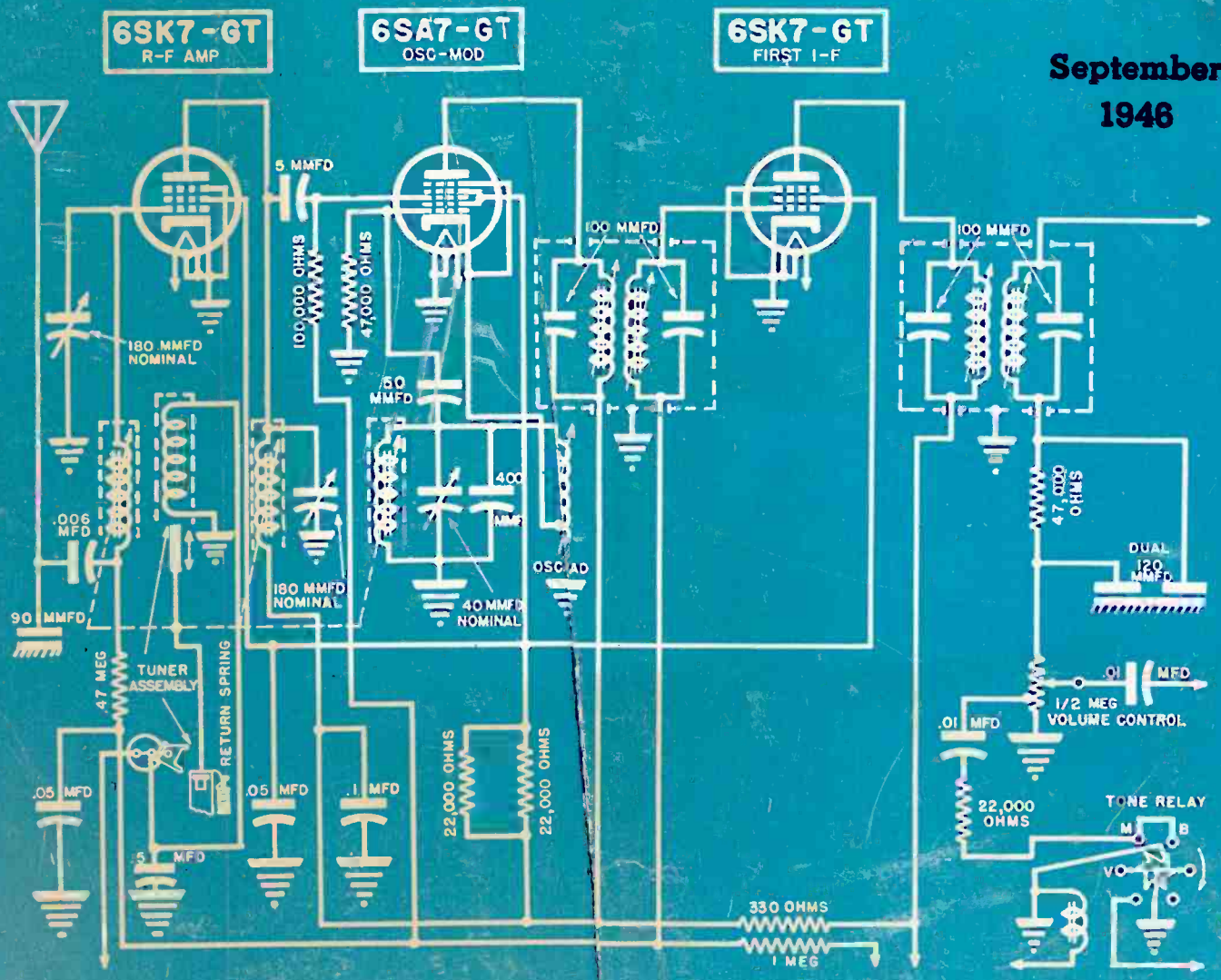
RADIO · TELEVISION · ELECTRONIC

SERVICE



September
1946

Input system of an 8-tube auto receiver using three-gang permeability-tuning.
[See Page 42.]

THE TECHNICAL JOURNAL OF THE RADIO TRADE

Better Than a Sandwich Man

Put these attractive colored display cards to work for you in your window or on your counter. They carry a terrific impact where competition is keen, where even an old-timer must sell his service over and over again to his community. These cards point up strong reasons for a 6-month radio check-up and show that you employ only new, genuine replacement parts. Display them prominently and business will come to you.

All these sales aids help to make your shop headquarters for radio service in your community

- NEWSPAPER MAT
- MATCH BOOKS
- COUNTER CARD
- STATIONERY DEALS
- SHIPPING LABE
- POSTCARDS
- "C-D CAPACITR"
- CATALOGS

let yourself grow! See your local C-D jobber today and order these powerful sales builders. Most of them are free. Get on the "C-D Capacitor" mailing list now, write direct to: Cornell-Dubilier Electric Corp., South Plainfield, N. J. Other plants at New Bedford, Worcester and Brookline, Mass., and Providence, R. I.

MICA • DYKANOL • PAPER • ELECTROLYTIC

CORNELL-DUBILIER

WORLD'S LARGEST MANUFACTURER OF

CAPACITORS

GE RADIO TUBES

TOO many radio owners insist on them, for G-E tubes to linger on your shelves! *Dust doesn't gather on G-E tube cartons.* They're in your store, then out again quickly, with your cash register singing a merry tune of profits and fast capital turnover. . . . Reasons? . . . The biggest one is the General Electric monogram—what it means to millions of people in the way of quality and *proved* performance!

Your neighbors have confidence not alone in their G-E radios, but in their G-E refrigerators, irons, and other home appliances. Their light fixtures hold G-E lamps. Mostly the current that spins their G-E fans and clocks comes from big G-E dynamos and transformers. *Your neighbors are G. E.-minded.* When they want radio tubes, it's second nature to go to the store with the General Electric sign they know and trust . . . YOUR STORE!

Opportunity, with an attractive profit message for you, stands at your door. So don't delay! Write for information about G-E tube selling rights to *Electronics Department, General Electric Company, Schenectady 5, N. Y.*

● Every tube dealer and service man should have G.E.'s Tube Characteristics Booklet ETR-15. Send for your free copy!

GENERAL ELECTRIC

170-ED-6050

FIRST AND GREATEST NAME IN ELECTRONICS

EDITORIAL

COLOR, AN IMPORTANT FACTOR in Service Shop design, has now become quite a panel-instrument factor, too. It appears as if the commonplace black and gray panels are now being replaced by panels featuring green, brown, red and other similar bright colors. Color dynamic specialists have shown how gayer colors can be used effectively on even complex instrument panels to reduce eye fatigue and thus improve Service Shop use.

IT WILL BE TELEVISION WEEK from October 7th to 12, with the Television Broadcasters Association projecting a coast-to-coast campaign to promote television. The event will be highlighted by a two-day conference at the Waldorf-Astoria in N. Y. City, October 10th and 11th.

SERVICE will carry a full report of the conference during which the maintenance and service programs of the nation's leading manufacturers will be revealed for the first time.

WITH THE INCREASED USE OF cathode-ray units in the laboratory and Service Shops has come a rather interesting debate involving the exact word to use to describe the instruments. In the past both oscilloscope and oscillograph have found wide usage. Some have stated that oscilloscope should be used because it aptly describes the unit as an indicator. Others have been in favor of oscillograph because this word correctly describes the instrument as a writing tool.

Greek roots have been cited to prove the views of both schools of thought: For graph, the root *grapho*, which means to write; for scope, the root *scopos*, which means watcher or indicator.

Undoubtedly you have come across this 'scope'-graph topic too and have a definite term in mind. We would like to see your comments and present them, with your permission, on an open-forum page now being planned. We hope we'll hear from you soon!

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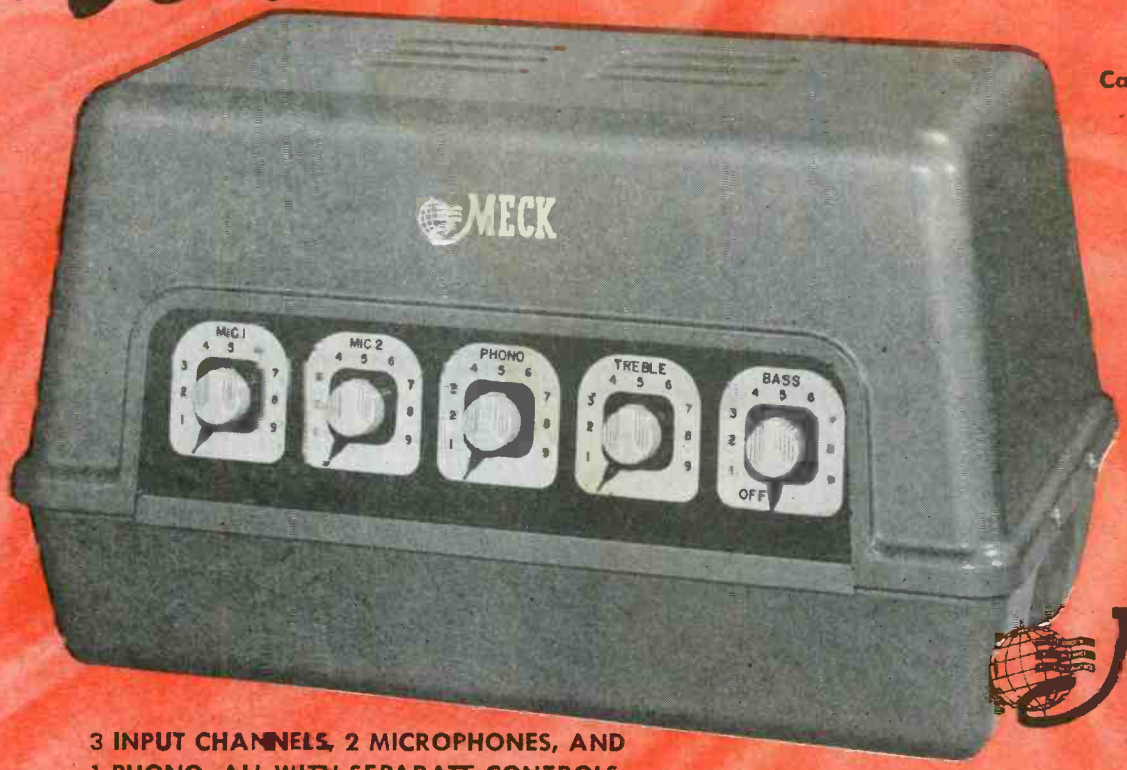
IMMEDIATE DELIVERY

New 30-WATT AMPLIFIER!



Cast Aluminum
25 lbs.

MECK
MODEL
A-30

3 INPUT CHANNELS, 2 MICROPHONES, AND 1 PHONO, ALL WITH SEPARATE CONTROLS

- ☆ Attractive lightweight cast aluminum housing, 14⅝" x 9¾" x 8½".
- ☆ 30 Watts at impedences of 4, 8, 15 and 250 ohms.
- ☆ Illuminated transparent plastic dial.
- ☆ Two distinctly separate frequency response controls . . . 1 for treble boost . . . 1 for bass boost.
- ☆ Built-in remote control circuits for both microphone channels.

—COMPARE THESE FEATURES—

NEW STANDARDS OF FREQUENCY RESPONSE CONTROL

The Meck A30 Amplifier is equipped with two distinctly separate frequency response controls—1 for treble boost and 1 for bass boost. The adjustment of either or both of these controls does not appreciably affect the over-all volume of the amplifier. These controls may be quickly adjusted from the front panel to give any variation from straight line frequency response between 40 and 10,000 cycles to any combination of broad band bass boost and broad band treble boost.

MICROPHONE AND PHONO INPUTS

Any high impedance dynamic or crystal microphone may be connected to either of the two identical channels. Any high impedance phonograph pickup may be connected to the Phono input channel. All cable connectors are marked and located on the rear of the amplifier.

OUTPUT CONNECTIONS

The two speaker plugs furnished and the speaker sockets located on the rear of the amplifier chassis provide a convenient means for connecting speakers to the amplifier . . . Speaker load impedance is adjusted by connecting the spade lug on the terminal strip to the proper tap 4, 8, 15 or 250 ohms. Additional 2 ohm and 500 ohm taps are available at the output transformer.

REMOTE CONTROL CIRCUITS

Remote volume control circuits for both microphone channels are built into the amplifier so that the volume of either microphone channel may be controlled up to 1000 feet from the amplifier using any 2 conductor unshielded cable and an inexpensive control box.

TUBE COMPLEMENT

2—6SF5—As microphone preamplifiers.
1—6SL7—Dual triode cascaded as voltage amplifier and grid choke driver for the power amplifiers.
2—6L6G—Power amplifiers in push pull.
1—5U4G—Power rectifier.

POWER REQUIREMENTS

Amplifier operates on 105-124 volts 60 cycles AC current only. Power consumption is 175 watts. Power circuit is fused with a 3 ampere type 3AG easily replaceable fuse mounted on the rear of the chassis.

ASK YOUR MECK JOBBER

MECK SOUND AMPLIFIERS

J. M. I. SALES CORPORATION • 35 E. WACKER DRIVE, CHICAGO 1, ILLINOIS

308 SPRAGUE DISTRIBUTORS TO SERVE YOU

So many users of the SPRAGUE TRADING POST, our free wartime advertising service, have asked for the names of their nearest Sprague distributors that—well, here's the entire list. These firms will supply you with factory-fresh Sprague Capacitors and Koolohm Resistors of the very latest types. They'll be only too glad to serve you.

THE SPRAGUE TRADING POST did its part during the war. Now, both Sprague and its distributors will "follow through" by bringing radio servicemen, amateurs and experimenters the finest components backed with the best service obtainable.

As always, we'll appreciate it if you continue to: *"Ask for Sprague Capacitors and Koolohm Resistors by name!"*

SPRAGUE PRODUCTS CO., North Adams, Mass.
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◀ ASK YOUR JOBBER for a copy of the big new Sprague Catalog. Gives full details on the most complete Capacitor line on the market—also Koolohm Resistors and the famous Sprague Tel-Ohmike Analyzer.

SPRAGUE CAPACITORS are specified by part numbers in the popular new HOWARD W. SAMS PHOTO FACT FOLIOS

SPRAGUE CAPACITORS . . . . . .

Ask for Sprague Products by Name!

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Phoenix—Radio Parts of Arizona

CALIFORNIA
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Fresno—Jack C. Arbuckle
Billings Wholesale Radio
Hollywood—Hollywood Radio Supply, Inc.
Long Beach—Radio & Tel. Equip. Co.
Los Angeles—Figart Radio Supply Co.
Kierulff & Co.
Nelson Brothers Co.
Radio Equip. Distributors
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Oakland—W. D. Brill Company
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San Francisco—Associated Radio Distrs.
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San Jose—Frank Quement
Santa Ana—Radio & Tel. Equip. Co.

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Bridgeport—Hatry & Young, Inc.
Hartford—Hatry & Young, Inc.
New Britain—United Radio Supply
Universal Radio Co.
New Haven—Thomas H. Brown Co.
Hatry & Young, Inc.
New London—Hatry & Young of New
London, Inc.
Stamford—Hatry & Young, Inc.
Waterbury—Hatry & Young, Inc.

DELAWARE
Wilmington—Radio Elec. Serv. Co.

DISTRICT OF COLUMBIA
Washington—Kenyon Radio Supply Co.
Rucker Radio Wholesalers

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Miami—Electronic Supply Co.
Major Appliances
Orlando—Radio Accessories Co.
St. Petersburg—Welch Radio Supply
Sarasota—Morley Radio Co.
Tampa—Kinkade Radio Supply
Major Appliances

GEORGIA
Atlanta—Concord Radio Corp.
Southeastern Radio Parts Co.
Specialty Dstg. Co., Inc.
Macon—Specialty Dstg. Co., Inc.
Savannah—Southeastern Radio Parts Co.
Specialty Dstg. Co., Inc.

ILLINOIS
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Grant Radio Co., Inc.
Nation Wide Radio
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Council Bluffs—World Radio Labs., Inc.
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Portland—Frank M. Brown Co.

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Mardick Dstg. Co.
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Manhattan Corp.
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Dymac, Inc.
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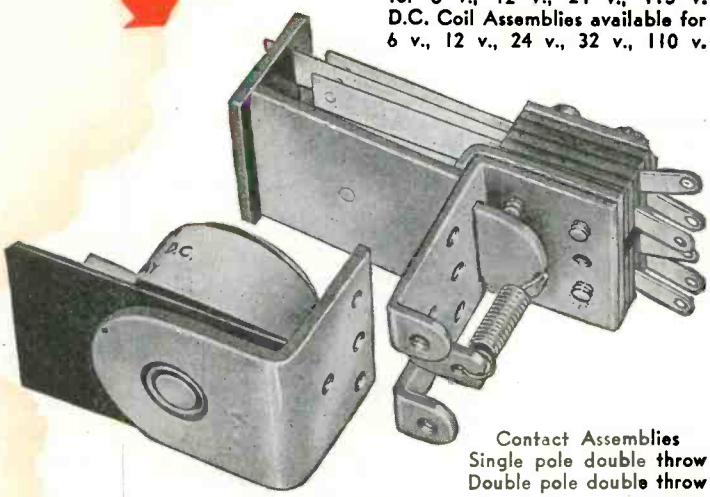
New! Series 200

A RELAY BY GUARDIAN with Interchangeable Coils

BUILT IN TWO PARTS

★ Two basic parts—a coil assembly and a contact assembly—comprise this simple, yet versatile relay. The coil assembly consists of the coil and field piece. The contact assembly consists of switch blades, armature, return spring, and mounting bracket. The coil and contact assembly are easily aligned by two locator pins on the back end of the contact assembly which fit into two holes on the coil assembly. They are then rigidly held together with the two screws and lock washers. Assembly takes only a few seconds and requires no adjustment on factory built units.

A.C. Coil Assemblies available for 6 v., 12 v., 24 v., 115 v.
D.C. Coil Assemblies available for 6 v., 12 v., 24 v., 32 v., 110 v.



Contact Assemblies
Single pole double throw
Double pole double throw

SERIES 200 RELAY

On Sale at Your Nearest Jobber NOW!

See it today! . . . this amazing new relay with interchangeable coils. See how you can operate it on any of nine different a-c or d-c voltages—simply by changing the coil. Ideal for experimenters, inventors, engineers.

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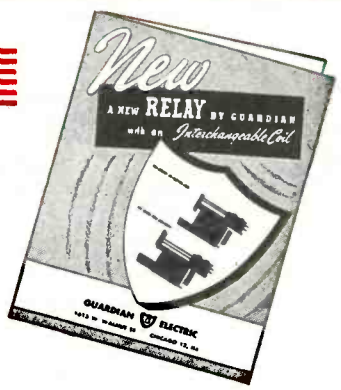
The Series 200 is available with a single pole double throw, or a double pole double throw contact assembly. In addition, a set of Series 200 Contact Switch Parts, which you can buy separately, enables you to build dozens of other combinations. Instructions in each box.

NINE COIL ASSEMBLIES

Four a-c coils and five d-c coils are available. Interchangeability of coils enables you to operate the Series 200 relay on one voltage or current and change it over to operate on another type simply by changing coils.



Your jobber has this sensational new relay on sale now. Ask him about it. Or write for descriptive bulletin.

GUARDIAN ELECTRIC
1617-K W. WALNUT STREET CHICAGO 12, ILLINOIS

A COMPLETE LINE OF RELAYS SERVING AMERICAN INDUSTRY

IT TAKES

14

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16

YEARS

TO COVER THE

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MILLION

RECEIVERS NOW IN USE IN AMERICA

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Rider Manuals are standard equipment in successful radio servicing shops throughout the world. They have earned the continuing loyalty of their users by providing authoritative servicing data on all important American made receivers sold between 1920 and 1942. They are the only single source upon which you you can depend for accurate and complete information on sixty million receivers now in American homes. These receivers, issued before 1942, are the ones now coming to your benches for repairs. They are the ones upon which Rider Manuals have demonstrated their value as time savers in localizing troubles. They are the ones for which Rider Manuals provide such vital information as receiver schematics, voltage data, alignment data, resistance values, chassis layouts and wiring and trimmer connections.

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On "Alternating Currents in Radio Receivers"
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On "Automatic Volume Control"
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RADAR—JUST OUT — $1.00
Entertaining, Revealing, even a layman can understand explanation

SYLVANIA NEWS
RADIO SERVICE EDITION

SEPT. *Prepared by* SYLVANIA ELECTRIC PRODUCTS INC., Emporium, Pa. 1946

NEWEST AND FINEST IN TUBE TESTERS NOW READY FOR RADIO SERVICEMEN

Made by the men who have tested tubes by the million!

LARGE METER 4½ inch size for high legibility. Sensitive but rugged.

PROVISION FOR NOISE TEST

8-FT. LINE CORD — extra lang far extra convenience.

LEGIBLE DIAL MARKINGS — lines and numerals in white against green panel.

TESTS STANDARD, LOCK-IN, ACORN TUBES. Extra sockets and switches allaw easy adaptation when new tube types appear.

SHORTS TEST at valtage low enough to prevent tube damage or faulty indications — high enough for full brilliancy on Sharts Indicator.

FINGERTIP CONTROLS make settings easy.

DYNAMIC CONDITIONS All tube elements tested under dynamic conditions.

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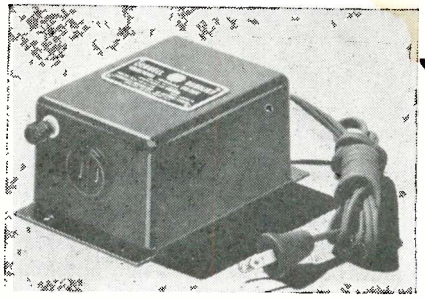
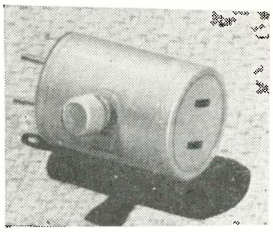




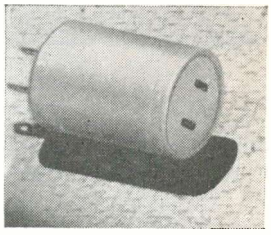


Fig. 1. Three types of receiver-line noise filters. Left, capacitive-inductive type; above, capacitive with ground connections; right, capacitive type without ground connections.

ELIMINATING NOISE At the Receiver

Practical Approach to Problems With Instructions on Uses of Filters

by WILLIAM M. ROBINSON
Assistant Chief Engineer
Industrial Capacitor Division
Cornell-Dubilier Electric Corp.

ALL SERVICE MEN ARE EVENTUALLY CALLED upon to correct radio interference or noise conditions in a receiver.

The most frequent form of interference encountered is that caused by electrical equipment and appliances. Even the most minute spark at points where an electrical circuit is interrupted, such as between the commutator and brushes of a motor, contacts of thermostats, relays, and the like, creates a form of interference. Since the sparking circuit is untuned, the interference signal generally covers a very wide frequency band. The noise energy enters the power line where it is transferred by means of conduction and radiation to the receiver system.

Oil burners are one source of radio interference. The electrical arc used for igniting the oil vapor sets up a strong noise signal. Since the oil burner is connected to the power line, the noise energy passes into this circuit and reaches the receiver by conduction and radiation. The radio noise signals from many other types of electrical apparatus reach the receiver in the same manner. Most effective reduction of radio interference can be obtained by installing a filter in the device creating the noise signals. In the foregoing instance a filter installed on the oil burner would correct the noise conditions and might prevent interference with the reception of many other receivers. Where it is impossible to locate the source of the radio interference or impractical to apply corrective measures, there is no alternative but to improve conditions by working on the receiver installation.

Equipment available for servicing interference ranges from expensive analyzers and locaters to a simple capacitive type filter. A minimum of two high-attenuation capacitive-inductive line filters and several smaller filters are usually sufficient as noise-eliminating aids. Further aids include a midget receiver, preferably one operated from battery power, and interfering-creating devices, such as a small fan, electric shaver, hand grinder, etc. The latter items are useful in creating noise for immediate testing when the devices causing the interfering disturbances are not in operation at the time of the service call.

Since noise problems are apt to consume considerable time, a direct approach is recommended. It is wise to first make an audible check of the receiver by tuning in a moderately weak broadcast signal. Noise tests should not be made with tuning between stations as the avc will cause amplification of any signal present far out of proportion to normal operation. The factor to consider is the signal-to-noise ratio which must be kept high for satisfactory radio reception.

When radio-noise conditions are established at the receiver, either by normal or the means just described, a high-attenuation line filter should be installed in the power line supply circuit, the ground terminal of the filter being connected to a convenient ground connection; Fig. 3.

Other Types of Interference

There are three other types of radio interference:

(*1*) Radio noise energy from an electrical device or appliance con-

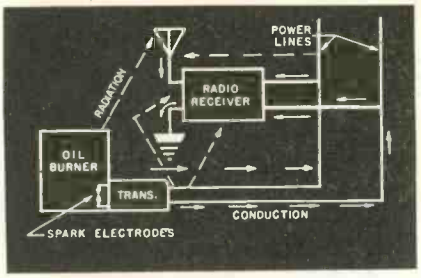


Fig. 2. How signals enter receiver by direct conduction through power line and by radiation from power line.

ducted through the power lines and radiated to unshielded wiring of the receiver.

(*2*) Noise voltages induced in antenna or ground systems after being conducted through the power lines from an electrical device or appliance.

(*3*) Defective components or imperfect circuit connections in the receiver.

Use of Grounds

In curbing these noises, ground checks play an important role. For instance, many midget a-c/d-c receivers have one side of the power line connected directly to the chassis, thereby making a ground connection a hazardous and impractical arrangement. Some of these sets use the power line as a ground system for obtaining broadcast signals. The larger sets, however, generally provide a ground tap. This is even true in the loop-operated types. Grounding the receiver chassis, where the circuit permits, should cause a reduction in radio noise. Best results are usually obtained when the receiver uses a different ground system than the filter; Fig. 4. It is recommended that all available ground facilities be tried alternately to obtain maximum reduction of radio interference by trial and error. It is safe to say that a very large part of the noise will be eliminated by the above procedure.

Unshielded Wiring

The next most convenient operation is to reduce the noise signals picked up by unshielded circuit wiring in the receiver. It is recommended that the receiver be rotated in small steps through an arc of at least 180°. If any noticeable reduction in radio noise is observed while the receiver is tuned to a moderately weak broadcast signal, an attempt should be made to locate the set permanently in that general position. Where the receiver cannot be located at right angles to a wall, it may be necessary to move the receiver to an adjacent wall where the noise pickup will be less.

Window Location

The best position for a radio receiver, with respect to interference, is adjacent to the outside walls of a building in the immediate vicinity of a window. This position will usually reduce the noise signals entering the receiver by radiation from power lines. Under all conditions unnecessary wiring, such as line cords of lamps and power extensions, should be removed from the immediate vicinity of the receiver. This will minimize the radiation of noise signals from these circuits, which generally increases the interference level.

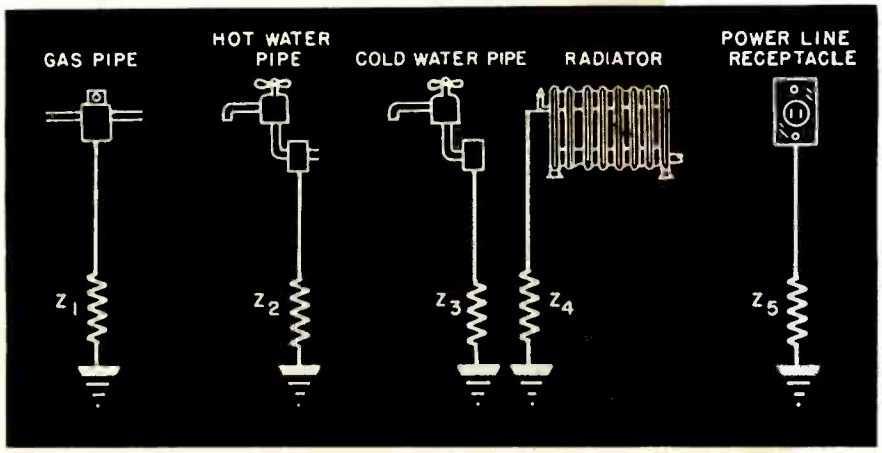
Antenna Pickup

In the next interference-curbing step, the extent of the noise signals introduced by the antenna system should be checked. The antenna should be disconnected and the antenna and ground terminals short-circuited. When making this connection, to avoid increasing the noise voltages at this point, there should be no bodily contact with either terminal. Here again the receiver should be tuned to the actual frequency of a broadcast station to limit the effects of avc.

Noise-Reducing Antennas

Of course, some means must be found to prevent the undesired interference signals from entering the antenna system. Most authorities recommend the installation of a so-called noise-reducing antenna system consisting of a single wire or doublet antenna with a transposed or shielded leadin complete with impedance matching transformers. This arrangement is an excellent solution to this part of the noise problem, although occasionally it may be impracticable to install because of local restrictions.

Fig. 3. Illustrating different types of grounds that have different impedances (*Z*) to ground due to resistance, inductance and capacitance in circuit.



Improving Signal-to-Noise Ratio of Antenna Input

Where the antenna consists of a single insulated lead extending from the receiver, the lead should be positioned in different locations in the room, preferably at the greatest practical height above the floor. Excellent results have been obtained by extending a length of the antenna lead out of a window. If such an arrangement is used, the lead extension must be kept away from power or telephone lines outside the building. An insulated connector strap will, of course, be required under the window sash for a permanent arrangement of this type. The lead should also be fastened in a

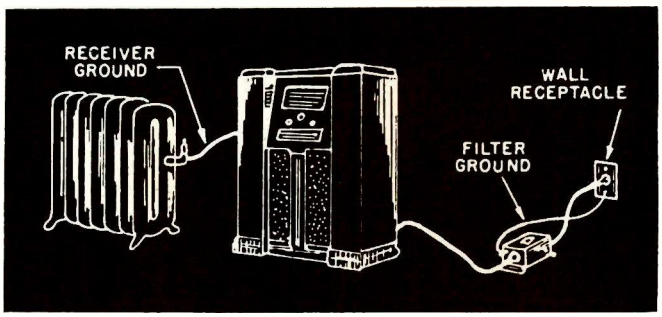


Fig. 4. Illustrating how different ground circuits can be used for receiver and line filter to avoid common impedance ground circuit.

fixed position with any suitable stand-off insulator.

Noise reduction can be effected by a short outdoor antenna or one constructed between two points in the conventional manner, connected to the antenna post of any receiver that has a two or three terminal pickup system. Another antenna for the same purpose is the window pole type which is easily installed and somewhat more presentable than a loose wire. These convenient forms of antennas are frequently found to be an effective means of increasing the signal-to-noise ratio as compared with the indoor type.

Antenna Heights

A conventional outdoor antenna and leadin located at the greatest possible height above ground will generally increase the broadcast signal pickup to improve the overall reception in a receiver. The antenna should be installed at right angles with any known source of radio noise, such as street cars or power lines, neon signs, etc.

Components as a Trouble Source

Assuming that the antenna and power line systems are made free from radio noise signals, it is still possible that the reception may be unsatisfactory. Defective components in a receiver may result in interference with broadcast signals comparable with that caused by an electrical storm. A partial breakdown of insulation in a transformer, capacitor, tube socket and the like is apt to cause discharges across points at a difference of potential. Faulty connections may result in crackling and sputtering noises without noticeable interruption of the radio signals.

Checking With a Midget

Any midget receiver, power line or battery operated, is a convenient tool for a noise comparison with the receiver being serviced. In this manner, it is possible to make a quick check on the internal noise of that receiver. It is suggested that both receivers be operated without an antenna system and connected to the power line through the same line filter.

Tuning as a Check

If the receiver being examined exhibits a less favorable noise level or a greater variety of objectionable sounds, it is safe to assume that a defective component or loose circuit connection is at fault. The test should be conducted with both receivers tuned to different broadcast signals of about the same power to avoid heterodyning and to reduce error that would be caused by the avc.

Short-Wave Interference

Reduction of interference on the higher frequency or short-wave bands may require a few refinements of the procedures already described. All lead connections, both the grounds to the filter and the receiver, the power line cord to the filter and the receptacle, should be reduced to a minimum length. It is not unusual for a capacitive-inductive line filter to be more effective if the power connections are reversed.

Summary

Exact rules and strict engineering practice are not always effective in servicing noise problems. The practical procedures outlined here have been found to be the solution to many cases of radio interference.

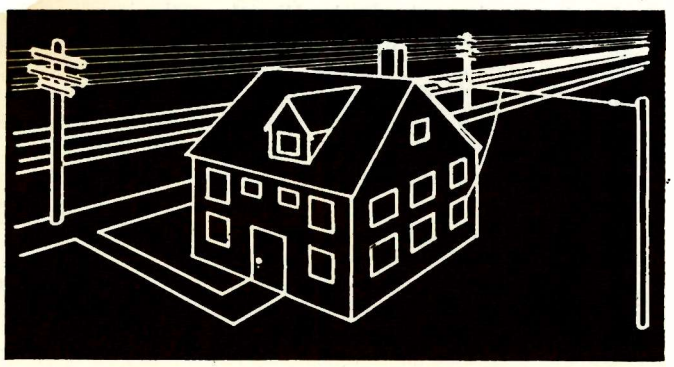
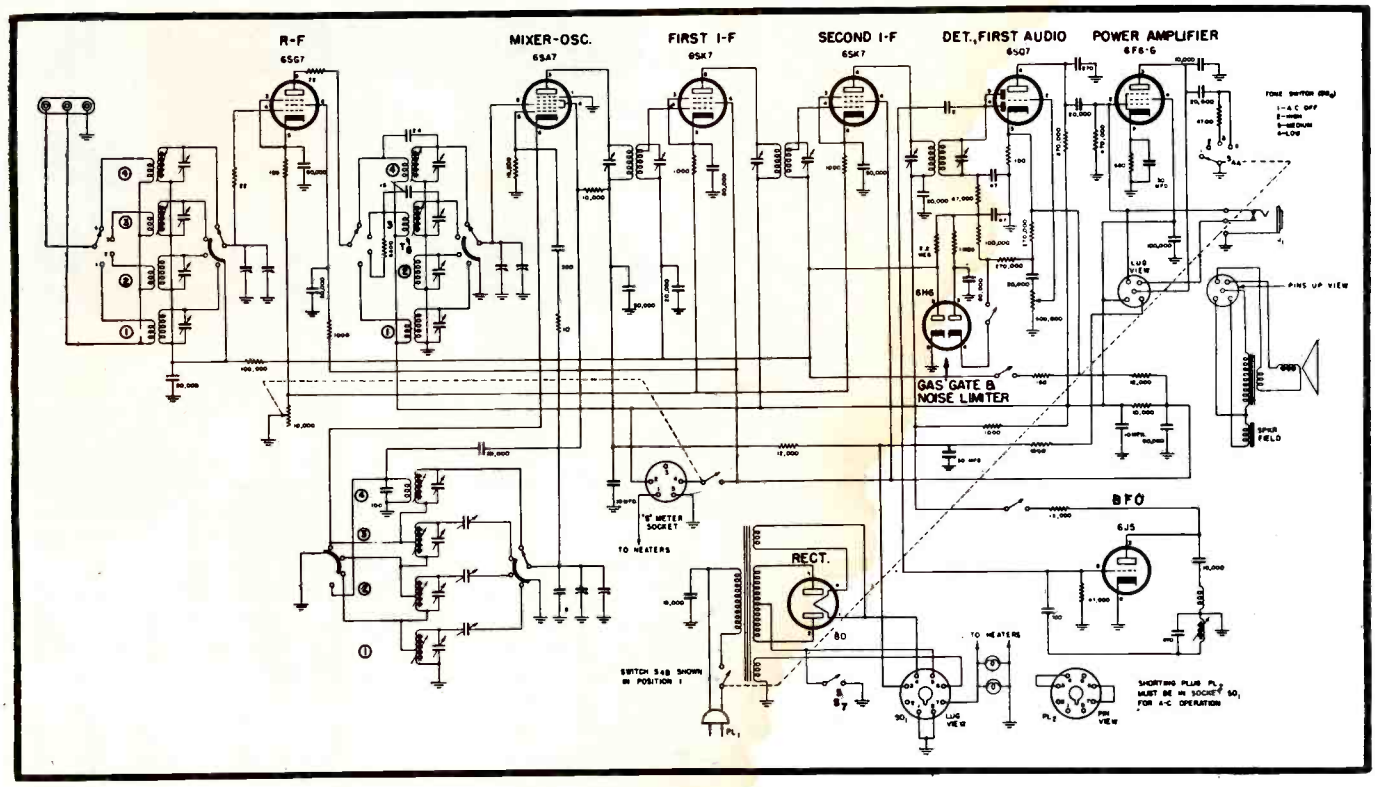


Fig. 5. To minimize interference from power lines, street cars or electric signs, the antenna should be mounted at right angles to sources of interference.



COMMUNICATIONS Receivers Today

by THOMAS T. DONALD

POSTWAR COMMUNICATIONS RECEIVERS RECENTLY DEVELOPED display a variety of circuit innovations, many of which were not only prompted by wartime designs but by the increased interest in the art developed during the war.

Receivers now feature an extended frequency range, increased audio output with a minimum of distortion, adjustable iron-core tuning, highly-efficient tube applications, extremely stable tuning and many other developments.

Hallicrafters S-40

In the receiver shown in Fig. 1 (Hallicrafters S-40), we have an interesting example of postwar communications-receiver design.

This, a nine-tube receiver, covering the frequency range from .55 to 44 mc, uses a four-position tuning-range switch.

A three-terminal network is provided at the antenna input to permit the use of either a single-wire or a doublet system. The primary of the antenna coil is therefore left ungrounded, with a jumper wire to be connected between the terminals where a single-wire antenna is used.

The antenna coils for band *1* (550 to 1700 kc) and band *2* (1.68 to 5.4 mc) are air-core types, whereas the coils for band *3* (5.3 to 15.8 mc) and band *4* (15.3 to 44 mc) are iron-core tuned. The use of an adjustable iron core as well as trimmer capacitors permits better adjustment of the band scale, since both *L* and *C* may be adjusted for proper tracking. In addition the iron core improves the stability as well as the stage gain.

The r-f stage employs a 6SG7, which is classified as a high-mu (4000 mhos) high-frequency semi-variable mu tube. Two 22-ohm resistors are used in series with the grid and plate leads of the tube to prevent parasitic oscillations, which may arise due to the high gain of the tube.

The r-f signal is fed to a 6SA7 pentagrid converter. The r-f stage is similar to the antenna stage, in that iron-core coils are used for bands *3* and *4*. Coupling capacitors are used between primary and secondary on these bands to improve the response and provide better coupling at the high-frequency ends of these bands. No individual primary is used for band *2*. Instead, a 6800-ohm resistor is used in series with the plate of the r-f amplifier, and coupling takes place through the primary of T_5, the r-f transformer for band *3*.

The oscillator portion of the converter stage also uses an iron core,

Circuit Above

Fig. 1. Schematic of the Hallicrafters S-40. Four bands cover the .55 to 44-mc bands: *band 1*, .55 to 1.77 mc; *band 2*, 1.68 to 5.4 mc; *band 3*, 5.3 to 15.8 mc; *band 4*, 15.3 to 44 mc.

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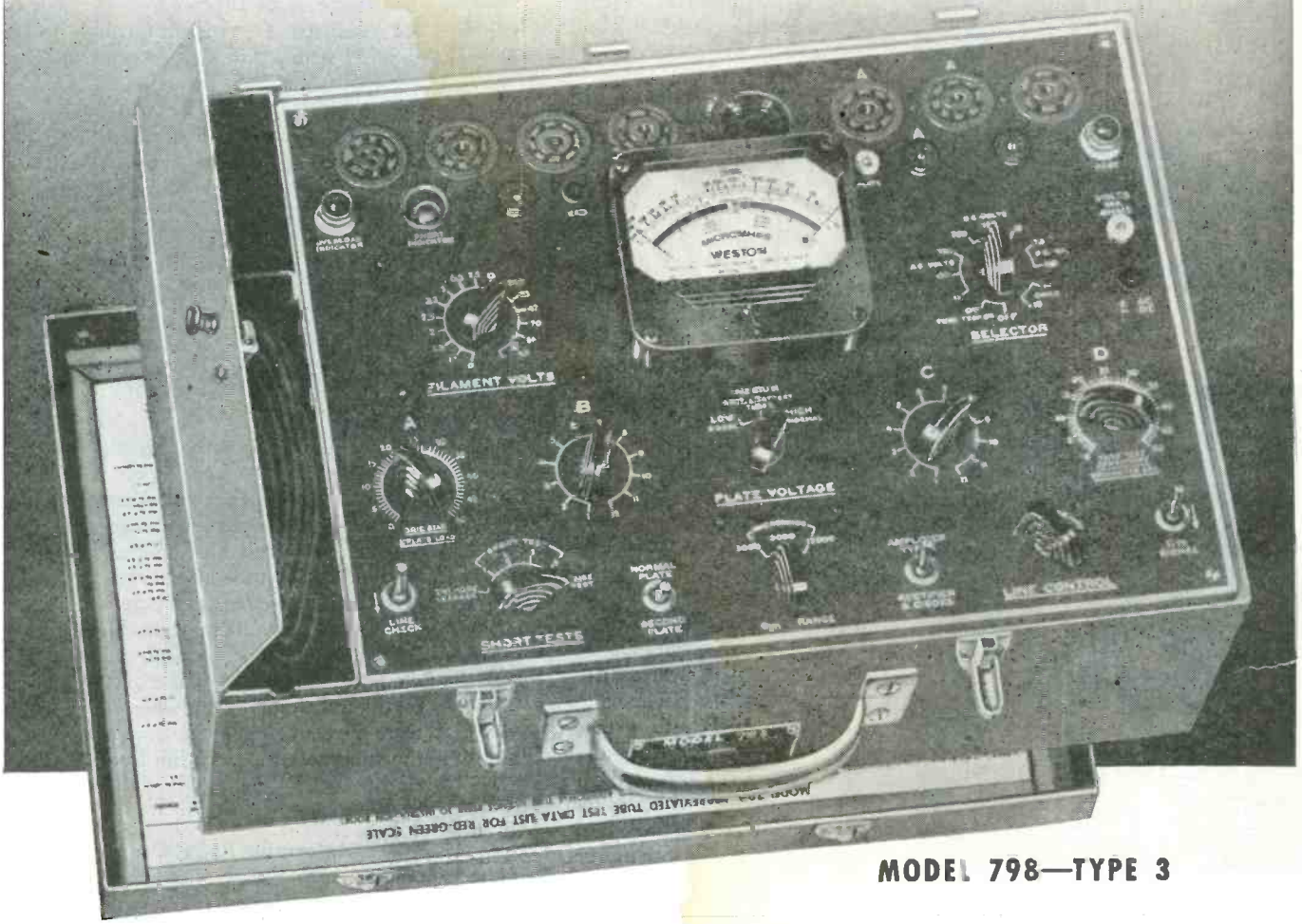

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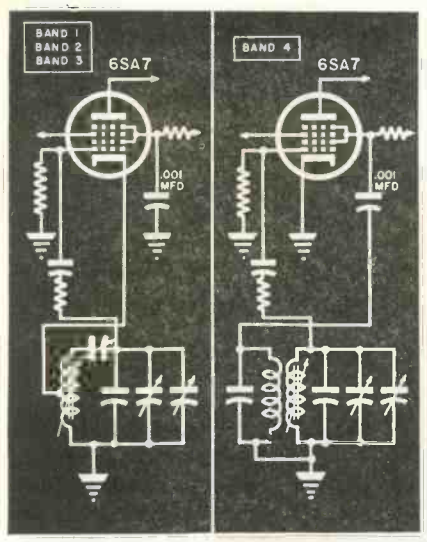


Fig. 2. Oscillator of the S-40. Iron core adjustment is available on all bands for better tracking. Band *4* uses a tickler type circuit, whereas the other three bands use tapped inductances. This has been done to improve oscillator response for the high-frequency band.

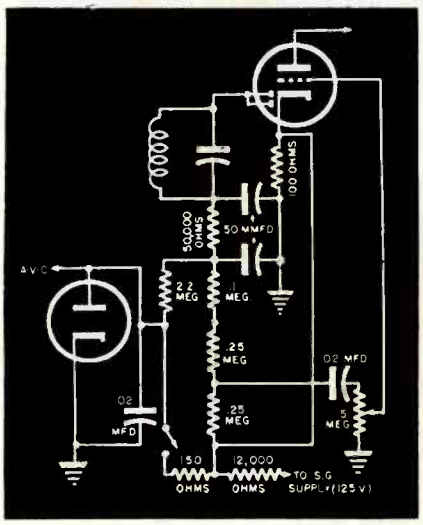
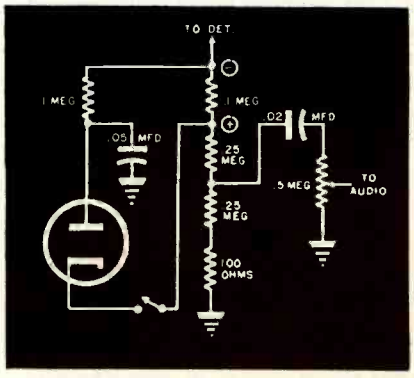


Fig. 3. Schematic of the avc system. The diode connected between the avc circuit and ground is a gas gate. This tube is used to bypass any accidental positive d-c voltage in the avc system which may damage tubes or associated parts. Closing the switch removes the avc and establishes a positive voltage on the grids of 1 volt, which serves to partially cancel out the high cathode bias.

Fig. 4. Circuit of the anl diode. Sharp noise impulses cause the cathode to become less negative than the diode plate, due to the presence of the high capacitance between plate and ground. When the tube is thus conductive the capacitor shunts out the radio signal temporarily.



and is trimmer tuned for all bands. As explained previously, this permits better alignment with the dial calibration. A 10-ohm resistor is used in series with the grid feed of the oscillator portion of the converter to prevent parasitic oscillations.

Oscillator Circuit

Fig. 2 shows the oscillator circuit for the four bands. On bands *1, 2,* and *3* the cathode is returned to ground through a tap on the oscillator coil. The oscillator frequency for these three bands is 455 kc higher than the incoming signal. Oscillators for high frequencies using a pentagrid converter do not oscillate uniformly, nor are they stable. Therefore, two operations are changed for band *4* (15.3 to 44 mc). The cathode is grounded and a reverse feedback circuit is used, with the screen grid of the pentagrid converter acting as the oscillator plate. For improved performance, the oscillator plate circuit, (or pentagrid screen), is resonated with a 100-mmfd capacitor to increase transfer efficiency. In addition, the oscillator circuit for band *4* oscillates at a frequency 455 kc below the incoming signal.

The signal from the converter stage is then fed to two i-f stages using 6SK7s operating at 455 kc. Both of these stages, as well as the r-f stage, are avc controlled. The cathodes of the i-f stages return to ground through the sensitivity control, a 10,000-ohm rheostat. Increasing the resistance common to both cathodes increases the bias, reduces the stage gain, with a consequent reduction in receiver sensitivity. The secondary of both i-f transformers is of the tapped inductance type with the trimmer capacitor tuning across the secondary, and the control grid of the tube connected to the tap. This is done to minimize the effects of change in input capacitance of the tube due to heat or *Miller* effect on the resonant frequency of the transformer. (The *Miller* effect refers to the change in input capacitance of a tube with a change in grid bias.)

The average tuning capacitance across the secondary of the i-f transformer is 80 mmfd. The input capacitance of a 6SK7 is 6 mmfd. It can be seen then that this represents a considerable portion of the tuning capacitance. By tapping the control grid down on the coil, the effects of any changes in the tube's input capacitance are thereby minimized.

Detector and AVC

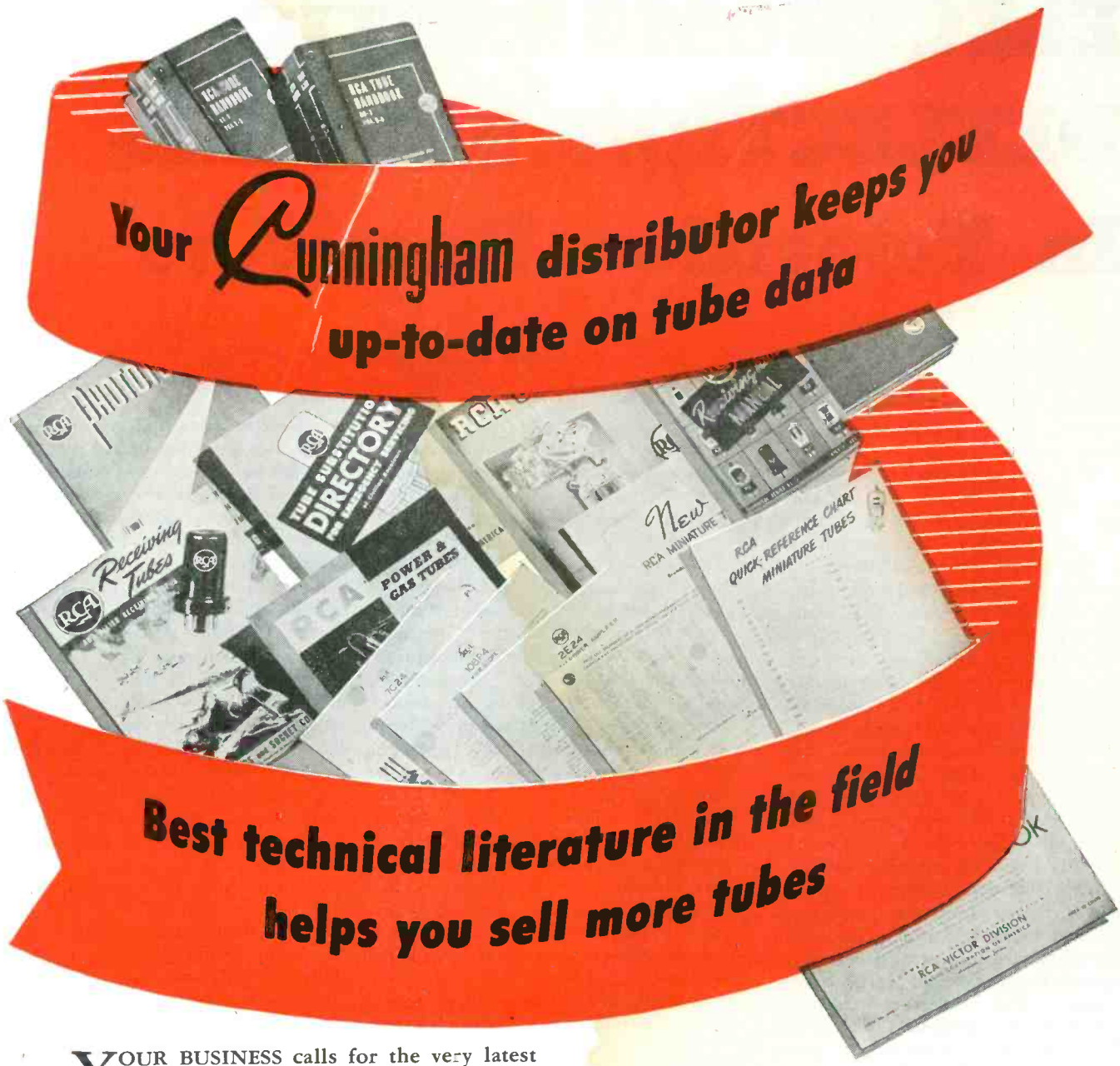
The detector and avc system is shown in Fig. 3. The two diodes of a 6SQ7 are tied together and used for both detection and as a source of avc voltage in the conventional manner. A voltage-bleeder system, connected to the screen grid voltage supply, maintains the cathode of the 6SQ7 at 1-volt bias. With the avc switch open, rectified r-f voltage is used tc supply the avc voltage to the r-f and i-f stages. When the avc switch is closed, the control grids of the r-f and i-f tubes are returned to ground through the cathode resistor of the detector tube.

One section of a 6H6 twin diode is connected to the avc bus as a *gas gate.* This provision is made because the d-c resistance of the avc system back to ground is rather high. Thus, if one of the avc-controlled tubes should become gassy, a high positive voltage would be created, causing the other tubes to draw grid current. This might damage either the tubes or the associated transformers. To prevent this, the diode is connected into the circuit with the plate side to the avc system, so that a virtual short to ground is set up if the avc voltage should become positive, while a high impedance is set up for normal negative avc bias voltage. The use of 1-volt bias on the cathode of the detector tube also serves to cancel the shot-effect voltage of the diodes. If no voltage were placed on the cathode, this shot-effect voltage would establish a negative bias voltage on the avc system even when no signal were present. Thus, the fixed bias on the tube acts to delay the avc voltage slightly.

Automatic Noise Limiter

The second diode of the 6H6 tube is used for an automatic noise limiter; Fig. 4. It will be noted that the plate of the anl diode is connected at the same point as the avc voltage source, through a 1-megohm resistor, and shunted to ground through a .05-mfd capacitor. The cathode is connected to another point in the detector-diode return which is positive with relation to the anl diode plate. The time constant of this circuit is such that audio voltage variations do not affect the charge on the capacitor. Therefore the tube remains non conductive for audio signals. However, during a severe noise impulse, the anl cathode becomes more negative than its plate, and this, in effect means that the plate is now positive with relation to its cathode. The tube then presents a low-impedance path to the capacitor, and the latter momentarily shunts out the

(*Continued on page* 28)



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ELECTROMAGNETIC DEFLECTION SYSTEMS In Television Receivers

by EDWARD M. NOLL

ELECTROMAGNETIC DEFLECTION of the television picture-tube beam is used for most tubes greater than 7" in diameter. It is also used for some smaller diameter tubes.

The deflection system consists of two pairs of coils, one pair for horizontal deflection and a second pair for vertical deflection. The beam must be moved at a linear speed horizontally (across the screen) and rapidly back 15,750 times per second. This motion requires passage of a sawtooth current through the horizontal deflection coils. At the same time the beam must be moved vertically down the screen at a much slower rate and returned quickly to the top. This motion occurs sixty times per second and is produced by a sawtooth of current in the vertical deflection coils. The simultaneous application of both waveforms produces the familiar television *scanning raster.*

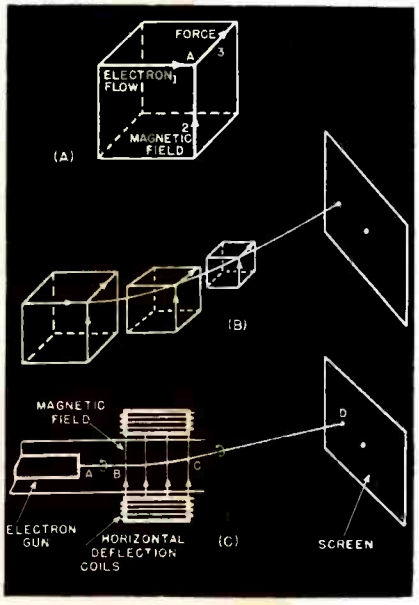
The deflection system of the receiver, therefore, consists of horizontal and vertical sawtooth generators (synchronized in operation by the received horizontal and vertical sync pulses), and deflection amplifiers which increase amplitude of sawtooth to a level which causes ample current flow in the deflection coils. In addition, a special circuit is incorporated to properly modify the sawtooth voltage so there is a sawtooth current flow in the deflection coils.

Basic Theory

In understanding magnetic deflection it is necessary to know what is meant when it is stated that the electron is deflected at right angles to both the magnetic field and the forward motion of the electron. With a bit of three dimensional perspective this can be analyzed. Let us study the simple block, Fig. 1 (*A*). If the electron moves in the direction indicated by arrow one and a magnetic force is exerted with its magnetic lines, arrow two, a force will be exerted on the electron at *A*, which will attempt to move the electron in the direction of arrow three. The three-dimentional perspective introduced by the block shows that this motion is both at right angles to electron motion and the magnetic lines of force. Actually, the motion of the electron is not so abrupt; it doesn't stop dead and make a sharp left turn as soon as it comes under influence of the vertical magnetic field. Rather, the electron does not lose its forward motion (acceleration given to it by second anode, in case of a television picture tube) but is only deflected in proportion to the strength of the magnetic field. Consequently, the motion of the electron is an arc of a circle so long as it is under the influence of the magnetic field. This motion is depicted by the series of blocks of Fig. 1 (*B*), which shows the influence of the magnetic field in causing the electrons to bear left. Once the electrons have left the magnetic field they continue along their forward straight-line path and, in case of a television screen, strike it left of center.

The influence of the magnetic field on the electron beam of a picture tube is shown in Fig. 1 (*C*). Here, once again, we have a vertical magnetic field set up by the two horizontally mounted deflection coils. Between *A* and *B* the beam moves in a straight line toward the center of the fluorescent screen. However, at point *B* it comes under the influence of the magnetic field and the beam is pulled to the left, between *B* and *C*, the amount it is being pulled, of course, is dependent on the strength of the field. Between *C* and *D* the beam again moves in a straight line, striking the screen to the left of center. If the lines of magnetic force are reversed (this can be easily accomplished by changing the direction of current flow through the coils), the beam is deflected to the right of center.

Fig. 1. Simplified analysis of magnetic deflection.



Likewise, if another pair of deflection coils are mounted vertically, their magnetic field can be used to deflect the beam vertically. This brings to light one difference between electrostatic and magnetic deflection. With electrostatic deflection the horizontal deflection plates are mounted vertically; the vertical deflection plates, horizontally. With electromagnetic deflection the vertical deflection coils are mounted vertically; horizontal deflection coils, horizontally.

The basic electron theories responsible for magnetic deflection are:

(1) When an electron flow exists in a long straight conductor, a magnetic field is established around the conductor. The direction of the magnetic lines viewed from the direction of electron flow is counter-clockwise, Fig. 2 (*A*). Thus if there is electron motion from *A* to *B* the magnetic lines are as shown. This very same rule applies to a narrow beam of electrons which are being accelerated by an anode. Therefore, in Fig. 1 (*C*) the direction of the magnetic lines about the electron beam is indicated by the small arrows.

(2) The second magnetic law that applies particularly to magnetic deflec-

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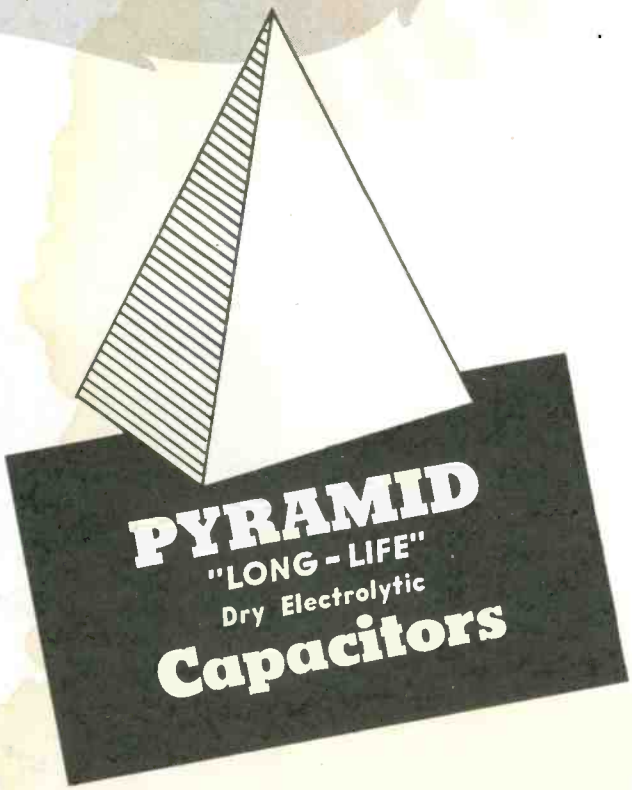


tion is that when a conductor carrying current is in a magnetic field a force is exerted on the conductor, attempting to move it at right angles to both the direction of current flow and the lines of force of the magnetic field. This rule also applies to an electron stream, the actual direction of the stream shifting.

Actually, the second rule is an expansion of the first for it is the magnetic field surrounding the beam which is a contributing factor in the deflection of the beam. To prove this, first let us take the deflection system of Fig. 1 (*C*) and look at it from the fluorescent screen as shown in Fig. 2 (*B*). In this drawing the electron stream appears to be coming off the paper toward us and thus the magnetic field surrounding the stream is clockwise. Now observation of the drawing shows that the magnetic lines from the deflection coils and those surrounding the electron stream buck each other on the right side of the beam, resulting in some cancellation. On the left side the two fields are additive. Thus there is a greater pressure on the left and the beam is forced to the right (beam is forced to the left so far as the perspective of Fig. 1 (*C*) is concerned, for there we are observing from the electron-gun end).

In Fig. 2 (*C*) the magnetic deflection field has been reversed, causing cancellation on the left side and a consequent left deflection. In the same drawing the deflection of the beam by vertical deflection coils is shown.

Fig. 2 (*D*) shows the influence of both vertical and horizontal magnetic lines on beam deflection. These fields do not react on each other so long as they are perpendicular. The combination of both fields and the control of currents through the two pairs of deflection coils can move the beam to any point on the flourescent screen.

In actual practice, the coils are not mounted in a squared rectangular manner as shown, but instead are curved to fit the neck of the tube. In fact horizontal and vertical coils almost entirely overlap each other to produce uniform magnetic fields. Inasmuch as the windings and resultant fields are perpendicular there is no appreciable interaction or coupling between windings.

The so called *deflection yoke* can have either an iron core or air core. The iron core is advantageous in being easy to match to the output stage and has some flexibility in that the pole pieces can be shaped to produce a uniform field. The air-core yoke, most commonly used, has no core saturation difficulties and its magnetic field is at all times proportional to the deflection

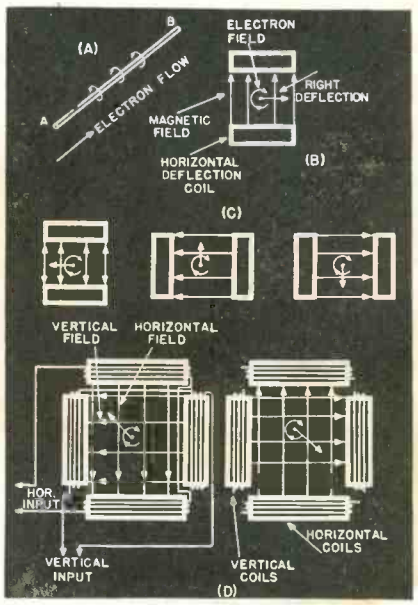


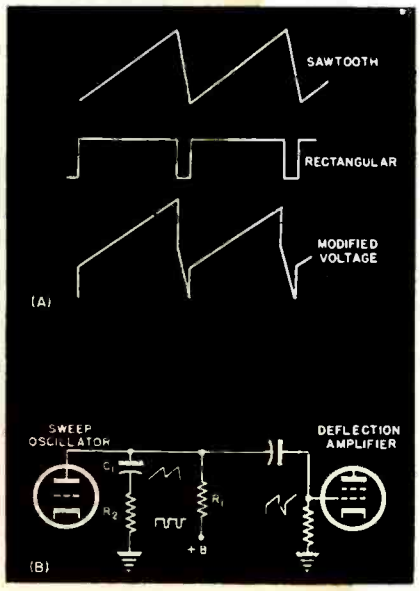
Fig. 2. Magnetic deflection fields.

coil current. The deflection yoke is surrounded by a soft iron shell to prevent induction of stray fields.

Modified Sawtooth Voltage

In the deflection system of a television receiver it is necessary to cause a sawtooth of current to flow in the deflection coils. If the deflection coils represented pure resistance a sawtooth of current would flow through them when a sawtooth of voltage was applied across them. Inasmuch as the deflection coil contains both inductance and resistance it is necessary to develop a modified sawtooth voltage to obtain a sawtooth of current through the coils. A simple sawtooth modifying circuit is shown in Fig. 3.

Fig. 3. Modified sawtooth and circuit.



To have a linear sweep it is necessary to have a linear rise of current through the coils. In a pure inductance, a linear rise of current is produced when a squared-wave voltage is applied across the inductance; in a resistance, a linear rise of current is produced when a sawtooth of voltage is applied across the resistance. Inasmuch as a coil contains both resistance and inductance, a modified voltage waveform must be used to obtain a linear rise of current. Such a modified voltage is shown in Fig. 3 along with a typical circuit which can be used to obtain the modified voltage from a sawtooth.

The initial sharp rise of the modified waveform acts as the squared wave to start the linear rise of current in the reactance (said to overcome the coil reactance). Then, the gradual rise of voltage sustains a linear rise of current through the combined inductance and resistance. It is important to note at this point that the inductive reactance of the coil becomes less and less as the sweep frequency decreases, requiring a smaller and smaller amplitude initial rise; modified waveform begins to look more and more like a simple sawtooth. In many cases, the inductive reactance is so small at the low vertical sweep frequency, it is not necessary to modify the vertical sawtooth voltage. At this frequency, the resistance exceeds the reactance and the load is largely resistive and, therefore, the current follows the voltage in shape and phase.

Waveform Modification

The waveform is generally modified in the sawtooth forming output circuit of the sweep oscillator. In addition to the charging capacitor, C_1 and resistor, R_1, another small resistor, R_2, is inserted between capacitor C_1 and ground. When the capacitor is charging linearly, the charging current is, of course, constant and low. Since R_2 is a part of this charging circuit a small constant voltage appears across it. When the sweep oscillator tube conducts the capacitor will then be shunted by the low resistance of the tube and its charge removed. The high current flow during the discharge develops a sharp negative voltage across the resistor. Inasmuch as the voltage which appears on the grid of the deflection amplifier is the combination of both of these waveforms we find that it has the desired shape to cause a linear sawtooth to flow in the deflection coils.

[To Be Continued]

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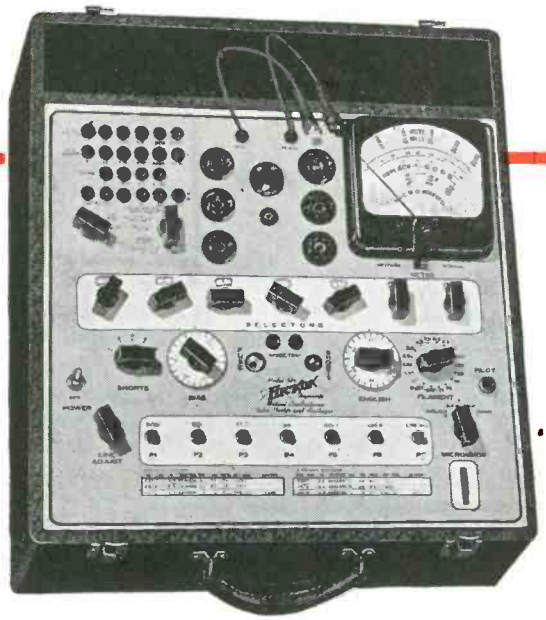
1 6X5GT—Power rectifier
1 6SN7—Contact potential
1 6SN7—Vacuum tube voltmeter
1 OD3/VR150—Voltage regulator



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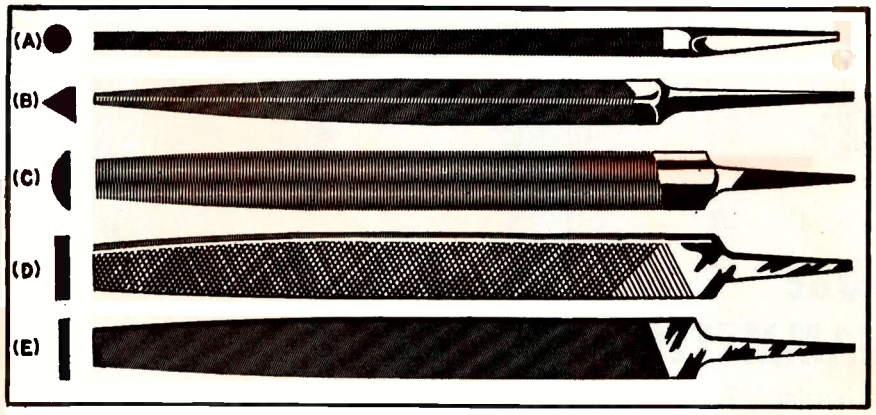

Fig. 1. Five additional kinds of files that are useful in the Service Shop: (*a*) tapered round machinists' file; (*b*) tapered triangular machinists' file; (*c*) half-round machinists' file; (*d*) flat wood file, and (*e*) tapered flat mill file. (*Courtesy Nicholson File Co.*)

Fig. 2. A simple file card for keeping your files free of metal chips. (*Courtesy Nicholson File Co.*)

TOOLS and ACCESSORIES for the NEW SERVICE SHOP

By ALFRED A. GHIRARDI

Advisory Editor

[*Part V . . . Supplementary and Special-Purpose Tools*]

IN THIS INSTALLMENT, we continue our discussion of tools which includ files, file cards, special pliers an wrenches, and screwdrivers.

Files

Only a small ignition-type and an 8″ flat hand standard-cut file were listed on the *basic* tool list. Several additional sizes, shapes and varieties will be found useful. Actually there are *thousands* of kinds, cuts and sizes of files made*, because there are thousands of different filing jobs in industry, each of which can be done *better* by using *the right file for the the job*. The right file saves time because it performs correctly, and usually faster, on the kind of metal or work for which it is designed.

Fortunately, the radio Service Man needs comparatively few sizes and kinds of files in his work. In addition to the files listed on the *basic* tool list, the Service Shop should have one ¼″ and one ⅜″ tapered round machinists' file, (*a*) Fig. 1; one ½″ tapered triangular machinists' file, (*b*); one half-round machinists' file, about 8″ long for general work, (*c*); one flat wood file, [this is not a rasp], about 8″ long (for filing wood), (*d*); and a *second-cut* or *smooth-tapered* flat mill file, about 6″ long for tool-sharpening purposes, (*e*).

Each of the files should be provided with a standard file handle. Such handles enable you to get a firm grip on the file, save wear and tear of your right hand, and eliminate the possibility of puncturing this hand with the point. If handles are not available, it will help if the tang of the file is wrapped with friction tape.

*Files and rasps are distinguished according to their length, kind (or name), and cut.

The *length* of the file is the distance between its heel (or part of the file where the tang begins) and the point (or end opposite). The tang (or portion of the file prepared for the reception of the handle) is *never* included in the length.

The *kind* or *name* has reference to the shape or style of the file, as distinguished by such names or *flat, mill, half round,* etc. These are divided, from the form of their cross-sections into three general geometrical classes: quadrangular, circular, and triangular. From them are derived, further, odd and irregular forms or cross-sections. These sections, in turn, are subdivided according to their general contour or outline, into *taper and blunt.*

The *cut* of files has reference to both the character and the relative degrees of coarseness of the teeth. The cut of files is divided, with reference to the *character* of the teeth, into *single, double, rasp* and *curved;* and with reference to the *coarseness* of the teeth into *rough, coarse* (very coarse), *standard* (coarse), *second cut* (half smooth), *smooth* (smooth), and *dead smooth* (very smooth). The first three are used on the heavier classes of work; the last three are used for finishing, or more exacting work.

Unfortunately, lack of space here prevents a thorough explanation of all the various types of files made, how to select the proper type for any material or job at hand, etc. The Service Man who is interested in acquiring a complete and valuable knowledge of this important subject should write to the Nicholson File Co., Providence, Rhode Island, for a copy of the free illustrated booklet "File Filosophy and How to Get the Most Out of Files". It is most interesting and informative.

File Card

Files should be kept free of filings or chips often collect between the teeth during use, for these will make deep scratches in the material being filed as the file is passed over the work. When these particles of metal are lodged too firmly between the teeth to be removed by tapping the edge of the file against the bench, they should be removed by means of a card file or wire brush drawn across the file in the direction in which the teeth run. A file card, see Fig. 2, is inexpensive and should be purchased.

Copper and aluminum have a tendency to clog a file. This may be reduced by rubbing chalk over the file before filing with it.

Additional Pliers

Two or three additional types of pliers are desirable, even though they may not belong on the *basic* tool list.

A pair of 6″ straight fine needle-nose pliers and a pair of 5½″ curved needle-nose pliers shown at (*a*) and (*b*) of Fig. 3 are very useful for

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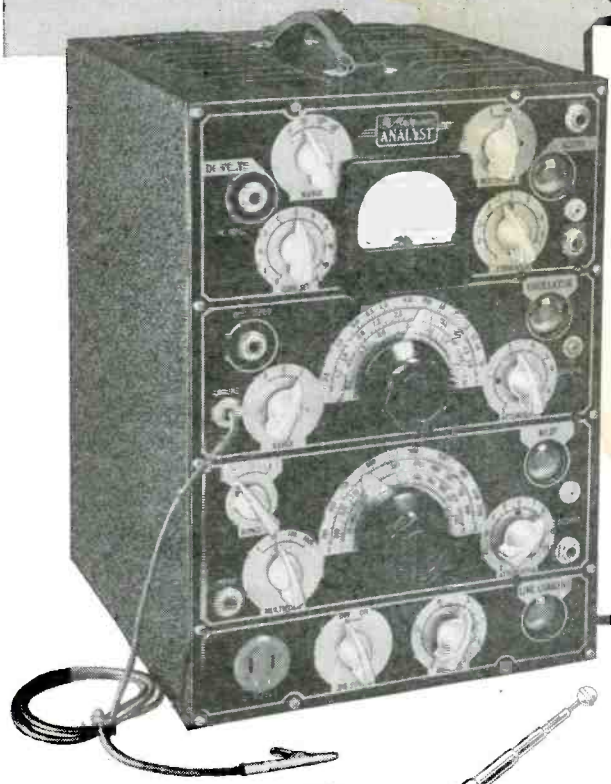

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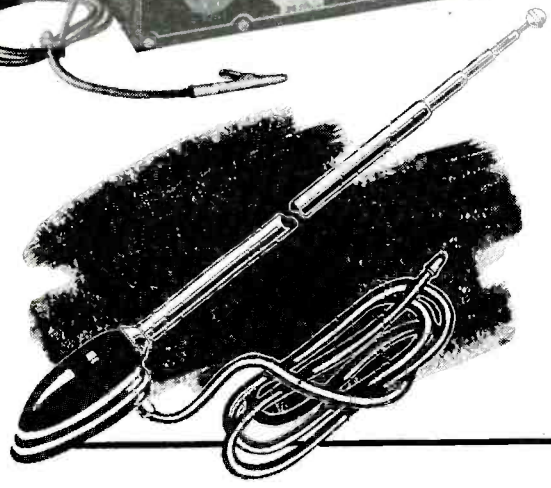

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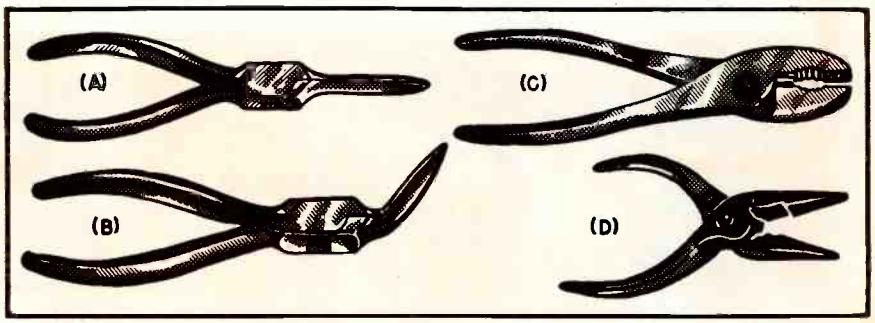


Fig. 3. Several additional types of pliers that it will be convenient to have for special uses: (*a*) straight fine needle-nose; (*b*) curved needle-nose; (*c*) adjustable combination. (*Courtesy Kraeuter Tool Co.*); and (*d*) plastic long nose (*Courtesy Special Products Co.*)

many jobs where it is awkward to get into places with the regular straight long-nose pliers, which were included on the *basic* tool list.

Perhaps the most versatile of the larger pliers is a 6″ slip-joint (adjustable) combination plier of the type illustrated at (*c*) of Fig. 3. It is worth while to get a good pair made of drop-forged steel. Combination pliers are intended as an all-purpose tool. They have serrated jaws, wire cutters and may also be used to hold round objects. They are frequently used instead of a wrench, but whenever this essential a padding should be used between the deeply serrated jaws to prevent them from marring the surface of the equipment worked on.

Plastic pliers, such as are illustrated at (*d*) of Fig. 3, have come into the market, to the advantage of the Service Man who wants a pair of pliers which will: (*1*)—not *short* plate and screen leads to the chassis while working on a *hot* set; (*2*)—avoid accidental shock or cause a *short* while picking up a loose nut, screw or washer from amid *hot* chassis wiring; (*3*)—avoid setting up disturbing magnetic fields while relocating *critical* wiring while the equipment is operating, etc. This type of plier is similar in appearance to the ordinary metallic type long-nose pliers, and the 5,000 psi tensile strength of its plastic material provides more than enough mechanical strength for all average radio uses. These pliers are not a substitute for metal pliers, but are useful for such specialized uses as just mentioned and will be found quite handy to have around.

Other Types of Screwdrivers

No matter how many different types and sizes of screwdrivers a Service Man has on hand, he can always use a few more. Several that may be added to the *basic* complement of screwdrivers previously presented are illustrated in Fig. 4.

The first shown at (*a*), is one of the heavy duty ¼″ x 1¼″ short, stubby type for those hard-to-get-at screws. Next is an extra-heavy one, shown at (*b*), having a ⅜″ x 10″ square blade for breaking free even the most reluctant screw. Next comes a long, slender screwdriver, shown at (*c*), that finds many uses in chassis work, one with a 3/16″ x 10″ round blade.

A flexible-shaft screwdriver of the type illustrated at (*d*) is extremely useful for "around the corner" screws that are difficult to get at. The all-insulated screwdriver at (*e*) is 6″ long and has a ⅛″ x 1″ metal bit. It is useful when the screwdriver must be stuck down past live circuits or parts on a *hot* chassis.

When working in tight places, a screwdriver is often needed which will firmly hold the screw onto the screwdriver point, so that the screw may be placed in any spot not accessible to the hand, or removed from it. Where machine screws made of magnetic material are encountered, a magnetized screwdriver practically fills the bill; but since brass, alumiunm, or other non-magnetic screws are more widely used, and since even a small magnetic field is sometimes objectionable around a sensitive receiver, some other design is required. One popular screw-holding model that employs a spring-grip arrangement is shown at (*f*). The screw gripper holds the screw firmly while the screw is being placed in its hole, and instantly releases it when desired. The gripper slips along the blade to the upper end when not in use. This tool can also be used as a regular screwdriver.

One or two small off-set screwdrivers of the type shown at (*g*) are useful for making adjustments to remote control units, and for tightening or loosening screws that are impossible to get at (where space is limited) with an ordinary screwdriver. One about 2½″ long and one about 4½″ long will do nicely.

Two sizes of Phillips-type straight screwdrivers in addition to the No. 5 to No. 9 screw size that was listed in the *basic* tool list will often come in handy. One that takes Phillips-head screws up to No. 4 and one that takes screws from No. 10 to No. 16 will complete the set.

A Phillips-type offset screwdriver is also very handy to have around. The one illustrated at (*h*) is made so that one end accommodates Phillips-head screws of No. 4 size and smaller; the other end takes the No. 5 to No. 9 size screws.

Additional Wrenches

Two or three additional types of wrenches will make a worthwhile addition to the *basic* wrench equipment.

The set-screw-wrench shown at (*a*) of Fig. 5 is designed especially for the *Bristol* No. 6B set screws that are found in many automatic record changers and other equipment.

Obviously, an offset hex-nut socket wrench is a big help where vertical space is limited, or where it is impossible to work with the usual

(*Continued on page 29*)

Fig. 4. Several types of screwdrivers that are timesavers when difficult working conditions are encountered.

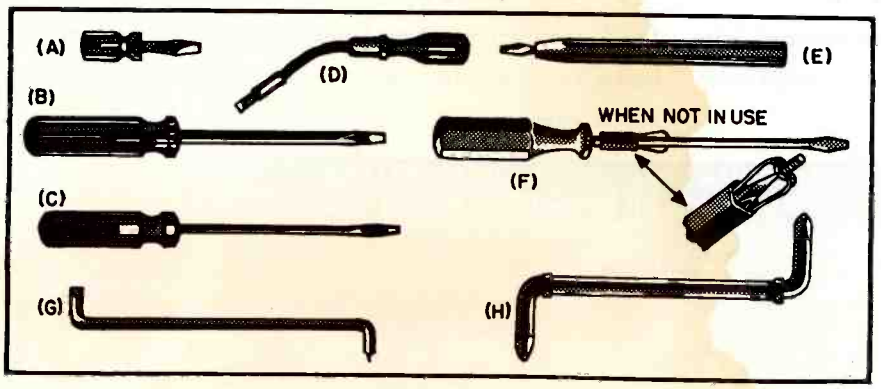
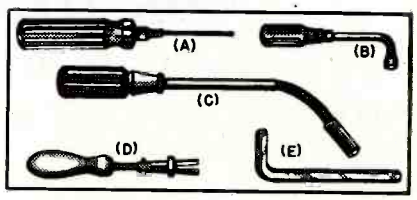


Fig. 5. Several types of special-purpose wrenches that are useful.



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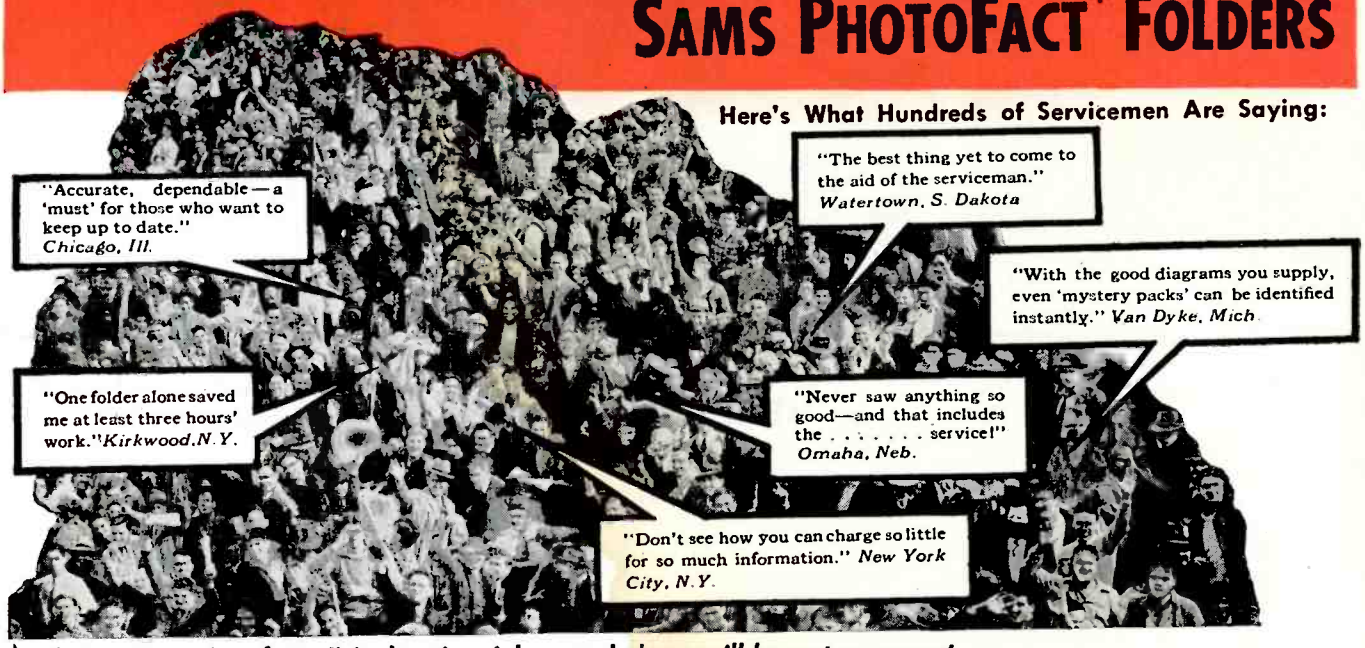

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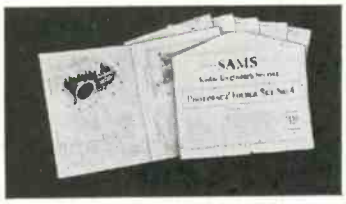

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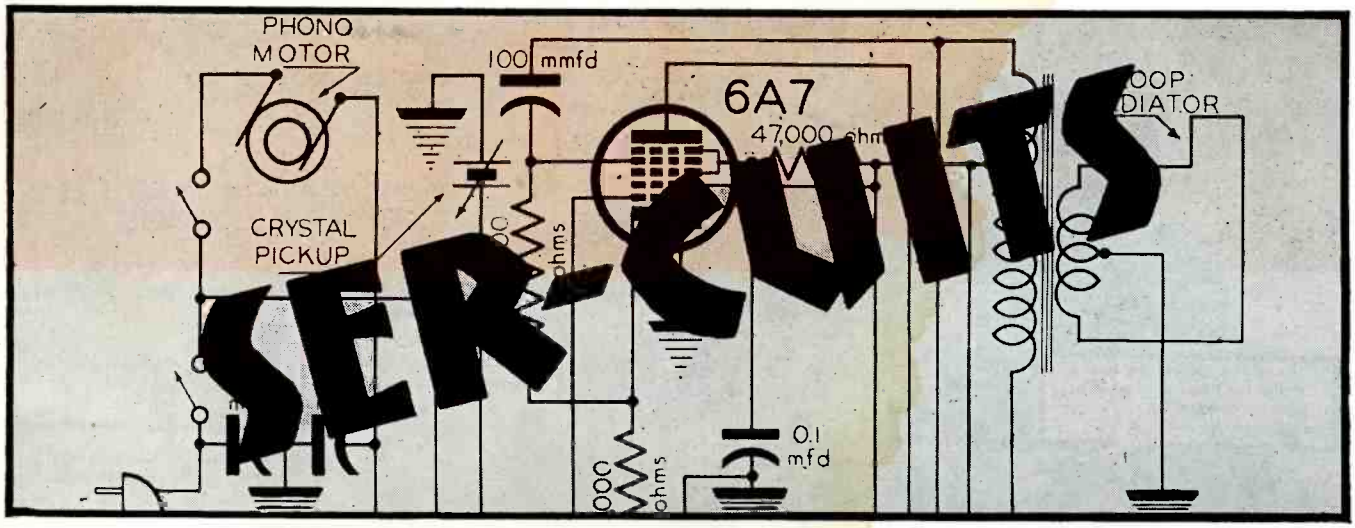


SERVICE CIRCUITS

by HENRY HOWARD

POSTWAR PORTABLES AND BATTERY-OPERATED farm sets are analyzed this month.

Both GT and miniature tubes are being used for battery-line combination power sets as well as the farm-type battery receivers. Most of the farm-type battery receivers are using external antennas for increased input, because of the scarcity of nearby stations in the farm sectors. Many portables have also been designed for external antennas to assure adequate pickup.

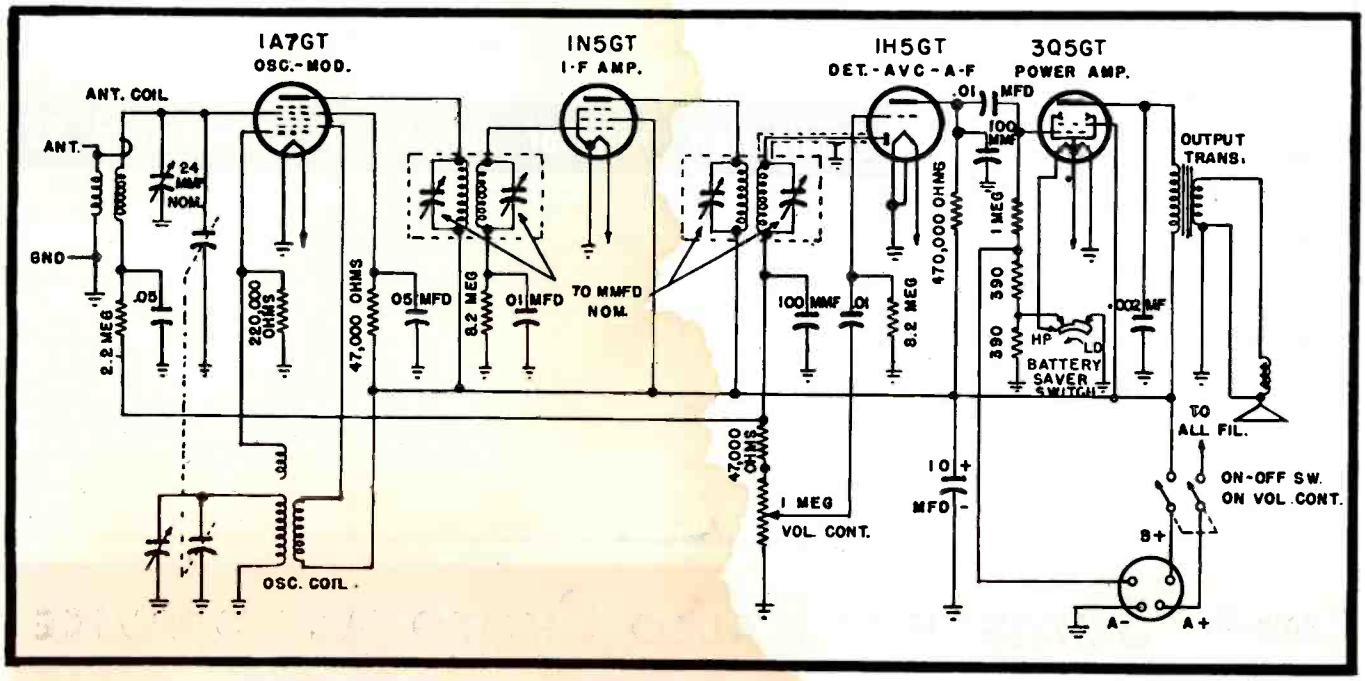
Economizers are still popular, and justly so when operating expenses are considered. Some types include resistance to the filament battery to cause a decrease in both *A* and *B* drain, the *B* saving being considerable. Other types use a resistance between the negative terminal of the *B* battery (*C*—) and ground (*B*—), increasing the bias on the power tube and lowering the *B* voltage by an equal amount. Since the power tube constitutes the principal drain on the *B* battery, this usually drops the battery current about 1/3.

Motorola 45B12

In the 4-tube Motorola 45B12, Fig. 1, a simple shorting type switch opens one half of the 3Q5 filament and, at the same time, increases the *C* bias as explained above. This method obviously reduces both *A* and *B* drain. All these sytems, of course, are compromises between reasonable sensitivity, quality and power output on the one hand and long battery life on the other.

This model, built for an external antenna, uses a 1A7GT oscillator-modulator, 1N5GT i-f, 1H5GT detector-avc-audio and 3Q5GT beam output. The antenna input transformer makes use of a small capacitor to supplement magnetic coupling. Avc is supplied to the modulator only, 1N5 bias coming from an 8.2-megohm grid leak bypassed by a .01-mfd capacitor. The battery saver switch, with its arm grounded, makes contact with one section of the filament of the 3Q5 and simultaneously shorts a 390-ohm bias resistor in series with the *B* battery. The closed position provides normal, full-output operation; the open position, low-drain economical operation with some sacrifice in quality, power and sensitivity. The normal bias resis-

(*Continued on page 26*)



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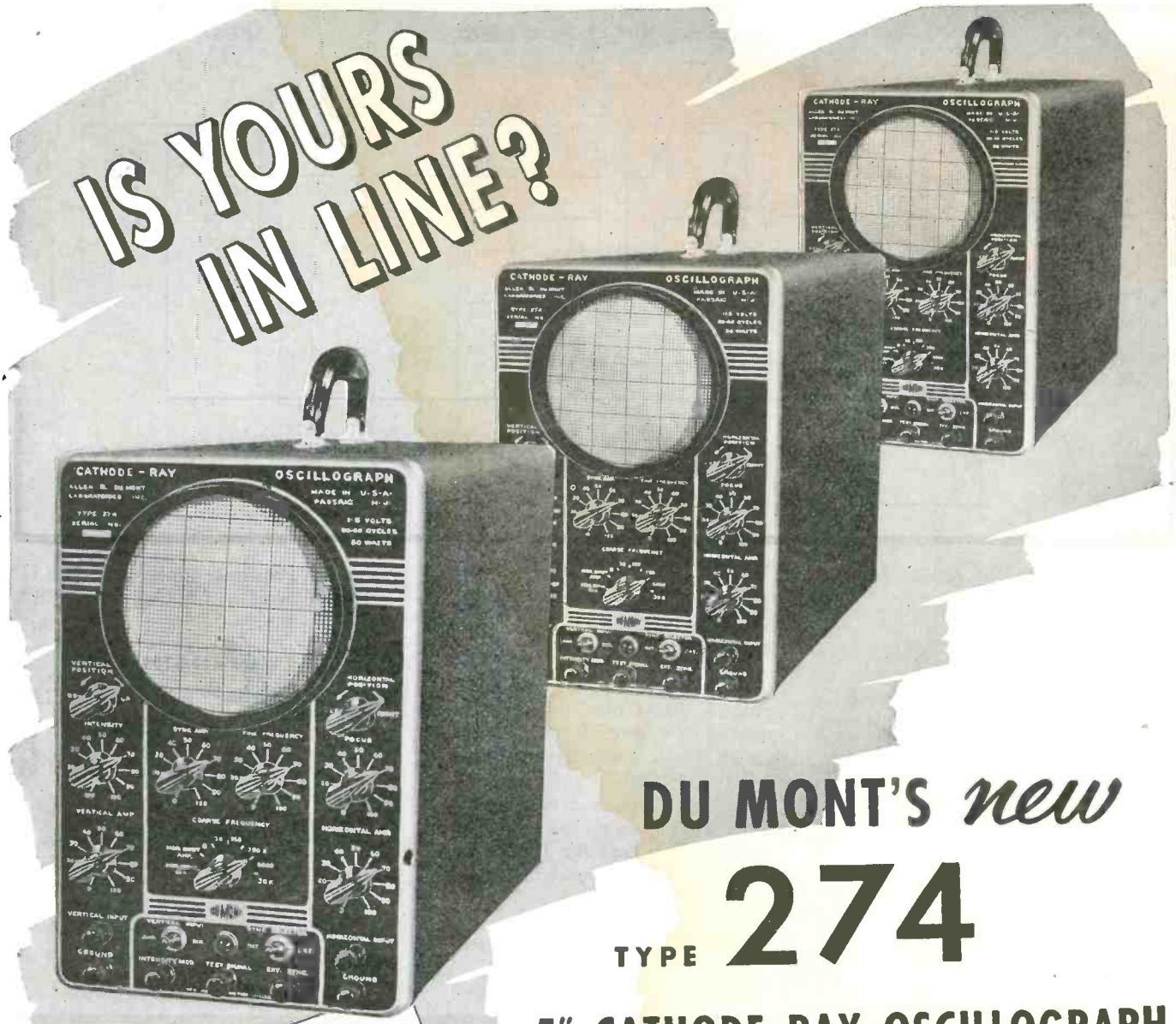

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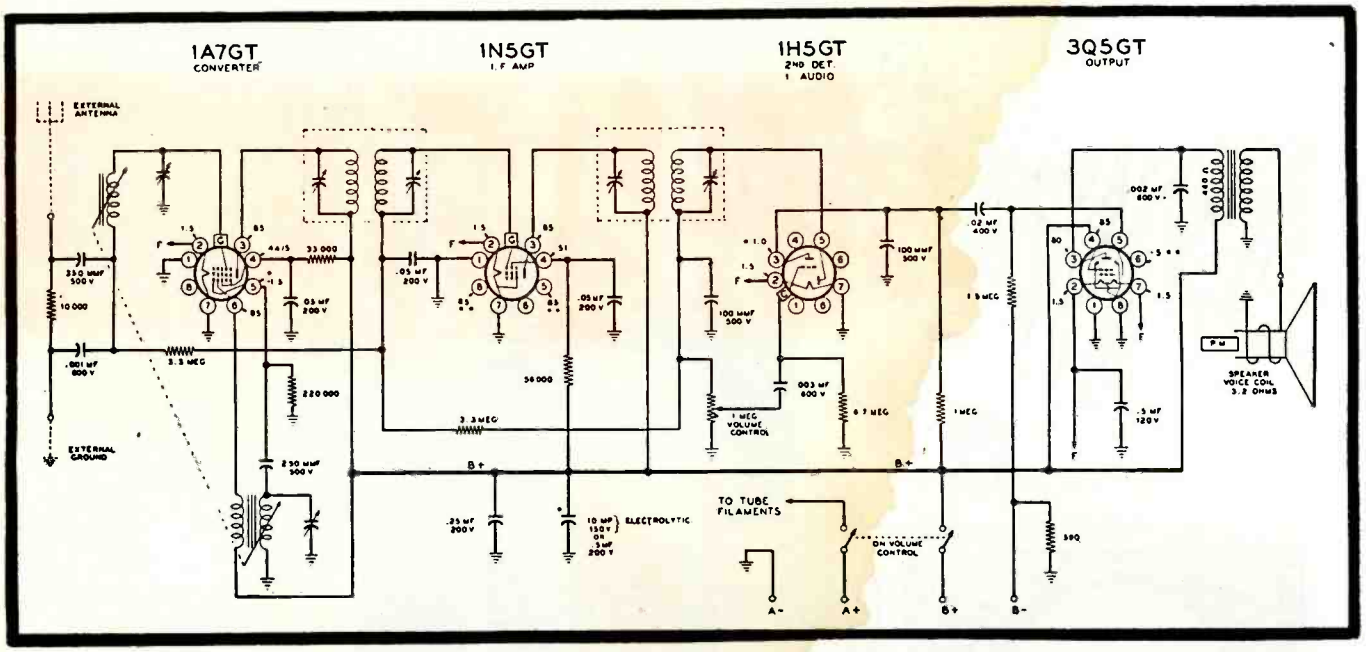


Fig. 2. Permeability-tuning battery model receiver, Belmont 4B17.

tor is 390 ohms, the *economy* value, 780 ohms.

Belmont 4B17

A permeability-tuning farm-type battery model, Belmont model 4B17, is shown in Fig. 2. This model uses a battery pack containing a 1½ volt *A* and 90-volt *B* section which is capable of providing approximately 1000 hours of good performance in average service. This represents about nine months' usage at the rate of 3 or 4 hours per day.

Signal voltage from the external antenna is capacitively coupled to a 1A7GT through a 380-mmfd capacitor across a 1000-mmfd bypass at the low potential end of the tuned antenna coil. A 10,000-ohm resistor between antenna and ground reduces any resonant peaks that may occur within the tuning range and provides an electrostatic leak to prevent a charge from building up on the antenna. Avc is supplied to both the 1A7 and 1N5, but the 1A7 has an additional 3.3-megohm grid leak. Power tube bias is obtained from a 390 ohm series "B" resistor.

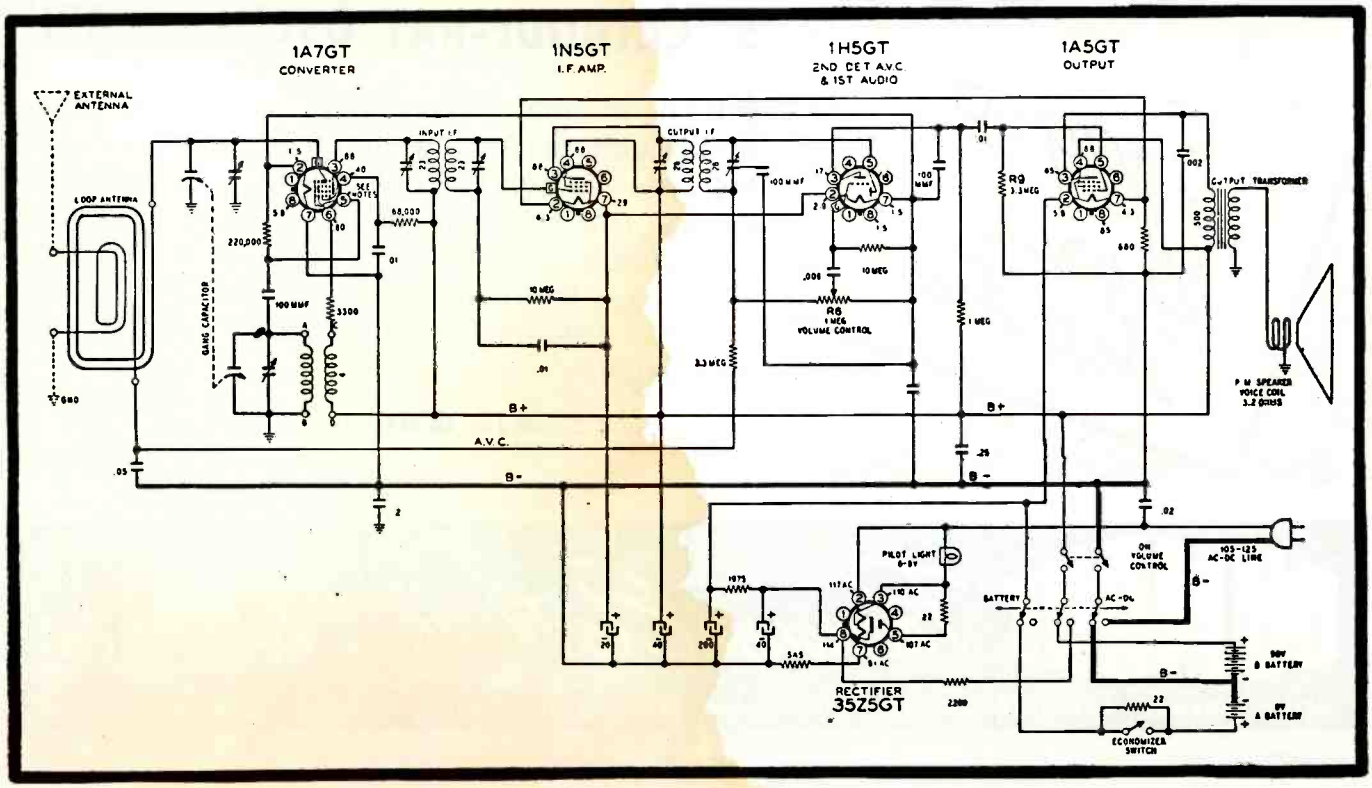
Fig. 3. A 3-way portable with a built-in loop, Airline 64BR-1051A.

Ward 64BR-1051A

Ward's Airline model 64BR-1051A, Fig. 3, is a 3-way portable with a built-in loop. A 3300-ohm resistor is in series with the plate tickler coil of the oscillator. The 1N5 i-f uses a 10-megohm leak bias. The output tube is a 1A5GT with a 50-mil drain for series filaments. A 6 volt *A* battery is used with a 22-ohm series resistor for *economizer* operation.

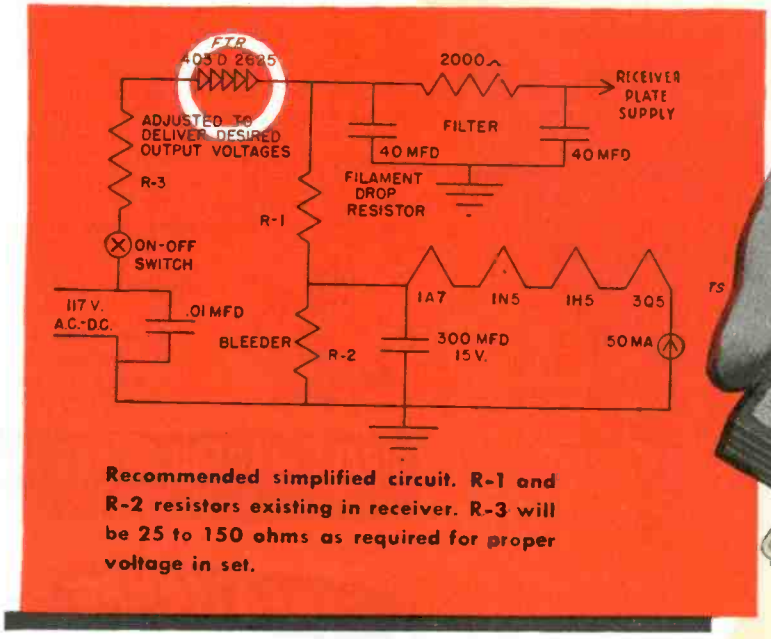
A 35Z5 is used for line-powered *A* and *B* supply. The *B* filter consists of

(*Continued on page* 31)



SHORT CIRCUIT THE RECTIFIER TUBE SHORTAGE

...with Federal's PROFIT-BOOSTING Miniature Rectifier Stack



Recommended simplified circuit. R-1 and R-2 resistors existing in receiver. R-3 will be 25 to 150 ohms as required for proper voltage in set.

29 DIFFERENT RECTIFIER TUBE TYPES NOW REPLACEABLE IN CONSOLE RADIOS, AC-DC PORTABLES, VIBRATOR POWER SUPPLIES!

YOU don't have to turn away repair jobs because there are no rectifier tubes on your shelf. Here's a replacement that is actually an *improvement* . . . and permits you to *earn more money!*

Install this remarkable, new rectifier stack which *costs less than a tube*, and the repaired set starts instantly without warmup, and runs cooler. Only 1¼ x 1¼ x 1⅛ inches, it fits anywhere in the chassis. What's more, you can tell your customer it's in for good! For this Federal stack is built to last the life of the set. It withstands overloads, even when charging deformed electrolytic condensers. All metal construction prevents breakage.

Every one of Federal's famous "Center Contact" Selenium rectifiers is designed to give the full measure of dependable performance that has made them the standard of the industry. This miniature, 5-unit stack will help you to more business. A Federal engineer will send full information to assist you in their application. Write department F656.

REPLACEMENT FOR THESE TUBES

5T4	5Y3	6Y5	25Z6	50Y6
5U4	5Y4	6Z5	35W4	50Z7
5V4	5Z4	12Z5	35Z3	117Z3
5Z3	6X5	7Y4	35Z4	117Z6
5W4	0Z4	12Z3	35Z5	OY4
5X4	80	25Z5	35Z6	

ELECTRICAL CHARACTERISTICS

Maximum RMS voltage	130 volts
Maximum inverse voltage	380 volts
Maximum peak current	1200 ma.
Maximum RMS current	325 ma.
Maximum DC output	100 ma.
Approximate rectifier drop	5 volts

Two Federal Miniature Rectifiers in a voltage doubler circuit give 250 volts and 80 milliampere output from 117 volt AC source.

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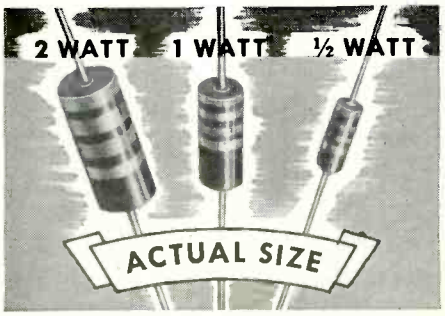

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Gives complete data and list of RMA values. Includes dimensional drawings and handy color codes.

Be Right with...

OHMITE
RHEOSTATS
RESISTORS • TAP SWITCHES

COMMUNICATIONS RECEIVERS

(*Continued from page* 14)

audio signal, and at the same time, the noise pulse.

Beat Frequency Oscillator

The bfo uses a 6J5 triode in conjunction with a tuned iron-core transformer. The output of this oscillator is coupled directly to the detector diode through a 2-mmfd capacitor. Frequency of beat note is varied by means of the adjustable iron core.

Audio System

The audio system is a conventional two-stage resistance coupled amplifier. A jack has been provided for headphone operation, which automatically cuts out the speaker. A disabling switch, S_7, is used to cut off the plate supply where the receiver is used in conjunction with a transmitter. This keeps the filaments of the tubes at operating temperature, so that the receiver may be placed in service immediately.

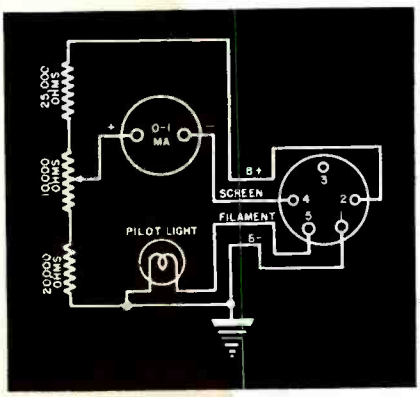
The audio output is one watt, and the distortion is said to be less than 10%.

S Meter

Another feature is a plug in the rear of the receiver which permits the use of an external *S* meter; Fig. 5. Provision is made at the *S* meter plug not only for the meter itself, but also for a

(*Continued on page* 29)

Fig. 5. How a separate tuning meter may be plugged into a socket in the rear of the chassis. Provision has been made for a pilot light.



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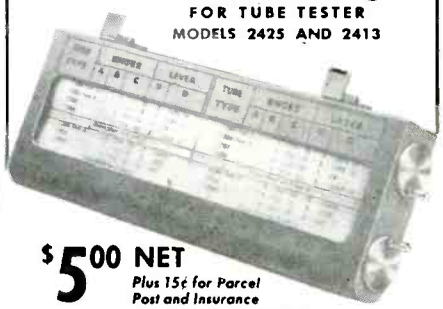

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TOOLS

(*Continued from page 22*)

straight-shank type because of a cramped location or obstructions. One is illustrated at (*b*) of Fig. 5. One for the hex nuts for No. 6 screws and one for the nuts for No. 8 screws should be purchased. For further versatility in this respect, the Spintite socket wrench shown at (*c*) is offered. This has a hexagonal socket head on a flexible-cable shank.

Although it may not often be used, since knurled nuts are no longer widely employed in radio equipment (excepting on toggle switches, etc.), the adjustable knurled nut wrench illustrated at (*d*) (RCA No. 10982 and, to the author's knowledge available only from RCA) may be added to the equipment. It will enable such nuts to be tightened or removed without marring.

Cap-screws and set-screws with heads recessed to take hexagonal bar or key wrenches of the type shown at (*e*) of Fig. 5 are coming into increasing use in radio and phonograph equipment partly because they require less head clearance than a bolt of equivalent strength designed to take an outside wrench. Also, the wrench recess can be considerably smaller than the threaded portion.

(To Be Continued)

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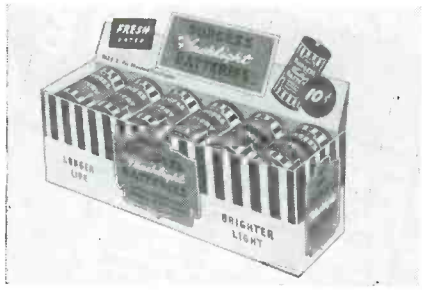
BATTERY DISPLAY



Counter display for flashlight batteries, 8"x2¼", recently released by the Burgess Battery Co., Freeport, Ill.

•

COMMUNICATIONS RECEIVERS

(*Continued from page 28*)

6-volt supply for the meter dial light.

Another plug in the rear of the receiver permits its use with a 6-volt storage battery for the filaments, and either 260 volts of *B* battery or vibrator supply. The total *A* battery drain, using a vibrator, is approximately 10 amperes. This same plug may also be used to convert the receiver to a voltage-supply source for bench use. The available voltages are 6.3 volts at 5 amperes and 260 volts at 70 ma.

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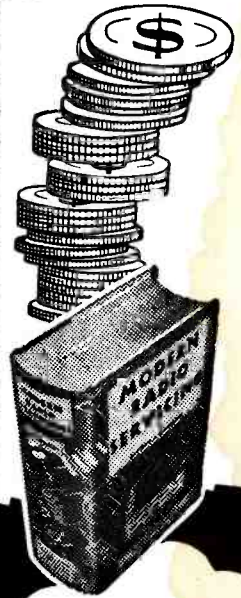

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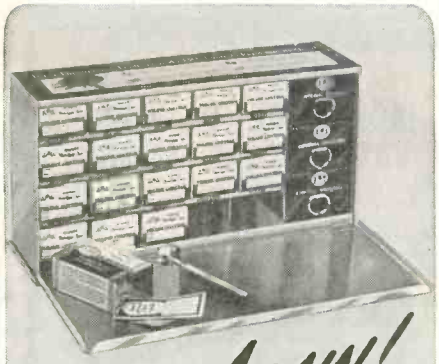

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SERVICING HELPS

by FRANK C. KEENE

I would like to build a converter, operating off 110 v a-c, to supply 6-volt d-c power for auto sets, and would appreciate a circuit of such a converter.—R. Looko

A typical design for an a-c operated pack to supply 6 volts d-c for auto-receiver operation is shown in Fig. 1. The type and size components required make the construction of such a device on the bench impractical. This type converter is commercially available at a cost of about $50 to $100 depending on the current rating.

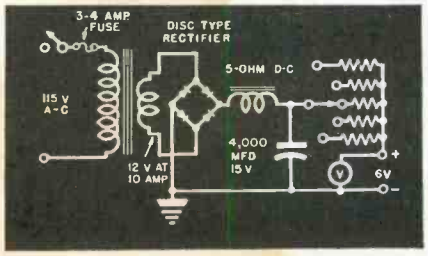
If it is desired to construct such a device, it is necessary to secure a filament transformer capable of delivering 12 volts at 10 amperes. For rectification, a heavy-duty copper-oxide or selenium rectifier is used. As shown in the diagram, this is hooked up as a bridge-type rectifier.

The filter will be quite large, since it must have a current rating of 10 amperes at a d-c resistance of less than .5 ohm. It is doubtful if such a choke is commercially available, and may therefore have to be wound by hand. The filter capacitor should be at least 4000 mfd at a rating of 15 volts; high capacitance is necessary in view of the high current demand, and low impedance of the choke. Even with this size capacitance, the ripple voltage will be about 5 or 6%. However, this will not interfere with the checking of auto receivers. This type of electrolytic is available.

A voltmeter will be required to check the output voltage, since the latter will vary depending on the current drain of the receiver under test, due to the presence of the choke in the filter network. Another requirement will be a tapped high-wattage rheostat to compensate for variations in load.

A 6-volt storage battery and charger would prove much more practical for the auto-set tests.

Fig. 1 (*Looko Query.*) Typical design for an a-c operated pack to supply d-c for auto-set operation.



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

(*Continued from page 26*)

40 mfd, 2200 ohms and 40 mfd; *A* filter, same 40 mfd, 1975 ohms (filter element as well as voltage dropping resistor) and 200 mfd. An extra 20 mfd is used at the 3-volt point in the filament system across a 1H5 and 1A7. Also, a 0.1-mfd r-f bypass is used at the junction of these two tubes. A 14-watt 545-ohm resistor drops the line voltage for the 35-volt heater.

The *on-off* switch opens the *B*+ battery or rectifier output as well as the line cord or battery common negative. The *battery-line* switch switches the *B*+ bus from the battery to *B* filter, the *B*— from common negative to the line cord and opens the battery *A*+.

The *A*+ power supply is always connected but, with the rectifier inoperative, only the filter condensers are across the *A* battery. Bias for the power amplifier is obtained from the filament string in both types of operation.

Motorola 5A1

In Fig. 4 we have the Motorola model 5A1 4-tube portable using miniature tubes, a loop, 1R5 conventional converter with a 270-mmfd oscillator padding capacitor, 1T4 i-f amplifier with iron-core transformers, 1S5 second detector-avc-audio and 3S4 power amplifier.

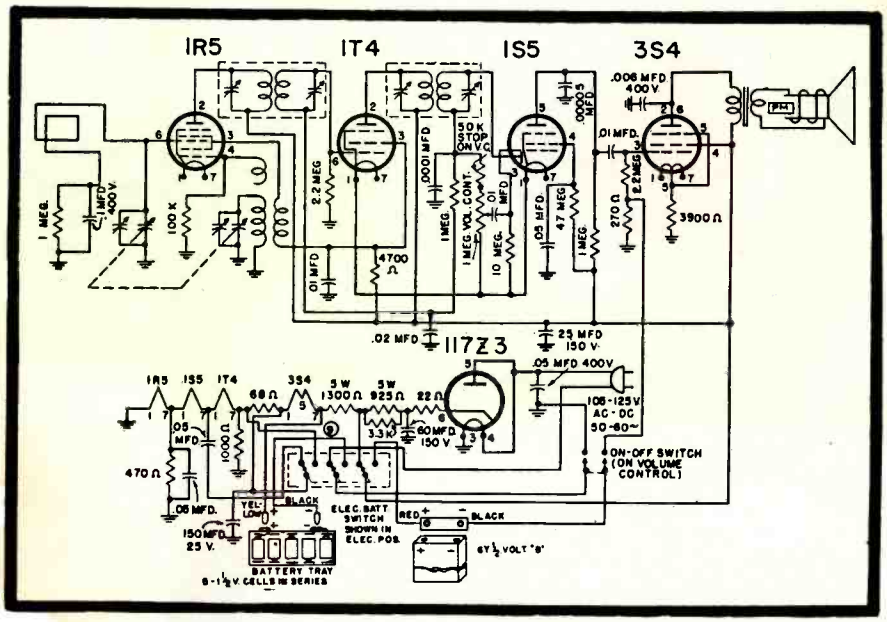


Fig. 5. An a-c/d-c battery portable, Garod 5D, using 1R5, 1S5 and 1T4-type tubes.

The output i-f transformer has an untuned primary. Two paralleled flashlight cells supply the .25-ampere *A* drain while a midget 67½ volt *B* battery supplies 9.25 ma.

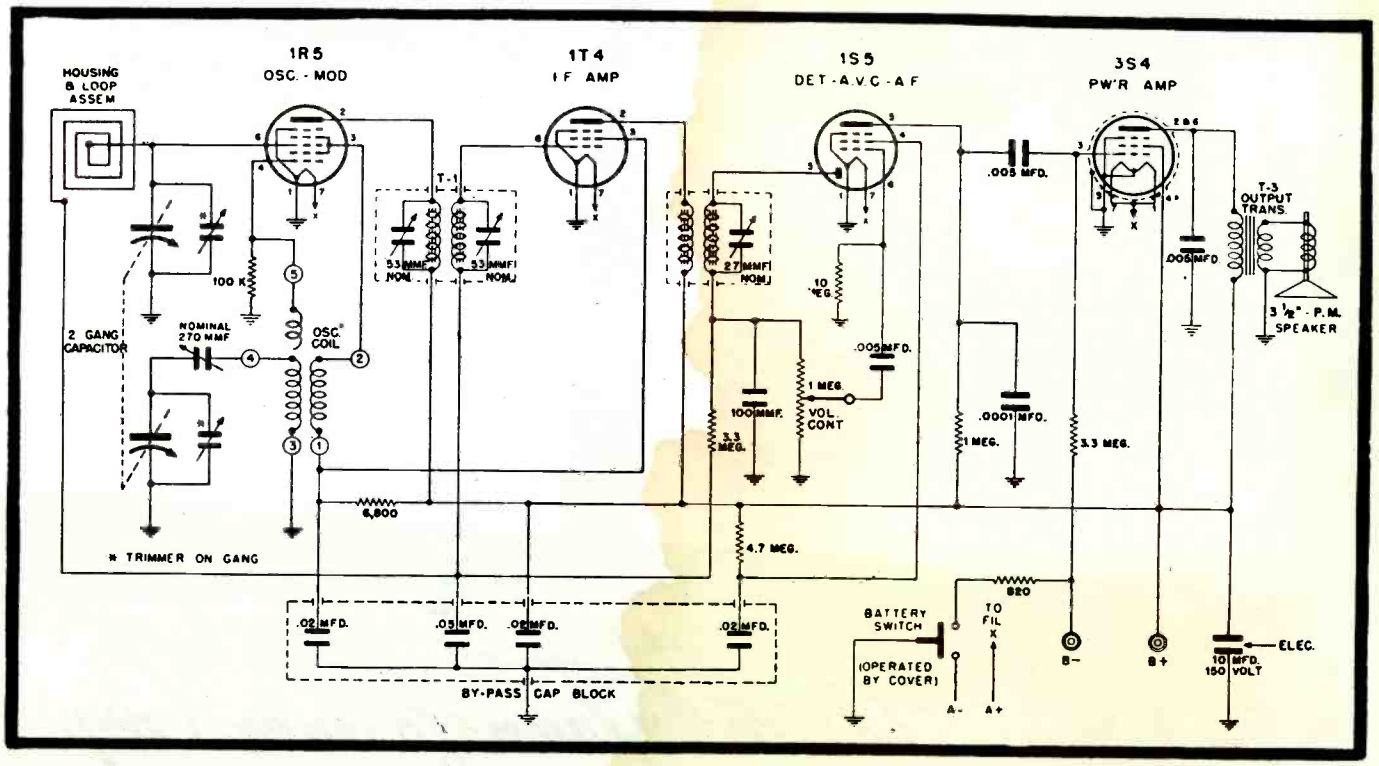
Garod 5D

Four miniature tubes and a 117Z3 power rectifier are used in Garod's model 5D, an a-c/d-c battery portable: Fig. 5. A 1R5 converter is given grid leak bias through a 1-megohm shunted by a .1-mfd capacitor. A *B* supply filter of 4700 ohms and .01-mfd isolates the 1R5 and 1T4 i-f screens.

Avc bias through a 1-megohm resistor and shunted to ground by 2.2-megohms is fed to the 1T4. The 1-megohm volume control has a stop at 50,000 ohms to prevent detector's overload. A 1S5 first a-f pentode with 1-megohm plate load and 4.7-megohm screen resistor feeds a 3S4 with 2.2-megohm leak and 270 ohms *C*-bias resistor.

Power rectifier delivers *B* voltage through a 22-ohm surge limiting resistance to a 60-mfd capacitor and a filter resistance made up of a 5-watt 925-ohm unit shunted by 3300 ohms. The second filter capacitor is a 25-mfd unit.

Fig. 4. A 4-tube portable, Motorola 5A1, using miniature type tubes.



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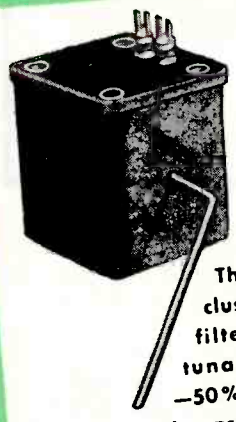
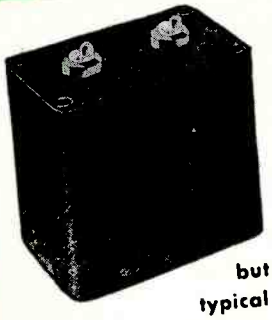


VI-C INDUCTOR

The UTC VI-C Inductor is an exclusive item of tremendous value in filter construction. This inductor is tunable over a range of +100% —50% from the nominal value, permitting precise circuit tuning using commercial tolerance capacitors. Standard units are available in nominal inductances from 10 Mhys. to 10 Hys. These units weigh 5 ounces, measure 1¼" x 1-7/16" x 1-7/16"

HQA REACTOR

These reactors are designed for audio frequency operation with high Q and excellent stability. For a typical coil, (.14 Hy.), inductance varies less than 1% from .1 to 25 volts . . . Q is 120 at 5,000 cycles . . . hum pickup is low (toroidal structure), 70 Mv. per gauss at 60 cycles . . . variation in inductance less than ⅓ % from —60° C. to +85° C. . . . hermetically sealed in drawn case 1-13/16" diameter x 1- 3/16" high . . . weight 5 ounces . . . available in inductance values from 5 Mhys. to 2 Hys.



HQB REACTOR

The HQB reactors are similar to the HQA series, but provide higher Q. For a typical coil, (.45 Hy.), inductance varies less than 1% with applied voltage from .1 to 50 volts . . . hum pickup twice that of HQA . . . variation of inductance less than ⅓ % from —50° C. to +85° C . . . Q is 200 at 4000 cycles . . . hermetically sealed in steel case 1⅝" x 2⅝" x 2½" high . . . 14 ounces . . . available in any inductance value from 5 Mhys. to 12 Hys.

3 AX EQUALIZER

The Universal equalizer for broadcast and recording service. Provides up to 25 DB adjustable aqualization at 25, 50, or 100 cycles for low end , and at 4000, 6000, 8000 or 10,000 cycles at high end. Calibrated controls read directly in DB equalization and frequency setting. The insertion loss effected is compensated for through special compensating pads so that insertion loss is constant regardless of setting. Rapid change in tone color can be obtained with negligible change in volume.

Descriptive circulars are available for each of the above products.

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EXPORT DIVISION: 13 EAST 40th STREET, NEW YORK 16, N. Y., CABLES: "ARLAB"

OLD TIMER'S CORNER

by **SERVICER**

LIKE AS NOT YOU, TOO, have met him. During the war he was conspicuous by his absence, but now, he's coming back into his own again. He's the bugaboo of every industry, the bane of every decent store manager, and the terror of the salesman. He's the fellow who walks into your store, asks to see the latest receiver you may or may not have on display, throws dozens of questions at you about the set, engages you in conversation for an hour or more discussing everything under the sun and then ends up with that gem: "Well, thanks a lot, but I think I can get that set wholesale through my brother-in-law!"

And usually he doesn't get that exact set, but he does buy something for considerably less than you could afford to sell it. Completely disgusted, you turn to the next customer, only to find that he, too has heard the conversation and will try to get it "Wholesale!"

Well, our town was no exception. There were the Peters and the Jones, both of whom had gone to extremes to get their radios wholesale, doing the venerable firm of Ace Radio Company out of a handy dollar or two. And Jimmy, who had been in the business only as long as Hitler had been dead and who established his store based on his GI Signal Corps experiences, was distraught, to say the least.

Anyway, that's the feeling I found when one evening I chanced into his very neat —but not gaudy store.

"What's got you down, Jimmy?" I queried. "You look like you'd like to drive a bayonet into every one of your customers!"

"It's the old, 'I can't get it wholesale' racket that's got me with my flaps down and in a flat spin," Jimmy returned. "Here I try to give my customers the very finest in post-sales service, as well as an honest dollar's worth of radio and what happens? All I'm doing is setting up sales for the wholesalers! It's just too disgusting for words!"

"Well, Jimmy," I said, "there are quite a few in this town who have to contend with that sort of thing at one time or another, but for the most part they used a system to get around it."

"I sure would like to know what it was," said Jimmy. "I'd use it!"

"Pete used one scheme, and Johnny used another," I said, "but I'll tell you both of them.

"Pete's system worked well and required very little cash outlay. But what it lacked in cash it required in brains and perseverance. Whenever a customer came in to see a set, he filled out a card on him. If the customer dropped a hint that he was going to buy the set wholesale, Pete duly entered that

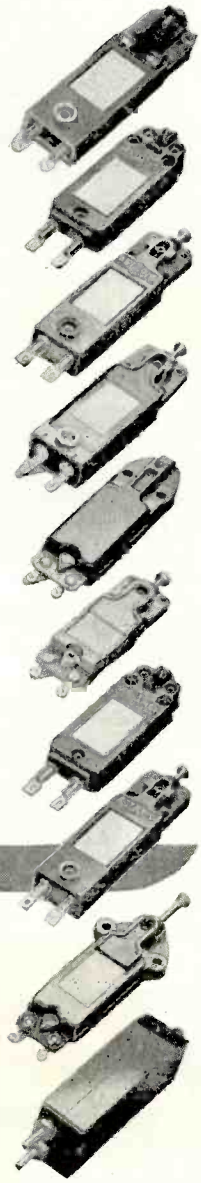
(*Continued on page* 34)

DON'T

. . . CHANGE *Horses* IN MIDSTREAM

EVERY radio engineer will tell you it is, literally, as hazardous to change to a "strange" type of Phonograph Pickup Cartridge in making replacements as it is to change horses while crossing a stream.

The cartridge used in any pickup arm originally supplied with phonograph equipment was carefully selected by set manufacturer engineers for certain characteristics contributing most to the quality of reproduction of such equipment. To switch to another type cartridge is taking unnecessary chances. The safest course is duplication of the original. That Astatic Cartridges are preferred and used by a majority of leading manufacturers of electrical phonographs and automatic record changers is convincing evidence of their expert engineering, high operating efficiency and dependable service.



THE Astatic CORPORATION
CONNEAUT, OHIO
ASTATIC
IN CANADA: CANADIAN ASTATIC LTD., TORONTO, ONTARIO
Astatic Crystal Devices Manufactured under Brush Development Co. patents.

Order from LAKE!
You'll Make No Mistake!

RADIO CABINETS & PARTS NOW AVAILABLE!

Postwar 2 Post RECORD-CHANGER

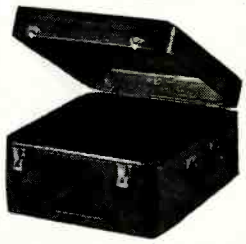
With luxurious brown leatherette portable case, 15" L. x 15" W. x 10" D. Latest electronic developments make this modern record-changer the finest on the market today!

Changer $19.00
Cabinet for same..... 8.95

DE LUXE RECORD-CHANGER and AMPLIFIER CASE

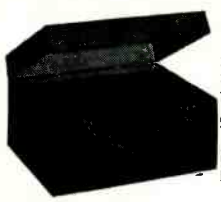
De luxe changer case with ample room for amplifier. Overall dimensions: 20" L. x 16" W. x 10" H. Sturdily built of ⅝" plywood, de luxe brass hardware throughout. Inside dimensions: 15½" L. x 14¾" W. x 9½" H.

Net **$12.95**



DELUXE PHONO CABINET

Covered in luxurious, genuine brown leatherette, has deluxe brass hardware throughout, made completely of plywood with brown plastic handle, has padded top and bottom. Motor board 14" x 14½". Overall dimensions 16" L x 15" W x 8" H. Your net price..... **$8.95**



Portable Phonograph Case of sturdy durable plywood, in handsome brown leatherette finish. Inside dimension 16½" long, 14" wide, 9½" high. Has blank motor board. As illustrated specially priced at **$6.95**

Also blank table cabinets of walnut veneer in the following sizes, with speaker opening on left front side: (*Note: *7 has center speaker grill.)

# 1 — 8¼"	L x 5½"	H x 4"	D $1.95
# 2 —10¼"	L x 6½"	H x 5"	D $2.75
# 3 —12½"	L x 7⅝"	H x 6¼"	D $3.25
# 7*—10¼"	L x 7"	H x 5½"	D $2.80

*Speaker Opening in center of front side.

All types of radio cabinets and parts are available at Lake's Lower prices. A large stock is listed in our catalog.

SERVICEMEN—RETAILERS

Join our customer list today.

Dept. D

Order our New Catalog Today! Get on our mailing list!

Lake Radio Sales Co.
615 W. Randolph Street
Chicago 6, Ill.

OLD TIMER'S CORNER

(*Continued from page 33*)

fact on the card in bright, red pencil. Then he put the card away and waited.

"After about two weeks, he would call the 'wholesale-buying customer' and respectfully ask if the set had been bought yet. Sometimes the answer was *'yes'* and sometimes it was *'no'*. If the answer was *no*, Pete would ask when the customer expected to receive the set and mark down the date on the card. If the customer did not know when the set would be received, that was marked down on the card, too.

"In due time the customer, if he was serious about buying the set wholesale, would report that the set was in the house, or else he would break down and admit that he was *not* buying it wholesale, merely that he was either buying from someone else at retail prices, or that he was not going to buy it at all. In the latter case Pete got after the customer all over again, trying to sell him something that he wanted or could afford. If a competitor was selling the set at retail, then Pete, if he did not know the other store intimately, would take a walk over to the fellow who was selling the set and look his store over and try to find out how the other fellow had sold the customer when he, Pete, had been unable to do so. That gave him a lot of ideas, and he really took them to heart. As a result he improved his selling so much that there is rarely any chance of a customer getting away from Pete if he once gets his hands on him.

"If it developed that the customer had really bought the set wholesale, and had it at his home, Pete would call on him with a 'Can't-I-do-something-for-you-to-help-you-with-the-installation?' It usually worked. That is true because when you buy something wholesale, there's no service, no repairs, no guarantee and no installation. For his work, Pete charged his usual fees, pointing out to the customer that he still had the set cheaper than had he bought it from Pete's store. Usually the customer paid without question, and likely as not Pete held the customer's good will and got more business from him which he would have lost had he been a sorehead and let the customer get away entirely.

"But best of all, he showed the customer that it is not the sale that counts, it's the service-after-the-sale; and perhaps it would have been better to have bought the radio set at retail in the first place and then the service and installation would have been included, and the customer would not have been 'nickeled and dimed' to pieces! It does work."

The other system is the one that Johnny used with equal success. He ran some ads and had some small handbills printed. This, in substance, is what they said:

Of Course You Can Buy It Wholesale . . .
We Do!!! . . .
But Will You Get the Service, the Guarantee, and Installation Wholesale Too?
When You Buy at Johnny's Radio Shoppe You Can Buy With Confidence That You Will Get

A Good Radio Set—
A Swell Installation
Personal and Continuing Service—

MUELLER

CLIPS

For Quick Temporary Connections

- Made in 10 sizes—from the tiny wee-pee-wee to the 300 ampere Big Brute.
- Offered in both steel and solid copper.
- Red and black rubber insulators to fit each size.
- A complete line with

A CLIP FOR EVERY PURPOSE

Send for free samples and catalog 810

Mueller Electric Co.

1565 E. 31st St. - Cleveland, Ohio

18 YEARS IN RADIO

Get This *New* Catalog By This *Old* Firm

Latest developments in radio and electronic parts and devices, newest hom gear, gadgets to delight the heart of the experimenter, bargains in war surplus supplies.

- Buy from B-A
- Save Time
- Save Money
- Get the Newest
- Deal with This Old House

It's FREE To You

MAIL COUPON TODAY

Don't delay, get your copy of this book.

BURSTEIN-APPLEBEE CO.,
1012 McGee, Kansas City 6, Mo.

Send me FREE new catalog. SERVICE

I AM_____
STATE CONNECTION IN INDUSTRY

NAME_____

ADDRESS_____

TOWN_____ STATE_____

All of Which You Will Find Is Included in the Sales Price

* * *

Smart People Buy Where They Can Get Service and From the Store They Know They Can Trust!

"Well, is wasn't very long before that advertisement started working. People would drop in and ask about this and that. Johnny made a big fuss about the installation and how he followed up every sale with a personal call from the *shoppe* to see that the set was really working as it should. People began to trust Johnny and soon many saw that they really saved money by buying retail and getting all that service without further charge than by buying the set wholesale through some relative and then having to pay for the normal service every set requires.

"And Johnny never once let on that many of his customers belonged to the crowd that usually said, 'I can buy it wholesale'. He just kept plugging *Sales and Service, Sales and Service.* He made the two words inseparable.

"So, my friend, stop bemoaning your fate. Nobody ever licked a problem by crying about. Do something, and likely as not you will find that what you thought was an insurmountable barrier, was only a little hiatus in the life of business, after all."

•

G. E. DISTRICT MANAGERS MEETING

Paul L. Chamberlain, right, manager of sales for the G.E. receiver division, discussing the G.E. electronic pickup with E. P. Toal, standard receiver line sales manager; W. M. Boland, San Francisco district manager; H. W. Mandernach, New York district manager; and W. M. Skillman, Dallas, Texas district manager.

•

PORTABLE DISPLAY

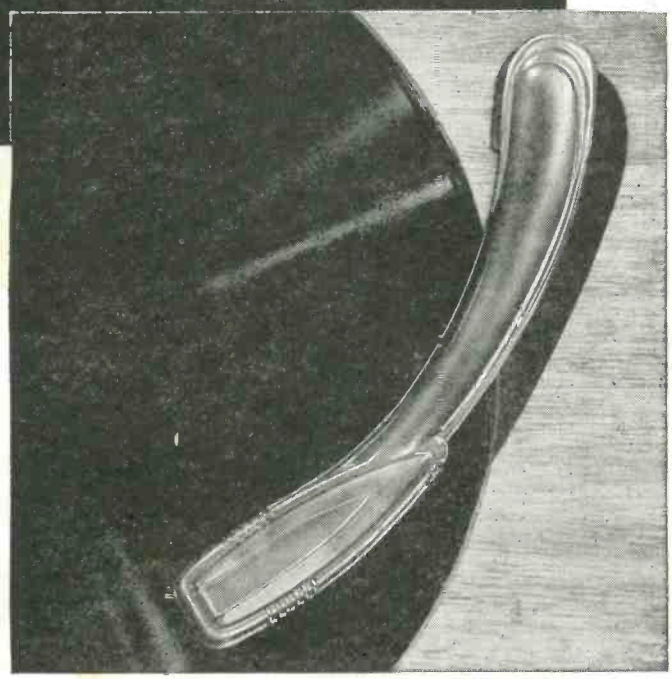
Display of G.E. self-charging portable receivers in the window of the Fair Department Store, Chicago, Ill.

•

CORRECTION

In the listing of pickups on page 13, SERVICE, August 1946, the pickups should have been identified as *Webster Electric.*

. . . don't change the cartridge . . . change the arm to *Glider*



Please your customers, completely, by bringing their phonographs up-to-date . . . not by just changing the cartridge . . . but by replacing the complete arm. "Glider," the standard arm for many leading set manufacturers, is now available to the servicemen. The "Glider" has nearly two volts output—consists of the new Shure Lever-Type Cartridge and aluminum tone arm, with needle force of only 1⅛ ounces—reduces record wear, improves tone quality, reduces surface noise. Easy to install and a profitable bit of business for you. Model 93A . . . $6.10 List (needle not included). Available at all Shure Distributors.

Patented by Shure Brothers and licensed under the Patents of the Brush Development Company

SHURE BROTHERS, INC.

Microphones and Acoustic Devices

225 West Huron Street, Chicago 10, Illinois
Cable address: SHUREMICRO

SHURE

A LABORATORY QUALITY OSCILLOSCOPE
For the Service Man . . .

Portable, sturdy, compact—the CRO-5A is an ideal unit for rapid, accurate, high quality service work. Check the utility and features which you have always wanted in the instrument on your bench.

- For better laboratory and production testing . . .
- For routine Service work . . .
- For studying any variable which may be translated into electrical potentials by means of associated apparatus . . .
- Designed with tubes for maximum amplification with minimum noise . . .
- Exceptionally stable trace even under adverse power line variations . . .
- Frequency response—essentially flat from 20 cycles to 350 KC . . .
- Completely self-contained . . .

Write to General Electric Company, Electronics Department SS-6407, Syracuse 1, New York.

GENERAL ELECTRIC

177-E2

You Should Have An OLSON

PANEL LAMP TOOL

25¢ POSTPAID

No C.O.D.'s

for easy installation and removal of all size panel lamps

The slickest tool yet offered to the Radio Service Man. Made of live rubber, with two size openings so that any bulb will fit. No more fumbling to get at a burned-out lamp. No more squirming to install a new one. Put a couple in your kit!

New Fall Catalog is off the press.

Write for your free copy

This offer good only in U. S. A.

MAIL TODAY

OLSON RADIO WAREHOUSE

73 E. MILL ST., DEPT. 54, AKRON, OHIO

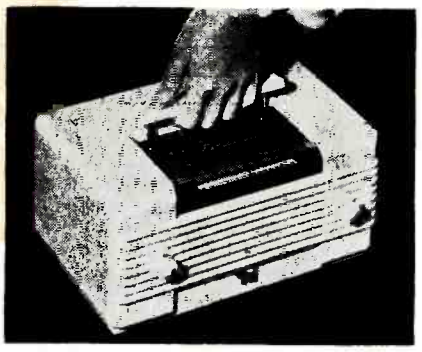
Send me_____Panel Lamp Tools at 25c ea.
I enclose $_____

NAME .....

ADDRESS .....

CITY..... STATE.....

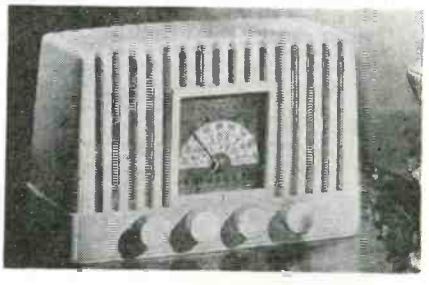
NEW MODELS



Remler Scottie. 5-tube, handle-type a-c receiver.

National Union 6-tube, a-c/d-c superheterodyne, model G-619. Has a tuned r-f stage, avc and built-in loop.

G.E. a-m/f-m 10-tube 5-band receiver, using a 12" Alnico speaker. Silver-plated variable inductances are used in place of gang capacitors.



Three band, five-tube Echophone EC-112. Covers the 535 to 1625, 2200 to 7100 and 6900 to 22,000-kc bands.

Lear desk-type radiophone unit with an 8-tube a-c receiver, featuring avc, push-pull, inverse feedback, 3 bands and push-button tuning.

NEWS

NEWS OF THE REPRESENTATIVES

S. K. MacDonald, 1531 Spruce St., Philadelphia, Pa., has been named chairman of the industry relations committee. Members of the committee include Leslie M. DeVoe, 4014 Washington Blvd., Indianapolis, Ind.; Fred Hill, 256—1st Ave. N., Minneapolis, Minn.; C. L. Pugh, 1670 Doone Rd., Columbus, Ohio; and Russ Hines, 234—9th St., San Francisco, Cal.

Gordon S. Gray, 1 N. Pulaski Rd., Chicago, Ill., is now chairman of the membership committee. Other committee members are Hal F. Corry, 3522 Gillon Ave., Dallas, Texas; H. P. Haggerty, 1507 Saratoga Ave. W., Ferndale, Mich.; Ernest K. Seyd, Andover, Conn.; and Norman W. Kathrinus, 1218 Olive St., St. Louis, Mo.

David F. Tobias, 30 Church St., New York 7, N. Y., has been selected as chairman of the publicity committee, which also includes Ralph C. James, Jr., 2411 First Ave., Seattle 1, Wash.; J. J. Perlmuth, 942 Maple Ave., Los Angeles 15, Cal.; J. Y. Schoonmaker, 2320 Griffin St., Dallas 2, Texas; and James Millar, 1000 Peachtree St., Atlanta, Ga.

Mrs. Carolyn Segar, Ellicott Sq. Bldg., Buffalo, N. Y., has been named as member-at-large.

The Chicagoland chapter has added Ralph T. Bringle, 549 W. Washington St., Chicago 6, Ill., to its membership.

Recently John T. Hill, 800 West 11th St., Los Angeles 15, Cal., became a new member of the Los Angeles chapter. Frank B. Koessler, Louis G. MacKenzie and Robert L. Morgan became associate members of the same chapter. They are all salesmen of the Norman B. Neely Enterprises.

* * *

LEON PODOLSKY TO HEAD SPRAGUE ELECTRIC FIELD ENG. SERVICE

Leon Podolsky has been appointed manager of a new field engineering department of the Sprague Electric Company, North Adams, Mass.

* * *

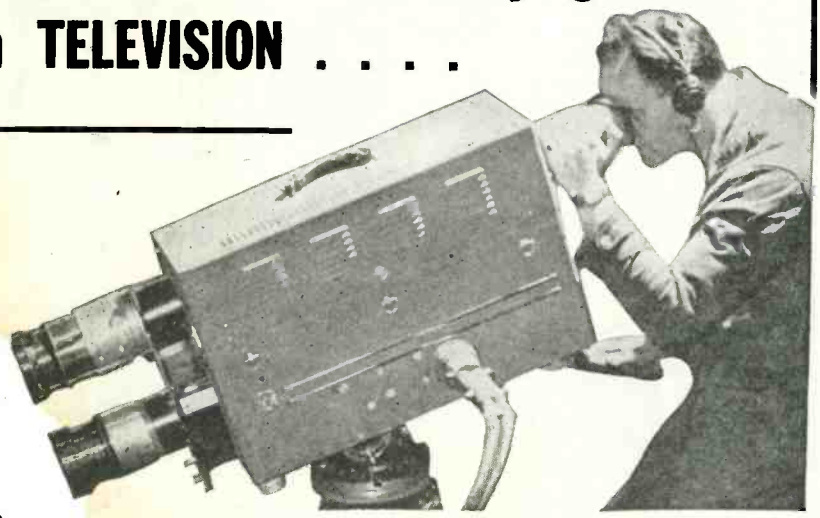
WALSCO SERVICE CONTEST

A $1,000 contest has been announced by the Walter L. Schott Company, 9306

(*Continued on page* 38)

ONE OF OUR MOST IMPORTANT ANNOUNCEMENTS IN 19 YEARS OF PROVEN LEADERSHIP IN TRAINING PROFESSIONAL RADIOMEN!

Here it is! Your First Practical Step Toward a Good-Paying Career in TELEVISION . . . .



CREI INTRODUCES A STREAMLINED HOME STUDY COURSE IN PRACTICAL

Television ENGINEERING

AVAILABLE NOW— FOR THE FIRST TIME!

Here's Your Chance to "Get in on the Ground Floor" of TELEVISION Opportunities.

Don't say, "I never had a chance!" Prepare NOW for the good paying jobs awaiting trained television engineers and technicians. Be in a position to command a "key" job in the growing TELEVISION Industry by preparing now with the type of thorough, practical TELEVISION Engineering training that the industry requires. The new CREI TELEVISION Engineering course is (1) A complete well-coordinated course of study that covers the entire field of practical TELEVISION Engineering, (2) Presented in CREI's professional and proven home study form, (3) Prepared by CREI's experienced staff, based on actual experience in our own TELEVISION Studios and Laboratories, plus years of close contact with leaders in television development. Here's your opportunity to be prepared for television well ahead of competition, if you start NOW!

CAPITOL RADIO ENGINEERING INSTITUTE

Dept. S-9, 16th and Park Road, N. W., Washington 10, D. C.

***Just Off the Press!* Mail Coupon for Complete Free Details and Outline of Course**

If you have had professional or amateur radio experience and want to prepare for opportunities in TELEVISION, let us prove to you we have the training you need to qualify. To help us intelligently answer your inquiry—PLEASE STATE BRIEFLY YOUR BACKGROUND OF EXPERIENCE, EDUCATION AND PRESENT POSITION.

8-9

CAPITOL RADIO ENGINEERING INSTITUTE
16th and Park Road, N. W., Washington 10, D. C.

Gentlemen: Please send me complete details describing the new CREI home study course in Practical Television Engineering. I am attaching a brief résumé of my experience, education and present position.

Name .....

Street .....

City ..... Zone ..... State .....

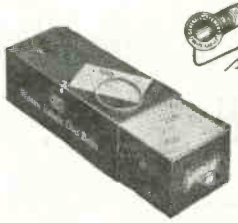
☐ I am entitled to training under the G. I. Bill.

Member of Nat'l Home Study Council — Nat'l Council of Technical Schools — and Television Broadcasters Association

SPEED UP REPAIRS WITH THESE G-C AIDS!

G-C is HEADQUARTERS for RADIO PARTS and SERVICE AIDS

All Types of Radio Cements. Chemicals, Coil Dopes, Compounds.



G-C leads the field in supplying Radio - Electronic Manufacturers and Service Men with Parts, Tools, Radio Cements, Chemicals and Compounds. Insist on Genuine G-C Quality.

Diol Cables, Dial Belts, Packaged Hardware, Cabinet Repair Kits

Speedex Wire Strippers

Alignment Tools Ne-O-Lite Testers

Order from Your Jobber — Send for G-C Catalog

G-C GENERAL CEMENT MFG. CO.
ROCKFORD, ILLINOIS

Over 20,000

radio and electronic Service Men subscribe to SERVICE—a large and vital market for your products. Advertising in SERVICE pays dividends.

Presenting The New Improved JFD REMOTE-O-CABLE REPLACER

The Most Efficient Auto Radio Tuning Cable-Servicing Machine in Use Today!

1. SWEDGES SHAFTING TO PREVENT UNRAVELLING.
2. CUTS SHAFTING TO EXACT LENGTH.
3. REPLACES OLD FITTINGS ON NEW SHAFTING.
4. CASING GROOVE MAKES CUTTING EASY

J. F. D. MANUFACTURING CO., 4111-17 HAMILTON PKWAY., BKLYN., N. Y.

NEWS

(Continued from page 37)

Santa Monica Boulevard, Beverly Hills, California.

Contest, open to all Service Men, offers $1,000 worth of prizes such as a typewriter, wrist watch, automobile tires, and set of Rider's Manuals for suggestions for new items to be added to the Walsco line. Required is a short description or sketch of items needed by Service Men not already available in practical form.

Contest closes September 30. All entries must be submitted on blanks which are available at all radio parts jobbers.

* * *

GEORGE C. CONNOR NAMED SYLVANIA ELECTRONIC PRODUCT S-M

George C. Connor has been appointed general sales manager of the electronics division of Sylvania Electric Products, Inc. Mr. Connor has been with Sylvania Electric since 1934.

* * *

ASTATIC CATALOG

A 24-page catalog describing crystal microphones and pickups, dynamic microphones, pickup cartridges, recording heads, microphone stands and accessories, has been published by the Astatic Corporation, Conneaut, Ohio.

* * *

CONCORD RADIO SURPLUS MATERIALS SERVICE

A surplus-sales service has been announced by the surplus division, Concord Radio Corporation, 265 Peachtree Street, Atlanta 3, Georgia.

George Manassa, formerly with the War Assets Corporation, is manager of the division. Headquarters and warehouse of the surplus division will be located at the Atlanta Chandler Warehouse. All available surplus materials will be on display and offered for sale at 265 Peachtree Street, Atlanta, Georgia.

The surplus division will also hold monthly *site* sales which will be announced two weeks in advance each month.

* * *

ELECTRO-VOICE MICROPHONE CATALOG

A catalog and selection guide has been published by Electro-Voice, Inc., 1239 South Bend Avenue, South Bend 24, Indiana.

Catalog includes data on cardioid, dynamic, crystal, velocity, differential, and carbon microphones. Selection chart facilitates selection of right microphone for each application. Catalog also contains a technical section with helpful information on various types of microphones.

* * *

PREMAX F-M/T-V ANTENNA DATA

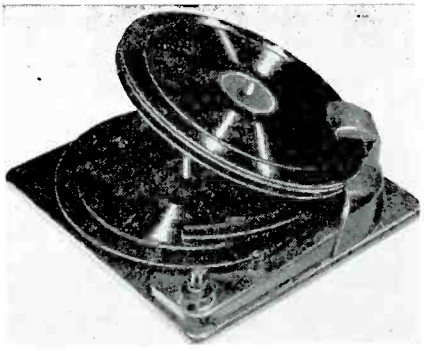
A four-page leaflet describing antennas for f-m and television has been published by the Premax Products, Niagara Falls, New York. Installation data are also covered.

NEW PRODUCTS

WEBSTER-CHICAGO AUTOMATIC RECORD CHANGERS

An automatic record changer, model 70, that will play a 1⅝" stack of 10" and 12" records intermixed has been developed by Webster-Chicago Corporation, 5610 Bloomingdale Avenue, Chicago 39, Illinois.

An automatic *disengage* device is said to relieve pressure on the rubber drive wheel when the machine is not in use. Other features include velocity trip, automatic shut-off, improved rim drive, and 4-pole shaded pole motor.



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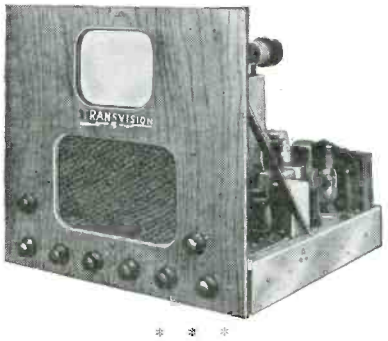
TRANSVISION TELEVISION KIT

An 18-tube television kit using a seven-inch electrostatic tube has been prepared by Transvision, Inc., 144 Union Avenue, New Rochelle, N. Y.

Circuit has three i-f picture stages, 3.5-mc bandwidth in the picture circuit, 3000-volts second plate supply.



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DIALCO LIGHT-SHIELD PILOT LIGHT ASSEMBLIES

Pilot light assemblies, designed on the light-shield principle, to direct a beam of light within a rotation of 360°, have been announced by Dial Light Co. of America, Inc., 900 Broadway, New York 3, N. Y. A turn of the knurled head directs the light on to any localized spot, at any desired angle.

Model 21408 has opening ½" wide x ½" long; model 89408 opening 3/16" wide x 9/16" long; model 90408 opening ½" wide x 3/16" long; model 22408 opening ½" wide x 3/32" long. Overall size of the unit is approximately 2¼" x 1".

Units have a built-in resistor for use

(*Continued on page 40*)

Raytheon tubes give peak performance. They have been built to this high level of maintained quality through continual testing and research by a company that is recognized everywhere as one of the advanced guard leading the way into the new era of electronics.

RAYTHEON
MANUFACTURING COMPANY

Excellence in Electronics
RADIO RECEIVING TUBE DIVISION
NEWTON, MASS. • CHICAGO

Immediate SHIPMENT!

RADIO PARTS
ELECTRONIC EQUIPMENT

New CONCORD Bulletin-FREE

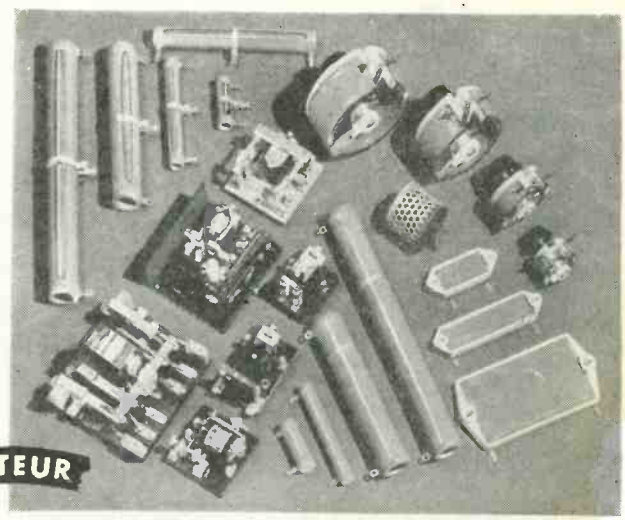
Hundreds of Bargains—Scores of New Items

READY NOW! 8 giant-size pages packed with long-awaited Radio and Electronic Parts, Supplies and Equipment—new merchandise, just received—now *in stock* for IMMEDIATE SHIPMENT! See hundreds of items for every Radio and Electronic need—for building, repair, maintenance—for engineer, manufacturer, service man, amateur—top-quality, standard-made parts—including Condensers, Resistors, Meters, Controls, Switches, Relays, Transformers, Test Equipment, Tools, Amplifiers, Record Players, Record Changers, and many other new and scarce items—scores of them at money-saving bargain prices—all ready for shipment at once from CHICAGO or ATLANTA. Mail coupon below TODAY for your FREE copy of new CONCORD Bulletin.

Did You Get CONCORD'S NEW COMPLETE CATALOG?
Showing the latest and greatest selection of guaranteed quality Radio Sets, Phono-Radios, Radio Parts, Supplies, Equipment, Amateur Gear, Kits—plus the new Multi-amp Add-A-Unit Amplifiers—exclusive with CONCORD. If you do not have the new COMPLETE CONCORD Catalog, check coupon below.

CONCORD
RADIO CORPORATION
LAFAYETTE RADIO CORPORATION
CHICAGO 7 — 901 W. Jackson Blvd.
ATLANTA 3 — 265 Peachtree Street

CONCORD RADIO CORPORATION
901 W. Jackson Blvd. Dept. S-96 Chicago 7, Ill.
Please rush my FREE COPY of the new Concord Bulletin of Radio Parts.
☐ (Check if you also want new Complete Concord Radio Catalog)
Name.....
Address.....
City..... State.....



FOR THE AMATEUR

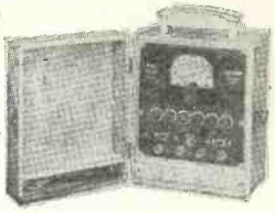
The Ward Leonard Line of dependable Resistors, Relays and Rheostats are more popular with the amateur than ever before. Get the latest information on new and improved types. Send for the bulletins recently printed.

On Resistors and Rheostats see Bulletin D-2. For Relays see Bulletin D-11.

WARD LEONARD
RELAYS • RESISTORS • RHEOSTATS
Electric Control Devices Since 1892

WARD LEONARD ELECTRIC COMPANY
Radio and Electronic Distributor Division
53E WEST JACKSON BLVD., CHICAGO, ILL.

IMMEDIATE DELIVERY
SUPERIOR MODEL PB-100
Net Price $28.40



6—D.C. Voltage Rangers, 0 to 5/25/50/250/500/2500 voltages.
5—A.C. Voltage Rangers, 0 to 10/50/100/500/1000 voltages.
5—Output Meter Rangers, 0 to 10/50/100/500/1000 volts.
4—D.C. Current Rangers, 0 to 10/100/250/ma. and 0 to 2.5 Amps.
3—Resistance Rangers, 0 to 10,000 ohms, 100,000 ohms, 1 Megohms.
3—Decibel Rangers, —10 to 15 DB, —0 to 35 DB.
Superior Model PB-100 comes housed in a hand rubbed Oak portable cabinet, complete with cover, self-contained battery, test leads and instructions.

WESTON SELECTIVE ANALYZER
Model #665, Type #1 Volt-Ohm-Milliameter, net price..... **$58.50**

COMPLETE LINE OF SUPERIOR TESTING EQUIPMENT

SERVICE MEN'S KITS OF ALL KINDS AT ROCK BOTTOM PRICES

"THE HOUSE OF A MILLION RADIO PARTS AND TUBES" FOR SERVICE AND SOUND MEN
Send for Bargain Bulletin

Lifetime
SOUND EQUIP. CO., Dept. 33
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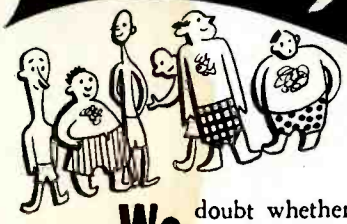
Variety



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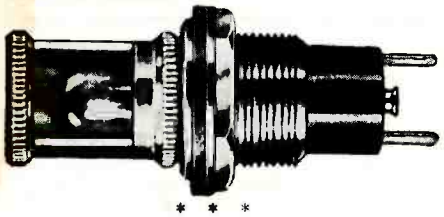
NEW PRODUCTS

(*Continued from page 39*)

with the NE-51 neon lamps on 110 and 200 volt circuits.



* * *

MONITOR CRYSTALINER

A signal generator for 175 to 35,000 kc coverage, Crystaliner, with crystal-control output, has been developed by Monitor Products, 815 Fremont Avenue, South Pasadena, California.

Frequency said to be accurate to .1 to 1%, with output approximately 10 volts. No stabilizing warm-up period is said to be needed. Single dial covers range; frequency-dial chart supplied with instrument.

* * *

JFD CABLE DISPENSER

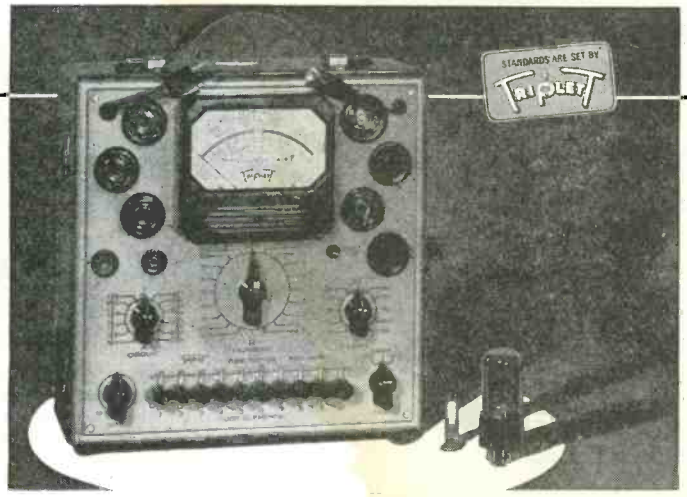
A spool line with cables and cords wound on a metal spool and housed in a transparent unbreakable glassein container, has been announced by JFD Manufacturing Co., 4117 Ft. Hamilton Parkway, Brooklyn 19, New York. The all-metal spool is said to prevent the cable from unravelling, kinking, or tangling; and the glassein container is said to render the cable weather-resistant and moisture-proof.

Spool line comes in two different forms: jobber's counter stand display containing 50 100′ spools; Service Men's bench-stand rack containing 5 100′ spools.

* * *

OLSON OHM CHEST

A 20-compartment ohm chest has been produced by Olson Radio Warehouse, 73 East Mill Street, Akron, Ohio. Chest, measuring 9¼″x6¼″x3″, with a removable tray, contains 100 insulated resistors stamped with resistance value and color coded. Ranges include sizes from 5 ohms to 20 megohms, ½ watt to 2 watts, tolerance 10%.



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AUTO RECEIVER

(See Front Cover)

AUTO RECEIVERS, once again in production, indicate that iron-core inductors will probably appear in most tuning systems. The current auto receiver model of Motorola, 705, shown on the cover, stresses the iron-core application. A 3-gang permeability tuning unit tunes a 6SK7 r-f amplifier input circuit, r-f amplifier plate circuit and the oscillator grid coil.

The antenna is capacity coupled to the first grid through a capacity voltage divider at the low potential end of the tuning inductor, the signal being applied across a 90-mmfd capacitor and through a .006-mfd capacitor. The r-f and detector trimming capacitors across the variable inductors are nominally 180 mmfd, while that across the oscillator is 40 mmfd. The tuned circuit of the first detector is located directly in the r-f amplifier plate circuit and capacity coupled to the 6SA7 signalgrid through a 5-mmfd capacitor across a 100,000-ohm grid leak.

Iron-cores are also used in the oscillator circuit which consists of a hot-cathode Hartley iron-core coil shunted by a 400-mmfd fixed capacitor, 40-mmfd trimmer and the permeability tuned variable inductor. A 6SK7 i-f amplifier also uses iron-core input and output transformers. Full avc is applied to all three tubes, a minimum (no signal) negative bias being obtained from a *C* bias voltage divider through a 1-megohm resistor. The divider consists of 150 ohms plus 62 ohms running from *B*– to ground. The full *IR* drop is applied to a 6V6 power amplifier; partial bias from a 62-ohm resistor to the avc bus.

Diodes of a 6SQ7 are used differentially, one for detection and one for avc coupled through a 50-mmfd capacitor. The detector load circuit consists of a tapped ½-megohm volume control, in series with 47,000 ohms, which serves as an i-f filter, in conjunction with a pair of 120-mmfd capacitors. The volume-control tap is connected to a .01-mfd capacitor in series with a 22,000-ohm resistor which is used for tone control in conjunction with a 3-position solenoid actuated tone switch. On *voice,* the network is open circuited; *medium,* the resistor is grounded, as in the conventional bass compensation arrangement; and *bass,* resistor is connected to the first a-f plate through a .002-mfd capacitor permitting some treble degeneration to provide an increased bass.

Another 6SQ7 is used as a phase inverter deriving its signal voltage from 470,000 ohms connected between *C*– and two 6V6 grid resistors, 220,000 and 270,000 ohms. A 250-mmfd capacitor is shunted across first audio output while 1,000 mmfd is across the phase inverter. Full *B* voltage direct from the rectifier is applied to the push-pull plates, while the 6V6 screens and the balance of the tubes are supplied after a 1,000-ohm resistor filter element. A high-voltage .006-mfd buffer capacitor is used across the high-voltage secondary while the usual complement of r-f chokes and bypass capacitors are in the primary system.

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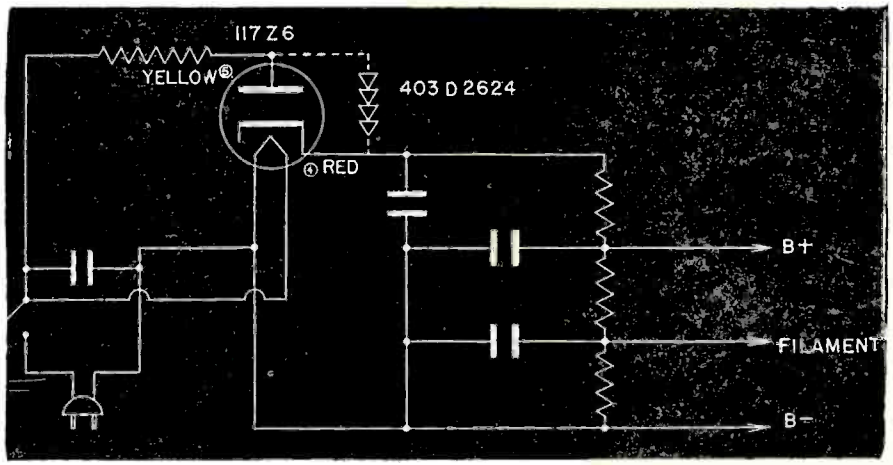


Fig. 1. Schematic of a typical power supply utilizing a 117Z6 rectifier tube. Dotted line indicates how the selenium rectifier is inserted into the circuit to replace the tube.

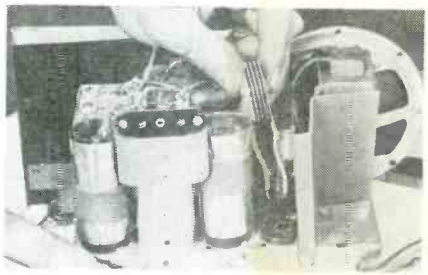
Fig. 2 (*step I*). Chassis is withdrawn from the cabinet and rectifier tube removed.

Fig. 3 (*step II*). Two extension leads are soldered on to the selenium rectifier lugs. Positive side is identified by a red wire while for the negative side a yellow or black wire is recommended.

Fig. 4 (*step III*). The leads are soldered on to the appropriate pins; red to pin 4 and yellow to pin 5. If filament voltage is too high, insert 27-ohm resistor in line just before rectifier.

(*All illustrations courtesy Federal Telephone and Radio Corp.*)

Fig. 2 (above).



Figs. 3 (above) and 4 (below).

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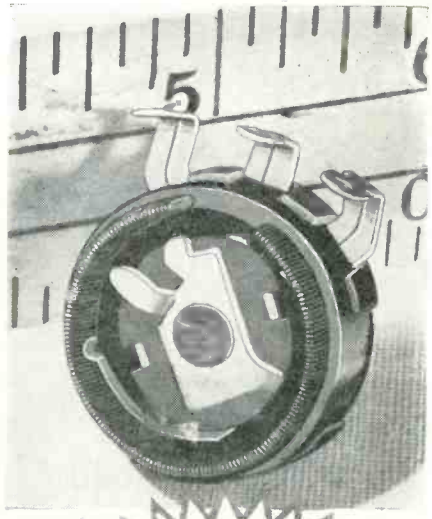

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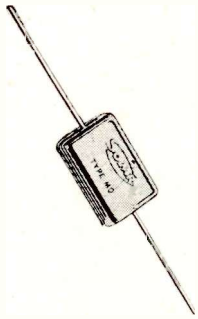
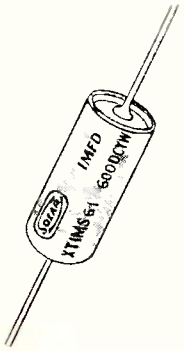
JOTS AND FLASHES

THIS FALL WILL PROBABLY see the first large-scale installation of electric-type receivers in the South, thanks to the expansion of electric light-line installations by the Rural Electrification Administration. According to REA, lines have already been installed to thousands of homes and in the not-too-distant future, it is expected that practically every rural home will have an electric-line feed. . . . The striking advancements made in television will be on display during the Television Broadcasters Association Convention in the Waldorf-Astoria in N. Y. City on October 10th and 11th. All of the leading manufacturers will display and demonstrate their new equipment. Special panels discussing television servicing will also be held for the benefit of distributors and Service Men. SERVICE will carry a full report on these important meetings. . . . The debated 20% tube-increase ruling requiring absorption of this charge by neighborhood Service Shops has been revoked permitting Service Shops to pass this increase on to the consumer. . . . Kasson Howe has been appointed district manager of the Ward Leonard Electric Co. Boston office. 38 Newbury Street, Boston 16, Mass. . . . Chicago taxis recently installed two-way f-m communications systems. Made by Galvin, the units receive on a frequency of 152.27 mc and transmit on 157.53 mc. . . . M. D. Burns is now general manufacturing manager of the tube division of Sylvania. . . . Howard J. Silbar has been named coordinator of advertising and public relations for Lear, Inc., to succeed Jean H. DuBuque who has become director of aviation for the City of Dallas, Texas. . . . A RMA-JAN color code resistor guide has been prepared by Allied Radio Corp., 833 W. Jackson Blvd., Chicago 7, Ill. Guides are available for 10¢. . . . The current issue of "RCA Radio Service News" contains an interesting discussion of trends in service work by John F. Rider. . . . G. E. plans to produce an f-m/a-m/record-player/television receiver next year. . . . Employees of the Triplett Electrical Instrument Co., Bluffton, Ohio have published a house organ, "The Tripletter" in which appears employee anecdotes and highlights of Triplett equipment. . . . Noma Electric Corp. has purchased the Pollak Mfg. Company. It is reported that Noma has sold the Oxford Radio Co., which they recently purchased from Aireon Mfg. Corp. . . . Sam H. Harper has returned to the manufacturer's representative business. He is now located at 215 Fulton Street, N. Y. 7. . . . Theodore A. Smith has been named general sales manager of the engineering products department of RCA. . . . Clarostat Mfg. Co. Inc., have purchased the Kurman Electronics Corp. Nathan Kurman will be vice president in charge of research for the new unit of Clarostat. . . . Robert Milsk (Detroit, Michigan), Henry P. Segel (Boston, Mass.), Neal Bear (Peninsula, Ohio) and Howard Fairbanks (Phila., Pa.) have been appointed district sales managers by Pyramid Electric Co., Jersey City, N. J. . . . An 8-page parts bulletin has been issued by the Concord Radio Corp., 901 W. Jackson Blvd., Chicago 7, Ill. . . . Robert Sackley and Rudy Weiss have opened a new company, Arrow Sales., Inc., at 59 W. Hubbard Street, Chicago.

ADVERTISERS IN THIS ISSUE

SERVICE INDEX — SEPTEMBER, 1946





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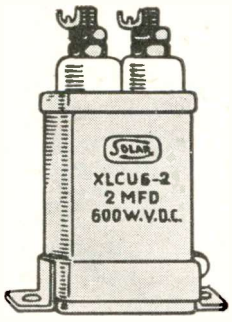

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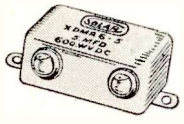

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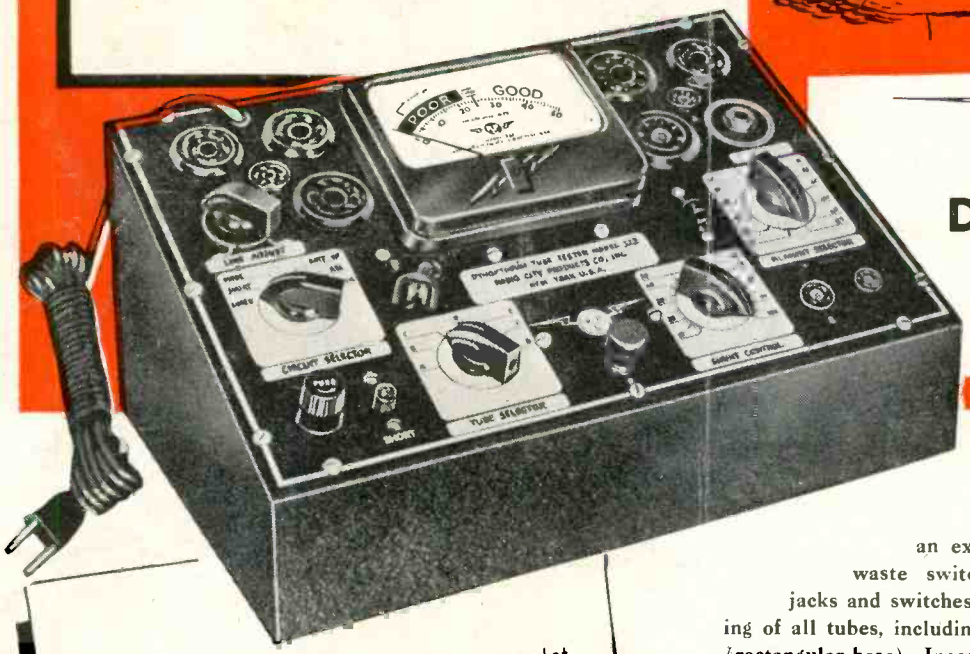

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