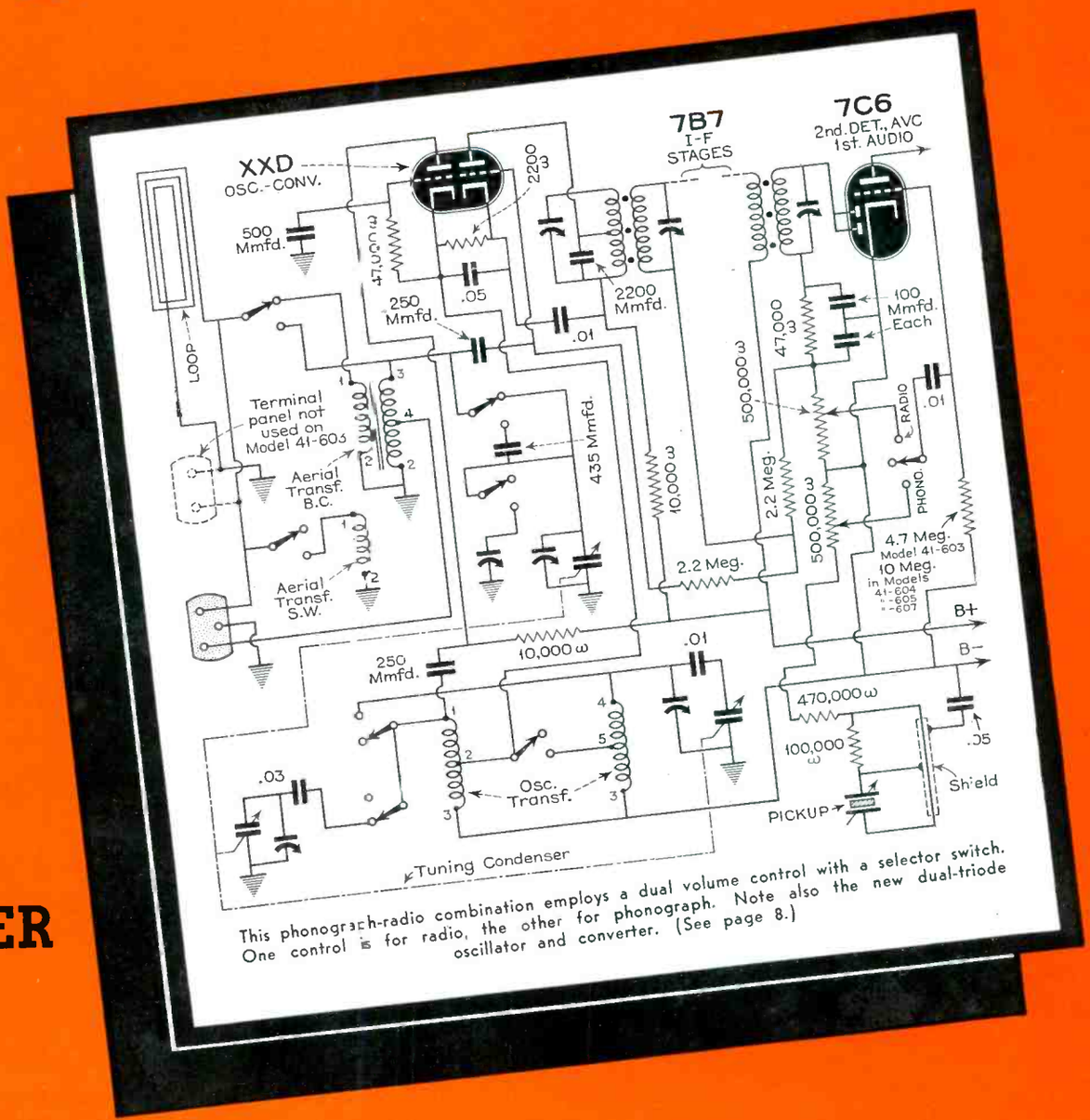
A MONTHLY DIGEST OF RADIO AND ALLIED MAINTENANCE

SERVICE



This phonograph-radio combination employs a dual volume control with a selector switch. One control is for radio, the other for phonograph. Note also the new dual-triode oscillator and converter. (See page 8.)

OCTOBER
1940

RADIO — TELEVISION

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The Mallory line of Replacement Condensers gives you a host of tangible economies and consequently an opportunity for better profits. The complete line has been specifically developed around an exhaustive study of *all* types used in original equipment. You can be sure of exact replacements for every need . . . on any radio you may be called upon to service.

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5 NEW HIGH FIDELITY EXTENDED RANGE REPRODUCERS WITH Bass Reflex

2 Models are with New Type J Dual Loud Speaker and Frequency Dividing Network. 2 Models with PM12-CT, 12" Loud Speaker. 1 Model with PM8-CT 8" Loud Speaker.

All with BASS REFLEX. Dealer price range, complete Reproducers, $17.70 to $56.55*... All Loud Speakers are Permanent Magnet ... All Loud Speakers are available separately... All Cabinets are available separately.

With the advent of Frequency Modulation in addition to the amazing interest everywhere in the reproduction of sound at High Fidelity there is a demand for these new products. Foresight together with Jensen engineering skill and facilities made these products possible. Write at once for Catalog No. 119; note the scope and wide price range of this new line and observe that each product is characteristically Jensen in every detail of performance ability, appearance and value. Jensen Radio Mfg. Co., 660 South Laramie Ave., Chicago. (cable address JERAD, Chicago)
*Dealer price, Loud Speakers only, from $5.40 to $27.90.

Jensen High Fidelity REPRODUCERS

VOL. 9, NO. 10 - OCTOBER, 1940

SERVICE

ROBERT G. HERZOG, Editor

A Monthly Digest of Radio and Allied Maintenance

Reg. U. S. Patent Office

CONGRESS has just appropriated 60 million dollars (in addition to the 50 millions last June) for the continuation of the Emergency Training Program for National Defense. The purpose of the program is to provide a large number of skilled mechanics as soon as possible for defense industries. Young men throughout the country are urged to take advantage of the program to become more proficient in their trade.

Radio ranks high on the list of defense industries. Hundreds of teachers of radio theory, servicing and code have been appointed and classes formed; many have been under way for months. This opportunity has been created for those who are not up to snuff on the basic fundamentals of their trade.

Go back to school a few nights a week and brush up on some of the things which you have previously overlooked, under the guidance of carefully chosen instructors!

◆

"IN the midst of stress and strain at home and abroad . . . a Presidential campaign . . . and the start of the football season, let us not forget that, this year, radio is twenty years old.

" . . . This anniversary is important. In the national emergency through which we are now passing, it is important that the public understand and appreciate the blessings of a free radio, parallel to a free press, free worship and free assembly." . . . *From a personal message by Neville Miller, president, National Association of Broadcasters to all broadcasters.*

And the whole industry is cooperating with the National Association of Broadcasters, the Radio Manufacturers' Association and the Radio Servicemen of America to celebrate Radio's Twentieth Birthday with a twenty-day party from November 11 to 30, inclusive.

◆

A SURVEY conducted by FM Broadcasters, Inc., in the past few weeks reveals that a considerable assortment of f-m receivers, most of them combination types providing both a-m and f-m reception, are to be produced by at least 14 manufacturers. Prices of these combinations range as low as $75.

The 14 manufacturers include Ansley, Emerson, Farnsworth, Freed-Eiseman, General Electric, Hallicrafters, Hammarlund, National, Philharmonic, Pilot, Scott, Stewart-Warner, Stromberg-Carlson, and Zenith.

◆

RADIOLA is back! A complete line of small receivers, manufactured by RCA, is designed especially for the Service Man to sell. A representative set manufacturer has become cognizant of the Service Man as a practical sales outlet for thousands of extra sets and is directing a sales campaign specifically to these channels.

With prevailing interest in events from abroad, the football season at its peak, election campaigns rampant, and the Christmas selling season just around the corner, wideawake Service Men can amplify their earnings plenty by pushing the sale of Radiolas.

BRYAN S. DAVIS, *President*

JAS. A. WALKER, *Secretary*

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Telephone: Wabash 1903

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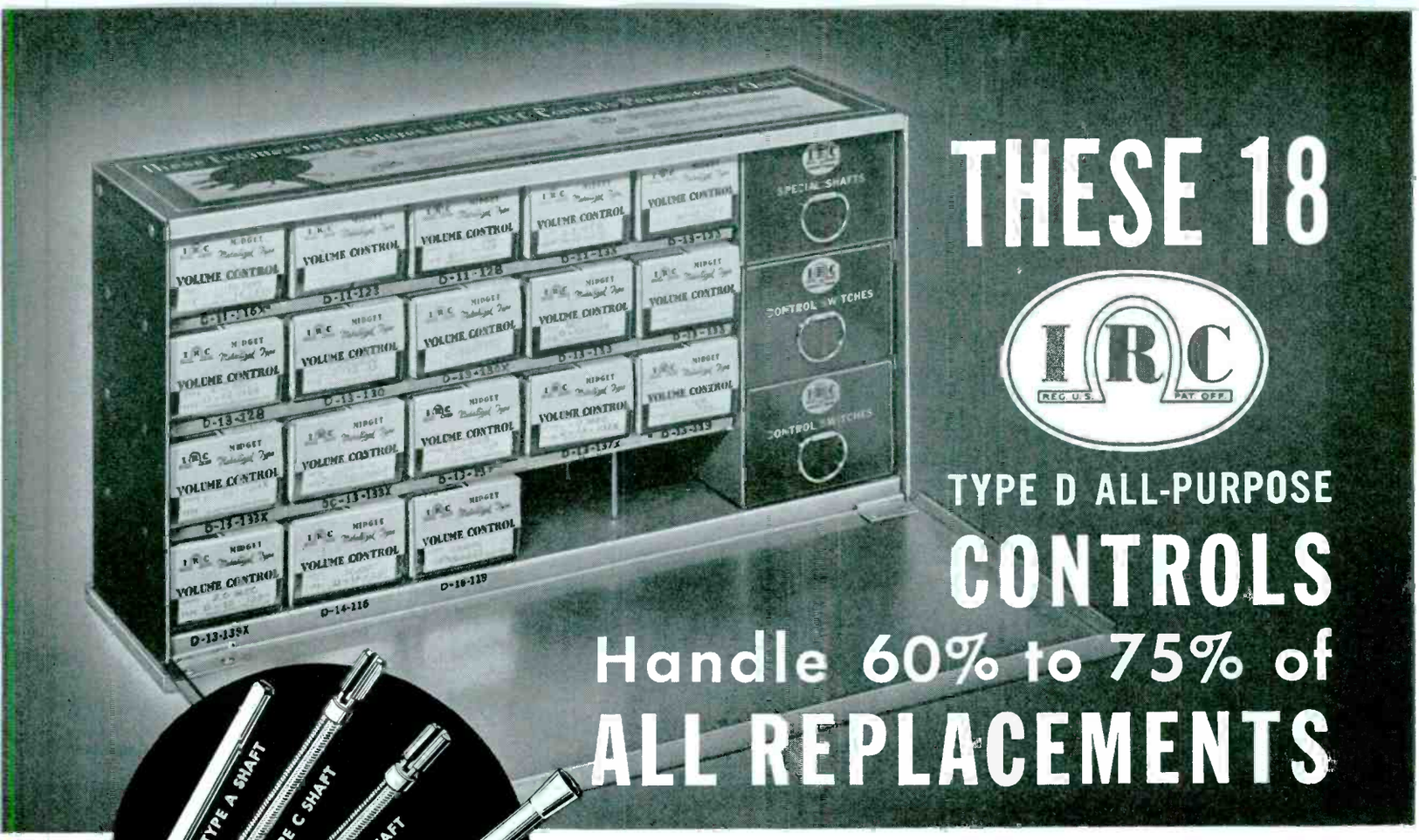

THESE 18

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TYPE D ALL-PURPOSE CONTROLS

Handle 60% to 75% of ALL REPLACEMENTS

TAP-IN SHAFTS *Stay Put!*

Type D All-Purpose Controls are exact reproductions of the larger IRC Type CS Controls, with exactly the same design, exactly the same features and with the added convenience of Tap-in Shafts.

Just pick the control you need, select the proper shaft, tap it into position in the cone-shaped control receptacle following simple instructions enclosed with each control, and the job is done. The shaft won't pull or vibrate loose—and you're sure the quality of the control is the highest money can buy.

HERE IS WHAT YOU GET!

The IRC Master Radiotrician's Cabinet is factory-packed with the following 18 Type D All-Purpose Controls, switches and special shafts of the most popular types shown by records to be capable of handling the big majority of all control replacements.

IRC Control Type No.	Resistance	Purpose
2—D13-133	500,000	A
1—D11-116	10,000	B
1—D11-123	50,000	C
1—D11-128	100,000	C
1—D11-133	500,000	C
1—D13-123	50,000	D
1—D13-128	100,000	A
1—D13-130	250,000	A
1—D13-130 X	250,000	E
1—D13-133 X	500,000	F
1—DC13-133 X	500,000	G
1—D13-137	1.0	A
1—D13-137 X	1.0	F
1—D13-139	2.0	A
1—D13-139 X	2.0	F
1—D14-116	10,000	H
1—D16-119	20,000	B

A—Tone or Audio Circuit Control
B—Antenna Grid Bias Control
C—Potentiometer Voltage Divider
D—Tone Control
E—Tapped for A. V. C.
F—Tapped for Tone Compensation
G—Friction Clutch Auto Radio Type
H—Antenna Grid Bias of 2 Tubes

Switches: 5—No. 41 S.P.S.T.; 1—No. 42 D.P.S.T.
Shafts: 1—Type B Auto Radio; 2—Type C with slotted, knurled terminals; 2—Type D with slotted, unknurled terminals.

Dealer Net on above controls, 6 switches, 5 shafts . . . $14.97

THE CABINET IS INCLUDED *FREE!*

USE THIS HANDY ORDER FORM

...The All-Metal Cabinet is Included—AT NO EXTRA COST!

Now, for the *first* time, you can purchase a stock of only 18 Controls, 6 switches and 5 special, extra shafts . . . and be prepared for quick, efficient service on more than two-thirds of the radios you are called upon to repair!

You save time, because it is no longer necessary to order a control every time you need one! You simplify installations because IRC Type D All-Purpose Controls with their Tap-in Shafts are easier to install and can be used universally to replace midget size or larger, old-style controls! You save money—and you assure your customer of a first-class job!

Best of all, you pay only the standard price for the controls, switches and shafts. The handy new IRC Master Radiotrician's Control Cabinet, as illustrated, is included with your purchase at not one cent of extra cost.

The Cabinet itself is of all-metal construction. Attractively decorated, it is an asset to the appearance of your shop. It is 14½" x 7⅛" x 4", weighs approx. 6 lbs. complete. IRC Control numbers are marked underneath each compartment so you can tell at a glance just what values should be reordered to keep your stock complete. Three drawers supply ample space for shafts, switches or other spare parts. Front metal cover snaps securely shut for carrying, or may be removed when Kit is used in your shop. The regular net price of the 18 Controls, 6 switches and 5 special, extra shafts is $14.97—and the Cabinet is included for not one cent extra!

INTERNATIONAL RESISTANCE CO.

401 N. BROAD ST., PHILADELPHIA, PA.

Attached is $14.97, ☐ check, ☐ money order (☐ or send C.O.D.) one IRC Master Radiotrician's Control Cabinet complete with the 18 Type D All-Purpose Controls, 6 switches and 5 Tap-in Extra Shafts as described. It is understood that, if this does not meet my full approval, I can return it in good condition for full credit within 5 days.

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RADIO

SERVICE
A Monthly Digest of Radio and Allied Maintenance

TELEVISION

HEARING AIDS

By ROBERT G. HERZOG
EDITOR

HEARING-AID amplifiers are older than radio. In the early days of the vacuum-tube repeater they were used on telephones to assist the partially deaf in hearing telephone conversations. Carbon-button microphones with button amplifiers were also used, and still are used, as portable lapel hearing aids.

With the advances in tube and microphone design, however, hearing aid amplifiers have been greatly improved. Wearable battery-operated amplifiers as well as all electric aids are obtainable for every type of installation. These modern aids are not only cheaper, but are more compact, have higher and more faithful amplification, less background noise, are more dependable and last longer than their earlier counterparts.

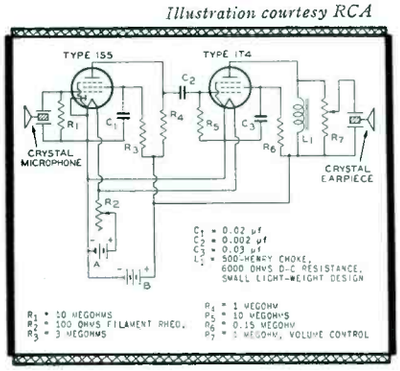
In the home, at the office, on the street, in the theatre, church, or opera the partially deaf need no longer have difficulty in hearing—no more than a myopic individual need do without the convenience of glasses.

In speaking before the Society of Motion Picture Engineers, recently, W. C. Beasley, of the National Institute of Health, United States Public Health Service, declared that only 5 percent of all Americans sufficiently deafened to derive benefit through hearing aids, actually use them. He based his conclusions on data obtained from 9,000 patients examined in 17 clinics in 12 cities. Mr. Beasley further declared that hearing aids are used three times as often by women as by men because of different types of deafness which affect the two sexes.

Most women, he found, have conductive deafness, with a large amount of relatively uniform hearing loss of air borne sounds, with practically no loss for sounds conducted through the bones of the skull. On the other hand, most men have progressive nerve deafness, which involves large amounts of loss by either air or bone conduction on tones below 500 cycles. Thus there is an intricate problem of relationship between the nature of hearing loss and the possibilities of improving the hearing for the deafened through improvement in the design of hearing aids.

Fig. 1. The recently introduced seven-pin miniature tubes are quite well suited for use in hearing-aid amplifiers which employ an air-conduction earpiece. Sufficient gain and output can be obtained by employing a 1S5 followed by a 1T4.

Illustration courtesy RCA



Service

At the present moment, most manufacturers of hearing-aid units recommend the return of the equipment for service. Many give a full year's guarantee; several give two years. In every case these guarantees are supposedly voided if the unit is subjected to "tampering."

Actually, except for the problem of tube testing, there is little in the hearing-aid amplifier that presents difficulty to the really first class Service Man. After all, a customer who is deaf cannot be without the hearing-aid unit for a period of several weeks (and this is the minimum time required for factory service) while the instrument is traveling from one part of the country to the other. Sooner or later the manufacturers must realize, much the same as the radio receiver manufacturers have, that the sales of their products will skyrocket only when they can assure their customers of continuous operation. Immediate service is the foremost consideration to such an assurance. Adequate distribution of their service literature with the purpose of enabling every good Service Man to do a real job of servicing the instruments is the only alternative to a costly program of factory service branches. . . . We say again, sooner or later the manufacturers must make it easy for the Service Man to repair this type of equipment, if they expect to keep selling it.

Circuits

The recently introduced seven-pin miniature tubes are quite well suited for use in a hearing-aid amplifier which employs an air-conduction earpiece; sufficient gain and power output for such a unit can be provided by two miniature voltage-amplifier tubes drawing a total filament current of 100 ma.[1]

Tests have shown that the best miniature-tube complement for an air-conduction hearing aid is a 1S5 followed by

[1]RCA Application Note No. 107, Copyright RCA Manufacturing Co., Inc., 1940.

a 1T4. The 1T4 is desirable for use in the second stage because it can provide more power output than the 1S5; the 1S5 is desirable in the first stage because it can provide more gain than the 1T4. A circuit using this tube complement is shown in Fig. 1.

It was found desirable to use choke coupling, rather than resistance coupling, for the output of the 1T4 in this circuit. With resistance coupling, the voltage at the plate of the 1T4 was so low that the gain and output of the 1T4 were inadequate. Suitable chokes, small enough and light enough for use in a wearable hearing aid, are commercially available.

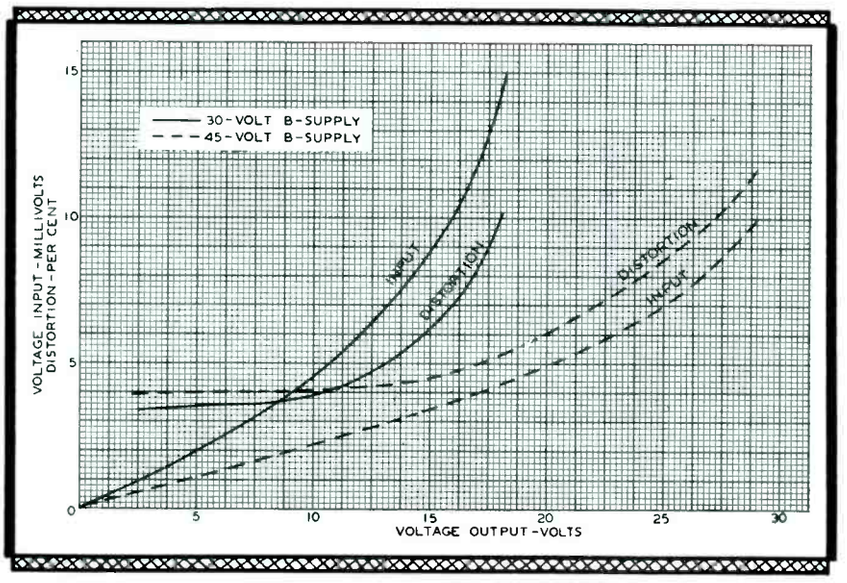
The filament rheostat (R_2) is the battery saver frequently used in hearing aids. This rheostat should be set so that filament current is at the lowest value providing adequate signal output. It is possible to use the rheostat as the volume control and thus to eliminate potentiometer R_7. However, volume can be controlled more smoothly by means of R_7 than by means of R_2. It is not advisable to insert a volume-control potentiometer in place of R_1 or R_5 because suitable potentiometers having a resistance as high as 10 megohms are not generally available. A resistance of less than 10 megohms for R_1 or R_5 would reduce the circuit's sensitivity.

Fig. 2 shows the performance of the circuit with a 45-volt, and with a 30-volt B-supply. These curves were measured at a signal frequency of 420 cycles. The capacitance of the earpiece was 0.0015 mfd. It can be seen from Fig. 2 that, with a 45-volt supply, a 5-millivolt signal from the microphone produces an output voltage of 20 volts across the earpiece with 6% distortion. This output voltage is large enough for most people who use an air-conduction unit. With a 30-volt supply, a 5-millivolt signal produces approximately 10-volts output with 4% distortion. This output voltage is large enough for many people whose hearing loss is not severe. The total plate and screen current drain by the circuit from a 45-volt supply is approximately 0.6 ma; from a 30-volt supply, the drain is approximately 0.4 ma. At these low drains, good life can be obtained from a very small B battery.

In the circuit shown in Fig. 3 the filaments are in series and the grids are grounded as is one side of the filament line. In this way the second stage obtains a volt and a half bias due to the voltage drop across the first tube. The output stage receives a three-volt bias due to the voltage drop across the first two tubes. Amplifiers which employ parallel filament circuits must use a bias cell to obtain bias for the output tube.

The power output of an amplifier of this type is on the order of 10 milliwatts and the plate potential is 30 volts. While this is relatively low power, it is sufficient for the purpose because of the availability of highly efficient earphones.

Fig. 2. The curves shown below indicate the performance of the hearing aid amplifier whose circuit is given in Fig. 1. Operation with 30- and with 45-volt plate supply is plotted.



Problems

The hearing-aid amplifier is really more than a high-gain two or three stage unit employing either resistance coupling or impedance coupling. Because of the low battery voltages employed, usually 30 volts on the plate, it is necessary that every component in the unit be of the highest quality and be permanent in value. Likewise the tubes must be of the highest possible quality.

In the amplifier circuits shown (Figs. 1 and 3) the resistors have extremely high values. With such high values it can readily be appreciated that leakage is a very important factor and that the presence of such may easily render the amplifier inoperative.

In the manufacture of tubes for hearing-aid amplifiers the shrinkage (tubes discarded because they do not measure up to standard) is many times greater than on receiving tubes, chiefly because of the extremely rigid limits imposed by the nature of the application.

For this reason, ordinary tube testing methods are usually useless. It has been general experience that the only reliable method of checking the tubes is in the circuit in which they are used. It is the opinion of one of the manufacturers of these types of tubes that some of the testers which provided sockets for testing such tubes actually ruin the tubes. While the characteristics are of interest, they are not of much help in servicing because individual tube readings vary over extremely wide limits.

Many hearing-aid amplifiers employ tubes without bases and it is necessary that these be wired directly into the circuit. Extreme care must be used in cutting, bending and soldering the leads so that no strain is placed on the glass seal.

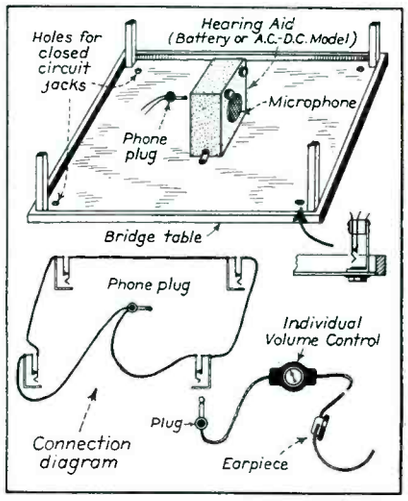


Fig. 4. The loan of equipment, similar to that shown, to assist a group of partially deaf people in enjoying an evening of bridge can often be used as the entering wedge for the sale of units to everyone in the group.

Accessories

In small communities, where each individual and his intricacies are known, the partially deaf may be located by judicious questioning. Sales pressure must be tactful and is usually best in the form of printed matter, skillfully worded.

In larger communities hard of hearing individuals often form clubs or leagues

The names and addresses of the members of these leagues can be obtained from the secretary and used for direct to the customer mail advertising.

Often the hard of hearing congregate in groups and spend much of their time playing bridge or in similar forms of entertainment. A bridge table, connected in the manner shown in Fig. 4, will prove a convenient accessory to the complete enjoyment of the game. The loan of such equipment for an evening may provide the entering wedge that may result in the sale, not only of a similar unit, but also of hearing-aid amplifiers to members of the group.

A single desk or portable amplifier can be used in the circuit shown, with a separate jack in each corner of the table for each player. The jack is so connected that the dummy position (or any other position) may remove his earpiece without interrupting the functioning or disturbing the volume level for the remaining players. Individual control of the volume level at each earpiece is, of course, essential in such installations. Similarly interconnected jackboxes can be constructed in the form of ashtrays, chip holders, etc., for the multiple earphone connection to a single amplifier.

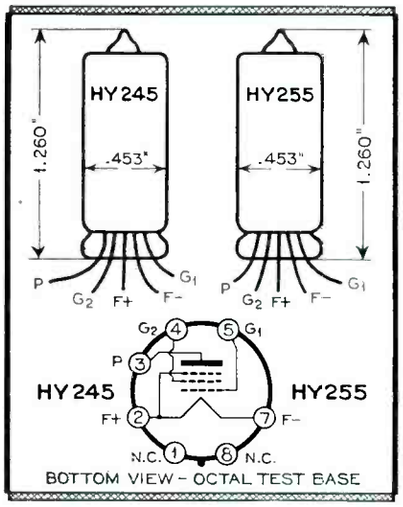


Fig. 5. Manufacturers of hearing aids generally solder the tube connections directly into the circuit. Replacement tubes are supplied with a standard octal base, however, for test purposes.

Tube Characteristics

The HY165 is a power output pentode designed specifically for use in wearable hearing aids where high-power sensitivity is of extreme importance. It may or may not be interchangeable with the HY155 tube, depending upon the nature and value of the plate load impedance.

Ratings and Characteristics

Filament	1.4 v
Filament current	0.05 amp
Plate potential	45 v
Screen potential	45 v
Grid bias	—3 v
Average plate current	1.39 ma
Typical variations[1]	1.25 to 1.6 ma
Average screen current	0.28 ma
Typical variations[1]	0.24 to 0.34 ma
Average amplification factor	145
Typical variations[1]	125 to 155
Average plate resistance	375,000
Typical variations[1]	320,000 to 450,000
Average mutual conductance	445
Typical variations[1]	400 to 500

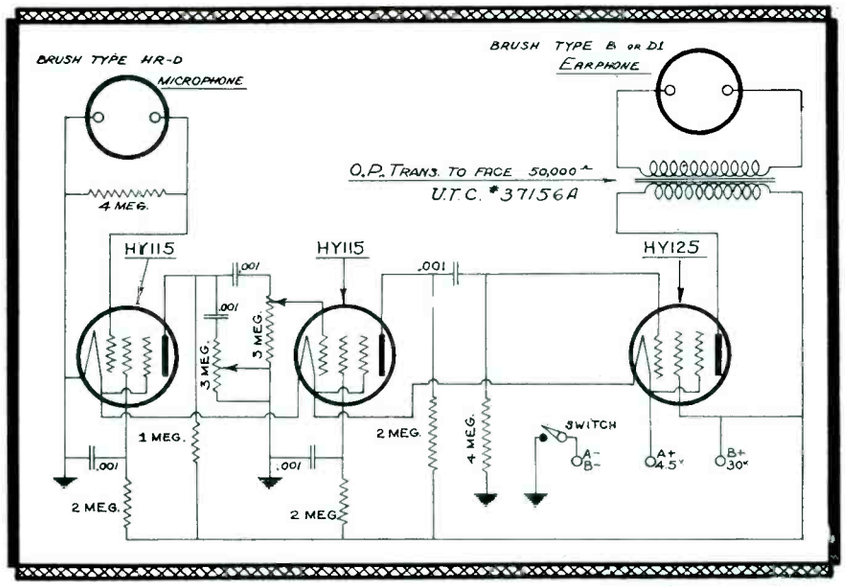


Illustration courtesy Hytron

Fig. 3. The hearing-aid is really more than a two- or three-stage amplifier. Because of the low battery voltages employed every component must be of the highest quality and be permanent in value.

The HY245 is an extremely small and efficient filament type pentode of very low drain. It is particularly suited for use as a high gain pentode voltage amplifier in applications where very small size and low drain are essential requirements. It is supplied with 1½-in tinned flexible lead wires for direct electrical connection of the tube elements. To facilitate retesting, the HY245 is equipped with a standard octal base. It makes use of a V type high tensile strength alloy filament to afford maximum life and minimum microphonism.

Ratings

Filament voltage[2]	1.25	v
Filament current	0.028	amp approx.
Plate voltage	45.0	v max.
Screen voltage G[2]	45.0	v max.
Grid bias	0	v
Plate current	0.4	ma approx.
Screen current	0.2	ma approx.
Mutual conductance	375	mmhos approx.
Plate resistance	1.0	meg approx.

Typical Operation (Class A)

	Resistance Coupled		Impedance Coupled	
Plate supply voltage[3]	30.	45.	30.	45. v
Screen supply voltage[4]	30.	45.	30.	45. v
Grid bias	0	0	0	0 v
Plate load[5]	1	1 meg	300	200 henrys
Screen dropping resis.	3	2	2	1 meg
Grid leak resis.	5	5	5	5 meg

The HY255 is an extremely small filament type pentode power amplifier of design and construction similar to the HY245.

Ratings

Filament voltage[2]	1.25 v
Filament current	0.028 amp approx.
Plate voltage[3]	45 v max.
Screen voltage G[2]	45 v max.
Grid bias[4]	—1.5 v
Plate current	1.1 ma approx.
Screen current	0.35 ma approx.
Mutual conductance	450 mmhos approx.

Typical Operation (Class A)

Plate voltage[3]	30	45 v
Screen voltage[3]	30	45 v
Grid bias[4]	0	—1.5 v
Load impedance[5]	50,000	40,000 ohms
Grid leak resis.	5	5 meg
Plate current	.85	1.1 ma approx.
Screen current	.2	0.35 ma approx.
Power output	10	18 mw approx.
Total harmonics	15	12 % approx.

[1]These variations are given merely for the designer's reference. This statement is not to be construed as test limits, nor does Hytronic Laboratories guarantee that all tubes supplied will be within such limits.

[2]Provision must be made to prevent the filament voltage exceeding 1.55 volts at the tube at all times. Less than 1.0 volt is not recommended.

[3]For optimum conditions, 30 volts is recommended.

[4]It is possible to operate at zero grid bias where the values of plate and screen voltage are 30 volts or less.

[5]This value is an approximation based on mean average laboratory measurements. It is recommended that the output loading choke be designed for a minimum inductance of 40 henrys at rated plate current. The reflected impedance of the receiver should not be less than 40,000 ohms to obtain maximum efficiency.

The CK-501 and CK-501X are miniature pentode type amplifier tubes designed for use as voltage amplifiers in applications where extremely small size and low battery drain are the primary tube requirements. The CK-501 is equipped with a special miniature base. The CK-501X has tinned copper leads for direct soldering and is supplied with a removable standard octal base to facilitate retesting.

Interelectrode Capacitances (Approx.)

Grid to plate	0.12 mmfd
Input	3.8 mmfd
Output	5.6 mmfd

Ratings

Max. fil. voltage (dry battery supply) volt. must never exceed	1.55 v

(Continued on page 32)

CIRCUITS

See Front Cover

By HENRY HOWARD

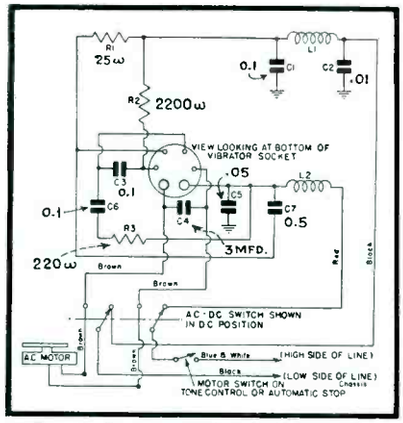


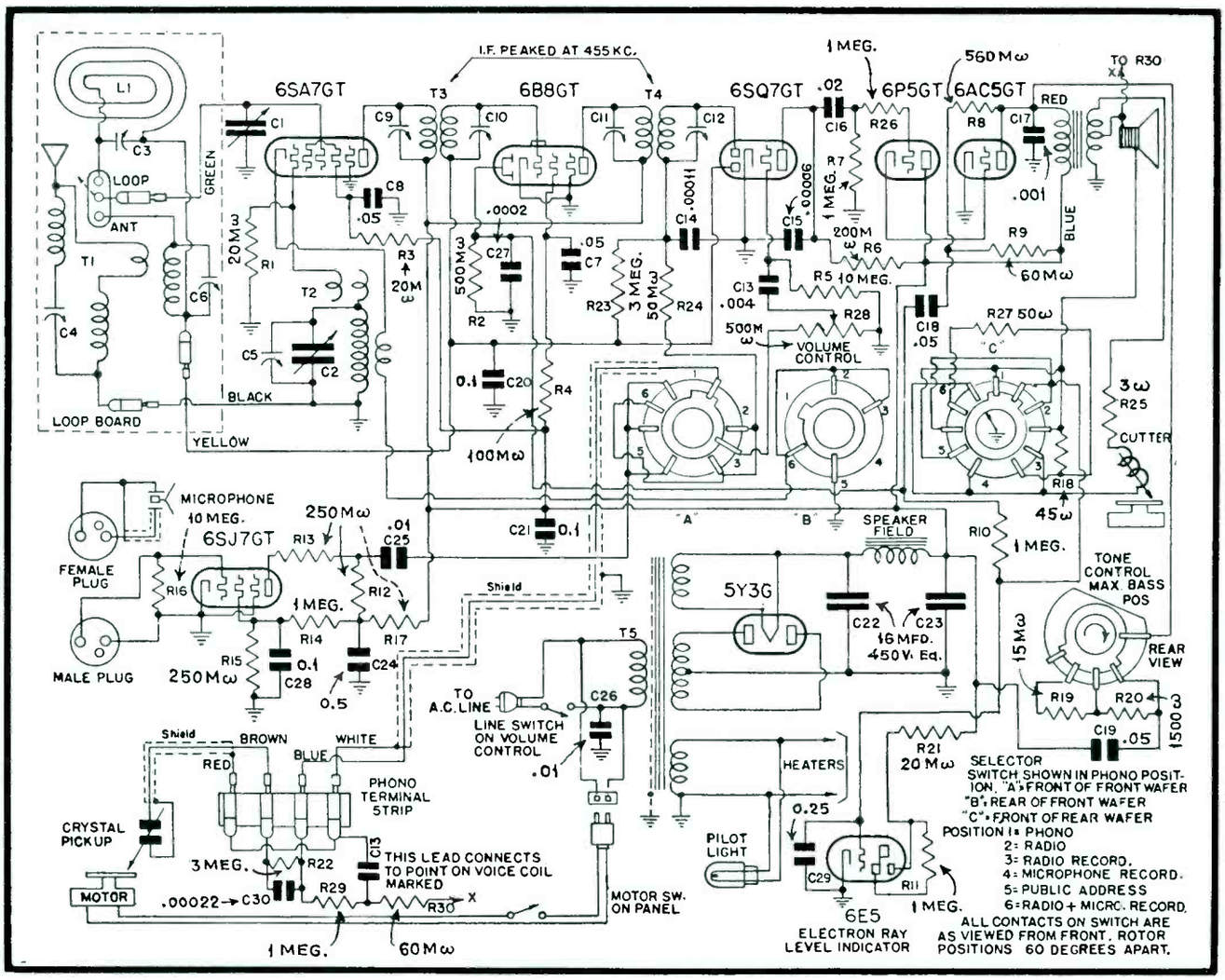
Fig. 1. Emerson 8MT574 phonograph inverter.

IT LOOKS as if we are really going to have something in the way of honest to goodness high quality radio and phonograph programs in the near future. There is plenty of evidence of this in the new data sheets supplied by the manufacturers. We notice careful attention is paid to details as well as the more obvious features. The first of these features is the wide acceptance of f-m with the tendency to go all the way toward a real job including an audio range substantially flat from 30 to 15000 cycles; power output from 10 to 25 watts; properly balanced dual speakers, or dual audio channels in the more expensive models; separate tone controls for bass and treble, a minimum of hum and extraneous noises; and perhaps as important as any feature, the reduction of several types of distortion through the use of a considerable amount of inverse feedback (degeneration) from the output transformer to the first audio stage, taking in the entire audio system.

There are models for f-m only as well as f-m, a-m combinations; also further combinations of phonograph and recorder. Stromberg Carlson has announced a super deluxe f-m, a-m phono-combination with dual audio channels. Lafayette has just introduced their Model FM13, a similar combination less the dual channels in a much lower price bracket. General Electric has several new f-m models. There will be a parade of these high class sets before long. Here's hoping they have wide acceptance.

Another trend we are glad to witness is the return of the r-f stage with a three-gang tuning condenser For the broadcast band, at least, better sensitivity and signal-to-noise ratio is obtained over an extra i-f stage. This is especially noticeable in battery portables. Other favorable trends are the

Fig. 4. Emerson DV364.



progress in tube type standardization through the adoption by manufacturers of preference types and the elimination of fake tubes. Related to the latter is the hope that a rectifier will be called by name and an eye tuning or level indicator will be called just that—neither of them being counted as tubes. We have waited a long time for this! Octals, loctals and GT types are rated as standard. Last year, there was much concern over the life of 150-ma. a-c, d-c tubes. It appears that all the bugs have been eliminated, giving this series a new bill of health. For us bystanders the counting of regular tubes promises to be interesting. How about triodes being used as diodes when popular combination tubes are available? Or how about a set using a high quality push-pull input transformer in place of an inverter tube—is this set inferior for having one less tube? You tell 'em; we want to stay out of this mess!

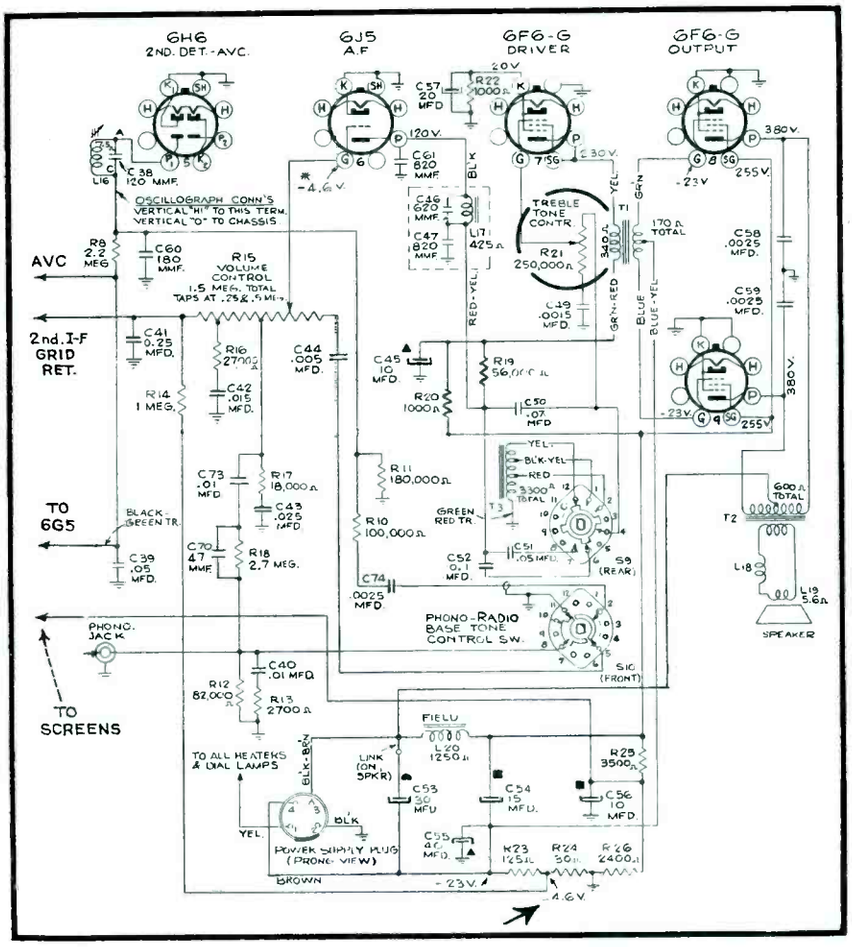


Fig. 5. RCA V300, V301, V302.

Phonographs and Recorders

We'll next consider phonographs and recorders for the trend is certainly upward in these items. New automatic record changers are simpler, more foolproof, cheaper and have less parts; hence, they are becoming very popular, some with recorder combinations. All the new phonograph motors have rim-driven turntables which eliminate gear noise and vibration. With few exceptions there is no adjustment for speed. Crystal pick-ups are flatter; crystal mikes are better and cheaper. Phonograph motors are available for a-c, d-c operation through the use of a vibrator type inverter, such as the Emerson 8MT574 (Fig. 1), on d-c. The inverter is a compact unit complete with filters and connectors and can be mounted directly to the underside of the motor board.

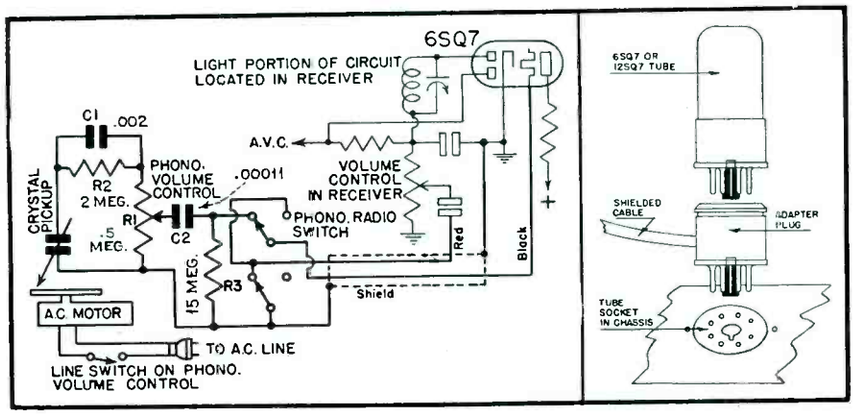


Fig. 2. Emerson EO388 phonograph adapter.

Fig. 3. Philco 41-602.

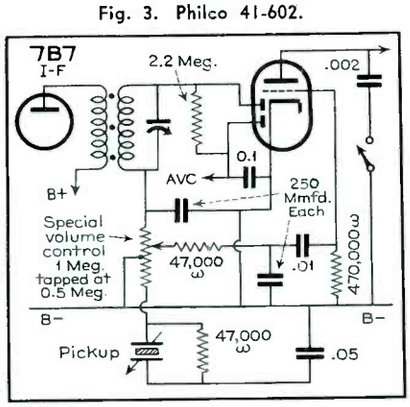


Fig. 8. Silvertone 5751.

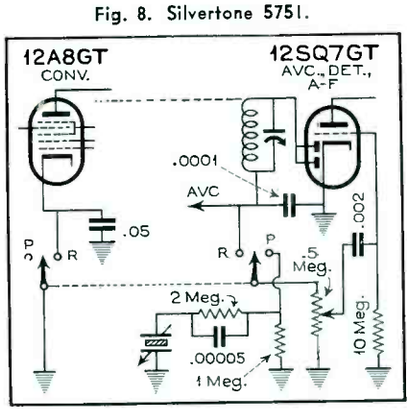
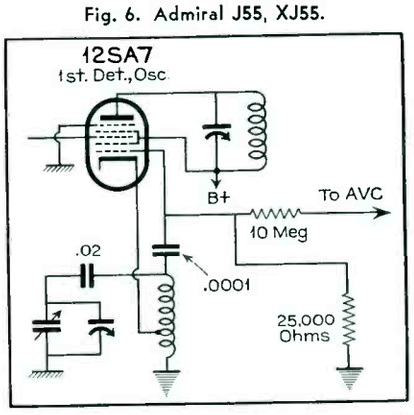
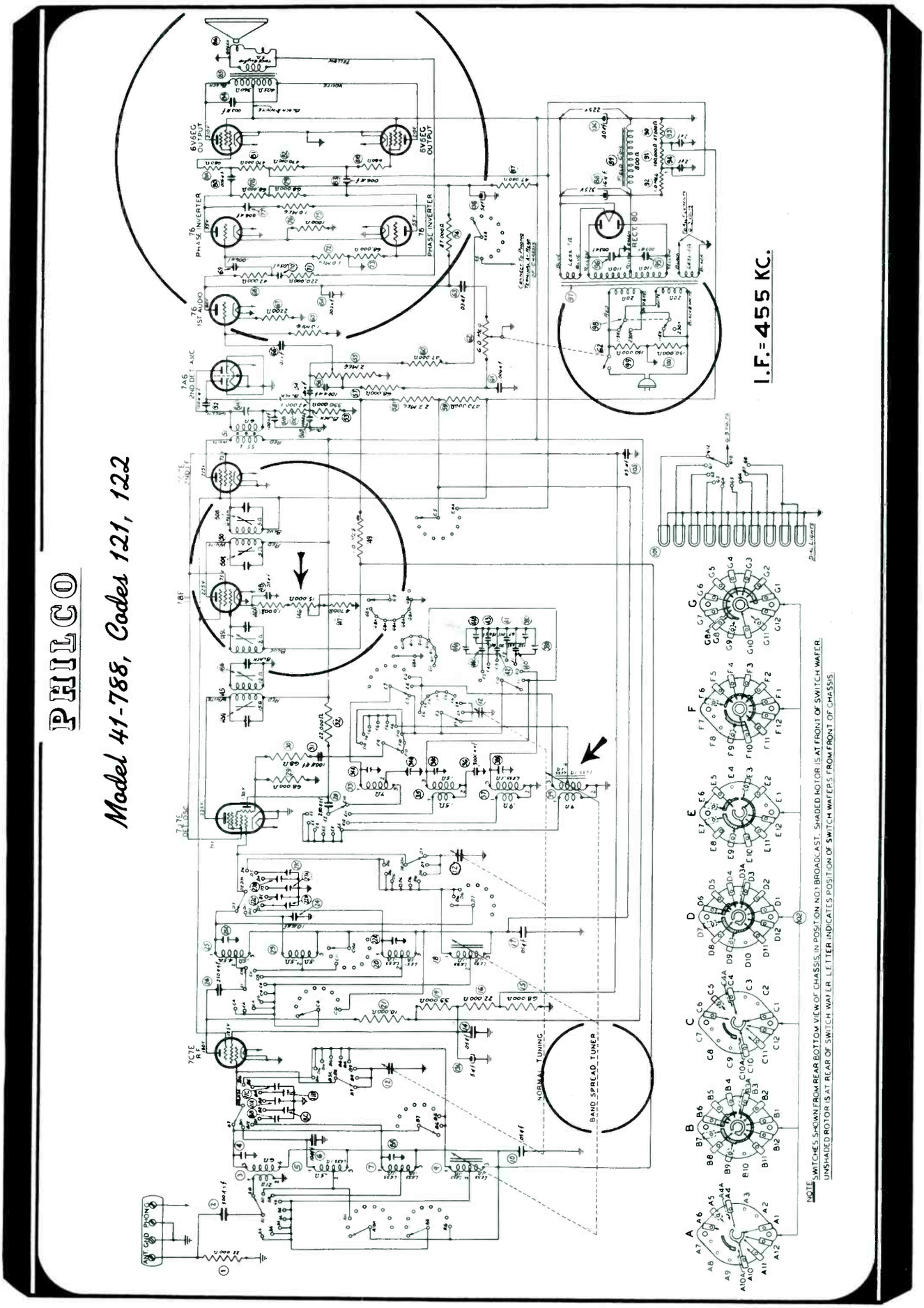


Fig. 6. Admiral J55, XJ55.



Emerson also has a novel phonograph adapter (Model EO388, Fig. 2) for a-c only, which may be used with any receiver that employs a 6SQ7 or 12SQ7. The tube is removed from its socket and



Revolutionary Tube Tester

LEVER SWITCHING

4 NON-OBSOLESCENT "Quick Change" FEATURES

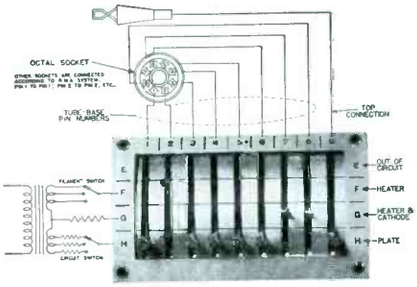
FOUR EASILY REMOVABLE SECTIONAL PANELS

1 If RED • DOT Lifetime Guaranteed Instrument is damaged accidentally return the separate panel on which it is mounted for replacement or repairs.

2 Speed Roll Chart complete with mechanism can be replaced when there are new factory releases by removing only four screws from front of panel.

3 New socket panel to meet future radical tube changes which present spare socket cannot accommodate will be available at nominal charge upon return of old panel.

4 Flexible lever switching section and power supply in separate panel can be replaced to meet unanticipated tube changes.



MODEL 1620
only **$37.84**
DEALER NET PRICE

Combining simplicity of operation with absolute flexibility. Triplett's new lever switching permits individual control for each tube element—yet test procedure is simple and quick. The switch setting shown above will permit tests of 45 commonly used different type tubes without change of positions of the levers. Many tubes require only two lever switch settings—more than half, only three settings. This revolutionary lever switching development, with individual control for each tube element, takes care of roaming filaments, tapped filaments, plural cathode structures and dual function tubes—conclusively checks all present receiving tubes including Miniatures, Bantam, Jr., and the new Midgets. Neon shorts test and noise test jack included. Gracefully proportioned wood case, natural finish. Beautiful two-tone brown-tan sloping panel; polished metal chrome trim with inlaid color. . . . Model 1620, Dealer Net Price . . . $37.84.

MODEL 1612
Dealer Net Price
$29.84

Impressive Counter Tube Tester . . . RED • DOT Lifetime Guaranteed Instrument with 6" GOOD-BAD SCALE . . . Illuminated Speed Chart . . . Sockets include Loctals, Bantam Jr. and new Midgets. Provides for tubes with filament voltages from 20 steps from 1.4 to 117 volts.

MODEL 1270

11 Ranges Test *All* Household Appliances

Five Wattmeter Scale Ranges . . . Four Alternating Current Scale Ranges . . . Two A.C Voltage Scale Ranges . . . Model 1270 is an advanced electrical circuit analyzer that shows the wattage consumption, amperes and line voltage of all household appliances including electric ranges under actual operating conditions . . . Dealer Net Price . . . 29.83.

MODEL 1213
Dealer Net Price
$22.00

Sockets to test all present day tubes including Bantam Jr., High Voltage Series, including 117Z6G and 1.4-volt Miniatures. Ballast Tube Continuity Test . . . Foldex Tube Chart . . . RED • DOT Lifetime Guaranteed Instrument.

Write for catalog on complete line of test equipment.

Triplett also manufactures electrical measuring instruments in more than 25 case styles.

THE TRIPLETT ELECTRICAL INSTRUMENT CO., Section 1710 Harmon Dr., Bluffton, Ohio

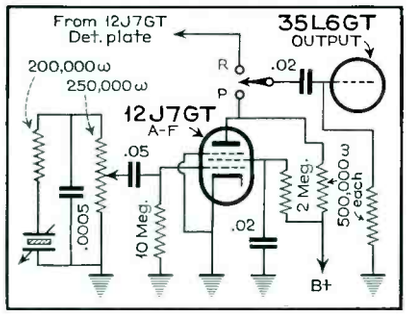


Fig. 9. Silvertone 6326A.

plugged into the top of an adapter plug, the plug being inserted in the tube socket. Volume control and phono-radio switch are contained in the phono unit.

Personal Receivers

Personal a-c, d-c battery receivers as well as a-c, d-c sets alone are getting smaller. We will probably soon see a lot of a-c, d-c tubes in miniature size envelopes to assist this reducing process —all but rectifier and power output tube, which cannot be made smaller because of the necessary heat dissipation. These smaller tubes would be excellent for auto sets, too. Many new portables have resistance coupled i-f stages with a gain of 10. Iron core i-f transformers are being made as small as ¾ inch square, especially condenser tuned, potted types. A method of assembling small p-m and electro dynamic speakers has been developed using thermal cements instead of welding. Shoulder straps are getting more popular as loop antennas. Philco has an auxiliary plug-in loop aerial for use where reception conditions are difficult. The auxiliary antenna plugs into the side of the portable receiver, disconnecting the set loop.

Television

After a period of inactivity, television in the New York area got a tremendous boost with the demonstration of color television by the Columbia Broadcasting System. An invention of Dr. Goldmark, the color is added by mechanical means by spinning colored discs in front of the picture tube in synchronism with

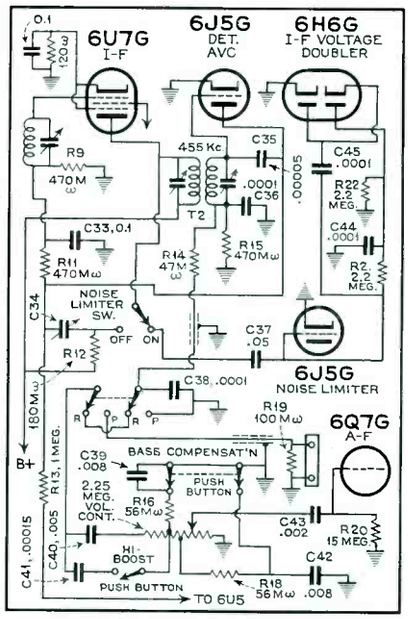


Fig. 7. Silvertone R121, 721

color changes in the transmitter. Using the same band width as standard television, the detail seems to appear greater to the eye.

It is said that the DuMont Laboratories are working on a system for introducing the color electronically. Another electronic method for color television has been discussed in SERVICE[1] recently.

In any case, it will probably be some time before any system will be put into operation commercially. There remains a great deal to be done with black and white pictures before we can hope for color.

[1] "Television in Natural Color," SERVICE, Sept. 1940, p. 28.

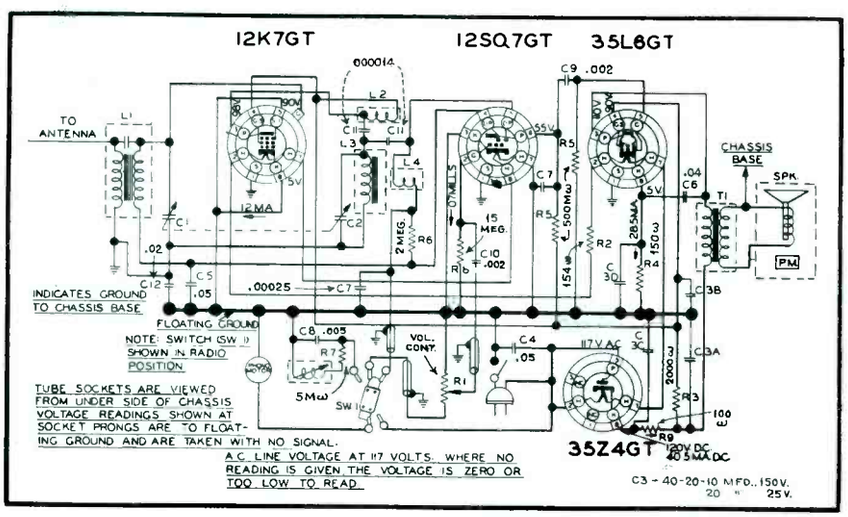


Fig. 10. Silvertone 5701.

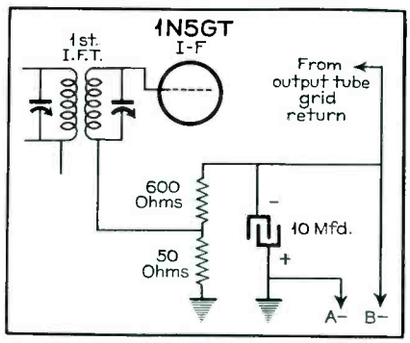


Fig. 11. Sentinel battery set.

Just a Tip

Why doesn't some smart manufacturer make a dial scale on a fluorescent lamp?

Philco 41-602

Philco Model 41-602 (Fig. 3) is a five-tube, radio-phonograph combination with a dual volume control and on-off switch combined in a single unit. The control is tapped at the center, this point being grounded, so that both ends are hot, one half of the control serves for radio, the other half for phonograph. No switching is required; the control does the complete job itself. A resistor running to the arm of the volume control, in conjunction with two 250-mmfd mica condensers, acts as an r-f filter to keep the i-f out of the audio amplifier. Separate diodes are used for avc and demodulation.

Emerson DV364

Emerson Model DV364 is a seven-tube superheterodyne and phonograph recorder for a-c only. One of the tubes (6SJ7GT) is a microphone preamplifier. In addition, a 6E5 eye is used as a recording level indicator. Dynamically coupled (cathode of driver connected to grid of output) output tubes are featured in combination with inversed feedback in phonograph position. A low-impedance cutter is fed from the secondary of the output transformer, the same winding feeds the voice coil of the speaker.

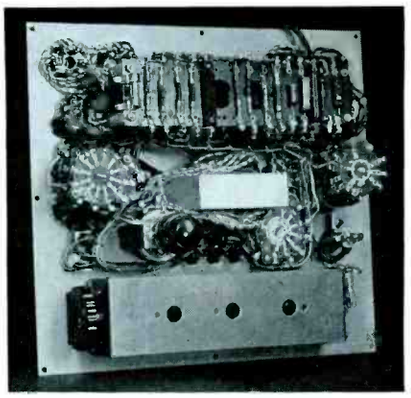
The radio-recorder-phono switch has a position for recording both radio and microphone simultaneously. This should be a great help to those disgusted broadcast listeners who have always wanted to talk back to the announcer or rotten performer. The manufacturer gives a word of caution which should be useful when servicing any recorder combina-

(*Continued on page 37*)

MODERN MULTITESTERS

(Part II)

By S. GORDON TAYLOR



A modern multitester, as exemplified by the Model 803 shown above, employs several selector switches and a host of shunts, multipliers, etc.

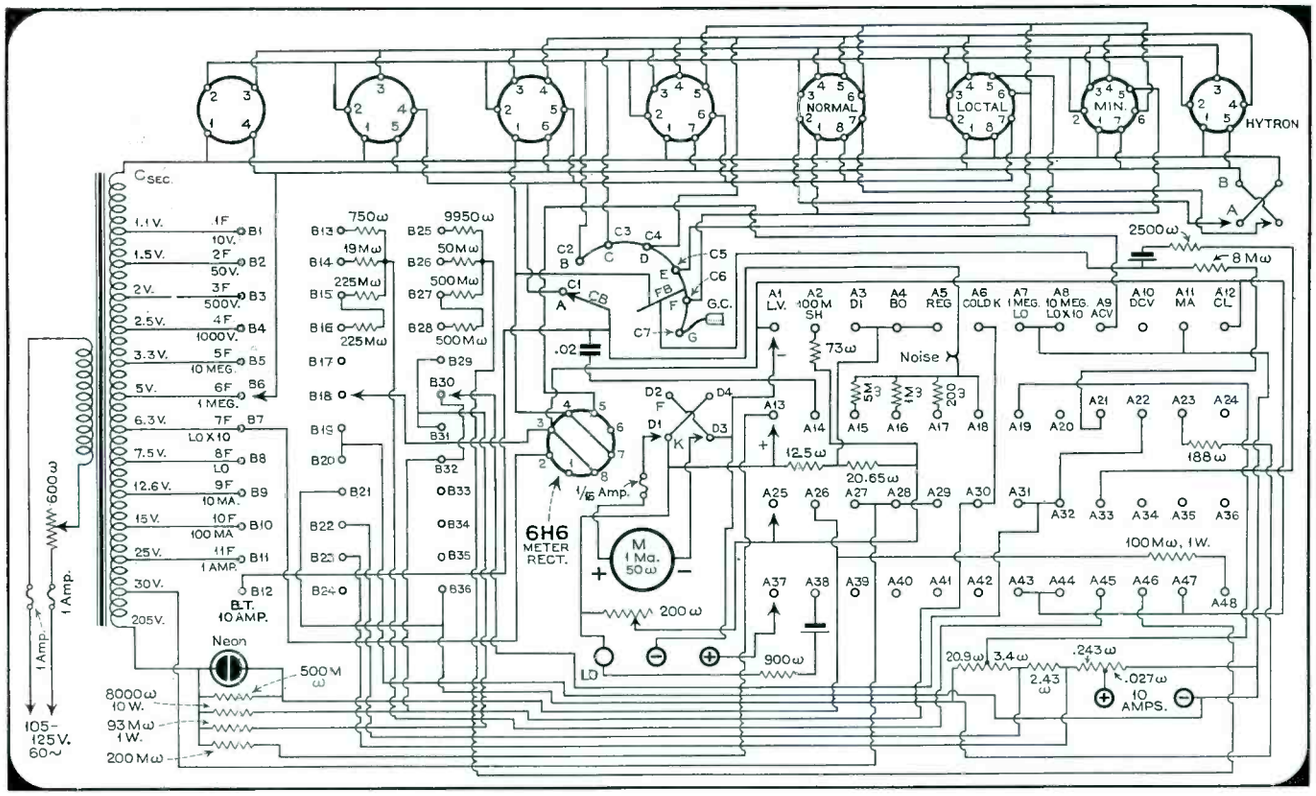
LAST month, in considering the functional breakdown of the circuits of a modern multiple-purpose service instrument, the circuits for the d-c voltmeter, a-c voltmeter, direct-current meter and tube tester functions were shown individually, as set-up by operation of the selector switch. This month the discussion is continued and includes the circuits employed for the several different ohmmeter positions and the capacitor leakage test circuit. These and the circuits covered last month are those of the Radio City Products, Model 803 combination tube and set tester. A front view of this compact instrument, also a close up of the multiple scale of its meter, were shown last month. The rear view shown herewith completes the illustrations.

In the individual circuits shown, each component employed in a particular function is included, as well as the switch contacts which come into play in each. This latter feature is being included to aid those who wish to compare the individual functional circuits with that of the complete unit as shown in Fig. 5 herewith. Switch contacts having the letter "A" are a part of the 4-gang, 12 position "Circuit Selector" switch; those with the letter "B" are a part of the 3-gang, 12 position "Range Selector."

In all, five resistance measuring ranges are provided as follows: 0-500/5000/100,000/1 meg/10 meg. Of these, the two lowest ranges employ a circuit of the back-up type, the middle range is battery operated (for use in locations, such as in checking car installations, where an a-c line is not available) and the two highest ranges are of the series type with voltage provided by a built-in line supply. Because of the circuit differences, each of the three types will be described.

Fig. 6 shows the 0-5000 ohm range with the test prods connected to the "Common" (−) and "Lo" jacks and the "Low Ohms" scale on the meter employed, but multiplied by 10. It is the back-up type of circuit in which the meter reads full scale with no resistance connected, and backs off when a resistor is connected for test, this resistor functioning as a direct shunt. The necessary current is drawn from the line transformer through a 6H6. Because this is a half-wave rectifier the applied a-c voltage is reduced to roughly 45% so that with 93,000 ohms in series it provides just 1 ma full-scale current from the 205-volt tap of the transformer. The

Fig. 5. The switches employed in the RCP Model 803 involve a total of over a hundred contacts, so ganged in design, that the operation of two knobs sets up the tester for a desired type and range of measurement.



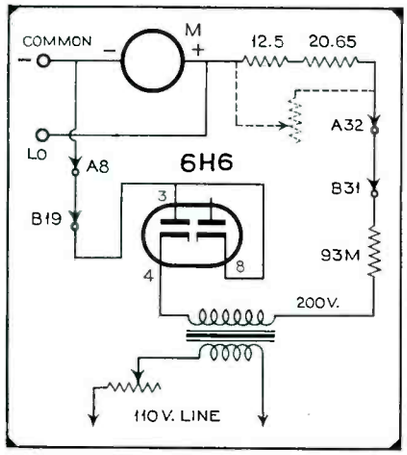


Fig. 6. The 0-5,000-ohm section of the tester is of the back-up type in which the meter reads full scale, when the prods are not connected to a resistor, and backs off for measurement of a particular value.

smaller resistors in this circuit serve no useful purpose. They are employed for another function of the instrument and are simply left in this ohmmeter circuit because their value is so small as to be negligible. No conventional zero-adjustment control is necessary as this purpose is served by a line-voltage control in the primary circuit of the transformer. It is only necessary to adjust this for full-scale meter deflection.

The "Lo Ohms" circuit differs from the one of Fig. 6 only in that an 8,000-ohm resistor replaces the 93,000-ohm series value, and a 6.1-ohm resistor is shunted across the meter, increasing the meter capacity to 10 ma and decreasing its overall resistance to 5.5 ohms. This arrangement results in a midscale value of 5.5 ohms for this range, and the first 10 divisions represent a value of 0.1 ohms each.

Offhand it would appear, if the current is to be multiplied by ten, that the series resistor should be reduced to one-tenth the original value, or 9300 ohms. Actually the rectifier itself contributes some resistance to the circuit—something over 1000 ohms. With 93,000 ohms in the circuit this can be safely neglected but in the high-current arrangement where the series resistance required is relatively low it is necessary to make due allowance for this rectifier resistance. It is for this reason that the 8000-ohm resistor is employed instead of one of 9300 ohms.

The battery ohmmeter circuit operates from a 1½-volt cell incorporated in the tester. Only the circuit selector switch comes into play in setting up for measurements on this range, this switch closing contacts A2 and A38 as indicated in the circuit of Fig. 7. This circuit offers a particularly interesting feature in that the accuracy of measurement can be designed to be one-half of 1 percent regardless of the adjustment of the 200-ohm zero-setting control which constitutes a portion of the meter-shunt network. The meter and its fuse represent a resistance of 55 ohms, which is reduced by the shunt network to approximately 36 ohms with the 200-ohm rheostat all in (or open), or 31 ohms with this rheostat shorting out the two small parallel resistors. This value is in series with the 900-ohm resistor, therefore the total resistance of the circuit can vary only from 931 to 936 ohms, or 5 parts in 931.

Obviously, with the current always adjusted for full-scale deflection when the test prods are shorted, and with the internal resistance constant, any given value of resistance inserted in the measurement circuit will always cause the same degree of deflection. For instance, a value of 935 ohms would double the

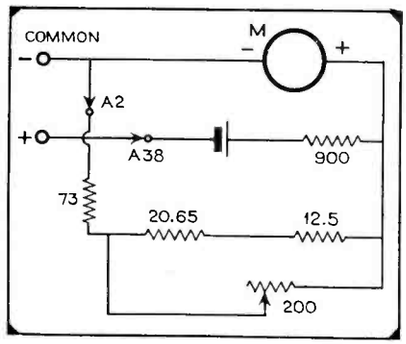
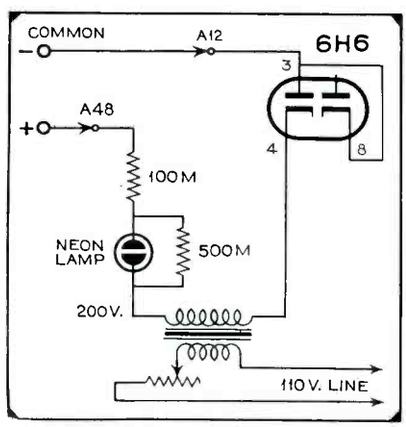


Fig. 7. The battery-operated scale of the ohmmeter section receives its current from a 1½-volt cell housed within the tester.

total circuit resistance and would reduce meter deflection to half-scale, and so on. The meter calibration therefore, can always provide a high degree of accuracy.

Fig. 8 shows the circuit employed in the 10-megohm range. It will be noted that this circuit and its values are identical with the low-resistance circuit of

Fig. 9. A neon indicator is employed instead of the meter for checking condenser leakage. The 6H6 supplies rectified d-c for the test.



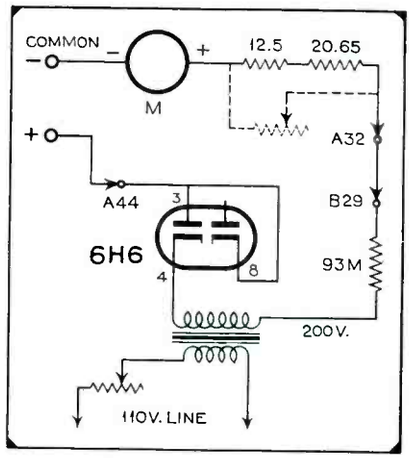


Fig. 8. The values employed in the 10-meg range of the meter are similar to those used for the 0-5,000-ohm range except that the resistance under test is connected in series with the meter instead of across its terminals.

Fig. 6 except that the resistance under test is connected in series with the meter, internal resistors and power supply, instead of being shunted across the meter. This is because the regular test prod jacks are employed instead of the separate "Lo Ohm" jack in Fig. 6. Here again the applied a-c voltage is reduced to something less than half due to the relative inefficiency of the half-wave rectifier, with the result that when the line voltage control is adjusted for a current flow of 1 ma on the meter, the applied d-c voltage is only about 93 volts.

The circuit arrangement for testing leakage in capacitors is shown in Fig. 9. This circuit does not utilize the meter but instead employs a neon lamp as an indicator, working on the principle that such a lamp will not glow until the voltage across it reaches a certain predetermined value. With the test prods shorted five-sixths of the total available d-c voltage is applied across the lamp by the voltage divider action of the 500,000- and 100,000-ohm resistors, and because this exceeds the striking voltage of the lamp, it will glow brightly. If a capacitor is connected between the test prods, it will be the equivalent of inserting an additional high resistance in the voltage divider network (asuming the capacitor to be one with satisfactorily high leakage resistance). This means that a large part of the available voltage will be developed across the capacitor and not enough across the lamp to cause it to glow. Therefore failure of the lamp to glow is an indication that the leakage through the capacitor is normal. If it does glow (beyond an instantaneous flash during the charging period of large capacitors) it is an indication that leakage is excessive. This test is for use only with paper and mica capacitors. The inherent leakage in elec-

(*Continued on page 28*)

ADVERTISING with little expense

By Jack H. Zeilenga

Jack H. Zeilenga, operating the Universal Radio and Electrical Laboratories on the outskirts of Chicago, never misses a chance to advertise his shop. Every chassis, every tube, yes, and even every receipt carries the Universal name in some form as a continuous reminder of the "Headquarters for Guaranteed Service, Sales, Repairs."

Calendars, similar to the one pictured at the right, have been hung in better business places where there is plenty of store traffic, for the past five years. They have easily proved their worth. Each year, during the past five, Zeilenga has increased the number distributed.

I ESTABLISHED my present trade name in 1921. I started from scratch but always kept at it and made up my mind to go forward. I consider my business a high class profession; my place speaks for itself. I have ample stock, modern equipment, and the shop is neat and efficient looking. I keep up a good front; a well groomed, recent model sedan delivery truck helps. Store windows, too, are kept well groomed and attractive. Although I do some sound work and sell some accessories, my chief income is from service work. Universal has become headquarters for "Guaranteed Service, Sales and Repairs." Each year, without exception, has brought improved business.

From the beginning, I have tried numerous methods of attracting new trade. Local newspapers, telephone directories, church bulletins, baseball sweaters, tire covers, blotters . . . each has had its limited success. Only one idea, however, has proved itself outstanding in its ability to bring in new customers consistently. Five years ago I had a stock of swell calendars printed (see accompanying illustration). I distributed them personally to better business places where there is plenty of store traffic, such as barber shops, beauty parlors, taverns, auto repair shops, show rooms, gas stations, etc. They cost $53.00 per hundred but they have certainly paid good dividends what with 365 days and nights of real advertising. The first year I used 100 large size calendars for this purpose. I also distributed 500 smaller ones, with the same copy and picture, to some of my customers. The quantity has gradually increased and last year I distributed 250 of the larger calendars and 2,000 of the home size, still using the same copy. I hope to be able to do better this year.

Small plates are attached to the cabinet of every set overhauled in the Universal Laboratories.

Tube stickers are used on every tube tested as well as on new tubes sold across the counter or in receivers.

When a job comes in, or is picked up, for repairs and the customer wants an estimate, I charge a minimum of $1.00 for this service. On bigger jobs the charge is proportionate. Of course, if the set is left for repairs this fee becomes part of the labor charge. On these estimates the customer is informed that if any additional parts require replacement after the final air check, these will be billed. No labor charge will be made on these, however, unless there is an exceptional amount of work attached.

I have a definite procedure for receiver repairs. First of all I test all the tubes thoroughly. Then I give the set a complete mechanical check; look over the wiring, tube prongs, screws, dial and other controls, speaker cone, transformer laminations, etc. After I am sure that everything is in its proper place I start the job of repairing the

The Universal Radio and Electrical Laboratories, 7020 South Halsted Street, Chicago, looked like this for a number of years. It is now being modernized, however.

set and its components, electrically

Every set is given a performance and quality test before it leaves the shop and it has to be perfect or it doesn't leave. On intermittents and noise jobs we leave them on the air for a few stretches of two hours each with an hour between each stretch.

If the set has been aligned in our shop, we seal the screws against tampering or vibration.

As mentioned above, every repair job that leaves the shop, regardless of its size or the amount of profit it provides, must perform perfectly or it stays until it does. I always tell the customer that if she wants her set to give top performance it must get a first class and complete repair. If she wants a slipshod job or wants to chisel, I let her go elsewhere.

It seems never to have failed,—sooner or later they all wake up and come back. When they do and you are able to satisfy them, you have earned a lifelong customer.

I always urge replacement of weak and worn out ubes. If the entire set has seen ample service, I recommend a completely new set for the best in performance and dependibility. If the set has six or more tubes, I allow an additional 10-percent discount, providing that all the tubes are purchased at the same time. This often provides the final argument that clinches the sale. I know that I'm way ahead in allowing the 10 percent, even if only the expense of future testing of their tubes is considered.

When her receiver clicks perfectly, your customer is happy and pays your fee gladly. Of course, there will always be a few that growl and grumble. If you do your job conscientiously and completely, however, you will know that you are right, as will most of your customers. If practically everybody thinks you are good, even the disgruntled few will believe it and remain your customers in spite of their grumblings.

I charge full list price on all parts, tubes and accessories. On jobs that run over ten dollars in parts alone I may allow five or ten percent off list, depending on the net cost of the parts. Minimum repair charge (parts extra) is $1.00.

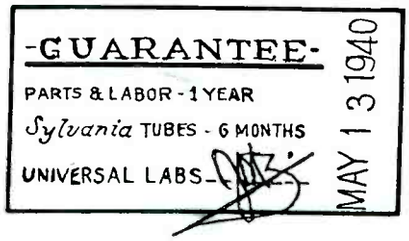
For as far back as I have been keeping books, the bench has averaged better than three dollars an hour, and has often doubled this amount during peaks.

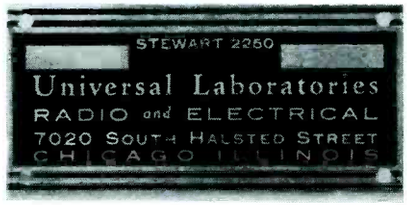
The job sheet has each part that is replaced itemized. In cases which require pickup and delivery there is a minimum charge of $1.50 for a radius of 2 miles, beyond that the charges are more. The job ticket also shows a complete report on the condition of each tube. N. G. stickers are placed on all questionable tubes.

A guarantee is stamped on each ticket —it is dated and signed. The guarantee covers only the parts replaced and the labor required for this. It is void if any defective or weak tubes are not replaced or if the set shows obious signs that someone had been tampering with it. On the wind up of each repair job I attach a repair plate with a code date and number so as to make it non-transferable.

The customers seem to like the plate set up and it leaves your name and phone number permanently on the set where it is easy to find. I always call our customer's attention to the job plate with this in mind.

Repeats, or kickbacks, have been about two percent. I have always endeavored to take care of these without charge and given the customer the benefit of the doubt as to whether is was coming to her or not.





Jack Zeilenga rarely misses an opportunity to publicize his shop. At the head of the column to the left is the Universal imprint which is stamped on each bill and job ticket. Below this is a repair plate which is attached to finished jobs. Following the plate is an advertising sticker that is distributed freely throughout the neighborhood. A throw-away card, in various colors, is also distributed. A small plate similar to the one at the bottom of the column is tacked on the cabinet of every new set sold.

¶ *Special low deposits on all N. U. Triplett Deals to November 30th*

and it's Yours on N.U. DEAL

TRIPLETT TUBE TESTER Model 1620

$12.50 DEPOSIT

TRIPLETT TUBE TESTER MODEL 1620

Has new lever-type flexible switching giving individual control for each tube prong . . . Filament voltage switching from 1.1 to 110 takes care of present and future tubes with filament voltages up to 117-volt types . . . Giant 6-inch scale RED•DOT lifetime guaranteed indicating instrument . . . Neon short test . . . Separate line voltage meter . . . Speed Roll Chart can be spun from one end to the other in less than four seconds . . . Housed in wooden case of graceful proportions with sockets, knobs and markings in ivory.

TRIPLETT MODEL 1620

Regular Dealer Price $37.84

YOU TOO CAN HAVE THE

"Best Equipped Shop in Town"

Get it the National Union way . . . you deposit $12.50, immediate delivery is made on Triplett Model 1620 Tube Tester. You sign agreement to purchase 875 points over a 2 year period. On completion you receive bill of sale and your deposit is refunded as a merchandise credit.

☆ ☆ ☆

National Union purchase points can be taken in Tubes, Condensers or Batteries. All products the finest in quality, thoroughly guaranteed and competitively priced.

☆ ☆ ☆

National Union Radio Tubes are known as the radio service dealer's tubes because they are used by more service dealers than any other make.

☆ ☆ ☆

You too can have the best equipped shop in town, just get your equipment the easy "N. U. Way" — Remember National Union has the finest sales helps and promotional pieces to help you sell yourself to your community and make more money.

☆ ☆ ☆

Special low deposit on all Triplett Testers until Nov. 30th, 1940.

Over 50,000 completed deals your guarantee of complete Satisfaction

J. E. STAGE, *Longview Radio Sales & Service Co., Longview, Wash. Think your Free Equipment Plan great—Have signed 20 N U Equipment Deals—have been using N U program 9 years. N U tubes all check alike—rarely have to make replacements.*

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

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

Ask Your Jobber or Write to

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57 STATE STREET, NEWARK, N. J.

The Best Equipped Shop in Town Gets the Business

FOR "DURABILITY, FLEXIBILITY, and ALL-AROUND UTILITY RCP TEST EQUIPMENT IS INDISPENSABLE!"

writes R. L. DUNCAN, *President*
Radio-Television Institute, New York

"This Institution," R-T.I's President Duncan says, *"has been using various testing instruments manufactured by your company . . . we have found your instruments to be of great value, not only in our laboratories, but also in teaching our students to become skilled in general service work. The durability, flexibility and all-around utility of your (RCP) equipment makes it indispensable in our training program."*

★ ★ ★

TAKE A TIP from famous training schools—buy RCP Test Equipment if you want to get *lasting* dependability. You can rely on RCP instruments—to meet the most exacting service requirements. And to provide the utmost in flexibility, speed and convenience. That's what President Duncan means by RCP's "all-around utility." Actually, you save money three ways with quality RCP Test Equipment. On first costs, on shop maintenance costs and on replacement costs. That's because these modern, improved instruments are priced lower, built better and last longer! Get all the facts and figures. Mail the coupon for new informative RCP catalog TODAY.

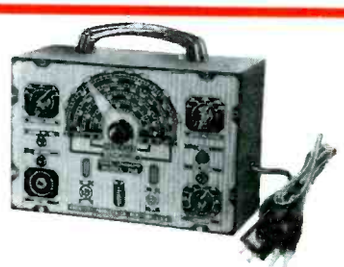
AC-DC COMBINATION TUBE AND SET TESTER MODEL 802 NET $27.95

Tests all new and old tubes, ballast tubes; hot interelement short and leakage tests on each individual element. Smooth line voltage regulation 103 to 135 volts with direct meter indication. As Multitester, Model 802 provides four range DC voltmeter 0/10/50/500/1000. AC, 0/10/50/500/1000. Ohmmeter 0-500/5000/1,000,000/10,000,000. DC milliameter 0/1/10/100/1000. Dc amps 0/10. Also, D.B. and output meter. D'Arsonval Meter fuse protected against burn-outs. Complete with battery, tube and test leads. Line double fused. Unusual value!

MODEL 803 COMBINATION TUBE & SET TESTER

SAME FEATURES AS MODEL 802, EXCEPT WITH BUILT-IN ROLINDEX CHART . . . Complete portable "service shop." Compact, ready to use with test leads and "ON-OFF" PILOT LIGHT, surprisingly low priced. Net $32.95

MODEL 702 SIGNAL GENERATOR



Everything a fine signal generator ought to be, except costly. Extremely wide all wave coverage continuously variable from 95 KC to 100 MC. Net $22.95

MODEL 308 SERIES D-9 SALES PROMOTING JUMBO METER

Famous Dynoptium Test Circuit. Fully up to date. Tests new miniature tubes, all sections of rectifier and multi-purpose tubes. Noise and hum tests for tubes showing "good." Net $25.95

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RCP dependable TEST instruments

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SOUND IDEAS

By JAY ALLEN

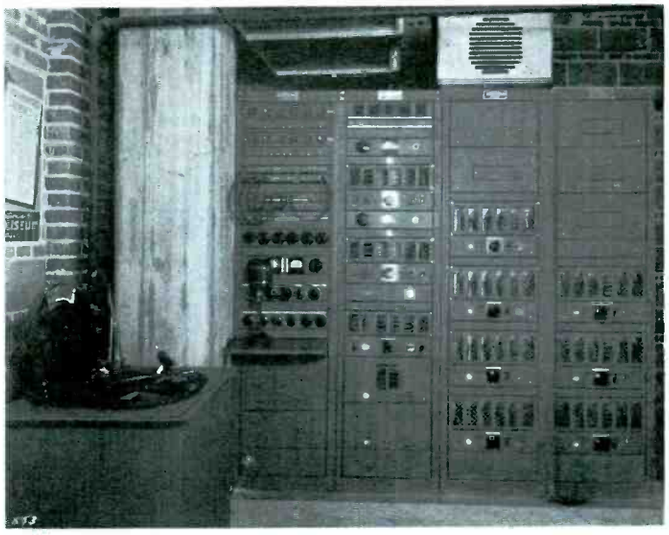


Fig. 2. A special rack and panel amplifier was designed to meet the requirements for the Live Stock Pavilion at the Indiana State Fair Grounds. It is installed in a small control room built especially for that purpose alongside the arena.

THE Live Stock Pavilion at the Indiana State Fair Grounds, Indianapolis, Indiana, was planned and built to give the people of Indiana the finest building of its kind possible, both architecturally and functionally. When the problem of sound reinforcement arose, the State Board of Agriculture conferred with authorities on the subject who prepared specifications which assured the Board that the sound system would be the finest obtainable. Eugene Van Sickle, president of the Van Sickle Radio Supply Company, recognized the importance of such an installation and started work with Operadio Engineers with the result that, when the bids were opened, Van Sickle was the successful bidder and Operadio Equipment was selected.

A building of this type always presents a difficult problem to the sound engineer. In this case the ordinary problems usually encountered were complicated by the size of the building—seating capacity 9,000—and the classes of activities to be covered, ranging from live stock judging, rodeos, hockey games and other types of indoor activities up to and including symphony concerts. But, when the installation was completed, it was said, that the results obtained actually exceeded the extremely rigid specifications.

A special rack and panel assembly

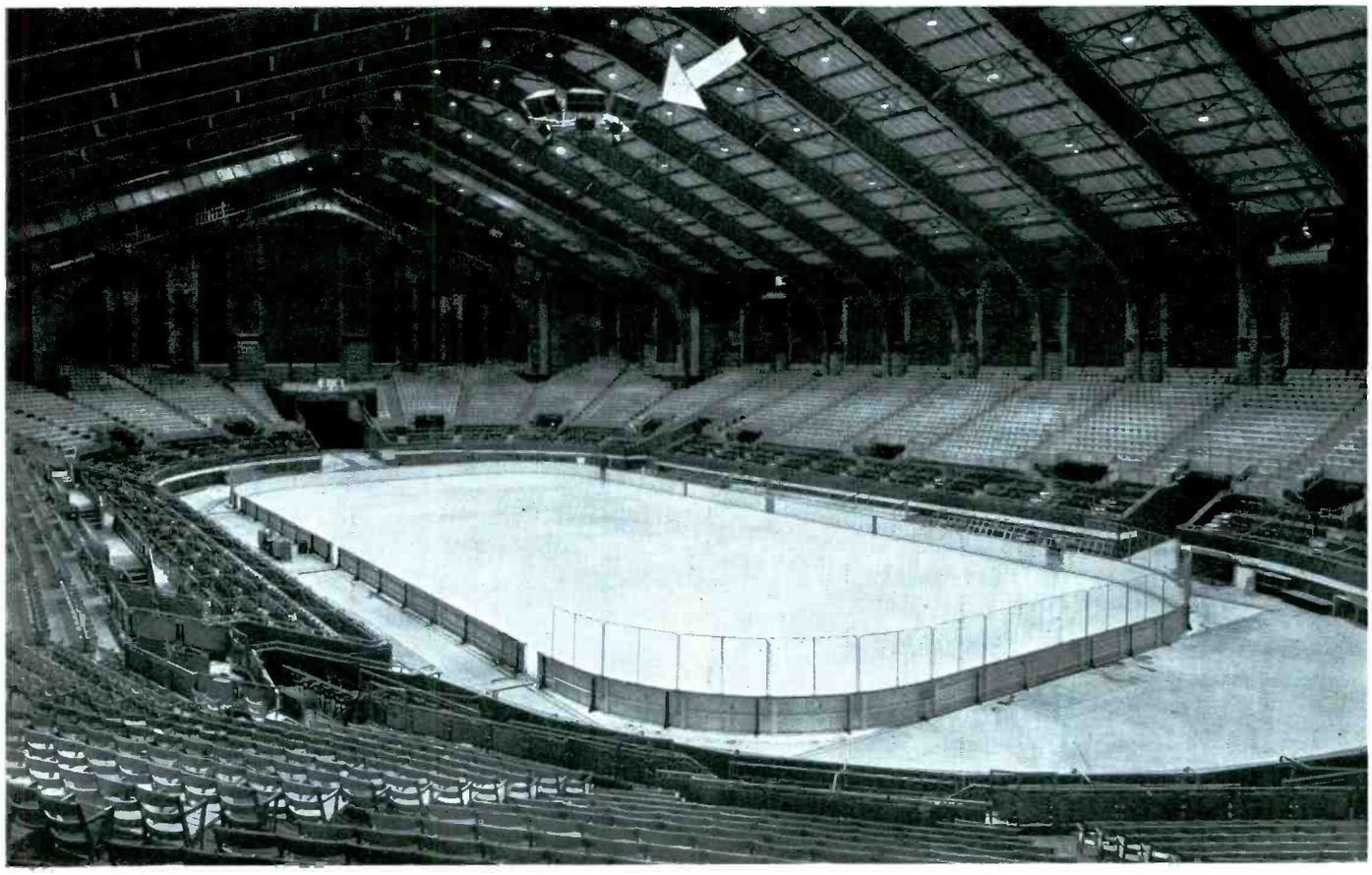


Fig. 1. The usual problems encountered in sound installations were complicated by the size of the Live Stock Pavilion and the wide variety in the types of activities covered, ranging from live stock judging to symphony concerts. Loudspeakers can be seen in the center overhead.

Illustration courtesy Operadio

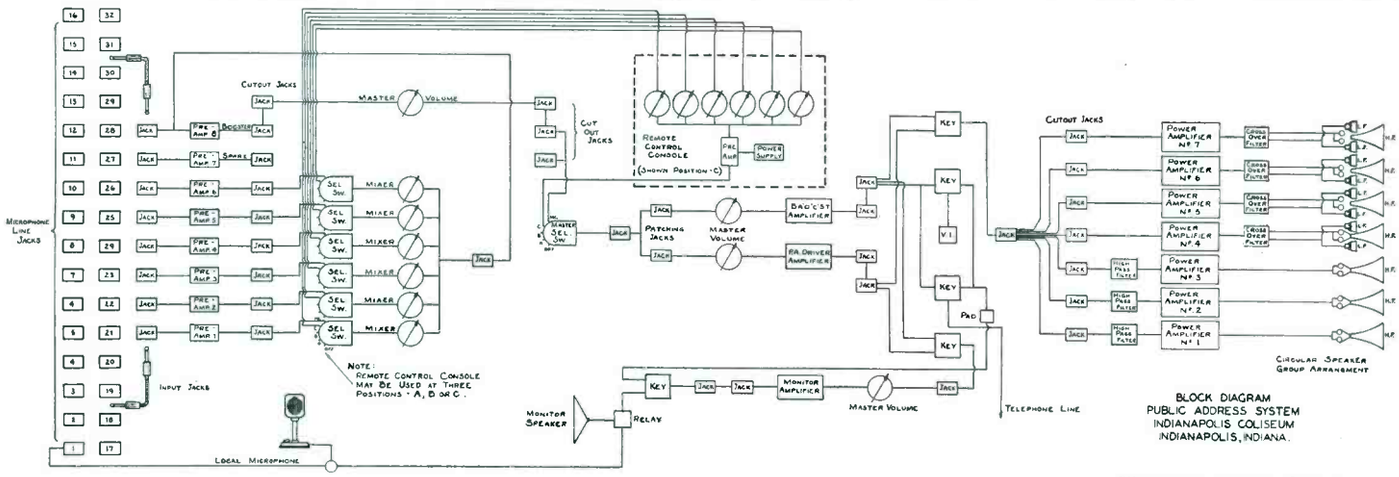


Illustration courtesy Operadio

(See Fig. 2) was designed to meet the requirements and installed in the control room adjacent to the arena. The equipment in this assembly is mounted on four standard sized racks and consists of eight preamplifiers, patch panels, six-position mixer with master volume control, public address driver amplifier, broadcast line amplifier, monitor amplifier, seven 50-watt power amplifiers, cross-over filter panels, power supply panels and necessary associated control panels. Driver, line and monitor amplifiers incorporate compression, expansion and voice equalization.

Fig. 3. (Right) The remote control console permits mixing any six of twenty-six microphone positions from any one of four predetermined locations in the audience section. A portable automatic phonograph unit may also be used at any of the twenty-six positions.

Fig. 4. (Above) In spite of the somewhat elaborate arrangement, the fair grounds installation is quite flexible and can be controlled from the remote console board shown in Fig. 3. This console permits control and mixing from any of four predetermined locations in the audience section.

Low impedance cardioid type microphones were furnished; and twenty-six microphone input positions are provided throughout the arena, any six of which may be selected and mixed simultaneously. A remote control console (See Fig. 3) was also furnished which permits control and mixing from any of four predetermined locations in the audience section. A portable automatic phonograph unit may be used in the control room or at any microphone position to provide transcribed programs.

The speaker equipment consists of eight low-frequency folded horns, each containing two 15-in. heavy-duty permanent magnet speakers in combination with seven high-frequency cellular horns, each driven by two heavy-duty permanent magnet units. All of the above mentioned speaker equipment is mounted on an octagonal gondola twenty feet in diameter, the total weight being approximately 5,000 lbs. The entire assembly may be raised, lowered and moved from one end of the building to the other by means of a motor driven carriage running on a track installed directly under the building roof.

This installation has been pronounced one of the finest of its type in the country and the Indiana State Board of Agriculture and their architects, Russ and Harrison of Indianapolis, should be complimented for the manner in which they outlined their requirements; the Van Sickle Radio Supply Company of Indianapolis, for a fine installation;

Fig. 8. A triple dive is announced through the Saltshaker microphone at the Olympic Pool in New London's new Ocean Beach Park. The microphone is part of what is said to be one of the largest outdoor sound systems in the United States.

Illustration courtesy Western Electric

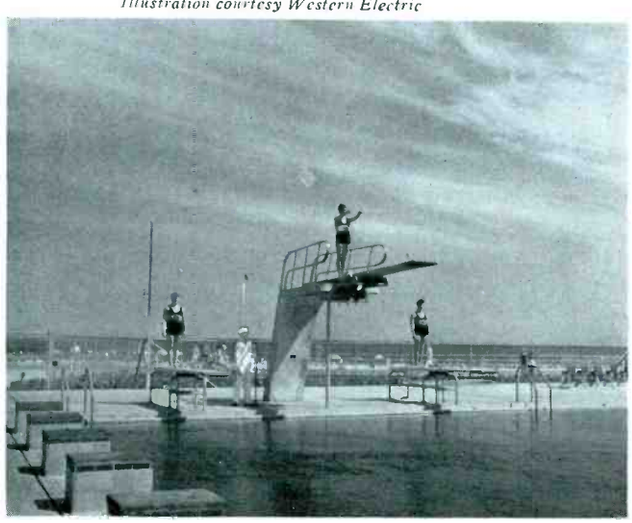


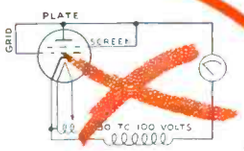
Fig. 6. Control and amplifying equipment for the system. The illustration shows push-button controls which allow the operator to choose between recorded music, live talent, radio programs, announcements or special features from the nearby Olympic Pool.

Illustration courtesy Western Electric

See why you get MORE in a JACKSON Tube Tester

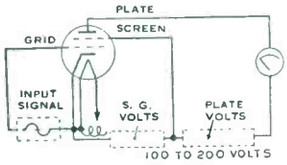
Learn how Dynamic TRADE MARK REG method doubles accuracy, boosts profits

ORDINARY TESTERS



Will pass many BAD tubes as OK because tube elements are "tied together" for the test.

JACKSON DYNAMIC TESTERS



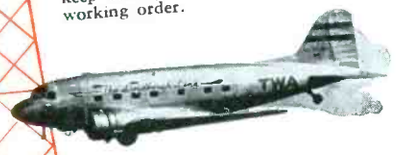
Detects ANY fault because tube elements are properly connected to separate circuits. The complete method—yet all in one simple reading.

JACKSON INSTRUMENTS ARE THE FIRST CHOICE OF EXPERT RADIO ENGINEERS

In the most exacting branches of Radio Communication, where reliable testing methods are absolutely necessary to protect human life and valuable property, experts select Jackson instruments.

AIRWAYS COMMUNICATIONS

To safeguard passengers and maintain flight schedules, service engineers select Jackson Dynamic Test Equipment to keep airways radio systems in perfect working order.



POLICE COMMUNICATIONS

To prevent failures in the vast Police Radio Communications Systems, skilled maintenance engineers select Jackson Test Equipment.

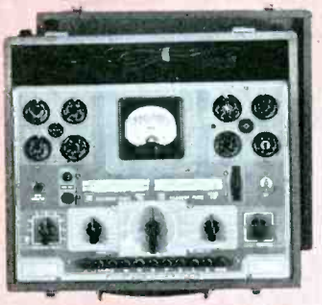
BROADCASTING SYSTEMS

Only the very finest equipment is selected by Radio Engineers in charge of Broadcast Stations. WBNS, Columbus, Ohio—one of the best equipped stations in the nation—selected Jackson test instruments.

Are you putting up with expensive "call backs" and customer complaints? Or are you losing tube sale profits that should be yours? Are you trying to "get by" with obsolete equipment? Solve these problems by using a Jackson Dynamic Tube Tester. Jackson is more accurate because it tests every element of a tube SIMULTANEOUSLY—just as it would operate in a radio receiver. BOTH mutual conductance and emission must be satisfactory to produce a "good" reading. Often a Jackson finds "poor" tubes which might pass for "good" in ordinary testers. Jackson Tube Testers have full range filament selection marked directly in volts, high voltage power supply, sockets for latest tubes and additional "spares." FREE new tube data for one year. You'll be proud to own a Jackson. Order from your Distributor now.

$29.95 net

Bench style Tube Tester No. 636-B. Built-in roll chart. Weight 10 lbs. $29.95 net.



Portable Style Tube Tester No. 636. Strong leatherette case. Roll chart. $34.95

SIGNAL ANALYZERS

Signal testing with a Jackson Signal Analyzer is direct, positive and easy. Analyzer is actually simple to use. Measures the signal itself, tracing its path through the receiver to the exact point of trouble. It shows ALL results instantly on direct reading meters. A money-maker for any shop!

Model 660 Signal Analyzer. Simple to use. Makes all signal tests. $79.50

"SERVICE LAB" UNIT Remember, a well equipped modern shop attracts customers. Investigate Jackson "Service Labs." The Service Lab earns extra profits—helps obtain better prices—speeds up shop work. Each unit in the assembly is a standard Jackson Instrument.

FREE!

"Learn The Truth about Dynamic Tube Testers" is an informative booklet that you'll want. Write for it today.

Leading Distributors Sell Jackson Instruments

THE JACKSON ELECTRICAL INSTRUMENT CO., Dayton, Ohio

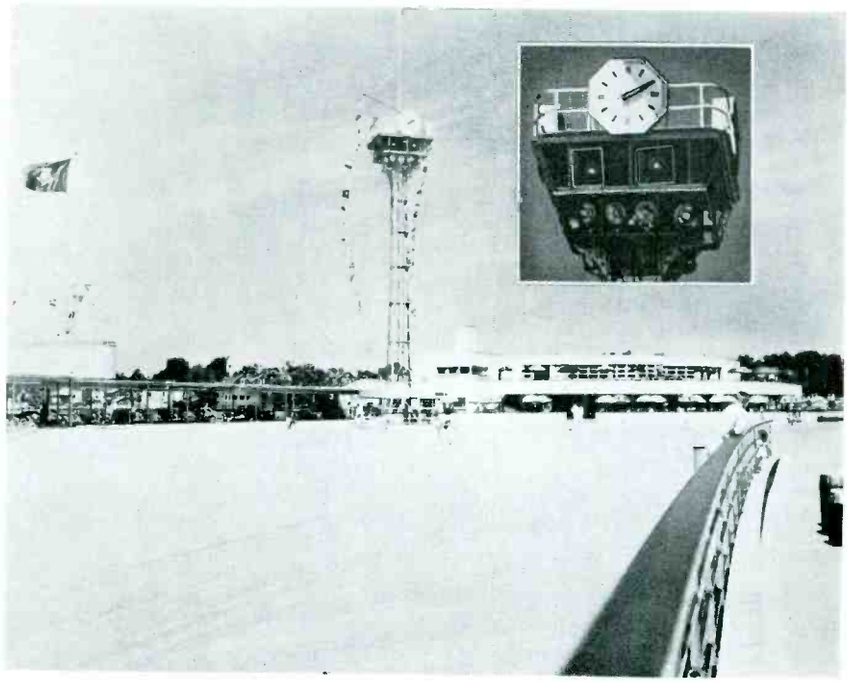


Fig. 5. The beach plaza at Ocean Beach Park, New London, Connecticut. Loudspeakers may be seen directly under the clock on the tower. These five speakers carried special announcements of music to swim by to crowds along a half-mile stretch of beach.

Fig. 7. Two-wide range Western Electric loudspeakers are installed as part of the beach system. The beach park is estimated to have cost approximately $3,000,000. The sound installation is said to be one of the largest outdoor systems in the United States. It consists of a number of units with a special arrangement that permits extreme flexibility in interconnection.

Fig. 9. Chicago's Grant Park employs several amplifier systems to reenforce musical offerings of guest conductors and soloists. Separate speakers are used for low and high frequencies.

and the Operadio Manufacturing Company of St. Charles, Illinois, for the equipment furnished.

Beach Sound

At Ocean Beach, New London, Connecticut, where a $3,000,000 recreation project has brought order out of the chaos wrought by the hurricane of 1938, a sound system has been installed by the Langevin Company of New York to serve a full half-mile of crescent shaped beach with its 30-foot boardwalk, adjoining recreational pavilions, and the 165-foot Olympic Pool.

The system was designed for maximum flexibility. Thus, at the push of a button, speakers atop the centrally located 80-foot tower (See Fig. 5) can flood the beach with music—either radio, recordings, or live talent—or carry special announcements.

Each day George Cronin, superintendent of Ocean Beach Park, stepped to the Western Electric Saltshaker (633A) microphone to announce a program of special events, entertainment in the Gam (an old whaling term for a sailors' get-together which New London has applied to the central pavilion at the beach) or swimming and diving exhibitions in the Olympic Pool. A Western Electric 300A reproducer panel, which plays either vertical or lateral recordings, provided the crowds with a background of music to swim by.

Amplification of the recorded music and of the voice currents from the announcer's mike is provided by a two-channel system consisting of Western Electric 117A and 118A amplifiers. (See Fig. 6) A similar system is used in connection with the Gam restaurant (Fig. 7) where the music of visiting orchestras is picked up by two W. E. 639 type Cardioid microphones and projected through two wide-range speakers and an extension speaker downstairs in the grille room. With favorable weather conditions the visiting orchestras play under the stars on the beach plaza in front of the tower. Under these conditions the Cardioids feed the tower speakers.

Another system which may operate independently—with its own amplifier and speaker—or feed into the general system has been installed at the Olympic Pool (Fig. 8) where a Saltshaker microphone picked up announcements of aquatic contests. When the Spence family put on their famous water show as part of the Park's dedicatory ceremonies, the pool system fed the announcements into the main system on the beach, attracting a large crowd to the event.

Push-button controls can bring to the

(*Continued on page* 30)

TRIPLETT 1183, 1620, 1621 TUBE TESTER

THE Triplett Models 1183, 1620 and 1621 test instruments use a lever-type flexible switching system which gives individual control for each tube prong. The Model 1183 is a combination tube and set tester; the 1620 and 1621 are tube testers. The 1620 (described and illustrated) employs a 6-inch square (red-dot) meter and is available either as a counter or portable type. The 1621 is similar, except that it has a 4-inch meter.

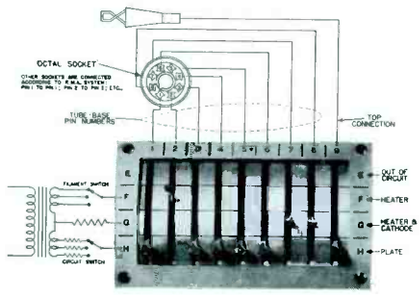


Fig. 1. The switch setup gives individual control for each element no matter what its function in the tube. It is also possible to switch off individual elements and note the effect.

When making emission tests, tubes are fundamentally built up into half-wave rectifiers. All elements are tied to the plate at one end of the transformer, while the cathode is tied to the other end of this transformer in series with some form of limiting resistors as well as the milliammeter with its variable calibration. This calibration is necessary so that all rejection points are brought to the center of the scale. Were it not for this latter function the so-called load settings could be eliminated on all tube testers of this type and minimum readings given on the scale for each tube.

The switch setup gives individual control for each element and it is possible to switch off any one element while the tube is under test and look for a change in the emission as an indication of its activity or check one element at a time against the cathode. When making this test it will be found under some conditions that the control grid will draw most of the current due to its proximity to the cathode and some suppressor or screen grids as well as plates may draw very little current when switched in alone.

Essentially there are nine switches, one for each terminal up to an octal tube base and number nine for the top connection of any tube. Each element in the tube has a definite function either as a filament, heater, cathode or plate, but the diodes must be taken out of the circuit while the balance of the tube is being checked (the voltage applied to the plates of a triode is too high for a diode even if the diode and triode plates are tied in parallel).

Fig. 1 indicates the operation of this switching device for the greater percentage of tubes as well as indicating the settings which will cover more than 40 of the common types in use. In this case only 3 of the switches need to be set into position. Where diodes or double section tubes are involved a cathode type tube will require the settings of three lever switches while a filament type tube will require the setting of only two levers. The lever settings necessary will be the two heater elements as well as the cathode for the cathode type of tube while in the filament type only the two heaters need be brought out from the group. The balance of the elements are all tied together as the plate portion of the half-wave rectifier and inasmuch as there are no separate sections operating on the cathode, one emission test is all that is required.

Should this emission test be low the tube is definitely defective and any additional tests are merely in the nature of experimental checks to determine just why the tube is defective. For this experimental setup no settings on the tube chart are given, but those interested should have sufficient technical knowledge to be able to set up tests inasmuch as the operation of the switch is a simple function.

The circuit switch in this tester is used to switch the plate group or all the elements tied to position H from the standard 30-volt connection to different limiting resistors as required by the Standardization Committee, such as diode or battery types up to and including the gas type rectifiers and eye tubes. The filament voltage switch as is shown in the diagram is also used to connect one of the heater busses to any filament or heater voltage on the transformer. The load switch has a 200-ohm resistance in series with the plate bus and by its various settings changes the full scale calibration of the milliammeter so that the rejection points for a tube drawing only say 1 or 2 milliamperes comes to the same place as the rejection point for a tube drawing 20 or 30 milliamperes.

If the good-bad type of scale is to be used with the rejection point at the center, some form of sensitivity changing resistor must be used for the milliammeter which accounts for the load control. Due to the fact that the various sections or types of tubes as well as rectifiers must be worked at different values of plate current to approximately load the cathode to its normal amount, some sort of current limiting resistance must be used in series with the plate transformer to avoid overloading the tubes requiring less current. The circuit is so designed that regardless of the setting of any switch lever no damage can be done to the tube or the tester, it is said.

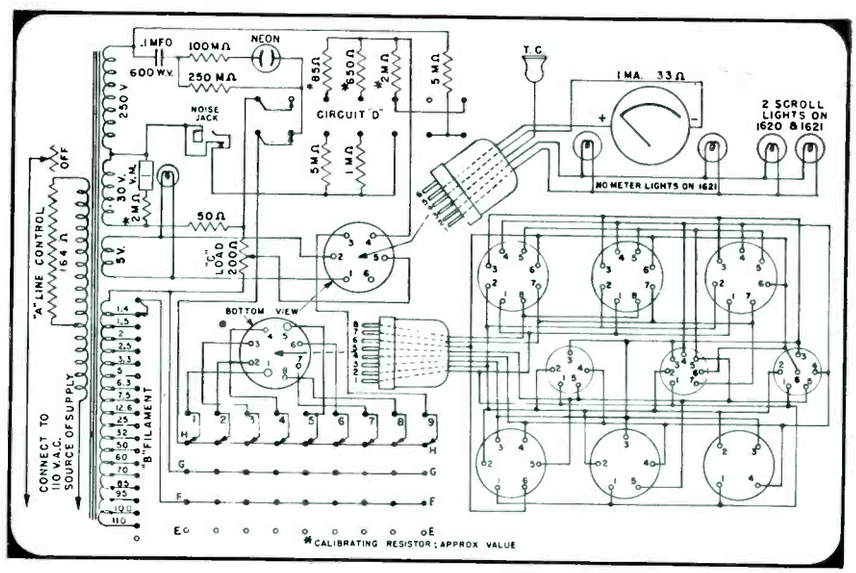
Inasmuch as the heater connections may appear on any two or even three pins of a tube the switching arrangement must be 100% flexible if it is to be obsolescence proof.

As an additional safeguard against obsolescence the testers are assembled so that separate sections can be removed and sent back for exchange for a modernized unit or repairs should the latter service become necessary.

Any switches in the same positions are all tied together except on position E where in the Model 1620 and 1621 they are not connected in any way and in the 1183 they are connected to the cord and plug as a free-point tester. As shown, all elements connected to position H go to the upper transformer terminal supplying plate voltage to the circuit switch which contains the necessary limiting resistors. The elements connected to position G are connected to one side of the heater circuit as well as the cathode return. This is generally called the common terminal of any tube. Elements connected to position F are the second heater connections and are connected through the heater voltage selector switch.

A neon short test is provided in the usual form as well as the standard line voltage indicator.

Figs. 2 and 3. The Model 1620 tube tester is of the emission type and employs a unique adding-machine type of switching shown in Fig. 1. Tube quality is indicated on a good-bad type of scale. As an additional guard against obsolescence the testers are assembled in sections.



When Better Transformers Are Made

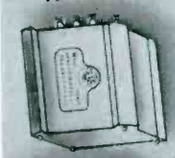
UTC WILL MAKE THEM...

• It is interesting to note the great number of sensational, new developments advertised by contemporary transformer manufacturers • Close scrutiny will generally show the new development as an imitation of designs and features originally initiated by UTC.

Examination of the major improvements in transformers over the past few years will readily substantiate this:

1933

HIGH PERMEABILITY CAST SHIELD
(TOP AND BOTTOM MOUNT)



Used by UTC since 1933, the HIGH PERMEABILITY CAST SHIELD has been copied extensively by other manufacturers since that time.

1933

HUM BALANCED COIL STRUCTURE

Used by UTC in practically all High Fidelity designs, hum bucking and hum balanced transformers are now accepted as standard practice in the transformer field.

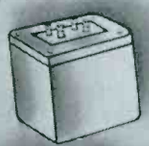
1934

LINEAR STANDARD AUDIO UNITS

Flat from 30 to 20,000 cycles . . . a goal for others to shootat.

1934

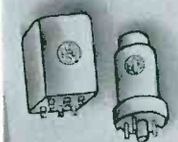
PORTABLE UNITS



The UTC HIPERM ALLOY group of transformers were brought out to take care of portable high fidelity requirements. Have you seen copies since?

1935

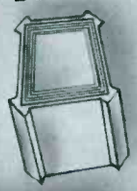
ULTRA COMPACT AUDIO UNITS



Developed originally for Aircraft and Hearing Aid Devices. In 1936, an entire series of these units were released for Broadcast Station applications. ULTRA COMPACT AUDIOS are HUM BALANCED, weigh from 4½ to 5½ oz. and are guaranteed ± 2DB from 30 to 20,000 cycles.

1936

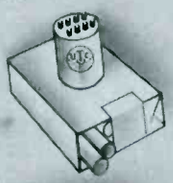
TRI-ALLOY SHIELDING



The combination of Linear Standard frequency response and internal TRI-ALLOY magnetic shielding is a difficult one to approach. That is why these units are used by G.E., R.C.A., Philco, Western Electric, Westinghouse, M.G.M., Walt Disney studios, and other discriminating organizations.

1937

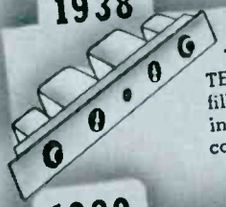
OUNCER AUDIO UNITS



Extremely compact AUDIO UNITS for portable applications were a problem until the development of the UTC OUNCER UNITS. Fifteen types take care of practically all applications. Units not carrying DC are flat from 40 to 15,000 cycles. Imitations of this line are close; — even the name has almost been copied.

1938

UNIVERSAL EQUALIZERS



The UTC UNIVERSAL EQUALIZERS, ATTENUATORS, and SOUND EFFECTS FILTERS fill a specific need of the broadcast and recording field. Almost any type of audio equipment can be equalized to high fidelity standards.

1939

PLUG-IN AUDIO UNITS

The manufacture of UTC PLUG-IN components was commenced in 1937. In 1939, a simple octal base structure was developed. Fifteen stock items are now available in this housing similar to our OUNCER UNITS.

1940

NEW ITEMS

The UTC research laboratory will develop new items and improve standard designs in 1940. While some of these developments are described in our advertisements, many are applied to customer's problems. May we cooperate with you on your problem?

Imitation is the sincerest form of flattery

UNITED TRANSFORMER CORP.

150 VARICK STREET ★ NEW YORK, N. Y.

EXPORT DIVISION: 100 VARICK STREET NEW YORK, N. Y. CABLES: "ARLAB"

BOOK REVIEWS

APPLIED ACOUSTICS, second edition, by H. F. Olson and F. Massa, published by P. Blakiston's Son and Co., Inc., 1012 Walnut St., Philadelphia, Pa., 1939, 494 pages, price $5.50.

The second edition of this text has been considerably enlarged and revised with the result that its usefulness has been greatly enhanced. Although the authors assume a familiarity of differential equations and vector analysis on the part of the reader, sufficient descriptive matter has been included so that those who have grown mathematically rusty will also find this book of great utility in his work.

The treatment is mainly theoretical in character, but, as its title implies, this book is concerned with the practical aspects of electro-acoustic equipment. The major emphasis of the book is placed upon an analysis of microphones, telephone receivers, and loudspeakers, although other topics such as acoustical measurements, architectural acoustics, measurement of noise, and physiological acoustics are also dealt with. It is unfortunate, however, that such sketchy treatment has been given to the chapter on Electrical Apparatus for the Acoustical Laboratory, and it is to be hoped that future editions will find this section considerably enlarged. R. L.

A DICTIONARY OF RADIO TERMS, edited by L. O. Gorder, published by Allied Radio Corp., 833 W. Jackson Blvd., Chicago, 1940, 36 pages, paper covers, 10c.

This booklet contains simple, illustrated definitions of approximately 800 terms and abbreviations most likely to be encountered in magazines, books or lectures on radio and allied fields. Schematic symbols, tips on reading circuit diagrams, instructions for reading the RMA code, historic data and other useful information are included.

Although the definitions are not always technically accurate, they are not involved and will easily suffice for the layman. The book is surely worth the modest purchase price and is especially recommended to those who are constantly besieged with questions from laymen. R. H.

HIGH FREQUENCY ALTERNATING CURRENTS, by K. McIlwain and J. G. Brainerd, published by John Wiley and Sons, Inc., 440 Fourth Ave., New City, 1939, 530 pages, price $6.00.

Although most sections of the book presuppose a knowledge of differential equations and vector analysis on the part of the reader, the majority of the work can be read without familiarity of these topics. A grasp of the symbolic treatment of alternating current theory is, however, prerequisite.

The authors' analysis of the triode is unusually good. On the other hand, they dispose of pentodes in less than half a page. Nor do they return to them when they discuss radio frequency amplification, for their analysis is based on r-f triode amplifiers, which are completely in the discard today.

As is customary in books written by members of the teaching staff of a university, no answers to the problems are given, thereby considerably lessening the value of the book. R. L.

TRANSMITTER GUIDE, prepared and published by Thordarson Electric Manufacturing Co., 500 W. Huron St., Chicago, 1940, 44 pages, 8½ by 11 in., paper covers, 15c.

This interesting booklet contains circuits, new ideas on ham transmitter equipment and technical articles covering Class B output calculations, driver transformer ratios, matching Class C loads to modulators as well as a wide selection of circuits for transmitters with power ranges from 2 to 1,000 watts.

The Guide is a handy reference book, with a minimum of advertising, and is recommended to everyone interested in the construction and maintenance of low power transmitting equipment. R. H.

SERVICING BY SIGNAL TRACING, by G. N. Goldberger, published by Precision Apparatus Co., 647 Kent Ave., Brooklyn, New York, 1940, 119 pages, 5 by 8 in., (typewriter size type, photo offset), paper covers, 35c.

This booklet presents a method of dynamic receiver analysis which extends the usefulness of test equipment . . . tube tester, multimeter and signal generator . . . found in the everyday service shop. Individual problems such as the adjustment of frequency modulation receivers is also included in special chapters.

Although the treatment is somewhat laborious in that it is largely a series of instructions, it is of interest to the Service Man because of its extreme importance in his daily work.

The book is recommended for those who make their living from the servicing of radio receivers and other electronic equipment. R. H.

Catalogs & Bulletins

One of the best methods of keeping up to the very minute in this rapidly changing industry is through the pages of latest catalogs from the various manufacturers. Write for them now.

• • • • A 2-color bulletin on Audax Microdyne pickups and high-fidelity cutters is available from Audak Co., 500 Fifth Ave., New York City.

• • • • A 28-page catalog illustrating and describing antennae and transmission cables for every purpose as well as cables, and accessories is available from Birnbach Radio Co., Inc., 145 Hudson St., New York City.

• • • • 160-page general catalog of sets, tubes, parts, p-a equipment, testers, small tools, books and appliances for the amateur, Service Man and experimenter. Write to Burstein-Applebee Co., 1012 McGee St., Kansas City, Mo.

• • • • Cornell-Dubilier offers free subscriptions to their periodical "C-D Capacitor" to readers of SERVICE. The publication features interesting and helpful hints for the Service Man. Write to Cornell-Dubilier Electric Corp., South Plainfield, N. J.

• • • • 16-page short-wave station guide which lists several hundred stations throughout the world, together with frequencies and call letters. Includes operating schedules and stations and world-wide time map. Is printed in English with Spanish and French translations on same page. Listings are in English, with Eastern standard time specified. Copies may be obtained from General Electric Co., Schenectady, New York.

• • • • An up-to-the-minute, 12-page vibrator guide is available from Meissner Mfg. Co., Mt. Carmel, Ill. Handy, easy to read chart, listing operating voltage, shape, circuit, dimensions and list price of each type, is a special feature of the guide.

• • • • Raytheon has issued a booklet which illustrates the numerous helps offered Raytheon dealers and Service Men. In addition to the displays and other items, valuable technical information is included. Copies directly from Raytheon Production Corp., Newton, Mass.

• • • • Shure catalog No. 153 is a 12-page booklet which describes and illustrates the Shure line of microphones, recording heads, crystal pickups and accessories. Copies from Shure Bros., 225 W. Huron St., Chicago.

• • • • Sprague's bulletin SC contains tables showing what Sprague universal replacement condenser should be used with motors of horsepower ratings commonly used in appliances. Copies from Sprague Products Co., N. Adams, Mass.

• • • • The Doenut exponential horn is the subject of a bulletin issued by Wright-DeCoster, Inc., 2233 University Ave., St. Paul, Minn.

MODERN MULTITESTERS

(*Continued from page* 14)

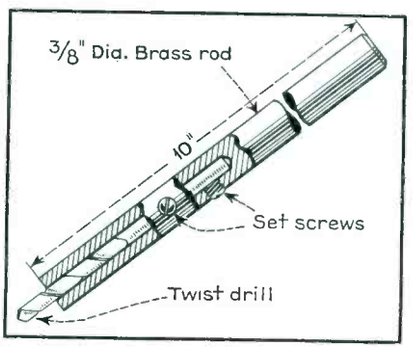
trolytics is too high to permit practical tests with this circuit.

It is realized, of course, that the functional circuits presented in this and the article last month can only prove suggestive so far as other makes of test instruments are concerned. However, for the Service Man who has never attempted a detailed study of individual circuits of modern and highly complicated test equipment, it is believed that the discusion presented will help to provide greater familiarity with the general principles and design practices involved and will make it easier for the reader to trace through the various circuits of his own equipment, gaining for him not only a better understanding of the equipment but making it easier for him to trouble-shoot if and when anything does go wrong with his equipment.

EXTENSION DRILL

A HANDY extension drill can be made by boring out the end of a 3/8-inch brass rod about eight-or ten-inches long, to almost the full length of the drill. The drill can then be soldered securely through a notch which may be ground through near the end of the hole.

These drills have several advantages. They seldom break. They are the cats whiskers in replacement work, since a power transformer, or what have you, may be put into place and the holes drilled from



A handy etxension can be made for a twist drill as indicated in the above drawing. Two holes can be drilled and tapped at right angles, in the side of the extension and set screws employed to hold the twist drill fast. It is also possible to jam the drill fast by soldering the drill through a long slot in the shaft.

above the transformer. They are equally ideal where the new holes don't quite line up with the chassis. In drilling holes from the top of the chassis the brass rod will prevent the drill point from scooting on through and wrecking something below deck.

R. G. Chrouch

EQUIPMENT

IRC CABINET DEAL

IRC offers Service Men a special deal in which the volume control cabinet illustrated may be obtained without cost through the purchase of 18 Type D con-

trols, 6 switches and 5 special, extra tap-in shafts. It is said that this selection will take care of requirements for from 60 to 75% of the control replacements which the Service Man encounters. The cabinet is of all metal construction and is attractively decorated. Additional information may be obtained directly from International Resistance Co., 401 N. Broad St., Philadelphia, Pa.

STANCOR PACK

Standard Transformer Corp., 1500 N. Halstead St., Chicago, offers their Stancor Model 132 auto radio demonstration pack. The 132 is a filtered unit delivering 12.5 amperes at from 3 to 6 volts for the

testing or demonstration of d-c operated equipment such as radio receivers, amplifiers, horns and other 6-volt automobile accessories and equipment. Additional information may be obtained directly from Stancor.

CABINET REFINISHERS

Walter L. Schott Co., 5264 W. Pico Blvd., Los Angeles, Cal., have announced an alcohol soluble cabinet touch up and refinishing kit that is said to fill the requirements of many shops. The kit contains stain, spirit lacquer, polish, French varnish, enamels, etc. Complete instruc-

tions are also included. Brushes are built into the bottle caps.

Additional information on this and other Walsco radio products may be obtained directly from the manufacturer.

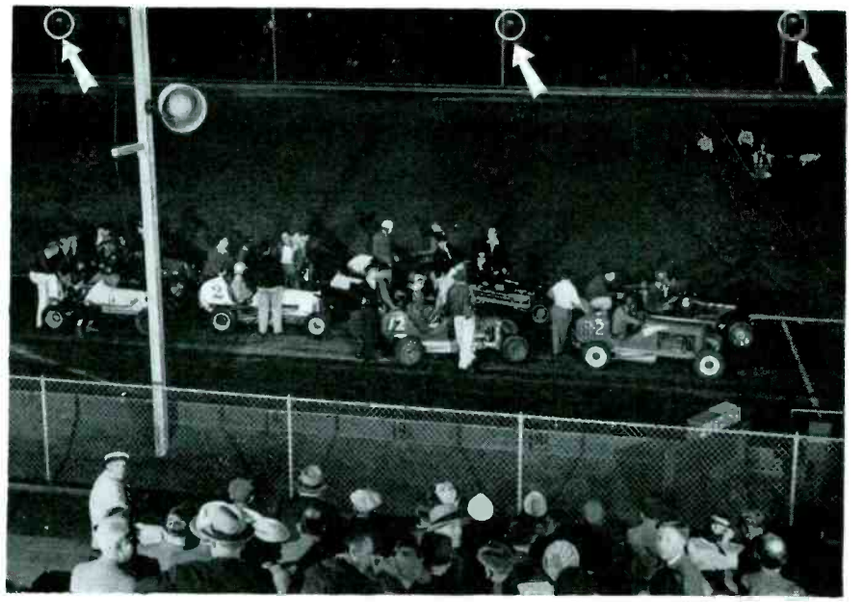


Illustration courtesy Atlas Sound

Fig. 10. Nine marine type loudspeakers carry announcements above the roar of racing midget autos at the Castle Hill Speedway, Bronx, New York City. A standard three-channel, 100-watt amplifier, located in the press room alongside the track, reenforces the sound that feeds these speakers.

SOUND IDEAS

(Continued from page 22)

tower speakers the operator's choice of programs. Each of these tower speakers is powered by a 118A amplifier. An additional amplifier and speaker are used for monitoring in the control room.

Park Sound

City sponsored concerts with famous guest conductors and soloists appearing in Grant Park, Chicago, have become outstanding musical events. (See Fig. 9.)

The installation of sound equipment, without the use of a multitude of speakers to amply cover the vast area of Grant Park, was effected by using Jensen Type B full range heavy-duty systems. Two of these new units provide ample sound for the great audiences. Each unit consisted of two Type X Jensen high-frequency units; one 32-cell multicellular horn, two low-frequency speakers with horn and frequency dividing network.

Auto Races

Around the fifth-mile track at the Castle Hill Speedway in the Bronx, New York City, nine Atlas sound Type WX8HL marine speakers blare forth announcements that overide the ponderous noise of the racing midget autos. Bill Heiserman, a pioneer in midget auto racing, had the system installed by a local Service Man in 1939. When the races are moved indoors to the New York Coliseum, during the winter months, the amplifier system goes along.

The equipment used is standard in every respect. A single 32-watt driver with several inputs picks up announcements from one of a number of microphones and feeds the inputs of a three channel 100-watt amplifier. Each channel feeds three of the nine marine horns.

The amplifier, built by Amplifier Corporation of America, employs three pairs of 6L6s, one pair for each channel, with three separate output transformers. The inputs are connected in parallel and are fed directly from the output of the 32-watt driver. Two small monitor speakers are connected to the 32-watt driver, one at the amplifier proper and one in a small room off the track.

While the stands are filling up, before the races start, and during intermissions, a Packard record changer feeds recorded music into the system to help pass the time.

A 10-watt Lafayette system with four small speakers located in the drivers' pits, is used in addition, to call the next event and to prepare the drivers to take their posts.

Werner J. Grunwald, who operates the system for the Bill Heiserman Promotions, is on hand each racing night to assure continuous operation.

WILCOX-GAY STYLUS

Wilcox-Gay has introduced their Hi-Clearance cutting stylus, which has been designed to eliminate the tendency of the thread to chip rather than have a smooth cut, during slow speed (33 1/3 rpm) recording. Additional information may be obtained directly from Wilcox-Gay Corp., Charlotte, Mich.

NEW TEST EQUIPMENT

OHMITE DETERMOHM

The Ohmite Determohm resistance box is provided in 2 new ranges, 1 to 9,999 and 10 to 99,900 ohms. These sizes are in addition to the 100 to 999,990 range box previously available. The Determohm is a

decade resistance box of ± 5% accuracy for industrial and laboratory uses. It may be used in the determination of replacement resistors in radio sets; as a voltmeter multiplier; or, with auxiliary apparatus, in an ohmmeter, resistance bridge or in many other applications.

Additional information may be obtained directly from Ohmite Mfg. Co., 4835 Flournoy St., Chicago.

HICKOK TUBE TESTER

Hickok Model 530M tests tubes by measuring dynamic mutual conductance in micromhos and is primarily designed to assist in making more tube sales across the

counter. It has a 9-in square meter with an illuminated dial that indicates good, bad or doubtful for each tube. Readings are also given in micromhos. The tester checks all tubes, ballasts, etc.

Additional information may be obtained directly from Hickok Electrical Instrument Co., 10308 DuPont Ave., Cleveland, Ohio.

HEARING AIDS

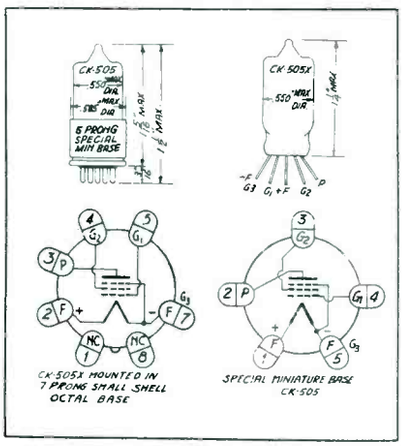
(Continued from page 7)

Mean filament voltage	1.25 v
Maximum plate voltage	45 v
Maximum screen voltage	45 v

Typical Operation (Class A)

	Impedance Coupled		Resistance Coupled	
Filament voltage*	1.25	1.25	1.25	v
Filament current	0.033	0.033	0.033	amp
Plate voltage	30	45	30‡	v
Screen voltage	30	45	30‡	v
Grid bias†	0	—1.25	0	v
Plate resist. (approx.)	1.0	1.5	—	meg
Transconductance	325	300	—	mmhos
Plate current	0.30	0.30	0.025	ma
Screen current	0.06	0.06	0.008	ma

The CK505 and CK505X are miniature pentode type voltage amplifiers of design and construction similar to the



The type CK505 tube is equipped with a special 5 prong base. The CK505X is mounted on an actual base shell which is used for test purposes.

CK501 and CK501X. The CK505 is equipped with a special miniature base. The CK505X has tinned copper leads for direct soldering and is supplied with a removable standard octal base to facilitate testing.

Typical Operation (Class A)

	Impedance Coupled		Resistance Coupled	
Filament voltage*	0.625 d-c	0.625 d-c	0.625 d-c	v
Filament current	0.030	0.030	0.030	amp
Plate voltage	30	45	30‡	v
Screen voltage	30	45	30‡	v
Grid Bias†	0	—1.25	0	v
Plate resist. (approx.)	1.1	2.0	—	meg
Transconductance	140	150	—	mmhos
Plate current	0.17	0.2	.020	ma
Screen current	0.07	0.08	.007	ma
Voltage amplification	—	—	15	—

* The filaments of two tubes may be operated in series directly from a single small flashlight cell. If larger cells are used or if other factors cause the mean battery voltage to exceed 1.25 volts computed over the normal battery life, a series filament resistor should be used to reduce the mean filament voltage to 1.25 volts for the two tubes in series.

† Grid circuit returned to negative filament. The d.c. resistance in the grid circuit should not be less than 5 megohms.

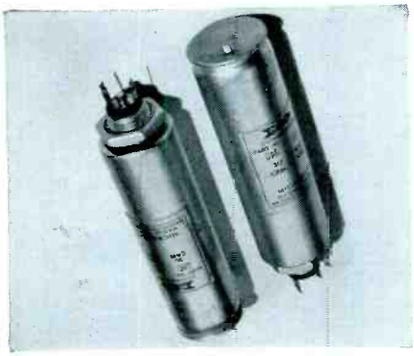
‡ Supply voltage. Plate resistor: 1 megohm. Screen resistor: 2 megohms by-passed with 0.01 mfd. Coupling condenser: 0.01 mfd.

The small size of the hearing aid tubes can be realized from this illustration by comparison with a man's hand.

In conclusion, the writer wishes to express his appreciation to the tube manufacturers for their help in preparing this article.

MICAMOLD MP ELECTROLYTICS

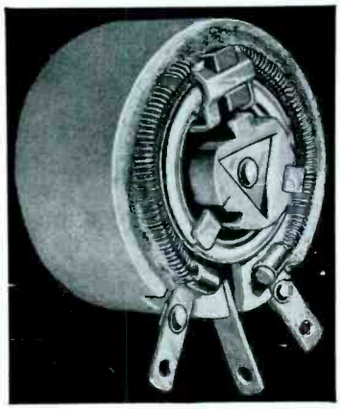
Micamold Radio Corp., Flushing and Porter Aves., Brooklyn, N. Y., announce the addition of a line of Type MP dry elec-



trolytics. These are available in a wide variety of capacity and voltage ranges. Standard lug mountings with both 3 and 4 terminals, both 1 and 1⅜ in diameters. Additional information may be obtained directly from the manufacturer.

CLAROSTAT POWER RHEOSTAT

Clarostat has introduced a 25-watt power resistor whose element is wound on an insulated aluminum core. The core is cemented into the ceramic casing. A graphited-copper contact shoe rides a brass third-rail ring, and the winding, with a sliding



contact. A tripod-type rotor provides for three-point support on the brass contact ring and the winding against a concealed helical spring pressure. The rotor is insulated from the metal shaft by a center ceramic insulator. The rheostat may be mounted in any position with regard to its terminals and knob rotation, by means of the adjustable locking pin and disc.

Additional information may be obtained directly from Clarostat Mfg. Co., Inc., 285 N. 6 St., Brooklyn, N. Y.

TRANSMISSION CABLE

A high frequency transmission cable is announced by Belden Manufacturing Co., 4689 W. Van Buren St., Chicago. The

cable is of the 100-ohm twisted pair type and is designed for f-m and television use. It consists of 18-gauge stranded tinned copper, celanese braid, rubber covered, color coded; twisted pair with fillers; celanese wrap; tinned copper shield; cotton wrap; and rubber sheath. It is cataloged as No. 8219. No. 8218 is similar except that it does not have the outer tinned copper shield.

Additional information may be obtained directly from Belden.

GLOVER JOINS JENSEN

Ralph P. Glover, radio and sound engineer, has joined the staff of Jensen Radio Manufacturing Co., Chicago. According to Thomas A. White, Jensen vice president and sales manager, Mr. Glover will be active in an expanded Jensen sales promotion campaign.

PERMO PRODUCTS ADDS SPACE

Permo Products Corp., 6415 Ravenswood Ave., Chicago, have started construction on an addition which should double the size of their plant. Permo products manufactures phonograph needles and recording styli and was started by Arthur J. Olsen, president, 14 years ago.

SOLAR APPOINTMENT

Solar Manufacturing Corp., Bayonne, N. J., manufacturers of capacitors, announces the appointment of R. C. Merchant, 4829 Woodward Ave., Detroit, as district manager for the State of Michigan.

RADEX I-F TRANSFORMERS

Radex Corp., 1733 Milwaukee Ave., Chicago, have developed 3 new double-tuned i-f transformers. The three cover replacements for practically every frequency and may be used as input, interstage or output transformers. Provision has been made to bring the grid lead out from either the top or the bottom of the can.

Additional information may be obtained directly from Radex.

SOUND NEWS

CLARION AMPLIFIER

Transformer Corp. of America, 69 Wooster St., New York City, announces their Clarion A93K amplifier with a rated output of 71 watts. The unit has a gain of 125 db and is said to have a frequency response from 40 to 12,000 cycles. Four speaker outlets are provided and six inputs allow simultaneous operation of 4 microphones and 2 record players. The same amplifier is also available with a built in record player as A95K. Additional information directly from TCA.

N. U. SOUND X/TRA TUBES

The National Union Sound X/tra type 6W5G replaces the previous Sound X/tra type 6X5G and the type 6J5GT/G replaces the 6J5G. Two special types have been added that do not have equivalents in the standard N. U. line. These have been specifically designed for sound work. The type NU540SX is a super-power output triode, a pair of which will deliver 25 watts output (3% total distortion) with 350 volts on the plates. The second, type NU576SX, is a special mixer tube which is said to have low microphonics, low hum and low input and output capacities. The tube has two grids, two cathodes and a common plate. It is intended for two channel mixer service.

Additional information on Sound X/tra tubes from the National Union Radio Corp., 57 State St., Newark, N. J.

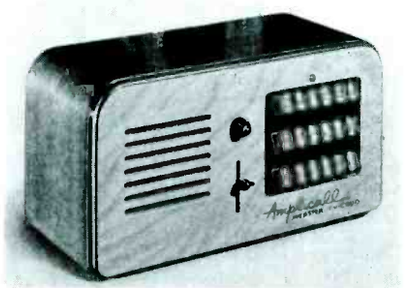
KNIGHT AUDIO-MASTER

The Knight Audio-Master combines into one portable unit a transcription player and p-a system for a-c, d-c operation. The amplifier has 2 input channels, tone control, inverse feedback, additional speaker outlet, phono-mike mixer and dual-speed phonograph record player. The gain is 120 db for the microphone input and 83 for the phonograph. Output is rated at 20 watts.

Additional information may be obtained directly from Allied Radio Corp., 833 W. Jackson Blvd., Chicago.

WEBSTER-CHICAGO INTER-COMMUNICATOR

Webster-Chicago's Series W300 intercommunicators offer a combination paging and intercommunication system whereby



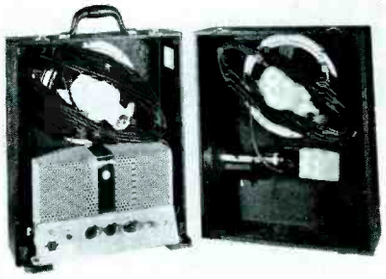
the master station can page independently over any one or all of the remote stations, or carry on a two-way conversation with each station. Remote stations are also able to originate calls. Maximum facilities for one master are 18 remote stations.

Master control unit is housed in a two-toned birch and walnut cabinet. Push-button selector switches are employed for station selection.

Additional information directly from Webster-Chicago Corp., 5622 Bloomingdale Ave., Chicago.

RCA PORTABLE P-A SYSTEM

The RCA PC180 is a portable 15-watt public address system designed for low-power installations. Two separate inputs are provided with individual volume controls. Two 10¼-in p-m speakers are sup-

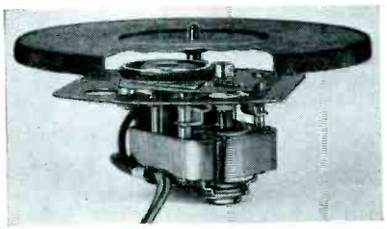


plied in the compact carrying case. The RCA Junior velocity microphone can also be placed into the case together with its table stand, while carrying the system about. The entire system weighs 43 lbs.

Additional information may be obtained directly from RCA Manufacturing Co., Inc., Camden, N. J.

ALLIANCE 25-CYCLE MOTOR

Alliance announces its Model K800 25-cycle motor which is adapted to the standard friction drive assembly as used on



the Alliance 80. This permits interchangeability in mounting without sacrificing performance, it is said. The Model K800 is available for 110 or 220 volt, 25-cycles in 8- or 9-in turntable sizes.

Additional information may be obtained directly from Alliance Mfg. Co., Alliance, Ohio.

BURGESS BATTERY DISPLAY

Burgess Battery Co., Freeport, Ill., is offering dealers and Service Men a humorous background display for the Christ-

mas holiday season.

Another Burgess Christmas item is a matched gift set— a modern light and a pen light boxed in holiday style.

For full details of this Christmas gift offer write Burgess directly.

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State whether Employer is a Service Organization, Dealer, Jobber or Manufacturer .....

CIRCUITS

(*Continued from page 12*)

tion: Keep any part of the dial and condenser assembly from touching the cabinet when replacing the chassis in the cabinet, otherwise there will be trouble with microphonics.

RCA V300, V301, V302

In line with the trend toward high power output, audio driver stages are coming back to work the final push-pull

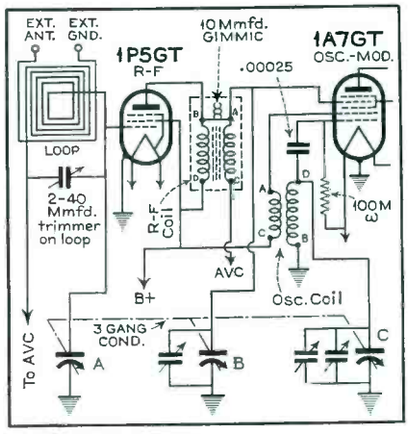


Fig. 12. Sentinel r-f stage.

amplifier in Class AB operation. RCA Victor V300, V301, V302 models employ a triode-connected 6F6G to drive a pair of 6F6G pentodes to 18 watts of undistorted output. Note also the separate treble tone control at the driver grid. The 6J5 first audio stage is biased at —4.6 volts by the power supply voltage divider which supplies bias for the output stage. A decoupling filter of 1 megohm and ¼ mfd serves to isolate these two audio circuits. See Fig. 5.

Philco 41-603, 41-604, 41-605, 41-607

Philco Models 41-603, 41-604, 41-605, 41-607 have a dual volume control consisting of two separate controls with selector switch, one being for radio, the other for phonograph. (See front cover.) The main a-c switch is also attached. Note also the new dual-triode tube used as oscillator and converter in a rather unusual circuit. The converter section is tapped down on the primary of the i-f transformer instead of being across the entire coil. This allows more gain and better selectivity. The first i-f amplifier tube is also tapped down on the second i-f transformer. The oscillator section has the grid at ground potential and the cathode hot. Two i-f stages are used.

Admiral J55, XJ55

In order to provide some initial bias on the converter and i-f tubes during

(*Continued on page 39*)

ASSOCIATIONS

RADIO SERVICEMEN OF AMERICA

Jersey City, RSA

New tube applications, what to look for in new circuits, and how to correct possible trouble that may be encountered was discussed by George C. Connor, Hygrade Sylvania Commercial Engineer, before the Jersey City Radio Servicemen's Association in Arion hall at their last meeting.

Martin Seel, president of the Jersey City group, conducted the meeting. The sponsoring distributor, Dale Radio Co., New York, was represented at the meeting by Jack Unger, Norman Leeb, Rene Jacobs Bob Termane and Dean Elher. A large, enthusiastic crowd of Service Men turned out for the meeting.

Following the technical discussion, refreshments were served.

Henry C. L. Johnson

RADIO TECHNICIANS GUILD

Boston, RTG

Our educational director, Albert C. W. Saunders, has finally given in to Old Doc Sawbones and consented to a little cutting up (at his age), picking, of all days, Friday the 13 to enter the hospital. I wonder if he put in his order for fancy hemstitching ? ? ?

Last time Brother Technician Bertram Lewis of Rochester, N. Y., visited us he ran into our famous hurricane of 1938. This year, when he again visited us we had another hurricane warning. He must have something that attracts them. But, after all, he is something to blow about. He has that rare faculty of making you feel as though you had known him all of your life, after only having met him five minutes before.

The Boston Chapter held its election of officers on Sept. 9, 1940. Emile Maginot, our president, was reelected while our former librarian, Bill Staples, has taken over the office of vice-president. S. DiRusso was elected librarian. The treasurer and secretary remain the same as in past terms, namely Frank Kennes, treasurer, and Joseph Cabral, secretary.

Rochester, RTG

The Radio Technicians Guild of Rochester extends a most cordial invitation to Service Men everywhere and especially to those living within a 400-mile radius of Rochester, N. Y., to attend the second annual Info-meet, being held this year in cooperation with the Rochester Fall Meeting of I.R.E., R.M.A. engineering department, Sunday, Nov. 10 It will be the opening gun of a four day session at which the greatest gathering of technical men the industry has ever seen will be assembled.

This is not an entertainment or a salesman's meeting, but the Service Man's opportunity to receive the latest information on technical developments in the radio industry direct from the men most qualified to tell it. Among these outstanding engineers will be Dorman D. Israel of the Emerson Radio and Phonograph Corp., Walter R. Jones of Hygrade Sylvania Corp., Robert G. Herzog of Service Magazine, and Albert C. W. Saunders of Massachusetts Radio School.

You will be rubbing elbows with the men who designed the receivers we maintain. F-m will come in for its share of discussion and demonstration.

Once more let us state that in Rochester, N. Y., Sunday, Nov. 10, 1940, the doors to the storehouse of radio knowledge will be thrown open to all those who care to come in.

For further information, reservations, etc., write Info-meet Committee. 22 Thornton Rd., Rochester, N. Y.

Dallas, Texas

At the long awaited meeting on Sept 27, we filled the auditorium with exception of standing room. Heard a good talk by Dan Fairbanks, of IRC, saw a good girl show and an act of vaudeville, had a whopping big dinner of fried chicken and all the fixins. Attendance from a radius of 100 miles all around Dallas and included over 100 of the leading Service Men of North Texas. Meetings are booked up until February and include several national engineers, etc.

Carter T. Bennett

Fairbanks Tour

Dan Fairbanks, sales manager of the resale merchandise division of the International Resistance Co., Philadelphia, Pa., is now on another of his trips to the trade during which he will visit jobbers and speak at various service meetings in a number of cities. Included in his itinerary are Charlotte, N. C.; Atlanta, Ga.; New Orleans, La.; Dallas, Houston, San Antonio, Oklahoma City, Kansas City, St. Louis, Chicago, Detroit and Dayton.

JOBBER GROUPS

Sales Managers Club

New officers for 1941 have been named by the Sales Managers Club, Western Group. The new chairman is John Robinson of Crowe Name Plate and Manufacturing Co., who succeeds Herbert W. Clough of Belden Manufacturing Co., the retiring chairman. The new vice-chairman is Win Hartford of Thordarson Electric Manufacturing Co., and Helen Staniland of Quam Nichols continues as secretary and treasurer.

Installations were made at the regular meeting in the Electric Club of Chicago, on Tuesday, Sept. 10, 1940.

NRPDA

At the meeting of Sept. 17, in the Hotel Manger in Boston a membership committee of five was set up to pass on all new applications for membership.

Luncheon meetings of Boston jobbers will be held shortly to discuss credit problems.

The next meeting of the National Radio Parts Distributors Assn. is planned for Springfield in order that traveling of the members will be equalized.

Among the many subjects discussed at this meeting were: the amateur situation in relation to National Defense; cooperative advertising of the New England jobbers; cash discount terms; prizes and program advertising; volume control price situation; problem of bid prices; uniform accounting; credit interchange; NRPDA cooperation with NAB and RMA on campaign "Listen Before You Vote."

The Philadelphia Radio Servicemen's Association recently invited Thomas F. Joyce, RCA Victor vice president and advertising director, to deliver a radio address under its auspices over Station WFIL, Philadelphia. Mr. Joyce (third from left) brought along three prominent RCA research engineers to assist him in presenting a round-table discussion on the importance of the Service Man (whom he called the unsung heroes of radio) and the possibilities of radio's future. From the left are Dr. G. A. Morton, of the Electronic Research Laboratory; G. L. Beers, television research engineer, and Dr. H. F. Olson, acoustic research engineer.

SERVICE HELPS

CHRYSLER-PHILCO C1708

Sensitivity control: To provide the greatest uniformity possible in the manufacture of the Chrysler custom-built auto radio, each set is provided with a sensitivity control. This is in the form of a variable resistance in the cathode circuit of the 7A7 radio frequency amplifier tube and the 7B8 detector oscillator tube. Access to the control is made by removing the wingnut holding the tube side cover. On the subbase next to the 7B8 tube is a round disc with a screwdriver slot in the center. By turning this slot clockwise the sensitivity of the set is increased and counterclockwise it is decreased.

In locations at a great distance from a broadcasting station a readjustment of this control, to gain more sensitivity may be made. It must be remembered that this increase in sensitivity will be accompanied by an increase in the circuit noise of the receiver and the noise heard when tuning between stations. The control is initially adjusted at the factory for best all around performance of the receiver. In all cases where an increase in sensitivity is desired, a thorough check of the antenna padding in the receiver should be made before readjusting the sensitivity control.

Where complaints of excessive noise are encountered in large cities, a reduction in sensitivity will help. This, however, if carried too far, will result in excessive fading of even local stations.

Philco RMS Service Note

STEWART-WARNER 5R, 5R4, 5R5, 5R6, 5R7

Increasing sensitivity: In locations where extreme sensitivity is necessary in a radio set, the 5R wood cabinet models (5R4, 5R5, 5R6 and 5R7) can be stepped up by the introduction of a slight amount of regeneration. This change can easily be made as follows:

Disconnect the 0.05-mfd condenser No. 23 from the suppressor grid terminal of the 12SK7 socket. In the Underwriters approved sets (Model 03-5R, etc.) connect it instead to the B— terminal of the volume control. This is the terminal nearest the 12SQ7 socket, and is clearly indicated in the tube socket voltage layout of the service manual. In non-approved models (07-5R, etc.) connect condenser No. 23 to ground.

After the condenser change has been made, realign the receiver. It is especially important to readjust trimmer No. 9, the broadcast oscillator padder, exactly as explained in the service manual. When aligning, keep the chassis away from the loop or oscillation may occur.

This change cannot be made on any of the plastic cabinet 5R sets (5R1 and 5R3). The plastic cabinet sets of this series will oscillate if they are stepped up beyond the present limit of sensitivity by this means.

STEWART-WARNER CORP.

Setchell Carlson features DorAFone, combined radio and intercall system with finger-tip control for talk and listen positions. An external p-m speaker serves as the remote position. Radio output may also be switched to this speaker.

CIRCUITS

(*Continued from page 37*)

the absence of a signal when no avc bias is being generated, Admiral uses a 10-meg leak from the avc bus to the oscillator grid. (See Fig. 6.) As long as the tube oscillates, it generates its own negative bias independent of any signal. This stunt gives added stability and guards against oscillation.

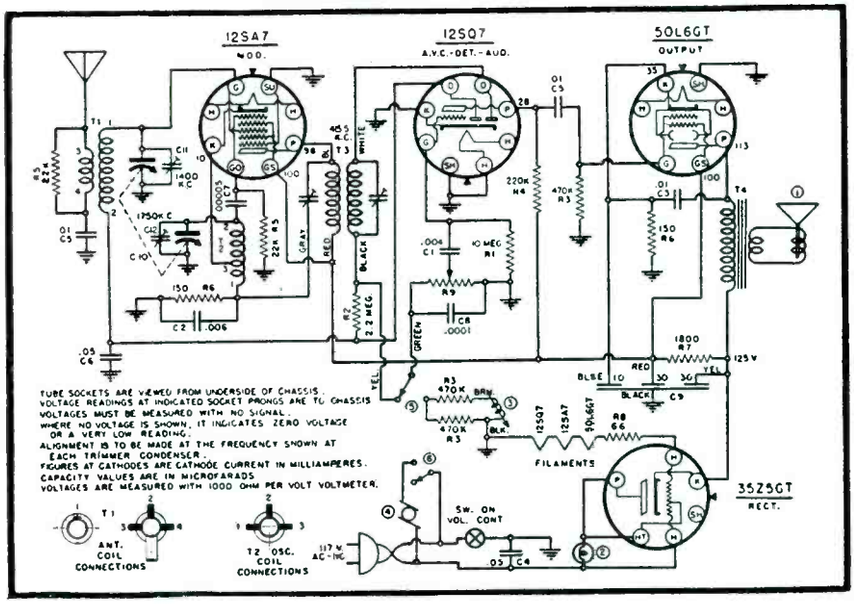
Other Models

Sears Roebuck Silvertone Models R121 and 721 feature an i-f voltage doubler using a 6H6G and a diode connected 6J5G as a noise limiter. (See Fig. 7.) Noise peaks such as static crashes and transients generated by sparking (electric razors, ignition systems, etc.) are considerably reduced. In Silvertone Model 5751, Sears opens the cathode of the converter tube to prevent radio reception from getting through on phono position. (See Fig. 8.) In t-r-f model 6326A, Fig. 9, a 12J7GT is used exclusively as a phonograph amplifier with its own volume control. Another t-r-f combination Model 5701 with only four tubes uses diode detection and avc. Iron-core coils are used and diode is impedance coupled to r-f stage. Fig. 10.

As an aid to battery set stablility, Sentinel returns the grid of the 1N5GT i-f stage to a tap on the power tube bias network. See Fig. 11. Another model, Fig. 12, having an r-f stage and 3-gang condenser uses a 10-mmfd gimmic as part of the r-f transformer. Warwick has a 4-tube superhet without an i-f stage, additional gain is obtained through regeneration in the converter. See Fig. 13.

Philco Model 41-788 is an eleven tube job with 8 tuning bands, 5 of which are spread bands separately tuned by a 3-gang permeability tuner with shunt aligning condensers for each spread band. (See Fig. 14.) Note the sensitivity control in the first i-f stage. Also, the five tube audio amplifier. The power transformer is tapped for 115 and 230 volt operation.

Fig. 13. Warwick WS1-41



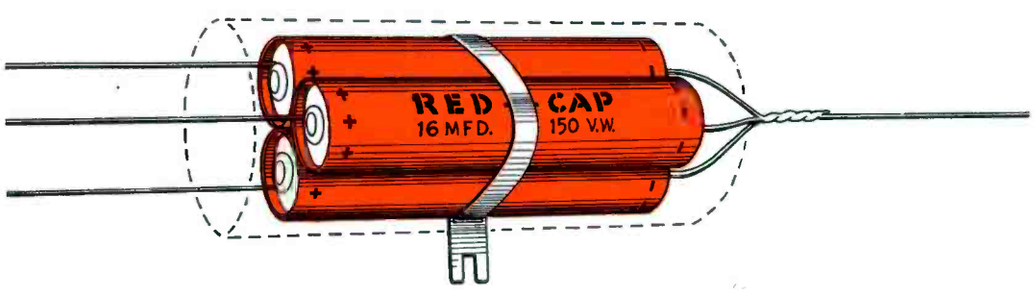
Index to Advertisers

RED-CAPS

CUT SERVICING COSTS

Here are *smaller* dry electrolytic condensers than ever offered before. They were designed especially for radio service work. New Solar developments in producing higher gain etched foil have made Red-caps possible. As few as 12 condensers cover most repair requirements for electrolytic filters. Utmost simplicity, adaptability, low-cost.

You have wanted Red-caps! Why delay repair jobs awaiting exact replacements? You have wondered when someone would offer unit dry electrolytics sealed in metal tubes—so small in diameter that several strapped together will occupy no more space than the filter condenser they replace — so high in quality they will stand up under surges which the original filters could not "take"—so low in price that they leave you much room for profit. These are your Red-caps!



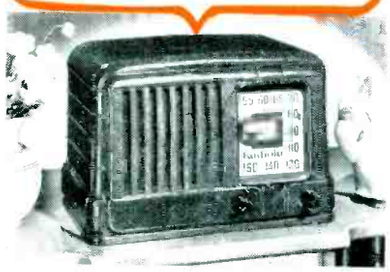
SO HANDY! Diameters are absolute minimums; lengths are uniform. An adjustable strap enables you to build your own filters with 1 or 2 or 3 or 4 Red-caps. Space-saving. (See illustration.) Ask for Red-cap price list.

SOLAR MANUFACTURING CORPORATION
BAYONNE NEW JERSEY

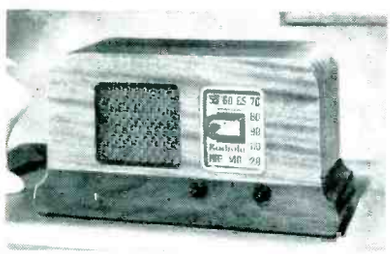
It's the Greatest News in Years!

Equipped exclusively with RCA Preferred Type Tubes!

THE HOTTEST SMALL-SET LINE YOU'VE EVER SEEN!



Radiola Model 510—AC-DC operation. Beautiful molded mahogany plastic cabinet with matching tear-drop knobs. 5 RCA Preferred Type Tubes. A.V.C. Superheterodyne, with beam power output, built-in tuned loop.



Radiola Model 512—AC-DC operation. De luxe modern cabinet, newly styled, with top and ends of striped mahogany. 6 tuned circuits. 5 RCA Preferred Type Tubes. Built-in tuned loop antenna. Large, easy-reading dial. A.V.C.

Radiola Model P-5—3-way operation. AC-DC and battery. Sensitive Superheterodyne circuit with large tuned loop. 5 RCA Preferred Type Tubes. Permanent magnet dynamic speaker. Tunes 540 to 1720 kc. Extremely sensitive on either self-powered or line operation. A real seller!

Plus Many Other Fast Moving Numbers

A Grand Old Name... a Great New Line!

Preferred Type SETS FOR SERVICEMEN TO SELL!

Here, at last, are sets specifically designed for *servicemen* to sell!

Backed by a great name—an old and honored name—the new RADIOLA line is feature-packed to sell and *sell* and SELL! Light enough for servicemen to carry on calls . . . to leave with customers while their sets are in the shop . . . these new Radiola models are real self-sellers. They meet today's trend toward *extra* radios—with extra features for extra radio enjoyment . . . and *extra* profits for you!

No wonder servicemen everywhere are shouting the good news: "Radiola's back!" See *your* distributor this week. Get in on the ground floor of the new profit opportunity that will bring thousands of extra dollars to servicemen the country over.

RCA PREFERRED TYPE RADIO TUBES
For Finer Radio Performance

Radiola *Preferred Type Radios*

Made by RCA Manufacturing Co., Inc., Camden, N. J., U. S. A.