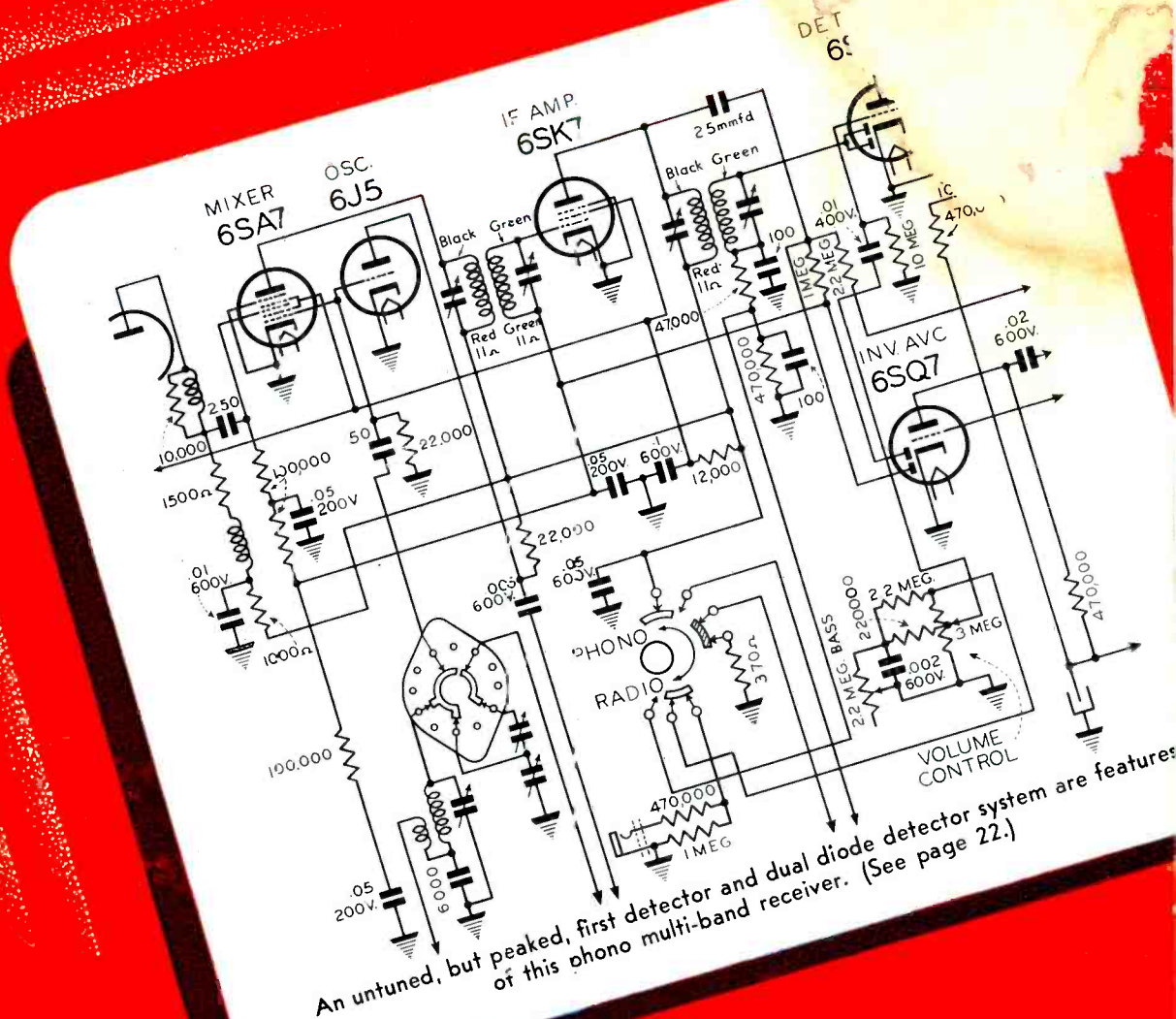
SERVI

A MONTHLY DIGEST OF RADIO AND ALLIED M... ...ANI...



An untuned, but peaked, first detector and dual diode detector system are features of this phono multi-band receiver. (See page 22.)

★ RADIO
★ TELEVISION
★ ELECTRONICS

MAY
1943

Cut Yourself a Slice of Cake

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Maybe you've never tried a slice of delicious cake, home-baked to perfection by Radiothermics. *But you may!*

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RCA

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RCA Victor Division, **RADIO CORPORATION OF AMERICA,** Camden, N. J.

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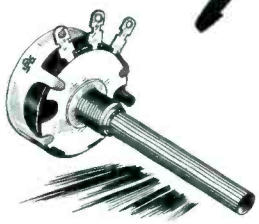

In accordance with the considered opinion of the Judges, five gentlemen hav been named winners in IRC's "Here's How" Volume Control Contest and each has been sent a $100 U. S. WAR BOND — in all, $500 in Bonds. Four winners are pictured . . . no photo available of the fifth, Mr. W. Pelham, New Harmony, Indiana.

E. PAT SHULTZ
10412 McCormick St.
North Hollywood, Calif.

JAMES G. RAPP
83 Raynor Street
Freeport, N. Y.

RAY PENTECOST
4314 Elston Avenue
Chicago, Illinois

CARL W. CONCELMAN
Riverview Drive
Brielle, New Jersey

and Thanks...Everybody!

Yes, "thanks a million" to you Radio Service Men of America for your response to IRC's "Here's How" Volume Control Contest! You really gave the judges a tough problem in trying to pick the five best ideas from among the hundreds received.

Fine Spirit Shown

While everyone can't be a winner, all of us can be proud of the enthusiastic way in which you cooperated for the good of the Industry. You not only came through in a manner that far exceeded even the most optimistic expectations but many of you wrote stating that whether you won or not, you hoped your experience would be helpful to someone else.

Many Original and Valuable Ideas

We asked for ideas and we got them! We asked you to tell how you were able to replace a volume control and get the radio set working satisfactorily—when you couldn't obtain the unit you would ordinarily have used.

From every section of the country suggestions poured in . . . emergency repair methods relating both to mechanical changes in the controls and to electrical changes in the circuits, which would do the trick when exact duplicates were not obtainable.

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EDITORIAL

WITH the issuance of the new limitation order L-265, calling for *tube-for-tube* and *part-for-part* sale, manufacturing and distribution of replacement parts and tubes enters a new phase of control. From now on, equipment will only be transferred to fill military or specified government orders, or to fill orders bearing a preference rating of A-1-A or higher, *except parts for maintenance and repair which may be transferred under a certificate plan.* This plan permits the transfer from a dealer or Service Man to a consumer, of a new part in exchange for an old part of similar kind. The dealer or Service Man can then certify to his supplier that he is entitled to receive parts equal in number and similar in kind to those which he has exchanged. Each supplier will be allowed to sell maintenance and repair parts only if he receives a purchase order bearing the certificate data.

Rural set owners, who can buy only by mail, and those who have lost the part to be replaced, will be able to obtain parts provided they certify their needs.

The certificate data, available from distributors, can be printed, typed, rubber stamped or made up in sticker form.

Defective parts accumulated before April 24, 1943, may not be used in applying for new parts. They must be scrapped. No Service Man or dealer may keep in his possession for more than 60 days any defective parts that cannot be reconditioned. He must dispose of these through regular salvage disposal or scrap channels.

L-265 is now in effect, so be sure to follow it carefully.

TUBES will now become available in greater quantities, according to Frank McIntosh of WPB. At the recent NAB War Conference in Chicago, Mr. McIntosh reported that 2,000,000 tubes to be made every month will be henceforth available expressly for civilian distribution, except in dire military emergencies. This plan, he said, should adjust distribution and bring the 117 standardized types more rapidly to the ultimate consumer!

SERVICE

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Reg. U.S. Patent Office

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Advisory Editor

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Consulting Editor

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MEMBER AUDIT BUREAU OF CIRCULATIONS

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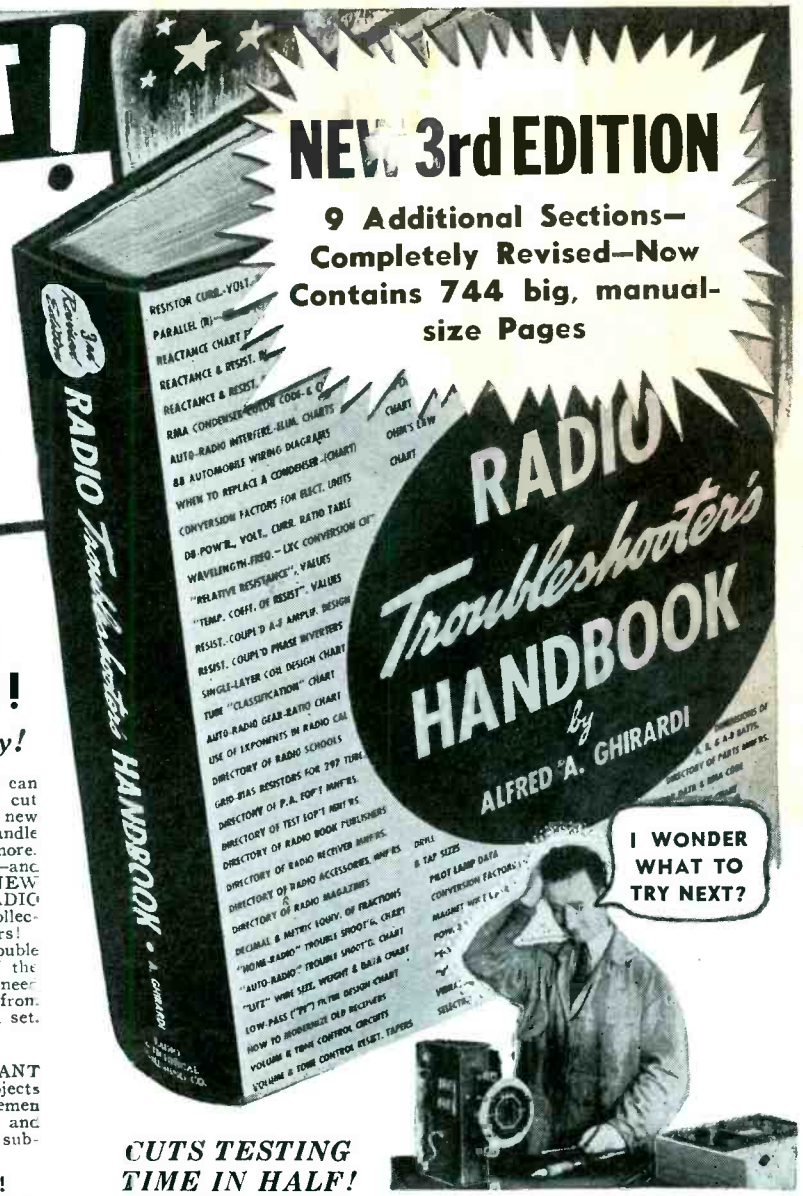

STOP GUESSING ON RADIO SERVICE JOBS!

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The most important book any service shop or individual can own during these critical times—bar none! Enables you to cut corners—save valuable troubleshooting and repair time—train new technicians in your shop—repair cheap sets at a real profit—handle tough jobs in half the time normally required—and much more. Now in its 3rd Edition—completely revised—bigger than ever—and containing NINE ADDITIONAL SECTIONS OF VITAL NEW MATERIAL. In short, this new 3rd Edition of Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK is the most valuable collection of servicing information ever assembled between two covers!

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NOW COVERS 75 IMPORTANT SUBJECTS

This feature, however, is ONLY ONE OF 75 IMPORTANT SUBJECTS covered in this brand new HANDBOOK—subjects which make the volume absolutely indispensable to busy servicemen at a time when both parts and test equipment are scarce, and when you've got to have plenty of "Know How" in order to substitute existing tubes, etc., properly.

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There are scores of time-saving charts, graphs, tables and data compilations — all designed to HELP YOU REPAIR MORE RADIOS — REPAIR THEM EASIER — AND DO IT IN LESS TIME! There are I-F alignment peaks for over 20,000 superhets; a big section of data on those pesky I-F transformer troubles—**AND THE MOST UP-TO-THE-MINUTE TUBE CHART you've ever seen, with complete information on EVERY tube type and with dozens of practical tips on how the types may be interchanged.** Other features include plug-in and ballast resistor replacement charts; condenser and resistor charts; coil and transformer data; wire tables—and a wealth of other material that saves time for you every day!

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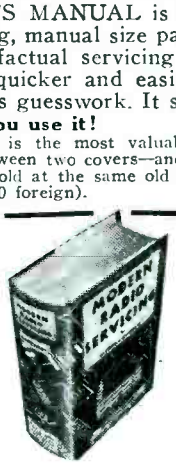

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WESTON ELECTRICAL INSTRUMENT CORPORATION, NEWARK, NEW JERSEY

SERVICE
A Monthly Digest of Radio and Allied Maintenance

A STUDY OF AUTOMATIC TUNING DEVICES

By ALFRED A. GHIRARDI
Advisory Editor

THERE are three automatic tuning systems . . . electric, mechanical manual and motor-driven mechanical. Receivers using electric tuning substitute some kind of pre-set tuned circuit for the ganged tuning condenser through the use of a switch or a set of switches, such as push buttons. The switches are always of the shorting type equipped with at least one *make-before-break* contact which is used to silence the audio amplifier while switching r-f circuits. This is done to eliminate *pops* or *thumps* which always accompany such switching.

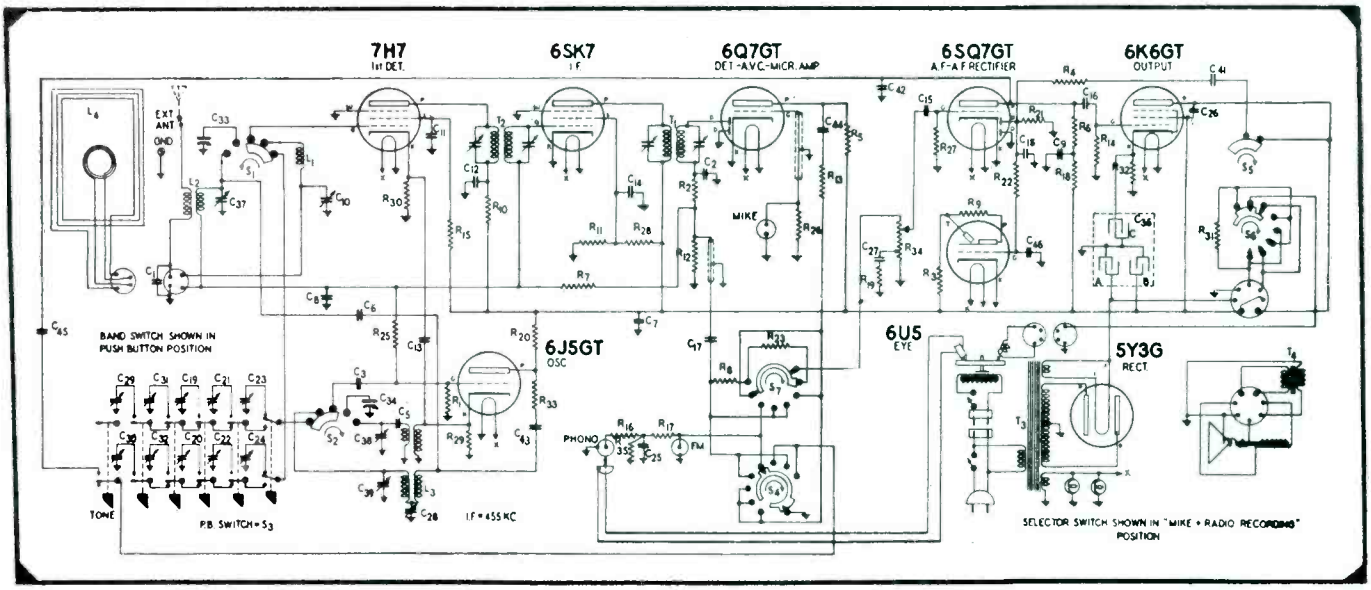
Early receivers used various types of screw-adjusting mica trimming condensers which were thrown into the detector and oscillator circuits in place of the variable gang condenser. Many of these condensers had some drift which was caused by changes in temperature and humidity, shock and time (aging). Warping was common. Such changes were aggravated by operating the condensers near their maximum capacity, where they operate on the sharp portion of the capacity curve. Here, a very slight mechanical change causes a large capacity change which easily detunes the receiver. Service Men can easily correct some of these faults. Where condensers are continually drifting, it is desirable to replace bakelite type washers with either ceramic or mica types which are less prone to change.

Whenever a condenser is tuned at or near its maximum capacity, a fixed mica condenser of approximately one-half its value may be shunted across the tuning condenser. This reduces the possibility of capacity variation in two ways. First, the ratio of variable capacity to fixed capacity is greatly reduced and, second, the trimmer is backed off the sharp portion of its capacity curve. Further correction can be made by selecting a silver mica condenser of the correct temperature coefficient to cancel the variation of capacity due to temperature changes in the trimmer.

While condensers for electric tuning have been considerably improved in later models, the better class of receivers make use of permeability tuning, or tuned iron core coils which are switched across a fixed condenser. These are much more stable than screw type variables and may be readily ganged, requiring only a single adjustment for setting up stations. The tuning is subject to variation due to changes in the fixed shunt condenser but this is minimized by using a high quality condenser. Many sets use a combination of capacity and permeability tuning, using the former for the broad-tuning detector and the more stable iron core coil for the oscillator.

There are a few receivers which are not provided with a ganged condenser or its permeability tuned equivalent and therefore have no provision for manual tuning. In the great majority of sets, manual tuning is selected by

Fig. 1. Silvertone 7072 two-band receiver with electric switching. Trimmers are on both oscillator and first detector. Manual control provided by bandswitch.



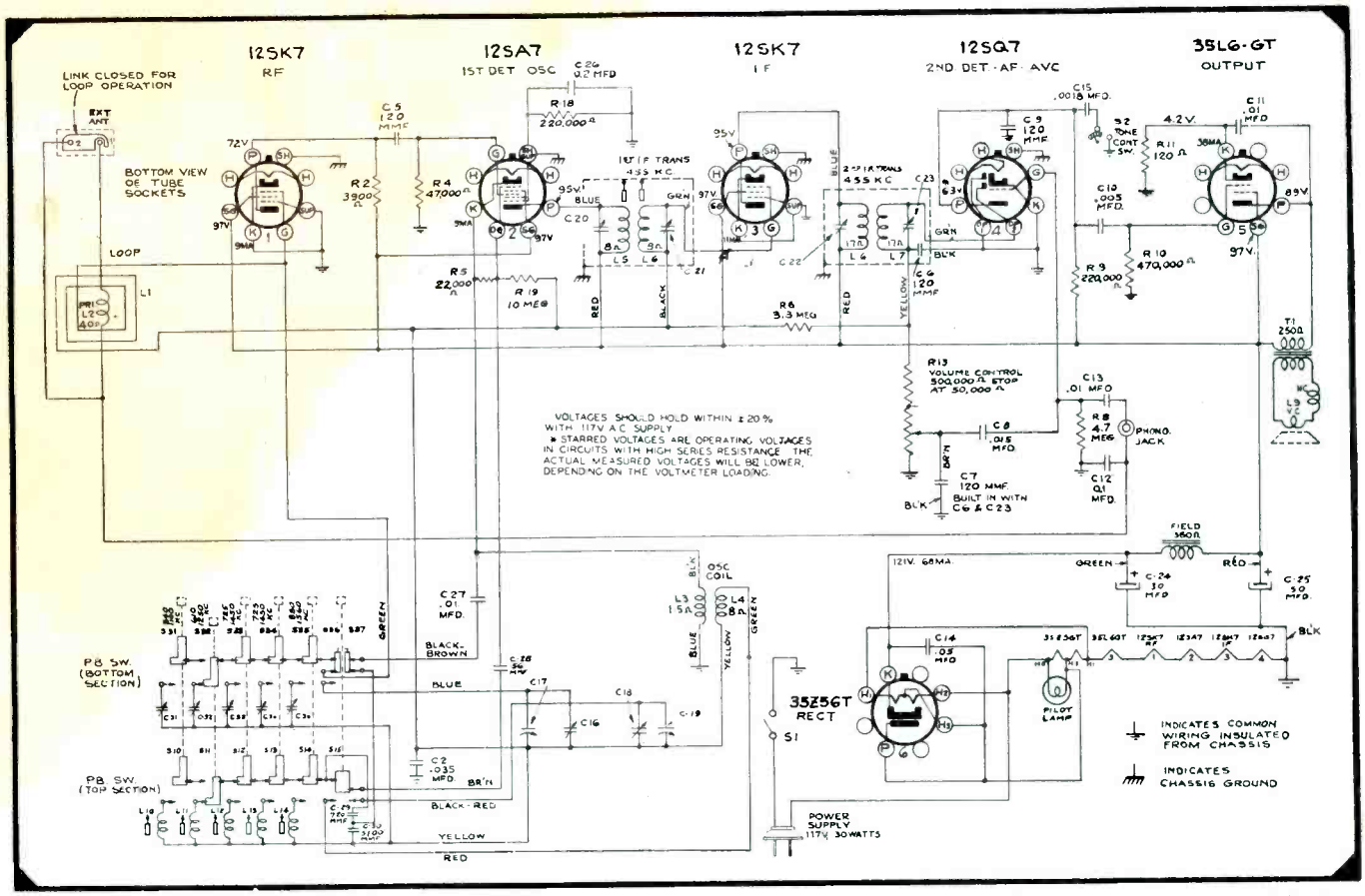
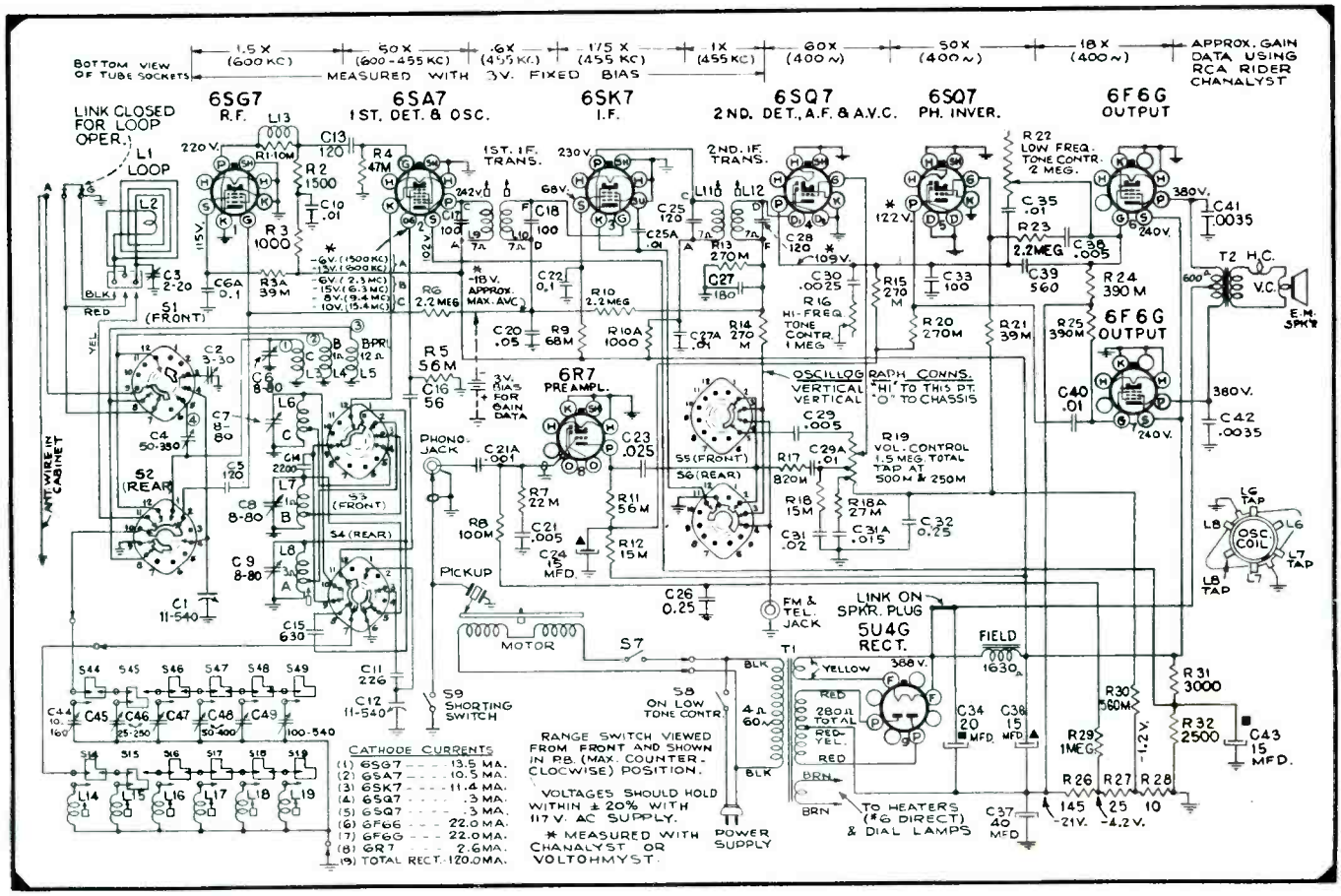


Fig. 2 (top). Westinghouse WR-12X14 with electric push-button switching and permeability-tuned oscillator. Capacitors are used in the first detector circuit with manual push-button provision.

•

Fig. 3 (bottom). RCA Victor V-225 with electric push-button and permeability-tuned oscillator. Capacitor-tuned first detector, with manual tuning position on bandswitch, is also provided.



either a push button or other type switch, often the waveband switch. In either case the switch may be used to select one additional station by making a habit of setting the manual tuning at a given point corresponding to a local channel.

Many automobile receivers make use of a rotary selector switch operated by a solenoid. A single push button is used for tuning, each operation corresponding to the next contact position until the end position is reached, at which point the switch is returned to its starting position. Some form of indicator must be used to designate the channel in operation. This is sometimes a rotary dial and oft-times an individual pilot light which indicates the station call letters.

A calibrated oscillator will usualy save time in setting the automatic tuning, especially in large cities where plenty of signals are rolling in. Where a signal generator is not available, the following procedure is usually used. Tune in the desired station in manual position and study the program. Switch to an appropriate push button or switch position for that frequency range and tune the oscillator circuit. If the station is not recognized in a few seconds, switch back to manual and check the program. After a few trials the station is usually found. Now tune the detector, and r-f, if any. It is always a good idea to recheck the tuning, especially if the set had not been given sufficient time to warm up. All sets change calibration in warming up, so at least ten minutes, and even twenty, if possible, should be allowed before setting the tuned circuits. Where a manufacturers' bulletin is available, the setting-up procedure described therein should be followed.

Servicing electric tuning systems is usually limited to the tuning instability already described and the treating of noisy switches. This consists of adjusting clips or contacts for adequate operating pressure and cleaning with carbon tetrachloride (Carbona). Those Service Men with extra mechanical ability can often repair and adjust cranky push buttons which refuse to lock, or which pop out at the wrong time. Defective clips can easily be changed.

Any automatic tuning system is worthless unless the stations are tuned right on the nose. The better grade sets employ automatic frequency control (afc) as an aid to perfect tuning. This form of control causes the frequency of the local oscillator to vary so that the difference frequency between the oscillator and the signal is equal to the i-f. This is accomplished by the use of a discriminator which uses a double diode. Some manufacturers substitute wide-band i-f for afc on the assumption that only strong local stations are set up for automatic tuning and, therefore, selectivity and sensitivity can be sacrificed. Also, the high frequency response is improved, providing high fidelity. Widening the i-f band allows the signal to be a little off-tune without spoiling the quality of reception.

Mechanical Systems

The first popular set with mechanical tuning was probably the Zenith job with lever arms. Then came the roller cam principle wherein the gang condenser was rotated by a lever acting on a heartshaped cam which was attached to the condenser shaft. The position of the cam on the shaft was adjustable so as to set the cam to correspond to a given capacity. A roller, given sufficient pressure, forced the cam to turn to the lowest point where the roller rested equally against two lobes, giving a very definite position.

The next version of mechanical tuning was made by Grunow and used an automatic telephone dial in combination with an afc system. The dial was geared to the condenser in such a way that almost the full 360 degrees of dial movement was obtained. Many refinements have been made in this system but the basic idea is still popular.

The rocker bar mechanical system has been very popular. This uses a sector gear to rotate the variable condenser and requires much less force than the cam type. Some types require no tools for setting the stations. Simply twisting the button unlocks it for setting. Other types use set screws.

In auto receivers, a large number of trick tuning devices have been used, as the torque required for operation is not so limited as it is in light table models. Some sets use considerable pressure to operate; others go to the other extreme and do the job magnetically. For instance, Motorola's *press-button tuning* system uses a motor drive and a series of selectively energized magnets.

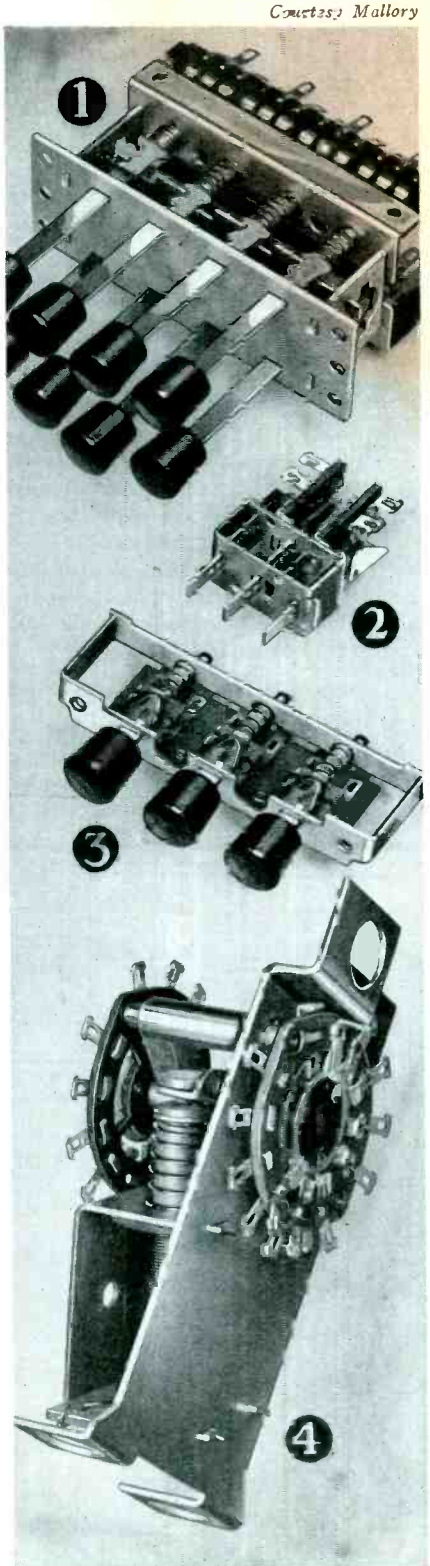
In some early push button sets a backstop had to be provided when selecting stations, since the pressure would push the receiver off the table. Later designs changed to a downward motion to prevent this.

During the tuning operation, provision is made to silence the speaker to prevent unwanted noise and the bellowing of in-between stations. Any Service Man can think of half a dozen methods of accomplishing this. Shorting any part of the audio system or applying a high negative grid bias to block an audio tube would do the job satisfactorily and these devices are used. For good measure, the r-f or i-f sections are sometimes also blocked.

In order to operate properly, the required torque for any mechanical tun-

Fig. 4. At (1), selector switch designed especially for 'ground side' switching. At (2), small latching type of push-button switch. At (3), switch for momentary solenoic operation of mechanical station selection. At (4) solenoid-actuated ratchet switch for remote station selection.

Courtesy Mallory



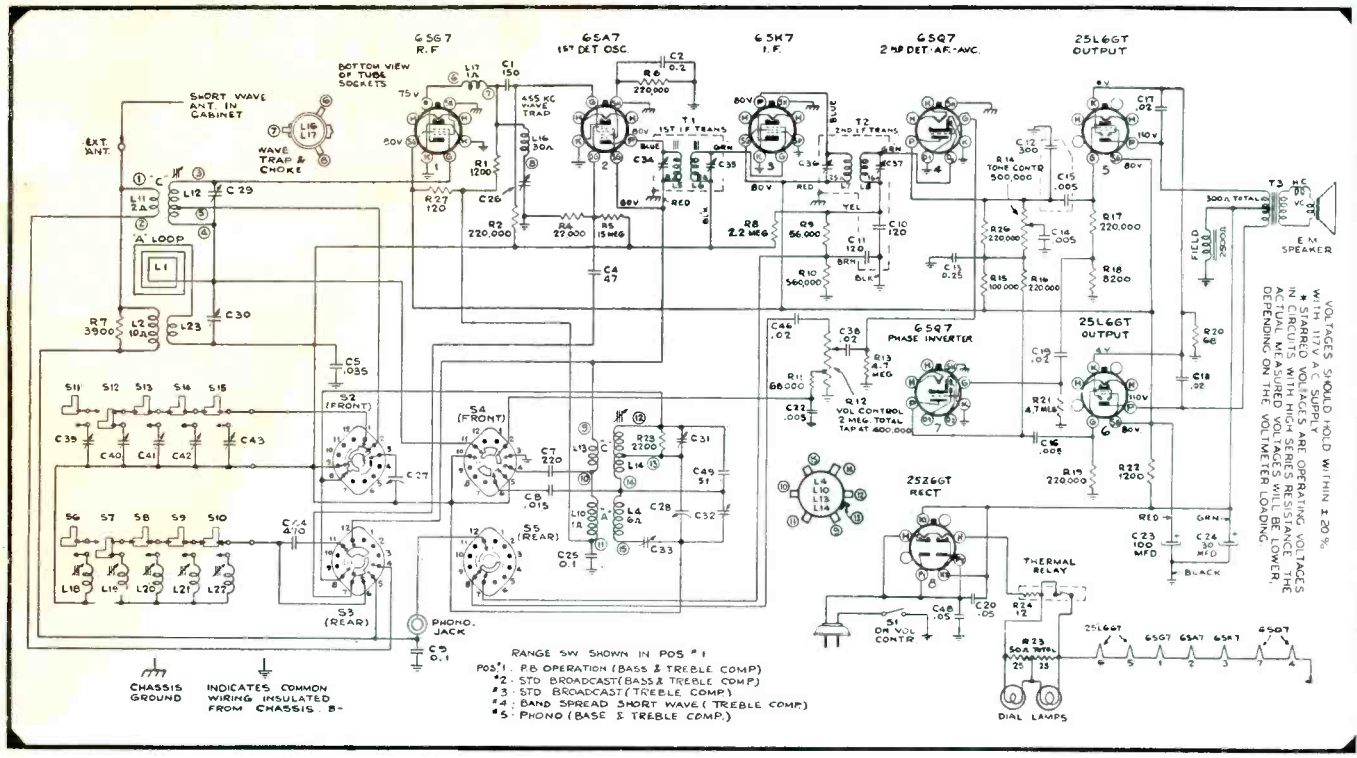


Fig. 5. A capacity-tuned first detector, permeability-tuned oscillator, and an r-f stage are featured in this receiver.

ing must be a minimum. Otherwise, the unit will not repeat the proper frequency. Where the operation causes the tuning knob to rotate, the mechanical condition should be especially good. The spring tension and friction of pointer and pulleys must be at a minimum. Units should be kept clean and well lubricated for long life.

Motor Drives

In this system the motor does the work. The trick is to stop the motor at the correct point and a lot of thought has gone into this problem. A sort of commutator is usually used, one form being a metal disc with a small insulated sector. The motor runs until a contact reaches this insulated spot. Tuning motors usually run on low voltage, from 12 to 32 volts, and are designed for intermittent operation so that they will heat excessively if any attempt is made to keep them running. Some have thermostat protection against overheating.

An ingenious trick is employed to silence the set and remove the afc when the motor is energized. The rotor has a considerable amount of end-play, or end-thrust. When at rest, a spring pushes the rotor axially, displacing it from the center of the stator. A leaf type switch is set at the end of the shaft, at the spring. When the motor is energized, the rotor pulls it-

(*Continued on page 23*)

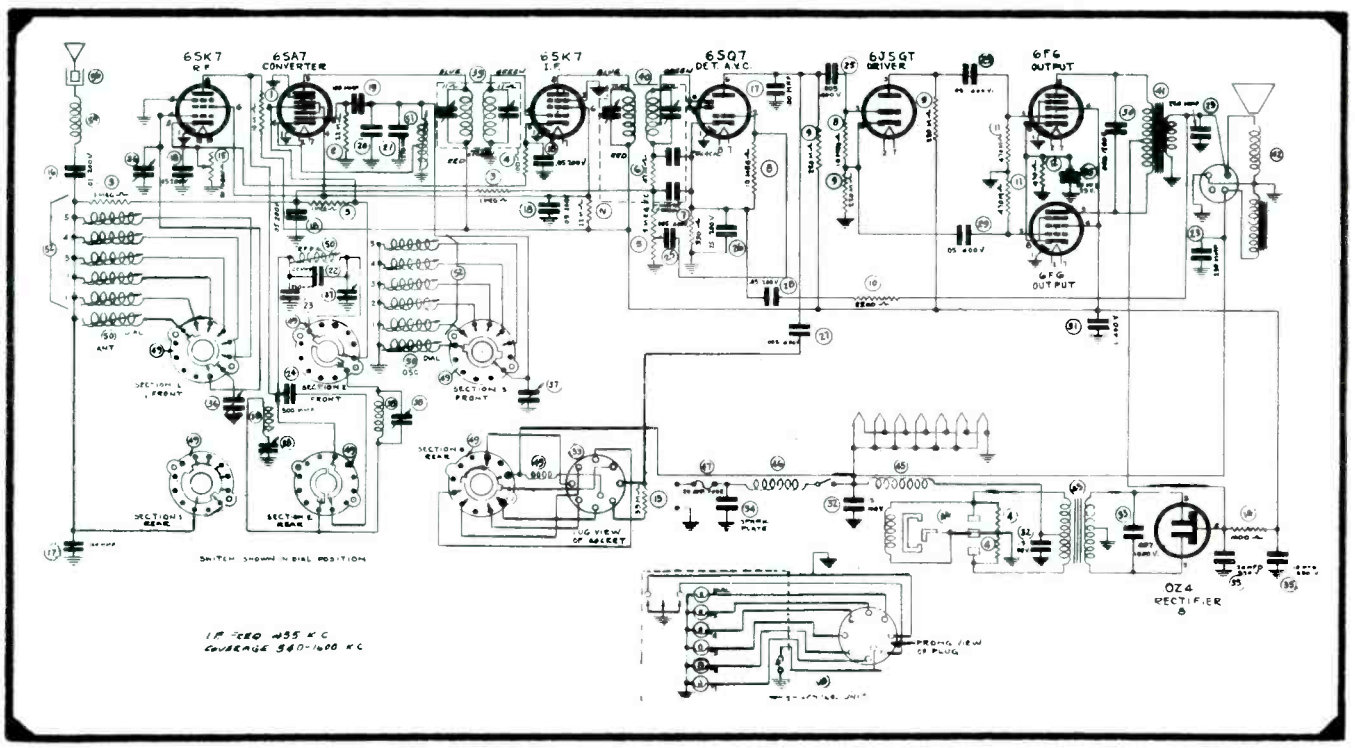


Fig. 6. Firestone S-7350-1, with rotary switch and magnetic plunger operating switch.

Designs for War...

Hermetic Sealing

The hermetic sealing of transformers covers a wide range of problems, and an equally wide range of applications. The two units illustrated at the left, for example, represent a high voltage transformer for high altitude operation, and an audio unit weighing approximately one ounce.

There is more to hermetic sealing than meets the eye. The illustrations below show some of the factors contributing to the high quality of UTC hermetically sealed units.

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DESIGN PROVING . . . POWER

Engineering . . . PRODUCTION

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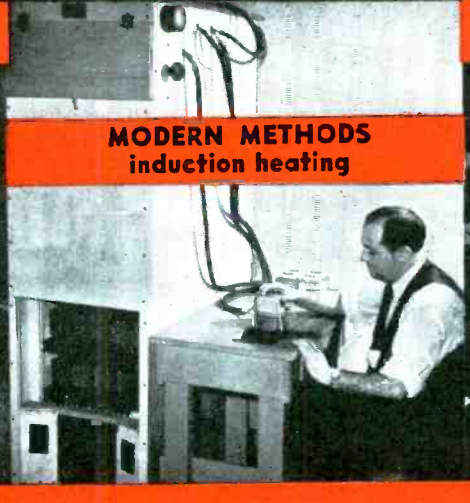
APTITUDE TESTING assures worker suited to operation

MODERN METHODS induction heating



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THE ELECTRON AND ELECTRONICS

By W. C. WHITE
Engineer in Charge
General Electric Electronics Laboratory

ELECTRONICS is defined as "the science which deals with the behavior of electrons." Like many definitions, this one is not very helpful and one must go a step further. Recently I saw a definition which I rather liked and which read "electricity freed from the bondage of wires." That, I think, is better because at least it is descriptive and somewhat intriguing.

The electron, of course, is the basic unit of electricity. Just as a drop of water can be considered a sort of basic unit in measuring amounts of water, so the electron is the unit by which we could measure the quantity of electricity. I say "could" because it is not a convenient measure. Again using the drop of water analogy, if we are talking about small amounts of liquids, such as a teaspoonful, it is logical to express the amount by the number of drops. However, when speaking of large amounts of water, such as go over Niagara Falls per hour, it would be absurd to express them by the number of drops.

The same thing is true of electrons. Even the number of electrons that make up the small current used in the filament of a household incandescent lamp is so huge and, therefore, runs into so many significant figures that we don't talk about the electric currents we use in such terms.

However, the electron is a very real thing and its mass and charge were accurately measured by scientists many years ago.

In addition to the extremely small charge it carries, the other unusual property of the electron is the enormous speed at which it can travel under proper conditions; a speed that can approach that of light. Here again, we do not express this speed in such terms as miles per hour because the number of zeros involved after the figure would make it too bulky to use. Instead we speak of the voltage used to accelerate the electrons.

Now, let's go back to the idea of free electrons because that is important. Until scientists created the so-called vacuum tube for these electrons to perform in, they were not free to be moved about as desired and their interesting and useful properties could not be studied and made use of.

Right here, let us bring up the point that the words *electron tube* and *vacuum tube* are used to describe the same device, it being largely a matter of personal preference which term is used.

What goes on inside a high-vacuum electron tube utilizes two basic components. The first is some source of free electrons and the second includes elements so that the motion of the electrons can be definitely guided.

The first we can liken to heating water to the boiling point to liberate steam. Heating a metal red hot liberates electrons from the surface in a somewhat analogous way.

Now, if that red-hot piece of metal is inside of a highly evacuated bulb, then this cloud of electrons coming out from the surface is very mobile.

Then comes the second step. You have all noticed that, when a comb becomes charged electrically, it will attract dust and bits of paper. In a somewhat similar way, the liberated cloud of electrons may be caused to move toward a positively charged terminal placed inside the bulb. Therefore, electrons pass from the hot plate, which is called a cathode, to the cold plate, which is called an anode, and the resulting continuous transfer of electrons constitutes a flow of electric current.

If this were all there was to the matter, one might well ask, why all this complication simply to provide a flow of electric current when an ordinary piece of copper wire might seem to accomplish the same purpose? However, this electronic method of conducting electric current offers possibilities of controlling the current in ways that are totally impossible in an ordinary conductor like a piece of wire. This possibility arises from the fact that these electrons may be started, stopped, and deflected very easily. This is done by putting additional electrodes in the tube and operating them at a certain combination of voltages which determines how many of these electrons travel across the space and at what speed and how often they are started and stopped.

Here again, it is well to remember those two separate steps in this process of electrons moving through a vacuum. The first is getting the electrons out of the metal and the second is getting them across the space to the other electrode. It is only during this second step, their trip across the space, that they are subject to control by additional electrodes.

Because such a huge number of electrons are required to carry an appreciable amount of current and because they move so rapidly, the flow of current through the tube can be subject to variations of an extraordinary degree as regards speed and nature of the variation.

This means that, if a wire carrying a small current is cut and this elementary vacuum tube is inserted in this gap in the circuit, you have great opportunities for unusual control of current in that circuit. When I say, cut the wire and insert the tube, I mean that one of the free ends of the cut wire, the negative one, is connected to the hot-cathode terminal of the tube and the other, the positive, is connected to the cold anode plate.

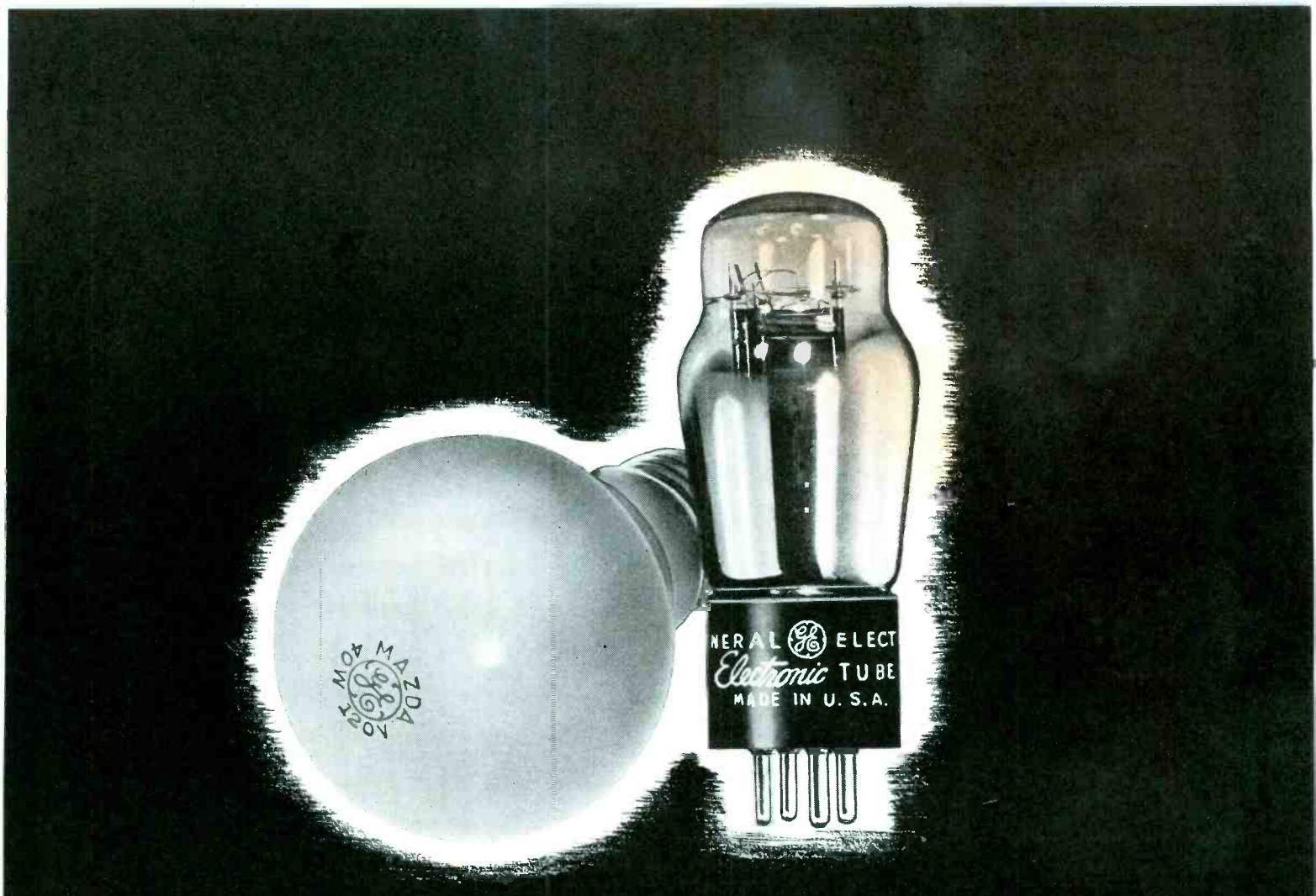
That, in its simplest form is an electron tube in an electrical circuit. During the split second when the electric current in this circuit is in the form of a stream of free electrons leaping across the gap through the vacuum of the tube, you can control this current with great speed and accuracy. The control element in the tube is usually like a screen or grid which is placed directly across the stream of electrons.

If to this grid or control electrode a proper voltage is applied, the current through the tube, and thus the current in the circuit, may be varied. The kind of tube used depends on the magnitude of the currents and voltages involved and how fast the control has to be, and it can easily be up to a billion times a second.

It is natural to ask why, year after year, we continue to use electron tubes both in our radio receivers and radio transmitters. Is it not possible to substitute for them other devices that will do the job as well or better? The answer is *no* and will probably continue to be *no* in radio for a very long time to come because electron tubes perform certain functions that just cannot be done in any other way.

There are several reasons why electron tubes are the heart of radio equipment. The first of these results from their almost complete independence of electrical frequency. As you

(*Continued on page* 25)



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To bring this about and to pre-sell the vast replacement market that will be waiting for your tube service after the war, G.E. is conducting a powerful four-color advertising campaign in the nation's big-circulation magazines.

A current advertisement of this campaign is illustrated at the right. Like all of the series, it draws special attention to G-E Electronic Tubes. General Electric leadership in electronics, built up through years of experiments with and improvements upon electronic products, is your assurance of the engineering excellence of these tubes, outstanding products of the famous G-E Electronic Research Laboratory.

When peace is restored, G-E Electronic Tubes will be your fast-moving stock, thanks to constant forceful advertising and promotion aids that are preselling your peacetime customers right now! . . . *Electronics Department, General Electric, Schenectady, N. Y.*

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GENERAL ELECTRIC

176-83

SOME PRACTICAL WARTIME SERVICE EXPEDIENTS

By HOWARD J. FOHT

Foht Radio Service

DURING recent months, in which the shortage of certain types of tubes and parts has become increasingly acute, several practical methods of utilizing or converting available parts to produce the desired results, have been discovered.

Defective 35Z5's have been one of the units, wherein conversion has been most effective.

Where a 35Z4 is available, its function may be converted to that of a 35Z5 by attaching a 25-ohm 10-watt resistor between the *2* and *3* posts at the base of the socket. If conditions in our locality reflect the entire country, it is probably safe to say that there are many more 35Z4's available than 35Z5's. However, where neither type of tube can be obtained, the defective 35Z5 can be salvaged and used, if after checking with an ohmmeter the portion from *3* to *7* is usable. In that case a resistor of approximately 35 ohms, 10-watt value, between *2* and *3* posts can be added.

Another conversion, which we have found helpful, was in the case of a faulty 50L6 tube. When this type is unobtainable, a 35L6 may be used by adding a 50-ohm 5 to 10-watt resistor to either of the filament legs in series with the regular hook-up.

We have found a complete lack of the 12-volt 150-milliampere tubes that are used so extensively in table model receivers. These are the 12SQ7, 12SK7, 12SA7. Substitutions for these, which work perfectly, are 12SR7 for 12SQ7, 12SG7 for 12SK7. For the 12SA7 we put in a 6SA7 and then the following procedure may be followed. Take the other tubes in the circuit and couple each pair of them with the most similar filament voltages changing them from series to parallel circuits. Then place a 160-ohm voltage divider dropping about 60 volts, which can dissipate 300 milliamperes, in series with the regular line cord. This causes the set to draw 300 milliamperes. Where an uneven number of tubes are left after substituting the 6SA7 for the 12SA7, we replaced another of the 12-volt, 150-milliampere tubes, with a 6-volt, 300-milliampere tube. These, the

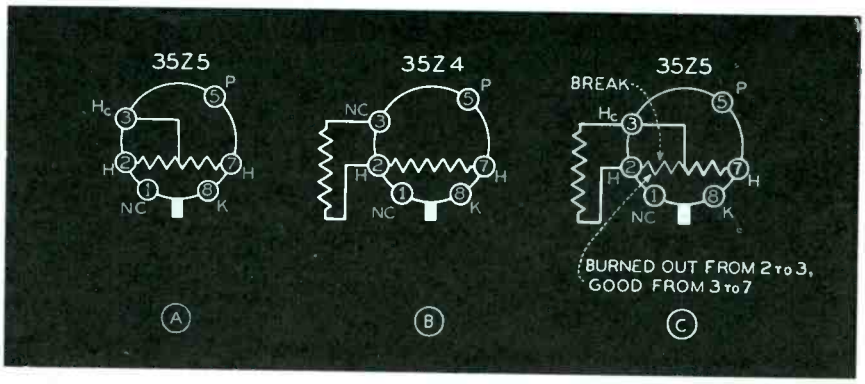


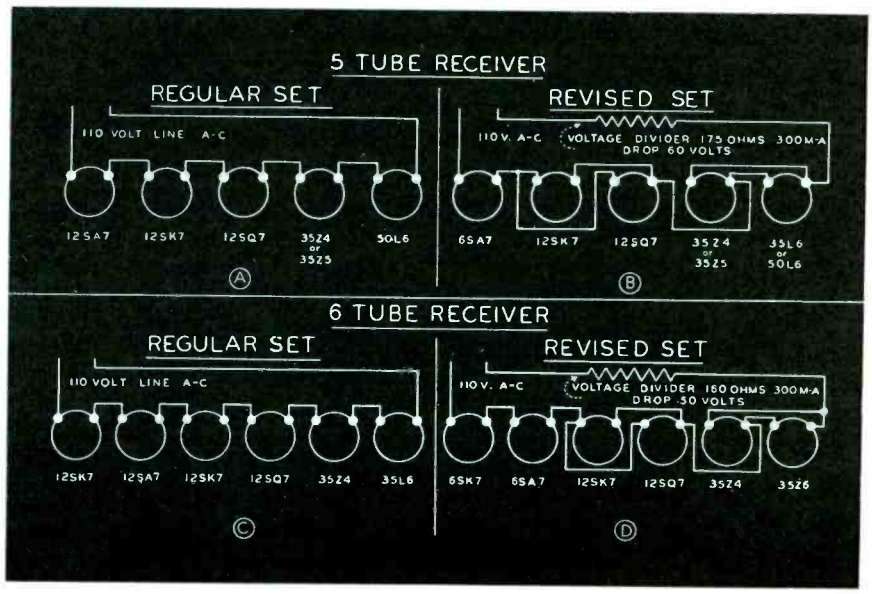
Fig. 1. Methods of converting 35Z4 for use as 35Z5 or salvaging 35Z5. The resistor between *2* and *3* in *B* is a 25-ohm 10-watt unit. Resistor used in *C* can be a 35-ohm, 10-watt component.

6SA7 and other 6-volt tubes were placed in series, and then the pairs left coupled in series-parallel. This is shown in Fig. 2.

There are many cases where a salvage of special volume controls or tone controls can also be effected. Several manufacturers have marketed control lubricants to afford a reduction of noise on wire-wound controls. Under test, on continuous contact controls, however, this lubricant did not solve the problem. We repaired nine out of ten units, by first simply removing the covers. We then selected a piece of very fine wet or dry sand paper, the finer the better. The resistance strip on the control was gently rubbed with the paper until the glazed part of the resistance was removed. It is important that you do not sand enough to remove carbon. Incidentally, it is this glaze that causes the noise. Then the contact point was sanded by placing the paper under it and working the control gently back and forth on the paper. The final step included an application of volume control lubricant. Then the control can

(*Continued on page 23*)

Fig. 2. Methods of substituting 6-volt for 12-volt tubes.



SER-CUITS

By HENRY HOWARD

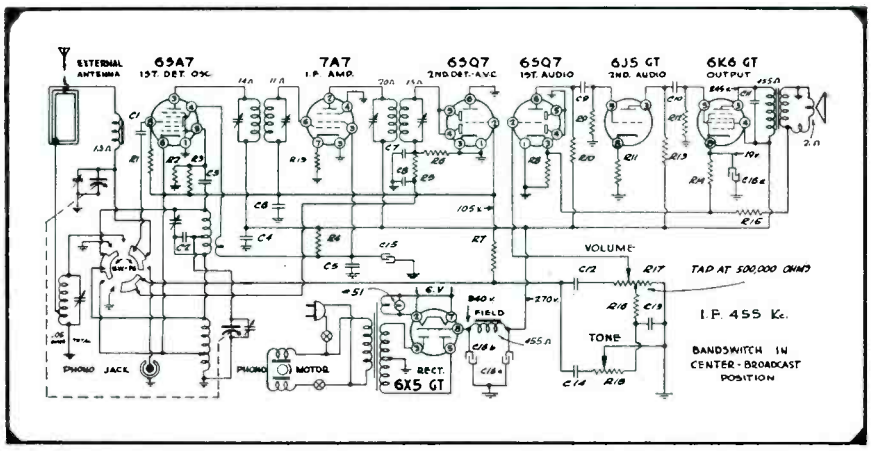
AUDIO degeneration was an important design feature in many of the late 1942 receivers.

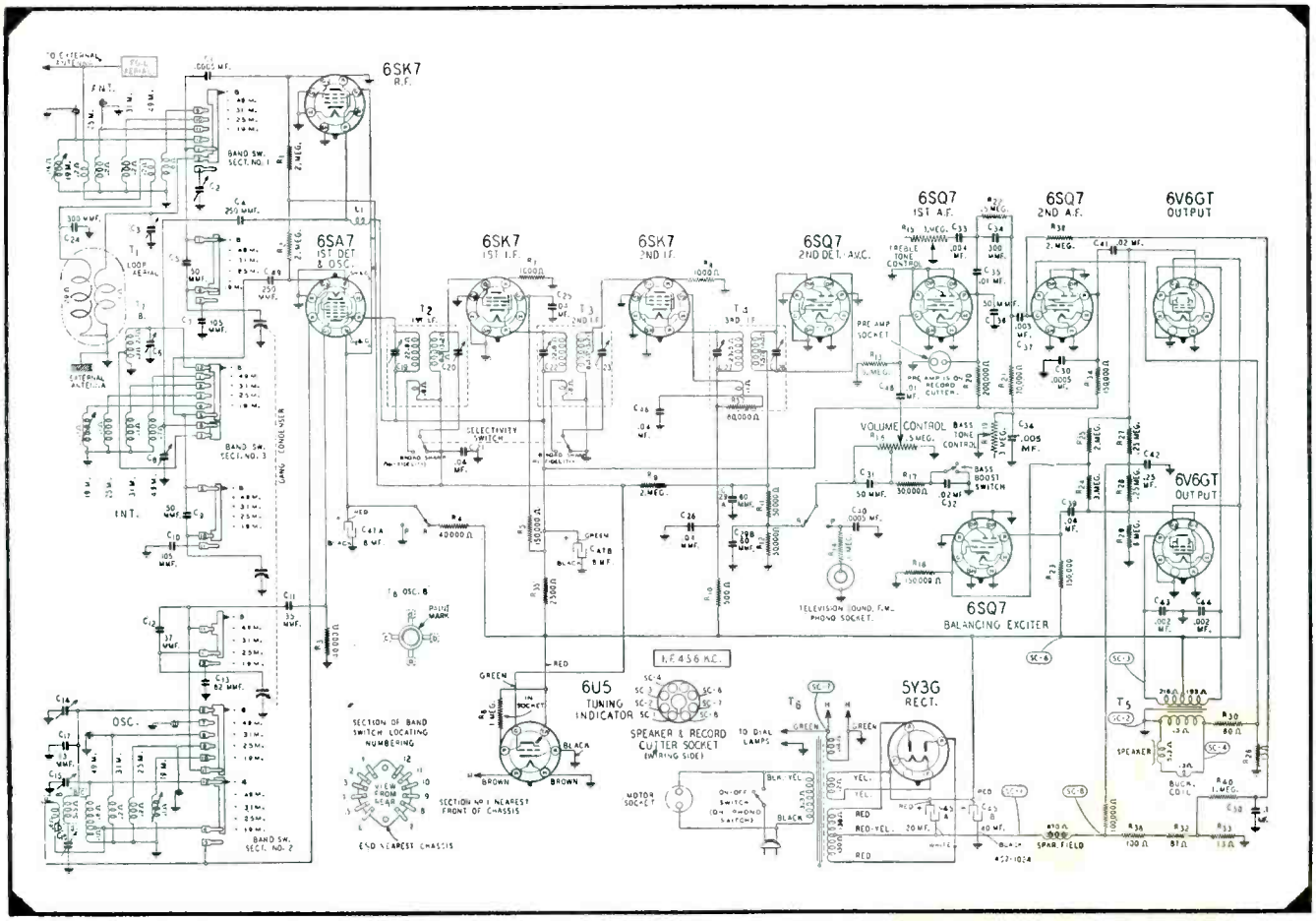
The Ward Airline 12-tube receiver, shown in Fig. 1, illustrates one such form of design. A filter from the first audio plate to the next grid, consisting of a condenser and resistor in parallel, has been included in the audio system of this receiver. This is probably a high frequency equalizer. Note the treble tone control also at this point. A bass-boost switch operates from the low end of the volume control to bypass the highs to ground, while the bass variable control operates from the second a-f grid to shunt a .005 mfd condenser. Voltage for degenerative feedback is picked up from the output transformer through a voltage divider and fed back to the second audio cathode. The *C* bias for the second a-f, inverter and output stages is derived from the voltage divider in the lower right corner.

The receiver, which covers 5 bands, has two-position selectivity for high fidelity. The input circuit is complete with all the trimmings and we can

Fig. 1. Airline 12-tube receiver featuring audio degeneration.

Fig. 2. Admiral C7, with a degenerative cathode in the second audio.





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North Adams, Mass.

WANTED — 0-1 ma-meter 2½ or 3", or 1 megohmmeter, and 35L6 and 50L6 Tubes. Describe in detail and name price. Have 1T4 and 117 volt tubes for sale or trade. John Hochmeister, East Walnut St., Boonville, Ind.

VOLTOHMMETER WANTED—ac-dc, small size. Have some meters to sell or trade. Arthur R. Miller, 2325 No. 22nd St., Lafayette, Ind.

OFFERED — Superior Meg-O-Meter; two scales 50,000 ohms to 5 Meg., and 2 Meg. to 100 Meg.; good condition, with batteries and leads. Will sell for cash, or exchange for what have you? O. H. Grinnell, 927 9th St., Monroe, Wis.

TEST EQUIPMENT FOR SALE — 1 Triplett, V.O.M. — 25,000 per volt—$40; Red Dot twin meters in good condition, used very little. 1 Triplett Model 1210A tube tester in good condition—$15. Tests everything but single ended and loctal tubes; can be made to accommodate these. 1 new Weston Model 506—milliammeter range 0-100 ma. case 2⅜"—$7; 1 Weston Model 301 — milliammeter, used very little; scale 30-0-30 zero center for use as ammeter with external shunts—$8. Cash or money order. Frank L. Dodd, 300 Rural Ave., Lewisburg, Pa.

WANTED — Supreme model 563; RCA model 154; or Jackson model 652 audio oscillator. Also Weston, Hickok or Clough Brengle vacuum tube voltmeter. Units needed to service defense sound equipment. Fox Sound Equipment Co., 435 So. 5th St., Richmond, Ind.

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HELP! Draftsman for transmitting tube company is badly in need of an A-1 drop bow pen. Give full particulars. Will pay cash. Mrs. O. C. Leach, 1724 W. 9th St., Owensboro, Ky.

WILL BUY — Need ac-dc multitester in good condition; late model good make preferred. All letters answered. Warren's Radio Service, 304 W. Williams St., Waterloo, N. Y.

WILL SWAP — Radio metal locator; used radio parts for portable radio using the new T and S tubes; the smaller the better. John Haynes, Doe Run, Missouri.

TUBE TESTER WANTED — Any late model tube tester in A-1 condition; Triplett model 1213 preferred. Will pay cash. Describe and name price. Lockerd Weeks, Box 375, Chilton, Texas.

FOR SALE — 6-drawer, upright floor model, motor-driven National cash register in good condition. G. R. Runyan, 522 Main St., Arkadelphia, Ark.

TELEPLEX FOR SALE—Teleplex machine with ear 'phones, teleplex key and ten tapes. Only two months old, never used. Price $18. Arthur Marinari, 329 Totowa Ave., Paterson, N. J.

EQUIPMENT FOR SALE—94BT1 RCA battery receiving set, 1941 model; 62-617 Airline 7-tube receiving set, both in good condition. Also one treasure locater; 80 condensers; 10 I-F transformers, 456-K.C.; oscillators, coils; ant. coils; speakers; resisters; voltmeters; tubes, etc. Also have new test equipment including one tube checker, one oscillator, and one portable lab. Write for details. Want two 175 KC I-F transformers; 0-100 micrometer; portable recorder; 5x8 printing press. Albert Nolan, Jr., Hensley, Ky.

TESTER FOR SALE — Model 710 Readrite set tester in fair condition. Make offer. William Porter, 1109½ Sentous St., Los Angeles, Cal.

TUBE CHECKER TO SWAP OR SELL —Model 307 Radio City Products Co. Will trade or sell for cash, $18.50. Rhoads Radio Service, 1495 Sunset Blvd., Los Angeles, Cal.

EQUIPMENT WANTED—Volt-Ohm-Meter, signal generator, tube tester, and Rider's manuals Nos. 1 to 13 wanted. State age, condition, and price. Wm. A. Wagner, 3814 Faversham Road, Cleveland Heights, Ohio.

FOR SALE—Set of five 10" Linguaphone code practice records. Play on any phonograph. Good as new. Price $5 or trade for a good meter, 0-1 ma. Ivan Stromswold, 1307 W. Newport Ave., Chicago, Ill.

WANTED — Meissner deluxe signal shifter. Will trade slightly used Clough Brengle OCX signal generator for it, plus cash. Pvt. Harold N. Christianson, 502 CA (AA), 1st Bn., Hq. Btry., Paterson, N. J.

WANTED — Someone to repair a multitester meter used on 406 Radio City checker, signal tracing eqpt. City Radio Service, 18 South St., Danielson, Ct.

WANTED—Solar Condenser analyser in good condition. Will trade good hand drill incl. 30' reavy rubber-covered cord. A. M. Marron, 390 Audubon Ave., New York, N. Y.

RIDER'S MANUAL WANTED —Full set. Name price and condition in first letter. Arthur Huonder, Larpenteur & East Ave., St. Paul, Minn.

TUBES FOR SALE — The following RCA tubes are offered for cash: 8—24A; 8—26; 8—45; 5—25; 10—39-44; 3—71-A; 4—75; 8—76; 10—80; 5—83V; 4—5Z3; 4—25Z5; 4—35Z3; 6—2A3; 4—35L6; and 2 Neon ballast tubes. Must sell all at one time. Make offer. C. J. Schexnayder, 636 Fifth St., Port Arthur, Texas.

TUBE TESTER FOR SALE — Triplett model 1213 in good condition. Will swap for new model or good used small a-c, d-c radios. Will also pay cash for these radios. Write giving price and full particulars. Sam Bloom, Southern Furniture Co., Lyons, Ga.

TUBES, INSTRUMENTS FOR SALE — 1 channel analyst with V.T.V.M., new condition; tubes, condensers and resistors at attractive discount; also many parts for Majestic, Philco, Eveready, Bosch, Sparton, etc. Will trade sound equipment for test equipment. Write for details. John H. Grey, Jr., Box 46, Bridgewater, Conn.

TESTER FOR SALE—Readrite tester, 3 meters 600v. DC., 700v. AC., 150 mils. 10 point switch, octal socket, cable plug and bat. leads, instructions. $6. Also slide rules 8" diam. round dial A B C D E F G H scales, $1. Kadette wireless remote tuner, 5-tubes, $5.00. W. F. Onder, Rt. 1, Box 389, Kimmswick, Mo.

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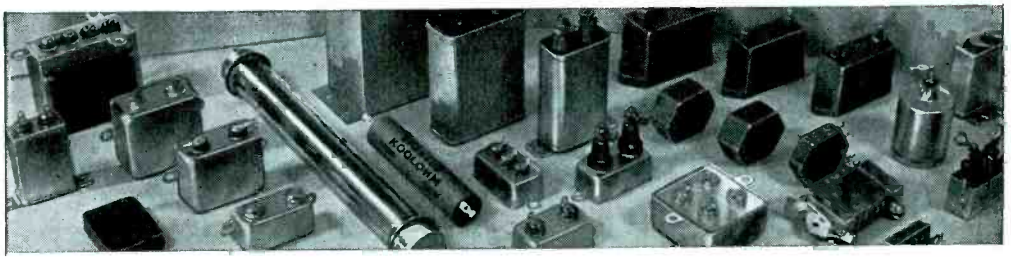

Here are some of the Sprague Condenser and Koolohm Resistor types being supplied in tremendous quantities for war requirements. Many of these represent outstanding engineering achievements which will be reflected in Sprague radio service and industrial components for post war needs. Meanwhile—as always—you can count on Sprague Condensers for utmost dependability for today's radio service needs. Busy as we are with war work, we're also doing our level best to keep you supplied with Atom Midget Dry Electrolytics, TC Tubular By-Pass Condensers and other types needed to keep radio working on the home front. Ask for them by name!

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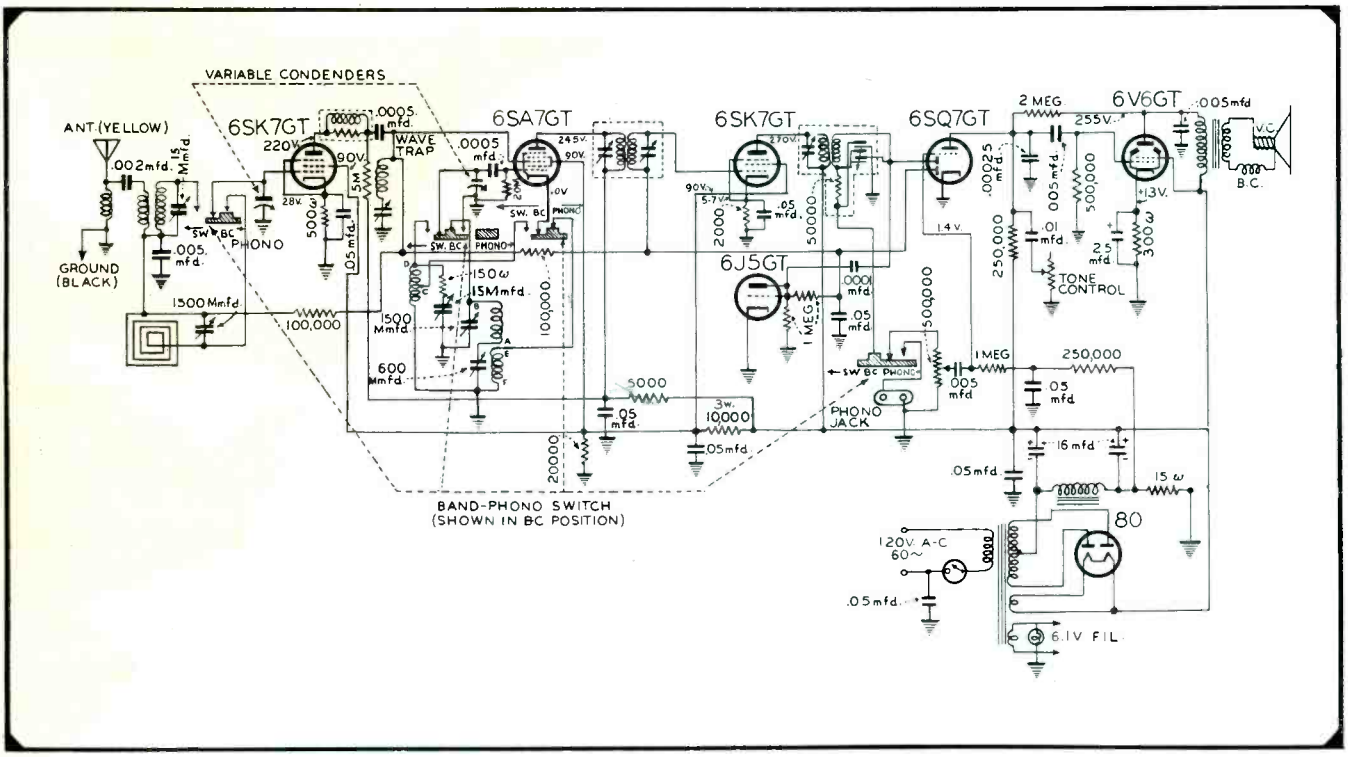


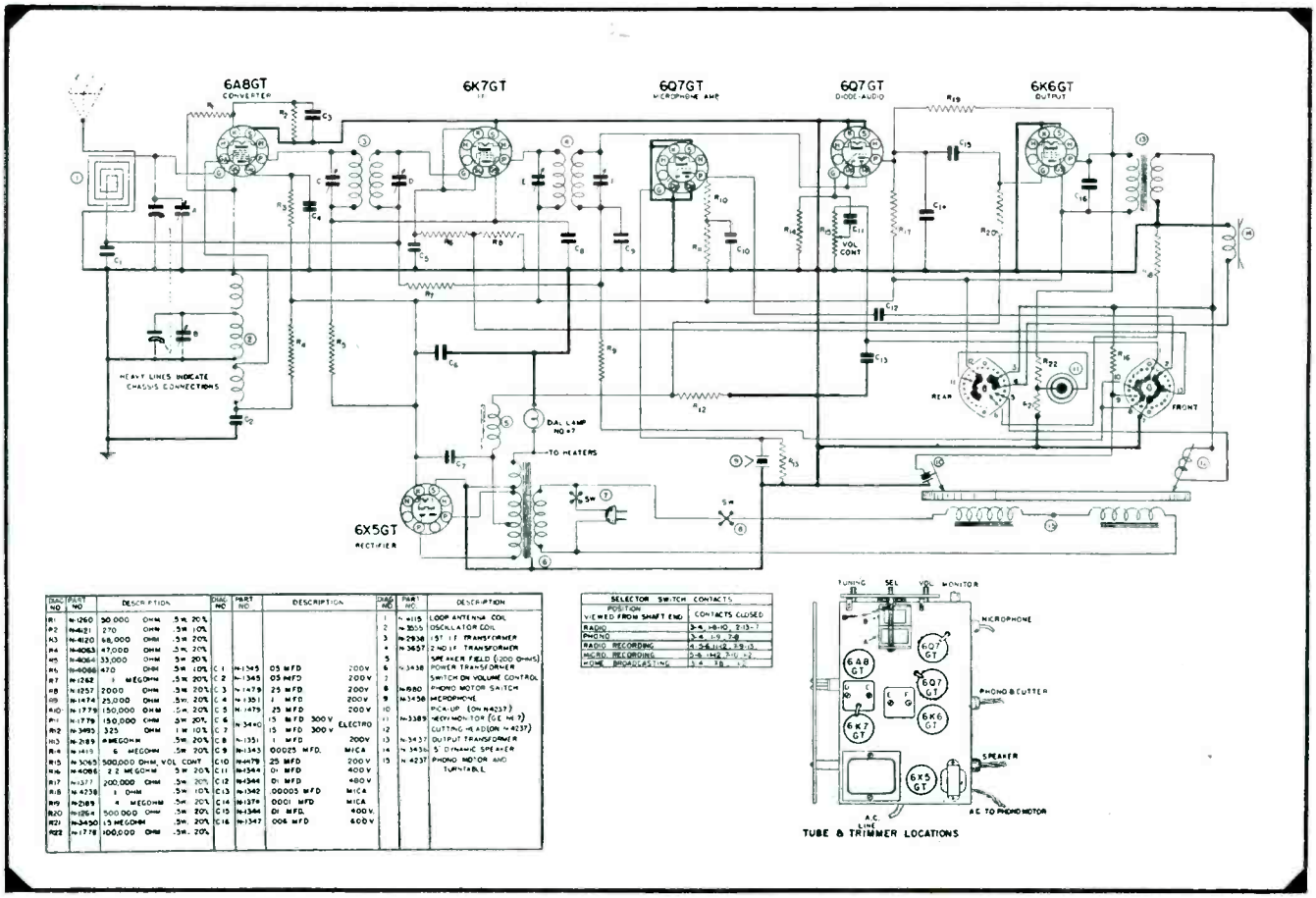
sincerely recommend the bandswitching circuits for students. A 3-gang tuning system is used with both series- and shunt-condensers for bandspreading. The antenna circuits are fed to the r-f input grid through a 50 mmfd coupling capacity, while the primary of the r-f coupling transformer is shunt fed. A plate choke and a 250 mfd condenser are used for this purpose. For the short-wave bands separate primary and secondary coils are used but, for *b-c*, an autotransformer is used with the plate tapped down to give a step-up ratio.

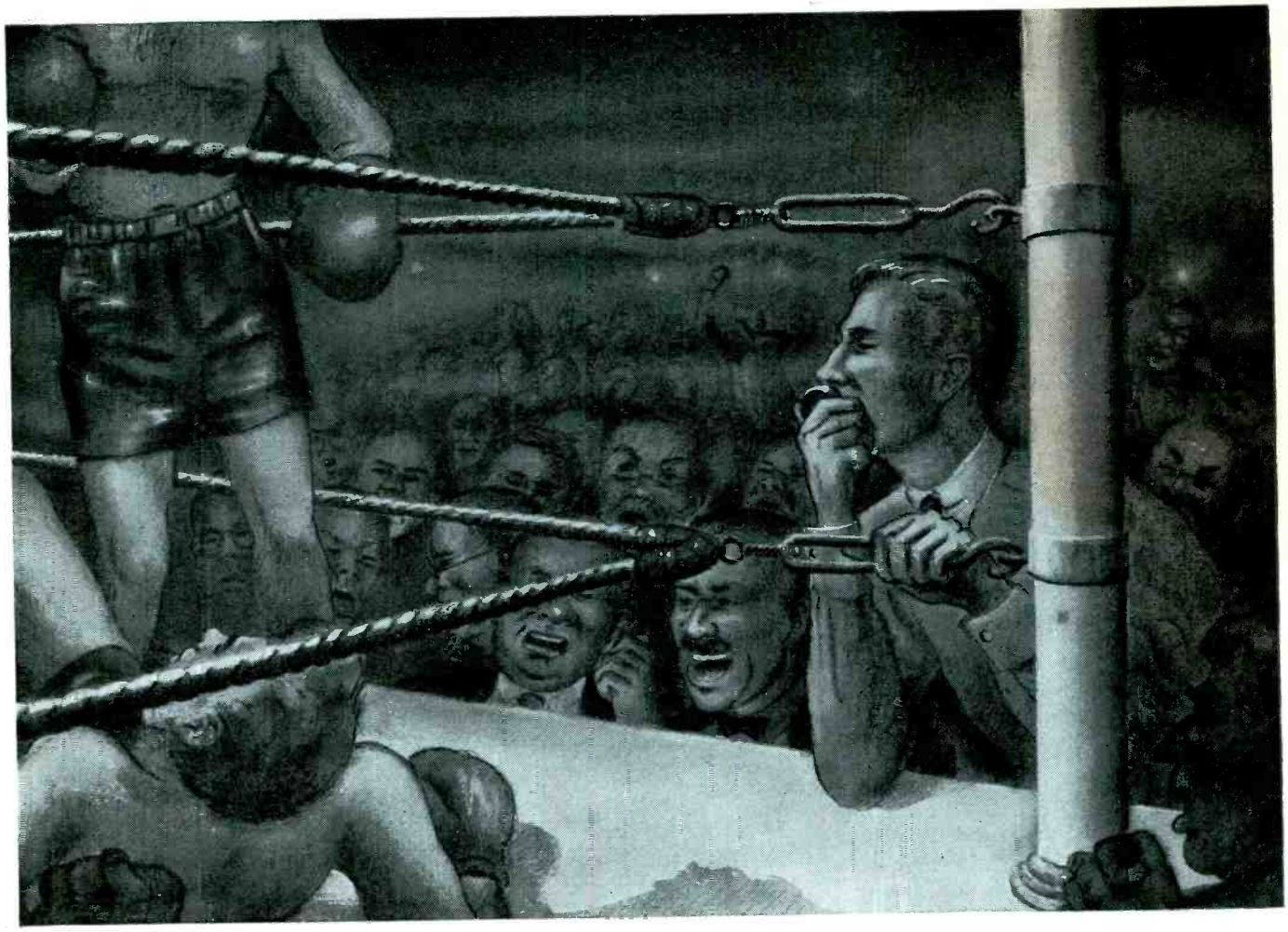
Two i-f stages are used with com-

Fig. 3 (top). Knight 278, featuring a four-section waveband-phono switch. An r-f choke is employed to ground the antenna to d-c, eliminating hum modulation due to antenna pickup.

•

Fig. 5 (below). Knight D174, with a plate decoupling filter in the mike amplifier.





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plete tranformers. The grids are tapped down on the secondaries for maximum selectivity in the *sharp* position, while the final transformer operates a push-pull detector. We haven't seen this design feature in quite a while. The selectivity switch places an additional coil (or tertiary) in series with the secondary tuning condenser. The final transformer has a screen grid tickler coil.

Admiral C7

Fig. 2 shows the method used for degeneration in the Admiral C7 chassis. The voltage divider for the feedback voltage consists of R_{15} and R_8, the latter also serving as a bias resistor for the first audio tube. The feedback potential goes to the first audio cathode. The 6J5 second audio is also tied to the feedback bus, but the cathode is heavily bypassed, allowing no a-c effects. The plate current flows through R_8, however, which helps the *IR* drop providing *C* bias for the first a-f. R_{15} is 300 ohms, while R_8 is 22 ohms. The second audio has a degenerative cathode.

Knight 278

A 2-megohm resistor from output plate to the first audio plate provides the feedback in the Knight 278, Fig. 3. An r-f choke grounds the antenna to d-c, eliminating hum modulation due to antenna pickup. A four section waveband-phono switch opens the input grid as well as the converter cathode and oscillator grid. The signal grid is shunted by an i-f wavetrap.

Fig. 4. Clarion L110, with a bandswitch that controls the input grid, antenna, s-w trimmer and oscillator.

A 6J5GT is used as a separate diode for avc voltage.

Clarion D110

The Clarion D110, shown in Fig. 4, has an interesting bandswitch which takes care of the input grid, antenna, *s-w* trimmer and the oscillator. The latter section puts the cathode at a tap on the *b-c* coil or shorts the upper part of this coil leaving the cathode with a few tickler turns for *S-W* operation. Degeneration takes place

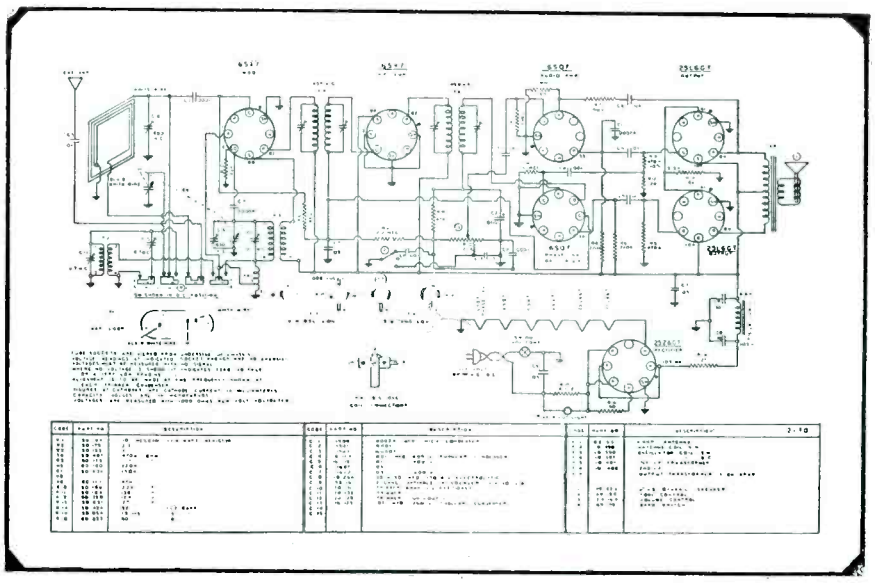
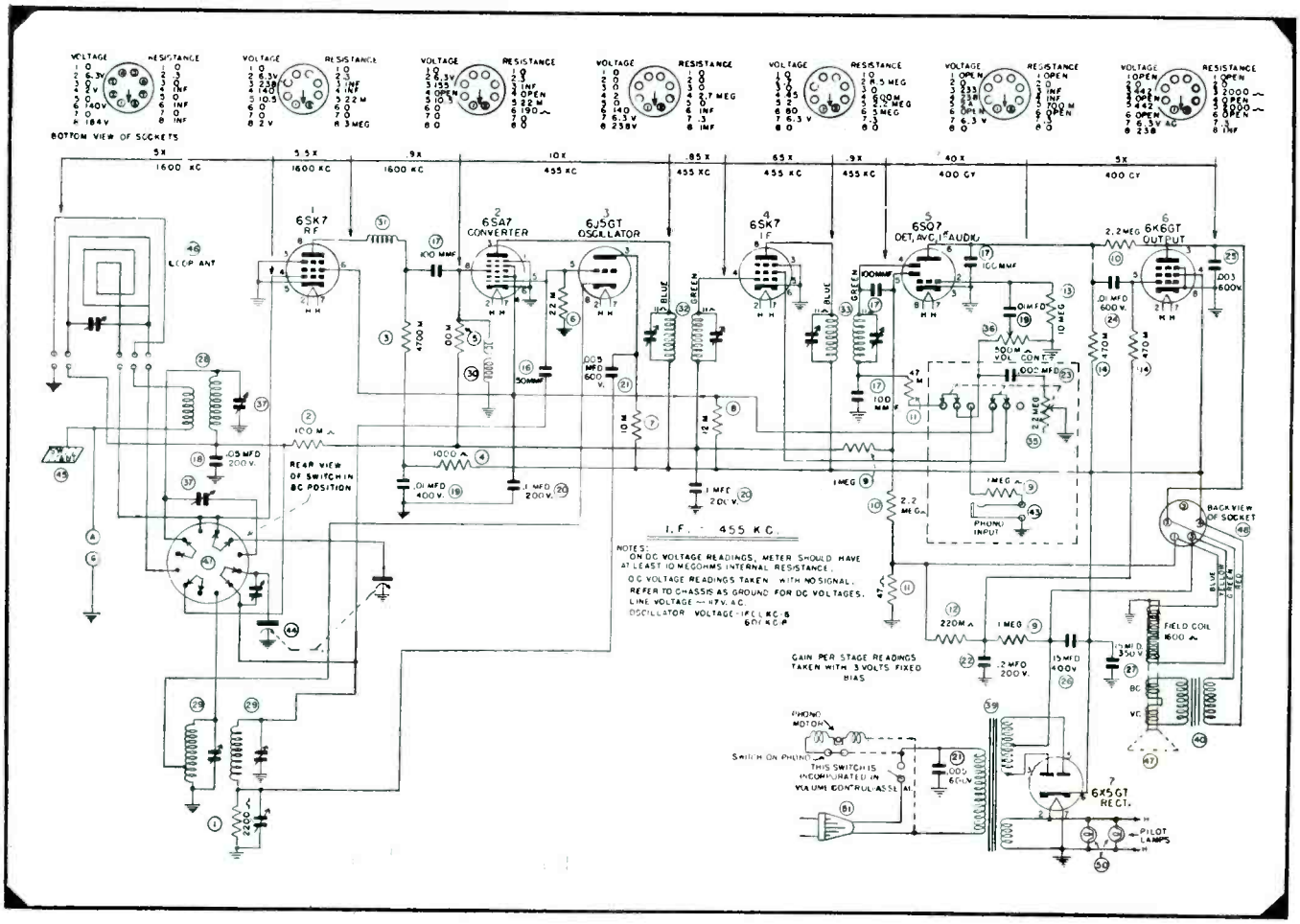


Fig. 6. Farnsworth DK-73 and 75, with plate equalized resistance coupled r-f stage.



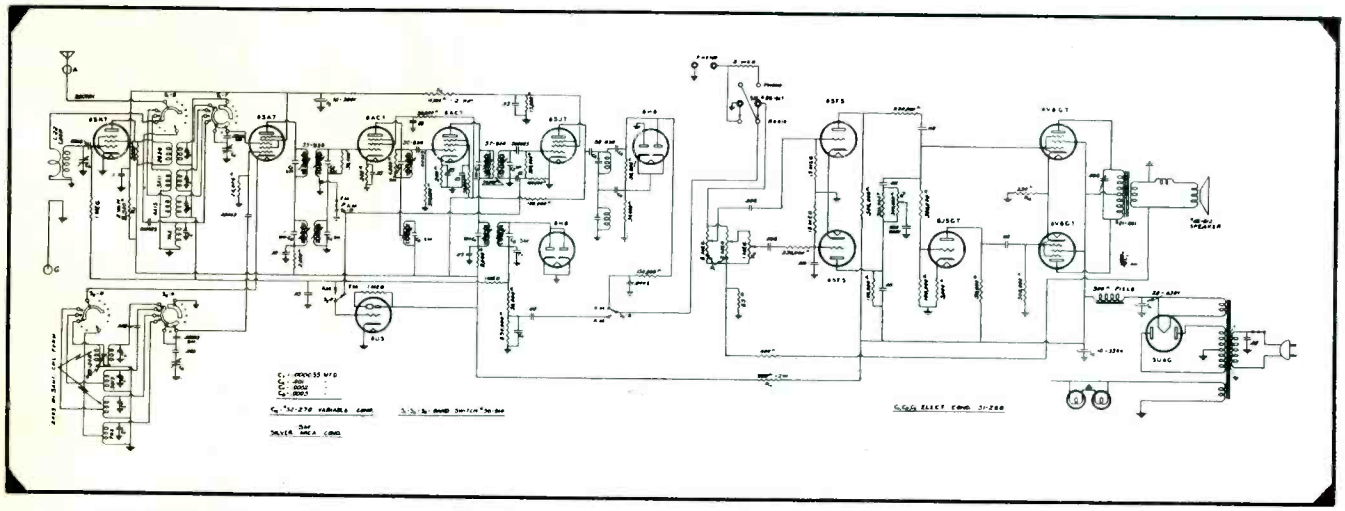


Fig. 7. Knight D182-197 a-m/f-m receiver, with a degenerative system which feeds back from the voice coil to the volume control-bass tone circuit.

from the plate of one of the push-pull 25L6s through a condenser and resistor to the first audio cathode.

Knight D174

The recorder type receiver, shown in Fig. 5, Knight D174, uses a low impedance cutter fed from the voice coil secondary of the output transformer through a 1-ohm resistor. The course, that there is a separate plate supply resistor to the first audio plate. Some sets use the degenerative resistor for supplying plate voltage.

Farnsworth DK-73 and 75

A resistance coupled r-f stage with plate equalization is shown in Fig. 6, Farnsworth models DK-73 and 75. A separate 6J5GT oscillator is connected grid-to-grid, with the converter in an unusual oscillator circuit, sometimes known as the *ultraudion* circuit. Grid and plate are connected to opposite ends of the coil without a cathode tap. The plate is shunt fed. A 2,200-ohm resistor is connected from the plate end of the coil to ground, shunted by a trimmer. This trimmer performs the duties of a bypass condenser on *s-w*, where the grid is switched to the coil on the left, in a more conventional oscillator circuit. This set uses a 2.2-megohm plate-to-plate inversed feedback resistor. Separate diodes are used for avc and detector. The avc bus is biased from the *C* voltage divider. The i-f screen grid is opened in phono position.

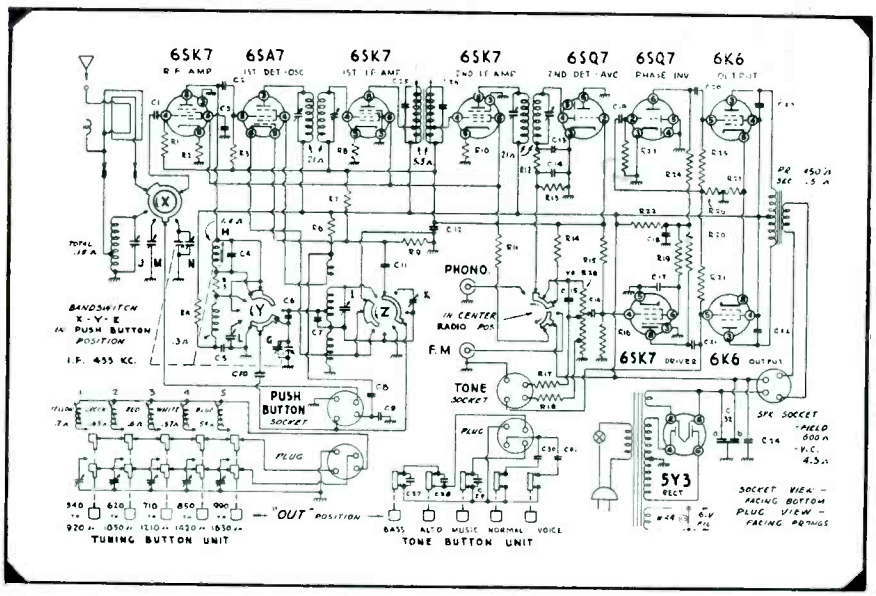


Fig. 8 (top). Admiral A10, with two i-f stages used in conjunction with cathode degeneration.

mike amplifier which feeds the first audio has a plate decoupling filter necessary because of the high audio gain. A 4-megohm plate-to-plate degenerative connection is quite a bit higher in value than the standard, since the first a-f plate load consists of a .2-megohm plate resistor and .5-megohm grid leak. While these plate-to-plate resistors unquestionably do some good, the values are not critical and they may be readily omitted in a service job. This is provided, of

Knight D 182-197

In Fig. 7 appears an interesting a-m/f-m receiver, Knight models D 182-197. A conventianal 3-gang t-r-f stage is used with a cathode feedback oscillator and 4-gang bandswitch. The plate circuits of converter, first and second i-f contain two anti-resonant circuits in series for the

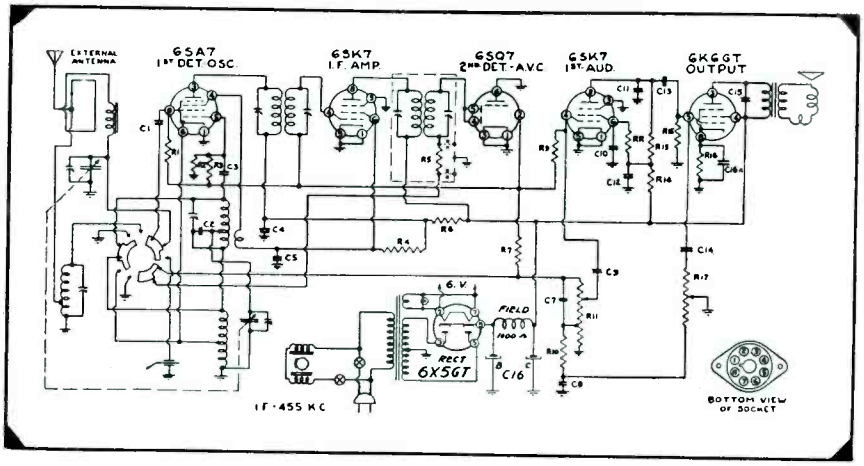


Fig. 9 (below). Admiral C6, with a remote cut-off tube in the first audio.

two different i-f channels. The inter-i-f transformer is actually an impedance coupled stage with a resistance-shunted tuned circuit for the f-m i-f and a high-Q lightly loaded circuit for the a-m i-f. The grid has no tuning. Iron cores are used in all i-f components of both channels. Decoupling filters are used in the r-f screen, converter plate, both i-f screens, second i-f plate and discriminator screen. The plate filters consist of a 2,000-ohm resistor and a .05 mfd condenser, while the grid filters have higher resistance.

This receiver also uses a degenerative system which feeds back from the voice coil to the volume control-bass tone circuit. The volume control is a complicated affair consisting of two 2-megohm units.

Admiral A10

Admiral's A10 chassis featuring pushbutton tuning and tone selection, is shown in Fig. 8. The tuning unit places different capacities across the loop and variable inductors across the oscillator grid and plate. The short-wave antenna input coil has a tap for external antenna. The coupling between the r-f and first detector is most unusual. The plate load circuit consists of an anti-resonant circuit tuned to the short-wave band, a 3,000-ohm resistor, r-f choke and 500-ohm resistor, different parts of which are used for the pushbutton tuning, broadcast and short-wave. In pushbutton position the tuned circuit is shorted. On *s-w*, the resistor is shorted, leaving the tuned circuit active. An interesting feature of this tuned circuit is the condenser, C_4, a .000785 mfd mica with 2½% tolerance. This would be a tough replacement item. One solution would be a combination of a fixed mica condenser and trimmer, say a .0005 mfd with a 300 mmfd trimmer.

Two i-f stages are used here with cathode degeneration. The interstage transformer is a high-Q iron core job with the connections tapped down. The tone control operates on the 1-megohm doubly tapped volume control and one of the push-pull grids. The phono-switch cuts the screens of both i-f and the r-f stages.

Farnsworth CK-111

The audio section of Farnsworth's model CK-111 presents some interesting design features. For instance, a 6J5 diode detector is connected to the volume control having a resistance of 3.3 megohms, through an equalizer network. The bass tone control shunts a .002 mfd condenser connected to the volume control tap. The diodes of the 6SQ7 first audio, supply initial bias to the avc bus. The phono switch

disconnects r-f, mixer and i-f screens from plus B.

Admiral C6

Fig. 9 shows Admiral chassis C6, with a low Z loop having the antenna directly connected to a tap. The low end of the loop is grounded by way of the short-wave antenna coil which provides the antenna connection. A 10-megohm resistor connecting the oscillator grid with the avc bus, provides initial bias to the avc tubes and the first audio as well. By using a remote cut-off tube (6SK7) for the first audio, avc bias controls the audio gain as well as the r-f gain. A two-way ½-megohm tone control operates from the volume control and also the output tube grid.

UNIQUE DETECTOR SYSTEMS

(See Front Cover)

THE detectors, in this series of receivers, Farnsworth CC-90, CK-91, 92 and 93, have many unusual circuit features. The first detector, for instance, is untuned, but peaked. A series plate choke, shunted by a 10,000-ohm resistor, tends to attenuate high frequencies, or favor the low. The plate load circuit, however, has a series circuit with 1,500 ohms and a choke. This network favors high frequencies. Thus the combined arrangement is a sort of band-pass filter. An *R/C* filter has been included in the mixer grid and the 6J5 separate oscillator, with grid-grid coupling.

The detector-avc circuit is most interesting, too. Two parallel circuits are used from the i-f amplifier output. The diode detector is fed, in the usual way, through the i-f transformer, whereas the avc circuit is fed through a 25 mmfd coupling condenser to one of the 6SQ7 inverter diodes and then through a 1-megohm resistor to the other diode and avc bus. An initial negative bias is provided by a 22-ohm resistance in the negative B lead, through a 2.2-megohm unit. The contact potential of the second diode augments this bias. In this way, all the cathodes of the avc fed tubes may be grounded. This includes r-f, i-f and mixer.

The phono-radio switch is shown in phono position. The 3-megohm volume control is connected to the pickup jack. An additional bias resistor is shunted across the standard 250-ohm unit and the entire B voltage bus is disconnected from the r-f and i-f section. This extends the tube life. It also raises the voltage where it is needed and eliminates the possibility of radio interference.

AUTOMATIC TUNING

(*Continued from page 8*)

self into the stator, giving sufficient shaft motion to operate the switch. Not only that, but most motors have a clutch so that the tuning operation stops instantly as the current is removed. The coasting time then has nothing to do with the tuning.

Two types of controls are used, momentary and latching. The momentary type requires that the button be held down until the tuning operation is completed. The button does not lock. In the latching type the button remains down until another button is pressed.

Motors are usually of the induction type using shading coils or a split-phase winding with a condenser. In either case, reversal is accomplished with a single pole, double throw switch. The motor voltage is useful for audio silencing. A diode rectifier in combination with a resistance/capacity filter supplies sufficient d-c blocking voltages to kill the audio, r-f and i-f amplifiers, while the motor is running. The afc must also be cut out, since it may cause the holding of a strong station several channels away instead of allowing the desired station to be tuned in.

Keeping the motor in good condition is the main servicing problem. When the insulator in the commutator becomes worn, it may be filed smooth or, better, turned down in a lathe. It is advisable to raise same if motor doesn't stop at correct spot. If the insulated segment is defective, it can be replaced easily. Discs sometimes become warped. These are easily straightened.

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WARTIME EXPEDIENTS

(*Conutined from page 12*)

be slipped into place. Usually it is not even necessary to remove the control or its connection. Formerly we used new controls on one out of four radios presented for repairs. Now we only occasionally use a control.

The repair of speaker cones, voice coils and field coils is also an important factor. These parts invariably burn out on the end of one of the leads. It the field shows an open with an ohmmeter, the cover should be carefully removed with a razor or other sharp tool. You should continue working back with the ohmmeter until the break is located. In most cases these items break within one-half inch of their outside contact. The fine broken end should be cleaned gently, and then a small wire should be soldered to it. These repair features restore thousands of hours of life to the unit. The same procedure should be followed on cone coils and i-f coils.

These makeshift arrangements are wartime procedures and obviously would not be resorted to if unlimited supplies of all types of parts were available. However, under the circumstances, we regard the use of these methods as most effective, not only as sources of revenue, since otherwise the repair of certain sets could not be undertaken, but also from a standpoint of service to the community. For it has been possible to extend the life of many receivers which otherwise might have been discarded or, at least, not used until further supplies of tubes are allocated.

Although our range of observation has been reasonably wide, there may possibly be isolated cases where, for obscure reasons, these methods may not be successful. We shall be very interested to hear the technical aspects of any such cases which may be found.

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POWER TRANSFORMER CHECKS

By T. R. CUNNINGHAM

CHECKING power transformers constitutes an important phase of servicing.

A transformer may be rated at so many volt-amperes. By taking the individual windings, and totaling the wattages, the rated power under normal working conditions can be estimater. (In some cases the manufacturer provides the exact and approximate ratings of transformers. The method is accurate enough for practical work. Having determined the power by the volt-ammeter method shown in Fig. 1 (most Service Men have a voltmeter and ammeter, but don't have a wattmeter), the rated and working powers can be compared, ignoring, of course, power factor.

If a set has something wrong with it, such as a shorted filter or even a leaky bias condenser, it will draw excessive power. This is indicated on the instruments.

A convenient ammeter scale is 0-3 amperes, but some of the midgets and universal sets draw as little as .3 or .5 ampere. In cases of intermittent operation, it is sometimes possible to have one set playing at low volume and to watch the ammeter at various times while working on still another set. The volume can be increased and the set checked, if a change in the meter reading is observed.

As for the transformer itself, there are other tests that can be made. With the secondaries opened and no load on the transformer, the only current taken from the line is the magnetizing curhent and the current prompted by losses due to hysterisis and eddy effects, copper losses. Normally, this is quite low, from 75 to 500 milliamperes, depending on the size of the transformer and the quality. In cases where the transformer has been overloaded and a burnt odor prevails, the no-load current will tell whether there are shorted turns or not. A little experience will indicate values to be expected on the ammeter. A simple way of disconnecting the rectifier filament load and high voltage load is to pull the tube. One lead to each of the other filament windings can then be opened up to take the load off the transformer when measuring primary current under no-load conditions.

To determine whether the transformer isn't overheating, we can measure the resistance of the primary

winding when cold and again measure the resistance when hot, after the set has been turned on for ½ hour. The temperature rise should not exceed 60° Centigrade according to the Underwriters rules. Temperature rise can be found using the formula,

$$T = \left(\frac{R_1}{R_2} - 1 \right) \times 235$$

where

T = rise, degrees C
R_1 = hot resistance
R_2 = cold resistance

In addition to checking the windings for continuity, the leakage resistance of each winding to core should be measured. A good transformer will have a resistance of over 20 megohms. The resistance of the primary may be quite low, ¼ to 20

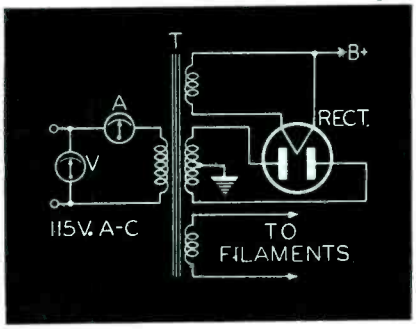

Fig. 1. Transformer check circuit.

ohms depending on the size. The high voltage secondary may have a resistance of 100 to 1,000 ohms either side of center tap. Resistance of filament windings will vary from .05 to .5 ohm, depending on the design.

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ELECTRONICS

(*Continued from page* 10)

well know, many electrical devices are suitable only for use on direct current or only on the one frequency of 60-cycle alternating current. However, as we have seen, an electron tube can function at millions of cycles a second just as well as at 60 cycles. It can do this because the myriads of electrons in the evacuated space inside the bulb can move at such enormous velocities that the frequency range mentioned above is slow compared with the time required for them to move from one electrode to another.

The second reason that electron tubes are unique is their ability to control electrical currents smoothly. Most devices that are used to vary an electric current do it step-by-step. The charge carried by each electron is so exceedingly small that the rhythmic increases and decreases of current to reproduce music or the human voice are easily, accurately, and smoothly accomplished.

The third feature is their ability to control the movement and velocity of the speeding electrons by merely changing the electrical potential of one of the electrodes inside the tube. This requires only a very small amount of electrical power. This is just another way of expressing the well-known fact that electron tubes are amplifiers and can reproduce, at a greatly increased power level, the impulses fed to them.

The fourth feature is their ability to pass current only in one direction or, as it is often expressed, to act as a rectifier.

Electron tubes are now available in an almost bewildering array of kinds and sizes and are now in use for many purposes in addition to radio. However, in all their applications, they represent that vital link in the electrical circuit where the current flowing in that circuit is no longer in a wire but rather of such a nature that it can be controlled in unique and useful ways *free from the bondage of wires.* Such is the essence of electronics.

NEWS

RCA MORSE CODE ALBUM

The International Morse Code has been incorporated in an RCA Victor six-record album.

Prepared by John N. Cose, director of instruction at the RCA Institutes, the album and accompanying booklet are designed to acquaint students with the actual sound of the Morse code letters as they would be sent over the air and to provide them with specially prepared practice transmissions which should develop the students' ability to copy regular code messages.

A novel feature of the Morse code album is the incorporation of instructions on the records themselves, with the handbook as a check on all practice messages transmitted.

* * *

FOSTER AND FREESE PROMOTED BY MAJESTIC RADIO

Dudley E. Foster has been elected vice-president in charge of engineering and Arthur W. Freese has been elected vice-president in charge of production of the Majestic Radio & Television Corporation, according to E. A. Tracey, president and general manager of the Corporation.

* * *

NEW NAME FOR WESTERN SALES MANAGERS CLUB

The Sales Managers Club, Western Group, has changed its name to the Association of Electronic Parts and Equipment Manufacturers. The present chairman is Jerome J. Kahn.

* * *

DON N. DULWEBER KILLED ACCIDENTALLY

Don Noble Dulweber, head of the Supreme Instruments Corporation, was accidentally shot and killed recently by a discharge of a shotgun which was knocked over as he opened a closet door.

Mr. Dulweber was thirty-seven years of age.

* * *

PARTS MAKERS HONOR S. N. SHURE

At its April meeting the Association of Electronic Parts and Equipment Manufacturers presented to one of its charter members and past presidents, S. N. Shure, general manager of Shure Brothers, a large decorated cake commemorating the recent Army-Navy "E" production award to that company. The presentation was made to Mr. Shure by Jerome J. Kahn, chairman of the Association.

NEW EXPORT UNIT FOR UNIVERSAL MICROPHONE

Frazar and Hansen, San Francisco, will hereafter handle foreign activities for Universal Microphone Company, Inglewood, California.

* * *

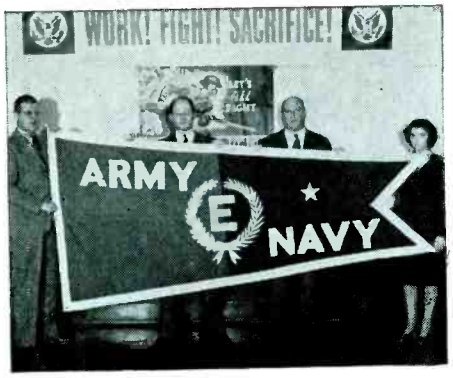
ELECTRONIC HEAT USED IN TUBE MANUFACTURE

To safeguard the operation of U. S. Signal Corps radio tubes, in the field, G. E. electronics engineers are using high-frequency induction heat to drive gases from the metal parts of the tubes, and to "explode" tiny pellets of barium inside the tubes to absorb any remaining particles of gas which may come from the metal while the tubes are in use. Such gases, if not properly exhausted during manufacture and absorbed during operation, would cause premature failure of the tubes.

The tubes are placed in a machine which first exhausts the air. As they pass around the machine, the tubes go through a series of water-cooled coils of copper tubing from which the high-frequency induction waves emanate. Although the waves do not affect the glass and other insulating parts of the tubes, when they strike the metal parts they cause them to heat and give off gases which are exhausted. The tubes then pass by another high-frequency coil which causes vaporization of the barium. This absorbs whatever gases may not have been exhausted, and provides for future absorption of small amount of gases driven from the internal metal tube parts when they are in field operation.

IRC ADDS STAR TO "E" FLAG

The International Resistance Company has been awarded a white star for its Army-Navy "E" pennant.



(From left to right) George Berry, president of Local 105 UER and MWA.; Harry Ehle, vice-president of IRC; Dan Fairbanks, IRC jobber sales manager, and Alice Flannery, union secretary, displaying the new white star on IRC's Army-Navy flag.

* * *

PARTS SALES MANAGERS TO MEET AT CHICAGO RMA CONFERENCE

A joint meeting of the members of the Sales Managers Club of the East and West will be held on the morning of June 10, at the Palmer House, Chicago, in connection with the RMA convention.

Chairman Charles Golenpaul of the Eastern group has accepted the suggestion of Ken Price, executive secretary of the Western group, that such a joint meeting be held. In view of the recent WPB Order L-265, the setting up of the Electronic Research Supply Agency, and other current problems, all sales executives in the radio parts industry are urged to be present at this joint meeting.

* * *

ONSTAD NOW THORDARSON PRESIDENT

R. E. Onstad, formerly vice president and general manager of Thordarson Electric Manufacturing Company, Chicago, has been made president and general manager following the resignation of C. H. Thordarson as president. Mr. Thordarson, who founded the company nearly a half century ago, and who is now nearly 76 years old, will continue to lend his talents to the organization as technical consultant.

L. G. Winney, former treasurer, was named vice president and treasurer, and W. R. Mahoney, formerly connected with Arthur Anderson and Company, was elected assistant treasurer.

* * *

GHIRARDI TROUBLESHOOTER'S HANDBOOK

A revised 744-page edition of Ghirardi's Radio Troubleshooter's Handbook has been published by Radio and Technical Publishing Company, 45 Astor Place, N. Y. City.

Featured are 404 pages of *case histories* giving all the common troubles and their remedies for over 4,820 receiver and automatic record changer models; a complete tabulation of i-f peaks and alignment data for practically every known superhet receiver; a complete tube characteristic and basing data chart.

In addition there are 133 additional pages containing 52 more specially prepared reference graphs, charts, tables and other compilations. Appearing are data on receiving tube types recommended for substitution, special purpose tubes, tube testing, receiver modernization, i-f transformer troubles, servicing and replacement, ballast resistors, dial lamps, coil winding, grid bias resistors, condenser replacement, transformers, etc. The price is $5 in the U.S.A.

* * *

RADIO CIRCUIT HANDBOOK

A 40-page handbook containing radio and electronic circuits with analyses, comparisons, and discussions has been published by Allied Radio Corporation, 833 West Jackson Boulevard, Chicago, Illinois.

The method of presentation was especially planned for the classroom and for home study and to serve as a guide for experimenters and builders. Fundamental principles of radio are illustrated and explained in sixteen basic circuits. The application of these principles to various components of receivers, transmitters, and other electronic units is shown in twenty-five additional circuits of conventional radio and electronic units. A schematic and pictorial diagram is shown for each unit, ranging from simple one-tube sets to superheterodynes. Cost is ten cents a copy.

* * *

PHILCO TRAINING SCHOOL BOOK

The story of the training and installation division of Philco Corporation for the U. S. Army Signal Corps is told in a brochure just released by Philco. This unusual school provides instruction to enlisted and civilian personnel in the operation, maintenance and repair of airborne electronic and communications equipment.

(*Continued on page* 30)

THE MAINTENANCE OF VOLUME CONTROLS

By BARRY KASSIN

Assistant Editor

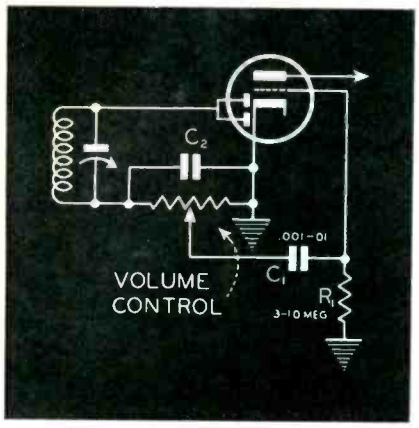


Fig. 1. Volume control in diode circuit where noise is common.

TODAY, one of the major problems is . . . can the item be replaced?

The Service Man can and must use his ingenuity to help overcome any parts shortage. Old practices of discarding parts because of minor defects or because to repair them would take too long or be too troublesome can no longer be countenanced. Conservation and preservation are the orders of the day. Practicability, however, need not be sacrificed or overlooked.

Solutions

There is no cure-all for the problem, but there is an effective partial solution.

The procedure to be followed is threefold. First, repair where possible; second, if repair is useless, interchange; third, salvage for replacement.

To illustrate the first step, let us take the case of noisy elements in a defective volume control. The contact arm and element can be cleaned with carbon *tet* and then the noisy section can be covered with soft grapite pencil or aquadag (conductive carbon paint). This frequently corrects the defect.

Then again in some cases the noise from the defective control will be eliminated by bending the contact spring. Applying this additional pressure, and also cleaning the surface of the spring that rubs the resistance element, using a fine sand-paper, will help solve the problem. It is also advisable to clean the surface that makes contact with the spring.

The interchange of parts is not entirely new. It has not however been, as it now should be, universal. Nor has this practice been as refined as is now necessary. Since the second step in the recommended procedure ties in with the third, the illustrations used are to be applied to both.

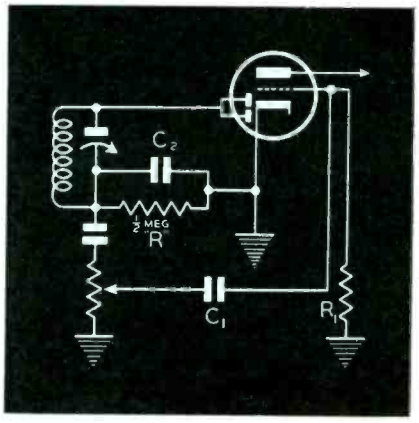


Fig. 2. Circuit changes of Fig. 1 to eliminate noise problems.

Defective volume controls that have noisy elements may be corrected by replacing the element, keeping the same shaft length, mounting bushing and switch, if one is used as on the defective receiver. The remaining useful component parts of the volume control from which the element has been removed, must not be discarded. Junk? No, salvage.

The switch from the old control may be used to replace a defective switch on another control.

The shaft and bushing can undoubtedly be used to replace one that is too short. The case may also be used to house similar type controls. If the replacement control has too short a shaft, an ideal extension can be made by flattening the shaft on one side and bending another flattened salvaged shaft and soldering. If more convenient, a shaft can be extended by soldering a sleeve to the shaft filled with solder.

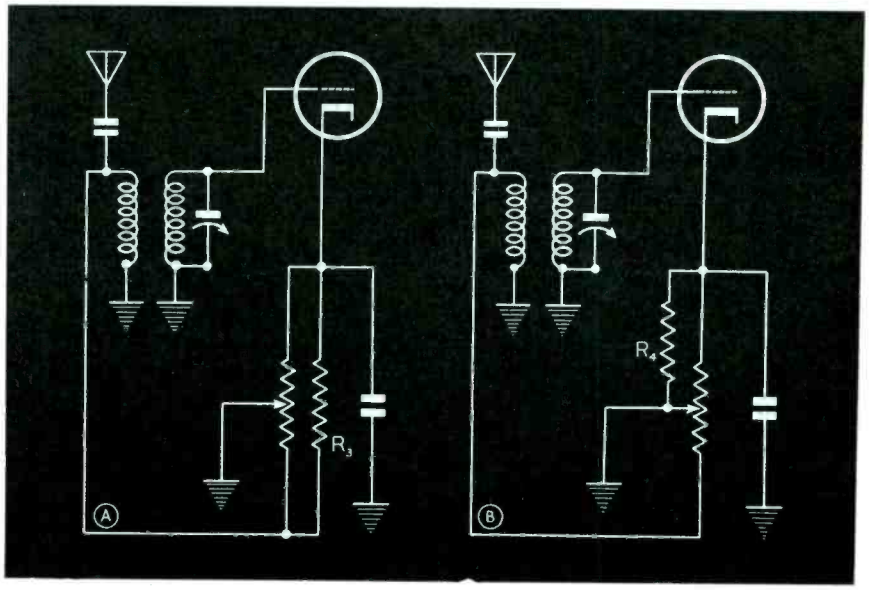
Controls in diode circuits also become noisy since there is a d-c voltage drop across the control and some contact noise is thereby developed, (Fig. 1).

Noise may be eliminated by changing to the circuit shown in Figure 2. The d-c diode voltage is no longer in the control, but now is in the *R* ½-megohm resistor.

In Fig. 2 the volume control must still be isolated from the grid by C_1 because the cathode of the tube is grounded or connected to B —.

By eliminating the combination of C_1 and R_1, the volume control feeds the grid and when set at a low volume

Fig. 4. By shunting the control, or using a high value volume control, it is possible to use control to reduce bias and remove shunting effect of primary, as shown in Fig. 3.



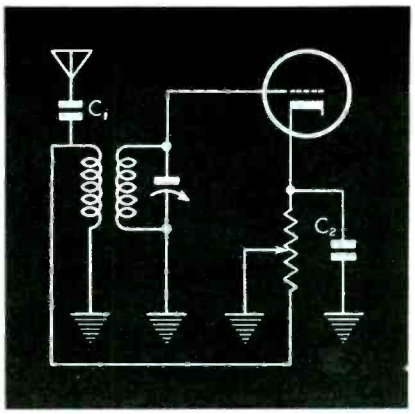


Fig. 3. Dual purpose v-c system; reducing bias and removing shunting effect of antenna primary.

there is very little resistance from the grid to the ground. The result of this is that practically no negative voltage is applied to the grid and consequently distortion will occur.

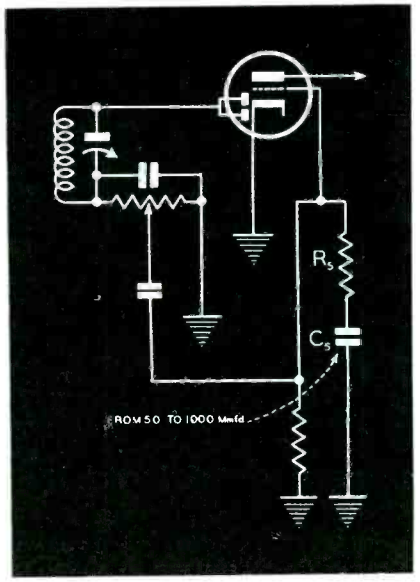
Fig. 3 demonstrates the volume control circuit used in the majority of a-c/d-c t-r-f sets. In this type circuit, the function of the volume control is to serve as a dual purpose unit. The control when tuned to its maximum volume will remove the shunting effect of the antenna primary and furthermore will reduce the bias on the tube.

The resistance of these controls are fairly critical.

In practicing the process of interchange, it may be possible to obtain a satisfactory result by employing not only an exchange of parts, but also some circuit variations.

The same result as shown by Fig. 3 may be obtained by using controls of higher ohmage, if found in stock, by either shunting the control (R_3), or by varying the circuits as shown in Fig. 4.

Fig. 5. Obtaining necessary bass control by adding shunt capacitor.



If the replacement control lacks a stop, and a certain value of resistance must remain in the circuit for the purpose of keeping a residual bias on the r-f tube with the arm at maximum, an external resistance of 250 to 500 ohms may be substituted. A ¼-watt resistor may be used since very little power is dissipated in this type resistor.

Where bass compensation is used, a tap, either one or several, may be used with resistors and condensers connected to these taps so that the tone quality will be compensated at different positions of the volume control setting. In the event difficulty is encountered in procuring these tapped units, compensation at low levels (where compensation is primarily needed) may be obtained by connecting a shunt capacitor such as C_5 in Fig. 5. It is also possible to govern the degree of compensation by the size of the C_5 and resistor R_5 combination.

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Our country is at war. On the home-front, it is your obligation, small enough surely, to keep your industry functioning smoothly "for the duration."

NEWS

(*Continued from page 27*)

SOLAR STANDARIZED CAPACITORS CATALOG

New catalogs V-1 and V-2, with complete listings, technical data and illustrations of standardized capacitors, have been issued by Solar Capacitor Sales Corporation, Bayonne, New Jersey.

* * *

NEW OFFICERS AT ZENITH

G. E. Gustafson was elected vice president in charge of engineering, of Zenith Radio Corporation. Others elected to new posts were R. D. Burnet, secretary; Karl E. Hassel, assistant vice president, and J. E. Brown, also an assistant vice president.

* * *

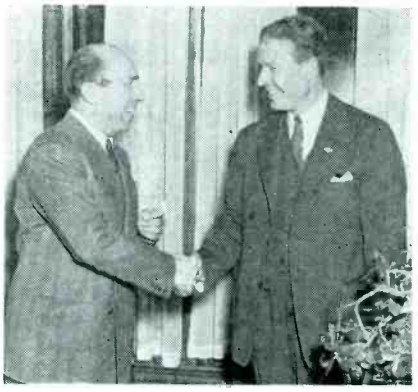
SYLVANIA BULLETIN ON 28D7 TUBES

A new bulletin covering the operation of 28D7 tubes with data on the use of this tube with transformer coupling, has been released by Sylvania Electric Products, Inc., Emporium, Pa.

The 28D7 is a double beam power tube.

* * *

AT SPRAGUE'S "E" DAY



R. C. Sprague (right), president of the Sprague Specialties Company, and sales manager Harry Kalker, of the Sprague Products Company, North Adams, Mass., extending mutual felicitations on the occasion of the presentation of the Army-Navy "E" award to Sprague early in April.

* * *

IRC ANNOUNCES WINNERS OF *HERE'S HOW* VOLUME CONTROL CONTEST

The ingenuity of America's Service Men was proven, when in response to International Resistance Company's *Here's How* Volume Control Contest, hundreds of replies embodying original ideas were received.

Left to right: Jesse Marsten, Joseph Kaufman, William Moulic, and E. E. Johnson, who assisted the judges studying the IRC contest suggestions.

After a prolonged session, awards were made to James G. Rapp, Freeport, N. Y.; Wilbur Pelham, New Harmony, Ind.; E. Pat Shultz, North Hollywood, Cal.; Carl W. Concelman, Brielle, N. J.; Ray Pentecost, Chicago, Ill. Each was notified that he had won a U. S. War Bond of $100 denomination.

The judges were Joseph Kaufman, National Radio Institute; William Moulic, Radio Retailing Today, and IRC's chief engineer, Jesse Marsten.

Mechanical repairs suggested fell mainly in the category of using the old shaft and adapting it through the use of specially devised couplings. Another group in this classification appeared to make out well by making use of parts from old controls in their stocks.

Electrical repairs were effected chiefly through changing the original circuits. The outstanding case of this type of repair was the substitution of a single control for a dual type by means of a simple circuit change. A dual control, one section of which had been used to control screen voltage and the other to control antenna input, was replaced by a single control in the cathode and antenna circuit. In another instance a dual control was used to obtain tone compensation and the dual unit was replaced by a single control with tap for tone compensation, using proper electrical constants in the compensation circuit.

The International Resistance Company is planning to make the best of the solutions available at an early date to all radio Service Men.

WHEN YOU CHANGE YOUR ADDRESS

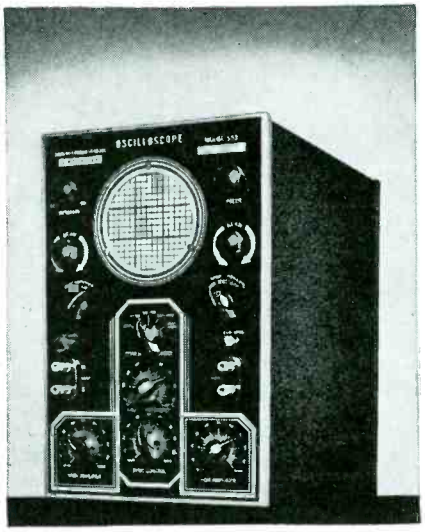
Be sure to notify the Subscription Department of SERVICE at 19 E. Forty-seventh St., New York City, giving the old as well as the new address, and do this at least four weeks in advance. The Post Office Department does not forward magazines unless you pay additional postage, and we cannot duplicate copies mailed to the old address. We ask your cooperation.

NEW PRODUCTS

RCP 3" OSCILLOSCOPE

A 3" cathode-ray oscilloscope, model 553, has been announced by the Radio City Products Co., Inc., 127 West 26th Street, New York City.

All controls and terminals are located on the front panel. Switching arrangement permits applying input either directly to deflection plates or to input of the amplifier. Position and stable locking of the image can be obtained with either the vertical signal or any external signal. The high gain amplifiers use



television tubes for maximum sensitivity.

Input impedance through either amplifier is .5 megohm, 20 mmfd; without amplifier, it is 2.2 megohms, 40 mmfd.

Deflection sensitivity through either amplifier (max. gain) is .6 rms per inch; without amplifier, it is 35 rms per inch.

Amplifier frequency response is ± 3 db from 20 to 100,000 cycles. In the linear time base, the frequency range is from 15 to 22,000 cycles.

There are six binding posts on the 553 oscilloscope. Two marked *Vertical* are for the introduction of voltages for vertical deflection, while the two marked *Horizontal* accommodate the voltages for horizontal deflection. The binding post marked *Ext-Sync* accommodates the external synchronizing voltage.

PRECISION COIL-TURN COUNTER

An improved coil-turn counter for laboratory or factory use in determining the number of turns in wound electric coils has been announced by G. E. The counter is capable of checking or determining the effective turns of coils ranging from 1 to 11,110 turns, at a rate of from 80 to 100 coils of like specifications per hour.

In addition to the magnetizing current control box, the new coil-turn counter comprises a portable light beam galvanometer, two yoked test rods, a galvanometer control panel, and a foot-operated switch—all conveniently assembled for operation on a table or bench.

The operation of the counter is simple. The coil to be tested is placed over the test rod and connected to test clips. The dials on the galvanometer control panel are set to the number of turns the coil should have, and the foot switch is pressed. If the galvanometer dial shows a deflection, the dial readings are increased or decreased until the deflection is zero. The dial reading is then the number of turns. When the probable number of turns in a coil is not known, a trial reading is taken and the dial is adjusted until the reading is zero on the galvanometer.

The magnetizing circuit is designed to operate from a 120-volt direct-current supply when used with a resistor furnished as part of the control box, or from a 20-volt storage battery without a resistor.

The accuracy of the counter is one turn in a thousand for coils having air cores at least ⅝ inch in diameter, an outside diameter of 8 inches and less, a coil build-up to 2⅝ inches, and up to 6 inches in height. Accuracy is not as high for coils outside these limits.

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GARNER FREQUENCY METERS

Four new models of the *Telrad* line of frequency meters have been announced by Fred E. Garner Company, 43 East Ohio Street, Chicago, Ill. All models are crystal-controlled. Frequency carrier signals are provided every 10 kc and every 100 kc from one hundred cycles to forty-five megacycles. A carrier signal is also produced every 1,000 kc from one megacycle to one-hundred-twenty megacycles.

Special models designed for use under adverse conditions are available equipped with two precision crystals that have been ground to produce exact frequencies of 100 and 1,000 kc.

Models are available for either a-c or portable battery operation.

JOTS & FLASHES

CONGRATULATIONS to Oden F. Jester, sales director of Utah Radio Products Co., elected to vice-president post . . . ditto to Karl A. Kopetzky elected vice-president of Oxford-Tartak Radio Corp. . . . still another new vice-president, Roy S. Laird, sales manager of Ohmite. . . . Requests for free ads in Sprague Trading Post included one addressed to North Atoms, Mass. . . . Atoms are the Sprague Midget Dry Electrolytics . . . factory is located in North Adams. Corporate name of Stromberg-Carlson Telephone Mfg. Co. shortened to Stromberg-Carlson Co. . . . Bud Welsh, formerly counterman for J. V. Duncombe Co., National Union Distributors in Erie, Pa., was first American soldier to land a jeep on Libyan soil. . . . Orchids to employees of Belmont Radio Corp., Chicago, for contributing nearly 1,000 pints of blood to the Red Cross. . . . Belmont won the White Star to be added to their Army-Navy Production Award flag. . . . The same high achievement attained by Hallicrafters. . . . Raytheon Mfg. Co. of Newton and Waltham, Mass., wins Army-Navy "E" for excellence in production . . . ditto Shure Bros. of Chiago . . . Ward-Leonard Electric Co. of Mt. Vernon, N. Y. . . . Driver-Harris Co. of Harrison, N. J. . . . and Hawley Products Co. of St. Charles, Ill. . . . "Pat" Shea appointed Chicago district manager by Henry L. Crowley & Co., Inc., manufacturers of Crolite products. . . . Earl S. Patch appointed sales manager of same company. . . . Rose Hilliard made director of priorities for Victor J. Andrew Co. of Chicago. . . . Sorry to report death of George E. Deming, vice-president and secretary of Philco Corp. . . . Philco reports that James T. Buckley has been named Chairman of the executive committee and John Ballantyne made president of the company. . . . Karl Mautz promoted to post of purchasing agent of Universal Microphone Co., Inglewood, Calif. . . . Hope all you Service Men are continuing to buy plenty of War Bonds, as well as contributing your much needed scrap to the war program . . . not one of us can afford to slacken our efforts in the slightest. . . . Guardian Electric offices moved to 1400 W. Washington Blvd., Chicago. . . . Don H. Burcham, 917 S. W. Oak St., Portland, Ore., appointed jobber and industrial sales rep for Pacific Northwest by Standard Transformer Corp. . . . Frederick R. Lack elected a vice-president by Western Electric.—P. S. W.

ADVERTISERS IN THIS ISSUE

SERVICE—MAY, 1943

SOLAR CAPACITOR SALES Corp., BAYONNE, N. J.

Sole National Distributors of Solar Capacitors to the Jobbing Trade

WORLDS CONQUER!

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Under the guidance of highly skilled operators, the finest precision machines are employed to insure uniform high quality in all National Union tubes. In this photograph a bending machine in the Stem Department is shown doing its war job of helping to provide this year the largest number of the finest electronic tubes National Union has ever built.

Sure, winning the War is our big job right now. To that end we here at National Union are exerting our every thought and energy—both on our production lines and in our research laboratories. But after the war—what then? For you as a service man the post war outlook is especially promising. Countless new peacetime products will emerge from today's ever increasing use of electronic tubes to help win the war. New applications of electronics in the home will add new and profitable service activities to your already established business. From radio technician you will expand to become your community's "electronician." And National Union will have ready for you the tubes, the test equipment and a plan of action to help you make the most of this great new opportunity.

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