



radio service dealer



MARCH, 1948



IN THIS ISSUE:

KNOW YOUR TUBE TESTER

TV POWER SUPPLIES

A-C/ D-C/ BATTERY SET CIRCUITS

BLURB ELIMINATOR

TECHNICAL QUIZ 5

Uniform Resistance

Mallory carbon
controls are accurate
in overall
resistance value



You will find no variation in the resistance values of Mallory carbon controls. Frequent, critical inspections reject the imperfect, and pass only those carbon elements of the resistance values specified on the labels.

Recently dozens of controls from leading manufacturers were tested competitively for overall resistance value. Mallory controls averaged within 2% of specified resistance, the closest tolerance of any group in the test.



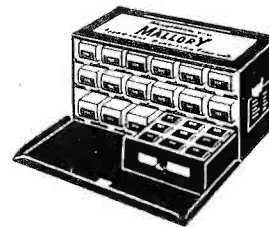
Every carbon element that goes into Mallory controls is individually inspected to be sure that its resistance value is the same as specified on the labels.

In volume controls you look for uniform

resistance, accurate tapers, silent operation and long life. Mallory gives you all four, and more, too. The Mallory trade mark is your assurance that the volume control, vibrator or capacitor you buy is the finest that can be made.

The Mallory 1485 Control Deal

This attractive metal cabinet contains the 15 Controls and 9 Switches that will take care of 90% of your service calls. Its arrangement makes inventory control almost automatic—saves you frequent trips to the distributor's counter. It contains a rack for your Radio Service Encyclopedia. You pay only for the Volume Controls and Switches; the cabinet is included in the deal at no extra cost to you. Check your Mallory distributor on this special offer.



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New York
March 22-25

P. R. MALLORY & CO. Inc.
MALLORY

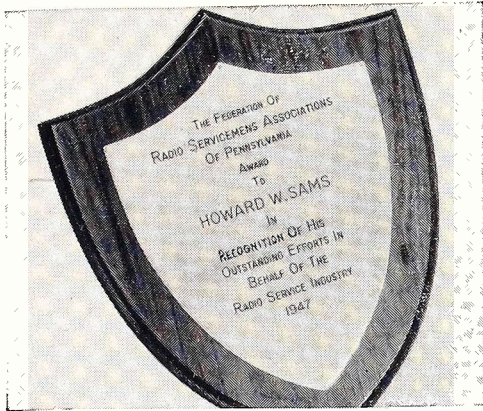
CAPACITORS . . . CONTROLS . . . VIBRATORS . . .
SWITCHES . . . RESISTORS . . . RECTIFIERS . . .
VIBRAPACK* POWER SUPPLIES . . . FILTERS

*Reg. U. S. Pat. Off.

APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

HOWARD W. SAMS WINS "OSCAR" FOR AID TO RADIO SERVICE INDUSTRY!



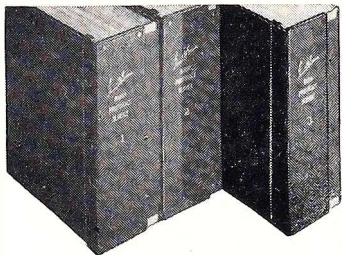
The handsome plaque awarded to Howard W. Sams carries the inscription: "The Federation of Radio Servicemen's Associations of Pennsylvania Award to Howard W. Sams in Recognition of His Outstanding Efforts in Behalf of the Radio Service Industry, 1947." The award is a tribute to the practical usefulness of PHOTOFAC Publications—the world's finest radio service data—indispensable to the Radio Serviceman.

PHOTOFAC Publications Cited as Outstanding Effort in Behalf of Servicemen

"For Outstanding Efforts in Behalf of the Radio Service Industry"—reads the citation of the first annual award bestowed on Howard W. Sams by the Federation of Radio Servicemen's Associations of Pennsylvania. The "Oscar" was presented before a group of over 600 persons, including many radio industry leaders, at a banquet held on January 12, 1948, at Philadelphia's Bellevue-Stratford Hotel. The surprise ceremony was arranged as a demonstration of appreciation for the significant, practical aid made available to Radio Servicemen in PHOTOFAC Publications, and for the efforts of the SAMS' organization in behalf of the Radio Service Industry. This spontaneous demonstration marks a milestone in the Radio Service field. It is a healthy sign of growing recognition of the Serviceman's importance to the Radio Industry.



These Are the Award-Winning Service Aids that Earn More Money for You!



Own PHOTOFAC Volumes 1, 2 and 3—the world's most complete, accurate, practical radio service data manuals. Here is everything you need for faster, easier, more profitable servicing—bound in easy-to-use volumes. Exclusive Standard Notation Schematics; photo views keyed to complete replacement parts lists; exhaustive electrical and mechanical analysis of every set covered. Brings you right up to January 1948! Have the exclusive advantages that are now earning bigger profits for thousands of servicemen!

Vol. 1. All post-war models up to Jan. 1, 1947.
Vol. 2. Models from Jan. 1, 1947 to July 1, 1947.
Vol. 3. Models from July 1, 1947 to Jan. 1, 1948.

YOUR PRICE, EACH VOLUME, IN EASY-TO-USE DELUXE BINDER . . . **\$18.39**



Radio Receiver Tube Placement Guide

Shows you exactly where to replace each tube in 5500 radio models, covering 1938 to 1947 receivers. Each tube layout is illustrated by a clear, accurate diagram. Saves time—eliminates risky hit-and-miss methods. You'll use this handy

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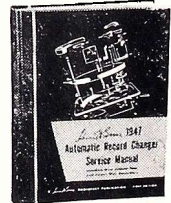
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The book that shows you the *one right* way to string a dial cord. Here, for the first time, in one handy pocket-sized book, are all available dial cord diagrams covering over 2300 receivers, 1938 through 1946. Makes dial cord restringing jobs quick and simple. A "must" for every service bench and tool kit.

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"The Service that pays for itself over and over again"

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... brings **GIANT-SIZE** screens to even the smallest television sets!



\$5995
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(Model 1059)

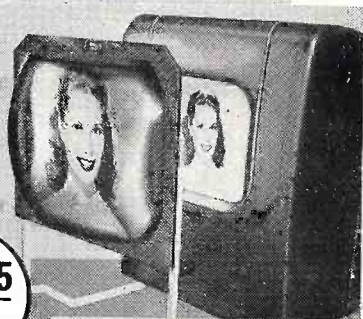
Fits all table and console models up to 12 inches. Fitted with beautiful wood-grain frame to match set. World's finest precision magnifier for television. Terrific profit-maker. Magnifies screens up to four times original size. FULLY GUARANTEED.

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BY WALCO—MAKERS OF WORLD-FAMOUS DIAMOND, SAPPHIRE, RUBY AND PRECIOUS METAL LONG-LIFE PHONOGRAPH NEEDLES

EDITORIAL

by S. R. COWAN

Another Birthday

This issue brings to a close *Radio Service Dealer's* first 8 years of endeavor. Next month we will be able to claim that "RSD" is in its ninth year and pushin' towards 10. We mention this because during the past few weeks we've heard a few rumors around the trade that "a couple of radio magazines are shaky, having tough going, are about to fold, etc."—and we want to be sure that no one confuses "RSD" with the weak sisters, if there are some. Rest assured, we intend to be around for the next 9, or perhaps 99 years, and all indications point that way.

At this minute "RSD" can boastfully and proudly claim and prove that: More leading independent radio servicemen, Service Dealers and service organizations subscribe to it than to any other technical monthly trade journal published. This gives rise to an interesting query. How many of our present subscribers have a complete file of "RSD" from its very first issue through the current number? There are hundreds and if you are amongst them, please let us know.

Predictions Come True

The Editorial in "RSD's" first issue, (written by M. L. Muhleman, then editor), contained several opinions and predictions that have subsequently been borne out. For example, Mr. Muhleman opined before the advent of FM as an actuality that a system of broadcasting capable of making the public tone-quality-conscious would increase the popularity of consoles and thus enhance profits from sales and servicing. Certainly FM has done just that. And Mr. Muhleman's idea that the public would avidly buy phonograph records and record-players when they were made in wider range and of better quality is a fait accompli.

In similar manner our predecessor stated that the time would undoubtedly come when the radio servicing profession would abandon its then general policy of making free diagnoses, testing tubes gratis, and making estimates sans charge. Now-a-days only a relatively few Service Dealers cling to the proven obsolete practice of doing most of their work for nothing. More important, the public itself seems to hold in much higher regard those Service Dealers who openly and aboveboard insist upon being paid for every service rendered, whether it be that of testing tubes or making estimates on a repair job. Supporting this are many surveys, including our own, which show that most shops having a policy of giving "free estimates" are in much lower income-earning brackets than competitive shops having a "minimum fee" policy.

Strength in Unity

The serious threat by various municipalities to require licensing of all radio technicians, rife until very recently, is diminishing by the minute simply because intelligent, far-sighted and aggressive radiomen did the wise thing and banded together, pooling ideas and find-

[Continued on page 35]



Member of the
Audit Bureau of
Circulations



VOL.
9
NO.
3

SANFORD R. COWAN, Editor & Publisher

SAMUEL L. MARSHALL, Technical Editor

MARCH, 1948

Editorial	3
Trade Flashes.....	8
Last-minute news on various phases of the industry	
Understand Your Tube Tester, by Rufus P. Turner.....	13
Describing methods of testing and a tester employing a combination of methods	
TV Power Supplies, by S. L. Marshall.....	15
Classifying types of power supplies used in TV sets to make easier the installation and service of same	
Power Supplies Found in A-C/D-C/ Battery Portables, by Albert Loisch.....	21
A refresher course timely because these sets are now coming in for repairs in big numbers	
Technical Quiz No. 5.....	22
Another quiz on television from a new angle	
Shop Notes.....	23
Matching impedance; Impedance measurements; Improving reception with a built-in antenna; To measure voltage beyond the range of any voltmeter; Resistance multipliers; Transformer multipliers	
Blurb Eliminator, by Llewellyn Bates Keim.....	24
A gadget that may "click" with the public and pour \$ into the Service Dealers' cashbox	
New Products.....	26
Circuit Court.....	28
Motorola 95F series; Airline 64BR-1205A, 06A series; Zenith 8H023-8H034 models; RCA's model Q10 S.W. range set	
Book Reviews.....	36
Literature of interest to technicians	

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**Speakers
that mean
business...**

FOR YOU!



TELEPHONE CHEAT 8573
The Drive-In Theatre Equipment Company, Inc.
Manufacturers of NATIONAL AUTO VOICE in-car Speaker Units

2110-2130 SUPERIOR AVENUE
CLEVELAND 14, OHIO

January 20, 1948

Mr. R. S. Fenton, Sales Manager
Parts Section, Receiver Division
Electronics Department
General Electric Company
1001 Wolf Street
Syracuse, New York

Dear Mr. Fenton:

We would like at this time to express our appreciation for your expeditious handling of our recent rush order for 5½" PM Speakers.

The speakers used in the Drive-In Theatre in-car units must meet more rigid standards than those ordinarily required commercially. The Drive-In Speaker is subjected to the most adverse weather conditions, and must be able to stand up over a period of years without appreciable impairment of its electrical characteristics. The voice coil form, and the cone proper, must be impervious to moisture or direct rainfall.

It may be of interest to you to know that after a survey of the speaker field, we chose the GE Speaker as the one best able to meet our exacting requirements. The aluminum voice coil form is ideal for our work, since there is no danger of expansion due to moisture absorption. The speakers met Navy type tests such as shock, vibration, temperature, salt spray, and frequency response requirements.

Since standardizing on GE speakers, our customer reaction has been entirely satisfactory.

Very truly yours,
DRIVE-IN THEATRE EQUIPMENT CO., INC.

E. B. Brady

President

THE LETTER reproduced here speaks for itself and —G-E Speakers. The superb engineering which makes this speaker ideal for outdoor use, also makes it ideal for replacement in home receivers, where widely varying conditions of dryness and humidity affect speaker performance.

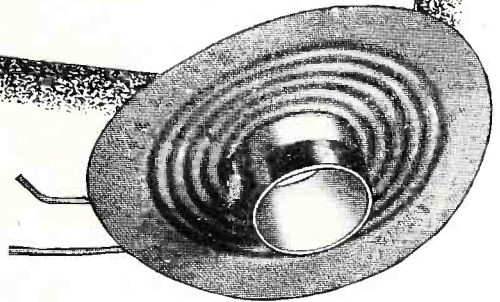
Here is an opportunity to develop the speaker replacement market to its fullest extent and push the outdoor theatre market.

G-E Speakers are competitively priced—and in quality they are outstanding. Build speaker business now. Send us your order.

For complete information write:
General Electric Company, Electronics Department,
Electronics Park, Syracuse, New York.

GENERAL  ELECTRIC

169-G2



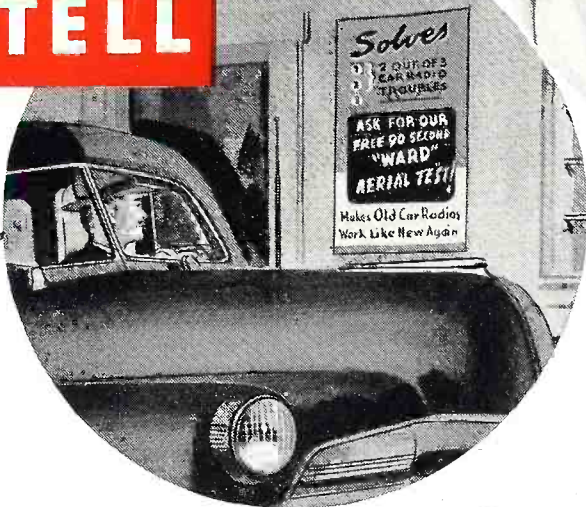
**ALUMINUM FOIL BASE
VOICE COIL**



TEST



TELL



SELL



New 3-step aerial replacement deal by WARD makes you extra sales, extra profits, extra fast!

Ward's new national advertising makes selling auto replacement aerials *easier* than falling off a log. The new 1-2-3 strategy gives you everything you need to . . .

- 1 TELL the customer the likely cause of his radio trouble.
- 2 TEST to see if the aerial is at fault.
- 3 SELL a handsome replacement aerial to make the radio play like new.

Nothing complicated about it; it works like a charm. You make \$2, or more, on every aerial you sell, plus an installation charge.

Ward's Auto Aerial Tester Package includes free sign and display. You pay only for the aerials. Write today for details. Also . . . please send name of your parts jobber.

THE WARD PRODUCTS CORPORATION
1526 EAST 45th STREET, CLEVELAND 3, OHIO
DIVISION OF THE GABRIEL COMPANY

IN CANADA: Atlas Radio Corp., 560 West King Street, Toronto, Ontario
EXPORT DEPT.: C. O. Brandes, Mgr., 4900 Euclid Avenue, Cleveland 3, Ohio

WARD *Aerials*

WORLD'S LARGEST PRODUCER OF AERIALS FOR CAR AND HOME

RADIO SERVICE DEALER ♦ MARCH, 1948

FAULTY AERIALS CAUSE 2 OUT OF 3 CAR RADIO TROUBLES



Watch for these ads in The Saturday Evening Post, Collier's and The American Weekly

EFFICIENCY More APPLICATIONS VALUE

by using these NEW RACON SPEAKERS and HORN UNITS

NEW SPECIAL PM HORN UNIT, having Alnico V magnet ring, completely watertight, housed in a heavy aluminum spinning. Provides extremely high efficiency reproduction with minimum input. Handling capacity 35 watts continuous, 60 w. peak.

NEW SMALL RE-ENTRANT HORNS, extremely efficient for factory inter-com and paging systems; for sound trucks, R.R. yards and all other industrial installations where high noise levels are prevalent. Watertight, corrosion-proof easily installed. Two new models—type RE-1½, complete with Baby Unit, handles 25 watts, covers 300-6000 cps.; type RE-12, complete with Dwarf Unit, handles 10 watts, freq. response of 400-8000 cps.

NEW RADIAL RE-ENTRANT SPEAKER, excellent for all types of industrial sound installations. Provides superlative and complete 360° speech intelligibility by efficiently over-riding factory high noise levels. Frequency response 300-6000 cps. Handling capacity 25 watts continuous 35 w. peak. Has mounting bracket. Size 12" wide by 12½" high.

Other RACON products now available:

PM Horn Driving Units, 10 types.	Straight Trumpets, 21 types.
Reentrant Trumpets, 7 types.	Re-entrant Cone Speakers, 7 types.
Tweeter & High Freq. Speakers, 3 types.	Flat bell straight trumpets, 2 types.
Radial Horns and Speakers, 3 types.	Armored Cone Projectors, 7 types.

Also—cellular and auditorium horns, inter-com, paging, monitor, and dwarf speakers, cone speaker housings, etc., besides all basic accessories such as swivel brackets, mounting units, cone housings, multiple horn throat combinations, etc.

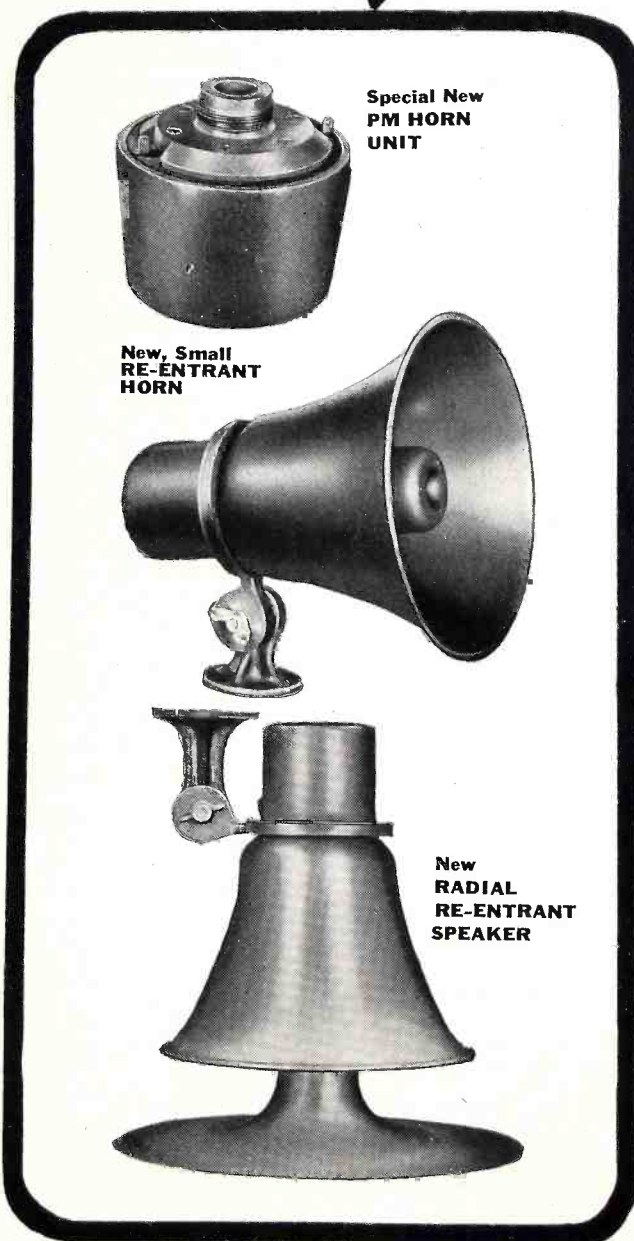
To the more than 60 different type and size speakers and horn units that already comprise the RACON line — these new models have been added. There is a RACON speaker and horn unit ideal for every conceivable sound system application.

RACON has not only the most complete line, but also the most preferred line. For over 20 years leading Soundmen have recognized and specified them because of dependability, efficiency and low-cost, and because the reproducers are trouble proof.

ASK YOUR JOBBER, OR—Write today for full details

RACON ELEC. CO., INC., 52 E. 19th ST., N. Y. 3, N. Y.

RACON

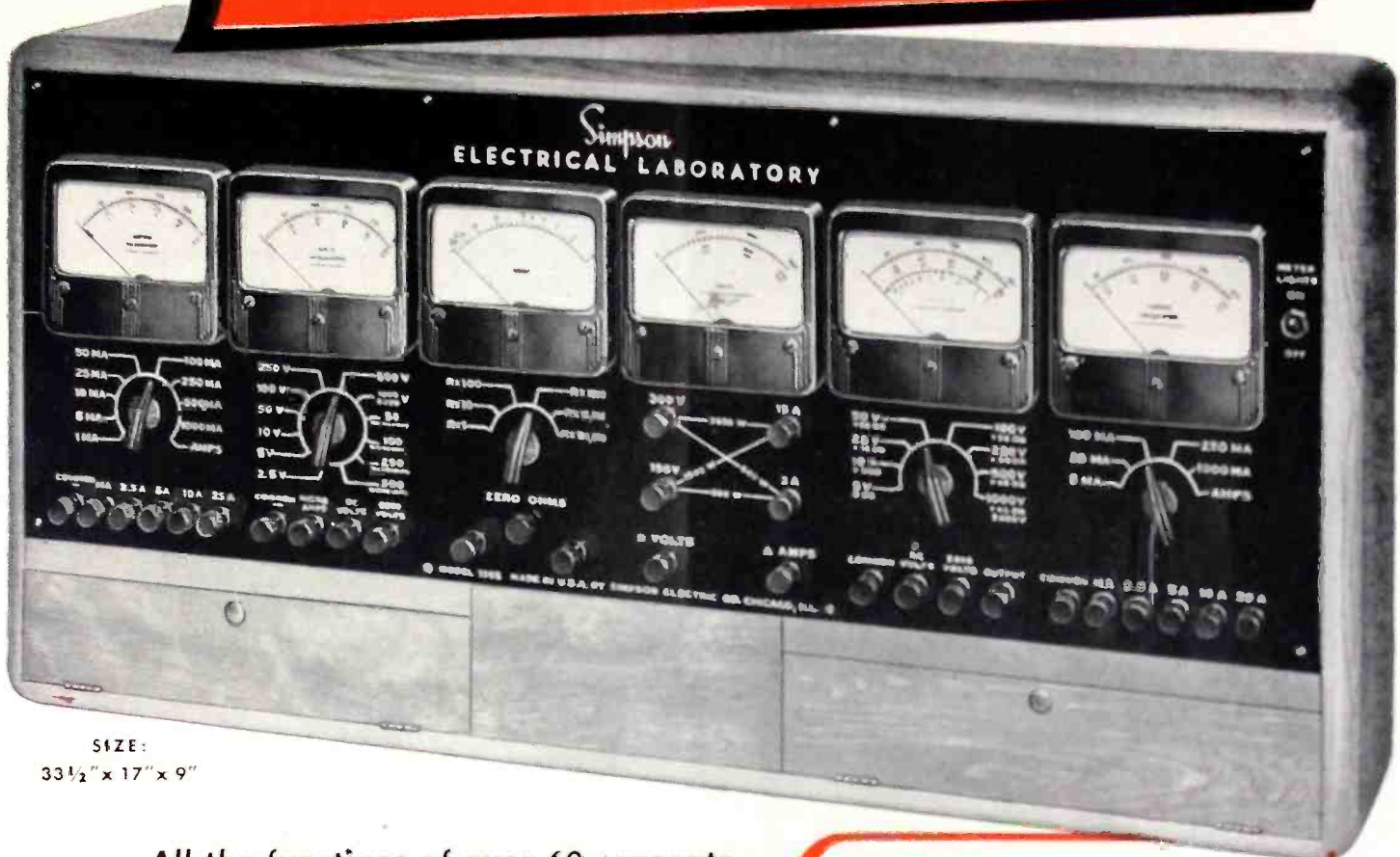


Special New
PM HORN
UNIT

New, Small
RE-ENTRANT
HORN

New
RADIAL
RE-ENTRANT
SPEAKER

SIMPSON ELECTRICAL LABORATORY MODEL 1005



SIZE:
33½" x 17" x 9"

All the functions of over 60 separate instruments combined in one unit!

Here is a complete test unit for use by radio, electronic, and electrical technicians in laboratories, shops, or service departments. It is adaptable to the testing of all electrical appliances, small motors, circuits, radio sets, etc. It consists of six individual 4½" rectangular instruments, indirectly illuminated, each with a complete set of ranges.

In addition to the wide variety of A.C. and D.C. voltage and current ranges, a multi-range ohmmeter and a single phase wattmeter have been incorporated. Also, to meet the need for extreme sensitivity required in testing circuits where only a small amount of current is available, an instrument is provided with a sensitivity of 50 microamperes, providing 20,000 ohms per volt on all D.C. voltage ranges. The Electrical Laboratory incorporates a rectifier type instrument for measuring A.C. voltage with a resistance of 1,000 ohms per volt on all ranges. This latter instrument also has in combination a complete coverage of DB ranges, from minus 10 to plus 54 for volume indications.

This beautiful instrument is Simpson-engineered and Simpson-built throughout for lifetime service.

Dealer's Net Price, complete with Leads and Break-in Plug, \$218.00

SIMPSON ELECTRIC COMPANY

5209-5218 West Kinzie Street, Chicago 44, Illinois
In Canada, Bach-Simpson Ltd., London, Ont.

Simpson

Ask your jobber

RANGES OF MODEL 1005

Meter No. 1
(D.C. Milliammeter and Ammeter)
0-1 MA D.C.
0-5 MA D.C.
0-10 MA D.C.
0-25 MA D.C.
0-50 MA D.C.
0-100 MA D.C.
0-250 MA D.C.
0-500 MA D.C.
0-1000 MA D.C.
0-2.5 Amps D.C.
0-5 Amps D.C.
0-10 Amps D.C.
0-25 Amps D.C.

Meter No. 2
(D.C. Microammeter and Voltmeter)
0-2.5 Volts D.C.
0-5 Volts D.C.
0-10 Volts D.C.
0-50 Volts D.C.
0-100 Volts D.C.
0-250 Volts D.C.
0-500 Volts D.C.
0-1000 Volts D.C.
0-5000 Volts D.C.
20,000 ohms per volt
0-50 Microamps
0-100 Microamps
0-250 Microamps
0-500 Microamps

Meter No. 3
(Ohmmeter)
0-500 Ohms (5 ohms center)
0-5000 Ohms (50 ohms center)
0-50,000 Ohms (500 ohms center)
0-500,000 Ohms (5,000 ohms center)
0-5 Megohms (50,000 ohms center)
0-50 Megohms (500,000 ohms center)

Meter No. 4
(Wattmeter)
0-300 Watts A.C.
0-600 Watts A.C.
0-1500 Watts A.C.
0-3000 Watts A.C.

Meter No. 5
(A.C. Voltmeter, Output meter and DB Meter)
0-5 Volts A.C.
0-10 Volts A.C.
0-25 Volts A.C.
0-50 Volts A.C.
0-100 Volts A.C.
0-250 Volts A.C.
0-500 Volts A.C.
0-1000 Volts A.C.
0-5000 Volts A.C.
Rectifier type
1000 Ohms per volt
DB Ranges
-10 to +54
Output Ranges
same as volts
except 5000 Volt Range

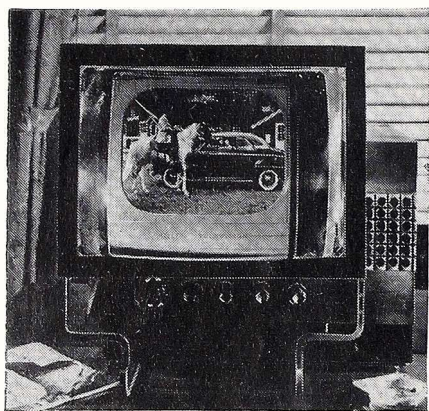
Meter No. 6
(A.C. Milliammeter and Ammeter)
0-5 MA A.C.
0-25 MA A.C.
0-100 MA A.C.
0-250 MA A.C.
0-1000 MA A.C.
0-2.5 Amps A.C.
0-5 Amps A.C.
0-10 Amps A.C.
0-25 Amps A.C.

TRADE FLASHES

A "press-time" digest of production, distribution & merchandising activities

Lens Enlarges TV Images

Owners of television sets with five, seven, ten or twelve-inch direct-viewing screens can now obtain images similar in size to those produced by the more expensive projection-screen sets, by using a Plexiglas magnifier, the Walco Tele-Vue-Lens.



The magnifier is a liquid filled lens, made by cementing together two quarter-inch thick pieces of Plexiglas—one formed to a convex shape and the other flat. The resultant acrylic plastic shell, filled with colorless, sealed-in liquid, is an optically accurate magnifying instrument through which the screen image is enlarged without distortion.

Measuring about 14 by 20 inches, the lens fit all screens up to the twelve-inch size. It is provided with base brackets that slip under the television set and permit horizontal adjustment to the desired distance from the screen. For literature, prices and details, write Walco Sales Co., East Orange, N. J.

Boston Gets TV Demonstration

An all-day television show was put on recently in the windows on three sides of Filene's Washington Street store, where 14 operating Transvision and Sightmaster sets delighted Boston residents. They flashed on the screen a succession of film shorts, live shows and, as a highlight, the first public demonstration of a network television program originating in New York and flashed to Boston over the just opened microwave link of the American Telephone and Telegraph Company. The throngs around the windows and in the street were so large that mounted police were sent to the scene to direct the crowds and keep traffic flowing normally. Truly a history-making event!

Mallory Offers "Vibrator Deal"

Radio servicemen are being offered a sturdy and practical metal stock cabinet in combination with a group of fast moving vibrators and buffer capacitors by P. R. Mallory & Co., Indianapolis, Ind.

Called the "2448 Vibrator Deal," the combination costs servicemen \$24.48 net which is the regular price for the assortment and no charge is made for the cabinet. The 6 vibrators in the deal cover about 75% of normal replacement requirements.



The metal cabinet simplifies stocking and keeping inventory and can be used in combination with the similar Volume Control cabinet Mallory made available in 1947. All Mallory distributors are now making immediate deliveries of the "2448 Vibrator Deal."

Television for Churches

General Electric television sets have been installed in twelve Roman Catholic parishes, and church halls of the People's Church and the Faith Presbyterian Church, at Chicago Ill., under a plan worked out by electronics district manager George S. Peterson, G-E distributor R. Cooper, Jr., and G-E radio dealer John L. Keeshin. It calls for installation of the sets in parish houses and church halls at a reduced price.

Primarily, the plan's purpose is to make available television reception of football games, hockey matches, or other programs of youth interest to youngsters. Later on, the sets will be used by other groups within the congregation.

Webster-Chicago Builds Millionth Record Changer

A milestone in the history of Webster-Chicago Corporation was reached when the factory produced its one millionth postwar record changer. C. P. Cushman, Executive Vice-President looks on as R. F. Blash, President accepts the record changer, which has just come off the assembly line, from W. S. Hartford, General Sales Manager.

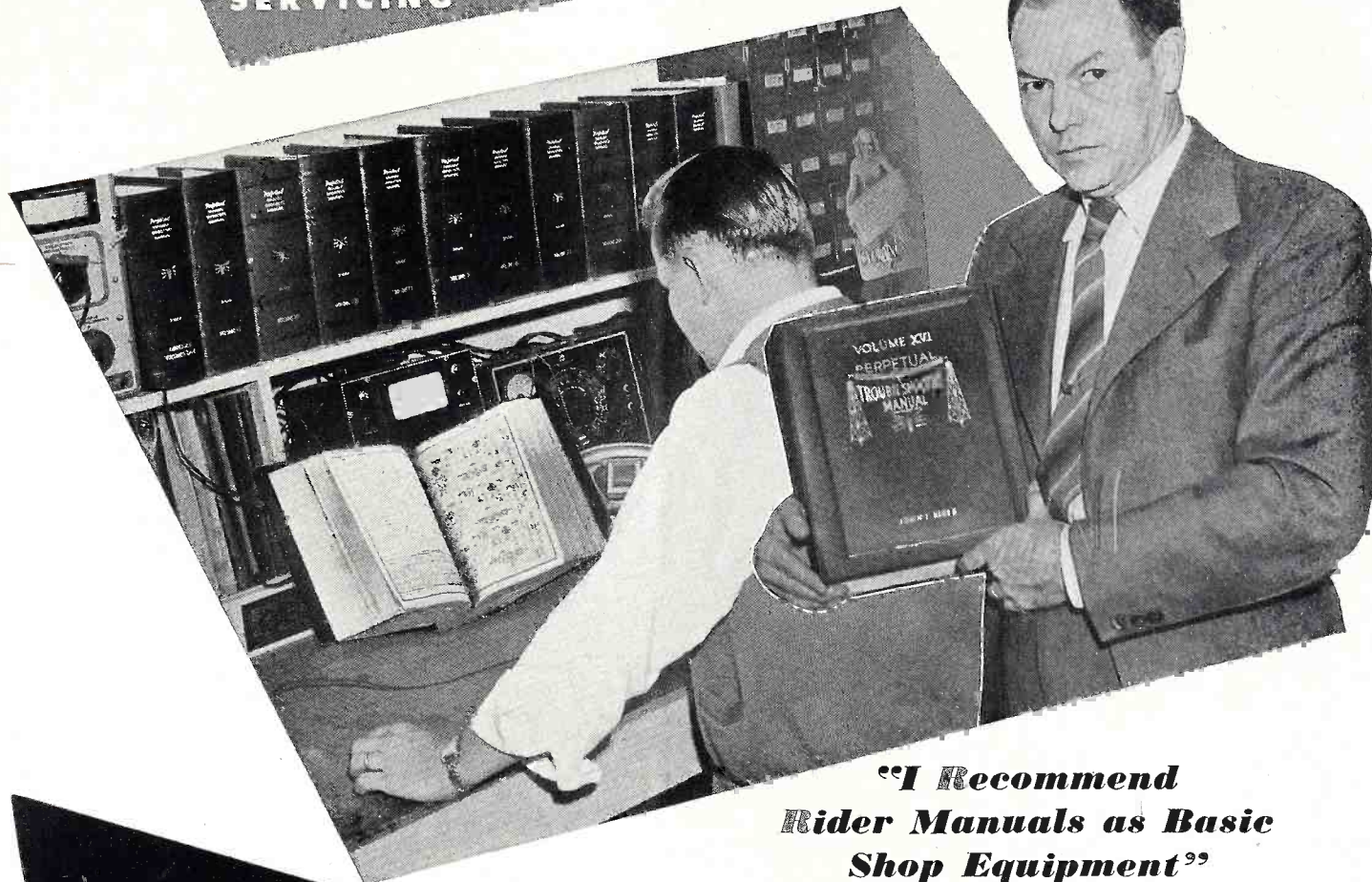
[Continued on page 10]



RIDER MANUALS

Mean
**SUCCESSFUL
SERVICING**

**SMITH HAS ALL 16 (AND VOLUME XVII)
ON ORDER**



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Rider Manuals as Basic
Shop Equipment"**

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1600 PAGES—Plus
"How It Works" Book
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Watch for Publication
Date in Late Spring

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TRADE FLASHES

[from page 8]

Obituary—Koch and Clune

On Sunday, February 15th, George Koch, well-known sales manager of Simpson Electric Co., Chicago, test equipment and instrument manufacturers died after a brief illness. Old timers will recall that Mr. Koch was prominent in the affairs of the Jewell Instrument Co. two decades ago.

Seriously injured in an automobile accident on Feb. 12th while driving through Morocco, Indiana, Mr. John J. Clune, sales manager of Air King Radio Products Co., Inc., Brooklyn manufacturers of radio receivers, subsequently died on Feb. 18th in Chicago.

Both Messrs. Koch and Clune were widely known and held in high regard by the radio fraternity. Their passing leaves a great void.

Ward Promotes Unger

Ward Products Corporation, manufacturer of radio, television and auto antennas, announces the promotion of Roy Brown Unger to sales manager.



Unger, who served as a first lieutenant of artillery in the Pacific area, was formerly assistant sales manager of the jobber division of Ward Products.

Rochester to Have TV Station

Stromberg-Carlson's long drawn out legal battle to bring television to Rochester, N. Y. ended in a victory for the 54-year old communications firm when the Town Board approved the company's application for re-zoning the crest of Pinnacle Hill for limited commercial purposes.

Coincident with this development was the announcement by the FCC of approval of Stromberg-Carlson's appli-

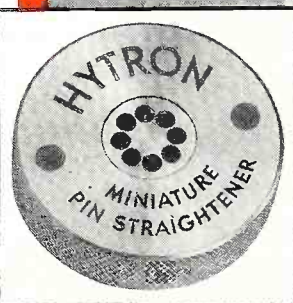
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A PREVIEW

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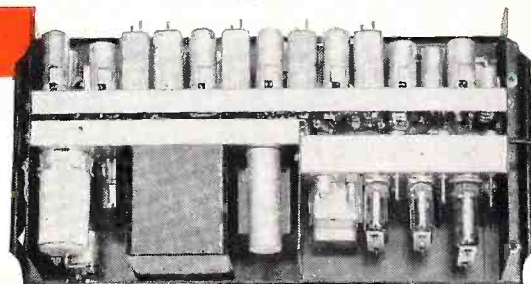
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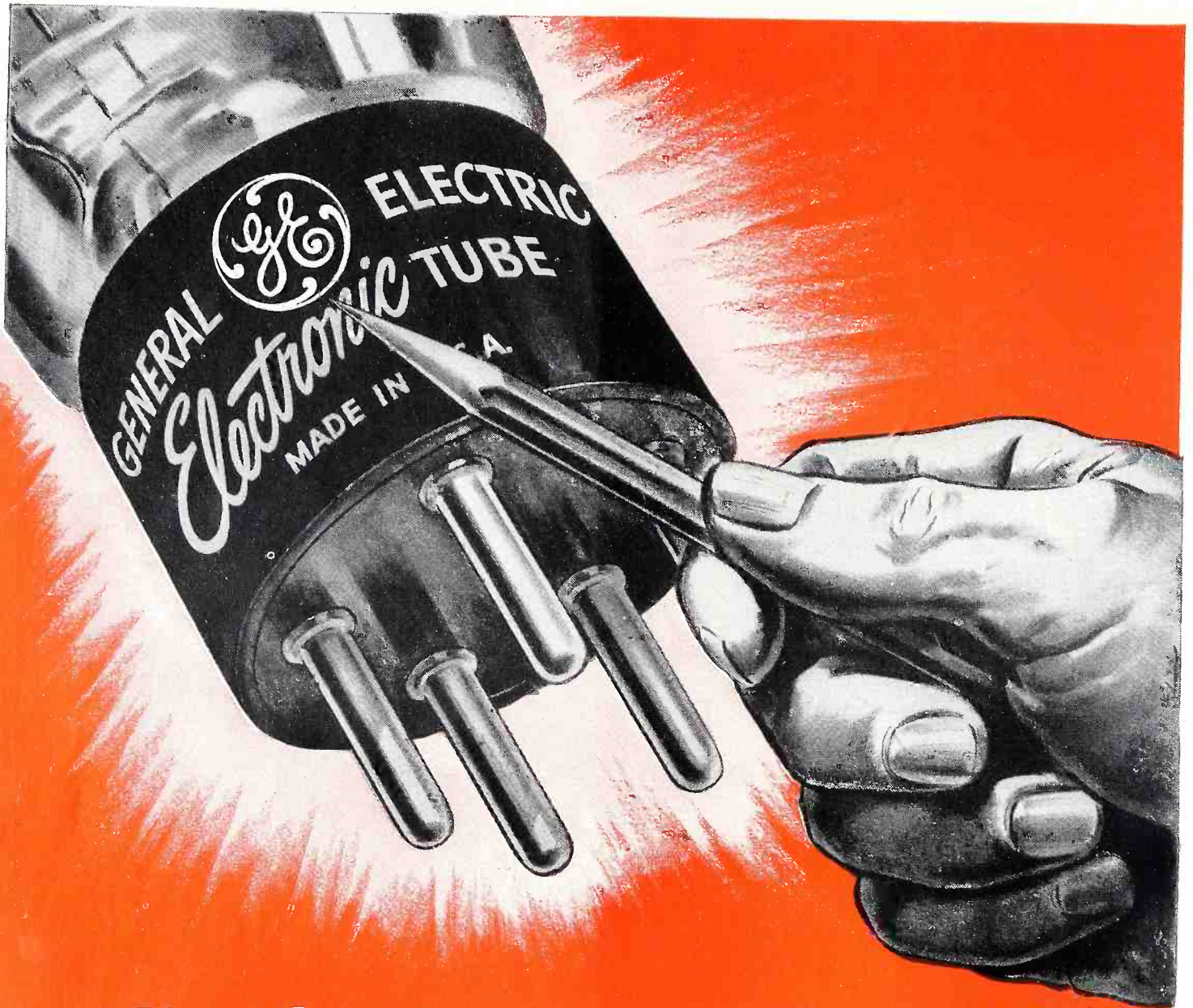
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Understand Your TUBE TESTER

by RUFUS P. TURNER*

**Describing methods employed in modern service tube testers.
Also discusses a tester employing new combination methods.**

THE relative merits of tube testers is a subject that has been argued for many years in the radio service field. It is the opinion of some technicians that no single instrument can show reliably the actual condition of each of the many types of tubes now employed in radio receivers and test equipment. While it may be true that the final criterion of tube condition is the ability of the tube to operate in the circuit in which it is to be used, there can be no argument that the busy service dealer definitely needs *one* instrument for tube testing. He certainly cannot be expected to maintain a multiplicity of separate test circuits (oscillators, amplifiers, detectors, rectifiers, etc.) for the sole purpose of tube testing. That certain testers have failed to fill the bill is another story. The serviceman's tube tester must be capable of rapid and easy operation, involve no calculations, and should give indications that may be interpreted readily by a customer who knows nothing about technical radio.

A laboratory-type tube testing set-up may be built to supply a separate continuously variable d-c voltage to each tube electrode. Similarly variable load resistors and input signal voltages may be provided, and meters included in every circuit to measure current flow and voltage levels. With such a piece of equipment, it is comparatively easy to measure important tube characteristics, such as amplification factor, plate resistance, transconductance, voltage gain, power output, and emission, and to compare the results with manufacturer's tube ratings. However, a piece of laboratory apparatus of this type is large in size. It hardly could be made

portable. It probably could not be made direct reading, some computations being required. Moreover, it is very expensive.

Essential points in good service tube tester design are that the instrument be small and portable, afford rapid checks, be capable of easy manipulation, and provide a simple GOOD-BAD scale

the switching operation of the tester to form a diode, and the resulting emission current, due to electron current flow from the heated cathode, was taken as a measure of tube quality. Objection raised to this method is that high emission does not always indicate a good tube. Subsequent tube testers have made it a point to check instead amplification, power output, or transconductance.

Comparison of Methods

Figures 1 and 2 show the circuit arrangement commonly employed for emission and transconductance testing, respectively.

In Fig. 1, the various electrodes other than the heater and cathode are connected together and to the negative terminal of a d-c milliammeter. The positive terminal of the meter is returned to the tube cathode. When the cathode is heated, electron current deflects the meter, giving an indication of the tube emission. The adjustable meter shunt rheostat is set, according to a previously determined scheme, to a different resistance value for each type of tube to be tested. In this way, the meter scale may be graduated in per-

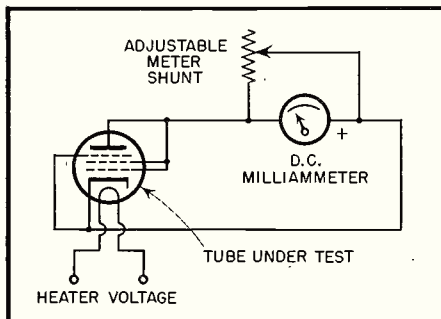


Fig. 1—Arrangement for emission testing.

which may be read by a non-technical customer as well as by the serviceman.

Considerable contention has arisen in recent years as to which tube characteristic should be checked by a service tube tester. Early instruments, and some present ones as well, measured only tube emission. That is, all of the tube electrodes except the cathode (or filament) were connected together by

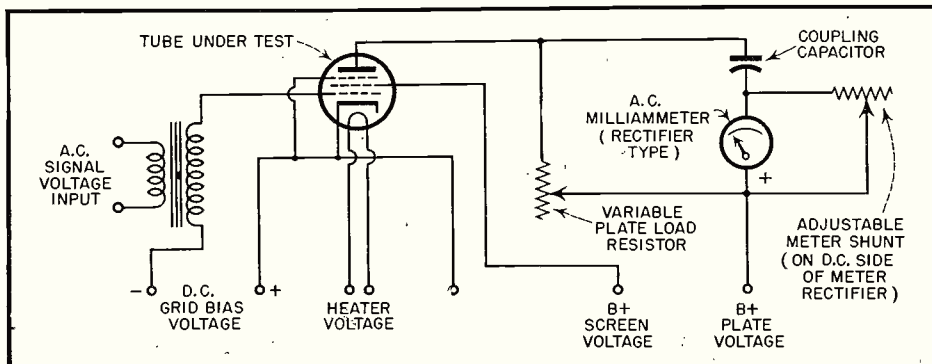


Fig. 2—Arrangement for transconductance testing.

*Engineer, Electronics Division, Sylvania Electronic Products Inc.

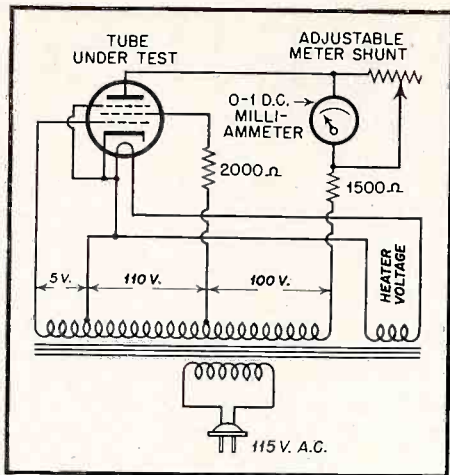


Fig. 3—Basic tester circuit.

centage of normal operation or simply "GOOD?-BAD."

In the circuit of *Fig. 1*, emission current indicated by the meter is the total current for all of the electrodes which are connected in parallel. Most emission-type tube testers provide single-pole, single-throw switches in each electrode lead to enable the operator to connect or disconnect as many electrodes as he wishes. However, the special meter scale of these testers and the meter shunt adjustment assume parallel connection of *all* electrodes, as shown in *Fig. 1*. Theoretically, at least,

separate switches allow the operator to discover open-circuited electrodes. However, in some cases, the additional emission current reading obtained when a given electrode is switched-in, is too small to be detected accurately.

In *Fig. 2*, the tube control grid, screen, and plate are operated at their rated d-c voltages. An a-c signal voltage (usually 60 cycles in service tube testers) is delivered to the grid-cathode circuit of the tube by the secondary of the input transformer. A variable plate load resistor is included and is set to the recommended resistance for the tube under test. The a-c milliammeter is coupled to the tube plate circuit either capacitively, as shown in *Fig. 2*, or through an appropriate current transformer. The adjustable meter shunt is set to a predetermined value for the particular tube under test. A given a-c signal input voltage then will deflect the milliammeter by an amount proportional to the transconductance of the tube. The various controls on the front panel of the tube tester are used to set the various electrode voltages, signal voltage, and variable resistors.

From the foregoing discussion, it is seen that transconductance testing is a method of dynamic checking, approxi-

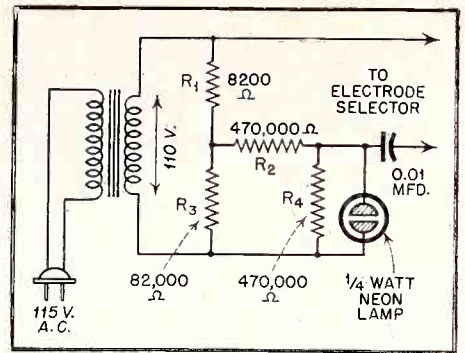


Fig. 4—Basic short tester.

imating the operation of the tube in equipment such as a radio receiver, while the emission check is a static test.

In addition to measuring or indicating some tube characteristic, modern service tube testers, of course, also have provision for checking short circuits between tube electrodes, presence of gas, tube noise and microphonics, and open circuits in filaments or heaters.

Although emission may not be an all-determining characteristic in appraising tube condition, it is of sufficient importance to warrant attention along with one or more other characteristics in simple tube testers. Consequently,

[Continued on page 37]

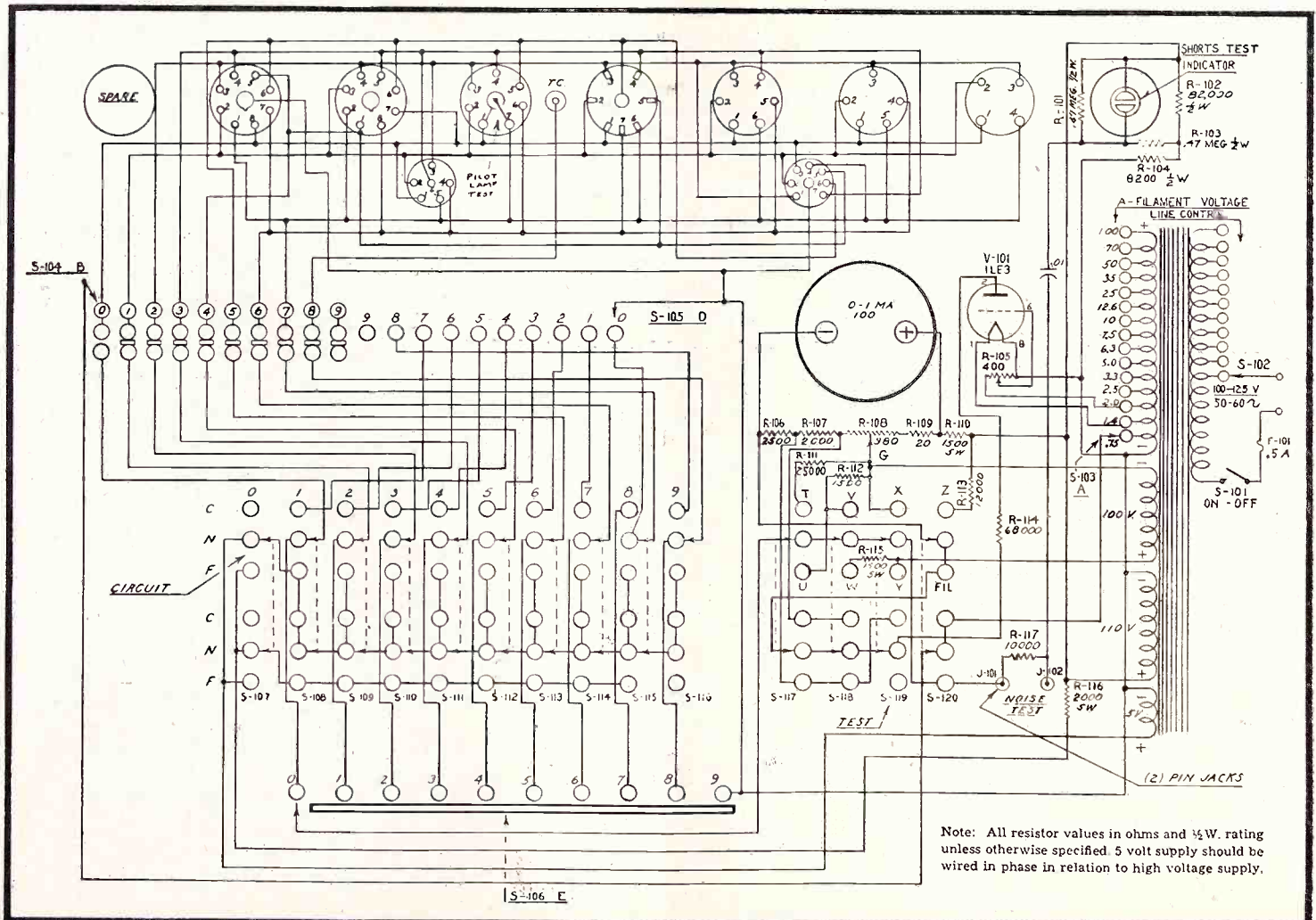


Fig. 5—Complete circuit of type 139 and 140 tube tester (see pictures, pages 38, 39)

TV POWER SUPPLIES

by S. L. MARSHALL

Many types of power supplies are used in modern television sets. This is quite in contrast with conventional AM and FM circuit arrangements where the basic full-wave, condenser-input type of power supply is the general rule. At first glance the variety of TV circuits might be confusing, but a careful analysis reveals they can be classified into certain basic groups. By understanding the principles of operation of these various types of power supplies technicians will find they are better to maintain and service TV receivers with confidence and efficiency.

IN GENERAL, television receivers contain both high and low voltage power supply systems. The low voltage power supply may consist of one or more units for use in the major portion of the receiver, and is characterized by high current (200 ma or more) output. Voltage requirements seldom exceed more than 450 volts. High voltage power supplies, on the other hand, may have outputs ranging between 3,000 and 30,000 volts, the current requirements being between 200 to 300 microamperes. This supply is used primarily in the cathode ray tube circuit.

Quite often it will be found that the CRT grid bias is obtained by means of circuits contained in both power supplies. These circuits will be analyzed as they are presented in the text of this article.

The high voltage power supplies discussed in this article are all designed primarily to satisfy the requirements of the cathode ray tubes used in these circuits. These tubes, varying in size and purpose, require various operating electrode potentials. For convenience to the reader a chart (Fig. 1) has been prepared to illustrate the base connections and operating potentials of the cathode ray tubes most commonly employed.

Basic Types of H. V. Power Supplies

High voltage power supplies may be divided into three basic groups, these being:

1. The conventional 60 cycle half-wave power supply.
2. The r-f power supply, operating at frequencies between 50 kc and 250 kc.
3. The Horizontal Pulse, or variously termed Flyback or Kickback power supply, operating at the hori-

zontal pulse frequency of 15,750 cycles per second.

Conventional 60 Cycle Half-Wave Power Supplies

This is the earliest type of high voltage power supply used in television receivers. However, its simplicity and excellent stability makes it still a popular type as evidenced by its adoption by DuMont in their most modern RA-101 chassis, used in several telesets. It is also used almost without exception by the various manufacturers of popular kits.

Viewtone VP 101A

Although the Viewtone Company is no longer in existence, many of its receivers are in active use today and so a description of its power supply circuit is justified. In addition, the principles of operation of its "C" bias circuit as used on the CRT are somewhat universal, and much can be learned from an analysis of it.

Filter Circuit

In Fig. 2, which is a simplified version of the VP 101A high voltage power supply circuit, we find that it consists essentially of a 2x2 rectifier tube connected in a half-wave rectifier circuit. The filter itself consists of a .03 μ f-100

K ohm-.03 μ f combination of condensers and resistor. Shunted across the output of this filter to ground is a series of 6 resistors which serve as a voltage divider.

Due to the low current requirements of the beam of the 7EP4, and the high resistance of the load, the value of the filter capacitor used can be low as compared to the high values employed in high current, low voltage, power supply circuits. As an example, let us consider the shunting effect of the hum ripple of a .03 μ f condenser connected across a typical 10 meg. load.

The reactance, X_c , equals:

$$\frac{1}{2\pi fc} = \frac{1,000,000}{377 \times .03} = 88,300 \text{ ohms}$$

Since the load resistance (10 meg.) is more than 100 times the value of this reactance, very little of the 60 cycle current will find its way past the filter. It must be understood that this example was presented merely to illustrate the comparative filter requirements of high and low output loads. Actually, of course, other factors, such as circuit loading and tube characteristics must be taken into consideration.

"C" Bias Circuit

The B- point of the high voltage circuit is connected to the B+ point of

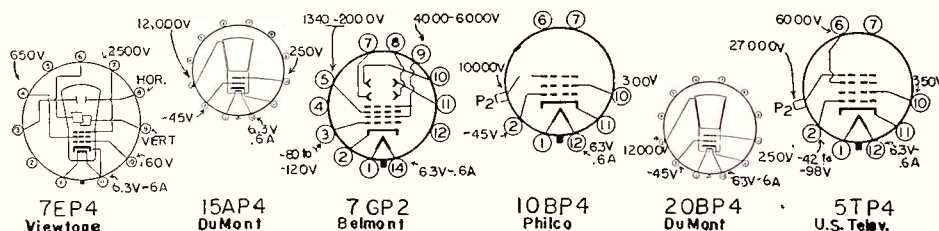


Figure 1

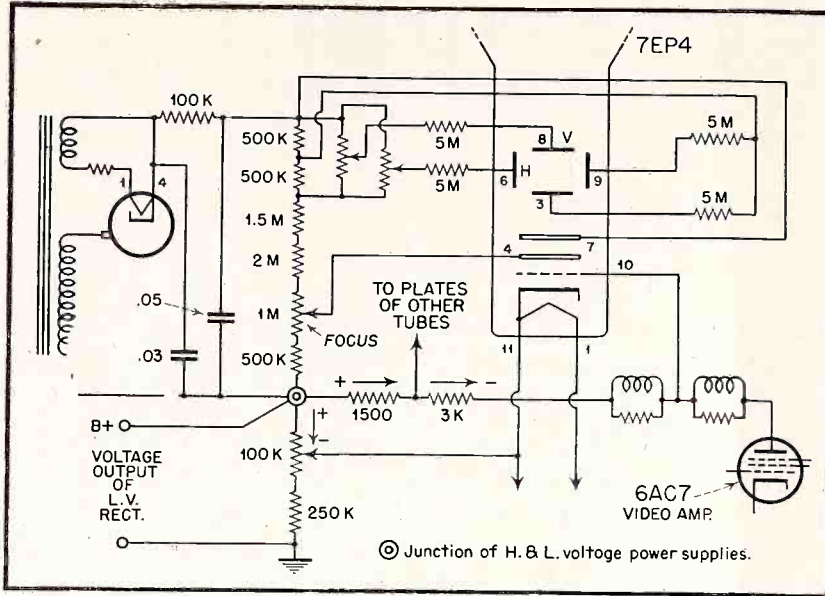


Fig. 2—Simplified H.V. power supply diagram of Viewtone Model VP 101 A

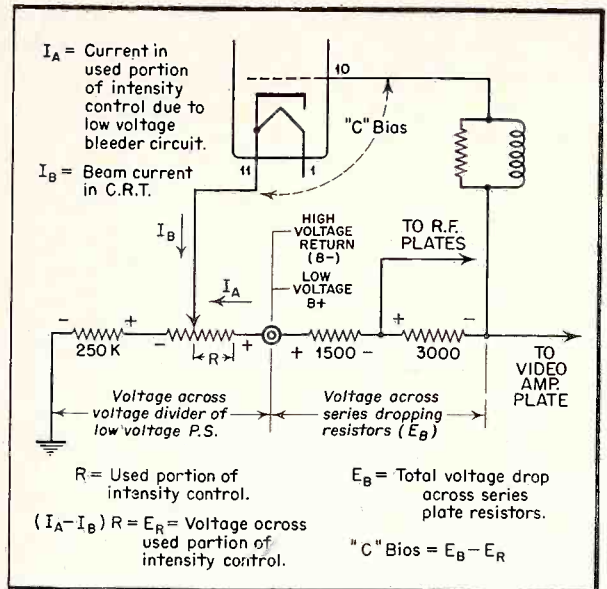


Fig. 3—Equivalent "C" bias circuit of Viewtone VP 101 A

one of the low voltage power supplies in this receiver. This can be seen by reference to Fig. 2. This permits the use of a unique C bias and intensity control circuit for the CRT, which is explained, with the aid of Fig. 3, as follows:

When the intensity control is moved to the right, the C bias on the CRT is the voltage drop across the 1,500-ohm and 3,000-ohm series plate resistors.

When the intensity control is moved to the left, the current in the used portion (R) of the intensity control is $I_A - I_B$, where:

I_A = current in low voltage bleeder circuit.

I_B = beam or cathode current of the CRT.

The voltage drop across the used portion of this control opposes the voltage drop across the 1,500-ohm and 3,000-ohm resistors, and their difference is net the C bias on the tube. Thus, maximum C bias on the tube occurs when the intensity control is at the extreme right, and minimum bias occurs when the intensity control center arm is moved to the extreme left.

DuMont RA 101 Chassis

A simplified diagram of the DuMont RA 101 high voltage power supply and its connections to the CRT, which may be a 15AP4, or a 20BP4, is shown in Fig. 4. The voltage applied to the accelerating anode is 12,000 volts. The circuit used is a half-wave, voltage doubler connected to the type of filter circuit just explained.

Voltage Doubler Circuit

Reference to Fig. 5 will help considerably in understanding the operation of the voltage doubler portion of this circuit. On the cycle alternation when terminals A and B of the secondary are negative and positive respectively, the 1 μ f condenser charges up to the maximum value of the secondary voltage through diode, V_2 . On the next half of the cycle the voltage across the transformer secondary is in series with the voltage across the condenser, C_1 . During this portion of the cycle the polarity of the applied voltage to the plate of V_1 results in a discharge through this tube so that the output voltage at the cathode of V_1 is approximately equal to twice the maximum

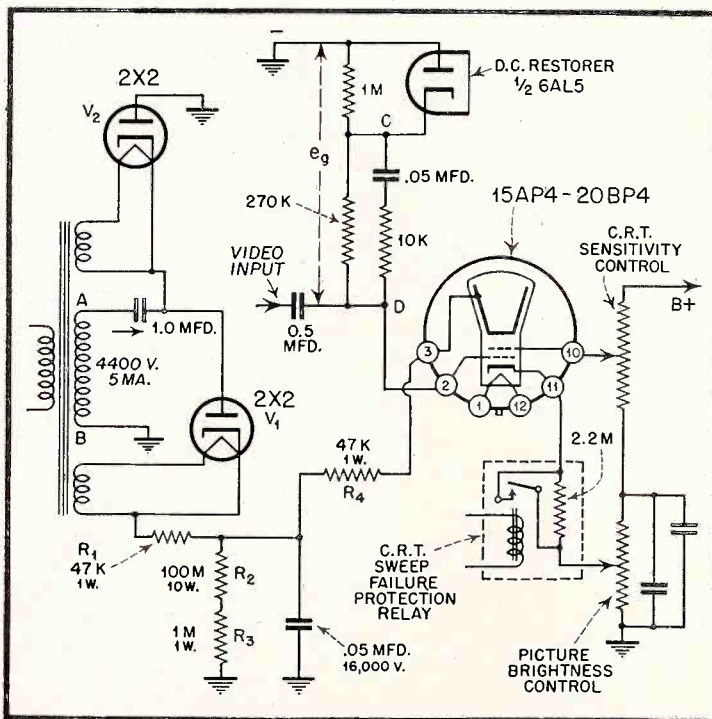


Fig. 4—DuMont Chassis RA-101 high voltage power supply and connections to CRT

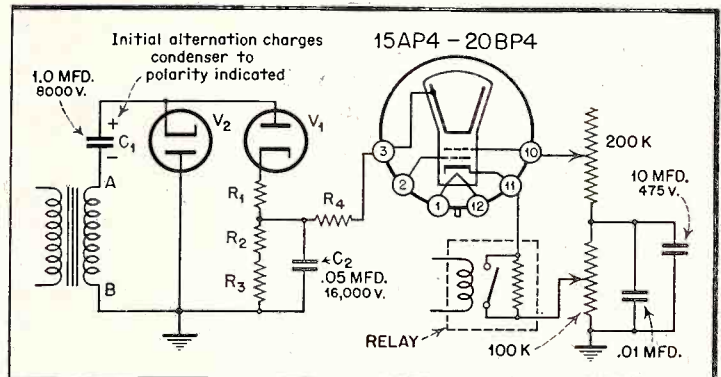


Fig. 5—Simplified voltage doubler schematic of DuMont chassis RA-101 H.V. power supply

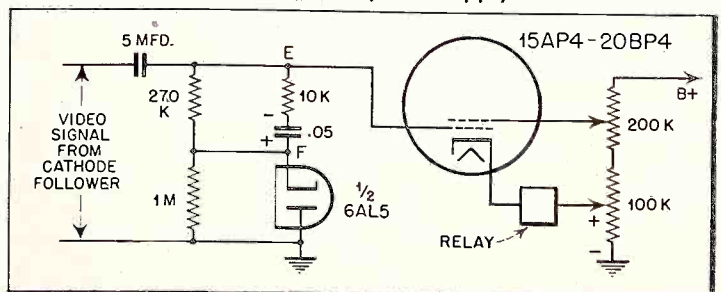


Fig. 6—Simplified "C" bias circuit on CRT of DuMont chassis RA-101

value of the voltage across the secondary.

These pulses are then smoothed out by the filter circuit comprised of R_1 , R_2 , R_3 , R_4 , and C_2 .

"C" Bias Circuit

The C bias circuit employed in the DuMont RA 101 chassis is shown in simplified form in Fig. 6. Initial bias is obtained by means of the low voltage power supply bleeder circuit comprising the 200K and the 100K potentiometers. This bias is variable, depending on the position of the center arm of the 100K brightness control.

The action of the d-c restorer in determining the grid bias on the CRT is as follows: A positive picture signal appears between point E, and ground. During the synch pulse the signal amplitude is high, so that at the instant of the cycle when ground is plus with respect to point E, the diode plate of the 6AL5 conducts, thereby charging the .05 condenser connected in cathode circuit of this tube. This makes point F, positive with respect to point E.

During the picture interval the diode does not conduct, and the condenser discharges slowly through the 270K and the 10K resistors. As a result, a voltage drop appears across these resistors, the amplitude of which is proportional to the synch pulse amplitude, and the polarity of which makes point E, negative with respect to ground. The time constant of the circuit is such as to maintain this bias constant over a substantial number of horizontal cycles. In this manner the bias on the CRT is determined by the setting of the contrast control and the amplitude of the incoming synch pulses, thereby effecting d-c restoration.

Shock Hazard in Low Frequency Power Supplies

A transformer is a very efficient device in transferring energy from its primary to its secondary, and, in 60 cycle power supplies it must be remembered that the energy in the line is unlimited. For this reason high voltage, 60 cycle power supplies can result in instant death or severe burns if accidental contact is made with any high potential point. Safety precautions *MUST* be exercised when servicing these supplies. These precautions consist primarily in:

1. Turning off the high voltage supply when working on any part of the chassis.
2. Never taking voltage measurements on the high voltage supply.
3. Removing the power plug from its receptacles when removing a chassis from the cabinet, or when soldering or replacing a part.
4. Keeping one hand in the pocket

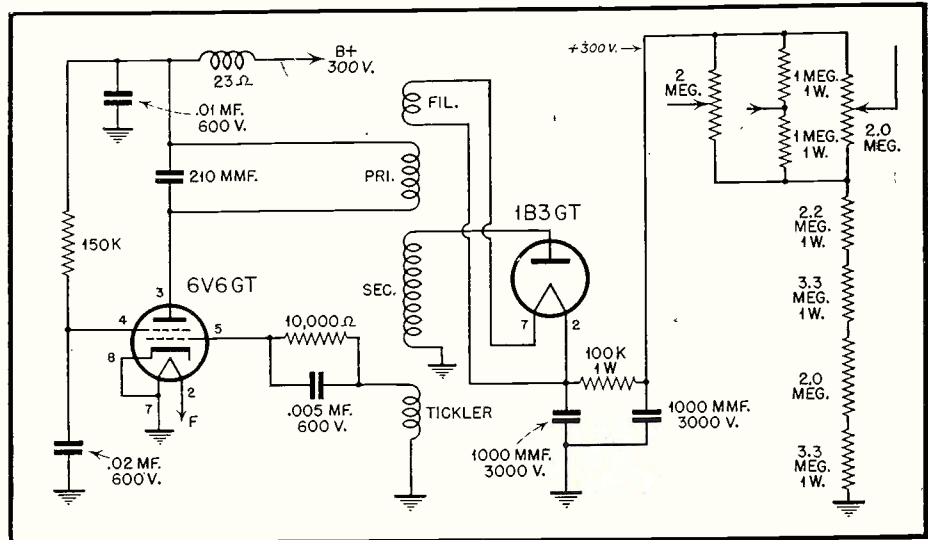


Fig. 7—Schematic of Belmont 21 A 21.

during all measurements and adjustments.

R. F. Power Supplies

In order to overcome the factors of danger inherent in 60 cycle power supplies, other types have been developed in which the primary source of energy insufficient to cause fatal injury should contact be inadvertently made with the high voltage points. One of the important characteristics of this type of supply is its poor voltage regulation characteristics, that is, the manner in which its output voltage decreases considerably with slight loading. In this manner, not only is the person coming in contact with the high voltage protected from absorbing lethal doses of energy, but the actual potential of the supply drops considerably, thereby protecting him from unpleasant shocks or serious burns. Coming under this category is the r-f power supply which will now be described.

Belmont Model 21A21

A typical r-f power supply circuit arrangement is shown in Fig. 7 which illustrates the circuit employed in the Belmont Model 21A21. In this cir-

cuit the oscillator coil assembly, which consists of 4 individual coil windings, is connected in an Armstrong circuit, the plate coil being tuned and the grid coil acting as the tickler. The secondary coil, located between the primary and the tickler, produces a high voltage step-up, in this case 3,000 volts. The purpose of the fourth coil, which consists of a few turns of heavy wire and is located at the lower end of the assembly is to provide a step-down voltage for the filament of the 1B3GT/8016 high voltage rectifier tube. Inasmuch as the oscillator output is about 12 watts, and the power requirements of the rectifier, about .25 watts, this may be done with little effect on the operating characteristics of the oscillator; the advantage being that the need for a separate high voltage filament winding is eliminated.

The secondary winding consists of 3 pi wound layers connected in series. It is common practice to construct high voltage coils so that each pi develops no more than 1,000 volts. Separation between pies is about 1/4 inch.

The output voltage of the coil is usually fed into a special type of rectifier, an 1B3GT-8016, this tube previously having been mentioned in

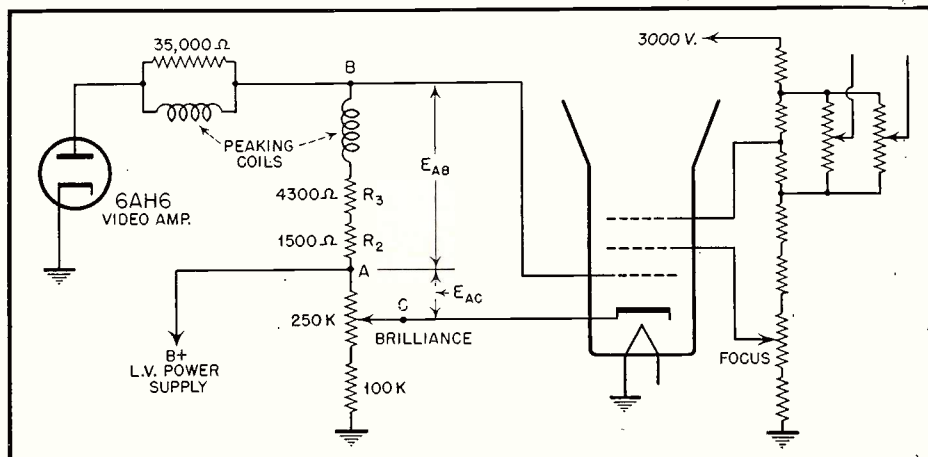


Fig. 8—Simplified CRT "C" bias circuit of Belmont 21 A 21 receiver.

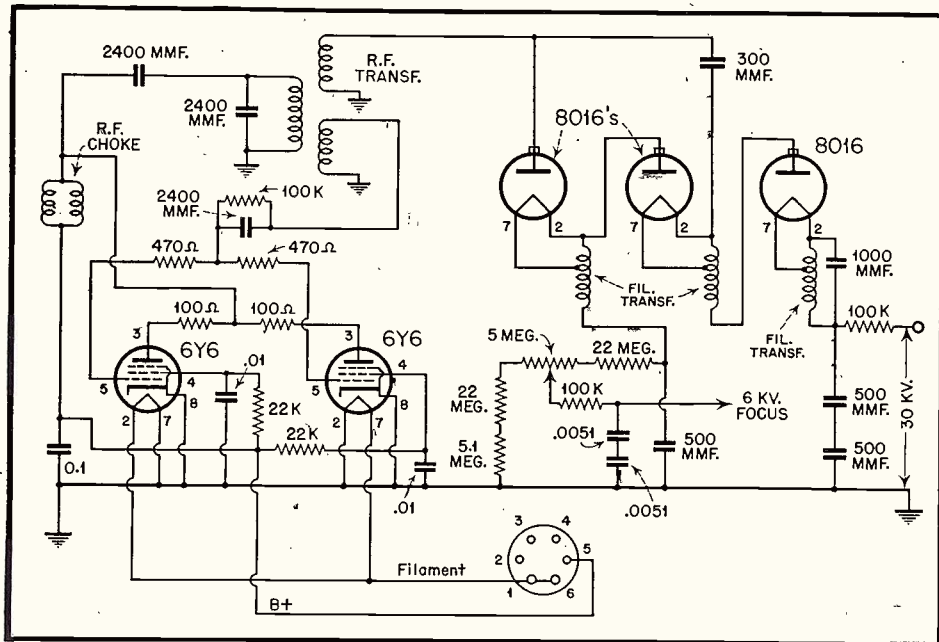


Fig. 9—U. S. Television receiver 30 kv power supply.

connection with this receiver. Voltages as high as 10,000 are easily handled by the B3GT, for which reason it is the most common tube used today for this purpose.

The filter circuit is a conventional pi connected resistance-capacitive filter, except that the capacitors are even lower in value than those used in the 60 cycle power supply. This is because the filtering action of the condenser is much greater at the higher frequencies employed in r-f power supplies.

In order to prevent r-f radiations from the supply into other portions of the receiver, it is contained in a perforated metal enclosure. This feature provides, in addition, protection against high voltage shock in case of accidental contact with any of the power supply points.

The cathode ray tube used in this receiver is a 7GP4. (See Fig. 1). Connections to the deflecting plates, the second anode and the focusing anode

are straightforward as indicated in the diagram, all points being referred to at some positive potential above ground.

"C" Bias Circuit

C bias on the CRT is obtained by means of an arrangement similar to the one employed in the Viewtone receiver. A simplified circuit is shown in Fig. 8. Point A is a B+ point of the low voltage power supply. When the center arm C, of the brilliance control is at point A, the bias voltage between the CRT grid and cathode is essentially the voltage drop in the plate and screen series resistors, R_2 , and R_3 . Moving the center arm of this control in the direction towards ground results in a voltage drop between points A and C which is opposite in direction to the voltage drop between points A and B, thereby reducing the grid bias.

Because the cathode is above ground at potentials which vary with the position of the brilliance control, the actual measured potentials between the anodes of the CRT and ground will be somewhat higher than the true values.

U. S. Television-Projection Unit

Another type of r-f power supply is the U. S. Television 30 kv unit used in their projection receiver. This is shown in Fig. 9. A 5TP4 projection tube is employed. Observe that a focus potential of 6 kv is required. In order to obtain these high voltages it has been found advantageous to step up the output of a 10 kv r-f oscillator to 30 kv by means of a voltage tripler. Notice that the r-f oscillator consists of 2 tubes connected together in a plate-tuned reversed feedback circuit. The oscillator coil contains three windings, a tank winding, a tickler winding, and a high voltage secondary.

Corona

Due precautions against corona effects must be taken in circuits of this type otherwise the power losses will seriously impair the efficiency of the unit. The following is a list of such precautions:

1. Avoid wiring or connections with sharp or irregular edges and surfaces.
2. Keep all high potential leads as short as possible and well removed from objects across which these discharges are likely to take place.
3. Broken strands of Litz wire are to be avoided because they offer the initial step to corona discharges which become cumulative and eventually lead to the breakdown of the coil.
4. The diameter of the wiring at 30 kv should be at least $\frac{1}{4}$ inch, and the contours of all objects in the high voltage circuit should have a minimum radius of the same value. Distance between conductors should be at least $\frac{3}{4}$ inch.
5. Corona shields should be used wherever possible.

Voltage Tripler Circuit

The operation of the voltage tripler in the U. S. Television high voltage

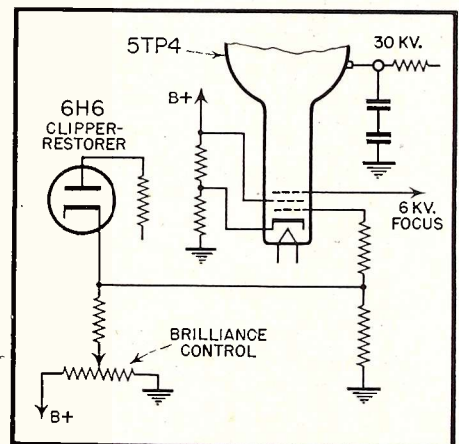


Fig. 11—Simplified diagram of "C" bias circuit of U. S. Television Projection Unit.

power supply is explained with the aid of Fig. 10, a, b, and c. During the first alternation of the cycle from the 10 kv r-f supply, the top of the high voltage winding is +. This causes condenser C_1 to charge up through diode D_1 to the maximum r-f voltage value. See Fig. 10a. On the next half of the cycle the polarity of the transformer winding is reversed. As a result, the voltage across C_1 acts in series with the voltage across the transformer winding to charge up condenser C_2 , through diode D_2 . The voltage across C_2 is $2E$. See Fig. 10b. On the third reversal, the voltage across C_2 acts in series with the transformer winding to charge up condensers C_3 and C_4 through diode D_3 . The 30 kv output across C_3 and C_4 is then applied to the high voltage anode of the 5TP4 through the filter resistor R_1 .

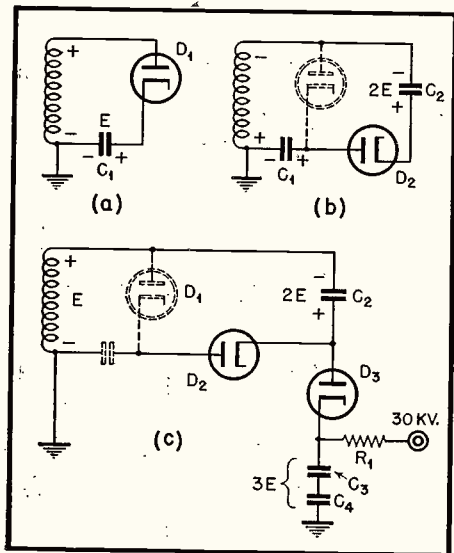


Fig. 10—Simplified voltage tripler analysis of U. S. Television Projection Unit.

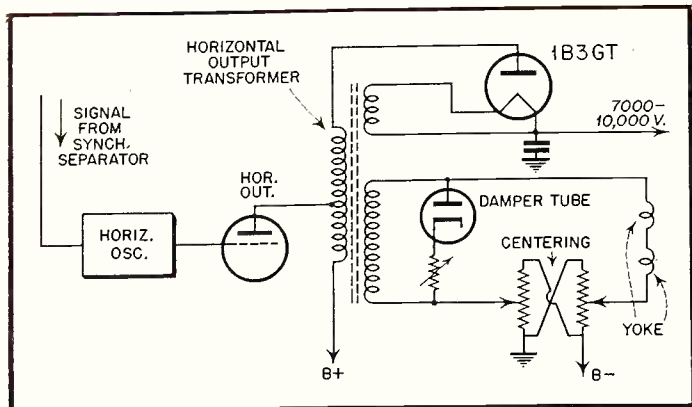


Fig. 12—Basic pulse or "flyback" power supply circuit.

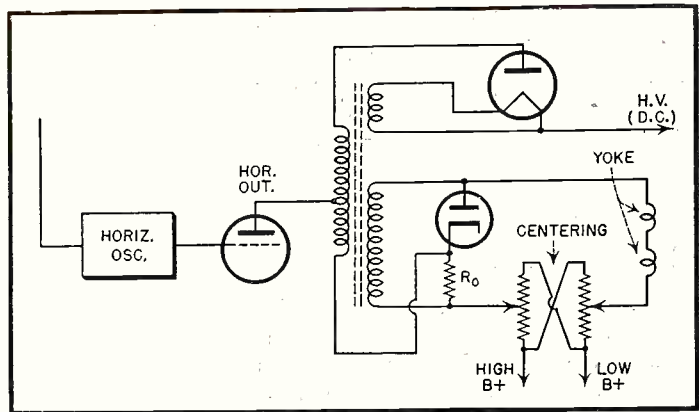


Fig. 14—Booster-damper pulse power supply circuit.

Overall voltages between the various elements of the CRT and cathode are shown in Fig. 11. The cathode is connected to the voltage divider which in turn is connected across the low voltage power supply. The first anode is connected to the B+ point on the voltage divider, and the control grid is connected to the brilliance control which varies the relative potential of the control grid to ground. In this manner the grid is made more or less negative with respect to the cathode of the CRT.

Horizontal Pulse Power Supplies

Horizontal pulse, or flyback (sometimes called kickback) power supplies utilize the horizontal pulse contained in the television signal to effect a voltage

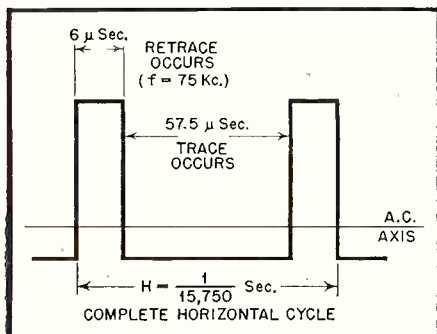


Figure 13

step-up in the horizontal output transformer of the horizontal sweep circuit. This is illustrated in Fig. 12.

Low loss systems of this type have been made possible by the development of molded sponge-iron dust cores which are extremely efficient units.

Deflecting Cycle

A full deflecting cycle of a horizontal pulse is 1/15,750 sec., or 63.5 uses. During the deflecting cycle two distinct periods occur. These are shown in Fig. 13. During the trace period the beam is swept across the picture tube from left to right. The retrace period, which takes about 6 uses., finds the beam moving rapidly from right to left. It is evident that the retrace frequency is much higher than the trace frequency. In this case a value of about 75 kc is in order, and as a

result a high voltage is induced in the high voltage winding of the autotransformer. This voltage is then rectified by a tube of the 1B3 type, after which it is suitably filtered.

Booster-Damper Circuit

A postwar development of the horizontal pulse type of power supply is the booster-damper circuit which is shown in basic form in Fig. 14. In this circuit the energy from the damper tube is returned to the primary of the horizontal output transformer. Observe that the cathode output from the damper tube is connected directly to the lower end of the primary of this transformer. This is in contrast with the previously employed circuit arrangement shown in Fig. 12, in which the damper tube energy is dissipated to ground via the damper cathode resistor. Booster-damper power supplies result in power loss reductions of about 25% as compared to the straightforward damper types.

In well designed and balanced circuits the resistor RD shown in Fig. 14 is dispensed with entirely. Ordinarily RD controls the amount of energy entering the horizontal deflecting coils during the retrace period, and therefore

controls the horizontal linearity.

Philco Model 48-1000

A commercial application of a booster-damper circuit is shown in Fig. 15 which is a simplified diagram of the Philco Model 48-1000 horizontal pulse power supply. The entire high voltage circuit, as well as the method of obtaining the d-c potentials required by the 10BP4 CRT, is illustrated. A special type of triode damper tube, the 6AS7G is used. This tube provides excellent control of the damping cycle, so that a linear sweep is obtained across the horizontal deflection coils throughout the entire horizontal cycle.

Grid Bias on CRT

The method of obtaining grid bias on the CRT is conventional except for a few innovations which we will endeavor to explain. Notice that the background, or brightness control, is inserted in the low voltage power supply circuit thereby effecting a variable positive voltage between cathode and ground. The grid is returned to ground through a 470K and a 1 meg. resistor. Thus, with no input signal the original

[Continued on page 40]

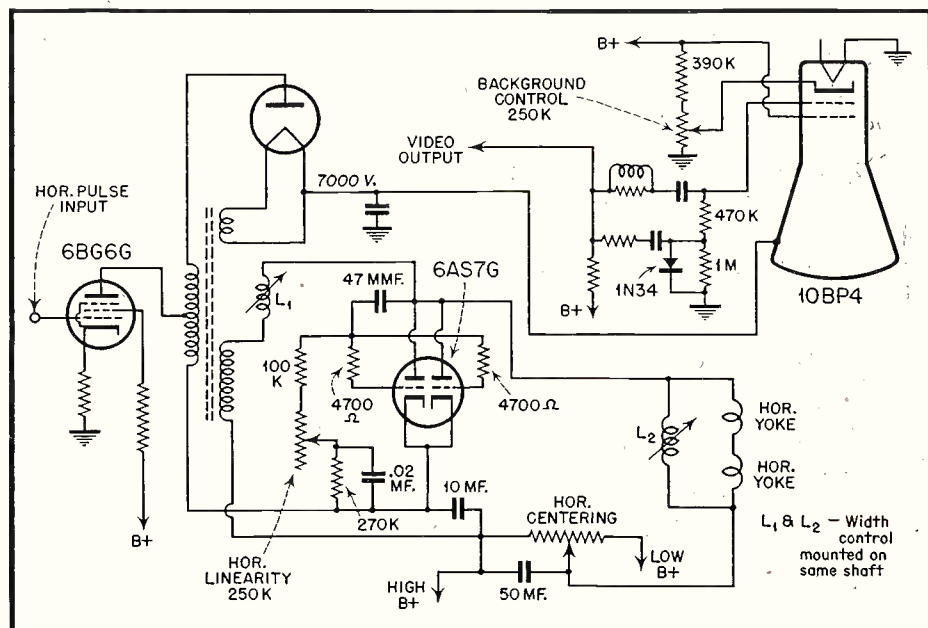


Fig. 15—Damper power supply of Philco model 48-1000

EVERYBODY remembers the difficulty servicemen had when the first a. c.-d. c. sets started to come into shops for repairs. It seems fitting that an explanation of the a. c.-d.-c. battery portables is again in order, as a refresher, because many postwar made 3-way sets are starting to arrive in shops for repairs.

The r-f circuits in these sets are quite conventional, however, power supplies vary considerably and are apt to be confusing. Four fundamental supply types are shown in *Figs. 1 to 4*. The most common version is that of *Fig. 1*.

Changeover from a-c/d-c to battery operation is accomplished by the DPDT switch at the right center of the schematic. To the right of this is the DPST off-on switch, an integral part of the volume control. With the switch in the line position, one side of the line is grounded by the lower half of the DPDT switch. This completes the circuit for the filament and plate of the 117Z6G rectifier. The upper section of the 117Z6G supplies filament power for the 1.4 volt tubes through the 150-1060-1060 resistor network. The action of this network is to drop the voltage to the desired value, and at the same time supply effective filtering in conjunction with high capacity condensers. The lower section delivers about 90 volts to the receiver circuits. The 1,000 and 2,000-ohm resistors, plus the 20 μ f condenser, filter this voltage. This filtering method has been used recently in small a-c/d-c sets with fine results. Battery operation is conventional as can be seen.

Several manufacturers have an automatic version, as shown in *Fig. 2* which switches to a. c. whenever the line cord is plugged in and the rectifier warms up.

When such a set is plugged into a line and the power switch turned on, it immediately begins to operate, obtaining its power from the batteries. As the rectifier warms up, the relay will be thrown over and the line will then supply

*A Radio Service-Dealer located in Pennsylvania.

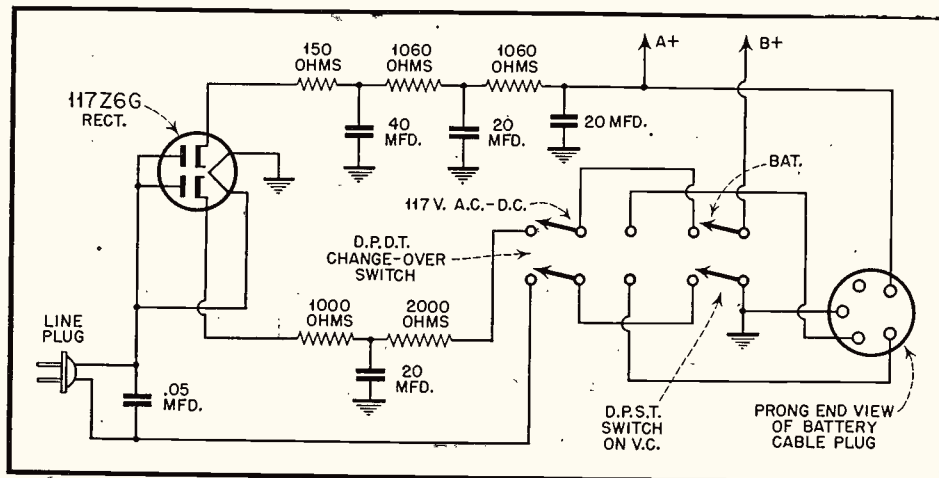


Figure 1

POWER SUPPLY A C - D C BATTERY

An analysis of more popular present-day 3-way receiver circuits. Serves as a timely refresher course now that such sets are frequently coming into service shops for repairs

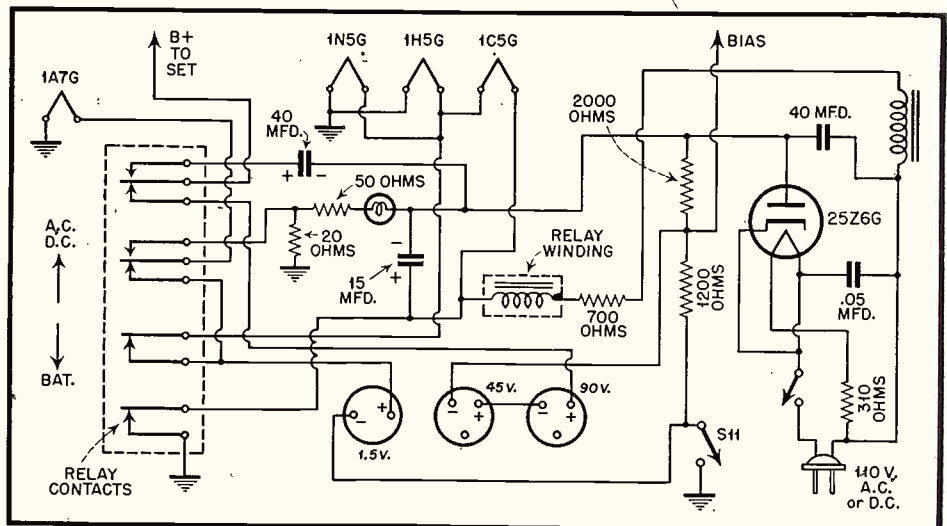


Figure 2

the power. This is easily accomplished by connecting the relay, in series with a suitable resistance, across the output of the rectifier. When the relay closes,

the ground end of the coil is opened, permitting the energizing current to flow through a series parallel filament circuit. A pilot light and resistor network drop the voltage for the 1A7. ADPST switch on the volume control operates the receiver for either battery or line use. Some manufacturers have increased the power output of these sets when used on the power line by adding a separate output tube. This is illustrated in *Fig. 3* and has the advantage of battery economy when used as a portable, and good output when operated at home.

Switching from line to battery is accomplished simply with a minimum of switch contacts. A DPST switch on the volume control permits the battery or line voltage to flow, depending on which one is desired. For line operation, the line cord is plugged into any wall outlet and the volume control

LIES FOUND IN ERY PORTABLES

by ALBERT LOISCH

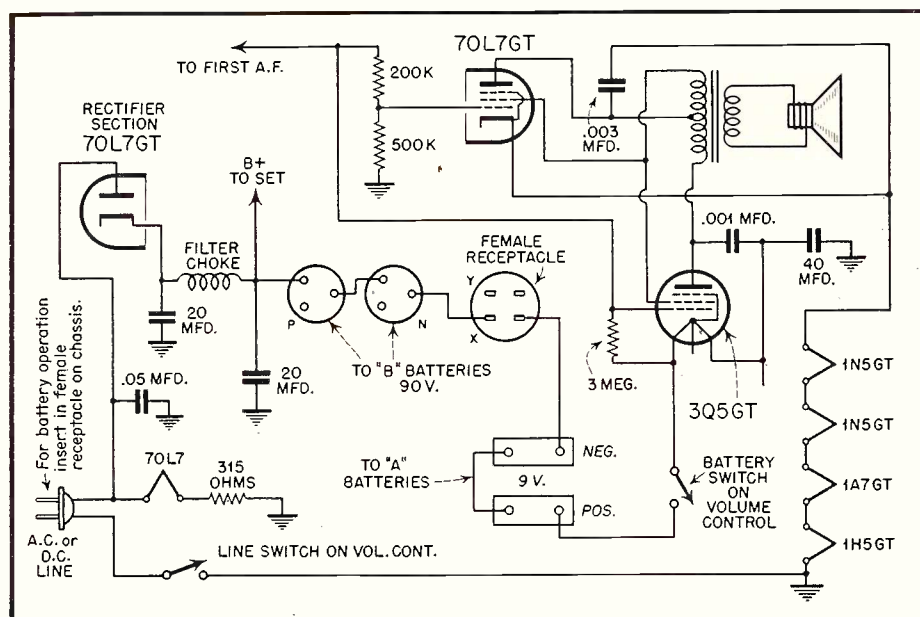


Figure 3

turned up, operating the line switch. As the 70L7GT rectifier and output tube heat up, plate voltage flows through the output section. Since the filament circuit of the 1.4 volt tubes is connected in series with the cathode of this tube, the voltage drop across the filaments gives the desired filament operating voltage. In addition, this voltage is used as bias for the 70L7GT. Output section voltage is supplied through the upper lead of the output transformer to the center tap. On battery, plate voltage for the 3Q5GT flows through the entire winding. This is necessary to provide the desired output load. For battery operation the line cord is removed from the wall outlet and plugged into the female receptacle on the chassis. This completes the B minus and A minus return to ground when the volume control switch is closed. The filament of the 3Q5GT is heated also

by this action. The circuit of Fig. 4 is somewhat similar to Fig. 1 except for the tapped choke serving as an auto transformer.

Heater and pilot light voltage are supplied from the taps. Filament voltage is delivered by one section of the rectifier

while plate voltage is supplied by the other. Resistor-capacity filtering is used throughout as in the case of Fig. 1. This circuit may be used on a.c. and battery only because of the auto transformer. If plugged into a d-c line the transformer would quickly be burned out. There are many other supply arrangements possible, only the most commonly used have been shown here. Some make use of series filaments on both line and battery as in Fig. 3. Thus a battery voltage will range anywhere from 1.4 to 6 or 9 volts, depending on the filament circuit. A word of caution about replacement parts, especially in filament circuits... in sets using dropping resistors to obtain filament voltage be sure to use the exact resistance value when repairs are necessary, otherwise filament voltage may be increased materially, shortening tube life. It might be a good idea to check filament in the line position when sets are brought into the shop. Resistance values often change radically with age and use. If a set is found with too high or too low filament voltage when the line is approximately 117 volts, figure out the proper resistance value by Ohms Law and make the change.

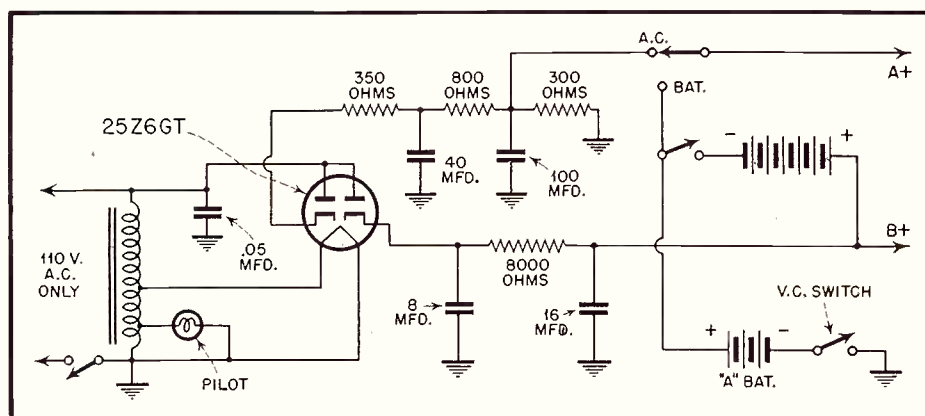


Figure 4

TECHNICAL QUIZ NO. 5

Subject: Television

BEFORE ANSWERING THE QUESTIONS—READ THESE RULES:

There are 25 questions. After each question, preceded by a letter *a*, *b* or *c* are optional answers. In each case one answer is basically correct. You are only allowed 20 minutes time in which to mark the letter *a*, *b* or *c* which you believe represents the correct answer.

For each correct answer to a question you are credited with 4 percentage points. Thus 23 correct answers would give you 92% or 17 correct answers would rate you 68% on the examination. Answers to the questions are given on Page 37.

RATINGS FOLLOW: 100% = Perfect, 90% = Excellent, 80% = Good, 70% = Fair, 60% = Passing
Any score below 55% is failure. Tests must be completed within 20 minutes.

How much do you know about TV?
Listed below are a number of questions, each of which has but one correct answer. The accuracy of your answers, and the relative speed with which you can complete this quiz is a measure of your theoretical knowledge and practical experience.

QUESTIONS 1 to 6

1. A booster is:
 - A. A circuit in which the energy from the damping circuit is returned to the horizontal output tube instead of ground.
 - B. A circuit in which the B voltage of the power supply is increased by means of a suitable circuit in the rectifier.
 - C. One whose product is the best.
2. A birdie is:
 - A. A fluttering of the waveform appearing on an oscilloscope due to a separately injected signal, applied for purposes of alignment.
 - B. Audio oscillation occurring in the upper frequency spectrum.
 - C. A hole above par (golf).
3. A travelling detector is:
 - A. A super-regenerative detector.
 - B. A crystal detector mounted in a probe assembly, enabling the serviceman to align i-f circuits, stage by stage.
 - C. A Bureau of Internal Revenue investigator.
4. Ghosts are:
 - A. Displaced images on the screen due to phase distortion in the video circuit.

- B. Displaced images on the screen due to reflections of the transmitted signal.
 - C. What appear in the night.
5. Grunting is:
 - A. Low frequency distortion.
 - B. Caused by the interaction of the video signal with the audio signal.
 - C. Sounds coming out of a pig.

QUESTIONS 6 to 11

6. Snow:
 - A. Is a screen disturbance caused by noise or weak signals.
 - B. Is a screen disturbance caused by a defective synch separator circuit.
 - C. Is what we get in the wintertime.
7. A clipper is:
 - A. A circuit which clips off the synch pulses thereby allowing only the video signal to be transferred into the video circuit.
 - B. A circuit which clips off the synch pulses thereby allowing these pulses to be transferred into the synch circuit.
 - C. What a barber uses.
8. Blanking is:
 - A. The process of cutting off the beam in the CRT during the time the synch pulse is active.
 - B. The process of blanking out the video signal during the time the synch pulses are active.
 - C. When the set you've built won't work.
9. Sink:
 - A. Is an abbreviation for synchroni-

- zation as applied to television pulses.
 - B. The return circuit of all the horizontal and vertical pulses.
 - C. Is where you wash the dishes.
10. Clamping is the process of:
 - A. Maintaining the incoming signal constant.
 - B. Establishing a reference level so that the peaks of the signal may correctly influence certain circuits, such as the D.C. restorer and the clipper.
 - C. Saying, "I do."

QUESTIONS 11 to 16

11. Stretching is:
 - A. The elongation of the picture in either direction due to improperly adjusted size controls.
 - B. The elongation of the dark portions of the picture to the right due to poor low frequency, response.
 - C. A seventh inning custom.
12. Peaking is the process of:
 - A. Compensating for the high and low frequency attenuation at the ends of the video response curve.
 - B. Obtaining the required slope of the synch pulses in order to properly trigger the horizontal and vertical oscillators.
 - C. Squatting before keyholes.
13. A director is:
 - A. An element in an antenna array.
 - B. A part of the electron gun which directs the electron stream to the face of the CR tube.

[Continued on page 30]

Matching Impedance

A speaker or output load should have an impedance or resistance equal to or higher than the effective impedance of the transformer which drives it. Good practice is a matching ratio of 1:2 to 1:5.

Impedance Measurements

Method 1—substitution. An unknown impedance may be determined by first measuring the a-c voltage drop across it, then across a noninductive resistor, adjusting the value of the resistor until the same voltage drop is obtained across both loads. The d-c resistance of the resistor may now be measured by means

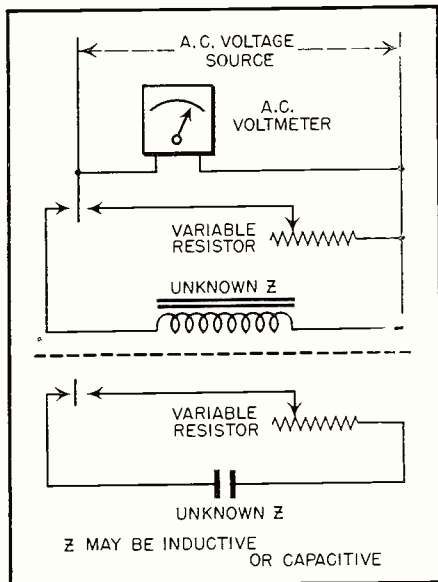


Figure 1

of an ohmmeter or a Wheatstone Bridge. The value of the unknown impedance in ohms is equal to the value of the resistance in ohms. Since impedance changes with frequency, the measurement thus made indicates the impedance of this inductive or capacitive load only at the frequency under which the test was made. See Fig. 1).

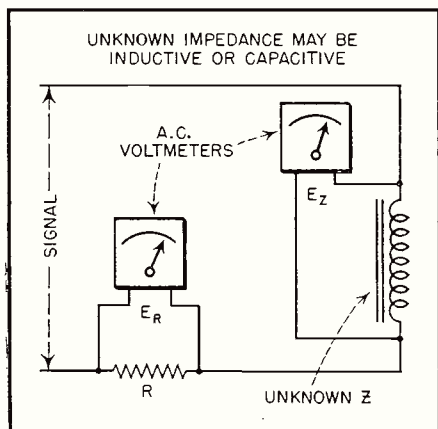


Figure 2

Method 2—voltmeter reading and computation. Place a resistor R in series with the unknown impedance Z . Then make a voltage reading across the resistor R , calling this (E_r). See Fig. 2,

SHOP NOTES

Write up any "tricks-of-the-trade" in radio servicing that you have discovered. We pay from \$1 to \$5 for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor".

and also across the unknown impedance Z , calling this (E_z).

Now, by computation,

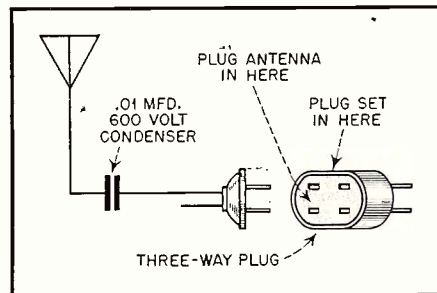
$$\text{Using formulas } Z = \frac{E_z}{I} \text{ and } I = \frac{E_r}{R}$$

and substituting

$$\text{for } I \text{ in the first equation } Z = \frac{E_z}{\left(\frac{E_r}{R}\right)} = \frac{E_z R}{E_r}$$

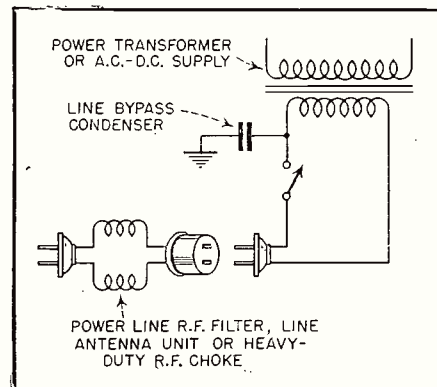
Improving Reception with Built-in Antennas

Two types of built-in antennas are used in modern sets, the loop antenna, comprising a tuned r-f input circuit, and the line antenna, consisting of a capacity, coupling the antenna terminal to the power line. Either one will usually provide excellent results under average conditions. Where operation of line antenna sets is poor, connect an outside antenna to the live side of the power line through a .01 μ f condenser (as in the illustration). With this arrange-



ment, the antenna picks up the signals, feeding them into the power line from where they go to the set. This system also works nicely in the home where the set is moved from room to room.

There is one other thing that will seriously reduce signal pickup with a line antenna set. Practically all sets other than line antenna sets have a line bypass condenser across the line from one side to ground. When such sets are used in the vicinity of line antenna sets



this condenser will bypass nearly all R.F. in the line. To overcome this, insert an r-f filter between the line cord and wall outlet of these sets. Such a filter may consist of a standard r-f line filter, many of which are on the market, or r-f chokes, or a separate inductive-type line-antenna attachment. If the latter unit is used, no connection is necessary to the antenna and ground provision of the unit. It is used only to decouple the set from the line. If necessary, any number of sets can be run from this unit providing its wattage rating is not exceeded.

To Measure Voltage Beyond the Scale of Any Voltmeter

Place a series of resistors across the voltage to be measured, being careful that the combined resistors have sufficient resistance value so that they do not appreciably load the circuit, draw

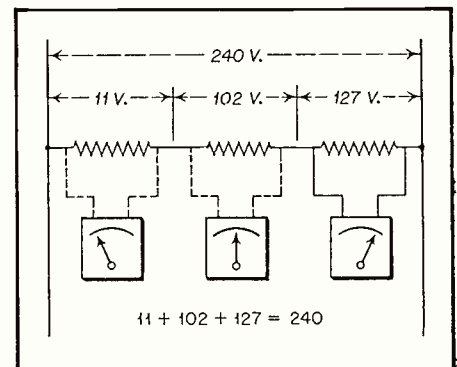


Figure 3

too much current, and thus lower the overall voltage. Now take readings across each resistor in turn. (See Fig. 3). The total of these individual readings is equal to the voltage across the line or load being measured.

Resistance Multipliers

Place a resistor in series with the voltmeter, choosing a value that will keep the needle on scale. Then, using a voltage within the normal meter range, take a reading with the voltmeter alone (reading A), and a second reading on the same voltage with the selected resistor in series with the meter (reading B). (See Fig. 4 on page 33).

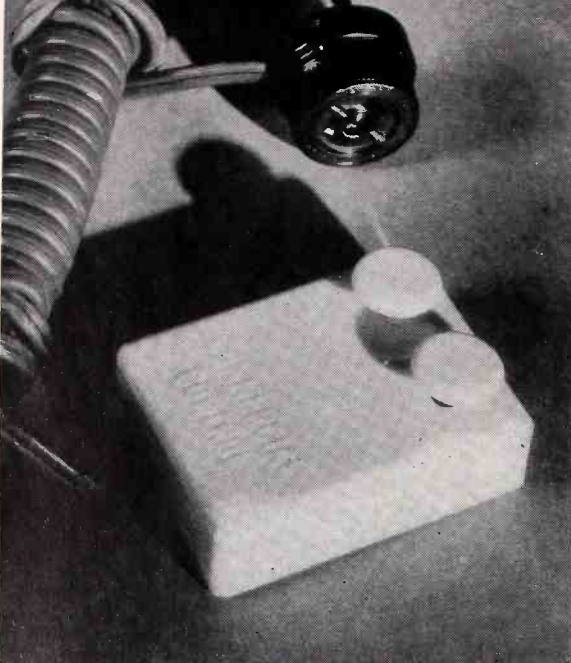
Now divide reading (A) by reading (B) to obtain the constant (K) of your multiplier resistor. Then, using the voltmeter with the multiplier resistor in series, make readings and multiply all

[Continued on page 33]

BLURB ELIMINATOR

by LLEWELLYN BATES KEIM

Describing a new gadget that the public may "go for" and if that happens, Service Dealers will cash in



SERVICE that can be rendered by the servicemen throughout the country has many facets. Besides repairing the receiver, there are from time to time offered certain gadgets which are truly worthy of the careful consideration by the better service dealer, to be offered their clients. And these devices are an added means of ready profit, especially when they are potential sales items to be carried on every service call.

For less than three dollars retail there has been introduced the Commercial Control, but it had better be known as the "Huckster Hexer," for now the listener can select what he will accept as listenable commercial matter on the radio programmes of his choice. A small cream colored plastic box on one end of a generously long attachment cable is placed beside the listener's easy

chair, or moved about the room, as the listener desires. On the other end of the wire is a series'd type attachment plug, into which the receiver is plugged, and then the combination goes into the wall outlet.

Two buttons, marked "L" & "S" for eliminating the long and short commercial radio blurbs are on the plastic box. Depressing the appropriate one for a second and then releasing it will silence the receiver until the unwanted commercial disappears, and allows the program thence to resume. As shipped from the California factory, they are timed by the makers for approximately 20 and 60 seconds, but a simple adjustment allows them to be set for the correct time for the individual receiving set to which the control is attached. Each control carries a full year long guarantee.

There is another very important feature of this unique device so timely

offered to assuage the overwrought ears of the American listener—an angle worthy of the servicing fraternity's careful study. By removing the attachment plug furnished, the leads of the long cable can be lengthened, and the control can also be so attached to the receiver that it interrupts the voice coil of the loudspeaker, instead of turning off the power fed to the set. Then a legitimate service job results from the sale of these units, yielding a dual source of profit to the service dealer.

Packaged in an attractive transparent plastic container, complete with instruction sheet and guarantee return card, they are easily handled by the selling service dealer, and can be taken along on each service call, as well as prominently and profitably displayed on the counter of his store. And think how many friends the service dealer will make for himself by selling and installing such a device.

TRADE FLASHES

[from page 10]

cation for permission to erect and operate a video station on Pinnacle Hill, said to be the best natural television transmitting location of any city in the country the size of Rochester.

William Fay, Stromberg-Carlson vice-president in charge of broadcasting and general manager of Stations WHAM and WHFM, said that plans for erecting a 323-foot tower and transmitter building would be activated immediately. He estimated that the video station would be on the air in 10 to 12 months.

New Converter Makes Television Available to Millions in DC Areas

Special converters which will make it possible for millions of persons in direct current metropolitan areas to have television receivers in their homes or offices were shown for the first time Friday, Feb. 27, at a sales meeting at

Electronic Laboratories, Inc., Indianapolis.

Sales representatives from all parts of the country attended the two-day session, at which Norman R. Kevers, new-elected president of the company, and Walter E. Peck, vice-president in charge of sales, disclosed details of the company's streamlining under a recent financial reorganization plan.

The converters, Model No. 110R15 for table model television receivers, selling for \$80, and model No. 110R30, listed at \$120, for console models, have been tested in 100 retail outlets in the New York area with unanimous acceptance, according to Peck.

"In Manhattan New York alone," said Peck, "more than 3,000,000 persons live or are employed in an area in which only direct current is available. The new converters for television, the first available on the market, will open up untouched fields for television in DC areas of New York, Chicago, Boston, Washington, Philadelphia, and many other large metropolitan areas, as well

as in hundreds of hotels and large buildings which manufacture their own direct current."

No special wiring is required for the converters, which operate with a new-type automatic remote starting system. The unit for table models weighs 15 pounds, while the console converters weighs 55 pounds. Either converter may also be used for wire recorders, juke boxes, radio-phonograph combinations, and office dictating machinery.

New Rider Manual Out

Volume XVII of the "Perpetual Troubleshooter's Manuals," published by John F. Rider Publisher, Inc., 404 Fourth Avenue, New York 16, N. Y., is now in distribution. It contains more than 1600 pages and also the companion "How It Works" book and cumulative index for Volumes XVI and XVII. Volume XVII features "Clarified schematics" which break down multi-wave band jobs to show immediately what

[Continued on page 34]

DYNAMIC DEPENDABILITY

Immunity to weather conditions, circuit adaptability, and absence of inherent distortion are features that characterize these two attractively designed dynamic microphones.

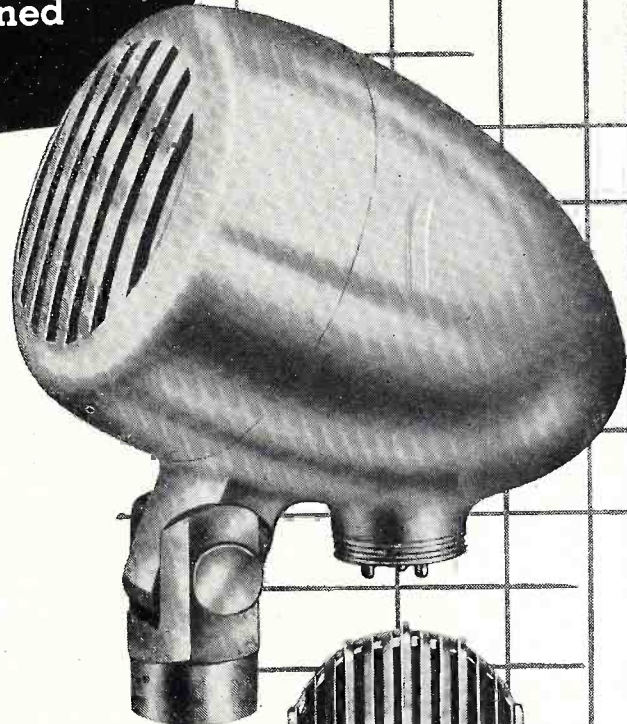
D5T DYNAMIC MICROPHONE (POLISHED, HEAVY CHROME FINISH)

A wide range, versatile dynamic microphone housed in a handsome, streamlined case. Being a pressure-operated instrument, the response is unaffected by either a close or a distant sound source. Sensitivity 52 db below 1 volt per bar.

D5 — 30 to 50 ohms

D5T — 38,000 ohms — also available in 200 and 500 ohms imp.

Complete with 25-foot cable and plug.

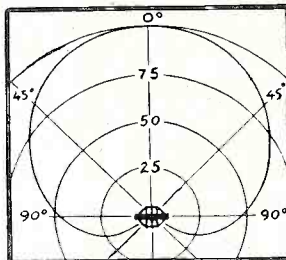


D9AT UNIDIRECTIONAL DYNAMIC

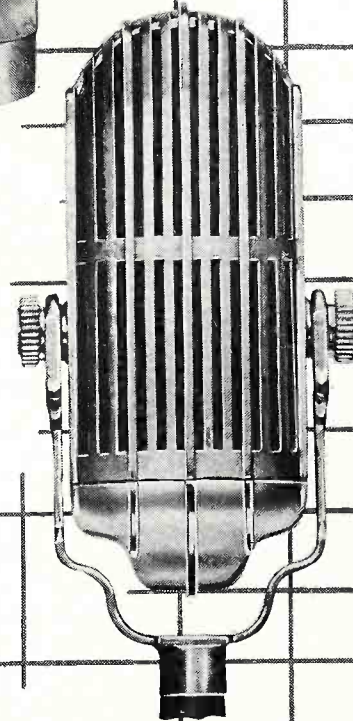
The D9AT dynamic is a pressure-velocity combination with a true cardioid pattern pickup, broad frequency response and high output. Feed-back and extraneous noise pickup are held to a minimum. Excellent for public address and general sound installations. Satin chrome finish. Complete with 25-foot rubber-jacketed, shielded cable.

D9A — 50 ohms

D9AT — 38,000 ohms — also available in 200 and 500 ohms.



The graph above is the polar response pattern of the D9AT and D9A, the field of which is a cardioid of revolution.



SEE YOUR JOBBER TODAY OR WRITE:

American MICROPHONE CO.

Dept. 3B 370 So. Fair Oaks Ave., Pasadena 2, Calif.

NEW PRODUCTS

New Knight Amplifier

The newly designed Knight 20 watt phono amplifier is especially adapted to high-fidelity reproduction from phonograph records, or AM or FM tuners. Especially suitable for industrial plants broadcasting music programs, and for all purposes requiring wide range response. Precise engineering affords less than 2% harmonic and less than 8% inter-modulation distortion at rated power of 20



watts. Individual bass and treble tone controls permit both boost and attenuation of bass and treble frequencies. Frequency response is plus or minus 1 db from 20 to 20,000 cps. Hum is better than minus 75 db from rated output. Gain is 78 db. Adjustable automatic volume expansion is incorporated. Dual high impedance input selected by switch. Output impedances of 4, 6, 8 and 500 ohm are provided. For additional details including complete specifications and response curves write to Allied Radio Corporation, 833 W. Jackson Boulevard, Chicago 7, Illinois.

Allied Supplement

Allied Radio Corp. announces a new 48-page supplement to their regular master catalogue. The supplement features the most recent developments in radio and electronic equipment as well as latest price information.

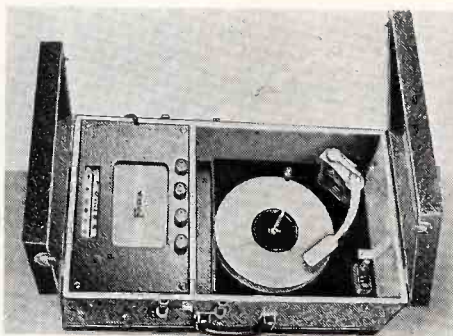


The new supplement No. 114 as well as the regular 164-page master catalogue No. 112 can be obtained without charge from the Allied Radio Corporation, 833 West Jackson Blvd., Chicago 7, Ill.



S-W Model 62T36

Housed in a marble plastic cabinet, this 5 tube plus rectifier Stewart-Warner table model covers two bands, 540-1725 kc and 9-12 mc. Operate on ac/dc.

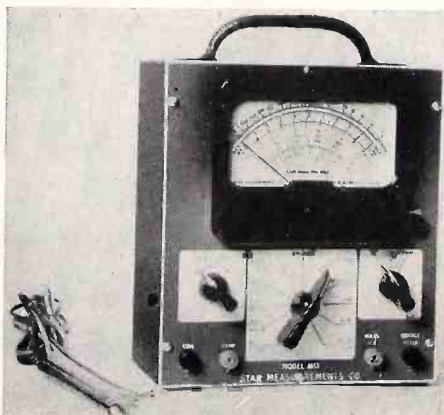


Fada Portable Combination

Fada's new deluxe model 637 is a portable radio combination record changer in luggage type case. It has beam output, 5" Alnico V speaker, 5 speakers plus rectifier, needle noise filter and covers 528-1680 kc.

Star Tester

The Model M 11 Tester is a volt-ohm-milliammeter. Voltage ranges are provided up to 1,000 volts on both A.C and D.C. Current ranges up to one ampere and resistance ranges up to five megohms are also incorporated. Calibrated DB scales are provided for measurements as high as 54 db; the zero power level is based on a 6 mw level in a 500 ohm line. In all, twenty



seven separate ranges of measurement are available.

The instrument features a large 4 1/2", 400 micro-ampere Marion meter, an etched aluminum panel, and a gray crackle finish metal cabinet. Weight is four pounds and it comes complete with test leads and batteries. For more complete data write to Star Measurements Company, 442 East 166th St., New York 56, N. Y.

Locking Plug

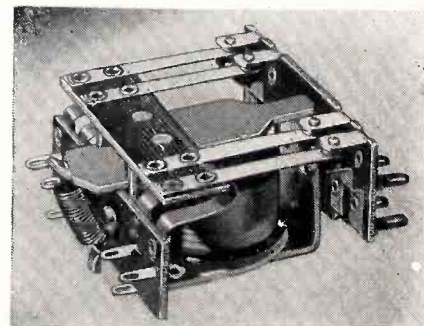
A new type locking plug the Neolock "105" that fits any standard outlet is announced by Neoline, Inc., 130 South Hewitt Street, Los Angeles 12, Cal.



Slight finger-tip pressure on a plunger forces the prongs of the plug tightly against the contacts of the receptacle, locking the plug in and forming a positive contact even in a badly worn receptacle. It is unlocked with equal ease and speed merely by pulling out the plunger. Is needed for inserting and locking or unlocking and removing the plug.

General Purpose Relay

Comar Electric announces the new multi-purpose Type "C" Relay, designed for general circuit control applications. It can be quickly mounted



on base or panel, in any desired position, with terminals easily accessible. A single screw mounting simplifies coil removal. Average coil consumption [Continued on page 32]



a New **LARGER**
Jensen
*Hypex** **SPEECH MASTER**

Model VH-15 Speech Master, a new completely weatherproof 15-inch Hypex, is the latest addition to the JENSEN Hypex family, thus expanding this line of projectors to cover a wide range of sizes and prices. Designed only for speech reproduction, without compromise to music requirements, it affords greater naturalness in the low frequencies than do other Speech Masters. Model VH-15 is recommended for sound reinforcement, indoors and out, where distinct natural speech reproduction is required to carry through high noise levels.

Developed acoustic length, 36 inches. Useful response, 190 to 6,000 cps. Voice coil impedance, 8 ohms. Polar coverage angle, 90 degrees. Power rating 15 watts maximum speech signal input. Mouth diameter 15 5/8"; overall length 15".

Model VH-15 Speech Master (ST-757) List Price **\$47.00**

*Hypex and Speech Master are Registered Jensen Trade Marks.

NOTE THESE FEATURES

- Horn designed to JENSEN Hypex formula (Pat. 2,338,262) for improved acoustical performance.
- Alnico V driver unit completely enclosed, yet replaceable without special tools.
- Trunnions adjustable through 180 degrees, lock projector in position simply by tightening two nuts with small wrench.
- Non-ferrous and stainless steel rust-proof fittings. Phenolic diaphragm.
- Rustproof, weatherproof terminal box; no exposed terminals. No soldering needed to connect.
- Improved weatherproof finish on all metal parts. Horn finished in two-tone baked enamel.
- Power rating 15 watts maximum speech signal input.



Model VH-91
 Speech Master
 List Price
 \$32.50



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Designers and Manufacturers of Fine Acoustic Equipment

CIRCUIT COURT

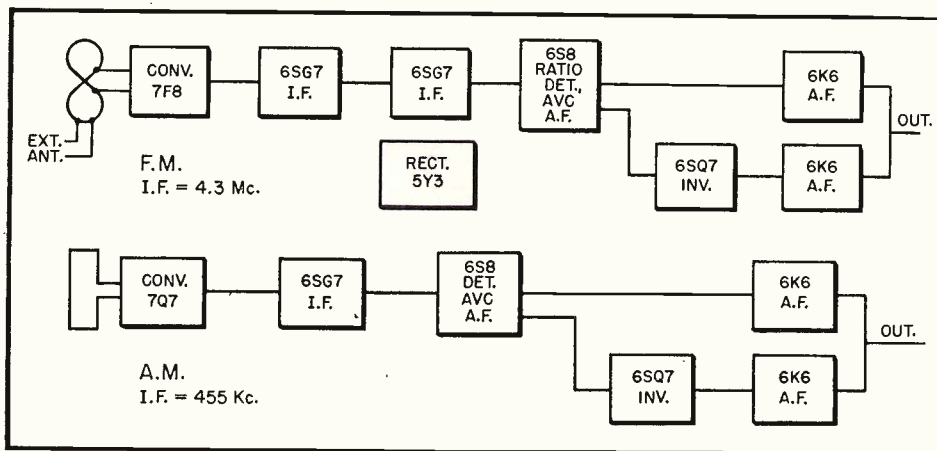
Motorola 95F Series

Several unusual features appear in the Motorola 95F series. The block diagram shown indicates the functions of the several stages. During AM operation, a built-in loop feeds a 7Q7 convertor stage. Conventional gang condensers tune the mixer and oscillator circuits. The 455 kc I.F. passes through a single 6SG7 stage to be rectified by one diode of a 6S8. AVC is developed by the diode and the rectified a-f signal amplified by the 6S8 triode portion. One 6K6 output tube is directly excited, while the other 6K6 is fed via a 6SQ7 inverter.

Switching to FM operation removes the plate and screen voltages from the 7Q7 and apply voltage to a 7F8-dual triode-acting as a dual-conversion oscillator-mixer. Linear tuning elements are employed, and are ganged to the AM condenser shaft.

The I.F. developed is 4.3 kc. Two stages of 6SG7 tubes, the first common to the 455kc Am complement, raise the signal to a level adequate to feed the remaining two diode sections of the 6S8 as a ratio detector. The a-f circuits are the same used on AM operation. A 5Y3 rectifier powers the set.

A unique "figure 8" antenna is built in for FM operation. It has the signal taken off at the crossover points and applied to the 7F8 mixer as a high impedance element. Leads at one end of the "8" serve to attach an external FM dipole via a transmission line.

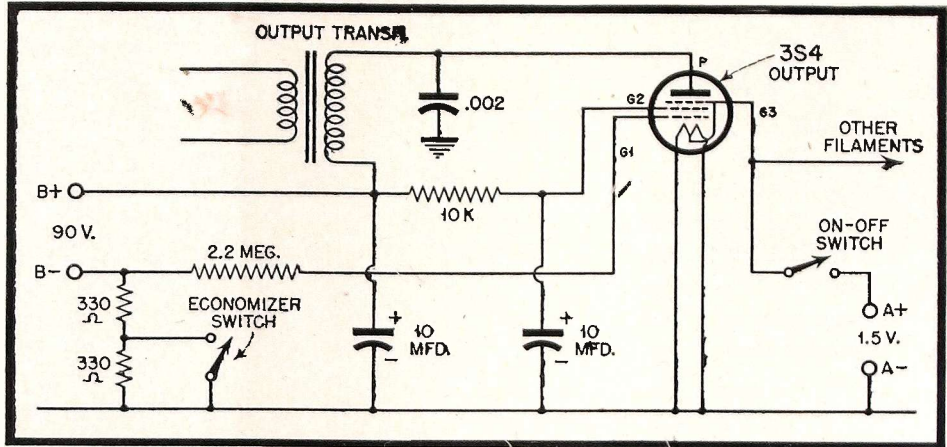


Block diagram of Motorola 95 F Series Receiver.

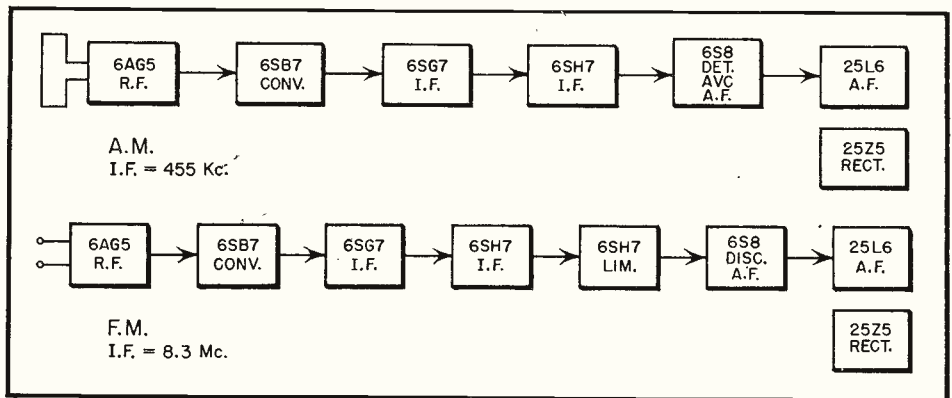
Airline 64BR-1205A, 1206A

This set is designed for farm use with a dry battery pack, supplying 1.5 volts at 250 milliamperes and 90 volts at 10.5 milliamperes. The tubes employed are the miniature types: 1R5, 1T4, 1S5 and 3S4.

As in any receiver the greatest part of the "B" supply current is used in the output stage, in this case the 3S4. Where power must be derived from batteries it is vital to reduce the consumption as much as possible. Several possible



Output stage of Airline Models 64 BR-1205A, 1206A series.



Block diagram of Zenith Models 8HO23-8HO34.

it introduces another 330 ohm element in series with the first one. This operation will substantially raise the bias on the 3S4 and considerably reduce the drain from the "B" section of the pack. This method is more desirable than reducing the "A" voltage to the filaments, particularly if the oscillator requires full A voltage to insure operation. No saving in A battery results, however.

Zenith-8HO23-8HO34

This is one of the first AM-FM receivers capable of operation on A.C. or D.C. live power. Seven tubes and a rectifier are used. Operation on Broadcast band and both FM bands is provided. The table model cabinet contains a loop for the AM band and provision for the power-line pick-up on FM bands.

Reference to the block diagram indicates the tube functions and types. A miniature type 6AG5 is used as a tuned r-f amplifier on all bands. This is followed by a 6SB7 as convertor. This tube is similar to the more common

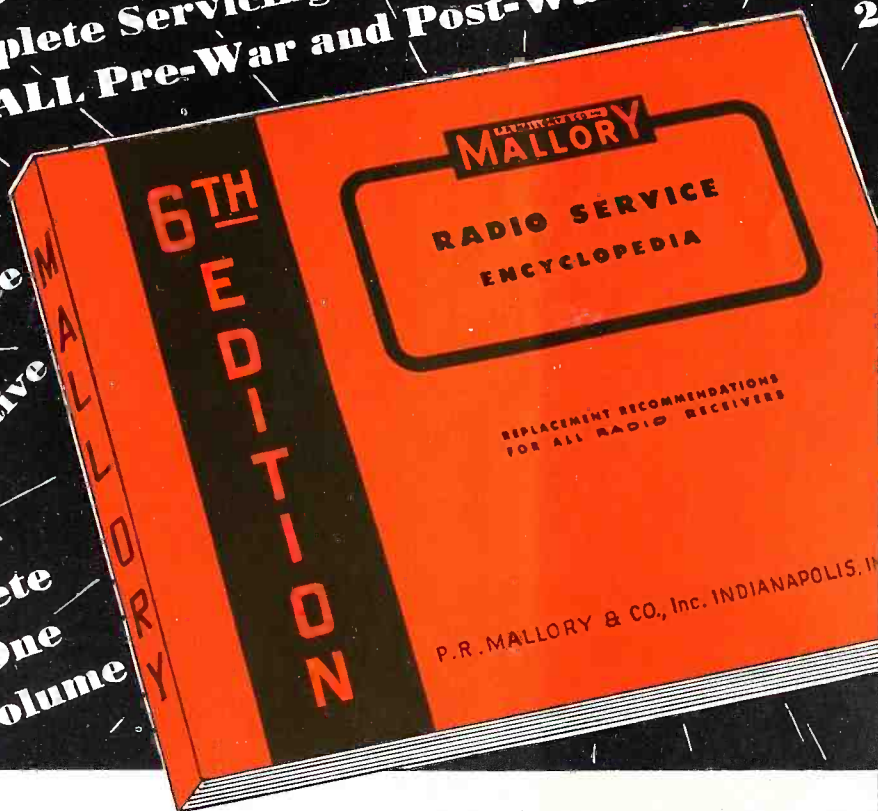
methods of accomplishing this result have been used, one of which is used in this receiver and shown in the diagram.

It is well known that if the grid bias is made more negative the plate current, and screen current too if one is involved, will be reduced. In an audio stage operating class A there is only one value of

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- IF peaks
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number of tubes . . . and in addition, cross-index to Rider by volume and page number for easy reference. **NO OTHER BOOK GIVES YOU ALL THIS INFORMATION**—that's why it's a **MUST** for every radio service engineer.

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6SA7 but is designed for higher frequency operation.

The AM signal is changed to an I.F. of 455kc, amplified in two stages using 6SG7 and 6SH7 tubes, and is rectified by a diode in the 6S8. This tube contains three diode plates and a triode section. The rectified signal also develops AVC voltage in the usual manner. The audio component is amplified first in the 6S8 triode, then in the 25L6

ple, extended short wave range. This is a 5-tube, AC-DC instrument designed for export distribution. One of the features of most export sets is the extensive short wave coverage, often requiring several settings of the range switch, and attendant expensive complication of components.

The result desired, or at least a good approximation of it, is accomplished in the Q10 by making one range perform over a frequency coverage of 4.7 to 18.2 Mc. This coverage includes the 6, 9.5,

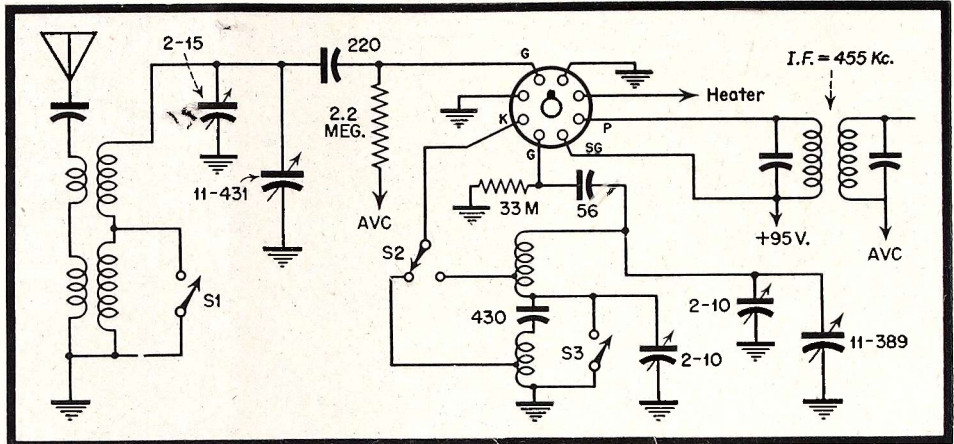


Fig. 4—Converter circuit of RCA Q10 S-W export model.

output tube. A 25Z5 rectifier provides power for the d-c circuits of the set.

During FM operation, the same tubes are used through the two i-f stages (except at 8.3 mc I.F.) and an additional 6SH7 is used as a limiter. The remaining two diode plates in the 6S8 are used as the discriminator elements. Subsequent A.F. layout is identical with that used in AM operation.

SHORT WAVE RANGE (RCA Q 10)

In the RCA Model Q10 (Figure 4), there is an example of unusual, and sim-

12, 15 and 17.8 Mc broadcast bands. The usual broadcast band of 540 to 1680 Kc is, of course, covered.

The wide coverage is provided by a combination of low circuit capacities and large tuning condensers. The converter circuit is shown herein. Note the values of the tuning condensers; the very low minimum of only 11 mmfd., and the large maxima of 431 for the mixer and 389 for the oscillator section. The switches S1, S2 and S3 are all combined in one wafer. It can be seen that S1 and S3 simply short out the broadcast coils for short wave operation and S2 switches the cathode tap to the appropriate coil.

TECHNICAL QUIZ 5

[from page 22]

C. A big shot.

14. Damping is:

A. The process of limiting the video i-f signal in the final stage in order to prevent feedback.

B. The process of short-circuiting high frequency transients in the horizontal sweep circuit.

C. Baby's favorite indoor sport.

15. Flip-flop:

A. Describes a type of multivibrator oscillator.

B. Is the action of a picture on the screen when the vertical synch is erratic.

C. Is a repeat performance on 14C.

QUESTIONS 16 to 20

16. A Bug in the Rug is:

A. One of many little black spots that appear between white vertical lines due to imperfections in the screen.

B. The action in which the synch pulses cause black spots to appear on the screen as the result of improper D.C. restoration.

C. Just that.

17. Trigger is:

A. The action describing the manner in which the synch pulses start the beam moving horizontally and vertically.

B. The action in which the synch pulses stabilize the horizontal and vertical oscillator frequencies.

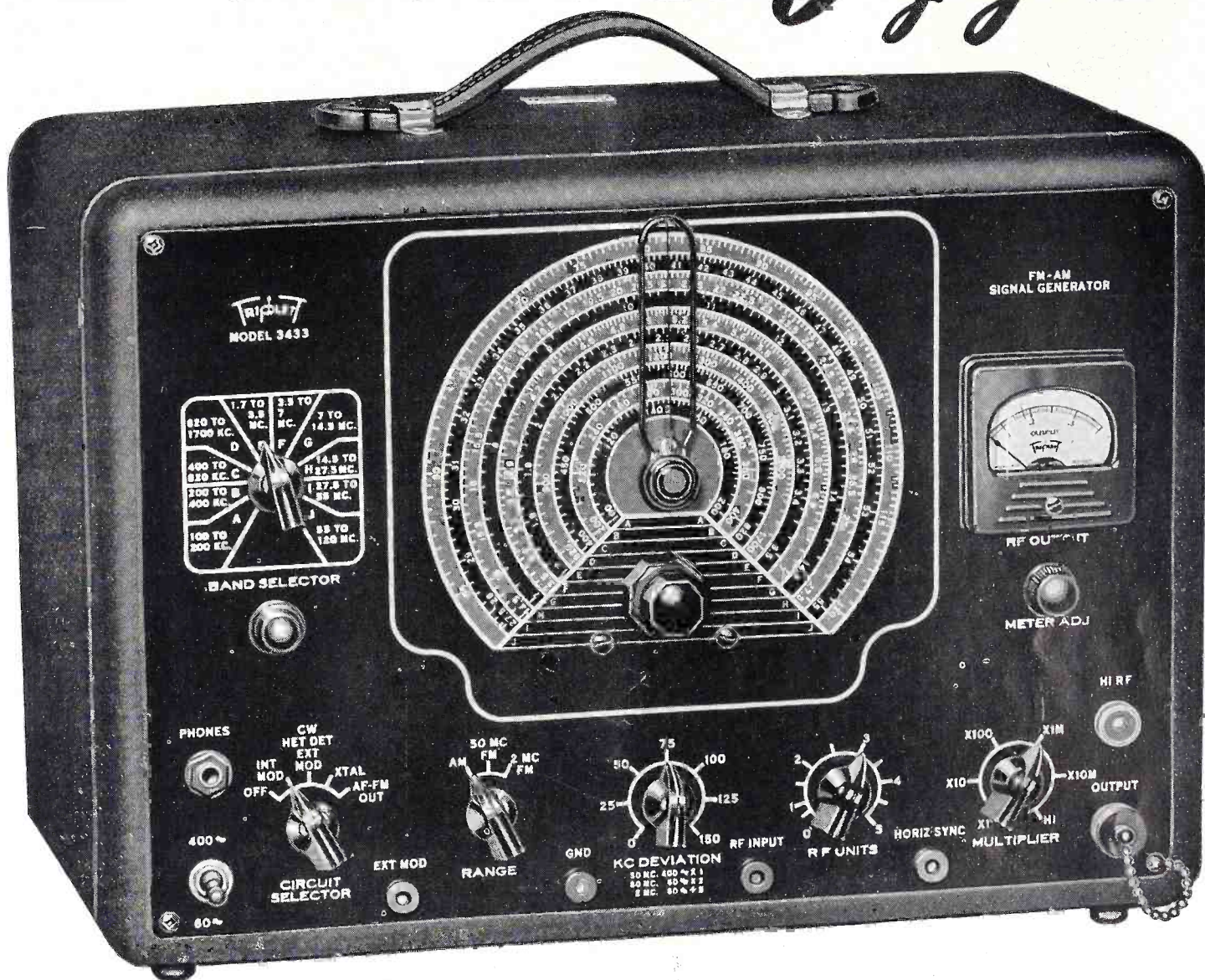
C. Roy Roger's horse.

18. Flywheel:

A. Refers to the action of the horizontal output transformer in which a high voltage pulse is generated on the return trace.

B. Refers to the action of the horizon-

Here's that NEW F.M. - A.M. *Sig. Gen.*



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F.M. SWEEP FROM 0 TO 300 K.C. MODULATION FREQUENCY 60 OR 400 CYCLES PER SECOND.

Stable frequency modulated signals give undistorted wave form. This permits easy and more precise alignment over all frequency ranges thus insuring maximum performance in a radio set that can in every way be comparable with original factory adjustments.

Other features include: constant deviation by using a fixed frequency reactance oscillator, 110 Volt A.C. line filter to prevent leakage thru power supply, horizontal synchronized sweep voltage available thru jack on front panel.

Be sure to see this new Triplet F.M. - A.M. Signal Generator at your Parts Distributor.

For complete technical description write Dept. WP-38

Model 3433 Signal Generator

Frequency Ranges: Fundamentals—from 100 K.C. to 120 M.C. in ten bands. Added Frequency—(provided by built-in fixed 50 M.C. oscillator) from 120 M.C. to 170 M.C. Second harmonics can also be used to double the A.M. fundamental ranges.

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- tal sweep circuit in which the continuity of pulses is maintained constant by Automatic Frequency Control.
- C. Anybody knows its a part of an automobile.
19. Kickback:
- A. Refers to the action of the horizontal output transformer in which a high voltage pulse is generated on the return trace.
- B. Refers to the action of the horizontal sweep circuit in which the continuity of pulses is maintained constant by Automatic Frequency Control.
- C. Just a little gravy for politicians

and gangsters.

20. Front End:
- A. Refers to the synch separator circuit where the horizontal and vertical pulses are separated and begin their progress through the respective horizontal and vertical sweep circuits.
- B. Refers to the r-f Oscillator, and Mixer circuits.
- C. Is where the engine is cradled in an automobile.

ADDRESS CHANGES . . .

Subscribers to RADIO SERVICE DEALER should notify our Circulation Dept. at least 3 weeks in advance regarding any change in address. We cannot duplicate copies of RADIO SERVICE DEALER sent to your old address. Old and new addresses MUST be given.

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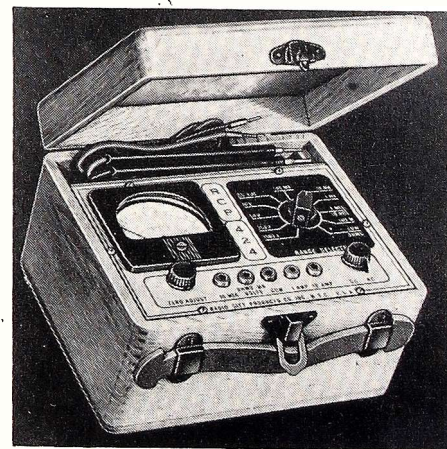
NEW PRODUCTS

[from page 26]

tion, 7½ V. A. Contact current capacity, 5 amperes at 115 volts, AC. Wiping action of points insures positive electrical contact. Available in any contact arrangement up to 4-pole double-throw. Overall size, 2" x 2-¾" x 1-¼". Weighs 3 oz. For complete details, write Comar Electric Company, 2701 Belmont Avenue, Chicago 18, Ill.

Reiner Volt-Ammeter

Outstanding feature of a new "Volt Ammeter" is that when measuring voltage or current, the user connects the individual shunt or multiplier into the circuit manually and immediately visualizes the specific circuit connection and range. Such an arrangement permits a far greater variety and flexibility of ranges than are available in the average multi-tester. A built-in drawer holds a supply of coded shunts and multi-



pliers, as well as fuses for easy replacement.

Meter, shunts and multipliers are accurate to 1%. Voltage multipliers will give a range from 1 to 1,000 volts and shunts a range from 2.5 milliamps, to 10 amperes.

Now in production are four of these models, namely: Model No. 333 for DC, Model No. 334 for AC-DC, School Model No. 343 for DC and School Model No. 344 for AC-DC. For catalog write to the company at 152 West 52nd Street, New York 1, N. Y.

Radex Universal Signal Generator

Excellent for all types of trouble shooting. An R.F. and audio signal source of multivibrator type useful for quick analysis of circuit difficulties. Generates a universal frequency which can be used for alignment or test purposes. Excellent for obtaining accurate B. C. padder adjustment. Also generates an audio frequency in addition to R. F. and I. F. Total current consumption of only 150 milliamperes. Uses single

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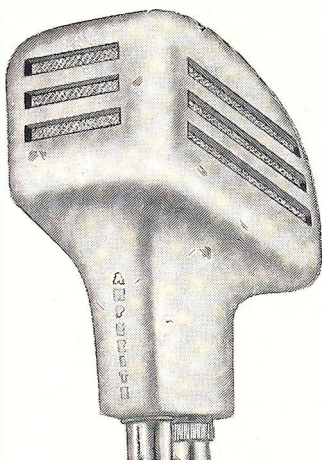
Position or Title

penlite type flashlight battery. For further details write Radex Corp., 2076 Elston Ave., Chicago 14, Ill.

New Amperite Mikes

The new Amperite Velocity Microphone for Public Address has a frequency response of 50 to 11,000 cps plus or minus 2 db. Output is -62 db. The discrimination with angle from 60 to 10,000 cps is less than 5%.

The microphone comes complete with cable connector and a switch



which is "hidden" in the back of the microphone in such a way as to prevent tampering.

Available in two models: Model RBHG (high impedance); Model RBLG, 50-200 ohms. Complete information, prices, will be promptly sent by the Amperite Co., Inc., 561 Broadway, New York 12, N.Y. Canadian Address—Atlas Radio Corp., 560 King St. W., Toronto, Ont.

SHOP NOTES

[from page 23]

of the readings thus made by the (K) to obtain true voltage. The resistor so calibrated and tagged with the (K)

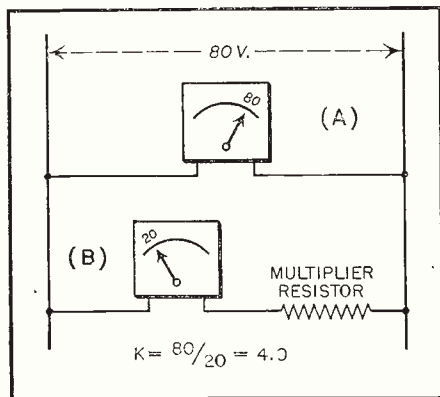


Figure 4

value can be used with the same voltmeter again without recalibration. It is desirable, but not necessary, to select a resistor that will make the (K) value an even number.

Transformer Multipliers

On a-c voltmeters only a transformer

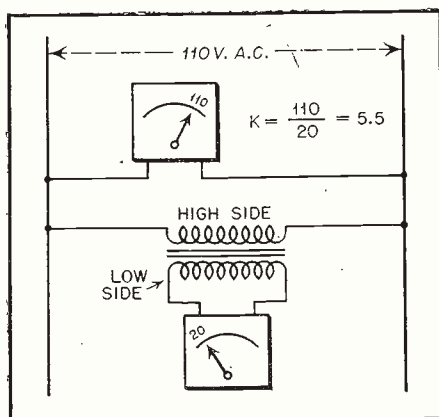


Figure 5

may be used as a voltmeter multiplier. To obtain the constant (K) for such

a multiplier, read a voltage with and without the transformer multiplier in circuit. Divide the reading taken without the multiplier transformer in use by the reading with the multiplier transformer in use to obtain the (K). (See Fig. 5). To obtain the true voltage when using the multiplier with this same voltmeter, multiply all scale readings by (K). Be sure to connect the low voltage side of the transformer to the meter.

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- 2** **THEY MAKE IT EASY...**
for your customers to buy Burgess Batteries. These bright, open, buy-appeal displays encourage your customers to examine—and buy—Burgess longer life batteries!
- 3** **THEY MAKE IT EASY...**
to convert one-time buyers into regular customers. From these bright Burgess displays, and others like them displayed in several prominent places throughout your store, your customers gain an impression of complete stocks of attractive, high quality merchandise, and the feeling that your store is alert and progressive!

DON'T DELAY...
 Order these Burgess Batteries in buy-appealing displays from your Burgess distributor today!

BURGESS
BATTERY COMPANY Freeport, Illinois

TRADE FLASHES

[from page 24]

parts are in and out of operation for each possible position of the band switch, without tracing an original schematic.

Johnson Now Hickok Sales Manager

H. D. Johnson, formerly Assistant Sales Manager for The Hickok Electrical Instrument Co., has been appointed Sales Manager, succeeding the late Robert Williams.

Connected with the radio and test instrument industry since 1928, John-



son received his initial experience as a "Test Man" in the radio receiver department of the General Electric Co. During the past war, he served in charge of Test Instruments for the War Production Board.

Espey Advocates TV Training

Harold Becker, Sales Manager-Distributor Division of the Espey Manufacturing Company has just returned from a mid-western sales tour amongst jobbers. He investigated the possibility of setting up jobber-servicemen television training programs with the Espey television kit serving as the basic tool.

"Jobbers definitely seemed interested in doing something about servicemen television training in their area before telecasting begins," Mr. Becker said. "However," he added, "the question of just what could be done and how tended to by the impeding factors. The Espey television training kit has proven to be the answer for many of them."

When jobbers were made to realize the volume lost through the lack of servicemen handling television business, they seemed very interested in the idea of a servicemen tele-training program as outlined by Espey.

The jobbers in presently active TV areas realize what "missing the boat"



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means. They lost many sales of antennae and lead-in wire, for example, because their servicemen were not equipped to handle TV installations. Independent radio service organizations, too, lose profits if they don't get TV installation jobs.

Permoflux Appoints

New representatives to handle the Permoflux Corporation's line of Radio Speakers, Transformers, and allied products have been recently appointed as follows: Representing Michigan and Northern Ohio is Mr. Curtis R. Stoutenberg, Curtis Sales Company, 3548 Euclid Avenue, Cleveland 10, Ohio. Representing Eastern Pennsylvania, Southern N. J., Maryland and Delaware is Mr. Elliot March, 115-80 221st Street, St. Albans 11, New York. Representing Nebraska, Kansas and Western Missouri is Mr. Clyde H. Schryver, Clyde H. Schryver Sales Company, 108 Waltower Building, Kansas City 6, Missouri.

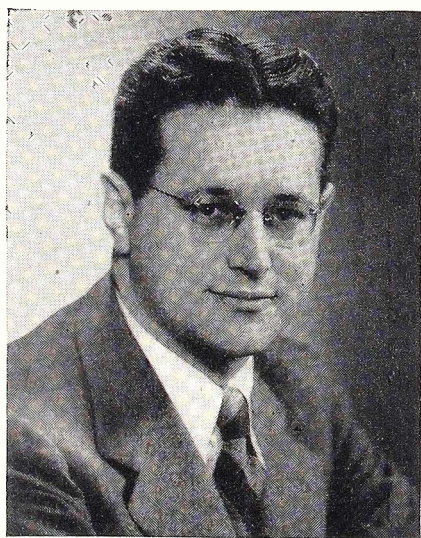
Jablon Joins Espey

W. W. Jablon, formerly of Hammarlund Mfg. Co. has been elected a Vice-President of the Espey Manufacturing Company, Inc. of 528 East 72nd Street, New York City it was announced by Nathan Pinsley, President. Mr. Jablon will head both the jobbing and special products divisions of the company.

The firm markets a line of replacement chassis and tuners through distributors and mail order houses.

Raytheon Ups Krim

Norman B. Krim has been appointed manager of the Receiving Tube Division of Raytheon Manufacturing Co.,



it was announced by Charles Francis Adams, Jr., President.

Mr. Krim succeeds Carl J. Hollatz, vice-president of Raytheon's subsidiary, Belmont Radio Corp. of Chicago. Mr. Hollatz will devote his full time to that branch of the company.

EDITORIAL

[from page 3]

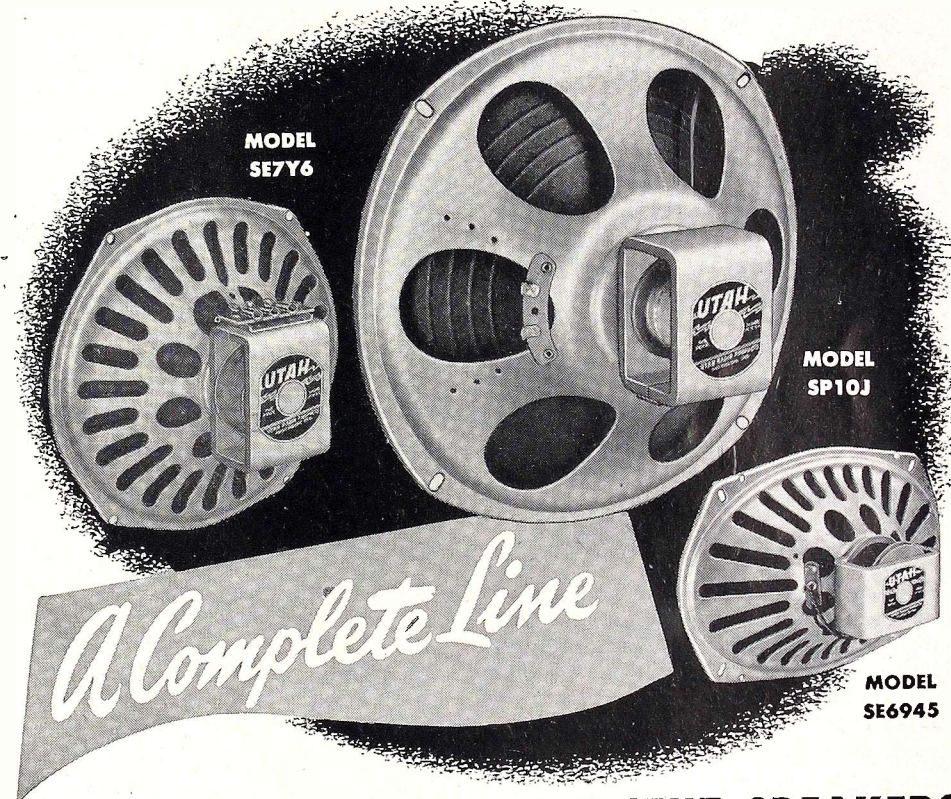
ing ways and means of doing their own "house-cleaning."

New York City's Association of Radio Servicemen and Associations of Technicians in other communities have not as yet had sufficient time in which to really accomplish all that they have set out to do. But, they have made excellent progress and the projects they have launched are gaining great momentum. In but a few short weeks it has already become apparent to Civic officials, the set-owning public, and radio technicians

themselves that the profession's status has been immeasurably improved. Public confidence is being restored and that's as it should be.

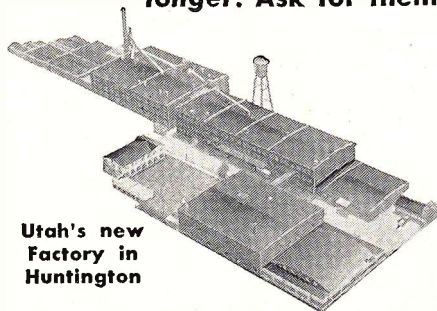
Now that rehabilitation programs are under way, let us not slacken our efforts in the slightest degree. The radio servicing profession is a complex and highly honorable one; one that can and will in time win public recognition and gratitude. Consequently, those who practice the profession will earn their just rewards in more tangible form, to wit, greatly increased earning capacity. Let's not delude ourselves. We all work to make a dollar. It is easier and better to earn money the honest way. Success breeds success, so let's take a fling at it sincerely.

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Our Apologies!

There were a couple of slight inaccuracies in our February issue regarding which we want to comment:

In the article "Visual Alignment," the caption on page 16 referring to the illustration stated that it was the author at his bench whereas this actually was a picture of Mr. Edward W. O'Malley, and his son, of McKeesport, Pa.

The captions of Fig. 5 and 6 on page 18 were transposed, and, the pattern of Fig. 5 as it appeared was improperly tilted at about a 30° angle from what it would actually be on an oscilloscope screen. —Ed.

BOOK REVIEW

UNDERSTANDING VECTORS AND PHASE

By John F. Rider and Seymour D. Uslan, published by John F. Rider Publisher, Inc., 404 Fourth Ave., New York 16, N. Y.

Pocket size, and is available in two editions, one paper-bound at 99 cents, the other cloth bound at \$1.89.

Written particularly for all men in radio and electronics who have not had the advantage of technical training.

Electronic engineering students, junior engineers and servicemen will find it easier to follow technical developments as they appear in radio magazines and books with a knowledge of vectors and phase. An understanding of vectors is important in following developments in frequency modulation and television. Vectors are the engineer's shorthand—a picturegraph adopted to relieve writer as well as reader from tedious mathematical presentations.

While the serviceman need not know vectors in order to repair a radio receiver, a knowledge of vectors will give him an opportunity to understand the new circuits as they are presented in radio magazines.

RADIO RECEIVER TUBE PLACEMENT GUIDE

Published by Howard W. Sams & Co., Inc., 192 Pages. Size 5¼ x 8¼. Price \$1.25

This book filling an important, everyday need of the Radio Service Technician, has been prepared in answer to literally thousands of requests received for such a publication.

It shows exactly where to replace tubes in more than 4500 receivers, covering 1938 to 1947 models. Every tube layout diagram is clear and easy to follow, each is based on accurate, original research.

It eliminates hit-and-miss tube placement and risky guessing. The handy index locates the set—then refers to the diagram and replacement of the tubes is accomplished quickly and correctly. Available from your local radio replacement parts distributor.

TELEVISION RECEIVER CONSTRUCTION

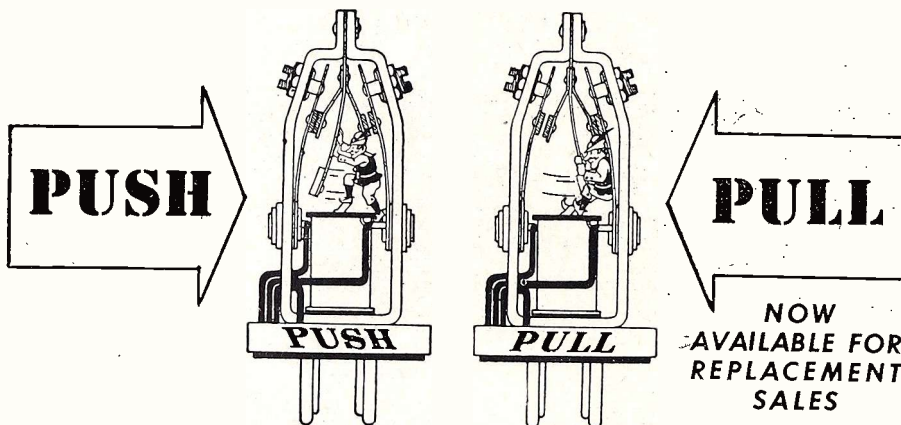
By Arthur Liebscher. Published by Electronic Development Co., 7618 Fayette St., Phila. 38, Pa. 47 pages. Price \$1.50.

In this "how-to-do-it" book, the author has broken down the constructional process into 243 well-defined steps, beginning with the sorting and labelling of components to the installation of the last tube and turning on the television receiver.

Each series of steps is pictured so that non-technically trained persons who might have difficulty reading a schematic diagram can construct this television set without assistance.

The first chapter is devoted to a brief resume of how television works. The discussion is non-technical and should prove of interest to the layman. A second chapter is devoted to the precautions which must be taken by the constructor in handling the high voltages present in a television receiver. The necessary tools and instruments

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are listed and explained in a separate chapter while a complete parts list including quantity, type, suppliers, and descriptions of the components is given in Chapter 4.

Details on inspection test and alignment, (of particular interest to technicians), operation of the receiver, troubleshooting, antenna construction, and a glossary of television terms completes the text.

The material is clearly presented and no difficulties should be encountered by those who follow instructions "to the letter." Many photographs, diagrams and charts further simplify the presentation.

VISUAL ALIGNMENT TECHNIQUES FOR FM SERVICING

A new 28-page booklet published by the Specialty Division of General Electric Company, Electronics Park, Syracuse, N. Y. It includes chapters on the theory and practical applications of the Cathode Ray Oscilloscope and the Sweep Frequency Signal Generator, and basic FM circuits. It is profusely illustrated with schematic drawings, block diagrams, sketches and curves. Copies are available from G-E distributors for twenty-five cents.

TECHNICAL QUIZ No. 5 ANSWERS

Do NOT read or study these answers until you have finished marking down your answers to the "Quiz" given on page 22 of this issue. When that is done, compare your answers to these correct ones.

ANSWERS

- 1-A; 2-A; 3-B; 4-B; 5-C;
6-A; 7-B; 8-A; 9-C; 10-B;
11-B; 12-A; 13-A; 14-B; 15-A;
16-C; 17-B; 18-B; 19-A; 20-B.

UNDERSTAND YOUR TUBE TESTER

[from page 14]

Sylvania engineers, in designing a new service tube tester, arranged the adjustment and calibration of the instrument to take both emission and transconductance into account in a single indication. This is an important step, because emission shows the condition of the tube cathode, while a dynamic transconductance test gives a picture of expected tube performance in the equipment (such as radio receiver, test instrument, or electronic device) in which the tube is to be used. The manufacturer's special factory adjustment and calibration procedure has been worked out carefully for each tube type to give meter indications based upon tests of several brand-new tubes of that same type. These tests take into consideration emission as well as transconductance.

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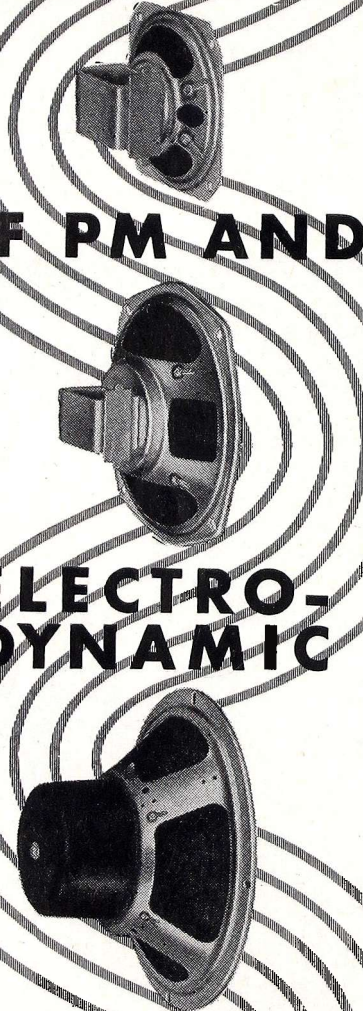
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The basic circuit of the tester is shown in *Fig. 3*. Note, from this simplified circuit, that a-c voltages are employed throughout. This results in considerable reduction of size, weight, and cost. Furthermore, since the electrode currents are composed of positive half-cycles (resulting from half-wave rectification at each electrode), large peak currents may be drawn in the testing process without damaging the tube. The series resistors in the screen and plate leads limit current, thereby preventing damage if the tube is gassy or has shorted electrodes.

The signal applied to the grid-cathode circuit of the tube under test is 5 volts R.M.S. at the line frequency (50 to 60 cycles). The indicating meter is set, according to a predetermined schedule, to the proper scale characteristic (meter range) for each tube type, by means of the shunt rheostat.

The large meter scale of the milliammeter (see *Figs. 5 and 6*) is graduated in English units (GOOD and BAD) as well as being provided with two numerical scales. The upper numerical scale is graduated 0-130 and is intended to show the comparison between the tube under test and "normal." Normal point is 100 on this scale. The lower scale range 0-100 is furnished for the benefit of those customers who may wish to use the indicating meter externally in circuits in which this 0-1 d-c milliammeter will be found useful.

Short Tester

The arrangement provided by this tube tester for checking interelectrode short circuits is shown in *Fig. 4*. In this circuit, the voltage divider network, comprised by resistors R_1 to R_4 , applies a low voltage at all times to the neon lamp, but this voltage is somewhat less than is required to light the lamp. In the event of a short circuit or leakage between a pair of electrodes in the tube under test, the neon lamp voltage is increased by the amount required to light the lamp. Approximately 50 volts are applied to the tube electrodes in this improved short-circuit test. This voltage is sufficient to indicate short circuits, as well as leakage paths up to 2 megohms, but will not cause the erroneous short-circuit indications given by other circuits, where a voltage between 100 and 200 volts is applied to the tube electrodes.

Also included in the circuit, but not shown in *Fig. 4*, is a pair of pin jacks for the connection of headphones or an amplifier to help locate intermittent shorts and for checking tube noise.

This portion of the circuit is connected to the selector switch to test all tube-elements individually.

Complete Instrument

The complete circuit schematic of

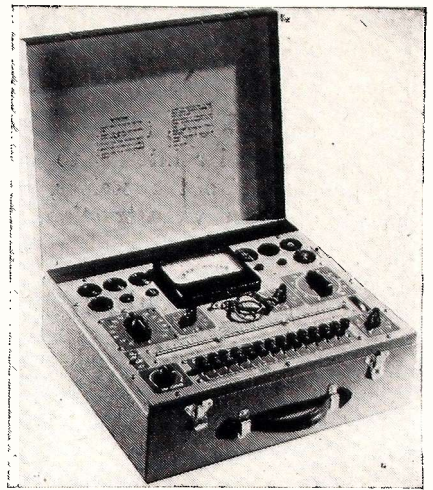
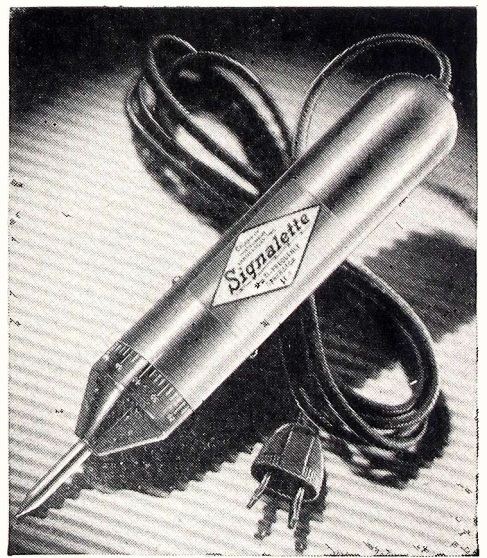


Fig. 5—Portable type tube tester

the improved tube tester is given in *Fig. 7*. External views of the instrument are shown in *Figs. 5 and 6*. Figure 5 shows the portable checker; Figure 6 the store counter model.

The filament (heater) terminal selector switch, *S-104B*, and its circuit are specially arranged to prevent short circuiting the heater winding by throwing any other switch. Other switch sections take care of selection of tube cathode, screen, and plate socket pins. *R-108* is the variable meter "shunt." Switch *S-102* selects various taps on the primary of the power transformer to



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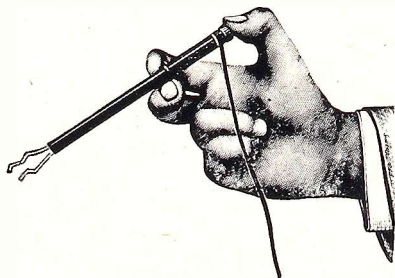


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provide line voltage control. Line voltage indication on the d-c milliammeter of the instrument is made possible by rectification in the 1LE3 tube, the only tube employed in this checker. A special FILAMENT TEST lever provides a quick check of filament (heater) continuity without requiring a waiting period while the tube heats up.

The tube checker may be employed at any line voltage between 105 and 125 volts at 50 to 60 cycles. Twenty watts power is taken by the instrument. An internal 1/2-ampere fuse protects the checker.

Every effort has been put forth to make this tube tester fully useful and easy to operate. Its two-tone green finish is an aid to visibility and reduces eye strain. Controls are at a minimum. The handy roller chart shows settings for more than 480 tube types and provides space for writing-in the settings for future types. All present tubes, including acorns, with filament voltages between 1 volt and 117 volts are accommodated. An extra socket space on the panel is an additional safeguard against obsolescence.

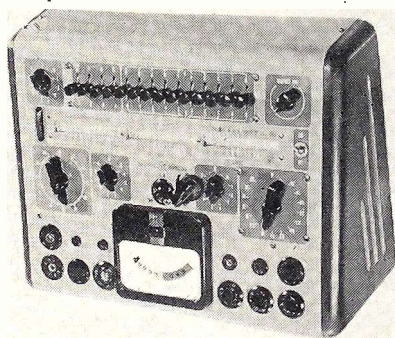


Fig. 6—Store counter type tube tester

Operation

Operation of the checker is simple, being reduced to the following easy steps (Refer to Fig. 7, complete circuit):

1. Throw ON-OFF switch to ON position.
2. Adjust LINE CONTROL switch until meter reads on "Line."
3. Select tube to be tested, on roller chart.
4. Make chart settings with CONTROLS A, B, C, and D.
5. Insert tube in proper socket.
6. Throw FIL. TEST switch. If neon bulb stays lighted, filament is good. If neon bulb does not light, filament is bad.
7. Rotate switch E through positions 0 to 8. If neon bulb stays lighted at any position of this switch, tube is shorted.
8. Make chart settings on CONTROLS E, F, and G.
9. Throw TEST switch indicated on chart.
10. Read condition of tube on meter.

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Ad Index

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Burgess Battery.....	34
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Concord Radio Corp.....	37
Delehanty School.....	40
Duotone Company.....	39
General Elec. Co. (Speaker Div.).....	4
General Electric Co. (Tube Div.).....	12
Haldorson Co., The.....	37
Hytron Radio & Electronics Corp.....	11
James Vibrapower Co.....	36
Jensen Mfg. Co.....	27
Macmillan Co., The.....	39
Mallory & Co., Inc., P. R., Cover 2.....	
Mallory & Co., Inc., P. R.....	29
Mueller Electric Co.....	39
Permoflux Corp.....	36
Precision Apparatus Co., Inc.....	36
Racon Electric Co., Inc.....	6
R C A (Tube Div.).....	Cover 4
Rider, Publisher, Inc., John F.....	9
Sams, Howard W. & Co., Inc.....	1
Simpson Electric Co.....	7
Strand Hotel.....	40
Tartak Speakers, Inc.....	38
Triplett Elec. Instru. Co.....	31
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[from page 19]

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The last word has, by no means, been said on television power supplies; and even as this article is being prepared new circuits and ideas come pouring in. However, we believe that the types in use at present, and those that will appear in the immediate future, are covered by the basic material contained herein.

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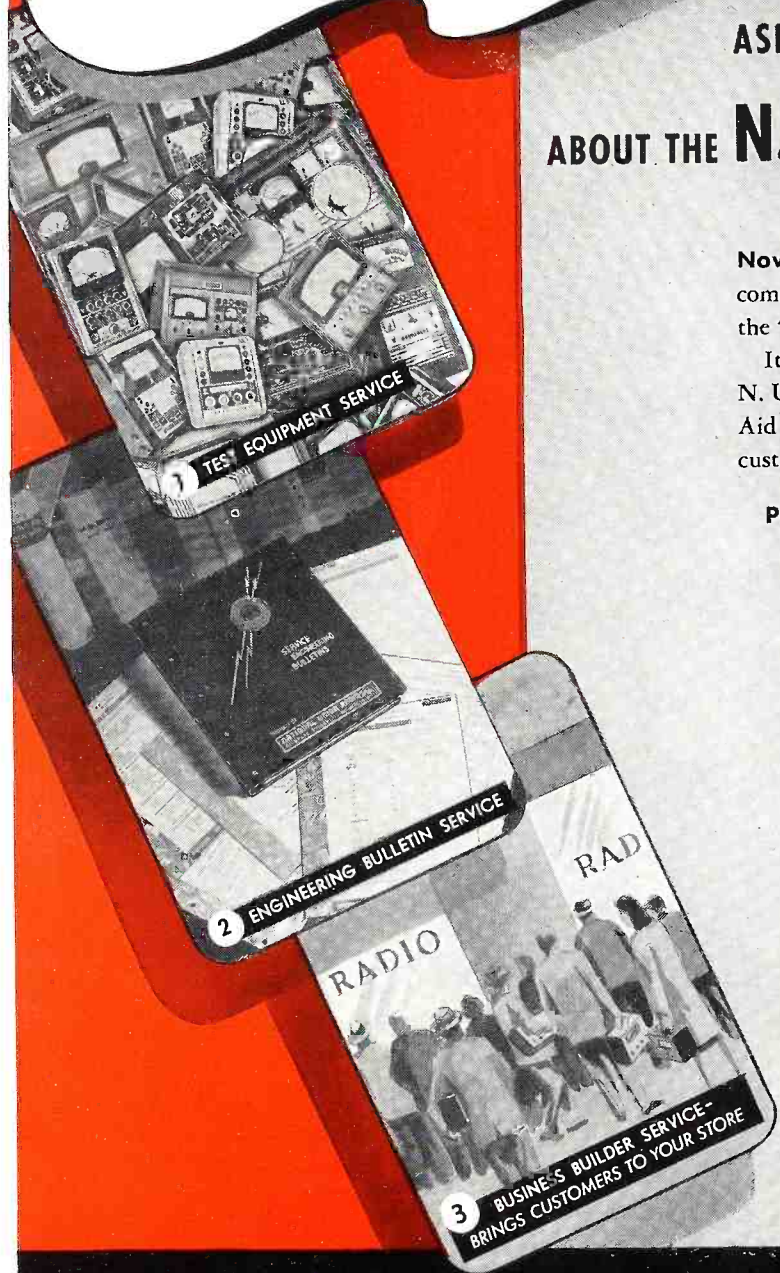
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