

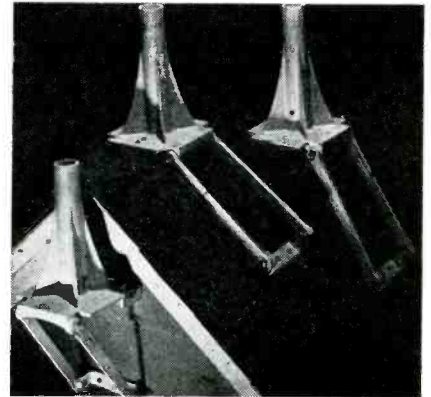


Fig. 13. Antenna mounts installed on peak and side of roof. (Courtesy Shur-Antenna-Mount, Inc.)

Fig. 12. A tile roof installation: A, watertight fitting; B, 7/8" rigid steel tubular mast; C, length of bracket determined from clearance necessary to keep antenna mast from hitting tile; D, guys or supports should not be placed on tile roof; E, brick wall; F, coaxial cable.

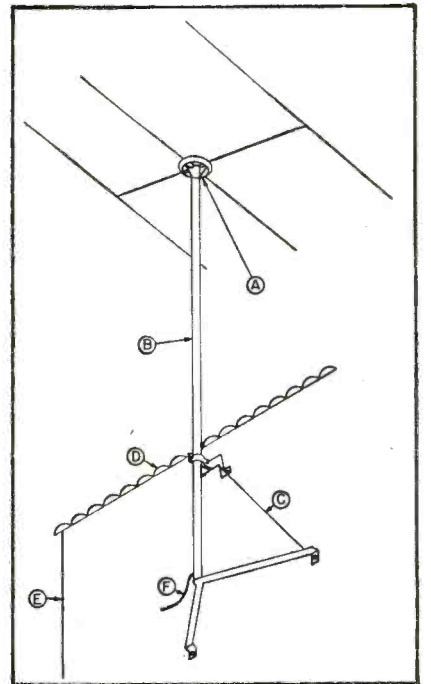
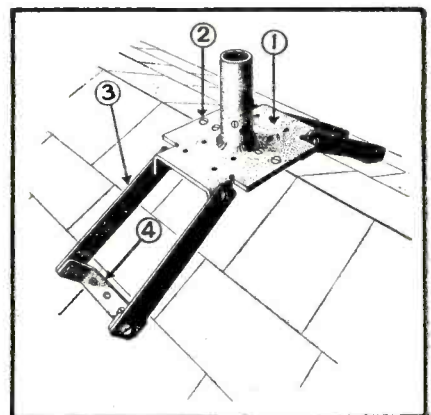


Fig. 14. Diagram of an antenna mount on a roof peak.





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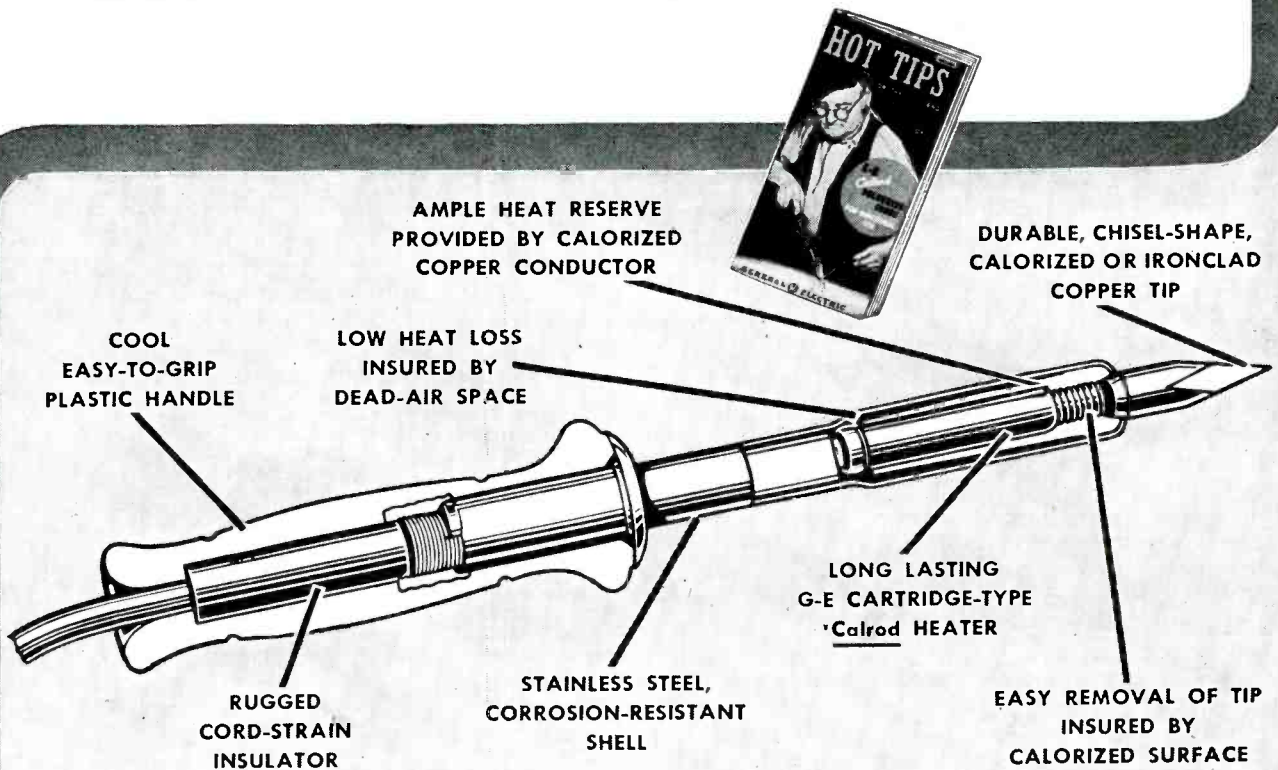
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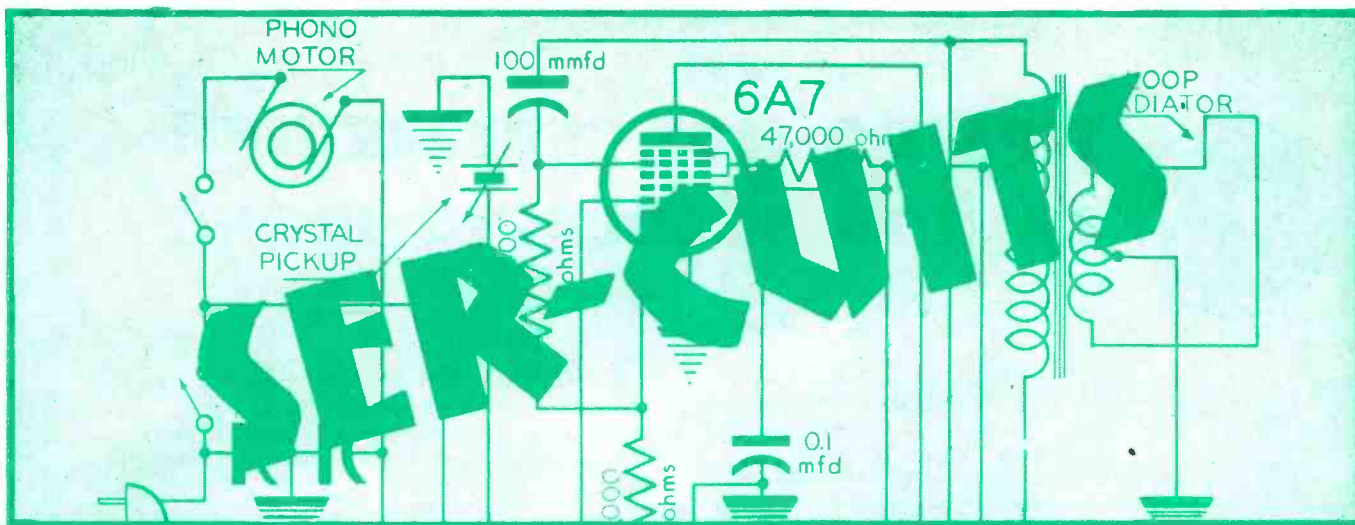
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# GENERAL ELECTRIC

109-04



## Detailed Analysis of Delco R-705 Automatic Station Selector System . . . Circuit Features of Oldsmobiles '46 and '47 Auto Sets, Motorola 508, Truetone D4630 and Buick Receivers . . . Crystal-Controlled Signal Generator

AUTO RECEIVERS, developed for the 1946, '47 and '48 cars, include many interesting design features. The Delco R-705 eight-tube receiver, for instance, employs a novel automatic station-selection system, the *electro-tuner*; Fig. 1.

Automatic tuning is accomplished by electronically controlling a motor-driven permeability tuned tuner. Rectified voltage from the received signal actuates a 6SN7 which, in turn, instantaneously operates a relay and a solenoid switch disconnecting the motor and stopping the tuner on the frequency of the station.

### Tuner Sweep Action

The tuner sweeps the broadcast band first in one direction and then in the other. To do this, the tuner driving motor is reversed at each end of the broadcast band. The tuner sliding mechanism trips a reversing switch each time the tuner reaches the end of its movement. This switch alternately grounds opposite end of the motor's center-tapped field coil.

The nature of the circuit is such that unless prevented the tuner would hunt for a broadcast signal after the receiver is turned on until the set is warmed up and stations can be received. This would cause additional wear on the motor and would cause a change in stations when a change might not be desired. A mechanical interlock switch prevents this hunting

when the set is turned on. This is done by keeping the motor circuit open when the receiver is turned on until the tuning control is operated. When the tuning control is operated for the first time after the receiver is turned on the interlock switch is closed, and remains closed until the set is turned off, which causes the switch to open. The interlock switch then remains open until the radio is turned on and the tuning control button is depressed.

### Detailed Analysis of Circuit

The heart of the tuner is the 6SN7 twin triode. With a signal being received, plate current flows in the relay section of the 6SN7 and through the coil of the relay switch, holding the relay switch contact in the position shown in Fig. 1. In this position the muting voltage is grounded and audio reaches the speaker. The solenoid coil circuit is open and the motor is not engaged. Thus the motor circuit contacts of the solenoid switch are open, and the 6SN7 d-c amplifier plate circuit contacts of the solenoid switch are also open.

The electro-tuner is actuated by momentarily depressing the tuning knob, thereby setting off a chain of events which happen almost simultaneously. First, the tuning control switch, ganged to the tuning knob, is closed when the tuning knob is depressed, thereby

grounding the grid of the relay section of the 6SN7 tube which stops the plate current flow in the relay section.

With no current flowing through the coil of the relay switch, the spring loaded contact arm of this switch opens, which permits approximately —10 volts to be applied to the grid of the first audio tube, silencing the receiver.

With the solenoid coil circuit grounded at the relay switch contact, the solenoid coil is energized, pulling plunger into the coil which mechanically engages the motor clutch, closes the motor circuit contacts of the solenoid switch which starts the motor driving the tuner, and closes the d-c amplifier plate circuit contacts of the solenoid, connecting the plate of the d-c amplifier section to the grid in the relay section of the 6SN7.

### Rectified Voltage Polarity

As the motor drives the tuner away from the received signal, the rectified voltage supplied from the detector stage to the grid of the d-c amplifier section of the 6SN7 disappears. This rectified voltage is negative in polarity with respect to the cathode voltage and is picked up from the detected signal at the input of the volume control in the detector stage through a potentiometer (sensitivity adjuster). The removal of this negative voltage from the grid of the d-c amplifier sec-

tion of the 6SN7 drives it well above the cutoff voltage.

Second, the tuning control switch is opened when the tuning knob is released. This removes the ground from the grid of the relay section of the 6SN7 and allows voltage to reach the plate of the d-c amplifier section.

### Plate Current Flow

Plate current then flows in the d-c amplifier section since the grid of the d-c amplifier is well above the cutoff voltage.

The plate current flows through a 220,000-ohm resistor and the resultant voltage drop keeps the grid of the relay section of the 6SN7 biased below cutoff, and current does not flow in the relay section.

The motor continues driving the tuning mechanism across the broadcast frequencies and control of the motor and clutch is transferred from the tuning control switch to the d-c amplifier section of the 6SN7, so that the tuner will stop on the first station with sufficient signal strength.

The tuner is stopped by and on the first station of sufficient signal strength with another chain of events that are almost simultaneous.

As the tuning mechanism sweeps into a receivable signal the rectified signal appears across the sensitivity adjuster.

### D-C Amplifier Biasing

A portion of this rectified voltage is applied to the grid of the d-c amplifier. Since this voltage is negative with respect to the cathode the d-c amplifier is biased near cutoff, which reduces the plate current flow in this section. This low current reduces the voltage drop across the 220,000 ohm resistor allowing the grid of the relay section to rise above cutoff. The relay section of the 6SN7 then starts conducting.

As the relay section of the 6SN7 starts conducting, it actuates the relay switch coil and pulls the contact arm back to the position shown in the diagram.

The muting voltage is thus removed from the audio circuit by grounding it through the contact arm of the relay switch.

The solenoid circuit opens, thus de-energizing the solenoid, and the motor

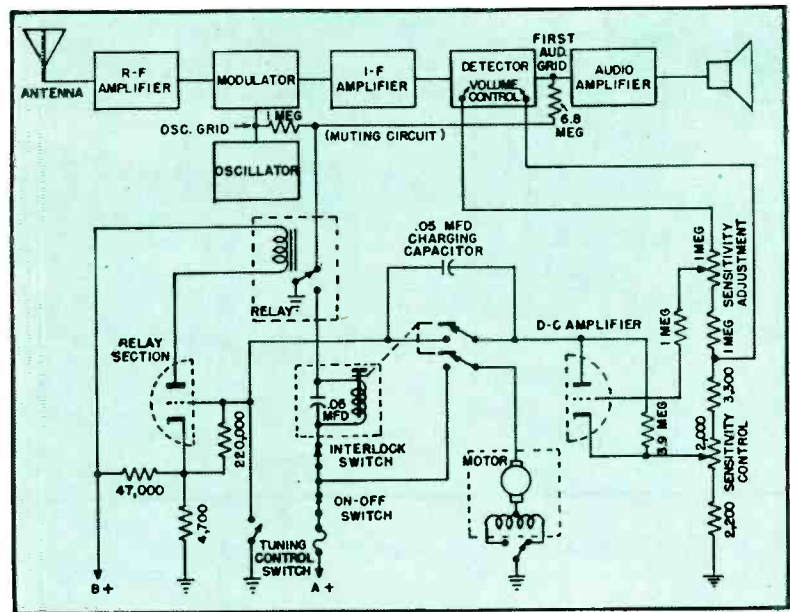


Fig. 1. Operational circuit of the electro-tuner used in the Delco auto receiver, model R-705.

is mechanically declutched stopping the tuning mechanism on the received signal, the motor circuit contacts of the solenoid switch are opened stopping the motor, and the 6SN7 d-c amplifier plate contacts are opened removing the d-c amplifier from the control circuit.

### Sensitivity Control

The sensitivity control is a continuously variable potentiometer located on the steering column control unit.

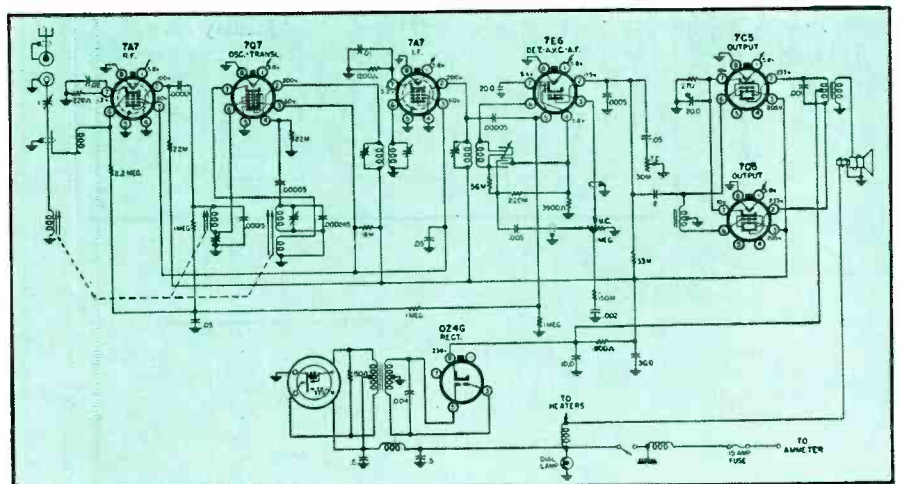
The control is located in the cathode circuit of the 6SQ7 detector tube. When the potentiometer arm is in the

position nearest ground, the cathode of the d-c amplifier section of the 6SN7 has the lowest possible applied cathode voltage. This means that the relative potential between the cathode and the grid of the d-c amplifier is a minimum resulting in maximum plate current flow in this section.

### Control Operation

To analyze, let us assume that the plate current in the d-c amplifier section becomes low enough to stop the tuner when the d-c amplifier grid is two volts below the cathode. When the tuner is sweeping between stations and no signal is being received the grid of the d-c amplifier is ap-

Fig. 2. Oldsmobile 1946-1947 auto receiver; model 982375.



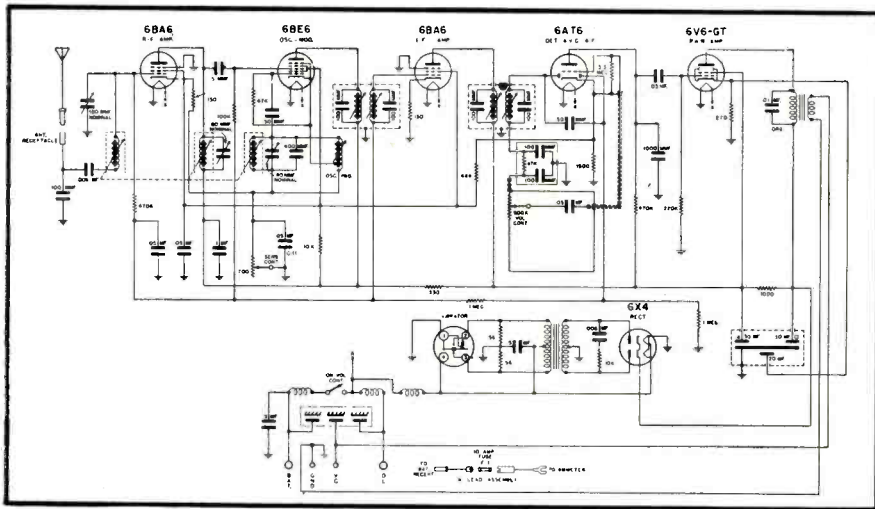


Fig. 3. Motorola, model 508, auto receiver.

proximately +12 volts, and the cathode is approximately +7 volts when the sensitivity control is adjusted to the maximum voltage position. Voltage differential from cathode to grid is now +5 volts. To stop the tuner a rectified signal voltage of -7 is required, which drives the grid two volts below the cathode.

If the sensitivity control is at the minimum voltage position with no signal the d-c amplifier grid is again +12 volts and the cathode is approximately +4 volts, making the differential from cathode to grid +8 volts. Thus, to stop the tuner a rectified signal voltage of -10 is necessary.

#### Signal Strength Conditions

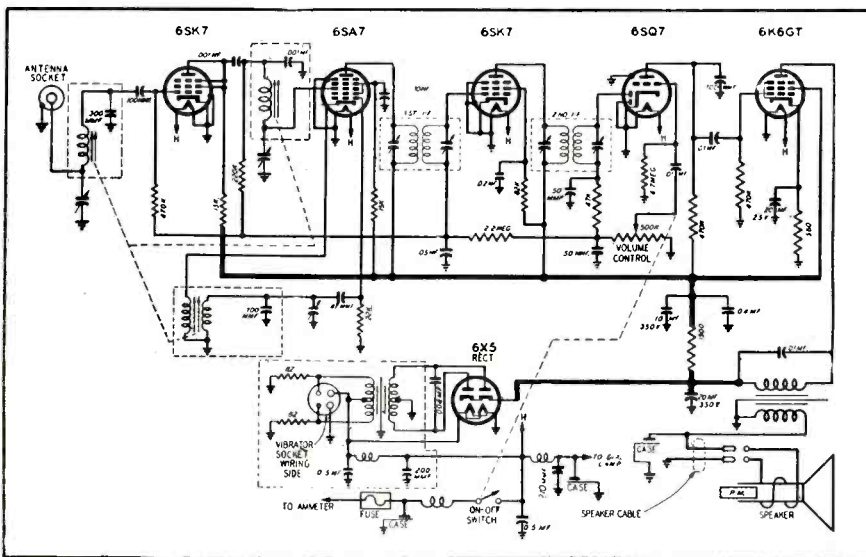
The local signal strength of the received station is proportional to the

value of the rectified signal; the stronger the station the more negative the rectified signal voltage. Therefore, when the sensitivity control feeds maximum voltage to the d-c amplifier cathode it is in the position of maximum tuner sensitivity and the tuner will stop on relatively weak signals. When the sensitivity control is feeding the minimum voltage to the cathode, the tuner will stop only on relatively strong stations.

#### Sensitivity Adjuster

Local reception conditions vary so greatly that an additional adjustment is necessary so the tuner can be made to select only the locally strong stations at minimum position of the steering column sensitivity control. This adjustment has negligible effect

Fig. 4. Truetone D-4630, 6-tube auto receiver.



on tuner operation when the sensitivity control is set so the tuner will stop on a maximum number of stations.

#### Adjuster Characteristics

The sensitivity adjuster is a potentiometer which governs the amount of rectified signal voltage impressed on the grid of the d-c amplifier. Therefore, it establishes the maximum signal strength necessary to stop the tuner when the sensitivity control is positioned to stop the tuner only on very strong stations.

#### Charging Capacitor

No matter where the sensitivity controls are set, there will always be a few weak stations which will produce enough signal to stop the tuner, but will not be strong enough to insure those stations being tuned in accurately. To prevent the tuner from stopping on such borderline signal-strength stations, a charging capacitor has been placed across the switch coupling the plate of the d-c amplifier and the grid of the relay section of 6SN7. Whenever the tuner stops on a station the rectified signal voltage must be maintained during the charging time of this capacitor or the capacitor will pass sufficient current to bias the grid of the relay section beyond cut off, causing the relay to open and the tuner to move on to the next station. This action will make the relay appear to chatter on some stations. This condition is normal and merely indicates that the received signal is not quite strong enough to stop the tuner accurately.

#### Oldsmobile Auto Sets

A 7-tube model used in the 1946 and 1947 Oldsmobile cars (982375) is shown in Fig. 2. Tubes in this receiver include a 7A7 r-f amplifier 7Q7 oscillator modulator, 7A7 i-f, 7E6 detector/AVC/AF and a pair of 7C5s in pushpull output. Both manual and push button control are featured in this model.

#### Motorola 508

In Fig. 3 appears a 6-tube Motorola model 508 with a 6BA6 in the r-f amplifier stage, 6BE6 oscillator modulator, 6BA6 i-f amplifier, 6AT6 as de-



rector/avc/a-f and 6V6GT as power amplifiers. In the 8-tube model, model 708, a pair of 6V6GTs are used in push-pull a-f and a 6AT6 is used as an audio inverter.

### Truetone D4630

In Fig. 4 appears a 6-tube auto model, Truetone 6SQ7 second detector D4630, with a 6SK7 r-f, 6SA7 first detector-oscillator, 6SK7 r-f, first a-f and 6K6GT output.

A shielded antenna cable (30 mmfd capacity) with bayonet connector plug is used with this model, which is designed for a low-capacity car antenna. The total capacity of antenna and shielded cable should be 40 to 70 mmfd.

There are several types of low-capacity antennas which can be used. The fishpole is one, such as door hinge and cowl. There are also the over-the-roof types which are short and are mounted quite a distance from the metal roof of the car.

Antennas should be mounted on the same side of the car as the receiver.

If the set is to be installed with a high capacity car antenna (70 to 500 mmfd total capacity of antenna and shielded cable) a 24" shielded adapter extension cable is necessary. The adapter is inserted in the socket at the side of the receiver case. Then the antenna cable plug is inserted in the socket at the other end of the adapter.

High-capacity antennas include the over-the-roof types which are long and are mounted close to the metal roof of the car; ordinary built-in roof antennas (not metal roof). Under-car antennas (usually high capacity) are not recommended for this receiver.

### Buick 980744 and 980745 Models

Receiver used in the 1946 Buicks is shown in Fig. 5; model 980744 on all 40-60-90 cars, model 980745 on all 50-70 cars. There are six tubes in this receiver; 6SK7 r-f amplifier, 6SA7 oscillator-modulator, 6SK7 i-f amplifier, 6SR7 first audio/detector/avc, and 6V6GT output.

Car antenna capacity is .000052 to .000068 mfd.

### Premier Signal Generator

An interesting signal generator circuit is shown in Fig. 6; Premier Mini Signal Generator. This generator, using miniature type tubes, has a range

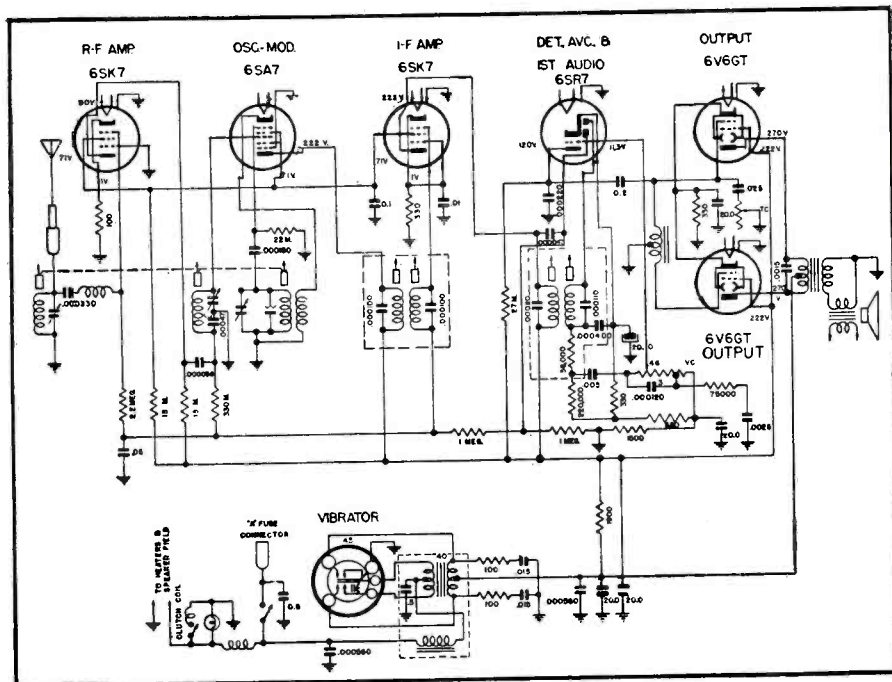


Fig. 5. Buick (1946) auto receiver models 980744/5.

of from 100 kc to 12 mc and can be used above 12 mc via harmonics. It has a continuously variable a-f attenuator.

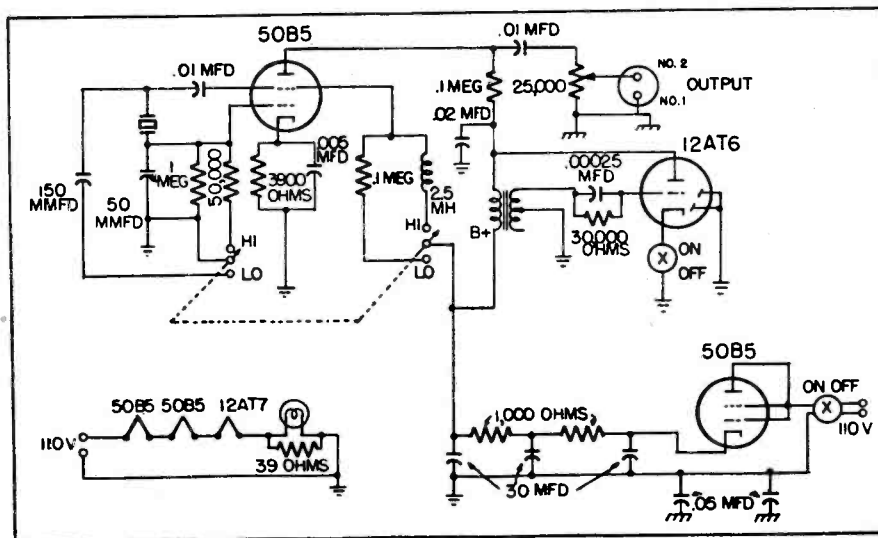
The generator can be used as a frequency standard. A 100-kc crystal can be adjusted to zero beat at the crystal fundamental or any harmonic with standard frequency transmission of WWV or with a secondary standard of frequency.

In using the equipment for tv receiver alignment, five crystals can be employed at five frequencies equal to one-half the frequencies required for stagger-tuned i-f peaking. The RCA receivers are aligned at 21.8, 22.3,

23.4, 25.2 and 25.3 mc. Television receiver local oscillators also can be adjusted with this unit to their proper fixed frequencies for each channel by using crystals at a lower frequency with a harmonic at the desired frequency.

The signal generator can also be used as an aid in f-m receiver alignment. For example, with a crystal at 10.7 mc, discriminators or ratio detectors can be aligned to their respective center frequencies. A 10.8 and 10.6-mc crystal can be used to check the balance in the negative and positive directions, as well as the band limit amplitudes.

Fig. 6. Circuit of the Premier crystal signal generator.



# Servicing Helps

## Buffer Capacitor Reference Circuits ... Automobile Battery Ground Data ... Vibrator Specification Information ... Auto Service Hints ... 'Scope In Auto Servicing

SECONDARY BUFFER CAPACITORS play an extremely important role in vibrator operation, values ranging, in the main, from .003 to .02 mfd.

In Fig. 1 appear nine buffer-capacitor arrangements. The system shown in *A* is used in many auto models, such as Admiral, Allied Radio, Belmont, and 1947 Chryslers, Cadillac, and Chevrolet cars, the capacitors having a wide range of values; .01, .004, .005, .006, .0075 and .008 mfd. The *B* circuit is used in many Buick models, with two .01 or .015 mfd and 100-ohm units being applied in most cases. The *C* system will be found in the 1941 Buick and Cadillac cars, with .01-mfd capacitors in the circuit. The 1934-35 Chryslers used the *D* circuit, with .01-mfd capacitors and 32,000-ohm resis-

by P. M. RANDOLPH

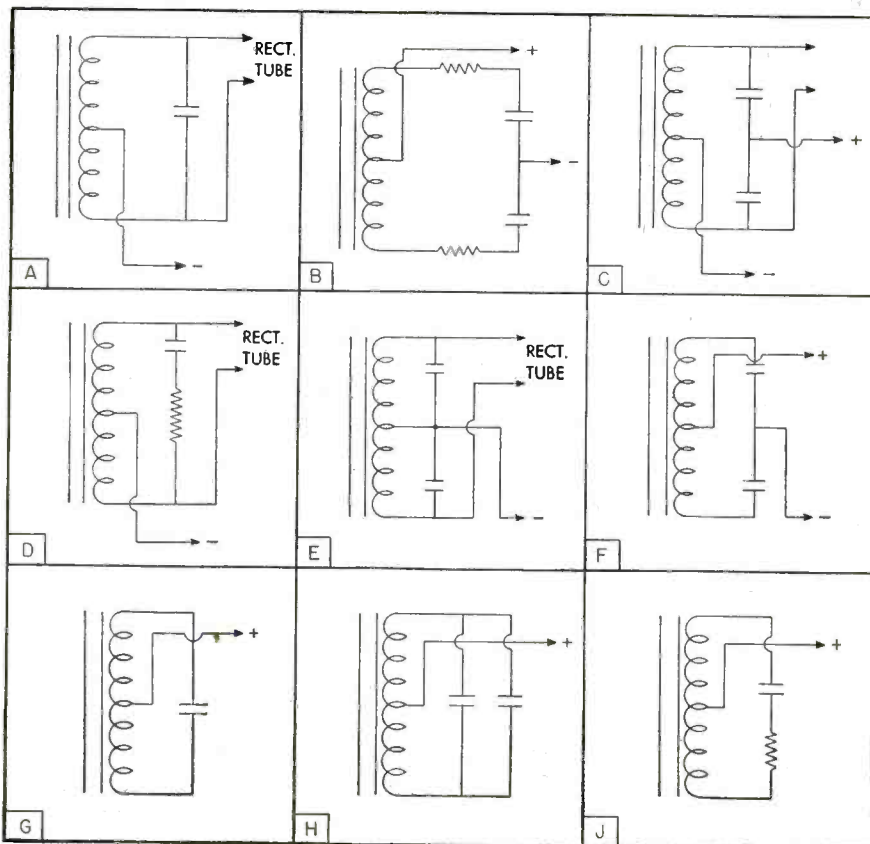
tors. The circuit shown in *E* will be found in 1940 Chevrolet cars, as well as such brand models as Arvin and Allied Radio. Capacitors are normally .01-mfd types, although pairs of .03-mfd have also been specified. The *F* system, with .01-mfd capacitors, has been used in oldtimers made by Atwater-Kent, Balkeit, etc. The 1935-1940 Cadillacs used the *G* system, with .0055, two .01 and .0075-mfd capacitors. The 1938 Chrysler also used the circuit with .018-mfd capacitor. In the *H* circuit, normally two .01-mfd capacitors are used. The *J* system has a .0055-mfd capacitor in series with a 4,000-ohm resistor.

To assure maximum vibrator efficiency, the correct value capacitors must be used with each circuit and model. Such information appears in replacement guides and should be followed carefully.

### Battery Grounds

ALTHOUGH THE NEGATIVE terminal of batteries are, in standard practice, grounded, in auto sets either the positive or negative can be grounded. The table in Fig. 2 shows the variations that exist in the ground systems.

[Data courtesy P. R. Mallory and Co., Inc.]



### Vibrator Design

IN MANUFACTURING vibrators, many factors are used as a basis of design. It is necessary, for instance, to determine if the vibrator is to be of the interruptor or a self-rectifying type. If self-rectifying, whether the vibrator be split reed is another factor to consider. The split reed allows the B- to be operated at a different potential from the supply voltage, but has somewhat shorter life.

The minimum, nominal and maximum input voltage and input current must also be known. Power supply output in voltage and current is necessary for self-rectifying vibrators, and may be given instead of output current for interruptor-type vibrators. Frequency of vibrator and type of operation, continuous or intermittent, are also vital design factors. The ambient temperature in which the vibrator will

Fig. 1. Buffer capacitor reference circuits.

# RADIO SERVICEMEN!

# 19 PRIZES FOR 18 IDEAS

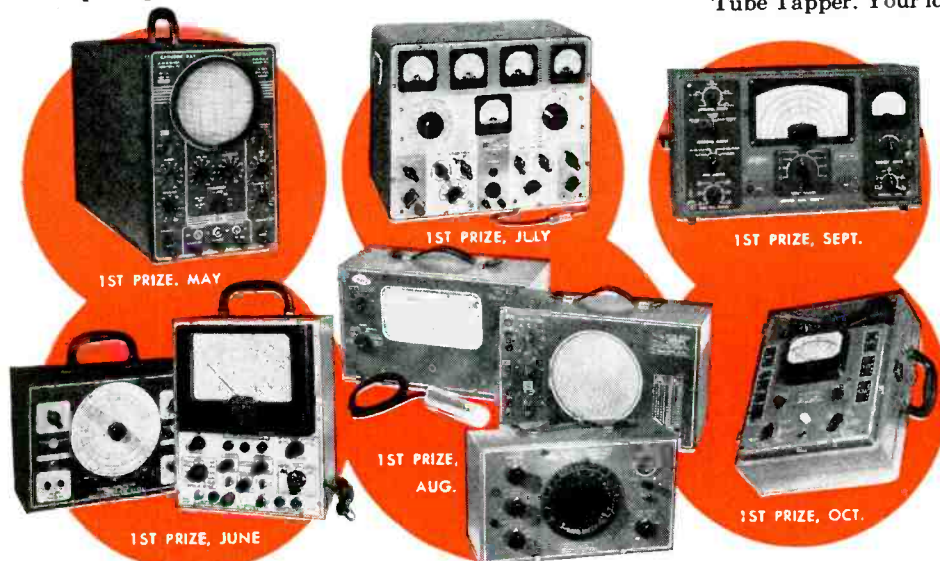
## HERE'S HOW EASY IT IS TO WIN

Right now, you may have a winning idea at work in your shop. An idea for a simple service tool which makes your work easier, faster, more profitable. Hytron wants to help make such needed tools available to all servicemen — at cost. You can cash in on your idea easily — and also help the other fellow.

Simply obtain an official entry blank from your Hytron jobber — or write us. Answer a few simple questions on the blank. Then include a sketch with constructional details — or a photograph — or a model of your proposed tool. Mail

to Hytron Contest Editor. The tool should be simple, practicable, durable, compact, easy and economical to manufacture. Examples: Hytron Tube Tapper and Miniature Pin Straightener.

That's all there is to it. Nothing to buy. Nothing difficult. No fancy writing. And could you use one of those beautiful deluxe test equipments — or one of those crisp new Savings Bonds! Check the easy rules. Get an official entry blank today for full details on how to win. Send in as many entries as you wish — in any or all six contests. Everyone wins a Tube Tapper. Your idea may hit the jackpot. Let's go!



## HERE ARE THE EASY RULES

**WHO** . . . Any bona fide radio serviceman who repairs radios for the general public and who lives in continental United States is eligible for these contests, except employees of Hytron, their advertising agencies, and their families.

**HOW** . . . Get official entry blank from your Hytron jobber, or write us. Describe on blank your idea for a shop tool for radio servicemen. Include sketch and constructional details — a photo — or model. Make your proposed tool simple, practicable, durable, compact, easy and economical to manufacture (preferably to sell without profit at 50¢ or less) — like the Tube Tapper or Miniature Pin Straightener.

**WHERE** . . . Mail to CONTEST EDITOR, HYTRON RADIO & ELECTRONICS CORP., SALEM, MASS.

**WHEN** . . . There are six monthly contests. Opening and closing dates for each contest are the first and last days of each of the months from May through October, 1948, inclusive. The postmark date determines month of entry. Entries for final month's contest must be postmarked before midnight, October 31, 1948, and received by November 15th. At judges' discretion, unsuccessful entries in any month's contest may be re-considered among following months' entries. You may submit as many different ideas as you wish in any or all six monthly contests. Use separate blank for each entry.

**PRIZES** . . . See special listing of prizes.

**JUDGES** . . . Entries will be judged on originality, simplicity, practicability, durability, compactness, and ease and economy of manufacture. Judges will be: Sanford Cowan, Editor & Publisher of *Radio Service Dealer*; W. W. MacDonald, Managing Editor of *Electronics*; Oliver Read, Chief Editor of *Radio News*; Joseph Roche, Editor of *Radio Maintenance*; J. L. Stoutenburgh, Executive Editor of *Radio & Television Retailing*; Lewis Winner, Chief Editor of *Service*.

Judges' decisions final. Duplicate prizes in case of ties. No entries returned. Entries become property of Hytron, who may, at its option and by special arrangement with the entrant, pay the cost of a patent application (if the tool is patentable) with the understanding that Hytron is to have a non-exclusive license to manufacture, distribute, and sell the tool without royalties. Contests subject to all Federal and State regulations. Winners will be notified by mail. Grand prize winner will be announced in radio service trade papers shortly after close of final contest. Prize winner list available approximately one month after close of last contest.

## HERE ARE SOME EXAMPLES



Hytron's Tube Tapper and Miniature Pin Straightener show you the kind of tool wanted. Check off the qualities. Simple? Yes. Practicable? Usable time-savers. Durable? Built to last. Compact? Carry them in your pocket. Easy and economical to manufacture? Adapted to mass production. Tube Tapper a nickel; Pin Straightener 49¢ — both under 50¢. Tools associated with tubes preferred, but other original service tools also acceptable.

## HERE ARE THE PRIZES

### First Prizes

- MAY DuMont Type 274 Five-Inch Oscillograph.
- JUNE Radio City Products Model 665-A, the "Billionaire", V-T Volt-Ohm-Capacity Meter, Insulation Tester; and Model 705-A Signal Generator.
- JULY Hickok Model 156A Indicating Traceometer.
- AUG. McMurdo Silver Model 900A "Vomax" Electronic Volt-Ohm-Milliammeter; Model 904 Condenser/Resistor Tester; and Model 905A "Sparx" Dynamic Signal Tracer/Test Speaker.
- SEPT. Jackson Model 641 Universal Signal Generator.
- OCT. Weston Model 769 High Frequency Electronic Analyzer.

Second Prize — Each Month \$50 U. S. Savings Bond

Third Prize — Each Month \$25 U. S. Savings Bond

### Grand Prize

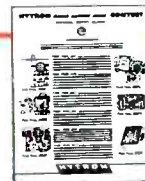
\$200 U. S. Savings Bond — to contestant whose idea is judged to be best of the 6 winning monthly first prizes.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

# HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS



	1936	1937	1938	1939	1940	1941	1942	1946	1947
Auburn	Pos.	Pos.							
Buick	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cadillac	Pos.	Neg.	Pos.	Pos.	Pos.	Pos.	Pos.	Neg.	Neg.
Chevrolet	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Chrysler	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Cord	Pos.	Pos.							
DeSoto	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Dodge	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Duesenberg	Neg.								
Ford	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Frazer								Pos.	Pos.
Graham	Pos.	Pos.	Pos.	Pos.					
Hudson	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Hupmobile	Pos.		Pos.	Pos.		Pos.	Pos.	Pos.	Pos.
Kaiser								Pos.	Pos.
Lafayette	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.			
LaSalle	Pos.	Neg.	Pos.	Pos.	Pos.				
Lincoln	Neg.	Neg.	Neg.	Neg.	Neg.				
Lincoln									
Continental									
Lincoln Zephyr		Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Mercury				Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Nash*	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Oldsmobile	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Packard	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Pierce-Arrow	Pos.	Pos.	Pos.	Pos.					
Plymouth	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Pontiac	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Studebaker	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Terraplane	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Willys	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

\*Some special custom-built models have negative grounded.

Fig. 2. Automobile battery ground chart.

operate is a very important bit of design information.

Sealing data are essential too, it being necessary to state if the unit is to be hermetically sealed, gas filled, or a conventional canned type.

Can quiet operation (acoustically) be sacrificed in order to obtain size is an engineering problem too.

Additional basic design factors include average life expectancy, base

wiring arrangements, can marking, etc.

[Data based on specification questionnaire prepared by Radiart Corp.]

#### 'Scope in Auto Servicing

IN THE MARCH and April issues of SERVICE Alvin Baer discussed the use of the 'scope in modern servicing.

Checking vibrator power supply with a 'scope.



Many have written in asking for a simplified description of 'scope controls and their function, particularly in checking auto receivers and vibrators.

Let us first take up the controls.

The vertical position control supplies a fixed voltage to the vertical deflection plates. By adjusting this voltage, the zero position of the dot in relation to its vertical travel may be adjusted. That is, the picture may be raised or lowered on the screen by adjusting this control.

Then we have a control for the horizontal position of the picture. Thus the picture may be moved from left to right with this adjustment.

Another control is used to regulate the intensity of the picture; this control varies the cathode voltage on the c-r tube. In practice, the intensity control is set to give the minimum brightness necessary to properly observe the image with a minimum of effort. The judicious use of this control will prolong the life of the c-r tube.

There is also a focusing control which adjusts the focal point of the electron beam, and operates in much the same manner as the focus control on a camera. Once this control has been adjusted, it need not be touched. Adjustment is made when the image appears on the screen, and then manipulated until the clearest image is seen. This control is usually operated in conjunction with the intensity control.

The synchronous amplifier also has a control. This is used to lock in the signal being viewed. When attempting to view a particular waveform, it will be found that the picture has a tendency to walk across the screen. If other adjustments fail, advancing the sync amp will stop the action. In practice, the sync amp should be advanced no more than necessary, since it has a tendency to introduce some distortion in the image.

Two controls are normally used to synchronize the sawtooth frequency with that of the incoming signal. The fine frequency control sweeps between the maximum and minimum frequencies of the coarse frequency control.

To regulate the voltage input to the horizontal and vertical deflection plates there are usually two controls. To increase the sensitivity of the tube, amplifiers are incorporated in the scope to amplify the input voltages. These controls are used to regulate

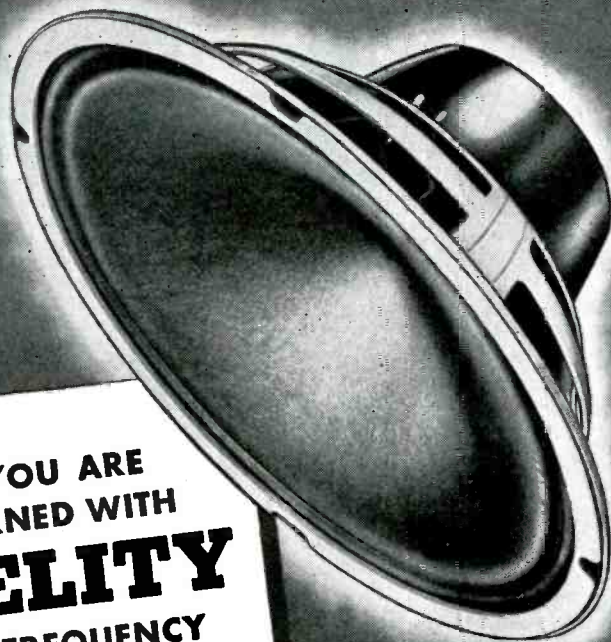
(Continued on page 46)

**Specify the**



**1201**

**DELUXE ALNICO 5  
LOUDSPEAKER**



WHEN YOUR  
JOB DEMANDS  
**POWER**  
25 WATTS  
POWER HANDLING  
CAPACITY

WHEN YOU ARE  
CONCERNED WITH  
**FIDELITY**  
BROAD FREQUENCY  
CHARACTERISTIC  
50-13,000 CYCLES

EQUIPPED WITH  
THE FAMOUS  
**GENERAL ELECTRIC**  
ALUMINUM FOIL BASE  
VOICE COIL

**P**OWER, fidelity and a price that will amaze you for a speaker of this exceptionally high quality—it's the G-E 1201.

It's a wide range speaker with the frequency response stretched out at both ends of the curve to give intense realism, smooth, full lows and "high fidelity." A curvilinear cone is employed to provide this extended frequency response. Alnico 5, 14½ ounces of it, gives high sensitivity and smooth response.

The moving parts in the speaker assembly are ruggedly designed to take high power without damage to the speaker in any way.

Note: Frequency response 50-13,000 cycles.

For complete information on this outstanding speaker write: *General Electric Company, Electronics Park, Syracuse, New York.*



**GENERAL**  **ELECTRIC**

169-03

# ASSOCIATIONS



*Elementary!*  
*Dear Radio Listener*

- RETA is an organization of expert Radio Repairmen who have joined together as a study and discussion group for the purpose of giving the radio listener the best possible quality of Radio Repair Service.
- RETA Radio Repairmen have proven their ability by passing a technical examination, and are constantly improving their skill through the RETA program of study courses, lectures, and open discussions on the most modern methods of Radio Repairing.
- The results of these studies and discussions are reflected in the superior performance of any radio repaired by any one of the following RETA Radio Repair Shops.

**IN SOUTH BEND, IND. PRONZ**

Radio Clinic, 729 S. Michigan, 4-2343  
 Kindig Bros. Radio Shop, 2222 Mish. Ave. 4-2745  
 Lackman & Son, Radio, 443 S. Logan, 3-5829  
 Feingold Home Appliances, 731 Western, 3-0322  
 E. W. Carr Radio Repair, 207 Union Way E. 2-2324  
 Wine Radio Service, 524 N. Michigan  
 Alfredo Radio Service, 643 E. Lexington, 8-6171  
 Chapin Radio Store, 842 Chapin, 2-3637  
 Palmer Radio Service, 615 N. Scott  
 Moore Radio Service, 2639 Hamlock Way, 2-5622  
 Davies Radio Shop, 206 E. Bowman, 4-2522

**IN MISHAWAKA, IND.**

Radio Service Co., 324 Lincoln Way W. 5-5525  
 Lear Radio Service, 522 W. Marion, 5-6276  
 Fishers Radio Service, 435 W. Lawrence  
 Harry Miller, 120 S. Hill, 5-3571  
 Baugher Radio Service, 1750 Homestead

**IN LAPORTE, IND.**

Victor Slater, 308 L. St.  
 Kubik Radio Service, 119 Laurel, 4-9319

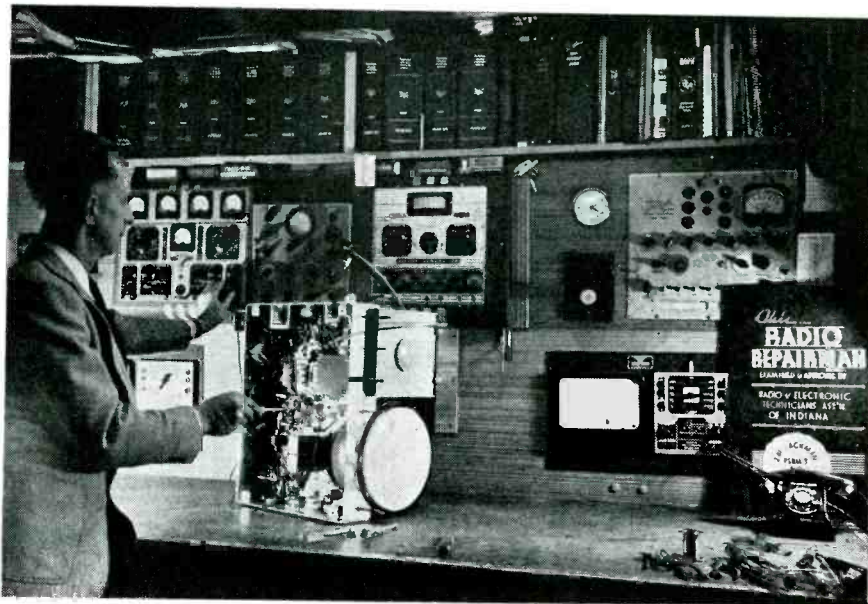
**IN CASSOPOLIS, MICH.**

Shank Radio Service, 219 S. Broadway, 12

**IN BENTON HARBOR, MICH.**

Hawks Inc., 214 Pipestone St., 6911

**RETA**  
**RADIO & ELECTRONIC**  
**TECHNICIANS ASSOCIATION**  
 323 E. Colfax Ave. South Bend 17, Ind.



Above: John Lackman, president of RETA, South Bend, Indiana, at his service bench. Note the RETA certificate at right. Left: Typical RETA newspaper advertisement.

## RETA, South Bend, Indiana

A REPORT from John Lackman, president of the Radio-Electronic Technicians Association states that beginning about June 1, they expect to present a series of monthly tv lectures by Professor Quigley of the University of Notre Dame. The text will be based on the course on television offered by Howard W. Sams.

## RRSA, Reading, Pa.

LEON PODOLSKY, manager of the field engineering department of Sprague Electric Co., addressed the Reading Radio Servicemen's Association a few weeks ago on *Improved Electronic Components—The Result of Wartime Research*.

The meeting was jointly sponsored  
(Continued on page 38)

## TEN YEARS AGO

From the Associations News page of SERVICE, May, 1938

A BETTER RADIO RECEPTION WEEK was being planned by the RSA. . . . The Flint Chapter under the leadership of Worden Stiles, participated in a regional meeting held in Pontiac, Mich.

. . . The Oklahoma City Radio Service Association held its annual banquet. . . . John F. Rider addressed the Chicago and Detroit Chapters on methods of improving servicing business. . . . The National Radio Service Association of Houston, Texas, voted to become affiliated with RSA. Chairman of NRSA was C. L. Robertson, and J. L. Stone was secretary-treasurer. . . . The Rockford Illinois Chapter was estab-

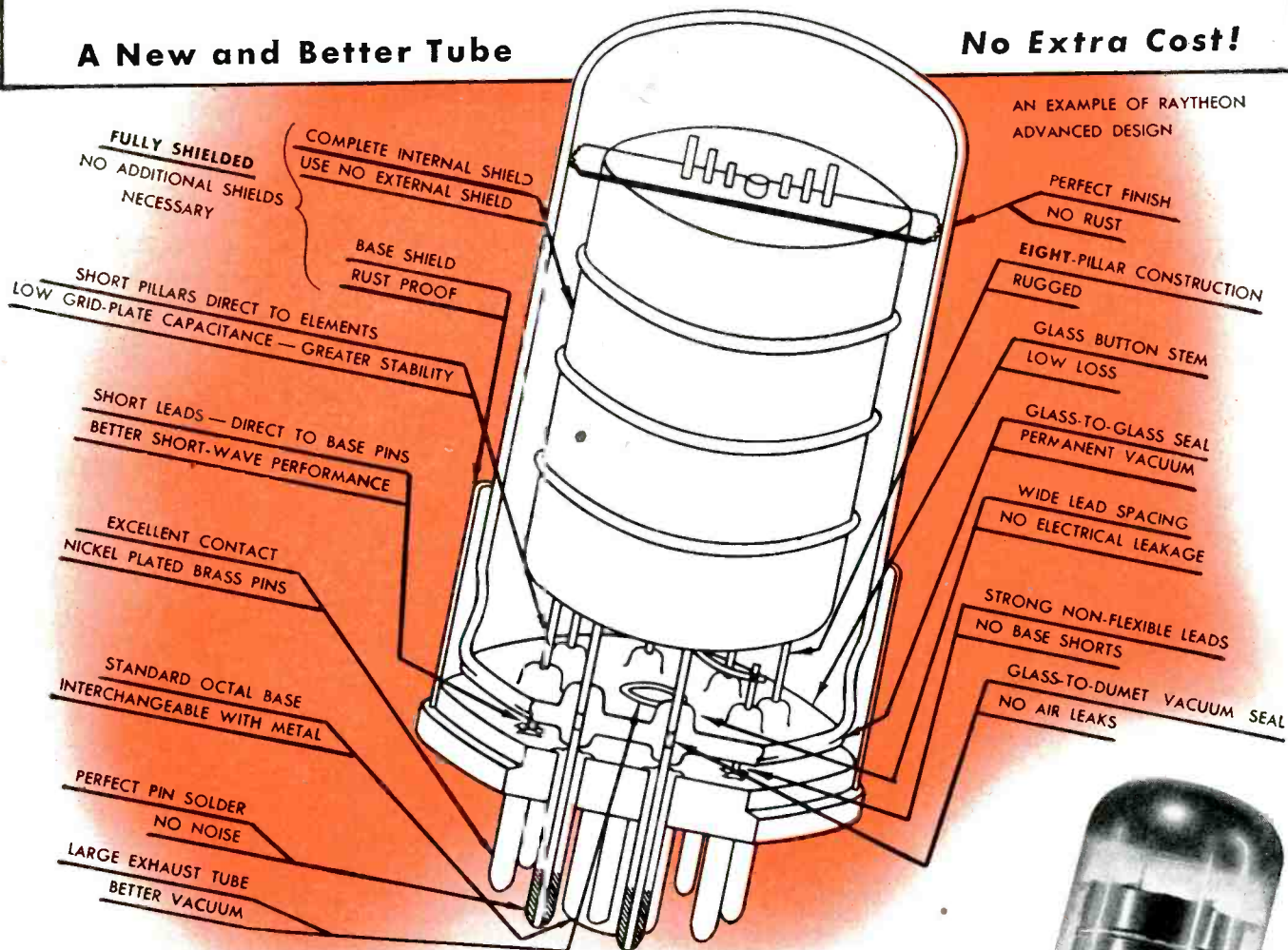
lished and Frank N. Welden was named chairman, E. S. Ary, secretary and A. L. Hissong, treasurer. . . . The Associated Radio Service Engineers of Buffalo became affiliated with RSA. Anthony Schreiber was chairman, Vincent E. Ball, treasurer, and Frank Bestine, secretary. . . . The Jamestown Association of Radio Service Engineers voted to affiliate with RSA. Lawrence Babcock was chairman, Richard L. Bonsteel, treasurer, and C. Leonard Johnson, secretary. . . . Noise interference problems were discussed at meetings of the Jamestown Chapter. . . . The Binghamton Chapter scheduled a banquet for the Spring. . . .

John Reitan of the Lucker Sales Company, Minneapolis, addressed the Duluth Chapter on the latest kinks in radio and television. . . . The Radio Technicians' Guild officially opened its new headquarters in Boston. J. O'Leary, chairman of the Guild, delivered an address on servicing equipment, and the address was recorded on a Presto recorder. A 52-week study program was organized at the meeting. Charles Golenpaul talked to the members of PRSMA as a guest of the Radio Electric Service Co. Mr. Shapiro of Radiart analyzed auto antennas for the boys at this meeting.

# ANNOUNCING RAYTHEON BANTAL TUBES

**A New and Better Tube**

**No Extra Cost!**



Just think! All the above design improvements and construction advantages in one tube—the RAYTHEON BANTAL tube.

- **Rugged Eight Pillar Construction**
- **Completely Shielded Internally** — No external shielding hardware or installation labor! Increases your service profit!
- **Made In Eight Popular Types** 6SA7GT-6SJ7GT-6SK7GT-6SQ7GT-12SA7GT-12SJ7GT-12SK7GT-12SQ7GT
- **Superior Performance Assures Customer Satisfaction And Repeat Business**
  - **All At No Extra Cost!**  
Your Raytheon Distributor — sponsor of the famous Bonded Dealer-Service Program — is now delivering Bantal Tubes.

Look for this distinctive marking on the Raytheon Bantal Tube. The 12SK7GT Tube illustrated replaces ordinary "GT" and Metal 12SK7 Tubes. Only the Bantal Tube is needed in stock!



**RAYTHEON MANUFACTURING COMPANY**

RADIO RECEIVING TUBE DIVISION

NEWTON, MASSACHUSETTS • CHICAGO, ILLINOIS • LOS ANGELES, CALIFORNIA

RADIO RECEIVING TUBES • SPECIAL PURPOSE TUBES • TRANSMITTING TUBES • HEARING AID TUBES

# Vibrator Design and Application

## Bases of Design of the Non-Synchronous and Synchronous Forms of Vibrators . . . How the Vibrators Operate in Modern Auto Installations.

by RALPH G. PETERS

IN THE EARLY days of auto receivers, crude types of inverters were connected to storage batteries to provide an a-c feed into step-up transformers to secure the required 200 or 300 volts of *B*. From the step-up transformer this high voltage would be fed to a rectifier of some sort which would convert it back to high voltage d-c. The d-c would then be filtered and would be available for high-voltage plate supply. The system was quite cumbersome. Various simplification ideas were tried but the one that took hold was the vibrating-contact system.

In one instance a Ford spark coil was employed. Other experimenters thought of a door bell as a type of vibrating contactor. Vibrators followed along soon after.

### Fundamental Vibrator Design Circuits

The vibrator circuit consists of a source of d-c, probably a storage battery, an iron core choke in series with this source and some method of contacting. In operation, when the circuit is closed, the choke begins to build up a magnetic field and while it does, the building of this field produces a voltage which opposes the voltage of the battery. Thus, when the contact is closed the voltage across the choke rises at once to practically battery voltage and remains at that value

until the magnetic field in the choke is built to almost its maximum. When the field approaches maximum, its rate of building decreases and the voltage across the choke begins to drop. If the contact is left closed long enough the voltage will drop to the same value you would have if the choke were a resistor having the same resistance as that of the choke's winding. When the voltage across the choke begins to decrease, the choke is said to be saturating. When the circuit is opened, the energy stored in the magnetic field of the choke attempts to keep the same amount of current flowing that had been flowing when the circuit was closed. Opening of the contact, however, changes its resistance from practically nothing to a number of megohms, so the voltage across the choke rises to an extremely high value in an attempt to keep the current flowing through the gap. This is the familiar inductive kick which has given most of us shocks when we broke the battery circuit to a speaker-field coil.

This ambitious little kick has its place when you want to operate a spark plug but it hasn't much use in an auto radio. By placing a capaci-

tor across the choke, we do not affect the choke's action in building up its opposing voltage, nor its saturation. But while there is a voltage across the choke, there is a voltage of the same polarity across the capacitor. When the circuit is opened, the inductive kick has the opposite polarity. Now the kick must first reverse the charge on the capacitor and then continue to charge with its remaining energy. Instead of a voltage that may go over 1000, without a capacitor there can be a harmless value of only a few volts depending upon the capacitor's capacity. Capacitors used in this fashion are called buffers.

### Step-Up Transformer

Now putting these principles to work, we can take the choke and add another winding, perhaps, having three times as many turns as the original winding. If we repeat our experiment of connecting or disconnecting the choke across the battery we will find that the original choke winding has the same voltage characteristics that it had before. We will also find that the new winding, which is three times larger, will draw a voltage wave similar to that of the original choke winding except that it will be three times as great. We have changed our choke to a step-up trans-

Fig. 1a. Half-wave non-synchronous vibrator circuit.

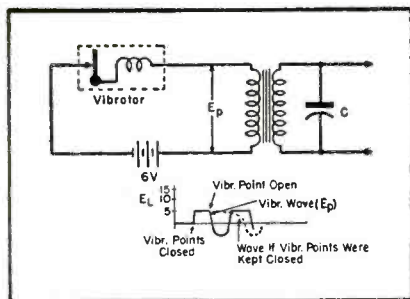


Fig. 1b. Circuit of a with transformer secondary loaded.

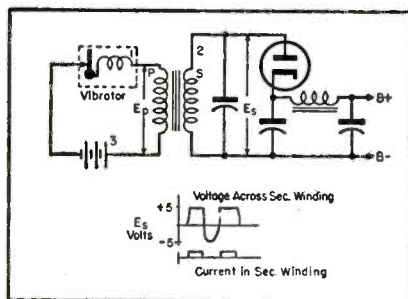
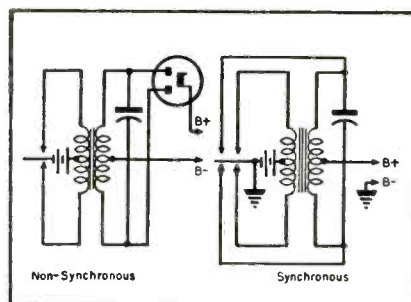


Fig. 1c. At left, a non-synchronous vibrator circuit and at right, a synchronous circuit.





former having a ratio of 3:1 and being capable of giving us an output voltage.

This was the approach used in some of the early vibrator applications, a type called half-wave non-synchronous.

Now let us study a circuit with two modifications; Fig. 1. Here a coil arrangement has been added so that the contact, or now the vibrator, makes and breaks the circuit automatically and does it continually. The buffer capacitor has also been moved from the primary winding of the transformer to the secondary winding. It is usually useful in either location, but since the secondary winding delivers a higher voltage, the capacitor will do the same work with a smaller capacity. A circuit of this type delivers a wave form about like the one shown. The constants of the circuit are chosen so that the vibrator point opens before the transformer primary starts to saturate and the buffer capacitor has a fairly low value. Thus the voltage that is left in the inductive kick is about equal to the voltage applied across the transformer primary by the battery.

#### Loading Secondary

The secondary of the transformer can then be loaded; Fig. 2. This circuit, however, has three disadvantages. The vibrator coil, being in series with the current drawn from the battery, depends for its strength upon the amount of load that was placed on the secondary of the power transformer. If this current should be lower than the value for which the coil was designed, the vibrator would flutter very feebly and would permit the transformer to saturate, causing sparking at the vibrator contacts.

The amount of output current to be drawn from the circuit could be raised, but the input current to the vibrator would increase and the vibrator would be driven so hard there would be danger of an early failure. The transformer secondary was the second source of trouble. Although there was a form of alternating voltage available in the secondary, the rectifier tube would pull current only when the voltage had one polarity. We would have the effect of trying to draw pulsating d-c through the inductance of the secondary winding. This winding would act as a choke and would limit the amount of power to be drawn from the secondary. The applications seldom exceeded an out-

put of 180 volts at 30 ma at rated input voltage and it was difficult to obtain more output. Increasing the number of secondary turns would raise the inductance faster than it would the output voltage and it was actually possible to reach a point where more secondary turns resulted in lower output.

#### Right Polarity of Wave

Studying the voltage wave form, which we find across the secondary of this transformer, we find that if the square topped half of the wave happens to have the right polarity to go through the rectifier tube, energy is being delivered directly from the battery through the vibrator and the transformer to the load.

If the rectifier, however, is so connected that it draws a power from the rounded half of the wave then output is coming simply from the stored energy in the transformer core resulting in low output and poor vibrator operation. The half of the wave which the rectifier takes depends upon the polarity of the battery and accordingly the circuit will work well with one polarity and poorly with the other. To obtain satisfactory performance with either battery polarity, it is necessary to provide some sort of switching in the circuit and to know the polarity of the battery before you install the receiver in the car.

#### Eliminating Disadvantages

The first of these disadvantages, that of the bottleneck presented by the battery coil, was readily eliminated, by connecting the coil across the vibrator contact instead of in series with it. Thus the vibrator coil could draw power when the contact was open instead of when it closed and the strength of the coil depended upon the battery voltage rather than upon the current drawn from the battery. This vibrator will run about the same regardless of the load that is placed upon it.

#### Back-to-Back Circuit

The other disadvantage of the original half wave circuit was overcome by taking two of these half-wave circuits and operating them back to back through the same power transformer. This added another set of contacts to the vibrator and pro-

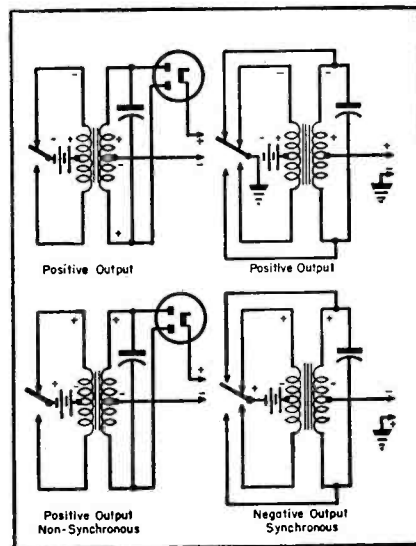


Fig. 3. The diagrams at left, top and bottom, illustrate the positive output of a non-synchronous vibrator. In this instance, the polarity of the battery does not matter, the output being positive in either method of connection. At right, we have the positive and negative outputs of a synchronous vibrator, and it will be noted that the polarity of the battery must be correct to provide a positive output.

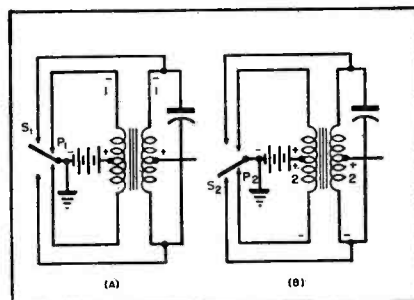
duced a vibrator waveform which keeps the desirable part of the half waveform and replaces the useless part with another of the desirable parts.

#### Polarities

Since the output of the transformer is now feeding a full-wave rectifier tube, there will always be the correct polarity of output voltage to make one-half of the tube conduct and there is no longer any problem of the polarity of the battery supply. Nor is there any difficulty with drawing d-c pulses through the secondary of the transformer, because one-half of the transformer secondary is always providing d-c output, and the two sets of pulses balance each other. With a cir-

(Continued on page 42)

Fig. 2. Basic circuits illustrating the operation of the synchronous vibrator system.



# Vibrator Power Supplies

Four Circuits Which Can Operate From 110-Volt A-C and 6, 12 and 24-Volt D-C Inputs.

by T. M. STERLING

THERE ARE several types of power-supply systems in which vibrators are used.

The usual construction of a power unit utilizing a self-rectifying vibrator is shown in Fig. 1. The vibrator used in this system is of the *reversing* type where the contact materials used are non-polarized. The base is so constructed and wired that it can be inserted into its matching socket in two positions, 180° apart. By wiring the socket in a manner similar to a reversing switch, the polarity of the connec-

tions to the secondary of the transformer can be reversed with this rotation of the base, and thus the output polarity can be reversed. This provision permits the maintenance of a correct output polarity when the input polarity cannot be predetermined, such as would occur in automobile receivers made for universal application. The 250-cycle vibrator uses polarized contacts and since the reed always must be connected to -A, the mechanism is connected to the *reversing* base and the wires to the socket in a different

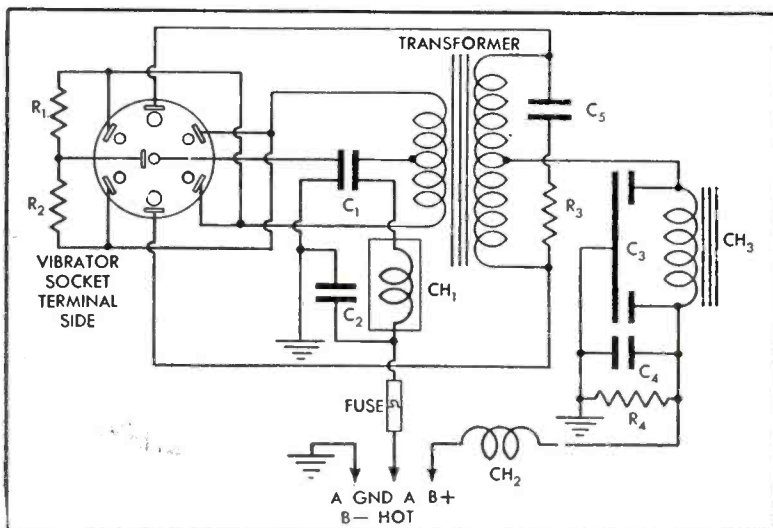
manner. However, the same end results are obtained.

The usual amount of *hash* filtering is provided in resistors  $R_1$  and  $R_2$ , capacitors  $C_1$ ,  $C_2$  and  $C_4$ , and inductances  $CH_1$  and  $CH_2$ . The smoothing filter consists of electrolytic capacitor,  $C_3$ , of the common cathode type, and reactor  $CH_3$ . Resistor  $R_4$  acts as a bleeder to discharge the high-voltage capacitors, and to act as a minimum load when the unit is operated on no-load. Capacitor  $C_5$  and resistor  $R_3$  form the timing capacitor circuit.

In Fig. 2 we have a circuit which permits the operation of a vibrator power unit from two or more different input voltages. In this case, provision has been made for three voltages, although the general rule would be for two; an example would be for 6, 12 or 24-volt equipped mobile vehicles, of perhaps the military type.

The transformer may be designed with a series primary arrangement, tap being made at the appropriate number of turns for the different voltages, and with graduated sizes of wire for the different currents encountered at the various inputs. This arrangement permits greater flexibility in adjusting the primary to secure identical output with different input voltages, and permits simpler form of switching for manual control, but it requires more winding space for the primary as

Fig. 1. Standard type of self-rectifying vibrator power-supply system.



various sizes of wires are required with this method.

An alternate method used for two input voltages of multiple value, such as 6 and 12, or 12 and 24 volts, is for a series and parallel arrangement of primaries. Here all four primaries are constructed of the same number of turns and wire sizes; they are then connected in parallel groups of two or in a series group of four, with appropriate center taps. This system permits better utilization of the winding space, but requires a more difficult switching arrangement and does not permit adjustment of the outputs by primary turn juggling.

The single vibrator is used on all voltages by bringing out the driving-coil lead, and switching an appropriate value of resistor in series with this lead as the transformer primary connections are changed. These switches are ganged for convenience. The capacitor  $C_1$  is usually required with the shunt-coil type of unit, when a high value of resistance is placed in series with the coil, such as when a 6-volt unit is operated on 24 or 32 volts. The value varies, but often runs from .2 to .5 mfd. The value of  $R_1$  and  $R_2$  will depend upon the driving-coil resistance and impedance; usually a resistance value slightly higher than the resistance of the coil is required to double the operating input voltage.

The only other unusual feature of the circuit lies in the connection of the primary timing capacitor across the entire primary winding. This keeps the effect of the capacitor constant insofar as its addition to the secondary timing capacitor is concerned, and a fairly constant waveform is maintained on all input voltages. It will also serve its purpose of preventing starting arcs.

Fig. 3 illustrates another type power supply circuit designed to function equally well when operating from a standard a-c line and from a battery. This is made possible by the addition of an a-c primary winding and an additional tap upon the vibrator primary so that this winding can be used for filament power when operating on a-c. Because of the different form factors of the sine and the square wave-forms, if the a-c primary is adjusted to provide the same d-c high voltage output as is secured with the vibrator, the voltage across one-half of the vibrator primary (on a-c) will be less than 5 volts, for instance, instead of 6.3 volts rms. The actual voltage value will depend largely upon the time efficiency

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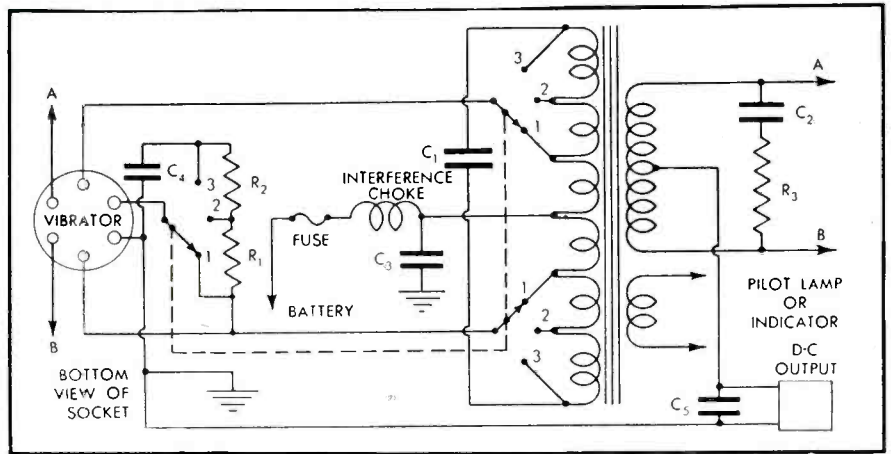


Fig. 2 Three-voltage input vibrator-power supply circuit.

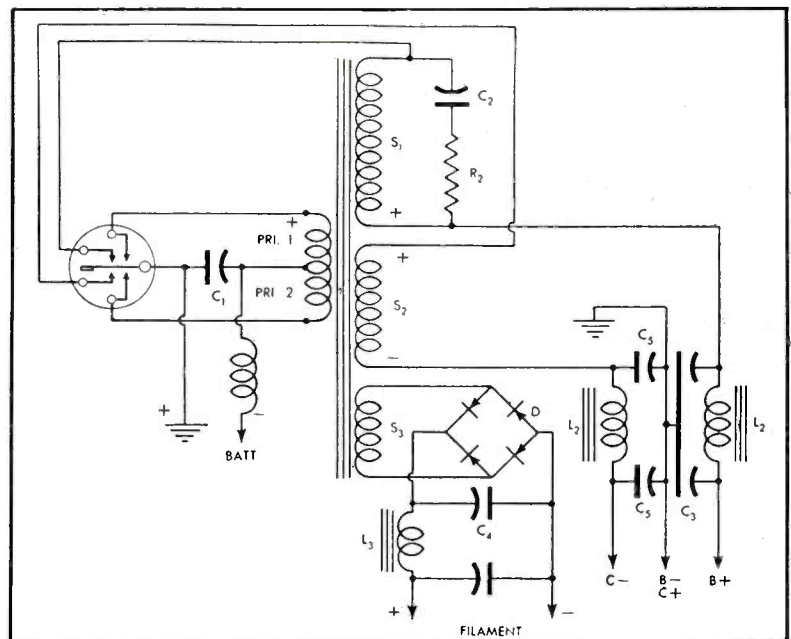
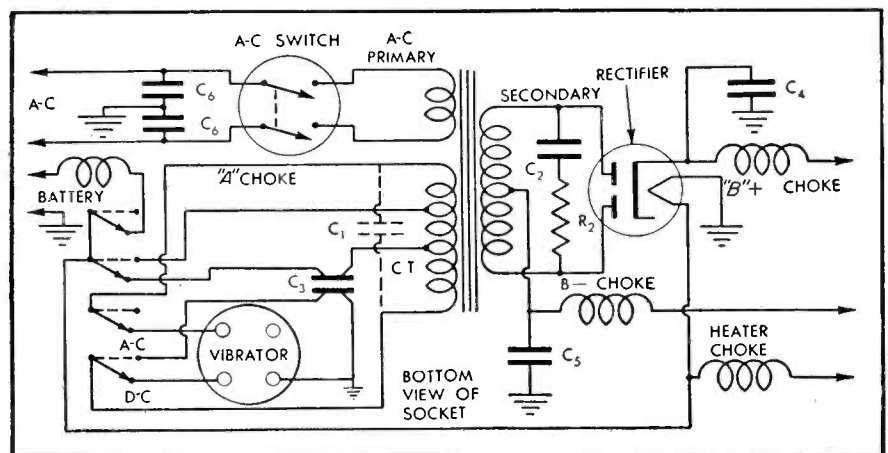
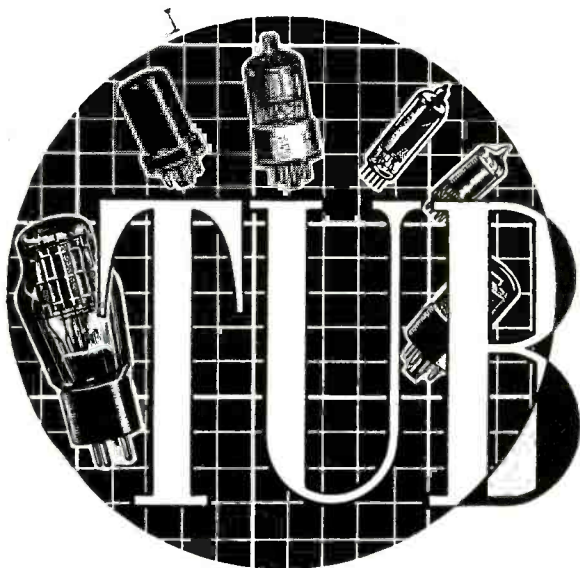


Fig. 4. Dual-output voltage circuit, with the rectifier portion of the vibrator serving as two half-wave rectifiers.

Fig. 3. A-c line/battery vibrator-power supply system.





# TUBE

## News

### Tubes For A-C/D-C A-M/F-M F-M Receivers . . . Application Notes on Use of Rectifiers in A-C/D-C Receivers . . . Aluminum-Backed TV Picture Tube Characteristics.

by L. E. STEWART

SERIES-STRING OPERATION of 35W4s, 35Z5GTs, and 45Z5GTs in a-c/d-c receivers requires that the heater as well as the plate and cathode elements of these tubes be at high voltage with respect to other circuits of the receiver. Suitable precautions should be taken to avoid accidental burnout of the rectifier tubes ordinarily caused by B+ shorts and other wiring shorts.

Before placing the rectifier tube in the socket, resistance should be measured from both the plate and the cathode terminals of the rectifier socket to B- to note the presence of short circuits.

When the set is operated for the first time, a low-wattage lamp should be inserted in one side of the line to indicate shorts in the filament string.

Accidental shorts to the chassis caused by poorly insulated or dangling pilot light sockets, phasing, and wire-dressing operations are frequently the cause of rectifier burnouts, unless the chassis is floated as in *shockproof* or Underwriters Approved sets.

Pretesting of electrolytics at normal operating voltage will effectively screen out those which are shorted and will possibly form those not correctly formed or those which have deteriorated since manufacture.

Use of a 33-ohm resistor in series with the rectifier plate will effectively

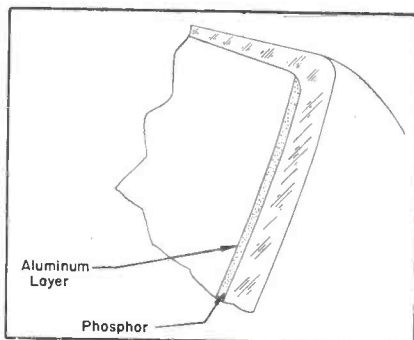
reduce the transient current when the power switch is closed. It will also give the tube some protection from temporary shorts. This resistor is particularly important when a large input capacitor is used.\*

#### TV Picture Tube<sup>1</sup>

A NEW TYPE of ten-inch tv picture tube, the 10FP4, with an aluminum backing is now being used in G. E. tv models.

There is no ion-spot blemish in this tube; the brown spot which forms,

Fig. 1. Location of the aluminum layer in the recently-announced aluminum backed tv-picture tube.



after some hours of operation, in the center of the screens of tubes in receivers which do not use ion-trap magnets. External magnets are not required around the neck of the tube.

Improvement in resolution is brought about by better contrast and improved brightness, it being possible to operate the picture tube at a much lower beam current with consequent reduction in the size of the electron beam. The smaller the electron beam, the larger the number of lines which can be resolved, Fig. 1. Comparing the beam currents of the two types of picture tubes we find that, at 20 footlamberts the 10BP4 requires 60 microamperes, while the 10FP4 requires 30 microamperes.

The 10FP4 can be installed in place of the 10BP4, in electrostatic type receivers with no major changes in circuitry.

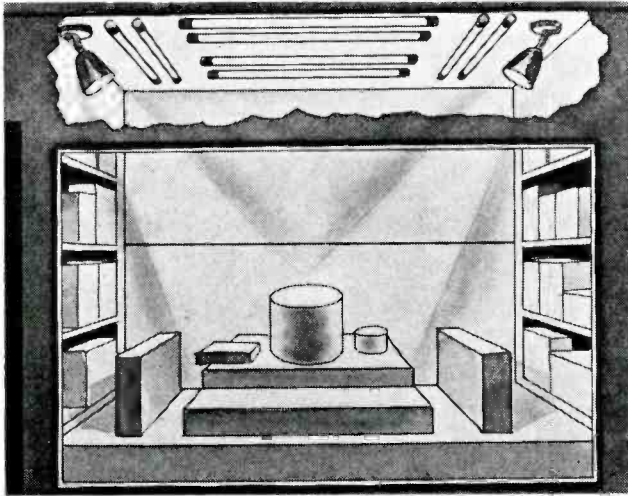
Since the 10FP4 requires no special electron gun and external magnet to eliminate ion-spot blemish, it is not necessary to use the external ion-trap magnet used by the 10BP4. When the ion-trap magnet is of the permanent-magnet type, it should be removed from the tv receiver.

In magnetic-type receivers the winding of the magnet is an integral part

(Continued on page 39)

\*From data prepared by Hytron Corp. engineering department.

<sup>1</sup>From data prepared by G. T. Waugh, Tube Division, G.E.



At left, a typical window-display setup.

Above, an interesting window display of the C. K. Wenzel Service Shop in Emporium, Pa.

# Your Shop Window

**Building Sales with Effective Window Settings Through Proper Use of Displays, Lighting, Display Themes, etc.**

by **H. G. KRONENWETTER**

Manager, Advertising Production  
Sylvania Electric Products, Inc.

ARE YOU GETTING your money's worth —by using your display window to attract more business to your shop? Sure—you *put something* in your window and so do others in your neighborhood, *but* does your display *stop* the passer-by, make him *look* and create the desire to go into your shop?

The amount of rent you pay is based on the location of your store or shop *and* the window display space available. You are paying for it and its no one's fault but yours if you are not *getting your money's worth*.

You don't have to be a professional to make an eye-catching display. Tubes for standard broadcast and tv, and other components are always novel and interesting to the public.

## Your Window Stage

Your display should be built around a feature, something of timely interest or something that fits in with the particular season. This might be portables in the spring or television during the major sports seasons. After selecting your feature it is just a question of good staging. This is simple enough if you visualize your window

from the standpoint of the passer-by. As you look at your display your eye should be led immediately to the main object you are highlighting. If your window is jumbled or confusing it is a sure bet that no one will give it a second glance.

## Your Window Show

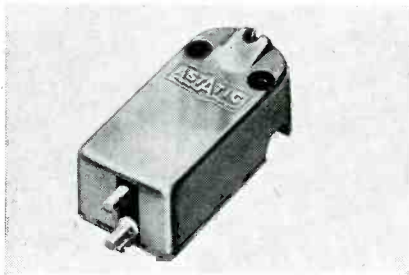
You may decide to highlight your feature by placing it on a platform. This, of course, depends upon the size of the article, making sure not to get it too high for good eye level. This feature item can be emphasized by color spotlights or decorations which draw the passer-by's eyes straight to the center of attraction. Don't be afraid to give your imagination free rein. Depending upon the product being highlighted, the viewer may wish to be told how the piece of equipment operates. This can be done by use of visual pointers and if there is something new and different about the product, let everybody know about it. The old technique of using ribbons leading from control knobs and outstanding features on a piece of equipment to a large descriptive poster is still a good

eye-catching stunt. Make your display so clear and arresting that the viewer can almost hear the set in action. The ribbon-to-poster device is effective because right through your show window it explains and demonstrates the set at the same time.

## Pick A Theme

Planning in advance you would do well to pick a theme for your display —let us say *Radio Entertainment*. It may be the fall of the year and popular winter broadcasts are back on the air. You can feature winter series like the Jack Benny show, Truth or Consequences program, concerts, basketball, the hockey games, prizefights, etc. Play up to your public seasonal radio consciousness and you'll increase the demands for your services. Another excellent display theme would be a display of components of a receiver, tubes, speakers, capacitors, sockets, transformers, etc., with small explanatory cards explaining the functions of these units in the radio receiver. Another theme would be to show the technical improvements in the manufacture of  
(Continued on page 41)

# NEW PRODUCTS



**ASTATIC MAGNETIC PICKUP CARTRIDGE**

A magnetic-type pickup cartridge, the *Magneto-Induction Pickup Cartridge*, has been announced by The Astatic Corporation, Conneaut, Ohio. Cartridge is said to eliminate the need for delicately spaced air gaps.

Cartridge is available in two models: Model MI-1 with standard housing, and model MI-2 with Mumetal housing, which is said to provide increased shielding effect for maximum reduction of hum.

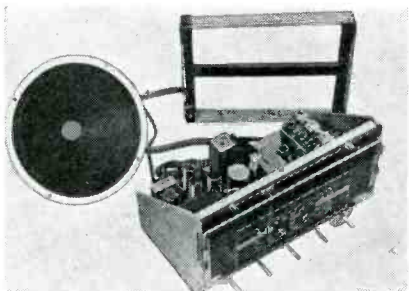
Velocity response of the pickup is said to be flat to 12,000 cycles; output, 100 millivolts. Needle pressure is one ounce. Has an impedance of 7,500 ohms at 1,000 cps, 110,000 ohms at 10,000 cps.

Two equalizer-amplifier models are available for use with the new cartridge. One, model EA-1, is for installation in sets and audio amplifiers having insufficient gain for operation of the pickup cartridges, and to provide *bass-boost*. The other, model EA-2, is a self-powered unit which provides adjustable *bass-boost*, adjustable treble *roll-off*, and selection of *turnover frequency*.

\* \* \*

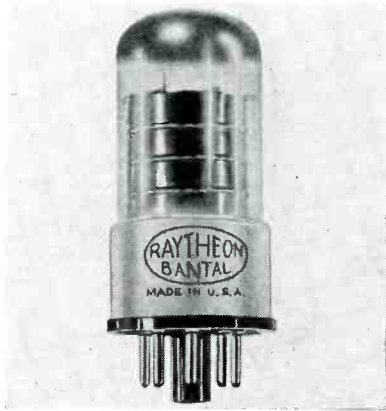
**ESPEY A-M/F-M CHASSIS**

An a-m/f-m 12-tube superhet chassis (plus a tuning indicator and rectifier) has been developed by the Espey Manufacturing Company, Inc., 528 East 72nd Street, New York 21, New York. Receiver features avc and tuned r-f on both a-m and f-m, separate full-range bass/treble tone controls, 13-watt push-pull audio output and provision for phonograph operation controllable from the front panel.



**TRANSMIRRA IMAGE DEFINER**

A plastic screen to provide contrast on tv picture tubes has been announced by the Transmirra Products Corp., 1650 Broadway, New York 19, N. Y. Available for 7", 10", 12" and 15" and projection-type tv sets.



**RAYTHEON BANTAL TUBES**

The radio receiving tube division of Raytheon Manufacturing Company, Newton, Mass., has announced the introduction of Raytheon *bantal tubes*.

Bantal tubes feature 8-pillar support construction.

Bantal tubes, such as the 12SK7GT, are directly interchangeable with its equivalent metal or GT type since they require no extra shielding.

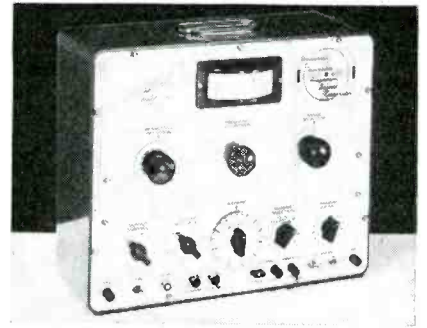
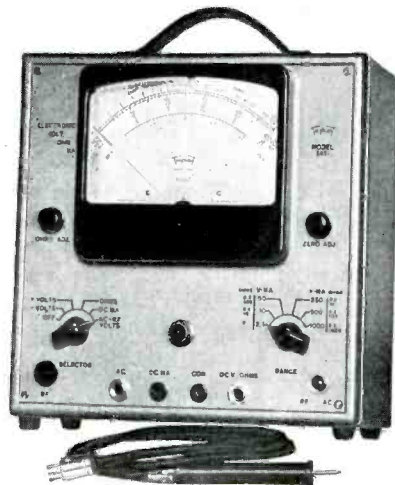
Bantal construction is now available in eight types: 6SA7GT, 6SJ7GT, 6SK7GT, 6SQ7GT, 12SA7GT, 12SJ7GT, 12SK7GT, and 12SQ7GT.

\* \* \*

**TRIPLET VOLT-OHM-MILLIAMMETER**

An electronic volt-ohm-milliammeter, model 2451, has been announced by The Triplet Electrical Instrument Co., Bluffton, Ohio.

Instrument is said to eliminate switching back and forth from range to range to balance the circuit, it only being necessary to zero the meter on the range to be used and proceed with the test.



**HICKOK UNIVERSAL TV-ALIGNMENT GENERATOR**

A tv-alignment generator, model 610, which permits visual alignment on any of the 13 channels from 44 to 216 mc has been developed by Hickok Electrical Instrument Company, 10529 Dupont Avenue, Cleveland 8, Ohio.

Instrument also provides visual alignment of i-f stages of tv receiver on high and low bands, alignment of traps with a calibrated signal-modulated or unmodulated, and application of an accurate marker at any point along the i-f response curve. Self-contained marker frequencies are directly calibrated on a 9 1/2" dial.

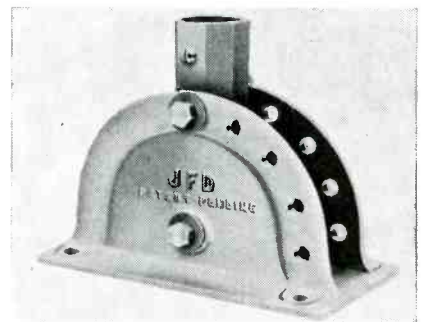
Channels 5 through 13 can be aligned directly by calibrated f-m oscillator without heterodyning the oscillator against a fixed oscillator. Instrument also provides a crystal-controlled frequency, modulated or unmodulated, from 1 to 216 mc.

\* \* \*

**JFD F-M/TV ANTENNA BRACKET**

A *multi-position* antenna bracket permitting mounting, with masts up to 1 3/8" o.d., on perpendicular walls, window sills or on peak, gabled or flat roofs, has been produced by J. F. D. Manufacturing Co., Inc., 4117 Fort Hamilton Parkway, Brooklyn 19, N. Y.

Booklet 248S contains full data.



\* \* \*

**WEBSTER-CHICAGO WIRE RECORDER**

A wire recorder, model 78, especially adaptable for home use in connection with a receiver or with a high fidelity public address type amplifier and speaker, has been developed by Webster-Chicago Corp., 5610 West Bloomingdale Ave., Chicago 39, Illinois.

(Continued on page 54)

# Vibrator Tester

[See Front Cover]

A PRACTICAL AUTO-RECEIVER vibrator tester, which will provide an effective indication of vibrator condition, is diagrammed on the cover this month.

## Application

In application, the vibrator is first placed in the proper socket. The voltage is then adjusted by the potentiometer, with switch  $S_1$  held in a closed position, to 5.2 volts.<sup>1</sup> Switch  $S_2$  is then closed. If the vibrator starts, the starting voltage is 5.2 volts or less, indicating a good vibrator. If it fails to start, switch  $S_2$  must be opened and the potentiometer readjusted to 5.6 volts,  $S_2$  being closed again. By adjusting the voltage to various values and opening and closing  $S_2$  the exact starting voltage of the vibrator and its corresponding condition may be obtained. After the starting voltage of the vibrator has been obtained, the potentiometer is adjusted so that the voltage is between 6 and  $6\frac{1}{2}$ . Then the output meter is observed for smooth flow of secondary power. The output meter can be calibrated in *good* and *bad* readings by using known good and bad vibrators.

## Adding Sockets

To accommodate vibrators whose pin arrangement does not mate with the sockets indicated in the circuit, additional sockets can be wired in. Pin arrangement of vibrators are available in vibrator guides.

<sup>1</sup>Vibrators which will start at 5.2 volts or less are *good* vibrators and will give many more hours of satisfactory service. Vibrators that start between 5.2 and 5.6 volts are *doubtful* vibrators and may be expected to fail in the near future. Vibrators that only start above 5.6 volts are *bad* vibrators and may be expected to give immediate trouble, usually when the car battery is low and not being charged by the generator.

After the starting tests are made, the vibrator should be operated on 6 to  $6\frac{1}{2}$  volts with a voltmeter connected in the output circuit. If the voltage fluctuates over a fairly wide range, the vibrator is definitely bad, but a fairly steady output voltage indicates a good vibrator. This test is equivalent to the *Short test* of tube testers.

[Data courtesy P. R. Mallory & Co., Inc.]

# Electronic

LABORATORIES, INC.

NEW 1948  
LINE WITH  
Exclusive features

The outstanding line  
of converters with  
new engineering...  
new design...

## TELEVISION

for Wire Recorders . . .  
Radio Phonograph Combination . . . Small  
Power Tools (1/10th H.P. maximum) . . .  
Public Address Systems . . . Amplifiers . . .  
Communication Receivers and Transmitters  
. . . Small Appliances (mixers, Vacuum  
cleaners, etc.) . . . Laboratory Test Equip-  
ment . . . Sound On Film Amplifiers . . .  
Intercommunication Systems . . . Movie  
Projector Motors . . . Razors . . . Other  
electrical devices.

1. The 110 volt and 32 volt converters are equipped with AUTOSTART . . . the automatic start and stop feature. This provides remote operation of converters, eliminating wiring and installation costs . . . provides instantaneous starting with no warming up.

2. E-L Battery Eliminators are the only units on the market that can simulate actual year 'round operating conditions in the radio repair man's shop. The overload switch is especially valuable to momentarily overload components to break down questionable parts and prevent service call backs.

3. E-L Power Supplies are radio frequency filtered completely for broadcast, short wave, F.M. and TELEVISION bands.



ATTRACTIVE  
NEW PACKAGING

**ELECTRONIC LABORATORIES, INC.** INDIANAPOLIS, INDIANA, U.S.A.

SERVICE, MAY, 1948 • 37

# Identify genuine TWIN-LEAD by this trade mark



## AMPHENOL

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Long recognized by both servicemen and amateurs as the original Twin-Lead, it incorporates all of the improvements developed by Amphenol plastics engineers. Its polyethylene insulation is full thickness from edge to edge and is unaffected by sunlight or weather... remains flexible indefinitely.

Low-loss properties make Amphenol Twin-Lead ideal for television and FM transmission lines and for amateur antennas. Satisfied customers and profitable business result from the sale of genuine Amphenol Twin-Lead.

### TWIN-LEAD ACCESSORIES



Amphenol Screw-eye and stand-off insulators, and line-spreaders of polystyrene.



Amphenol clear plastic window-pane: easy to drill for lead-in.



Amphenol Silicone Compound

### AMERICAN PHENOLIC CORPORATION

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COAXIAL CABLE AND CONNECTORS • INDUSTRIAL CONNECTORS, FITTINGS AND CONDUIT • ANTENNAS • RADIO COMPONENTS • PLASTICS FOR ELECTRONICS

## Association News

(Continued from page 28)

by the George D. Barbey Co. local distributor, and RRSA with the cooperation of Wilmer Trinkle, manufacturer's rep.

RRSA welcomes all radio Service Men and also dealers, students and anyone interested to attend their meetings which are held on the third Thursday evening of each month at the American Legion, 134 N. 4th Street, Reading, Pa.

### ARSNY, New York City

A SERVICING MEETING in which tv, f-m and p-a equipment were discussed was sponsored recently by John F. Rider, Publisher, Inc., under the auspices of the Associated Radio Servicemen of New York. The meeting was held at Manhattan Center, N. Y. City.

Talks were illustrated with film slides.

### ARSD, Columbus, Ohio

THE FIRST TECHNICAL meeting of 1948 of the Associated Radio Service Deal-

ers of Columbus, Ohio, held in April, featured a talk on the Brush magnetic recorder. The meeting was sponsored by Hughes-Peters.

A television committee was authorized to proceed with a television training school to be held in a recently obtained study room at the Buckeye Radio Labs. All expenses will be paid by the association.

### ARSD Code

ARSD report that they adopted a 11-point code of ethics in 1945, which has proved very effective.

The code states:

A member of ARSD will make an honest effort to give full satisfaction to his service customers.

A member of ARSD will conduct himself in his customer relationship in a manner which will reflect credit on ARSD and its members.

All members should furnish his client an itemized statement of material used and services rendered.

A member of ARSD will not engage in unfair practices nor take advantage of his client or a fellow member.

A member of ARSD will willingly cooperate in solving any problem for a fellow member, when called upon to do so.

A member of ARSD will not make derogatory statements concerning the qualifications of any member of our profession, who has previously served the client. If the article has been previously serviced by a member of ARSD, this member should be allowed to correct the complaint.

A member of ARSD will not knowingly hire away an employee of any other member.

A member of ARSD will not advertise free service or give free service, free inspection or free pickup and delivery.

A member of ARSD will refrain from any type of advertising which states or infers that his service is superior to that of a fellow member.

ARSD recommends that members use replacement parts made by or for the manufacturer of that specific product he is servicing or shall use standard recognized parts of equal or superior quality.

A member of ARSD is urged to purchase all supplies from our associate jobber members, as we believe it is to our mutual benefit.

### RTG, Rochester, N. Y.

THE OSCILL-O-GRAM, organ of the Radio Technicians Guild of Rochester, announces that election time will soon be around. Nominations were presented during the April meeting.



## Tube News

(Continued from page 34)

of the receiver power supply. Therefore, it must remain connected, but be kept physically out of the vicinity of the 10FP4. The magnet should be securely taped, wired, or clamped to some part of the chassis in a position as far from the picture tube as its lead wires will allow. It should not be placed close to a receiving tube.

If no convenient position can be found for the magnet, it can be removed from the circuit and a resistor of equal resistance be substituted.

### Tubes For A-C/D-C A-M/F-M

EIGHT TUBES, series connected, with a heater current of 150 ma, have been included in several a-c/d-c a-m/f-m models.

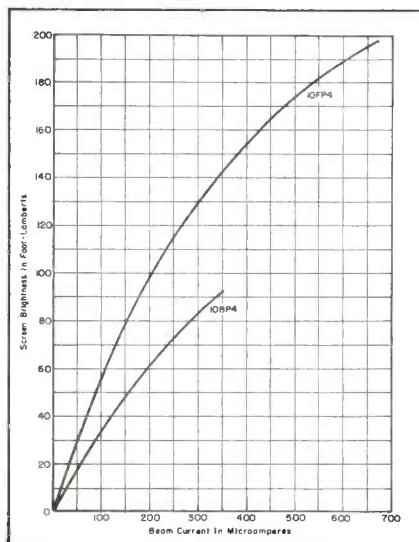
Tubes used include the 6BJ6 (6.3 heater volts), 12BE6 (12.6 heater volts), two 6BJ6s (6.3 heater volts, each), 12AL5 (12.6 heater volts), 6AQ6 (6.3 heater volts), 35B5 (35 heater volts) and 35W4 (32 heater volts), the voltage for the string being 117.4.

One 6BJ6 is used as an a-m/f-m r-f amplifier, and the 12BE6 serves as a converter. Another 6BJ6 appears in the a-m/f-m i-f amplifier stage, the third 6BJ6 being used as a driver in the f-m i-f amplifier. The 12AL5 is used as an f-m ratio detector.

The 6AQ6 functions as an a-m detector and a-m/f-m a-f amplifier. In

(Continued on page 40)

Fig. 2. Average characteristics of the 10FP4 and 10BP4 tv-picture tubes, prepared by the commercial engineering division of the G.E. electronics department.

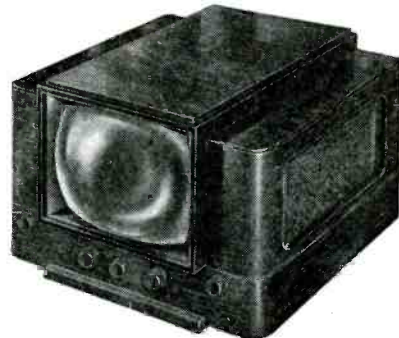


# A GREAT TRANSVISION FIRST!

**NEW... Sensational TRANSVISION Development now offers LARGE-IMAGE DIRECT-VIEW TELEVISION at low cost!**

## BIGGEST VALUE in TELEVISION

**Model 10BL TELEVISION KIT with FM Radio... Features Beautiful CABINET with BUILT-IN LENS... Gives LARGE 120 Sq. In. Picture**



MODEL 10BL

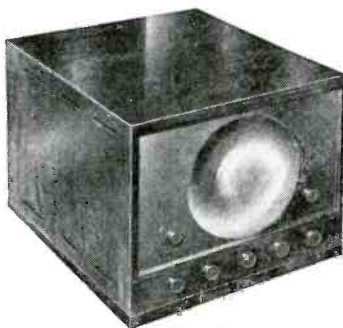
**Roto-picture effect:** Picture "rotates," giving the appearance of being in focus and clearly visible from every angle! Uses 10" Electromagnetic Direct-view Picture Tube. Features new-type cabinet with built-in lens which magnifies, clarifies, and heightens contrast of the picture. The lens also creates the effect of apparent rotation of the picture, so that when the observer moves, the picture still seems to be in focus and clearly visible from any angle.

**ECONOMICAL KIT, EASY TO ASSEMBLE.** In point of value, this Television Kit provides the opportunity of acquiring a LARGE-IMAGE direct-view television set at a **VERY LOW PRICE**; also very economical from a tube replacement angle. This model is available in **KIT FORM**, for easy assembly; no technical knowledge required. Simple step-by-step instructions are included. *Saves as much as 50% over the cost of receivers with similar picture magnitude.*

**TECHNICAL DATA:** Model 10BL uses a 10" Electromagnetic Direct-view Picture Tube; has complete F.M. Radio which comes completely factory-wired; receives all channels in any area; supplied complete with antenna and lead-in wire. The LENS is 15" x 11", giving a picture size of approx. 10" x 12" or 120 sq. in.; the highly-styled cabinet measures 26" wide x 17" high x 19" deep, available in Mahogany, Walnut, or Blonde finishes.

**PRICES:** Transvision *MODEL 10BL Television Kit*, with FM, 10" tube, cabinet with built-in lens, antenna, 60 ft. lead-in wire. **NET \$299.95**

## Scoop! New Revolutionary MODEL 7BL Television Kit with Specially Designed CABINET with BUILT-IN LENS



MODEL 7BL

- Uses 7" Electrostatic Picture Tube
- Gives 50 square inch picture of superior quality

**FEATURES:** Though it has a 7" tube, the effect is equivalent to a 10" set because the built-in lens magnifies the picture. Also picture performance is superior because the lens clarifies and heightens contrast of the image. Picture "rotates" apparently, as the observer moves, giving the effect of always facing the observer. This is effective to a very wide angle. Pre-tuned for 5 channels.

**PRICE:** Including cabinet with built-in lens, antenna, 60 ft. of lead-in wire. **NET \$189.00**

## TRANSVISION "SERVICE NOTES"

*The Key to Successful Television Servicing*

Transvision's "Service Notes" is a compilation of confidential Television Notes and Information, the product of experience with over 20,000 television receivers, now made available to the public. The "Service Notes" is a most valuable compilation of instructions and data on Magnetic and Electrostatic Television Receivers. Though compiled in the course of servicing Transvision Kits, the information is applicable to any type of television receiver. "Service Notes" is complete with photographs and diagrams. The information is worth a small fortune. The cost is low.

**NET \$1.95**



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For further information see your distributor, or write to:

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Ask your jobber or write to us for Utah's new 1948 catalog . . . just off the press. It's complete. Lists over 75 speaker types and sizes. Gives complete physical and operational specifications.



**UTAH RADIO PRODUCTS**  
**HUNTINGTON, INDIANA**  
 DIVISION OF INTERNATIONAL DETROLA CORPORATION

**LOOK FOR THE COLORFUL UTAH CARTON**

**Tube News**

(Continued from page 39)

the output amplifier stage is the 35B5, the 35W4 being used for rectification and panel-lamp supply. Several of these tubes have features which make them particularly suitable for a-c/d-c a-m/f-m service. Type 12AL5 is used in the ratio-detector circuit because of its high perveance and good balance between sections. The 35W4 is recommended because its heater is tapped for the operation of a panel lamp and because it is capable of

supplying the direct-current requirements of such a tube complement. The 6BJ6 is suited for r-f amplifier service in the f-m band because it has a high transconductance (3,800  $\mu$ mhos) and a low input conductance (275  $\mu$ mhos). As an i-f amplifier, the 6BJ6 has the high transconductance necessary for f-m service and the low grid-to-plate capacitance (.0035 mmfd max.) essential for f-m and a-m. The control characteristics (transconductance, plate current, and screen current versus grid voltage) of the 6BJ6 indicate a sharper cutoff than most other remote cutoff types. This

cutoff characteristic has been selected to obtain a high transconductance at a moderate value of plate current. Although it reduces the maximum signal level which can be handled by a tube without cross-talk or r-f distortion, signal levels at the input to the first tube, for receivers with self-contained antennas, do not generally become large enough to cause difficulty. When an outside antenna is used, however, the coupling from the antenna to the signal grid in the a-m band must be reduced to a suitable value. A preferred arrangement for maintenance of good signal-to-noise ratio is to use normal coupling between the antenna and the first tuned circuit, but to apply only part of the voltage developed in the tuned circuit to the control grid of the r-f tube. A convenient way of doing this is to use a coupling capacitor between the tuned circuit and the control grid which is of the same order of magnitude as the input capacitance of the tube (4.5 mmfd).

[Based on copyrighted material supplied by RCA.]

**TV Tools**

(Continued from page 18)

using lockwashers and nuts fastened snugly on the underside. All pivot points should be tightened with the proper tool. If, accidentally a crack develops in the shingle, a piece of copper flashing or tin roofing sheet can be inserted under the entire length of the crack.

**NEW YORK LICENSING-STUDY MEETING**



Aaron Lippman, president of NEDA, Louis B. Calamaras, NEDA executive secretary, and Hugo Rogers, president of the Borough of Manhattan, New York City, discussing the proposed Service Men's licensing bill which has been indefinitely postponed.

## Your Shop Window

(Continued from page 35)

equipment; tubes for example have greatly changed in design, function and size over a short period of years. An interesting display might be the evolution of the tube from the first crude diode type to the present amazingly small peanut types and the large complex cathode ray tubes used in television. If the tube is the brain of the radio and television set, then these improvements should be spotlighted, stressing that tubes cost very little in comparison to the enjoyment and entertainment they provide. You can stress how tubes effect the health of the receiver and how they can be reliably tested by you.

### Good Housekeeping

We all know the importance of cleanliness in the show window. Your windows, floor and merchandise should be kept clean and your display items in first class condition. Dusty and dirty products rub the consumer the wrong way, not to mention the impression it makes on the housewife. This also ought to be the rule within the store itself where products are touched and handled by patrons who expect to find everything in perfect condition.

### Effective Lighting Helps

Lighting should be dramatized to point up the features on the stage. This can be achieved by spotlighting, floods, flashers and color shields. Don't be afraid to experiment with lighting. It adds color to your entire window and can be used to single out individual items for particular attention. As it is on the stage, a well-placed spotlight focuses attention on the star of your display. Lighting might also be effectively used with a rotating display, cutouts furnished by some manufacturers and in many other ways.

### In The Store Show

You will also find reliable promotion devices in the dealer aids offered by manufacturers. Such items as display cards, merchandise stands, window streamers and decals give the added weight of well known brand names to your display. At the same time this material adds a professional and personal touch to your store front by identifying your name with a national advertiser whose goods and services you

(Continued on page 45)

# CURRENT CONVERSION

## ATR "A" BATTERY ELIMINATORS



### for DEMONSTRATING AND TESTING AUTO RADIOS

**New Models . . .** Designed for Testing and Operating Auto Radios and D. C. Electrical Apparatus from 110 Volt A. C. Lines. Equipped with Meter, Voltage Control, and Selenium Rectifier, Assuring Noiseless, Interference-Free Operation, and Extreme Long Life and Reliability.

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**AUTO RADIO  
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A Complete Line of Vibrators . . .

Designed for Use in Standard Vibrator-Operated Auto Radio Receivers. Built with Precision Construction, featuring Ceramic Stack Spacers for Longer Lasting Life.




New 34 page  
VIBRATOR  
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New Models



**STANDARD AND  
HEAVY DUTY  
INVERTERS**

For Inverting D. C. to A. C. . . .

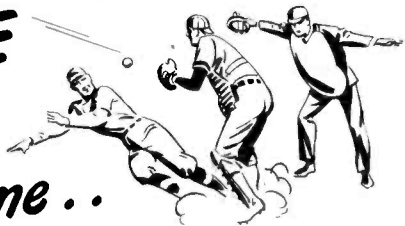
Specially Designed for operating A. C. Radios, Television Sets, Amplifiers, Address Systems, and Radio Test Equipment from D. C. Voltages in Vehicles, Ships, Trains, Planes and in D.C. Districts.



**NEW MODELS**  
**NEW DESIGNS**  
**NEW LITERATURE**  
*See your jobber  
or write factory*

**AMERICAN TELEVISION & RADIO Co.**  
*Quality Products Since 1931*  
**SAINT PAUL 1, MINNESOTA-U. S. A.**

**YOU'RE SAFE  
at HOME!  
for every ball game...**



**with the  
HIGHEST QUALITY**

## MEISSNER FM RECEPTOR

● The thrill and incomparable beauty of FM reception is available to all with the Meissner model 8C FM receptor. A simple connection to any present AM radio . . . and the full scale fidelity of FM reception, unbelievably free from static, interference or fading, is brought to the listener as only the quality of Meissner skill can produce it. See and hear the new MEISSNER — there is nothing like it! Retail Price . . . \$57.50.

● New FM Band, 88 to 108 Mc. ● Audio Fidelity, flat within plus or minus 2 db. from 50 to 15,000 CPS ● Audio Output, 3 volts R. M. S. at minimum useable signal input, 30% modulation. ● For greater signal inputs, output voltages as high as 15 volts R. M. S. obtained without distortion. ● Power Supply, 105 to 125 volts, 50 or 60 cycle AC. Consumption, 35 watts ● Tube Complement, 2 type 6AG5, 2 type 6BA6, 2 type 6C4, 1 type 6AL5 and 1 type 6X5GT/G

**M** **MEISSNER MANUFACTURING**  
DIVISION OF MAGUIRE INDUSTRIES, INC.  
MT. CARMEL, ILL., U. S. A.

## Vibrator Design

(Continued from page 31)

cuit of this sort it is possible to increase the output by increasing the number of secondary turns without any limit except the eventual overloading of the vibrator.

Thus we have the full-wave non-synchronous vibrator circuit, also known as the primary interrupter. It has proved to be highly successful and is the fundamental vibrator circuit

used in practically all auto radios today.

In successive developments, engineers found they could eliminate the rectifier tube by adding a couple of pairs of contacts to the vibrator. This resulted in the synchronous (or self-rectifying) vibrator circuit.

### How the Synchronous System Works

The vibrator in its two operating

positions is shown in Fig. 2. In *A* the battery voltage is applied across the primary winding 1 of the transformer. This voltage appears as a positive voltage at the center tap, with its negative appearing at the vibrator contact,  $P_1$ . Transformer action produces a positive high voltage at the secondary center tap with the negative appearing at the start of secondary winding, 1; this negative is connected to ground through the vibrator contact  $S_1$ . When the reed swings into the position indicated in *B*, the primary center tap is again positive with its negative appearing at the finish of primary winding 2, which is connected to ground through the vibrator contact  $P_2$ . There is now developed in the transformer secondary a voltage which is positive at the center tap and negative at the finish of secondary winding 2, which is connected to ground through the vibrator contact  $S_2$ . Thus we see that regardless of the position of the vibrator reed, we have a voltage which is positive at the secondary center tap with respect to ground, so we can obtain a positive d-c output from the transformer's secondary center tap. Thus we have a method of obtaining high voltage d-c without the use of a rectifier tube.

### Polarity Problems

It seems to be a law that whenever you obtain an advantage like this, you lose some other advantage. This becomes evident as we study the synchronous and non-synchronous circuits when the battery polarity is reversed.

With the non-synchronous circuit both plates of the rectifier tube are continually waiting for a positive voltage to appear and the plate that receives the positive voltage will conduct and deliver that voltage to the output. For this reason, either input polarity of the battery will result in a positive output from the rectifier tube. With the synchronous circuit, however, a reversed battery will mean that the secondary center tap is held at negative with respect to ground instead of positive.

### Sync Vibrator Restrictions

Of course receivers don't work with negative voltage applied to the tube plates. Because of this synchronous vibrator disadvantage, this type is usually used in auto sets designed for

only one make of car, when the circuit can be arranged for the proper battery polarity. Synchronous vibrators are sometimes used in receivers which can be installed in any car and it is then necessary to add a special switching circuit to reverse the primary of the transformer.

[Data based on material prepared by The Radiart Corp.]

### VIBRATOR BULLETINS

A 20-PAGE BULLETIN describing non-synchronous and synchronous vibrators has been prepared by the James Vibrapower Co., Chicago, Ill.

Data presented includes detailed analysis of push-pull action vibrators, base wiring diagrams, and replacement guide.

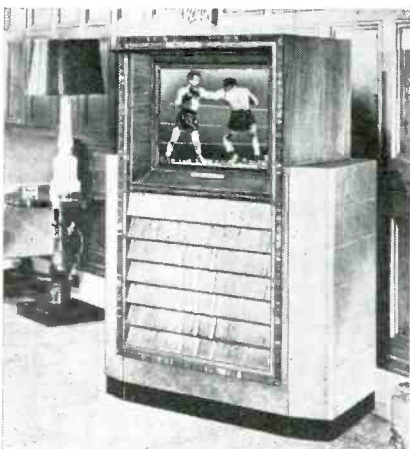
A 12-page vibrator-converter catalog has been published by Electronic Laboratories, Inc., Indianapolis, Ind.

Described are d-c to a-c converters for 6, 12, 32 and 110-volt inputs, battery eliminators providing from 2.5 to 12 volts output, d-c to d-c converters which operate on 6-volt battery sources, frequency changers designed for operation of 60-cycle amplifiers and turntables from 25- or 50-cycle power, and a line of 12 vibrators which, it is claimed, will take care of 98% of the replacements required today.

A 36-page vibrator guide has also been prepared by American Television and Radio Co., 303 East Fourth Street, St. Paul 1, Minn.

Data offered includes servicing procedures and replacement information.

### PROJECTION TV RECEIVER



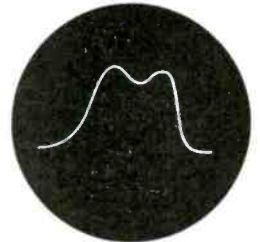
Specially-designed club room tv-projection receiver recently announced by RCA.

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## Your oscillograph MUST have



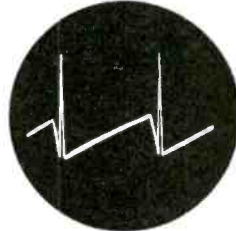
good low-frequency response to align video and r-f amplifiers and video and f-m i-f amplifiers. You NEED an adequate low-frequency response to display correct detector and discriminator curves. Also, you MUST have deflection sensitivity better than 0.02 rms volt/in. to obtain a readable pattern on the cathode-ray tube. The Du Mont Type 208-B Cathode-ray Oscillograph has a sensitivity of 0.01 rms volt/in. and its frequency response is 2 cps to 100 kc.



Frequency-response curve of i-f amplifier

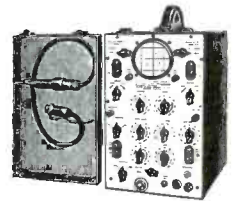
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## For GENERAL trouble-shooting



Sawtooth waveform and sync pulse of vertical sawtooth generator

such as checking video amplifiers and observing sync pulses, your oscillograph MUST have a HIGH frequency response of approximately 2 mc (higher response is not necessary) with a deflection sensitivity of 0.1 rms volt/in. to examine the waveform of these signals in the various circuits. The Du Mont Type 224-A has a sensitivity of 0.1 rms volt/in. and a frequency response to 2 mc. The Type 224-A also employs continuous sweep, which is entirely satisfactory for servicing applications.

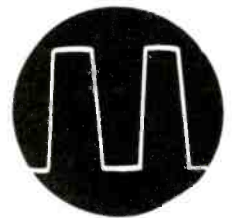


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## ... and to CHECK Signal level



at specific points, as designated by the television set manufacturer, the Du Mont Type 264-A Voltage Calibrator is ideal for measuring the voltage amplitude of ANY PART of a complex signal displayed on your oscillograph.



Square-wave output for measuring signal amplitude

**Cat. No. 1240-A, \$39.50**

- These three instruments constitute the "MUSTS" of Expert Television Servicing. Descriptive literature sent on request.

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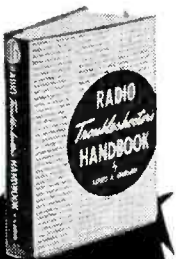
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Name .....  
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City & Zone ..... State .....

## Vibrator Power

(Continued from page 33)

of the vibrator, and upon the design center for input voltage for vibrator operation.

The output circuit is of the conventional type, except that a heater circuit filter choke has been added, since the receiver tubes must be supplied through this common lead. The input switching has two positions, one for d-c, or battery, as shown in solid arrows, and one for a-c as shown in dashed lines. When the connection is to the battery, the a-c snap-switch is open on both sides of the line to avoid conduction of interference picked up on the transformer to the outside leads. These leads are also bypassed to ground by capacitors,  $C_6$ . When operating on d-c, the primary connections to the vibrator are conventional, with the *off-center* tap open. When switched to a-c, the battery is disconnected, the lower end-tap of the primary is switched to ground, and the tube heater connection, which was formerly connected to the battery and primary center-tap, is connected to the *off-center* tap so that additional voltage is provided for the circuit.

When winding this type of transformer, the secondary and vibrator primary should be adjacent, so as to obtain the closest coupling and lowest leakage reactance.

Another means of operating vibrator power supplies on a-c power lines consists of removing the vibrator and replacing it with a plug of the same basing, to which is connected an a-c cord. This is attached to the interrupter contact pins of the plug; so that a suitable a-c voltage may be applied to the vibrator primary. For a 6-volt power unit, the required voltage would be approximately 10 rms across the entire primary. This can be supplied by an ordinary step-down transformer of sufficient volt-amperes capacity. This arrangement permits the design of the vibrator power supply to be made for minimum size and maximum efficiency, with reasonable cost.

In Fig. 4 we have a supply system developed originally for military equipment, but available for other uses. With this circuit it is possible to secure two output voltages, ordinarily of different values, and common at one point in the circuit (normally at ground potential). A self-rectifying vibrator of the usual type is used. The vibrator acts as a full-wave interrupter into the usual transformer primary. However, instead of serving as a full-wave rectifier as is usual, the rectifier portion acts as two half-wave rectifiers.

One portion rectifies on one-half of the cycle, while the other rectifies on the other half. This permits the two outputs to be either both negative with respect to ground, both positive, or one of each, as is desired. The circuit shown has one output positive to supply a B+ plate and screen circuit, and the other negative to supply a C- bias circuit. Each is filtered in a smoothing action by filters, as shown in the form of reactors  $L_2$  and capacitors  $C_3$  and  $C_7$ .

This system might be desirable in securing large values of positive and negative voltages at low currents, referred to ground as a reference point. If the watts drawn from one-half of the cycle are decidedly different from those on the other half of the cycle, the magnetization of the core of the transformer will be unbalanced to a rather large degree, and unbalanced vibrator operation will result. This can be balanced by deliberately unbalancing the transformer primary by setting the *center-tap* off-center by the required number of turns to equalize the magnetizing action. The timing capacitor may be located on either of the windings of the secondary, or both. If one is to be used, the higher voltage one will provide for the smallest value of capacitance. The one to which the capacitor is attached must be closely coupled to the primary.

The additional secondary,  $S_3$  is shown, together with a suitable dry-disc rectifier and smoothing filter, as an illustration of how an isolated low d-c voltage output may be supplied. The load should be small compared to the other output requirements or should be comparatively low compared to the vibrator's capacity, if suitable performance is to be maintained. Such a load, in this instance, consists of a series of filament type tubes, requiring very low current and voltage.

[Based on copyrighted data appearing in the vibrator data book, *Fundamental Principles of Vibrator Power-Supply Design*, compiled and published by P. R. Mallory and Co., Inc.]

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## Your Shop Window

(Continued from page 41)

offer. In grouping your feature item in the center of your window it is always wise to place a few display cards around the exhibit. These cards are sharp and colorful and make the passer-by familiar with brand names. Small supporting stands may be used to feature smaller items which might be placed in your display. It is especially important to use the proper display cards with the right product.

### Use of Decals

The most consistently used of all retailer aids is the decalcomania or *decal*. To the customer the decal is a reassuring emblem that stands for authorized Service. It is as familiar and important as the sign over your shop and ought to be used properly and effectively. Make sure a customer sees your decals, place one on your door, another on the lower corner of your show window and still others on show cases and elsewhere in your shop. You should be sure your decals are always fresh and up-to-date in design. When they become blistered by the sun or faded, remove them. You can always get new ones from the manufacturer without cost.

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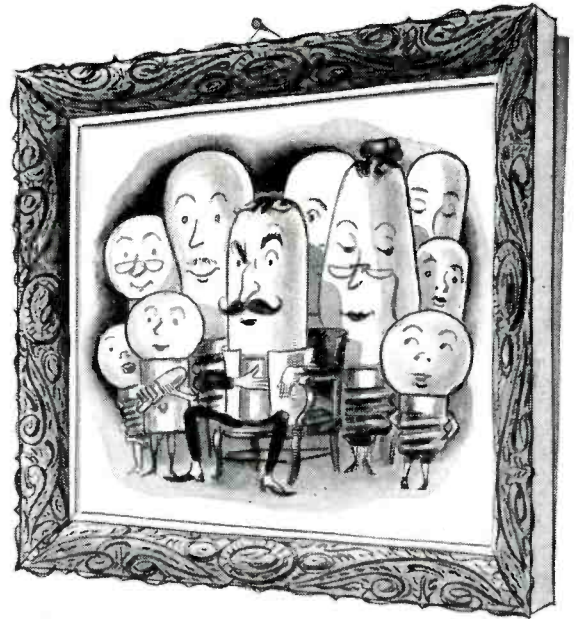
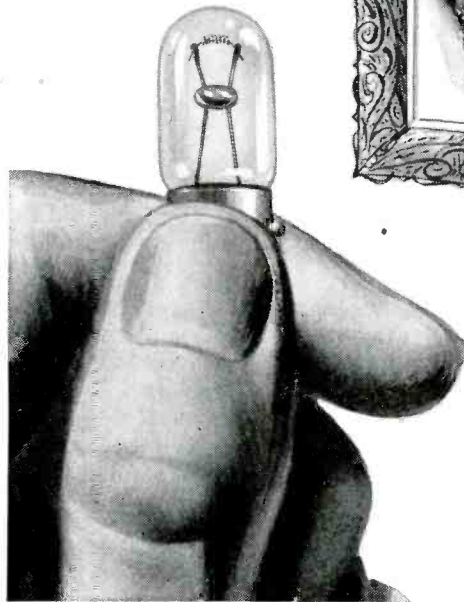
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An omnidirectional f-m receiving antenna, the *Trylon antenna*, has been produced by the Wind Turbine Company, West Chester, Penna.

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Voltage standing wave ratio said to be less than 2 between 88 and 108 mc.



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For information on prices and types of G-E miniature lamps, see your nearby G-E Lamp Office. Or write to General Electric Co., Div. 166-S-5, Nela Park, Cleveland 12, Ohio.

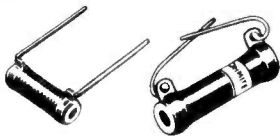


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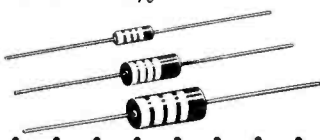
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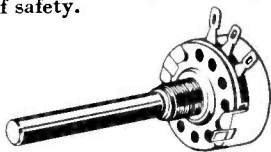
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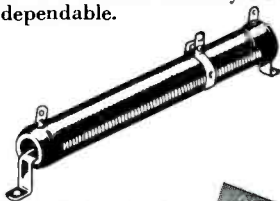
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## Servicing Helps

(Continued from page 26)

the vertical and horizontal dimensions of the image. The horizontal amplifier controls the amplitude of the voltage applied by the sawtooth signal generator, which is a part of the scope. However, the sawtooth signal generator may be disconnected from this circuit by swinging the coarse frequency control to horizontal input amplifier. In this manner, any external voltage may be applied to the horizontal input circuit.

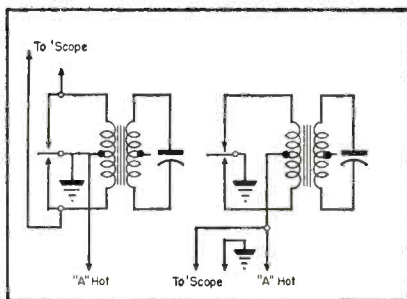
### Checking With the 'Scope

Both the voltage and the current waves of the vibrator on the 'scope can provide useful data. The voltage wave tells whether the vibrator is in good condition or electrically matched to the circuit and the current wave tells whether the circuit is faulty or the vibrator is correctly connected in it.

In making these tests the voltage wave is taken by checking the wave form in some section of the vibrator power transformer. This connection is usually made at the transformer primary connections to the vibrator socket.

The current wave form is taken by connecting the 'scope across the 6-volt supply; that is, between the A hot line and ground at almost any point in the set. The vibrator draws a pulsating current from the battery and there is a corresponding voltage drop in the battery line which has the same wave form as the current. Connecting the 'scope across this wave form and increasing the gain of the 'scope sufficiently will provide the desired wave.

Fig. 3. Circuits for connecting 'scopes to study the vibrator voltage wave (left) and vibrator current wave (right).



The vibrator should run smoothly both before and after the tubes in the set are warm. This is best checked by taking the voltage waveform. The vibrator should give a normal wave as soon as the set is turned on and the wave should not change very much in appearance as the tubes warm up and the load comes on.

### Sync Wave Forms

If the vibrator being checked is a synchronous type, the wave should look like wave A in Fig. 5 before the tubes are warm and will probably change its form to that of Wave B when the load comes on. The reason for the *ears* on the wave form is that the secondary points on the synchronous vibrator are set wider than the primary and accordingly do not place a load on the vibrator as soon as the primary points connect.

In all other respects, however, the

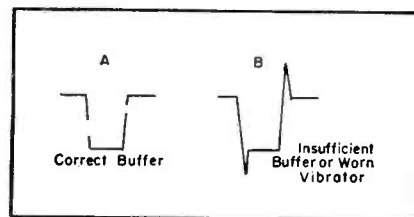
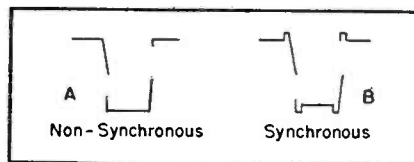


Fig. 4. Voltage waveforms (no load) which appears with a correct buffer (left) and insufficient buffer or worn vibrator (right).

Fig. 5. Voltage waves (load on) for non-synchronous (left) and synchronous (right) type vibrators.



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synchronous wave form is similar to the non-synchronous.

The 'scope can also be used to determine reasons for short life. In this case, a check of the current waveform will tell whether or not the load is equally divided between the two sets of vibrator contacts.

### Full-Wave Circuit

In the normal full-wave vibrator circuit, each vibrator contact feeds one plate of the rectifier tube and the load should be balanced about equally between the two contacts. This load balance will be indicated by equal height on consecutive current pulses; Fig. 7.

If half of the transformer primary were open in this circuit, there would be current pulses flowing when one pair of contacts is closed and none when the other pair is closed. This will give very nearly normal output voltage but it is undesirable and will cause short vibrator life. The current wave form will show this condition because of the long off period between the adjacent current pulses.

If one plate of the rectifier tube is weak or not conducting, or if half of the transformer secondary should be

(Continued on page 48)

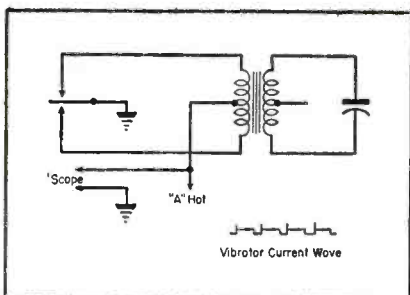


Fig. 6. Vibrator current wave viewed when the circuit above is employed.

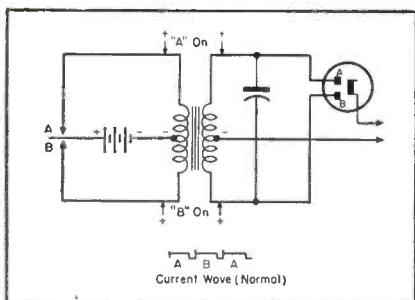


Fig. 7. Normal current wave forms. The current flow through contact A feeds plate A and the current flow through B feeds plate B.

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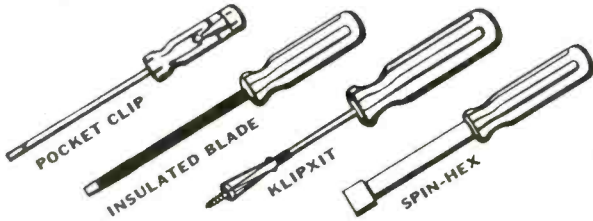
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## Servicing Helps

(Continued from page 47)

open, the current wave will indicate that one set of points is loaded and the other set of points is carrying magnetizing current. The wave form will be about as shown in Fig. 8. This condition will also cause short vibrator life.

The peaks at the front edge of current pulses are caused by a charging current for the buffer capacitor. In general these peaks should be no higher than two or three times the height of the current pulse when the vibrator is working under load. The peaks do not have to be equal for each pulse, but a value higher than normal indicates too much buffer capacity, which should cause short vibrator life. Peaks of this sort may also cause hum in the speaker because they get into the field coil and are induced into the voice coil.

### Vibrator Starting

At times it will be found that new vibrators may not start. This condition is usually caused by a coating on the vibrator contacts, often the result of storage in high humidity. It is thus necessary to eliminate this coating.

The ideal starting condition for the vibrator would be the instantaneous application of six volts across its magnet coil. In auto receivers, the tube heaters, when cold, draw a heavy starting current which drops the voltage initially applied to the vibrator

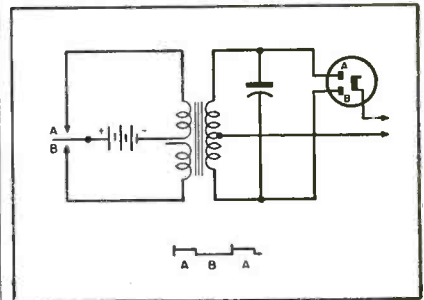
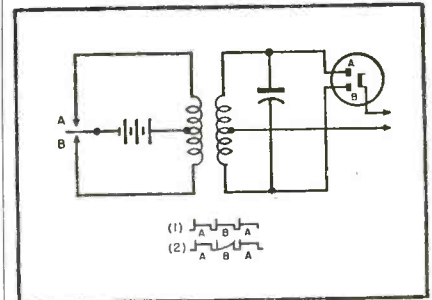


Fig. 8. A current waveform with contact B open. No current can flow in contact B.

Fig. 9. Wave forms when plate B does not draw full current. In one instance, curve at top, the emission to the plate B is weaker than to plate A or contact B has a higher resistance. In the second instance, the secondary plate B or plate B itself is open.



# HIGH-VOLTAGE

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as low as 4.5 volts. Thus instead of springing into action, the vibrator reed pulls over gradually and fails to break the film on the points.

There are three methods which can be used to start the vibrator:

In the first method, the receiver is left on until the tubes are warm. Then the receiver is turned on and off rapidly several times.

The second method requires that the vibrator be removed. Then the storage battery is connected in series with the automobile headlight bulb, or other resistance of about one ohm, and these two leads brought across the reed and one of the primary contacts. The reed in the vibrator will move when you hit the primary contact to which the coil is connected. Battery voltage should be applied several times.

In the third method, a 100-watt bulb is used and connected in series with the vibrator coil, and then the line voltage of 110 a-c is applied. When the bulb lights, you'll have current in the coil. The 60-cycle a-c will keep the reed rubbing the film away. About thirty seconds of this treatment should be sufficient, and will not damage the vibrator. When the vibrator

(Continued on page 50)

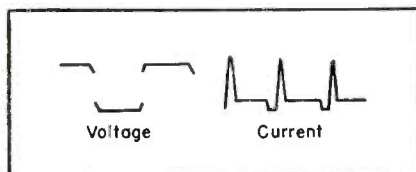
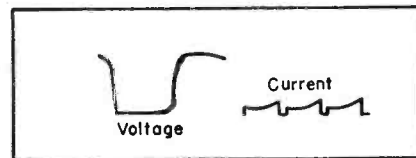


Fig. 10. Vibrator waveforms obtained when the buffer is excessive. Wave at left is for voltage and wave at right is for current.

Fig. 11. Vibrator waveforms secured when the vibrator frequency is too low for the circuit. At left, we have the voltage form and at right, the current form.



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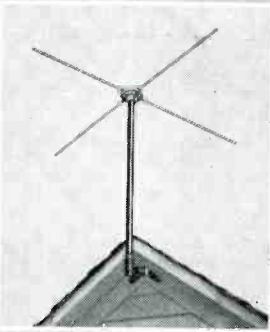
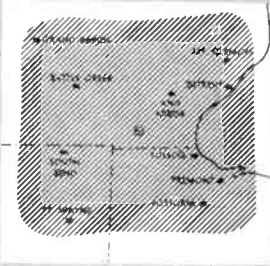
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## Servicing Helps

(Continued from page 49)

has started, about two minutes operation in receiver will clean contacts.

[*Scope checking analysis and vibrator-starting material based on data prepared by the Radiart engineering department.*]

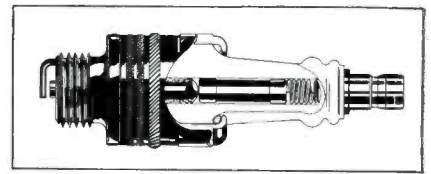
### Arvin Auto Model 18<sup>1</sup>

A common trouble with this set is in weak leads at terminals beneath variable capacitor which snap off frequently. It is impossible to notice the break without making use of a mirror. Even after finding the break there comes the problem of getting under the capacitor to resolder the broken lead. This repair can be made by unsoldering the leads from one of the i-f transformers located under the gang, removing the transformer shield and all, and then using the resulting hole to work through.

### Firestone Auto Radio 7407-3<sup>1</sup>

A dead set with a buffer capacitor burned to a crisp seemed to only require capacitor replacement. This was done with a .005-mfd 1,600-volt unit. But before replacing the cover, I noticed a charred piece of the capacitor adhering to the cover. On checking to see if the capacitor had been shorting to the cover, it was found that the terminal strip to which one lead of the buffer was connected had been shorting out instead. The strip was removed and the capacitor was connected to rectifier socket directly instead.

<sup>1</sup>From data prepared by John W. Findarle. Spark plug with built-in resistor which aids in suppressing spark plug interference. Test report indicated that interference was suppressed within 35 mv/m from 540 kc to 150 mc at 50'. (Courtesy The Electric Auto-Lite Co.)



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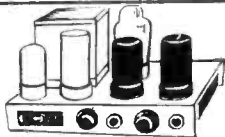
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# NEWS

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vision manuals has been announced by  
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Manual will cover the television re-  
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leaders in the industry.

Accompanying the manual will be a  
companion *How It Works Book*, of about  
200 pages 8½"x11", explaining the theory  
of operation of every phase of tv equip-  
ment, such as antennas, video amplifiers,  
sound amplifiers, sync generators, sweep  
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tion chief for the Signal Corps.



\* \* \*

### MILTON ROTH BECOMES RADIART JOBBER SALES MANAGER

Milton S. Roth has been appointed job-  
ber sales manager of the Radiart Corp.,  
Cleveland, Ohio.

\* \* \*

### H. C. SMITH NOW CONCORD RADIO DIRECTOR OF ADVERTISING

Harry C. Smith has been appointed  
director of advertising for the Concord  
Radio Corporation. He will handle  
national advertising for the Chicago and  
Atlanta branches, and the retail adver-  
tising for Concord's stores at 229 West  
Madison Street and 901 West Jackson  
Blvd., Chicago.



\* \* \*

### VACO PRODUCTS CATALOG

A 30-page loose-leaf catalog describing  
250 stock sizes of screwdrivers has been  
prepared by Vaco Products Co., 317 East  
Ontario Street, Chicago 11, Ill.

Application tables covering various  
sizes and types of screw and nut drivers  
are also presented.

(Continued on page 52)

## Built for Service



Servicemen's choice!  
in . . .



● Every year is an election year for  
Cunninghams in Colorado. People  
vote for Cunninghams because Cun-  
ningham tubes are "built for service."  
Their top performance and long life  
make them the outstanding renewal  
tubes. That's why *you* should vote to  
use Cunninghams in *your* work.

See your  
CUNNINGHAM DISTRIBUTOR

L. B. WALKER RADIO CO. . Pueblo  
L. B. WALKER RADIO CO. . Denver

# Cunningham Tubes

A product of  
RADIO CORPORATION OF AMERICA  
Harrison, N. J.

# REVOLUTIONARY

## THE NEW *Astatic* Magneto-Induction PICKUP



● Yes, this is it! A radically new pickup cartridge that opens broad new vistas of listening pleasure.

The Astatic Magneto-Induction Pickup represents the first clean break with traditional principles employed in the manufacture of magnetic type reproducers. Discarded now is the need for delicately spaced "air gaps," which collect lint and dust, become a prime source of trouble in other type magnetic pickups. Their elimination in the Magneto-Induction cartridge is a newly opened door to peak fidelity of reproduction that is stable and troublefree, even under the most consistent service or adverse climatic conditions.

**MODEL MI-1**      **MODEL MI-2**  
Standard Housing      Mumetal Housing\*

\*Provides increased shielding effect for maximum reduction of hum.

Also Two Equalizer-Amplifier Models

**NOW AVAILABLE**

Here are the OUTSTANDING FEATURES

1. No "Air Gaps."
2. No necessity for delicate handling.
3. No costly armature balancing problems.
4. Longer-lived performance without distortion or change.
5. Transcription quality reproduction.
6. Velocity response flat to 12,000 cycles.
7. Output is 100 millivolts, approximately 20 db. greater than most light-weight magnetic pickups.
8. Needle pressure, 1 oz.
9. Impedance, 7,500 ohms at 1,000 c.p.s.—110,000 ohms at 10,000 c.p.s.
10. Interchangeability: Can be employed with most standard pickup and transcription arms.



Manufactured under  
Massa Laboratories License

CALLING  
ALL CARS



WHERE  
MOBILE RADIOS  
MUST NOT FAIL...

### JAMES PUSH-PULL VIBRATORS ARE MANDATORY

Over the years the performance of the James Vibrator has justly earned its outstanding reputation for maintained frequency and output. It is for this reason that so many police cars, and taxicabs require James Push-Pull construction.

Note these additional features:

- (1) Uniform accuracy of contact adjustment.
- (2) Angular positioned reed arms (patented)
- (3) Larger magnetic coil—more driving force.

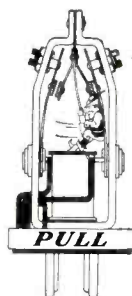
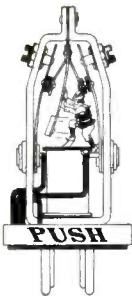
New vibrator replacement guide will bring you up-to-date on vibrator interchangeability.

Ask your Radio Parts Jobber or write

**JAMES VIBRAPOWR CO.**

3224 W. Armitage Ave.

Chicago 47, Illinois



## News

(Continued from page 51)

### BURGESS BATTERY REPLACEMENT GUIDE

A 1948 Replacement Guide for battery operated sets has been prepared by Burgess Battery Company, Dept. RG, Freeport, Illinois. Guide lists over 1,600 sets made by 100 manufacturers, and the correct batteries for each set.

\* \* \*

### R. K. McCLINTOCK APPOINTED ASSISTANT TO CHIEF ENGINEER OF SYLVANIA TUBE DIVISION

Raymond K. McClintock has been named assistant to the chief engineer of the radio tube division of Sylvania Electric Products, Inc. McClintock, formerly engineering manager for Sylvania's International Division, joined the radio tube engineering department in 1936, later serving as field engineer.



\* \* \*

### AIR KING APPOINTS R. D. PAYNE SALES MANAGER

Roland D. Payne, former sales manager of service equipment for G. E., has been appointed sales manager for Air King Products Co., Inc., Brooklyn.



\* \* \*

### ALTEC LANSING BULLETIN

A 6-page bulletin describing 4 types of speakers and 5 types of speaker cabinets has been prepared by Altec Lansing Corporation, 1161 N. Vine Street, Hollywood 38, Calif.

Response charts on duplex and dia-cone speakers are offered.

\* \* \*

### EDWARDS JOINS RADIO WIRE TELEVISION

Don J. Edwards has become general manager in charge of the Boston and New England sales area of Radio Wire Television, Inc., 110 Federal St., Boston.

\* \* \*

### SNC MFG. CO. COMBINES PLANTS

The SNC Manufacturing Co., Inc., Glenview, Illinois, has combined its Glenview plant with a second plant at Oshkosh, Wisconsin.

**AT NEDA CHICAGO CONFERENCE**

At the 2-day Chicago meeting of the NEDA board of directors and members of the executive committee: Aaron Lippman, president of NEDA, Louis W. Hatry, first vice president; Guy B. Paine, second vice president, and director of the Northwest Chapter; Lealis L. Hale, secretary, and director of the Louisiana-Mississippi Chapter; Arthur C. Stallman, treasurer, and director of the Empire Chapter; Louis B. Calamaras, executive secretary of NEDA.

Chapter directors present were: Lewis J. Bonn, Minneapolis, C. C. Brown, Golden Gate; John H. Brown, Iowa-Nebraska; Peter Chanko, New York Metropolitan; Hoyt Crabtree, North Texas; Harry Friedman, Ohio-Indiana-Kentucky; A. W. Greeson, Jr., Carolina; Owen H. Griffiths, St. Louis; Helen Hawley, Tri-State; W. D. Jenkins, Old Dominion; Frank Lingnor, Wisconsin; Thomas A. Lynch, Southern California; Dahl W. Mack, Keystone; A. W. Mayer, Yankee; H. H. Plunkett, Missouri Valley; Louis A. Richmond, Southern New England; Abe Seidler, Florida; W. O. Schoning, Chicago; Henry M. Spolane, South Texas; R. N. Swanson, Rocky Mountain, and George Wedemeyer, Michigan.



**CAMBURN ANTENNA CATALOG**

A revised four-page catalog on tv and f-m antennas has been published by Camburn, Inc., 32-40 57th Street, Woodside, N. Y.

Data covers the new line of 13 to 1 all-channel tv antennas.

**LEHMAN AND DAVIS FORM NEW COMPANY**

Ben Lehman, former vice president and general manager of Radio Wire Television, Inc., and Hy Davis, former purchasing agent at Radio Wire, have formed the Davis Electronics Corporation, 204 Main Street, Hempstead, New York.

Hy Davis



\* \* \*

**H. E. RHODES APPOINTED CHIEF ENGINEER OF MARION, ILL., SANGAMO CAPACITOR PLANT**

Howard E. Rhodes has been appointed chief engineer of the new Sangamo Electric Co. capacitor plant at Marion, Illinois. Rhodes has been in complete charge of the manufacturing of all types of mica, paper and electrolytic capacitors at this plant since March 1.

Rhodes was formerly vice president and chief engineer of the Aerovox Corporation.



\* \* \*

**PHILCO DISTRIBUTOR APPOINTMENTS**

J. J. Harris has become general manager of the New York Branch of Philco Distributors, Inc. W. T. Donnelly was named general sales manager.

**Free**

**Concord RADIO CATALOG**

23 pgs. Radio & Television Sets - 62 pgs. Radio Parts  
18 pgs. Sound Amplifiers & Accessories - 23 pgs. Ham Gear  
9 pgs. Electronic Test Equipment

**160 VALUE-PACKED PAGES**

Write for FREE copy of this great, new Concord Catalog—a vast, complete selection of everything in Radio, Television and Test Equipment. Thousands of items... new, latest 1948 prices. See new LOWER prices on finest-quality RADIO SETS, PHONO-RADIOS, RECORD CHANGERS, RECORD PLAYERS, RECORDERS—wire and disc, PORTABLES, AMPLIFIERS, COMPLETE SOUND SYSTEMS, TESTERS. Complete latest listings of all well-known, standard, dependable lines of radio parts and equipment. 4,212,014 SATISFIED CUSTOMERS CANNOT BE WRONG! For more than a quarter century at CONCORD the customer has been the Most Important Person in the world. This established reputation for Customer Satisfaction is the reason Radio Men (the Experts Who Know) keep coming back to CONCORD for every radio and electronic need. At CONCORD, YOU MUST BE COMPLETELY SATISFIED or your money will be cheerfully refunded. Write for Catalog Now—Please address Dept. 205.

**CONCORD RADIO CORP.**

**CHICAGO 7**      **ATLANTA 3**  
901 W. Jackson Boulevard      265 Peachtree Street  
Downtown Chicago Branch: 229 W. Madison Street  
**LAFAYETTE RADIO CORP.**

*Built for Service*

**Servicemen's choice!**

in...



For 32 years Cunninghams have enjoyed long terms of service in the Nation's Capital. That's because Cunningham tubes are "built for service"—give outstanding performance wherever they're used. Make Cunningham tubes your choice and you'll lead where there's need for top service.

See your  
**CUNNINGHAM DISTRIBUTOR**  
**CAPITOL RADIO WHOLESALERS**  
**Washington**

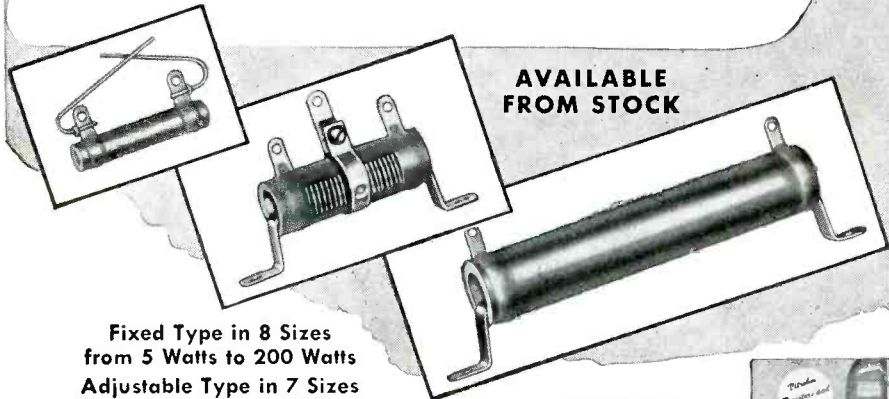
**Cunningham Tubes**

A product of  
**RADIO CORPORATION OF AMERICA**  
Harrison, N. J.

**EXTRA Protection for EVERY Service Job!**

**FIXED OR ADJUSTABLE**

# VITROHM RESISTORS



**AVAILABLE FROM STOCK**

Fixed Type in 8 Sizes  
from 5 Watts to 200 Watts  
Adjustable Type in 7 Sizes  
from 10 Watts to 200 Watts

You can guarantee dependable, trouble-free performance when you install VITROHM wire-wound resistors. Windings are held in place and protected by a special WL vitreous enamel which is tough, crazeless, moisture and acid-resistant. They give long service, avoid call-backs, build satisfied customers and greater profits. Available in wide range of resistance values.

*Authorized Distributors Everywhere*

WARD LEONARD ELECTRIC CO., Radio and Electronic Distributor Division, 53-E W. Jackson, Chicago 4

**SEND FOR FREE CATALOG**

Write for Catalog No. D-130. Gives complete data and information.



## WARD LEONARD RELAYS • RESISTORS • RHEOSTATS

Electric control devices since 1892

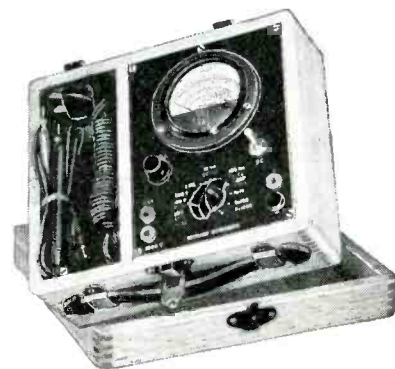
## New Products

(Continued from page 36)

### BRADSHAW RANGE-MASTER

A 25-range instrument, the model 10-F Range-Master, has been announced by Bradshaw Instrument Co., 348 Livingston St., Brooklyn 17, N. Y. The 25-ranges include: (1) capacity, .001-1, .01-1, .1-10 mfd; (2) a-c current, 0-.15, 0-1.5, 0-15 amps; (3) a-c voltage, 1-10-100-500-1,000; (4) d-c voltage, 10-100-500-1,000; (5) d-c current, 1-10-100-1,000-ma; (6) resistance, 0 to 10,000, 100,000, 1 megohm; (7) high-range ohmmeter to 2 megs and 20 amps without external battery; (8) a-c microammeter to 1,100 microamps.

The 10-F also incorporates a standard Littelfuse which protects meter movement, rectifier, and shunts against overload on all ranges.

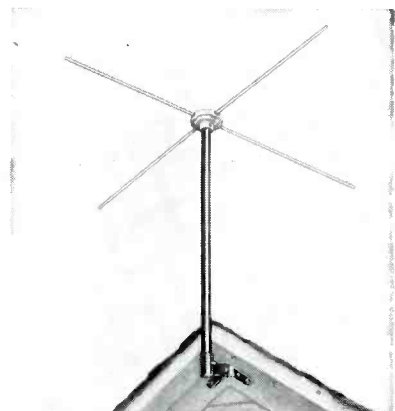


\* \* \*

### HI-PAR F-M ANTENNA KIT

A matching section, with 60' of 300-ohm lead-in wire, is included in an f-m antenna kit announced by Hi-Par Products Co., 53 East St., Fitchburg, Mass.

Antenna has a one-point mounting base.



\* \* \*

### BOND-OLIN MIDGET B BATTERIES

Small 67½-volt dry-cell B batteries, made up of 45 separate interlocking flat plastic cells, have been announced by the electrical division of Olin Industries, Inc., New Haven, Conn.

Midget battery was developed for Emerson midget. Battery will be marketed under the Bond-Olin trade-mark.

## TINIT CONTAINS ENOUGH SOLDER FOR SMALL JOBS!



Difficult radio repair jobs can be handled easily with TINIT because TINIT contains enough tin for small jobs without additional solder. In powder form, it makes tough jobs easy because you can get it into tight places! You know it's tinned with TINIT because you can see it! Cleans, tins and fluxes all metals including sheet aluminum, penetrates rust, grease and dirt in one easy operation! Twenty years on the market. Sold by automotive, refrigeration, tinning supply and other jobbers.

BUY FROM YOUR JOBBER

**TINIT MFG. CO., INC.**  
P. O. Box 794, Denver, Colo.

# Permoflux SPEAKERS

## YOUR JOBBER CAN SUPPLY YOU!

Permoflux quality and dependability—the same as supplied to the major set manufacturers—is your assurance of complete customer satisfaction. You'll find Permoflux Speakers easy to install and readily available in both PM and Electro-dynamic types. You'll find too, that it pays to give your customers "tops in tone" with a Permoflux Replacement Speaker.

TWO COMPLETE  
FACTORIES TO SERVE YOU



WRITE FOR  
FREE BULLETIN

PIONEER MANUFACTURERS OF PERMANENT MAGNET DYNAMIC TRANSDUCERS

## PERMOFLUX CORPORATION

4900 WEST GRAND AVE., CHICAGO 39, ILLINOIS  
236 SOUTH VERDUGO ROAD, GLENDALE 5, CALIFORNIA



## New Products

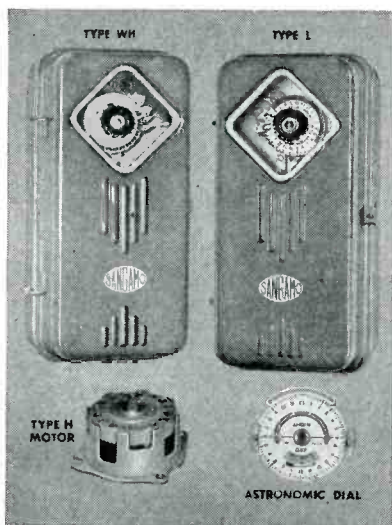
### SANGAMO TIME SWITCHES

Heavy-duty time switches equipped with fully-enclosed *hysteresis-synchronous*, low-speed motors, which are said to provide higher torque both in starting and synchronous operation, have been announced by Sangamo Electric Company, Springfield, Illinois. Replaceable bearing system, lubricated with a special silicone product prevents it from being affected by temperature.

A gasket prevents dirt, dust and rain from entering the case and a sealable hasp prevents tampering. Diamond-shaped window allows greater visibility.

The minimum time between settings of the *off* and *on* periods is 90 minutes; time intervals between *on* and *off* periods is 30 minutes. Manual tripping can be done at any time without disturbing the automatic operation.

Bulletin No. 1060 upon request.

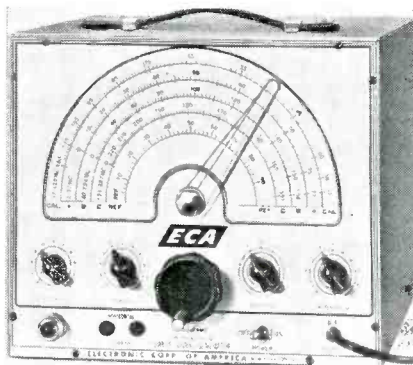


\* \* \*

### ECA F-M/TV SWEEP SIGNAL GENERATOR

A four-tube f-m/tv sweep signal generator has been developed by Electronic Corp. of America, 353 W. 48th Street, New York 19.

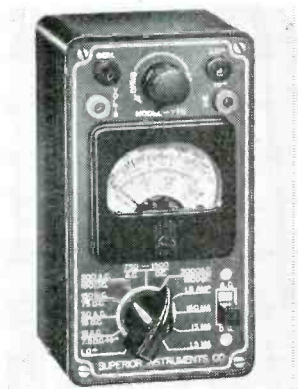
Frequency range in three bands; 2 to 77, 40 to 154 and 151 to 227 mc. Sweep width said to be 500 kc to approximately 10 mc. Has phasing and r-f output controls. Tubes include a 6C4 fixed-frequency modulated oscillator, 6C4 continuously-variable beat-frequency oscillator, 6C4 mixer and cathode-follower output tube and a 5Y3 rectifier.



### SUPERIOR INSTRUMENT VOLT-OHM-MILLIAMMETER

A pocket-size volt-ohm-milliammeter, model 770, is now available from Superior Instruments Co., 227 Fulton Street, New York 7, N. Y.

Has six a-c voltage ranges, 0-15/30/150/300/1,500/3,000; six d-c voltage ranges, 0-7½/15/75/150/750/1,500; four d-c current ranges, 0-1½/15/150 ma, 0-1½ amps; and two resistance ranges, 0-500 ohms and 0-1 megohm.



\* \* \*

### C-D TV CAPACITORS

A line of oil impregnated and wax filled television capacitors, type D5TH has been announced by Cornell-Dubilier. They employ double case construction with the capacitor element enclosed in two separate concentric wax sealed cardboard tubes.

Capacity range is from .0005 to .05 mfd. Voltage range is from 3,000 to 6,000 volts d-c. Sizes range from ½" in diameter x 2½" long to 1½" in diameter x 5" long.

\* \* \*

### AUDAX TUNED-RIBBON RECORD CHANGER REPRODUCER

Tuned-ribbon reproducers, designed for Garrard changers, model 79-G, have been designed by Audax Co., 500 Fifth Ave., N. Y. 18.

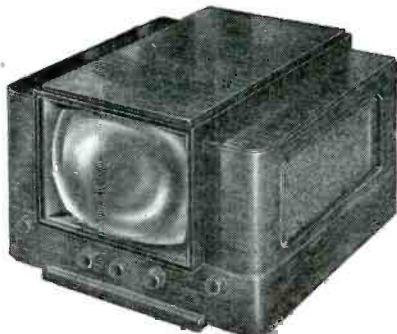
Linear 50 to 10,000 cycles; point-pressure about 24 grams; output about -30 db.

\* \* \*

### TRANSVISION 10" AND 12" TV KITS

Tv kits using 10" and 12" picture tubes, model 10BL and 12BL, and supplied with cabinets with built-in lenses providing 120 square-inch and 130 square-inch pictures, have been announced by Transvision, Inc., New Rochelle, New York.

Kits are supplied with wired f-m receivers and with antenna and lead-in wire.



**Servicemen's choice!**  
in ...



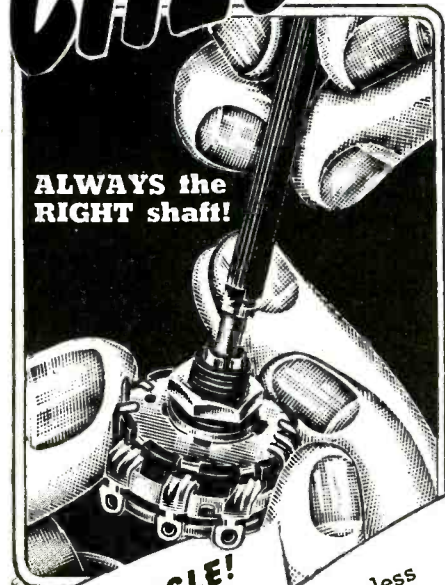
There's always a bumper crop of Cunninghams in Kansas because people in the Sunflower State are hep to the long life and top performance of Cunningham tubes in line and battery radios. You can cash in on the harvest by electing to use Cunninghams whenever new tubes are called for.

See your  
CUNNINGHAM DISTRIBUTOR  
ACME RADIO SUPPLY  
Topeka



# CHECK!

**ALWAYS the RIGHT shaft!**



**NO WIGGLE!  
NO WOBBLE!**  
Clarostat shafts are centerless ground. Fit snugly in bushing. Yet turn so SMOOTHLY!

**EASY TO CUT!**  
Clarostat shafts are of aluminum. That means easy and quick cutting to correct length.

**YOU PICK IT!**  
Select the right control — ohmage, taper, tap. Then select the right shaft. All for \$1.25. No extra charge for special shaft!

Ask your Clarostat jobber for latest catalog. Or write us.

**CLAROSTAT**



*Controls and Resistors*

CLAROSTAT MFG. CO., Inc. · 285-7 N. 6th St., Brooklyn, N. Y.

In Canada: CANADIAN MARCONI CO., Ltd. Montreal, P.Q., and branches

## JOTS AND FLASHES

TUBE SALES are reaching new records every day. In March, RMA member companies reported sales of over 18,000,000 tubes. In the first quarter of 1948, over 51,000,000 tubes were sold. Of this total approximately 38,000,000 were for new receivers and nearly 10,000,000 for replacements. . . . Tv receiver output is on the rise, too. A total of 118,027 receivers were made during the first quarter of 1948, almost three times the production rate of the corresponding quarter of '47. Thus far, over 300,000 tv receivers have been made. . . . Auto radio production is also on the rise with over 935,000 receivers having been made during the first quarter of '48. . . . Brower Murphy has been elected president of the Dixie Chapter of The Representatives. Rolfe H. Van Dusen is now vice president and John J. Cota, secretary-treasurer. . . . John F. Thompson of Maitland K. Smith Co. and Floyd Fausett, Sr., of Fausett's Electronic Manufacturers Agency, both of Atlanta, have been admitted to membership in the Dixie Chapter. . . . R. F. Becker is now a member of the Chicagoland Chapter of The Representatives. . . . Leonard L. Minthorne Co., 15 Moore Street, New York 4, N. Y., has been named as the export agent for the Illinois Condenser Co., Chicago. . . . J. D. Hughes has been appointed vice president in charge of sales of Littelfuse, Inc., 4757 N. Ravenswood Avenue, Chicago. He is also a member of the board of directors. . . . Dalton-Cooper, Inc., 200 W. 34th Street, are now the export agents for the Cosmo Electronics Corporation, New York City. . . . Joseph Pierson and Associates, 1255 S. Flower St., Los Angeles, Calif., have become sales representatives for Potter and Brumfield Mfg. Co., Princeton, Indiana. . . . John F. Rider, Publisher, Inc., 404 Fourth Avenue, New York 16, N. Y., has published a *Radio Amateur's Beam Pointer Guide Book*. A 32-page book, selling for \$1.00, it contains antenna orientation charts, disclosing the proper beaming of antennas to any country or island in the world. . . . Forrest C. Valentine, with offices in 9122 Wayne Bank Building, Ft. Wayne, Indiana, and 6408 Euclid Avenue, Cleveland, Ohio, will represent Sigma Instruments, Inc., Boston, Mass., in Ohio, Indiana and Kentucky. . . . Joseph H. Humble is now general sales and advertising manager of the Kester Solder Co., Chicago, Illinois. . . . David M. Salsbury has become president of the Westinghouse Electric Supply Company. . . . Norman C. Owen is now the sales-promotion manager for Webster-Chicago Corporation, 5610 Bloomington Avenue, Chicago 39, Illinois. . . . The Standard Arcturus Corporation have moved to a new plant at 54 Clark Street, Newark, N. J., where they will manufacture Kotron selenium rectifiers, tv receivers and other electronic equipment. . . . Thomas B. Jacocks has been named manager of the Washington, D. C., office of the G. E. electronics department. . . . The Chicago warehousing facilities of the Walter L. Schott Co. of Beverly Hills, California, have been enlarged. . . . Ray L. Hoefler has been appointed manager of distribution for Zenith Radio Corporation.

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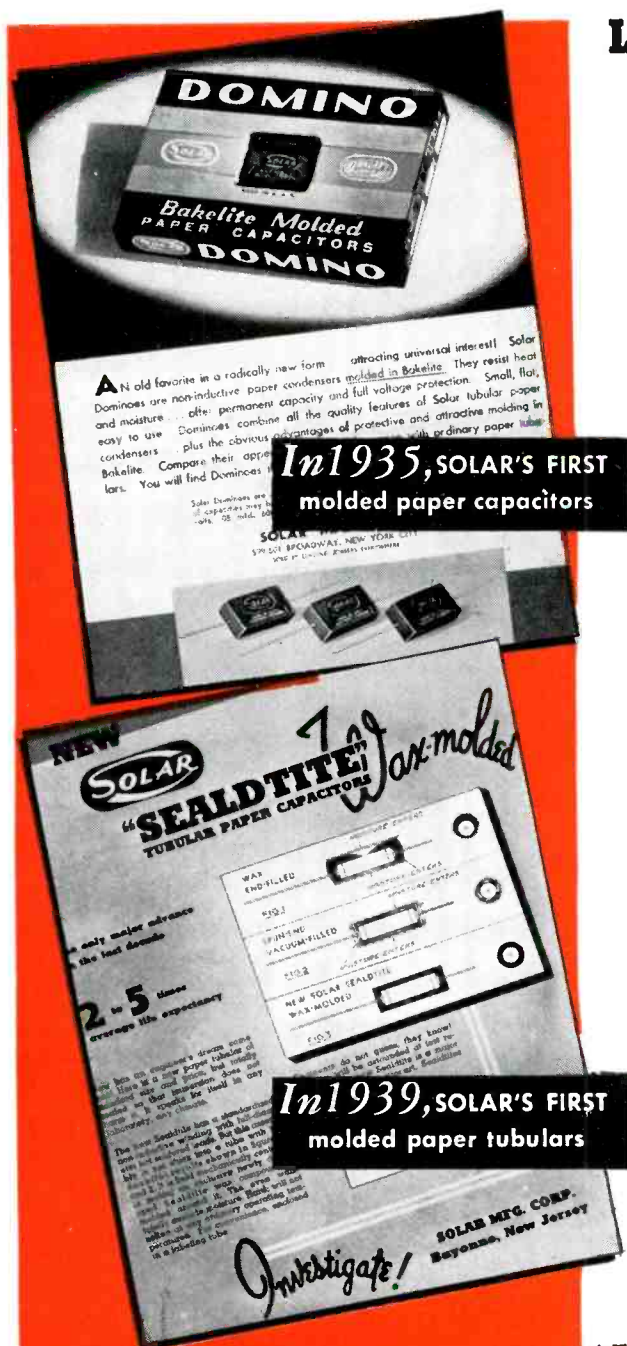
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# Thank you, thank you, COMPETITORS

**We are flattered**

**that after years of Solar pioneering  
you, too, are molding paper tubulars**

## LET'S LOOK AT THE RECORD



**In 1935, SOLAR'S FIRST  
molded paper capacitors**

**In 1939, SOLAR'S FIRST  
molded paper tubulars**

In 1935 Solar made its first phenolic-molded paper capacitor—the "Domino," then a revolutionary step in the capacitor art. Some had said Bakelite-molding of paper capacitors was impossible. But Solar did it!

Then in 1939 Solar again pioneered with its famous molded paper tubular, the Type S SEALDTITE\*. Wax molding was chosen for Seal dtites because the industry's field experience with thermo-setting molded capacitors was not entirely satisfactory. Humidity-cycling tests, which correlate with actual service conditions, showed that wax-molded capacitors stood up where thermo-setting units failed. "Molded Seal dtites" came to mean "the best tubulars." Export receiver manufacturers specified Seal dtites *exclusively* for sets going to the world's worst climates. Many quality approval lists have carried them at the top because "Molded Seal dtites" have longest life under tests.

In 1947, to meet the post-war trend toward ultra-compact sets and operation at higher temperatures, Solar introduced the first satisfactory plastic-housed tubular capacitors — All-Purpose, Hi-Temp\* Seal dtites (Type ST). These units are encased in a plastic molding compound, which resists temperatures up to 100°C and still maintains the same inherent resistance to moisture as molding wax.

Throughout all of 1947, as production was being built up, these new Hi-Temp Seal dtites were channeled to export and auto receiver manufacturers; in their products several million are now in use. *They stand up fine.* We are flattered that Solar molded tubulars are now imitated. The record shows that Seal dtites are millions ahead in satisfactory field experience among molded capacitors.

Bulletin SPD-200 tells the Seal dtite Story. Write for your copy *today*.

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