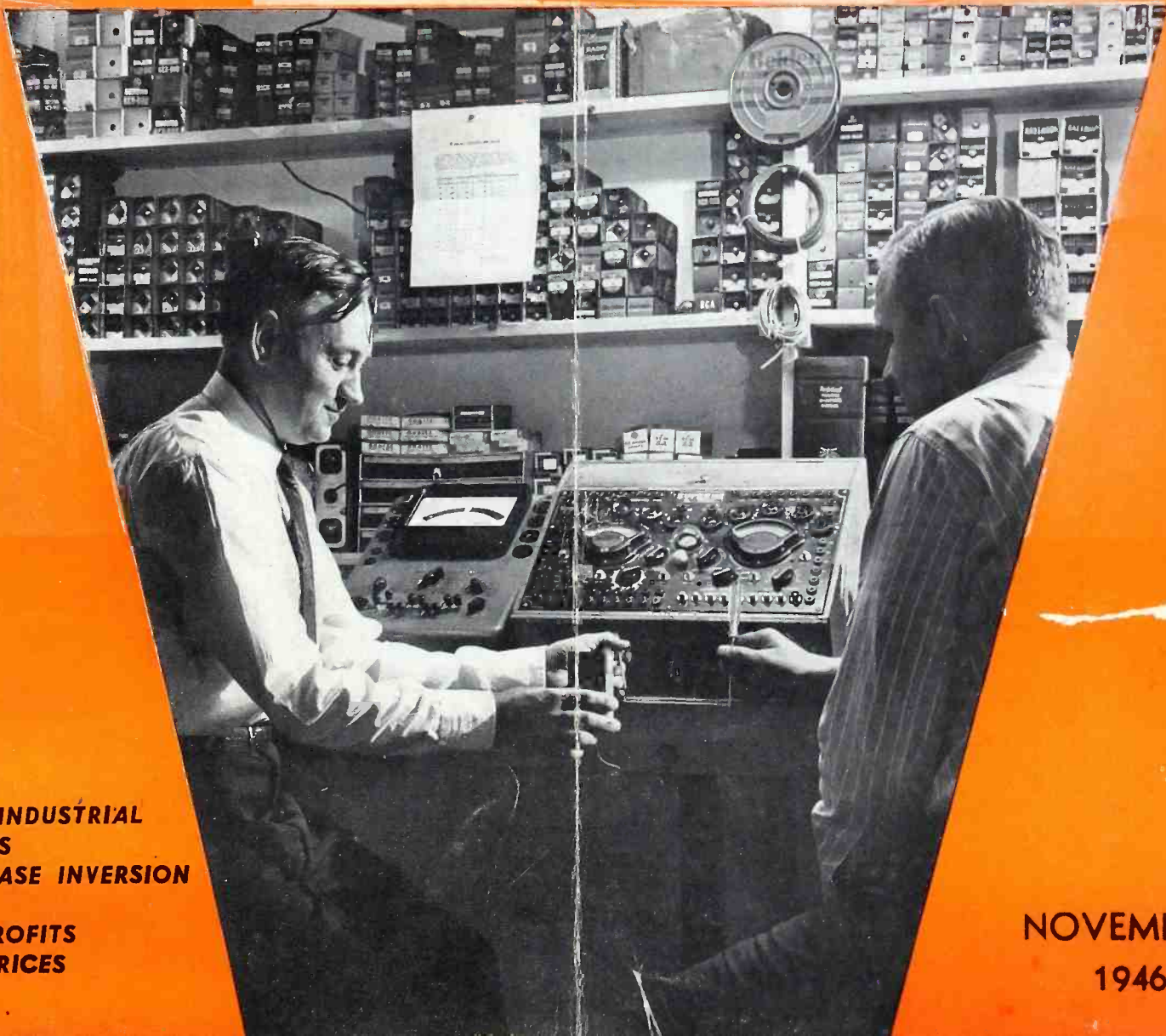


radio service dealer



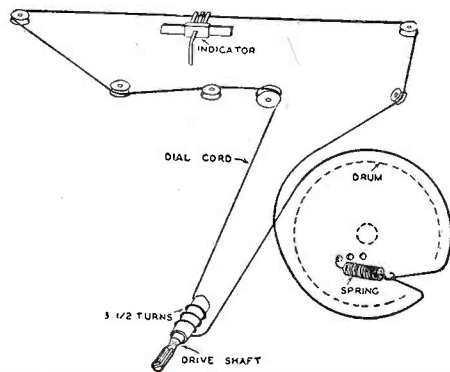
This Issue:
SERVICE IN INDUSTRIAL
ELECTRONICS
TESTING PHASE INVERSION
CIRCUITS
"HIDDEN" PROFITS
NEW TUBE PRICES

NOVEMBER
1946

No Service Problem Can Stump You When You Use PHOTOFACT* FOLDERS...



NOT EVEN DIAL CORD STRINGING!



What kind of service problems give you trouble, waste valuable time? Restringing dial cords? Identifying parts? Deciding on correct replacements? Shelve such worries—*make service time twice as productive*—with Howard W. Sams PHOTOFACT FOLDERS

PHOTOFACT FOLDERS speed up work, make profits bigger, by helping you lick every service problem. No other radio service data compares with PHOTOFACT FOLDERS in completeness, dependability, timeliness. Full-page schematics, clear-cut photos, *original* technical dope tell you *everything* in a jiffy about every radio manufactured since January 1, 1946. What's more, you get the information when you need it without waiting.

*Trade Mark Reg.

The cost per set (30 to 50 folders on the latest radios, phonographs, inter-communication systems and power amplifiers) is only \$1.50. This includes membership in the Howard W. Sams Institute. Demand is big, paper is limited. Use the coupon below for Sets No. 7 and 8 *before they are sold out!*

In Each PHOTOFACT FOLDER You Get—

1. A cabinet-view photo of the receiver to help you establish identity and control functions.
2. A top-view photo of chassis and speaker to identify component parts and alignment points.
3. A bottom-view photo of chassis and/or accessories.
4. A complete list giving keyed reference to all parts, alignment and schematic diagram.
5. A complete full page schematic diagram of the receiver.
6. Stage gain measurements listed on the schematic diagram.
7. A complete voltage and resistance analysis chart for rapid check of operational values.
8. Complete alignment instructions on the receiver consistent with the keyed alignment points indicated in top and bottom-view photos.
9. Dial cord diagram and restringing instructions on all receivers.
10. Complete disassembly instructions, where required.

Set No. 7 Due November 19—Set No. 8 Due November 29

Cut This Out and Mail It to Your Distributor! If you do not know his name and address, send it directly to Howard W. Sams & Co., Inc., 2924 East Washington Street, Indianapolis 6, Indiana, and we will see that your nearest distributor gets it. In Canada—write to A. C. SIMMONDS & SONS, 301 King Street East, Toronto, Ontario. Canadian Price \$1.75.

PLEASE PRINT

Send Set No. 7 Send Set No. 8
(Circle one or more of following) Send Set No. 6, 5, 4, 3, 2, 1, (\$1.50 a Set)

Send me a DeLuxe Remington Rand Binder @ \$3.39.
(If you send cash, be sure to use registered mail)

My (check) (money order) (cash) for _____ is enclosed.

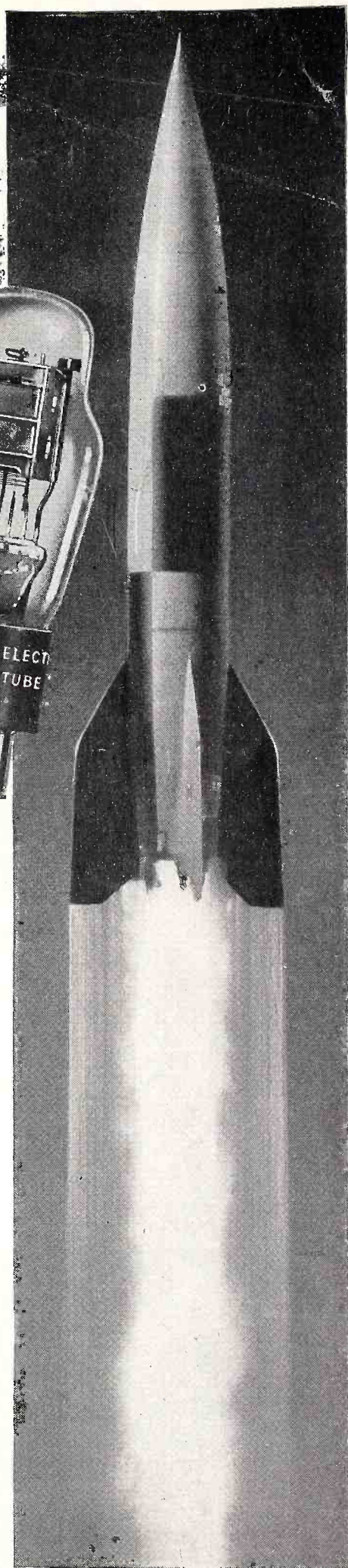
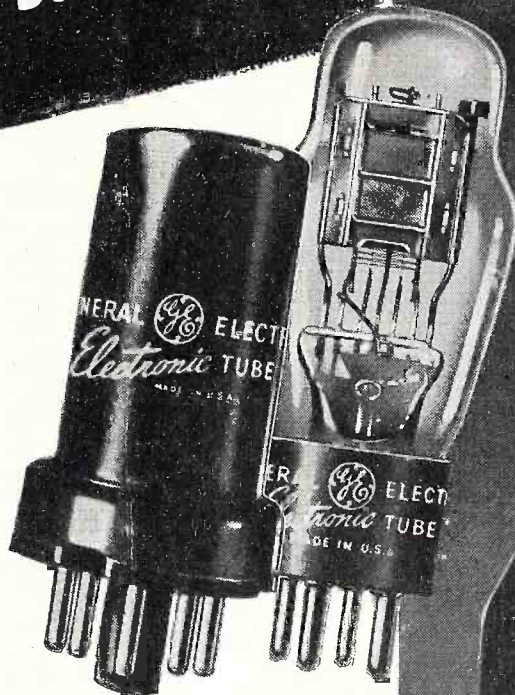
Name _____
Address _____
City _____ Zone _____ State _____
Company Name _____
My Distributor's Name _____ City _____

HOWARD W. **Sams** & CO., INC. **RADIO PHOTOFACT SERVICE**

In Canada—write to A. C. SIMMONDS & SONS, 301 King Street East, Toronto, Ontario

IT'S **POWER** THAT
DRIVES THE ROCKET
MILES UP INTO SPACE...

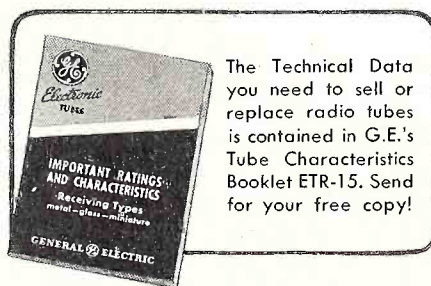
Be smart—use G-E
sales power to lift
your tube volume
to higher, more
profitable levels!



RADIO TUBES

MIGHTY productive sales-wise, the force which the G-E monogram exerts as a popular symbol of quality! Poll your area, and an overwhelming number of buyers will vote G-E on every ballot. That's because their G-E lamps, fans, irons, refrigerators, as well as radios, have served them long and well. In consequence, they'll come to *you* for tubes, once they know you sell the G-E make. . . . So your money-making formula is simple. (1) Arrange to handle G-E radio tubes! (2) Let local owners

know you handle them! That part's made easy by the display and promotion material you get free as a G-E tube dealer. . . . Write for complete information about tube selling rights to *Electronics Department, General Electric Company, Schenectady 5, N. Y.*



The Technical Data you need to sell or replace radio tubes is contained in G.E.'s Tube Characteristics Booklet ETR-15. Send for your free copy!

GENERAL  ELECTRIC

176-E6-9850

FIRST AND GREATEST NAME IN ELECTRONICS



GOOD NEWS!

Portable Radios are Back — and Selling!

Soon today's production stream will be a *flood*. Because experts agree that portable radios are one of the great radio market potentials today . . . perhaps *10,000,000* new sets to be sold as fast as they can be made! Buyers' demands are greater than even in the boom year of 1941!

Your customers *recognize* and *want* the proved advantages of "Eveready" "Mini-Max" radio batteries . . . Ounce for ounce, the *greatest power producers* . . . size for size, the *most compact* . . . penny for penny, the *most economical!* *Right now*, there's an existing backlog of battery replacement business in 4,000,000 to 5,000,000 pre-war sets! That's OPPORTUNITY . . . ready-made!

Get a head start in this great field. Order "Eveready" batteries from your distributor NOW!



The registered trade-marks "Eveready" and "Mini-Max" distinguish products of National Carbon Company, Inc.

DISPLAYS MAKE BUYERS OUT OF LOOKERS!

NATIONAL CARBON COMPANY, INC.
30 EAST 42nd STREET, NEW YORK 17, N. Y.
Unit of Union Carbide and Carbon Corporation



radio service dealer

Member Audit Bureau of Circulations
Covers all phases of radio,
phonograph, sound and elec-
trical appliance mer-
chandising and servicing

VOLUME 7 Number 11

November, 1946

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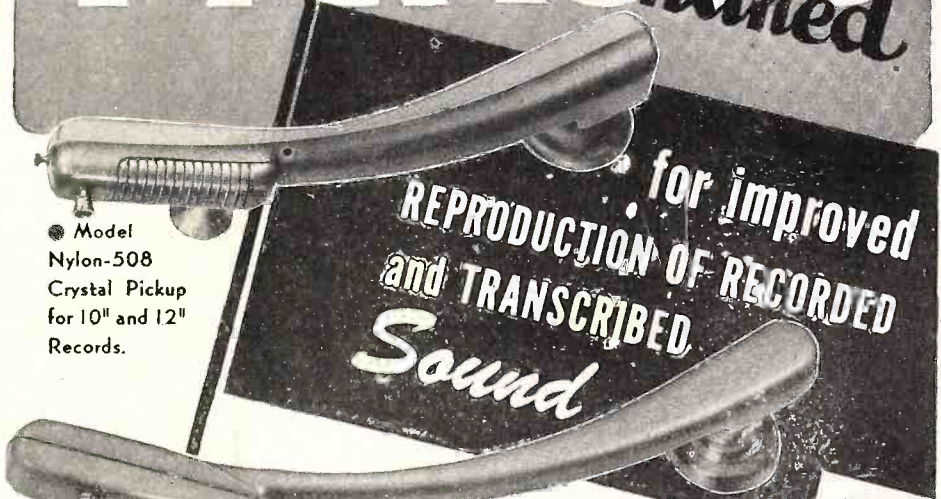
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NYLON PICKUPS

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● Model
Nylon-508
Crystal Pickup
for 10" and 12"
Records.

● Model
Nylon-400
Crystal
Pickup for
all size tran-
scriptions.

● The most advanced ideas in engineering and design are incorporated in Astatic's new Nylon Phonograph Pickups for reproducing all standard size records and transcriptions. The use of Astatic's new Nylon 1-J Crystal Cartridge in these pickups, gives them quality performance characteristics possessed by no other phonograph arms. Improved tracking and signal transmission ... reduced needle talk, needle scratch and resonance peaks ... increased record and needle life ... all contribute to finer quality reproduction obtained with the use of these new Nylon Pickups. For technical facts and more detailed information you are invited to see your Radio Parts Jobber or write for Catalog.

● Nylon 1-J Crystal Pickup Cartridge with matched Nylon Chuck and Sapphire-tipped, replaceable Nylon Needle.

THE Astatic CORPORATION
CONNEAUT, OHIO
IN CANADA, CANADIAN ASTATIC LTD., TORONTO, ONTARIO

Astatic Crystal Devices Manufactured
under Brush Development Co. patents.

with the publisher . . .

New Crystal-Tuned Receivers

SPECIAL receivers such as aviation and marine types, that are tuned by crystals, have long been made and used. Now at least two leading manufacturers of broadcast receivers plan mass production of home and automobile radio receiver models which will employ crystals for station selection.

The new crystal-controlled receivers will utilize a very interesting oscillator circuit. The tuner itself will be either a dial telephone or cash-register push-button type of station selector. Several tuning methods are under consideration. The set owner may be required to signal either the station's call letters or assigned frequency. RADIO SERVICE DEALER will publish the circuit and pertinent information just as soon as a release can be obtained from the manufacturing sources.

Service Dealers will like crystal-controlled type receivers for several reasons. Although they may cost servicers some repair jobs, such as work on dial cables or station selector switches, those types of jobs have ever been unprofitable. And variable condensers require replacement so infrequently that any substitute would be welcome. The new crystal tuners open new potentials such as work on a somewhat complex station annunciator or crystal selector; or replacing crystals which might become defective; or selling additional crystals to set owners who may want to receive stations for which crystals were not supplied as original equipment.

The Sound Business

ONLY a relatively few Service-Dealers or jobbers have specialized in the Sound Business, which means selling, installing, renting or servicing commercial public-address, paging, recording or intercom systems. Those few firms that do specialize in Sound have found it extremely profitable, but because of the nature of the business, we reiterate it requires specialization rather than mere haphazard effort if one wants to really get into a good, profitable field allied to radio sales and service.

Almost every Service-Dealer can be successful in the Sound Business if he goes about it properly. Practically every business enterprise, school, auditorium or club in any neighborhood can and should use some sort of sound-communication system either in daily routine or for some special occasion. Not much in the way of a cash outlay is required to get into this field. A little time and thought must be given to the idea though before one goes overboard. And in this regard we, and some leading manufacturers

of sound equipment, are now ready to be of help to you. Let us know if we can be of service.

Electronics . . . A New Vista

YOU have heard much of the so-called electronics industry. Because electronics so frequently overlaps into the ordinary radio business and is hardly distinguishable one hardly appreciates that there is a difference between radio and electronics. There is a difference, and the part radio Service Dealers can play in the pure electronics field is by no means a small one—if we play our cards properly.

Let's theorize a bit. Radio Service-Dealers know there are about 45 million homes in which there might be as many as 100 million radios of all types eventually. All of these radios are (1st) potential sales and (2nd) later potential service jobs. Then there are several thousand industrial radio applications, such as Taxi, Trucking or Utility communications, or private plane or pleasure craft radio uses. Ah! The field is broadening. Eventually it will be a big one, so big that present-day radio sales and servicing figures of a Billion Dollar-a-Year business will look small by comparison.

In-so-far as pure electronics is concerned, let's give it some thought. Take one simple example . . . the electronic blanket. Here is a typical new electronic item for average home use that by its very nature becomes a "natural" for the radio Service-Dealer. The electronic blanket uses a simple radio circuit and a couple of radio tubes that actuate a relay which in turn directs a thermostat in its job of keeping the electronic blanket at the owner's wanted temperature. It is estimated that this year over a million electronic blankets will be in use, and eventually many millions will be commonplace. Radio Service-Dealers should know how to repair electronic blankets, but do they? They should be the ones to get the tube replacement business which will eventually amount to millions of dollars annually. Will they?

RADIO SERVICE DEALER is now contacting manufacturers of electronic equipment. We will soon start to publish schematics of their circuits, give you trouble-shooting hints and servicing short-cuts. We hope to enable Service-Dealers to handle electronic equipment sales and servicing, opening a new vista which will be nice, clean and profitable.

S. R. Lowan
Publisher

SYLVANIA NEWS

RADIO SERVICE EDITION

NOV. Prepared by SYLVANIA ELECTRIC PRODUCTS INC., Emporium, Pa. 1946

FREE, AT YOUR SYLVANIA DISTRIBUTOR'S: VALUABLE BUSINESS AND TECHNICAL AIDS

**SYLVANIA
SERVICEMAN
SERVICE**

by
FRANK FAX



In case you haven't already taken advantage of the opportunity, Sylvania has a lot of valuable helps for the radio repairman that are *absolutely free*.

They include attractive, customer-catching window displays, interesting booklets on radio care to give to your customers, service hints and many useful technical charts and booklets.

GIVE-AWAYS

Now is the time to dress up your windows and invite new customers into the store. Inside, have the complete line of Sylvania tubes to satisfy your customers, the usual snappy service and a pamphlet or two to give away — as a reminder to stop in again.

Every item shown at the right is free (there are many others, some at a nominal charge). Just call on your local Sylvania distributor for your supply, or write to me at Sylvania Electric, Emporium, Pa. And *remember* — to carry the customer's goodwill, carry Sylvania tubes!



BASE CHART
Types and base views of Sylvania tubes

FOLDER-TAG
On radio cleaning

What is wrong with your RADIO

"HELPFUL HINTS" BOOKLETS FOR RADIO SERVICING

WINDOW DISPLAY

COLOR CODE CHART

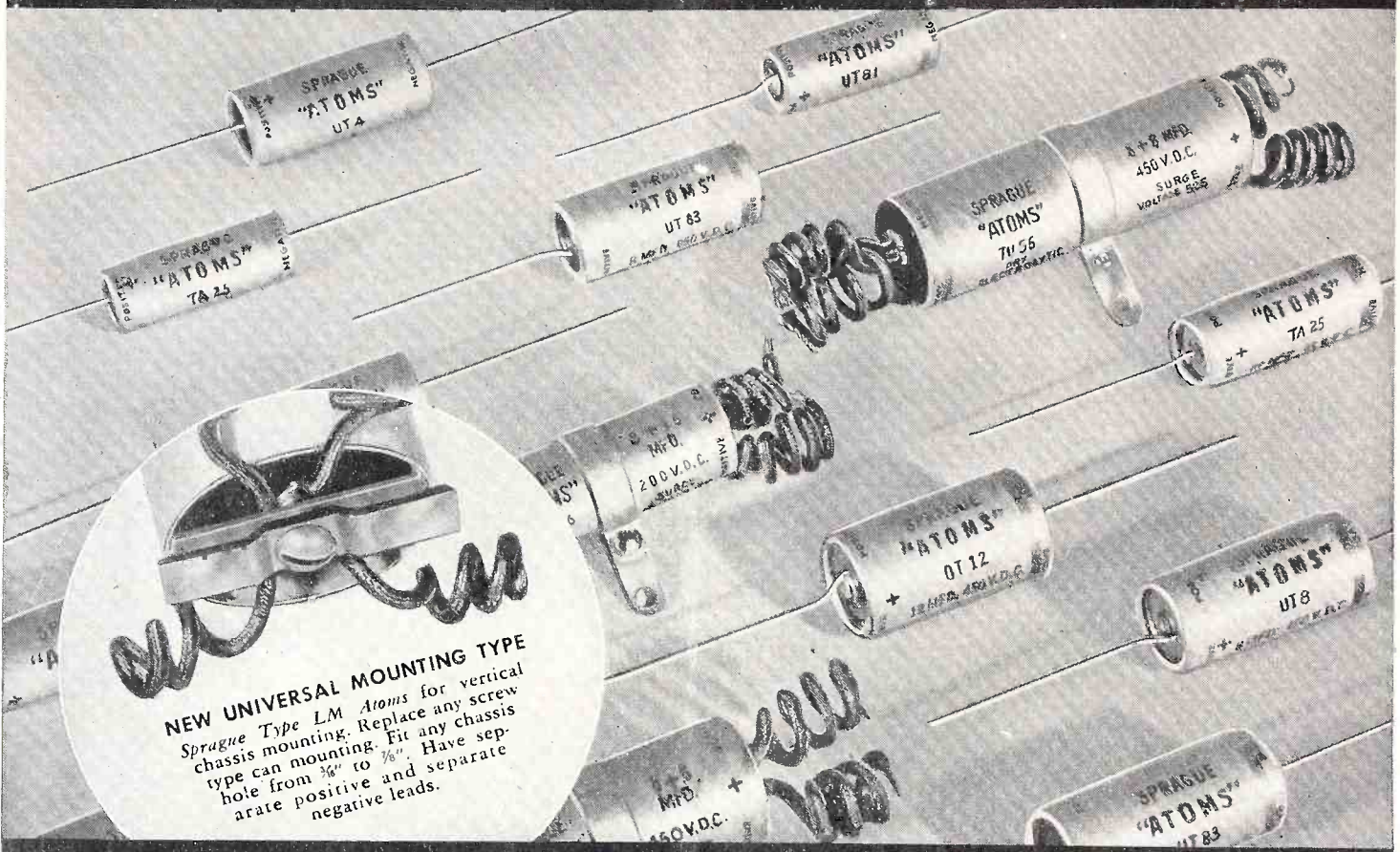
CHARACTERISTICS CHART
Characteristics of Sylvania tubes and panel lamps, with tube base views

SYLVANIA ELECTRIC

Emporium, Pa.

MAKERS OF RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS

REPLACE CAPACITORS Faster... Better... at Less Cost



NEW UNIVERSAL MOUNTING TYPE
 Sprague Type LM *Atoms* for vertical chassis mounting. Replace any screw type can mounting. Fit any chassis hole from $\frac{3}{16}$ " to $\frac{1}{8}$ ". Have separate positive and separate negative leads.

with **SPRAGUE ATOMS**



NEW CATALOG—JUST OUT!
 The finest, most complete and most helpful Sprague catalog ever issued! Contains complete details, dimensions, data, etc. on Sprague Capacitors and *Koolohm Resistors for every service, amateur and experimental need.
 *Trademark Reg. U. S. Pat. Off.

SEE US AT BOOTH 132—CHICAGO SHOW!

- Use them universally for ALL dry electrolytic replacements.
- A small supply equips you for ANY job—any voltage, capacity or capacity combination.
- Order them by name—be sure of getting genuine, factory-fresh Sprague Atoms—the kind that will not let you down.

SPRAGUE PRODUCTS COMPANY
 North Adams, Mass.

JOBGING DISTRIBUTING ORGANIZATION FOR PRODUCTS OF THE SPRAGUE ELECTRIC CO.



Get these colorful displays
to help you sell **MORE**
RCA Radio Batteries



TO HELP YOU PROFIT more from RCA Preferred Type Radio Batteries and increase your store traffic, RCA has designed this attention-compelling group of sales aids for counter and window display. Each sells RCA Radio Batteries . . . each serves to remind your customers when fresh batteries are needed.

Remember—your customers naturally look to RCA for the best in radio products.

That's why it's important to let them know you have RCA Preferred Type Radio Batteries in stock. So, get these eye-catching displays today from your RCA Distributor and capitalize more fully on the fast moving line of RCA Batteries.

RCA BATTERIES
are **RADIO ENGINEERED**
for Extra Listening Hours.

Listen to "THE RCA SHOW,"
Sundays, 2:00 P.M., EST,
NBC Network.



TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.

In & Around the Trade

Being a condensed digest of production, distribution and merchandising activities in the radio and appliance trade.



Brigadier General Calvert H. Arnold, Chief, Signal Corps Procurement and Distribution Service, presented a Certificate of Appreciation to P. V. Galvin for the outstanding and dependable service rendered by Galvin Mfg. Corp. to the Signal Corps during World War II.



Sylvania sales promotion men gather at Emporium, Pa. to discuss new test equipment for radio service men. Left to right: R. W. Andrews; C. C. Isham; J. T. Mallen; S. J. McDonald; H. G. Kronenwetter; John Hauser; R. F. Henderson; H. C. L. Johnson; H. H. Rainier; G. R. Wannan; R. P. Almy. Equipment, left to right: Polymeter; Modulation Meter; Electronic Tube Tester.

NATIONAL RADIO WEEK

Dealers will get merchandise and special show-windowing setups for display during national radio week, November 24 to 30 inclusive. The Radio Manufacturers Association announces that over 30 thousand radio dealers will participate. Posters for display by dealers are being prepared by the association advertising committee calling attention to the new radio sets which many manufacturers will have ready to show during the week. These will include AM-FM sets, with television receivers in locations where tele-broadcasts are programmed.

Participating in the celebration of national radio week are the National Music Merchants Association, National Electrical Retailers Association; also the National Retail Furniture Association and the National Retail Dry Goods Association. The member stores of these associations will also display the posters and some of the radio set merchandise made available to regular radio dealers for the occasion.

Tube Prices Higher

Ceilings on receiver tubes are stepped up another 14 per cent. This brings the total increase to 36.8 per cent over the base price established as a point of departure by OPA. The new price level affects also tubes used for p.a. and intercom. systems, hearing aids and audio amplifiers. The above percent increase applies to tubes for resale, including sales to manufacturers.

The increase announced today is the result of a survey of the radio tube industry made by OPA. The reports examined cover more than 90 per cent of the industry's total production. Analysis of the reports shows that labor increases and material increases in the industry have further increased the costs of manufacture of tubes. In addition, OPA is allowing as a profit margin the rate of profit earned by the industry on sales of tubes during the years 1936-39. This is less than the rate earned on over-all net worth during the base period.

The increases announced in May were computed to allow for recovery of total costs without inclusion of any profit factor. The survey just completed clearly demonstrates that the over-all earnings position of the seven companies comprising the industry are below that for the years 1936-39. Under these circumstances some profit margin was deemed requisite and a profit margin of 4.54 per cent on sales of tubes has been allowed.

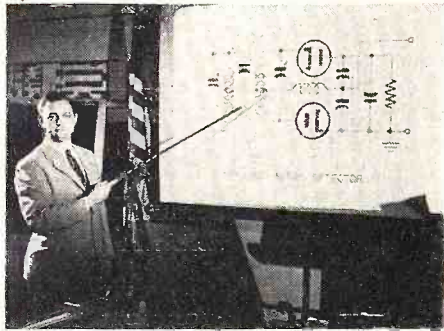
Sonora News

The absorption of Reko-Plastik, Inc., by Sonora Radio & Television Corp., was announced today (Monday, October 14) by Joseph Gerl, president.

Reko-Plastik, Inc., a Connecticut corporation, with plants in Meriden, Connecticut, manufactures phonograph records, and hereafter will be operated as the Reko Plastic Division of Sonora Radio & Television Corp.

Decontrolled

Removal from price control on acoustically amplified photographs is announced by OPA. (Electrically amplified phonographs and wired or wireless record players remain under ceilings).



Don Kresge shows service class diagram of improved ratio detector.

Coast-to-Coast Service Schools

Bendix Radio Division of Bendix Aviation Corporation opened the first of its three three-day service schools on October 21, at its factory in Baltimore. According to D. H. Kresge, service manager for radio and television, similar schools will be held in St. Louis starting on November 4 and in San Francisco on November 13.

The schools will be attended by distributor organization service managers and key service personnel. Activities will include the latest techniques in both the business management of service operations and the actual repair of standard radio and radio-phonographs. The course will also serve as an introduction to television.

Latest visual training aids including those developed by the armed forces during the war will be employed by Kresge and his staff to cover their ambitious program. Assisting him will be radio field engineers John Zapffe, and H. D. Rundell and staff engineer L. F. Graffis.

Philco Television Plans

Philco Corporation will present its postwar black-and-white television receivers to its distributors and dealers at the forthcoming midwinter convention. A complete line of receivers will be offered including both table and console models, and direct-view and projection sets.

The company plans to be in large-scale production of television sets early in 1947 in its new \$2,250,000 plant, which (See page 10)



Get these helpful books FOR CHRISTMAS.. Give them to friends FOR CHRISTMAS

Some friend or relative is wondering what on earth to get YOU for Christmas this year! Why not drop a hint that nothing would please you more than a Ghirardi money-making radio book? Or, if you're buying for a radio-inclined friend, why not give him one or both of these helpful volumes? They're Christmas gifts that will be long remembered—because they'll prove helpful every working day!

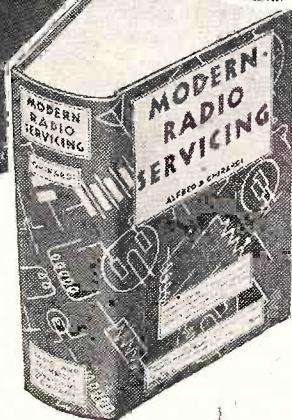
Ghirardi's big book that helps you FIX 2 RADIOS IN THE TIME NORMALLY REQUIRED FOR 1

A. A. Ghirardi's 744-page, manual-size RADIO TROUBLESHOOTER'S HANDBOOK is a service short cut that really works. Pays for itself first time you use it. Saves time on four service jobs out of five. Eliminates needless testing. Ideal for training new helpers. When a receiver comes in for repairs, turn to the 404-page Case History Section. Look up the notes on that model. Four times out of five you'll find exactly what the trouble is likely to be, how to diagnose it, and EXACTLY how to repair it. Every radio has its "weak spots" that give trouble first. The Handbook lists them all—helps you discover the trouble—then repair it in HALF THE USUAL TIME!

Hundreds of additional pages are devoted to i-f alignment peaks; transformer troubles; tube data; and literally dozens of charts, graphs, diagrams, and service data to help you repair ANY RADIO EVER MADE better and twice as fast!

A. A. GHIRARDI
Radio's foremost
servicing author-
ity and most
widely read mag-
azine and book
author.

Book weighs 4½ lbs. Not a study book. Just refer to it as you need it. Everything is fully indexed. Only \$5 complete. 5-DAY MONEY-BACK GUARANTEE. See special combination offer in coupon.



Let this Ghirardi book help you BRUSH UP ON MODERN SERVICE METHODS Test Instruments—Troubleshooting—Repair

Know how to make preliminary trouble checks on complicated jobs? Know how to analyze ANY circuit and its components quickly and scientifically? Know exactly where, when and how to use all types of test instruments and how to interpret their readings to track down the trouble? Only by truly professional training of this sort can you qualify for the big-money work—and especially on the complicated new F-M and Television receivers! Ghirardi's 1300-page MODERN RADIO SERVICING is the answer. This big book brings you up to date on modern methods, refreshes you on any type of difficult work, speeds up your handling of all types of Radio-Electronic repair. Only \$5—on our 5-DAY MONEY-BACK GUARANTEE OFFER. See special combination offer in coupon.

COVERS EVERY CONCEIVABLE SERVICE SUBJECT

MODERN RADIO SERVICING explains the circuits and operation of all types of essential service instruments; How and When to Use Them; How to Build Your Own; Preliminary Trouble Checks; Troubleshooting by Modern Professional Methods; Repairs; Tracing Obscure Radio Troubles; Aligning and Neutralizing; Auto and Marine Radios; Interference Reduction; AVC and QAVC Circuits, etc.; etc. The ideal "brush up" course for service men!

5-DAY MONEY-BACK GUARANTEE

- Dept. RSD-116, Murray Hill Books, Inc., 232 Madison Ave., New York 16, N. Y.
- Enclosed find \$..... for books checked; or send C.O.D. (in U.S.A. only) for this amount plus postage. In either event, if not fully satisfied, I may return the books within 5 days and have my money refunded.
- Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK, \$5 (\$5.50 foreign).
- Ghirardi's MODERN RADIO SERVICING, \$5 (\$5.50 foreign).
- MONEY-SAVING COMBINATION CHRISTMAS OFFER—Both of the above big books for only \$9.50 for the two (\$10.50 foreign)

Name

Address

City & Dist. No. State

See SPECIAL COMBINATION OFFER in Coupon!



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



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

IN TRADE

(From page 9)

covers an entire city block adjoining its radio production and research facilities in Philadelphia.

New Shure Catalogs

In the Shure 1946-47 catalogs emphasis has been placed on readability and imparting detailed information on applications, technical data, construction, design, etc. Catalog 155 illustrates microphones. It features an objective article, "How to Select the Proper Microphone," covering requirements, types, polar response, characteristics, and frequency response.

Catalog 156 shows the "Glider" crystal phonograph pickups and lever-type cartridges. It also features an objective article, "Facts You Should Know About Pickups," discussing needle-point compliance, tracking angle, tone arm mass, voltage sensitivity, type of needle, amplifier input circuits, and surface noise.

Olson's New Catalog

Olson Radio Warehouse, 73 East Mill Street, Akron, Ohio, have issued a new catalog. Every item is in stock as of the time of publication. Page 1 calls to the attention of the serviceman that it is not necessary to send any money when ordering. No deposits, no remittances are required. All orders received are shipped COD, and it is only necessary to pay the post office or the express company for the amount of the goods plus the usual carrying and COD charges.

The catalog lists microphones, amplifiers, fluorescent fixtures, and all of the popular radio parts. A copy will be sent any serviceman who will write in for it.

Oscillograph Manual

Though pertaining specifically to Du Mont Type 274 Oscillograph and serving as instructions, the "Operating and Maintenance Manual," issued by Allen B. Du Mont Laboratories, Inc., Passaic, N. J., contains much general data of interest to others. The 8½ x 11" manual contains 39 pages of solid information, plus a folded chart of the circuit schematic and constants of the popular-priced oscillograph. Several pages are devoted to the theory of operation of the cathode-ray tube and oscillograph circuits, with illustrations and diagrams. The operating instructions deal with the alignment of AM and FM receivers, and the use of the oscillograph in conjunction with radio transmitters. So great is the demand for this manual that it is being offered separately at 50c per copy, or \$5 per dozen copies postpaid in the U.S.A. only.

(See page 12)

BELL BAND-MASTER . . . New Leader in SOUND



MODEL
PA-3710-P

Low-Cost 10-Watt Portable Sound Unit

● Amplifier-phono unit and two 10" heavy-duty speaker housings with auxiliary equipment fit snugly into one compact, easy-to-carry Bell BAND-MASTER unit and provide sound coverage of any medium-sized auditorium for public address, recordings, or "live" music. Reversible amplifier base, at right, protects the phono turntable. The Bell BAND-MASTER Model PA-3710-P puts top quality and value into the low-price field.

For wider choice and bigger profits, sell the complete line of Bell permanent and portable sound systems. Ask your nearby Bell distributor for full details.

- Self-Contained 12" Phono Unit
- 3 Inputs—Phono, Mike, Instrument
- Beam-Power Output Tubes
- Inverse Feedback Stabilizer
- Quality Tone and Fidelity



BELL SOUND SYSTEMS, INC.
 1202 ESSEX AVENUE COLUMBUS 3, OHIO
 Export Office: 4900 Euclid Ave., Cleveland 3, Ohio



Type 403D2625

by installing Federal's Miniature Selenium Rectifier—in AC-DC home radio receivers to replace rectifier tubes

HERE'S A REAL OPPORTUNITY for the progressive service man — a chance to make extra money and do a better job. For Federal's new, miniature Selenium Rectifier is more than just a substitute for a tube. It's the modern way to give old sets new performance — gives them instant starting without warmup, makes them run cooler, last longer—replaces 29 different rectifier tube types.

Only 1¼ x 1½ x 5/8 inches, it fits anywhere, with just a few simple soldered connections and minimum circuit changes. Once installed, it's in for the life of the set. It withstands overloads from defective electrolytic condensers, and is practically unbreakable.

This miniature Selenium Rectifier gives the same performance that has made Federal "Center-Contact" Selenium Rectifiers the standard of the industry.

***HERE'S HOW YOU CAN DO THE SAME**
 By installing Federal's Miniature Rectifier in place of a tube, you earn from \$1 to \$2 extra per set serviced. Ten sets a day gives you \$60 a week (or more) added profit.

Replaces these 29 different rectifier tubes:

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

FREE—eight page service bulletin telling how to install this rectifier in AC-DC radio sets. Miniature Selenium Rectifiers now available in standard packages of 12, with window poster and mailing pieces. Send check or money order for \$12.00* for 12 rectifiers in display carton and complete sales accessories. Write to Dept. F855.
*excludes State and City use and sales taxes



Federal Telephone and Radio Corporation

In Canada:—Federal Electric Manufacturing Company, Ltd., Montreal.
 Export Distributors:—International Standard Electric Corp. 67 Broad St., N.Y.C.



Newark 1,
 New Jersey



UNIMETER

This unit fulfills an extremely important need for general utility portable service equipment. It has wide range coverage for both a-c and d-c measurements of voltage, current measurements on d-c and the popular ranges on resistance.

The UM-3 is designed to clearly indicate all the functions which aid in the prevention of application of high voltages when preparing for current or resistance measurements.

Other G-E units for better servicing include: CRO-5A Oscilloscope, PM-17 Electronic Voltmeter, YYW-1 High Voltage Multiplier.

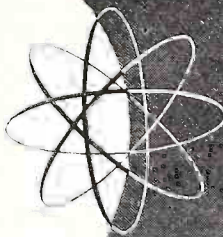
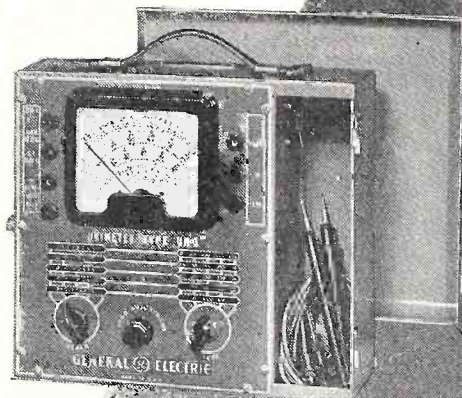
For details write:

General Electric Company,
Electronics Department, SRS-6411, Syracuse 1, New York.

Electronic Measuring Instruments

GENERAL ELECTRIC  **UM-3**

177-E3



IN TRADE

(From page 10)

Hoffman Convention

Annual convention for the distributors of the Hoffman Radio Corp., Los Angeles, was held Nov. 6, 7 and 8 at the Mayfair Hotel with opening speech by H. Leslie Hoffman, president. D. D. Spence, assistant sales manager, was to be monitor for round table conferences and discussions. Other listed speakers were R. J. McNeely, sales director; Walter D. Douglas, vice-president; Ray Yarcho, secretary-treasurer of the corporation; S. L. Spraggins, general plant supt. Max Manahan, director of engineering; D. E. Anderson, advertising-promotion manager; Francis Bauer, service dept. manager; Elmer Gertsch, special apparatus division manager and B. F. Fuller, surplus sales manager.

The program included luncheons at the Mayfair and at the Hoffman Commissary and dinners at the Mayfair and Bel-Air hotels. Final dinner and cocktail hour at the Bel-Air included preview of new Hoffman sets. All Hoffman distributors were represented, as well as the Hoffman Sales Corp., selling agent in the immediate Los Angeles and San Francisco territories.

Concord's New Catalog

Important news to every branch of the radio and electronics industries is the announcement of the first new, complete, 112 page post-war catalog of the Concord Radio Corporation of Chicago and Atlanta. The catalog offers Concord's new line of radio receiving sets and radio-phonograph combinations with many new war-born improvements and developments, in striking modern design cabinets.

An outstanding feature line of Multi-amp Add-A-Unit Amplifiers, offering many new improvements in design and performance. The Add-A-Unit feature provides any power step-up desired by simply plugging in additional inexpensive power units. This arrangement eliminates the need of adding costly cabinets and other equipment and enables a sound man to operate with 2 to 4 less amplifiers to cover the 30-90 watt range.

Also featured are tubes, meters, condensers, transformers, resistors, controls, switches, relays, generators, microphones, test equipment, tools, and amateur kits and supplies. The new catalog is ready now. A free copy may be obtained by writing Concord Radio Corp., 901 W. Jackson Boulevard, Chicago 7, Ill.

Scenic Catalog

Scenic Radio & Electronics Co., 53
(See page 39)

Automatic Combinations-NOW!

The New Arnold Shure Automatic Wired Record Player ready for immediate delivery

The Shure automatic record player connects easily to any radio. Its featherweight crystal pickup and quiet, smooth changer action assure high quality playing of ten 12" records or twelve 10" records. Every one of your customers can now own a fine automatic combination at a remarkably low cost.

Shure players are shipped complete with A.C. cord and shielded cable—only 2 wires to connect and it's ready to play.

Your price only **\$21.92 net.**

F.O.B. Chicago, Illinois

OPA Retail Price \$31.30 Zone 1

OPA Retail Price 33.87 Zone 2

Orders are now being accepted for immediate delivery—no waiting. Terms: 2% check with order. Or 25% deposit, balance express C.O.D.



PHONO AMPLIFIERS

1-Tube Phono. Amplifier.....	\$2.35 ea.
3-Tube Phono. Amplifier.....	4.50 ea.

PM SPEAKERS

4" Alnico (5) PM Speaker.....	\$1.39 ea.
5" Alnico (5) PM Speaker.....	1.49 ea.
6" Alnico (5) PM Speaker.....	1.89 ea.

TUBULAR ELECTROLYTICS

100-MFD-25 V...\$.22 ea.	10-MFD-450 V...\$.29 ea.
10-MFD-50 V... .22 ea.	16-MFD-450 V... .39 ea.
20-MFD-150 V... .22 ea.	10-10-MFD-450 V. .59 ea.
30-MFD-150 V... .29 ea.	20-20-MFD-150 V. .29 ea.
40-MFD-150 V... .39 ea.	30-20-MFD-150 V. .39 ea.
50-MFD-150 V... .45 ea.	40-30-MFD-150 V. .45 ea.
8-MFD-450 V... .25 ea.	50-30-MFD-150 V. .59 ea.

HOLLANDER RADIO SUPPLY CO.

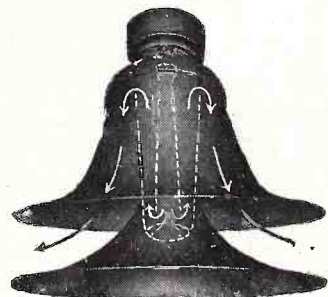
549 West Randolph Street Chicago 6, Illinois

RACON IS THE BEST IN SOUND EQUIPMENT

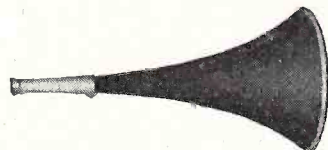


Leading Soundmen everywhere specify RACON Horns, Speakers and Driving Units when quoting on potential sound installation sales or rental contracts because RACONS deliver maximum output and response for size of driving unit used. There's a RACON sound reproducer for every conceivable purpose. Each affords more dependable and efficient service and they are competitively priced.

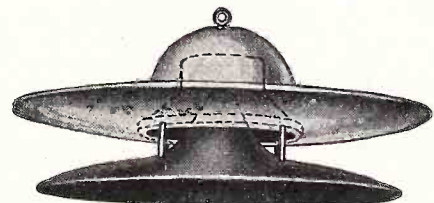
SEND FOR CATALOG
OF COMPLETE LINE



RADIAL HORN SPEAKER; a 3½' re-entrant type horn. Projects sound over 360° area. Storm-proof. Made of RACON Acoustic Material to prevent resonant effects.



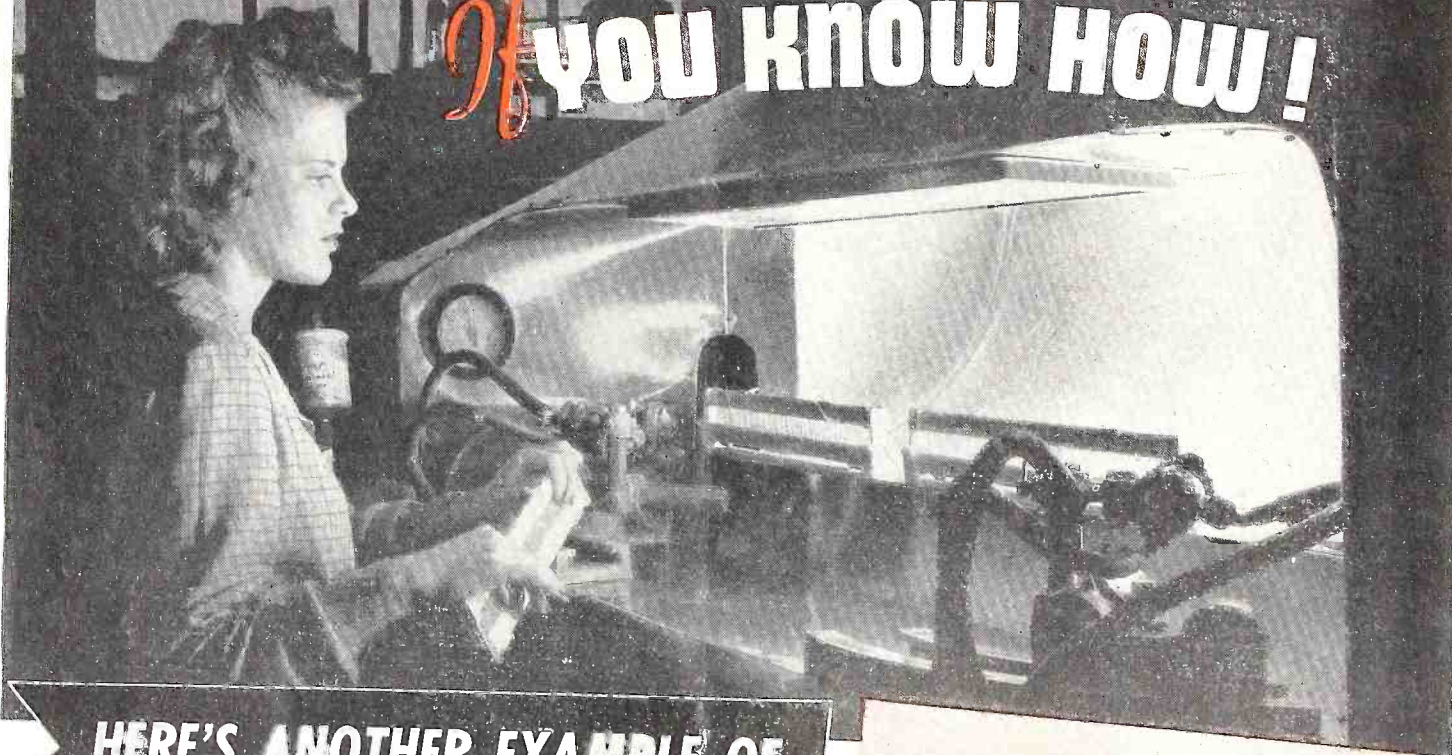
PAGING HORN; extremely efficient 2' trumpet speaker for use where highly concentrated sound is required to override high noise levels. Uses P.M. unit.



RADIAL CONE SPEAKER; projects sound over 360° area. Cone speaker driven. Will blend with ceiling architecture. RACON Acoustic Material prevents resonant effects.

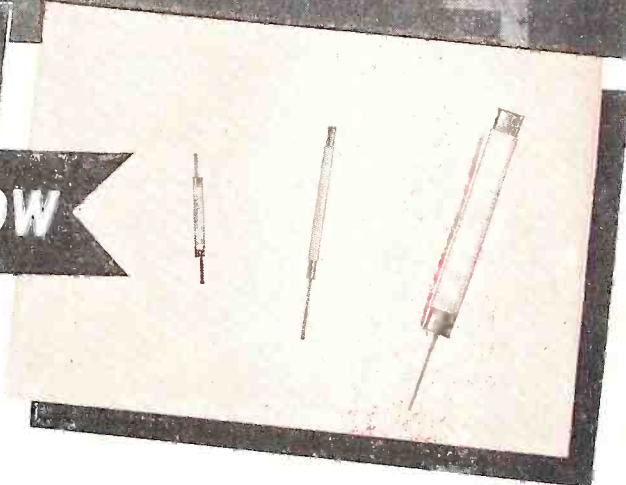
RACON ELECTRIC CO., INC. 52 EAST 19th ST. NEW YORK, N. Y.

MAKING TUBES IS EASY If YOU KNOW HOW!



HERE'S ANOTHER EXAMPLE OF

UNMATCHED HYTRON KNOW-HOW



A GAIN a painstaking, tough job is made easy. This Hytron electronically-controlled cathode-spray machine minimizes the element of human error always present with hand spraying. Evenly applied emissive coating of exactly the right weight and density is obtained hour after hour. Number and speed of coating passes, distance from spray guns to cathode sleeves, and intensity of the spray are precisely controlled.

An endless belt, with 8 racks each containing 40-100 bare cathode sleeves, travels before the two spray guns at 37-112 racks per minute. These guns are fired electronically only while racks appear before their nozzles. Each gun can be aimed through an arc of 0-45° to accommodate flat, oval, or round sleeves. Distance between gun and rack is finely adjustable. Number of passes is electronically controlled between 2 and 32.

An ingenious device automatically reverses—at each revolution of the endless belt—the side of a given rack exposed to the guns. A bank of infra-red lamps

dries each layer of coating immediately after its application.

Intensity and width of spray are regulated by pressure and nozzle adjustments. A continuously circulating system (instead of suction or gravity feed) maintains the coating fluid in the necessary state of suspension, and prevents clogging by coagulation.

Cathode coatings are held to such close tolerances that they must be measured by weight—on balances capable of reading .1 milligram. Yet this machine can apply accurately over 100,000 of such fine coatings daily. Another example of Hytron's mass production with precision—the Hytron know-how which gives you better tubes.



SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS



THE TELEVISION OPPORTUNITY

I. SERVICEMAN IS KEY TO TELEVISION ACCEPTANCE

by JOHN F. RIDER*

THERE is no technique in television receivers which is so complicated that it cannot be assimilated by the better grade of repairman intelligence. In fact, the goal of the design engineer must be such fabrication of equipment that it is foolproof and simple to repair. The latter condition has contributed much to the public response to conventional broadcasting. Just so long as the services of a highly trained engineer are required to make a television-receiver installation or to effect a repair—just so long will the popular acceptance be retarded. The ownership of a television set cannot be a restriction to free placement of the receiver to meet home needs or changes in location to meet family increase requirements.

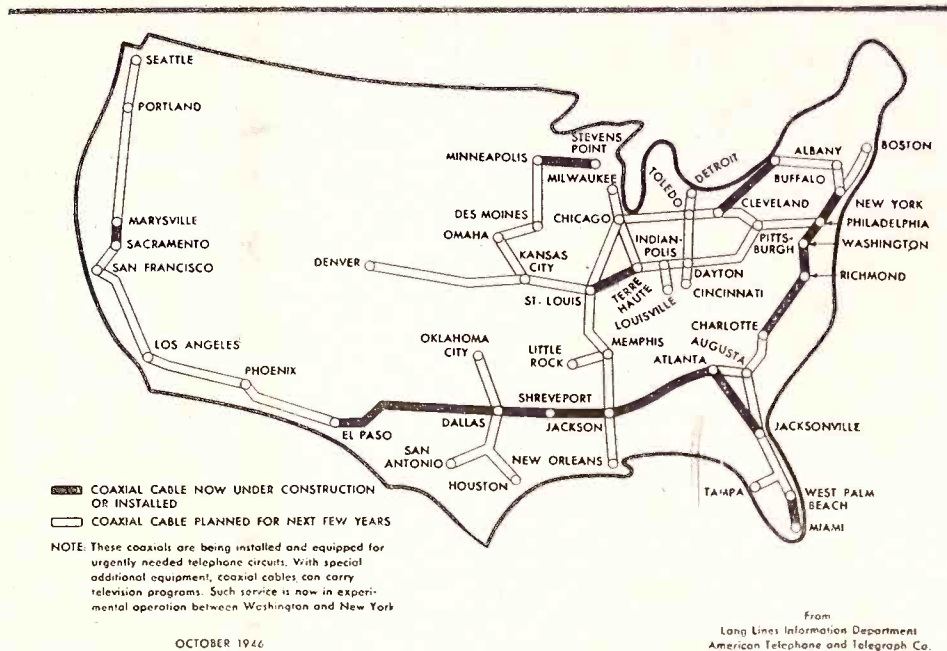
The greatest fault to be found with present maintenance planning by the equipment manufacturers is that a short-term requirement is being used for long-term planning. Even the service industry admits that factory participation is essential at the start — on the just grounds that ample familiarity with the technical requirements does not exist in the servicing ranks, the necessary equipment is not available, and last but by far not the least, that much information must be gathered for future use and possible simplification of the installation effort.

However, the repair industry does object violently—and rightly so — to any and all statements that the reason for factory participation is technical incompetency on the part of the service group. Any such statement or even an implication, is placing the entire industry in jeopardy—even in cities where the installation of television equipment is in the distant future. Bad news travels fast and in devious ways.

It is impossible to deny that the general technical level of the majority of personnel now engaged in radio-repairing activity is not on par with the level necessary to understand fully the operations involved in pre-installation surveys, the kind of equipment used for such work, and the circuitual structure of

(See page 29)

* Publisher, Rider's Manuals



OCTOBER 1946

Large quantities of receivers in the medium price bracket, which will develop an early mass market and audience, will be distributed and in the hands of the public by late 1946.

The FCC grants 28 permits for the construction of commercial television stations in 18 of the nation's top markets, serving 11,254,228 wired homes.

TELEVISION SERVICING AREAS ARE GROWING

Present commercial markets for television are New York, Chicago, Philadelphia, Schenectady and nearby cities. By the forepart of 1947, RCA television installations will be made in Washington, Los Angeles, Detroit, St. Louis, Minneapolis, Dallas-Ft. Worth and Baltimore. By mid-1947, more than 30 million people will be within the effective service range of television, forming a substantial base for the early rooting and development of the new industry. By early 1948, RCA expects to have installed other transmitters in Hartford, Providence, Trenton, San Francisco, Seattle, Los Angeles, Boston, Salt Lake City, Albuquerque, Cleveland, Miami, Omaha and Toledo.

Furthering television in its expansion across the country is the A.T.&T. which has already placed nearly 3,000 miles of coaxial cable in the ground, about half of which is now in telephone service. The lines now provide television and telephone service over coaxial cables linking New York, Philadelphia, Baltimore and Washington and telephone service linking Richmond, Greensboro, N. C. and Charlotte, N. C.; also Stevens Point, Wisc., and Minneapolis; Atlanta and Jacksonville and Shreveport, La., and Dallas. The company is already substantially expanding

its original 7,000-miles-by-1950 program.

Television gained tremendous impetus when the Louis-Conn fight, one of the first real tests of television's pulling power, was broadcast by NBC station WNBT and relayed to Washington, Philadelphia, and Schenectady. The C. J. Hooper survey reported that 141,375 persons saw the fight by television in homes alone. Thousands more saw the fight on receivers in public places. Gist of trade comment: Television was the winner of the Louis-Conn bout. Result: an accelerated interest on the part of the public for television receivers and a parallel interest on the part of broadcasters for studio and field equipment.

Today's television status is definite. Nothing can stop television now. This is apparent for two reasons: First: the public wants television; even those who have not yet seen it are eagerly awaiting the day when they can have it in their homes. The people want this complete home entertainment in their homes now. Second: all the elements making for television are ready—manufacturers, broadcasters, the FCC, consumers, network facilities, technical facilities, advertisers and industry.

Television is ready. Television is now underway as a great new American business.

Testing Phase Inversion CIRCUITS

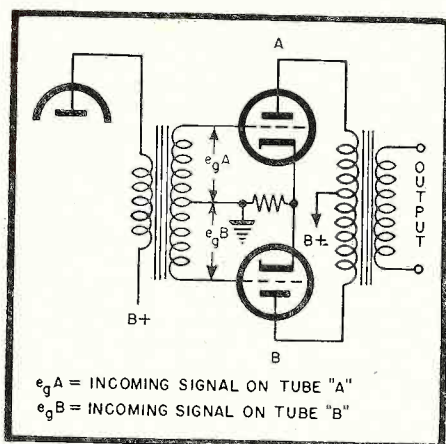


Figure 1.

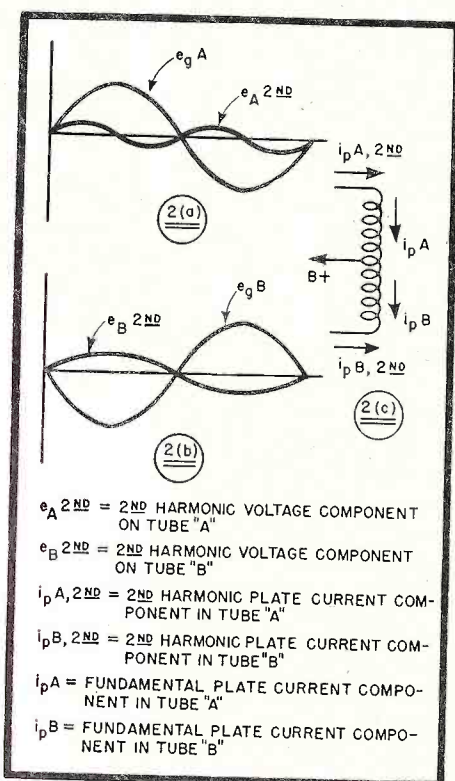
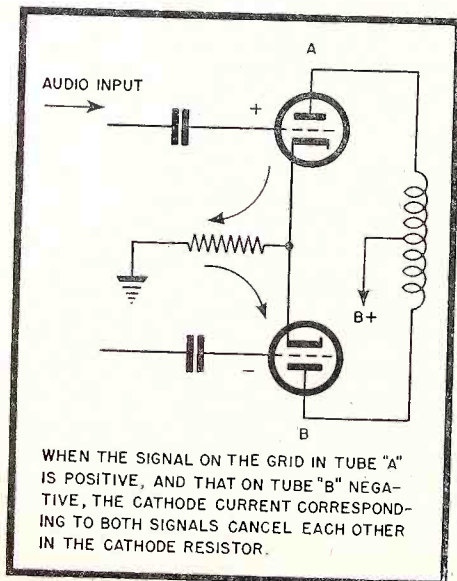


Figure 2.

Figure 3.



Measure Signal Magnitudes With High Resistance Voltmeter, Vacuum Tube Voltmeter or Oscilloscope

PHASE inversion is employed in almost all receivers using push-pull output stages, because of its low cost, small space requirements, and excellent fidelity response. Knowing the types of circuits used, and the methods of testing these circuits is a "must."

PUSH-PULL CIRCUITS

The necessary operating requirements of push-pull circuits are as follows:

1. The signal applied to the grids of the amplifier tubes must be of opposite polarity, or 180° out of phase with each other.
2. The signal applied to the grids of the amplifier tubes must be equal in magnitude.

One method of accomplishing these requirements is to connect a center-tapped audio frequency transformer between the input and output stages, as in Fig. 1. In any transformer, the top and bottom connections are 180° out of phase with each other. Also, if the number of turns in each winding is the same, the voltage developed across one winding will equal that of the other.

Push-pull operation virtually eliminates amplitude distortion caused by operation in the non-linear portion of the tube characteristic. The strongest component of distortion is the 2nd harmonic. Referring to Fig. 2, it will be observed that this type of distortion is cancelled in the following manner. The grid signals on tubes A and B and the second harmonic distortion components are illustrated in Figs. 2a and 2b. Note that the signal voltages are of opposite polarities, whereas the distortion components are in phase. The corresponding action in the primary of the output transformer is shown Fig. 2c. It will

be seen that the 2nd harmonic currents are in *opposite* directions in the transformer and therefore cancel each other. On the other hand, the signal currents are in the same direction and are additive.

You do not have to shunt the signal current flowing in the cathode circuit with a by-pass condenser. This will become apparent if we will recall that the respective plate currents of both tubes, and therefore the cathode currents, are of opposite polarity. For this reason whatever voltage variations occur across the cathode resistor due to the signal in one tube will be cancelled by action of the other tube, as shown in Fig. 3.

In addition to the reduction of 2nd harmonic distortion, and the elimination of cathode by-pass condensers afforded by the use of push-pull circuits, other advantages are to be gained. These are, higher output power per tube, reduced rectification hum, and more economical output transformer design. The latter is due to the cancellation of the D.C. magnetic component in the transformer core.

PHASE INVERTERS (4 Types)

A circuit which provides signals of opposite polarity to the grids of two tubes operating in push-pull, without recourse to an input transformer, is called a *phase inverter*. The tube effecting this phase inversion is called a *phase inverter tube*.

First Type

A simple phase inverter circuit utilizing a single tube is shown in Fig. 4. The method of obtaining phase inver-

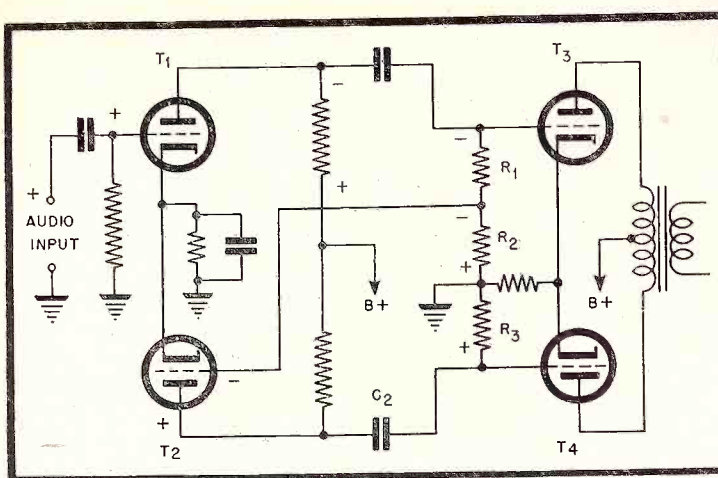


Figure 6.

sion in this circuit is shown by designating the instantaneous polarity of a signal as it progresses from the input to the output circuits. Thus, assuming that the signal is positive at the grid of tube T_1 , its polarity at the plate will be negative due to the phase reversal within the tube itself. At the grid of tube T_2 , its polarity remains minus, the condenser C_2 , because of its size, having little or no effect on the phase relations. Resistors R_1 and R_2 , which are equal in value, constitute the output load on the tube. The signal polarities on these resistors are marked accordingly. If we apply the signal voltage on R_2 to the grid of T_3 , the signal voltages on the grids of T_2 and T_3 will be of equal magnitude, and of opposite phase.

Fig. 5 illustrates a commercial application of this circuit. The output load of the 7A4 phase inverter tube consists of the plate and cathode 220,000 ohm resistors. This insures signals of equal amplitude on the grids of the 7C6 output tubes. The polarity of the signal on these grids is also of opposite sign, as can be checked by applying the procedure outlined in the previous paragraph to this circuit.

The bias voltage for the 7A4 tube is obtained by the contact potential developed across the 10 megohm resistor. It will be recalled that voltage feedback is present in this circuit because the signal across the 220,000 ohm cathode resistor effectively opposes the incoming signal, eg.

Second Type

A second type of phase-inverter circuit is shown in Fig. 6. Referring to the polarity designations shown in the figure, it will be seen that phase-inversion is obtained by virtue of the phase reversal in Tube T_2 , the output of which is fed into T_4 through the coupling condenser C_2 . The instantaneous signal polarity at the plate of T_1 is minus with respect to ground. Therefore, the signal at the grid of T_3 is also minus. At the junction of R_1 and R_2 ,

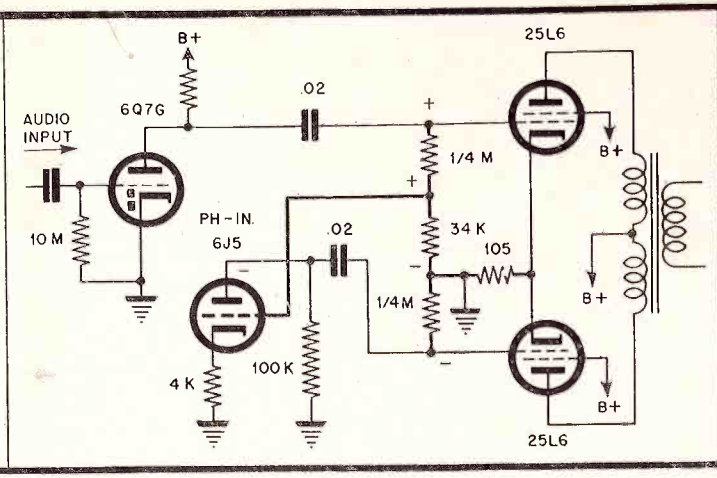


Figure 7.

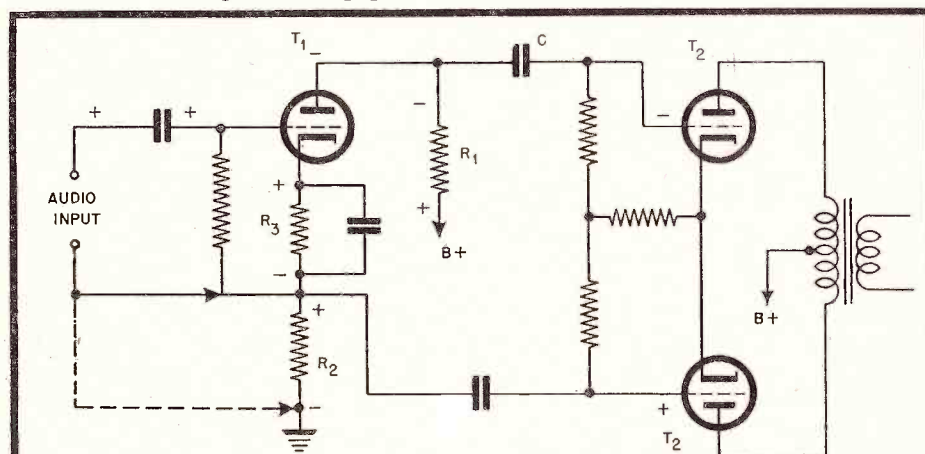
the signal is minus with respect to ground, and at this polarity is transferred to the grid of T_4 . The grids of T_3 and T_4 are therefore at opposite polarities. This meets the first requirement of phase-inverter circuits.

The magnitude relations at these grids are analyzed as follows. The signal voltage at the plate of T_1 is transferred to the grid of T_3 with little or no loss. It is also the voltage across the two resistors, R_1 and R_2 which are connected in series to ground. It will be recalled

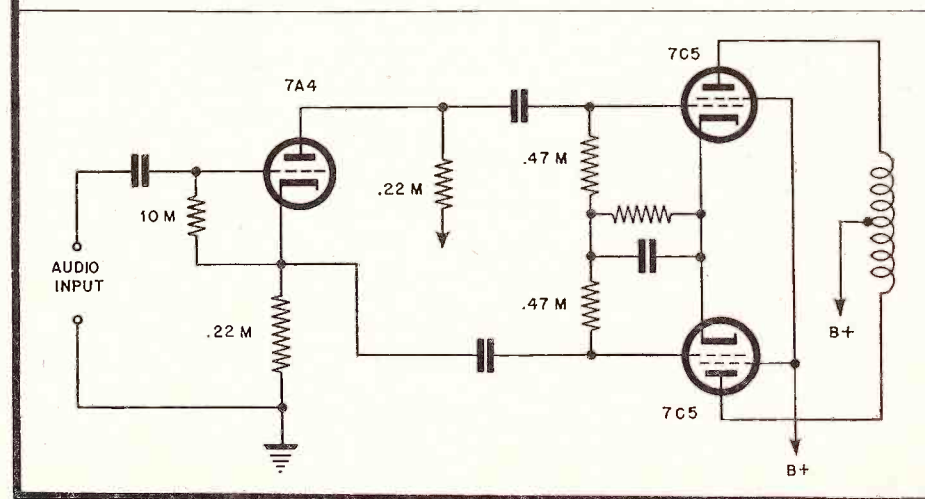
that the magnitude of the voltage applied to the grid of the phase-inverter tube should be such that corresponding signal voltages on the grids of the push-pull tubes should be equal in magnitude.

To explain further, suppose that the signal voltage across R_1 and R_2 is 20 volts. The voltage across R_2 should likewise be 20 volts. This is effected by amplifying the voltage drop across R_2 by phase-inverter tube V_2 . If the gain of the stage is 10, the voltage drop across R_2 must be 2 volts. Since the

Figure 4 (top portion). Figure 5 (bottom).



IF THE INPUT SIGNAL RETURN IS CONNECTED TO GROUND AS INDICATED BY THE DOTTED LINE, T_1 HAS A GAIN APPROACHING UNITY. THIS IS DUE TO THE DEGENERATIVE ACTION OF R_2 ON THE INCOMING SIGNAL. HOWEVER, THE INPUT SIGNAL RETURN IS NOW AT GROUND POTENTIAL, WHICH IS A DESIRABLE CONDITION. SEE FIG. 5. THIS DOES NOT AFFECT THE GRID BIAS ON T_1 , WHICH IS OBTAINED FROM THE VOLTAGE DROP ACROSS R_3 .



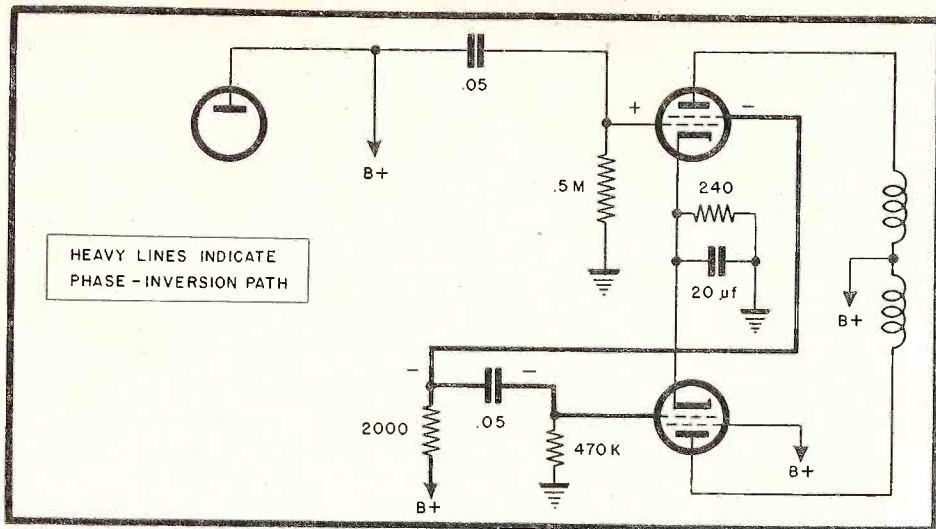


Figure 8.

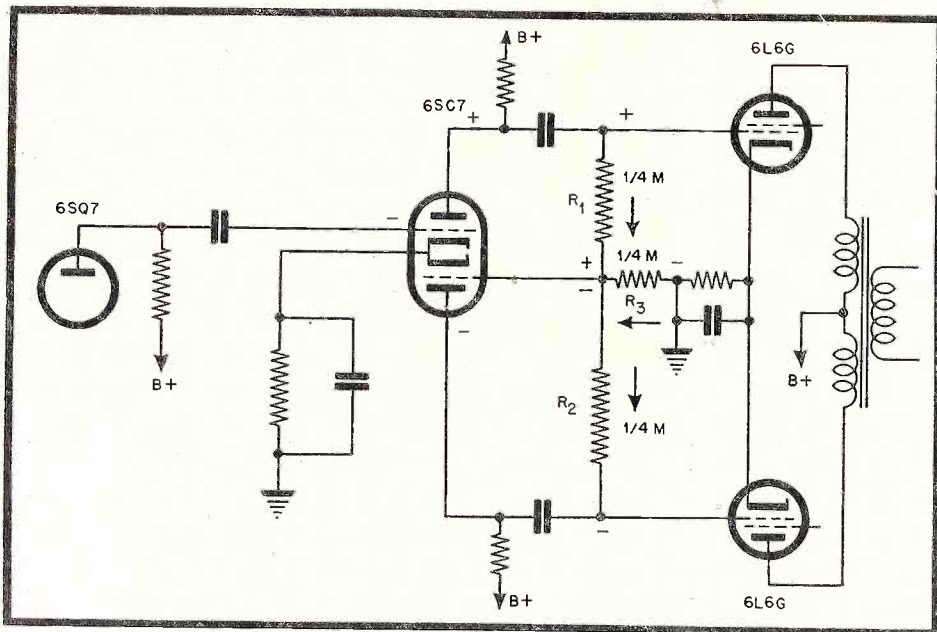


Figure 9.

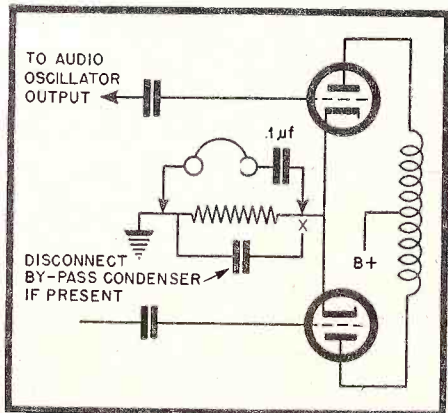


Figure 10.

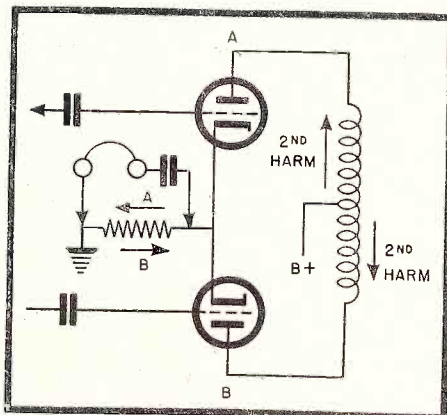


Figure 11.

voltage across $R_1 + R_2$ is 20 volts, the voltage across R_1 must be 18 volts. This corresponds to a resistance ratio between R_1 and R_2 of 18/2, or 9/1.

A convenient formula for the purpose of obtaining this ratio is:

$$R_2 = \frac{R_1 + R_2}{G}$$

Where G is the gain of the stage

containing the phase-inverter tube T_2 .

It is common practice to employ a twin triode tube for T_1 and T_2 . However, this is not always the case, as is illustrated in *Fig. 7*, which shows a commercial application of this circuit.

Third Type

Fig. 8 shows the commercial application of a third type of phase-inverter circuit. This is an interesting variation

in which phase-inversion takes place because of the phase change in the screen grid of the top 6F6. Just as on the plate, the signal on the screen grid is 180° out of phase with the signal on the control grid. Thus, referring to the figure, the signal on the grid of the top 6F6 is plus, making the signal on the unby-passed screen grid, minus. The end result is a minus signal on the control grid of the bottom 6F6. This satisfies the conditions for push-pull operation: e.g., the signals applied to the grids of both tubes are of opposite polarity.

The magnitude relations are such that the signal voltage across the 2000 ohm screen grid resistor is equal to the signal voltage across the grid load resistor of the top 6F6. The proper value of this resistor can be ascertained by measuring the relative magnitudes of the signals across both grids, and adjusting the value of this resistor until the magnitudes are equal.

Fourth Type

A fourth type of phase-inverter is shown in *Fig. 9*. The method of obtaining phase-inversion is readily apparent from a study of the circuit. Thus, assuming a signal of positive polarity at the top plate of the input tube, the signal at the grid of the top 6L6 will likewise be plus. Following the signal path to ground, we observe that at the junction of R_1 and R_3 , the signal is plus. This makes the grid of the bottom triode plus, and its corresponding plate minus. The signal on the grid of the bottom 6L6 becomes likewise, minus. Thus, the conditions for push-pull operation in this circuit are satisfied.

It is when we begin to analyze the magnitude relations in this circuit that we really appreciate its operation. Observe that the signal voltage drop across R_3 due to the signals on both grids are in opposite directions. Therefore, as far as the bottom and top triodes are concerned, their load resistors contain negative feedback, or degenerative signals. The symmetry of the circuit components insures equal signal magnitudes on the grids of the tubes, while the damping action due to the high degree of degeneration keeps the circuit well balanced whenever the circuit components vary slightly. This circuit is sometimes referred to as a "Floating Paraphase."

Types of Common Circuits

It will be found that more than 90% of commercial phase-inverter circuits are identical with, or vary slightly from, the four types discussed above. Circuit variations that do occur can be traced, in the main, to attempts at better cir-

cuit balance, frequency response, or the reduction of audio oscillation.

Measurements and Testing

The basic tests on phase-inverter circuits involves the measurements of signal magnitudes on the grids of the push-pull tubes, as well as checking their phase relationships. *Magnitude meas-*

urements can easily be made with a high resistance voltmeter, a vacuum tube voltmeter, or an oscilloscope.

The procedure is to apply a suitable signal from an audio oscillator to the input terminals of the audio amplifier, and to make signal voltage measurements directly on the push-pull grids or
(See page 38)

also outdated in styling.

You can give your customer a post-war, light-weight crystal phonograph pickup for as little as \$1.50 more in price to him than the installation of a replacement cartridge. For you it means simply taking out the old arm and putting in a new one. For the customer it means that:

1. You give him low needle pressure which reduces record wear and adds life to his records.

2. You offer him the convenience of permanent-point needles — eliminate the bother of changing needles after every play.

3. You give him more natural, life-like reproduction from improved post-war pickup design — not merely a replacement of the pre-war cartridge he once had.

4. You give him quiet playing — comparatively free from surface noise and scratch.

5. You return his phonograph with a beautiful new pickup, modernizing the appearance of his entire set.

After all, practically every post-war changer has a light-weight pickup; so do all the new phonographs. Why, then, change the old cartridge and still allow a heavy, old-fashioned pickup to remain in the set? Always change the arm! It's easier for you, more profitable for you, and better for your customer!

CHANGE THE TONE ARM

by J. A. BERMAN*

HERE'S a very simple suggestion on servicing phonographs. It will bring additional profits and make your customers happier.

A serviceman in Chicago told me he always suggests a new light-weight tone arm whenever a phonograph is brought to him for servicing. In doing so, he brings the old phonograph up to date, he sells a permanent-point needle, and adds new tone quality and beauty to the old machine. What's more — his customers have been enthusiastic about this extra service.

A large, modern record shop also reported an interesting experience. They replaced heavy pickups in their booths with new light-weight tone arms. Then they placed a card in each booth which read as follows:

“— Record Shop has installed new post-war, light-weight pickups throughout for your protection. Now there is no wear when you listen to the records you buy. They come to you new and lifelike in tone. Buy your records here and always be sure of first-play quality.

“You can have the same advantages on your phonograph. Ask at the counter.”

This store, too, has been successful in adding pickup profits to record sales, so the simple suggestion might easily be applied by you with more sales as the result.

First of all, the practice is made possible by the development of post-war, light-weight pickups, with output of 1½ to 2 volts — the same as the pre-war heavy arms. Until now, light-weight pickups only had output levels under 1 volt and could not be used to replace heavy pickups.

* Sales Manager, Shure Bros.

The disadvantages of heavy pickups are many:

1. The average needle force of the conventional pre-war phonograph pickup is very high — approximately 2 to 3 ounces.

2. This excess pressure results in high surface noise and noticeable wear of both the needle and the record.

3. It prohibits the use of a permanent-point needle — for its use with 3-ounce needle force would be damaging to both the record and the needle.

4. The conventional pre-war arm is

PROMOTION FOR RADIO SERVICE BUSINESS

Their new 1946, 7-piece window display for radio dealer and distributor use, has just been released by National Union Radio Corp. of Newark, New Jersey.

A new approach in point-of-sale radio service and product promotion is achieved by featuring a central theme of “Only Skilled Hands Touch The Radio We Repair For You.” The primary objective of the display is to capture customer confidence in the professional radio service man by tying in his skill and know-how with the use of quality service products.

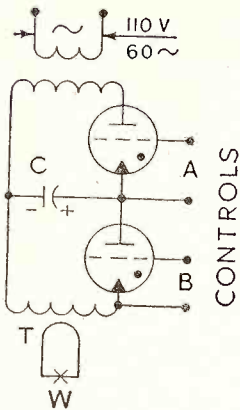
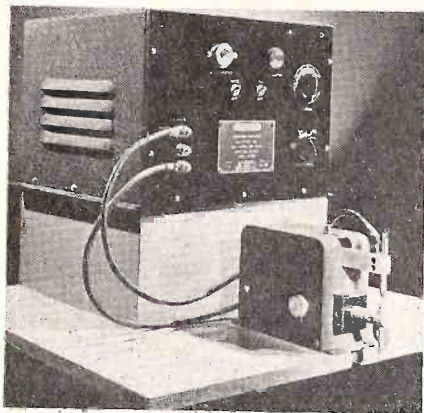
Specific company products are illustrated in detail on 6 separate small side cards featuring each product “in use.” The veil of mystery hitherto surrounding radio set repairing is thus lifted and further serves to instill public confidence in the serviceman.

The 7-piece display is varnished lithographed in 10 sparkling colors and supplied with individual ribbons to focus attention on the life size radio chassis illustrated in the large background display. The 6 small



side cards will be released from month to month in time for special promotion of any specific product, but the initial release will comprise a 3-piece set-up for immediate store display.

Available now at National Union Distributors throughout the country.



• The electrostatic energy in the capacitor "C," which has been charged to a selected voltage varying from 750 to 1000 volts by the rectifier tube "A" in approximately one second, is discharged in a small fraction of a second through the welding transformer "T" by tube "B" which acts as a switch. This sudden discharge generates a welding current of large magnitude at a low voltage to the electrode tips "W." This operation is analogous to the action of a fly-wheel in a punch press which stores kinetic energy by its rotation and then uses it in the punch or die by the release of the clutch mechanism.

Miniature Weld Power, Courtesy Raytheon Mfg. Co.

SERVICE MARKET in Industrial Electronics

Radio servicemen located in industrial sections have within their "service areas" an ever increasing field of repair and maintenance business in the expanding field of industrial electronics.

by OSCAR E. CARLSON

E.S.M.W.T. Instructor, Temple University

Article 5. (See October, November, December, 1945; February 1946)

IGNITRONS

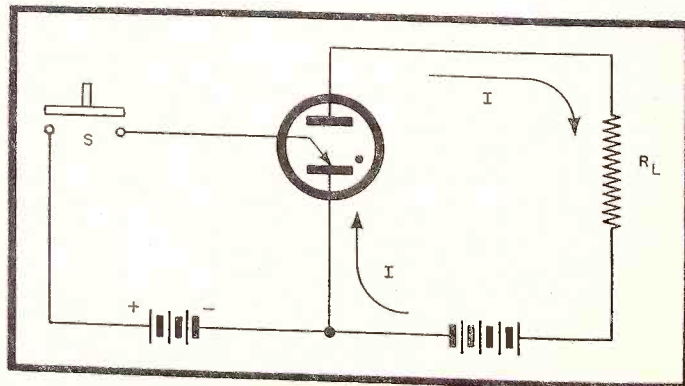
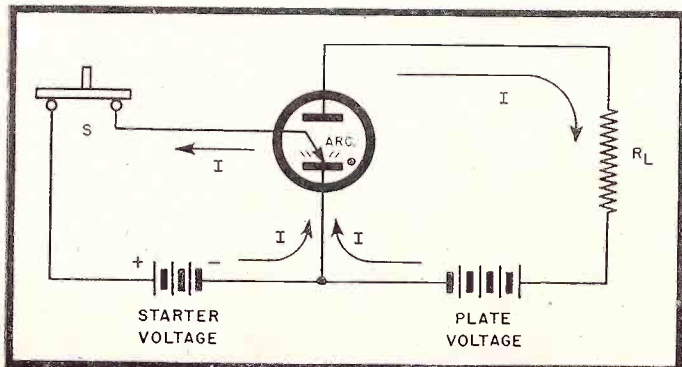
IN part 1 of this series the IGNITRON was mentioned as a special form of mercury pool rectifier. In any conventional type of electron tube rectifier the filament, or cathode, emission is a limiting factor in the available rectified power. The Ignitron was developed to give a tremendous in-

crease in the available electron flow from a rectifier cathode. This is accomplished by using a pool of mercury as the source of electron emission.

Fig. 1 illustrates the construction of and serves to clarify the operation of the ignitron. The mercury pool in this tube acts as the electron emitting cathode. Electrons flow from the cathode to the anode only after ionization takes

place in the mercury vapor between pool cathode and anode, or plate. This ionization is begun by producing an arc or spark at the surface of the mercury. A stationary electrode (the igniter of Fig. 1) produces this arc. The igniter is made of silicon carbide or other hard crystalline substance offering high resistance per unit of volume.

Figure 2-A (left). DC circuit showing how starting arc is initiated by positive potential across igniter and cathode. Figure 2-B (right). Same circuit, after ionization.



When the igniter is momentarily positive with respect to the cathode pool as seen in *Fig. 2A*, the resulting arc causes mercury vaporization and ionization. If the anode is positive with respect to the cathode, electrons will flow from the cathode to the plate even after the igniter has been turned off (*Fig. 2B*).

The igniter serves only to start the reaction. For d.c. circuits (as of *Fig. 2*) the plate current flow would be continuous after once starting.

With applied a.c. plate potential, the tube functions much as does the Thyatron discussed earlier in this series. As soon as the plate voltage drops below the ionization level, deionization occurs. On the negative plate voltage half cycle there is no plate current. The advantage of this "pool cathode" is its tremendous electron-emitting capabilities. Ignitrons may be built capable of handling thousands of amperes of current. *Fig. 3* shows the use of such a rectifier unit in conjunction with a Thyatron as the "firing rectifier".

The function of the Thyatron in series with starter electrode has a double function:

1. to suppress reversed current to the starter on negative plate voltage half cycles.
2. to interrupt the forward current to the starter immediately after the discharge in the Ignitron has been initiated.

The high arc drop in the Thyatron shortens the life of the inert gas filled Thyatron of this circuit. Therefore some high voltage circuits use two Thyatrons in series to replace the one in *Fig. 3*. This basic Ignitron rectifier circuit is half wave. It may be expanded to a full wave rectifier circuit using two Ignitrons and two Thyatrons (*Fig. 4*).

Resistance Welding

One of the major uses of the Ignitron comes in resistance welding. We shall therefore deal briefly with this subject to cover some facts not known to the service dealer.

Figure 3. Ignitron heavy duty rectifier with no control of firing (see text).

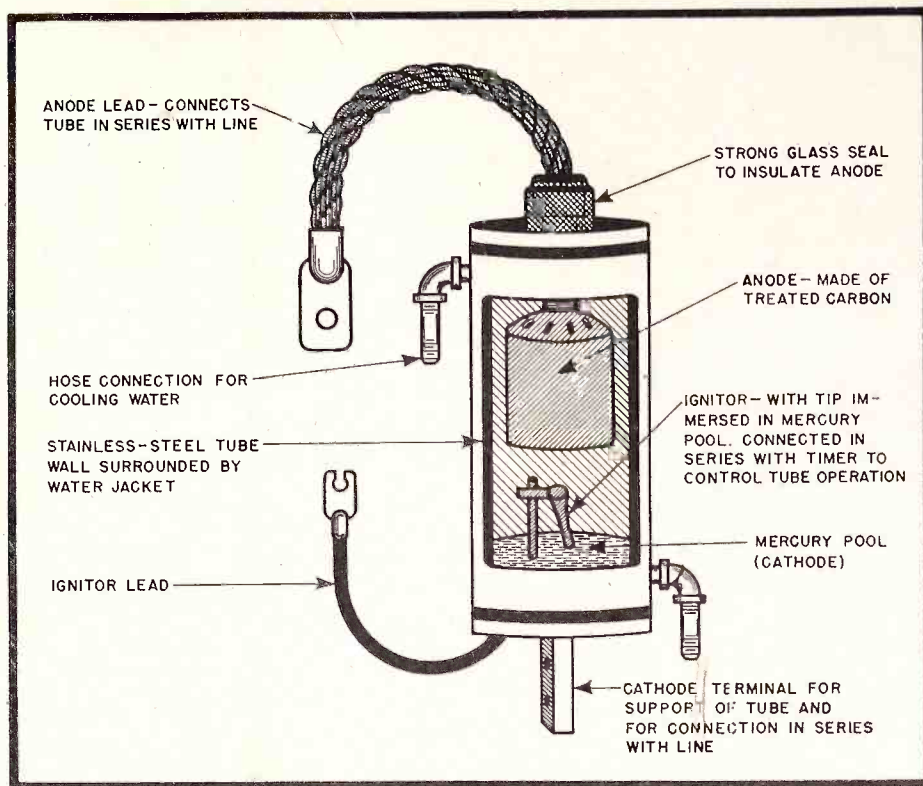
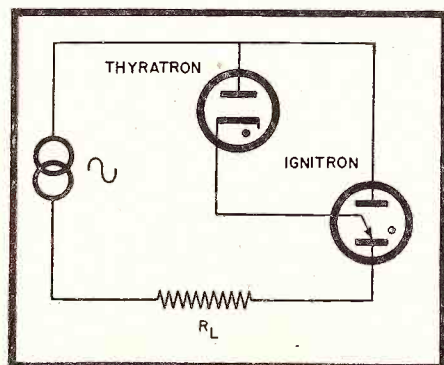


Figure 1. Cutaway construction view of an Ignitron Rectifier.

To make a resistance weld, the two materials to be joined are held in close contact and under pressure. The weld is made by passing a definite amount of current through the joint for a

definite period of time, causing the metals at the joint to soften and the grains to interlock. The final result is like a rivet in its mechanical properties.

VAST MARKET FOR ELECTRON TUBES IN INDUSTRY

by L. W. TEEGARDEN

Vice President in Charge of the Tube Division
Radio Corporation of America

THE modern "genii in a bottle" which we know as the electron tube has been mustered out of military service to resume, among other important peace-time jobs, a new career which may well become his greatest. He has come out of the war with his sleeves rolled up and both feet in the factory — a field in which he had scarcely begun to exercise his power and skills before war limited its expansion, but one in which, at the same time, war needs inspired new services.

The electron tube, after a quarter-century of service in the entertainment and communications field, is now ready to realize its full, vast potentialities as a toiler in peaceful commerce and industry.

When peace returned to the world, the electron tube industry was one of the few businesses which found itself in the fortunate position of having no major reconversion problems requiring modification of facilities.

Special-type tubes, particularly the phototube group, found many important military applications during the

war, and production and sales of such tubes rose to a peak 611 percent above their 1939 levels. Their potential field of peacetime applications is almost limitless, since electron tubes are now being made to perform all of the functions of the five senses and there is literally no industry which cannot employ electronic devices to advantage in its operations. For the immediate period we anticipate production and sales of special-type tubes at a rate about 105 percent in excess of prewar levels.

We believe that the prospect for immediate production, sales and employment in the electron tube industry compares very favorably with those of any other industry. As regards long-term prospects, we know of no industry having greater potentialities. There is literally no individual, no industry, no service, that is not a potential customer for electronic products or equipment, and therefore for electron tubes. The potential tube business is limited primarily by man's ingenuity in creating power necessary for its realization, rather than by technical considerations or want of ideas.

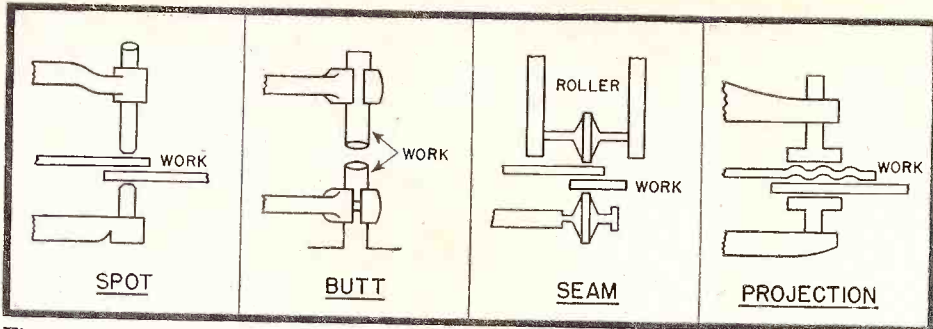


Figure 5 (above). The four principal methods of resistance welding. Figure 4 (below). Full wave heavy duty Ignitron rectifier circuit using two Ignitrons.

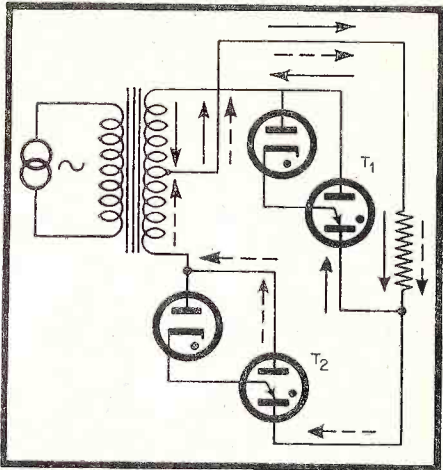


Figure 6 (below, top half): Simple resistance welding circuit.

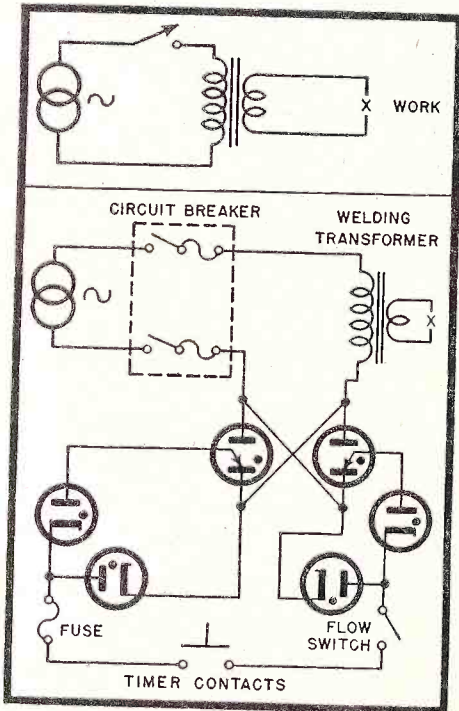
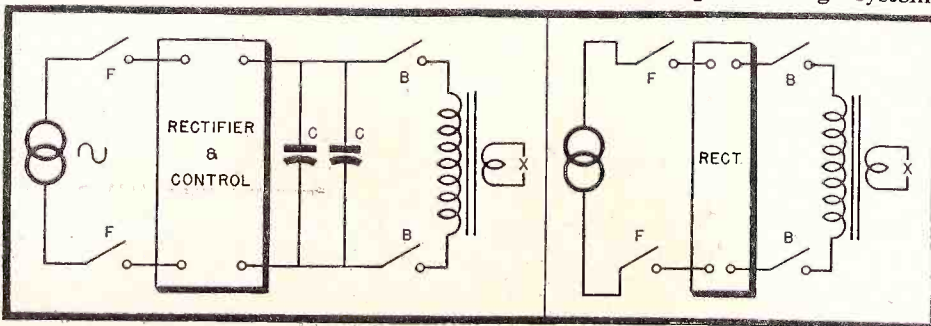


Figure 7 (above, bottom half): Reverse parallel connection of two Ignitron rectifiers for resistance welding. Figure 8 (left, below). Capacitor-type energy storage system; Figure 9 (right). Inductance storage welding system.



The four principal types of resistance welds are: Spot, Butt, Seam, Projection. See Fig. 5. Fig. 6 shows the simplest type of resistance welding circuit operating from an a.c. power line. Here the time of the operation is controlled by a manual switch and exact weld duplications for a series of welds is practically impossible.

Spot welding is the simplest, requiring three distinct operations:

1. setting electrodes on work and setting pressure. This is termed "squeeze time".
2. weld time (current flow time).
3. pressure maintained during cooling (hold time).

Time is specified in cycles of the supply voltage used for the welding operation. For a 60 cycle supply line a weld time of one half second would require that 30 complete cycles of the voltage be impressed across the work to be welded.

Fig. 7 shows two Ignitrons added to the circuit of Fig. 6 so that the Ignitrons carry the two halves of each cycle of the current flow for the welding transformer. Welding operations are timed with a relay circuit with adjustable delay which is placed at "timer contacts" in that figure. The theory of such circuit was discussed in part 4. (See February issue.)

The primary reason for the use of Ignitrons in the welding circuit is to act as readily controlled switching devices that control the a.c. flow through the welding transformer primary. The timing circuits and the Ignitron circuits serve merely as a method of

switching the a.c. line in time intervals not readily accomplished by mechanical switching. The control settings to allow such switchings prevent the need of an operator switching high current load circuits. This is accomplished in the Ignitrons. For full circuit details of actual commercial welding timers the reader is referred to the appended bibliography. For the theory of such circuits see part 4.

Energy Storage Welding

Another form of resistance welding makes use of energy storage capabilities of capacitors and inductors. This is Energy Storage Welding. For this we make use of the fact that energy may be stored slowly until a desired amount is accumulated and then released very quickly to do some work. If electrical energy is stored in a capacitor which is charged slowly from a low d.c. voltage source, much larger current values than the charging current may be released from storage at an accelerated discharge rate.

An a.c. operated resistance welding machine may require 1000 amperes for a time duration of 1/10th of a second. If we draw power from the line at the rate of 200 amperes per hour for a period of 1/2 second and store that energy we may release it in 1/10th of a second at a rate of 1000 amperes per hour. The line drain would then have been at the 200 ampere rate whereas the work operation was performed at the 1000 ampere rate.

Fig. 8 illustrates a simple system for capacitance storage resistance welding. Closing switch F allows capacitors to charge up slowly to the peak d.c. voltage value supplied by the rectifier and control circuits. Closing B opens F and the capacitor discharges through the transformer primary. The rate of discharge may be controlled by control of the voltage to which the capacitor is charged.

Fig. 9 illustrates Inductance Storage Welding. In this system the energy is stored in the primary inductance of a high primary inductance welding transformer. With the electrodes on the work, EE is closed and a current flows through the primary increasing until $I = E/R$. Opening EE causes this stored energy to be dissipated across the work which is the secondary load of the transformer.

Readers who wish to study this subject further are referred to: 1. Electronics—Coyne Electrical School; 2. Ignitron Contactors—General Electric Booklet GEA 3058C; 3. Fundamental of Electronic Controls for Resistance Welding—G.E. booklet GET 1170; 4. Resistance Welding—G.E. booklet GET 11890.

Below: Gus Larson (left) dealer sales representative, Walker-Jimieson, Inc., Chicago distributors of Sonora lines, congratulates dealer Byron E. Shaw, owner of new Brookfield, Ill., store. Thru W-J, dealer Shaw was able to secure hard-to-get items for radio and service departments.



COVER shows servicemen Ettinger and Buhrows at work in well-equipped downstairs radio service department (as above) plus pix of Mrs. Shaw (left on cover) in sales demonstration of new de-luxe Frigidaire range.

Dealer Shaw Opens Another Store

THE Brookfield Radio and Appliance Company's store at 8863 Ogden Avenue, Brookfield, Ill., is owned and operated by Byron E. Shaw. He is also proprietor of Downer's Radio and Appliance Store in nearby Downer's Grove, Illinois. The new shop promises to be an additional landmark in the suburban community.

Completely modern in both internal and external appearances, the store was planned and designed entirely by its owner. Lemon-colored walls and deep maroon floor tiling are used effectively to display the lines of nationally advertised radios and appliances. A large battery of overhead fluorescent lighting fixtures serves to flood the store with warm, friendly light.

Located on US route 34, the new structure attracts many passing motorists as well as residents of the community. Block-lettered neon signs above the show windows add to the exterior appearance at night, emphasizing the brilliantly illuminated showrooms within. The landscaped grounds surrounding the establishment offer an inviting view from the thoroughfare and flagstones placed directly in front of the display windows allow shoppers to linger without disturbing the lawns or the shrubbery. An unusual feature of the store's exterior design is the five-sided appearance (four sides contain display windows visible from the street.) A built-in garage facilitates shipping and receiving operations.



Above: Major appliances in open floor display; shelves hold displays of small radios at customer eye-level. Below: Front is visible from four directions.

Below: Record that made a record. Frank M. Folsom, executive vice president in charge of RCA-Victor (left) and J. W. Murray, vice president, record activities, admire the 1,000,000,000th phonograph record to be produced by RCA Victor since its inception in 1898.

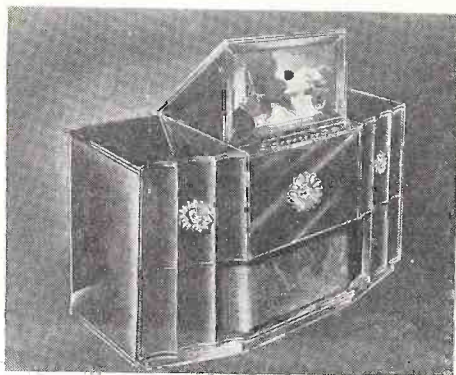


MERCHANDISE PRE-VIEWS-19



Crosley Model 106-CS radio-phonograph.

Crosley 106-CS radio-phono ("Carrollton") with master tone control and floating jewel tone system. Model was presented to Crosley production employee as door prize during a company picnic.



Above: Telecon de-luxe television console, to sell for \$2,640. Model below, same specifications, same price.



De-Luxe Tele-sets Appear

Telicon Corporation, New York, announce that they are producing a number of de-luxe television, radio FM and phono sets in time for Christmas trade. In letter to the editor, Television Engineer R. L. Snyder describes these sets (see photos) as follows: "They will be projection receivers exhibiting a picture of about 18" x 24"; push-button tuning, an AM-FM receiver, and a phonograph. The cabinets will be large and as carefully finished as a piano.

"Technically, the set will have a 14" Schmidt optical system using a 5" kine-

scope, operating at 27,000 volts. Miniature tubes will be used in the television chassis and in the AM-FM chassis except where larger tubes are required to provide sufficient dissipation.

"The television receiver will have ample sensitivity (50-100 micro-volts), wide range AVC, and a wide enough band to accept the full television band. The horizontal deflection circuit is equipped with AFC and direct synchronizing is applied to the vertical deflection. A separate RF power supply is used to provide the second anode potential for the kinescope. This system is used to insure good regulation. . . . Some time must elapse before complete specific information will be available. . . ."



Above: Phantom view, Farnsworth FV-200 table telereceiver; cased model below, in metal cabinet. (See text).

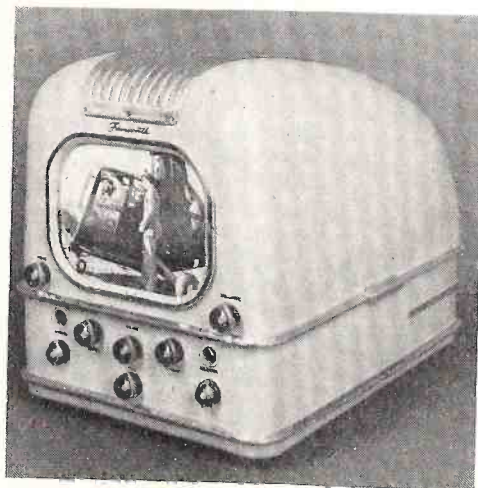


Table Model Metal Cabinet

The metal cabinet of the Farnsworth FV-200 table model television receiver is made of aluminum 1/16-inch thick. It is lighter than wood and is available in several colors.

Designed by David L. Evans, noted interior decorator and designer for the famous Capehart phonograph-radio line, the metal cabinet not only permits tonal

qualities equal to wood, but is highly desirable from an engineering standpoint. The aluminum, tear-drop shaped cabinet requires less ventilation, and also helps eliminate local oscillator radiation. By forming a complete shield around the chassis, the metal cabinet cuts out extraneous signals and prevents the local oscillator of one receiver from direct radiation of a signal strong enough to interfere with other television receivers nearby.

Like Farnsworth wood cabinets, it is designed for utmost safety and meets all underwriters' requirements. It has been thoroughly field tested in various sections of the country, with high standards of performance consistently maintained.

The metal cabinet is 14½ inches wide, 17 inches high at the front tapering to 11 inches high at the back, and 20 inches deep. A direct-view type providing a bright high-definition black and white picture, it has 22 tubes and a 10-inch semi-flat face viewing tube. It covers all commercial television channels in both the upper and lower groups, has an FM sound channel, and utilizes a dipole antenna.

This television receiver also can be used for standard broadcast reception by the addition of an AM adapter. Designed so that a radio serviceman can install it without removing the television chassis from the cabinet, the AM adapter fits inside the cabinet and requires no special tuning knobs or dial. AM tuning is handled with the "selector" control knob used to switch the receiver on for television. When the AM adapter is installed, it is adjusted for the tuning and reception of any five stations desired, and the call letters of these stations come into view on tabs in the "selector" eye as the control knob is rotated. Similar to the operation of push-button selectors on radios, an AM station is automatically tuned in on the television receiver as the corresponding call letters are selected. The retail price of the Farnsworth metal cabinet television receiver (and the model in wood) will be between \$250 and \$300, according to present plans. The price of the AM adapter will be about the same as that of a good standard broadcast table model.

Low-Boy Model

In addition to complete television sight and sound service, the Farnsworth low-boy combination console television receiver has standard broadcast reception and a phonograph with automatic record changer. The blonde wood cabinet is of modern design and is 33½



Farnsworth Low-Boy; record changer view.

inches high, 32¼ inches wide, and 21½ inches deep. The cabinet can be closed when not in use. The two top panels are of fold-back design, while the bottom panels are hinged doors.

The top left panel houses the automatic record changer, and the top right panel encompasses the television screen, which tilts at a slight angle to permit easy viewing from either a seated or standing position. A bottom section of the cabinet provides a large storage space for records. This receiver covers all commercial television channels in



Farnsworth Low-Boy; television panel.

both the upper and lower groups.

The automatic record changer is the newly-designed Farnsworth P-51, which

Farnsworth table tele-set; 10" tube.



plays twelve 10-inch or ten 12-inch records. It has a permanent Pfanstiehl needle and three shelves for suspension of records. A cut-off switch automatically shuts off the phonograph after the last record in a stack has been played.

Deluxe Model

The Farnsworth deluxe combination console television receiver incorporates facilities for television, FM and standard broadcast reception, and phonograph with automatic record changer. It covers all commercial television channels in the upper and lower groups, providing a direct-view high-definition black and white picture. A 10-tube (including rectifier) AM-FM receiver enables re-

ception of all standard and FM broadcasts.

The cabinet is covered with rich light-hued leather, and is divided into four panels. The top left panel houses the automatic record changer and all controls for AM-FM radio reception; the top right panel holds the television screen and controls; the bottom left panel is a large storage cabinet for records; and the bottom right panel houses an 8-inch and a 10-inch speaker. The four panel doors may be closed when the receiver is not in use.

All these features of the deluxe combination console television receiver are incorporated in a modernly-designed compact cabinet only 44 inches high, 33 inches wide, and 22 inches deep.

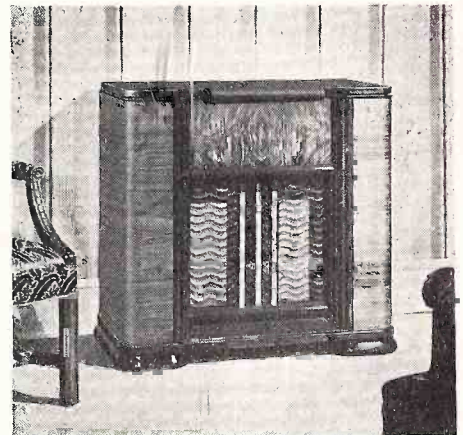


Bendix Model 747-A; AM-FM reception.

SEVEN NEW BENDIX RADIO RECEIVERS.

Model 747-A; AM and FM reception: 88-108 mc. FM; 540-1620 kc. AM. 4 x 6 Alnico V oval speaker; built-in FM Line-coupler antenna, plus built-in supersignal AM antenna. AC operator; 3 position tone control; underwriters' approved. Superhet circuits for AM and FM with 6 tubes and rectifier; blond walnut cabinet, lustre-brown control panel board.

Model 747-B, radio-phonograph with FM; 6 tubes and rectifier. Full FM band reception; full standard AM reception. 10-inch Alnico V speaker; built-in FM Dipole



Bendix Model 747-B combo, with FM.

antenna. Automatic record changer; featherweight tone arm, crystal pickup; long life needle of semi-precious alloy. Dual channel IF transformer. Walnut finish console cabinet. Underwriters' approved.

Model 667-A; table radio-phonograph; five tubes and selenium rectifier. Push-pull beam power pentode output; 6-inch Alnico V speaker; 2-position tone control; full vision slide rule dial. Automatic record changer, lighted compartment. AC operation. Underwriters' approved.

Model 687-A; 3-way portable in traveling case of plastic and leatherette. 110-

(See page 41)

RADIO RECEIVERS GO FREE

OPA took price controls off radios as of October 30th, under the formula that "the supply of table models including table radio-phonograph combinations and console sets exceeded or were in approximate balance in relation to demand." Comment on this event was made by R. C. Cosgrove, president, Radio Manufacturers Association:

"The public can be assured that the lifting of price controls from radio sets will not result in any general increase of prices to the consumer. The industry can now resume its normal, highly competitive pre-war practices under which radio prices steadily were reduced, with quality improved."

Small electrical appliances, such as non-automatic toasters, irons, hot plates, heating pads and electric shavers—were also decontrolled.

DON'T MISS THOSE "HIDDEN" PROFITS

by HAROLD J. ASHE

Part I.

"I MAKE my money in selling," said a successful dealer, and the first place I seek an opportunity to reinvest it is in my own business. Only after fully satisfying the needs of my business, and canvassing every possibility for using surplus funds to advantage and retaining, in addition, a comfortable margin for contingencies, do I look around for outside investment opportunities. I need hardly add that I rarely find it necessary to put any money to work outside of my business.

"On the street, at service clubs, in friends' homes, hardly a week goes by but what I hear discussions by businessmen about the rare opportunities that they are snapping up outside of their own businesses. Invariably these are the same businessmen who, in unguarded moments, reveal difficulties traceable to lack of working capital, even though they may not identify the real cause of their trouble."

In these few words this dealer has summed up a management philosophy too seldom appreciated by merchants. It would seem that it is almost second nature for certain businessmen to rush out the front door in search of nickels supposedly available down the street in some other venture, while overlooking the dollars lurking within their own business premises. They rob their business of working capital in order to invest it elsewhere, either in speculative ventures about which they know nothing, or in low-rate-interest securities which will promote other businesses whose management has a proper appreciation of the value of working capital, even if their investors do not.

"I've seen a lot of men come and go in our business," continued this dealer, "and it has been my observation that most of them never learn that the really big money-making opportunities for the small investor lie right at hand in his own business. Even though they make some money in retailing, they persist in doing so the hard way and overlook some of the best profit-taking phases of their business."

He cited the matter of taking all discounts as an example of shortsightedness on the part of management lacking working capital only because of having made outside investments.

While, during the war years, discounts were largely eliminated as a jobbing practice, they may be expected to return again in the wake of com-

petitive conditions. Even during the war this dealer continued to get cash discounts from several jobbers.

(To be continued)

Type	Retail Price	Type	Retail Price	Type	Retail Price	Type	Retail Price	Type	Retail Price
OOA	\$3.20	2A3 (2A3H)	\$2.65	6D5G	\$2.20	6Y5V	\$3.20	12Z5 (6Z5/12Z5)	\$3.20
OIA	1.25	2A4G	3.20	6D6	1.35	6Y6G	2.20	14	2.65
O4AG	2.65	2A5	1.35	6D7	3.20	6Y7G	2.20	14A4	2.65
OZ4	2.20	2A6	1.35	6D8G	2.20	6Z4 (84/6Z4)	1.50	14A5	3.90
OZ4G	2.20	2A7	1.50	6E5	1.50	6Z5 (6Z5/12Z5)	3.20	14A7 (14A7/12B7)	2.65
IA1/5E1	1.50	2A7S	3.20	6E6	2.65	6Z7G	2.65	14AF7 (XXD)	2.20
IA3	1.80	2B7	1.80	6E7	3.20	6ZYSG	1.80	14B6	2.20
IA4P	2.20	2B7S	3.20	6F5, G	1.50	7	1.80	14B8	2.65
IA4T (IA4)	2.20	2E5	1.80	6F5GT	1.35	7A4	1.80	14C5	2.65
IA5G	2.20	2G5	2.20	6F6	1.50	7A5	1.80	14E6	2.65
IA5GT	1.50	2S/4S	3.20	6F6G	1.25	7A6	1.80	14E7	1.80
IA6	1.80	2V3G	3.90	6F6GT	1.15	7A7	1.80	14F7	2.20
IA7G	2.20	2W3, GT	1.80	6F7	2.20	7A8	1.80	14H7	2.65
IA7GT	1.80	2X2/879	3.20	6F7S	3.20	7AG7	2.20	14I7	2.65
IA85	2.65	2Z2/G84	3.20	6F8G	1.80	7B4	1.80	14J7	2.65
IB1	1.50	3	1.80	6G5 (6U5/6G5)	1.80	7B5	1.80	14N7	2.65
IB4P (IB4/951)	1.80	3A8GT	3.20	6G6G	1.80	7B6	1.80	14O7	2.20
IB5 (IB5/25S)	1.80	3B5GT	3.20	6G4GT	2.65	7B7	1.80	14R7	2.20
IB7G, GT	1.80	3B7 (3B7/1291)	3.20	6H6, G, GT	1.50	7B8	1.80	14S7	2.65
IC1	1.50	3D6 (3D6/1299)	3.20	6J5, GT	1.25	7C4	3.20	14W7	3.20
IC5G	2.20	3E6	3.20	6J5G	1.35	7C5	1.80	14Y4	2.65
IC5GT	1.80	3LE4	3.20	6J6	2.65	7C6	1.80	15	2.65
IC6	1.80	3LF4	2.65	6J7	1.80	7C7	1.80	18	2.65
IC7G	1.80	3Q4	2.20	6J7G, GT	1.50	7E5	2.65	19	1.80
IC8	3.20	3Q5G, GT	2.20	6J8G	2.20	7E6	1.80	20	3.90
ID1	1.50	3S4	2.20	6K4	3.90	7E7	2.20	22	3.20
ID5GP	1.80	3V4	2.20	6K5G, GT	1.50	7F7	2.20	24A	1.25
ID5GT, G	1.80	4	1.80	6K6G	1.50	7F8	2.65	24A	1.25
ID7G	2.20	4A1	3.20	6K6GT	1.35	7G7 (7G7/1232)	2.65	25A6	2.65
ID8GT	2.65	4A6G	2.65	6K7, G	1.50	7H7	2.65	25A6G, GT	1.50
IE1	1.50	5	1.80	6K7GT	1.35	7J7	2.65	25A7G, GT	2.20
IE4G	1.80	5T4	2.65	6K8, G, GT	1.80	7K7	2.65	25AC5G, GT	2.20
IESGP, G, GT	2.20	5U4G	1.35	6L5G	1.50	7L7	2.65	25B5	3.20
IE7G	3.20	5V4G	2.20	6L6, G, GA	2.65	7N7	2.65	25B6G	2.65
IF1	1.50	5W4	1.50	6L7, G	2.20	7Q7	2.65	25B8GT	2.65
IF4	1.80	5W4G, GT	1.25	6N5 (6AB5/6N5)	2.20	7R7	1.80	25C6G	2.65
IF5G	1.80	5X4G	1.50	6N6G	3.20	7S7	2.65	25D8GT	2.65
IF6	2.20	5Y3G, GT	.95	6N7, G, GT	2.20	7V7	2.20	25L6	2.20
IF7G, GH, GV	2.20	5Y4G	1.05	6P5G	1.15	7W7	3.20	25L6G	1.80
IG1	1.50	5Z3	1.50	6P5GT	1.10	7X7 (XXFM)	2.65	25L6GT	1.50
IG4G, GT	1.80	5Z4, GT	1.80	6P7G	3.20	7Y4	1.80	25N6G	3.20
IG5G	1.80	6	1.80	6Q6, G (6T7G)	1.80	7Z4	1.80	25S (1B5/25S)	1.80
IG6G, GT	2.20	6A3	2.65	6Q7	1.80	8	1.80	25T5	3.20
IH4G	1.35	6A4 (6A4/LA)	2.20	6Q7G, GT	1.25	9	1.80	25Z5	1.35
IHS5G	1.80	6A5G	3.90	6R6G	3.90	10	3.90	25Z6	1.80
IHS5GT	1.50	6A6	2.20	6R7	2.20	12A	1.35	25Z6G, GT	1.35
IH6G	1.80	6A7	1.35	6R7G	1.50	12A5	3.20	26	1.05
IJ1	1.50	6A7S	3.20	6R7GT	1.25	12A6, GT	2.65	27	.95
IJ5G	2.65	6A8	1.80	6S7, G	2.20	12A7	2.65	27S	3.20
IJ6G	1.80	6A8G, GT	1.35	6SA7	1.35	12A8G	1.80	30	1.35
IK1	1.50	6AB5/6N5	2.20	6SA7GT	1.50	12A8GT	1.35	31	1.35
IL4	2.20	6AB7 (6AB7/1853)	2.65	6SB7Y	2.65	12AH7GT	2.20	32	1.80
IL4A	3.20	6AC5G	1.80	6SC7	1.80	12AT6	2.20	32L7GT	2.65
IL4A	3.20	6AC5GT	1.50	6SD7GT	1.80	12B7 (14A7/12B7)	2.65	33	1.80
IL4B	3.20	6AC7 (6AC7/1852)	3.20	6SF5, GT	1.35	12B8GT	2.20	34	1.80
ILC5	3.20	6AD6G	2.20	6SF7	1.80	12BA6	2.20	35 (35/51)	1.35
ILC6	3.20	6AD7G	2.20	6SG7	1.80	12BE6	2.20	35A5	1.80
ILD5	3.20	6AB5G	2.20	6SH7, GT	1.80	12C8	2.65	35L6G	1.80
ILE3	2.65	6AB5GT	1.80	6SJ7, GT	1.50	12CF8	1.35	35L6GT	1.35
ILG5	3.20	6AE6G	1.80	6SK7	1.35	12H6	1.50	35S (35S/51S)	3.20
ILH4	3.20	6AE7GT	1.80	6SK7GT	1.50	12J5GT	1.35	35W4	1.50
ILN5	3.20	6AF5G	1.80	6SL7GT	2.20	12J7G	1.80	35Y4	2.20
ILN5G	2.20	6AF6G	2.20	6SN7GT	1.80	12J7GT	1.80	35Z3	1.80
IN5GT	1.80	6AG5	3.20	6SQ7	1.35	12K7G	1.80	35Z4GT	1.10
IN6G	1.80	6AG7	3.20	6SQ7GT	1.50	12K7GT	1.35	35Z5G	1.80
IP5G, GT	2.20	6AK6	2.65	6SR7	1.50	12K8	2.20	35Z5GT	1.15
IQ5G, GT	2.20	6AL5	2.20	6SS7	1.35	12K8GT	1.80	35Z6G	1.80
IQ6	3.20	6AQ6	2.20	6ST7	2.20	12Q7G	1.80	36	1.35
IR1G	1.50	5AT6	1.80	6SZ7	2.20	12Q7GT	1.25	37	1.15
IR4 (1R4/1294)	2.65	6AU6	2.20	6T5	3.20	12SA7	1.35	38	1.50
IR5	2.20	6B4G	2.65	6T7G (6Q6G)	1.80	12SA7GT	1.80	39/44	1.35
IS4	2.20	6B5	2.65	6U5 (6B5/6G5)	1.80	12SC7	1.80	40	2.20
IS5	2.20	6B6G	1.50	6UG7	1.80	12SK7GT	1.50	40Z5 (45Z5GT)	1.50
ISA6GT	2.20	6B7	1.80	6U7G	1.35	12SF7	1.80	41	1.15
ISB6GT	2.20	6B7S	3.20	6V6	2.65	12SG7	1.80	42	1.15
IT1G	1.50	6BA6	2.20	6V6G	2.20	12SH7, GT	1.80	12SH7, GT	1.80
IT4	2.20	6BE6	2.20	6V6GT	1.50	12SJ7, GT	1.50	12SK7	1.35
ITS5GT	2.20	6B8	2.65	6V7	3.20	12SK7GT	1.80	12SL7GT	2.20
IU4	2.20	6B8G, GT	1.80	6V7G	1.80	12SN7GT	1.80	12SQ7	1.35
IV	1.35	6C4	1.80	6WSG	2.65	12SQ7GT	1.50	12SR7, GT	1.80
IW5	3.20	6C5	1.50	6W7G	2.20	12T3	1.35		
IY1	1.50	6C5G, GT	1.35	6X5	2.20				
IZ1	1.50	6C6	1.35	6X5G	1.50				
	2	6C7	3.20	6X5GT	1.35				
		6C8G	2.20	6Y5	3.20				

All radio tubes are guaranteed for not less than 90 days from date of sale. The following maximum charges apply to removing, testing, and replacing all radio tubes in electron equipment brought to this establishment by customer: Testing all tubes without detaching chassis mechanism from cabinet—\$5.00. Testing all tubes if necessary to detach chassis mechanism from cabinet—\$1.00. This schedule conforms to prices for sales at retail as established by OPA Revised Order No. 619, RMPR 136. Effective October 28, 1946.

RETAIL PRICES, RADIO RECEIVER TUBES

(Effective October 28, 1946).

THE above price list includes obsolete and current tubes. According to Sylvania Electric Products, Inc., who issued this list recently, the tube prices listed are based on OPA pricing schedules. Tubes that OPA did not list were priced on the basis of the last price on record. (Compare with page 24, September issue).

This provides a listing as nearly complete as possible so that it will serve as a convenient pricing guide not only for the commonly required tubes, but also for a miscellaneous variety of less frequently used types.

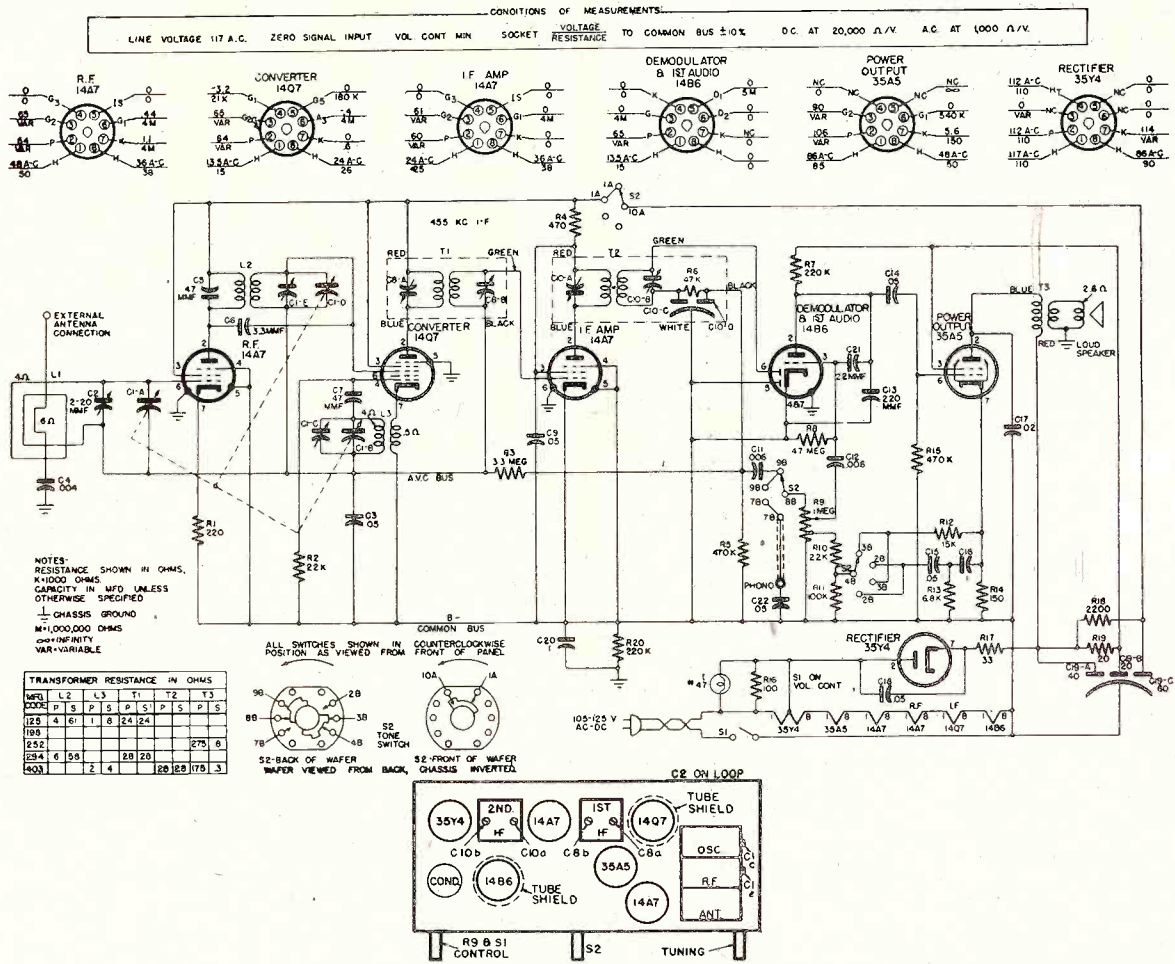
Courtesy Sylvania Electric Products, Inc.

SERVICE DATA

FOR

BENDIX

MODELS 636A, 636C, 636D



SERVICE INFORMATION

Alignment Procedure

Connect line cord plug to 117 volt, 60 cycles AC power source. Set volume control at maximum clockwise position and tone control (S2) in counterclockwise position. Connect output meter across voice coil. Adjust dial pointer by turning tuning control fully counterclockwise and sliding dial pointer on dial cord until it is exactly 2 3/16" from left end of dial back plate. Make all adjustments in order given in table and for maximum output. Dial Pointer Positions given measured from left hand end of dial back plate. Keep input as low as possible at all times.

Precautions

An isolating transformer should be used between the power supply and the receiver if any of the test equipment is AC operated. The use of isolating capacitors is not recommended as AC through the capacitor may introduce hum modulation, and if the capacitors should break down the test instruments will likely be damaged.

Circuit Aligned	Input Freq.	Dial Pointer Position	Adjustments
IF	*455 KC	Max. to right	C10b, C10a C8b, C8a
OSC.	**1475 KC	6 3/4"	C1c
RF	**1475 KC **965 KC **580 KC	6 3/4" 5 2-23/32"	C1e, C2 Check Calib.

* Applied to Antenna input .1 mfd. or less.

** Applied to Antenna input through 50 mmf. or less.

(Continued)

SERVICE DATA BENDIX, MODELS 636 SERIES

SPECIFICATIONS

Model 636

POWER

Voltage Rating—AC or DC	105-125
Frequency—Cycles per second	50-60
Power Consumption—Watts	30

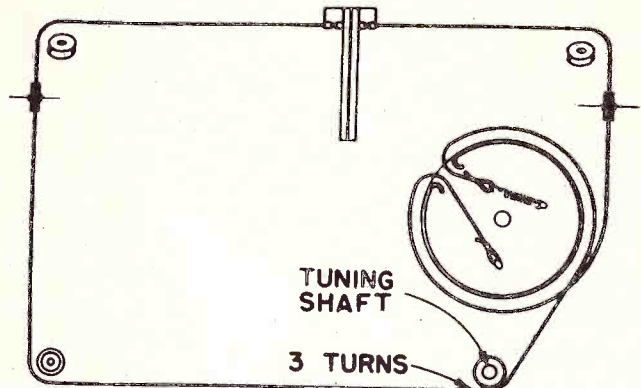
TUNING RANGE—FREQUENCY IN KC 535-1725

INTERMEDIATE FREQUENCY (KC) 455

MAXIMUM POWER OUTPUT IN WATTS 1.2

LOUD SPEAKER—PM-OVAL

Cone diameter—inches	4x6
Voice Coil Impedance (ohms at 400 cycles)	3.2



REPLACEMENT PARTS LIST

Stock No.	Description	List Price	Stock No.	Description	List Price
ELECTRICAL COMPONENTS			SPEAKER & COMPONENTS (continued)		
AL0C03*	ANTENNA-Loop	1.98	CS4001	CONE & V. C. ASS'Y. for SP4000 Code 328	
CC9A16	CAPACITOR-Ceramic 3.3 mmf. (C6)	.05	CS4002	CONE & V. C. ASSY' for SP4000 Code 270	
CE3A00	CAPACITOR-Electrolytic 20 x 40 x 60 mfd. 150 V	1.86	CS4006	CONE & V. C. ASS'Y. for SP4000 Code 191	
CL2A01	CORD-Power line	.47	CS4007	CONE & V. C. ASS'Y. for SP4000 Code 371	
CM5A05	CAPACITOR-Mica. 220 mmfd. (C13)	.18	TA0001	TRANSFORMER—Audio Output (T3)...	.96
CM5A14	CAPACITOR-Mica 47 mmfd. (C5, C7)	.19	MECHANICAL COMPONENTS		
CP2T51	CAPACITOR-Paper .1 mfd. 200 V (C16)	.17	AD0C00	ASSEMBLY-Dial Back	.81
CP4T20	CAPACITOR-Paper .006 mfd. 400 V (C11, C12)	.14	BT1S00	BOARD-Terminal 1 lug	.02
CP4T34	CAPACITOR-Paper .02 mfd. 400 V (C17)	.14	BT2S00	BOARD-Terminal 2 lugs	.02
CP4T40	CAPACITOR .05 mfd. 400 V (C18, C3, C9, C14, C15, C22)	.16	BT4S01	BOARD-Terminal 4 lugs	.05
CP4T51	CAPACITOR-Paper .1 mfd. 440 V (C20)	.18	CD0C02	CABLE-Dial (47 13/16")	.17
CP6T16	CAPACITOR-Paper .004 mfd. 600 V (C4)	.13	GR0S00	GROMMET-Variable Capacitor shockmount	.04
CV0C00	CAPACITOR-Variable (C1a, C1b, C1c, C1d, C1e)	7.91	HB0A01	BRACKET-Loop	.03
JR1S00	JACK-Phono (J1)	.06	HC0C00	CLIP-Coil mt'g	.65
LO6B00	COIL-Oscillator (L3)	.94	HC0C03	CLAMP-Dial Cable	.43
RC1H16	RESISTOR-220 ohms 1/4 W. Comp (R1)	.04	HC0S00	CLIP-Tuning shaft spring	.01
RC1H20	RESISTOR-470 ohms 1/4 W. Comp (R4)	.04	HC0T00	CLAMP-Tube Shield	.01
RC1H32	RESISTOR-4700 ohms 1/4 W. Comp (R19)	.04	HN9P45	NUT-3/8 x 32 Pal-nut	.60
RC1H34	RESISTOR-6800 ohms 1/4 W. Comp (R13)	.04	HR0S01	RIVET-Shoulder	.02
RC1H38	RESISTOR-15 K ohms 1/4 W. Comp (R12)	.06	HS0C00	SPRING-Dial Cable tension	.04
RC1H40	RESISTOR-22 K ohms 1/4 W. Comp (R2, R10)	.04	HS0P01	SPACER-Wood antenna	.01
RC1H51	RESISTOR-100 K ohms 1/4 W. Comp (R11)	.04	HS6F00	SPACER-Flared Variable Capacitor mt'g.	.02
RC1H54	RESISTOR-220 K ohms 1/4 W. Comp (R7, R20)	.04	ID0M02	INDICATOR-Metal Dial pointer	.33
RC1H58	RESISTOR-470 K ohms 1/4 W. Comp (R15, R5)	.04	IT0C01	INSULATOR-Elect. Cap. paper tube	.04
RC1H68	RESISTOR-3.3 meg. ohms 1/4 W. Comp (R3)	.04	MB0B00	BEARING-Tuning shaft	
RC1H70	RESISTOR-4.7 meg. ohms 1/4 W. Comp (R8)	.04	MP0F00	PULLEY-Idler Fiber	.02
RC4G28	RESISTOR-2200 ohms 2 W. Comp (R18)	.14	MS0T02	SHAFT-Tuning Capacitor	.15
RV4S00	Potentiometer-1 meg. ohms (R9, S1)	.02	PI0C00	PLATE-Capacitor mt'g. Insulator	.02
RW1A06	RESISTOR-100 ohms 1 W.W.W. (R16)	.14	PI0P00	PLATE-Power Cord Insulator	.01
RW1B14	RESISTOR-150 ohms 1 W.W.W. (R14)	.08	SM0T00	SHIELD-Metal tube	.05
SO0D01	SOCKET-Dial Lamp	.23	CABINET COMPONENTS		
SO9S00	SOCKET-Locktal Tube	.19	BZ0B02	BACK-Cabinet (Tekwood)	.49
SR4C00	SWITCH 3 pole, 4 position	.84	BZ0B02	BACK-Cabinet (Tekwood)	.49
T10C01	TRANSFORMER-I. F. 1st. (T1)	2.05	DS0A01	DIAL-Glass (54-170 kc)	.99
T10D01	TRANSFORMER-I. F. 2nd. (T2)	2.65	DX0R04	RETAINER-Dial (Spring)	.04
TR6L00	TRANSFORMER-R. F. Interstage (L2)	3.75	FZ0R02	FOOT-Rubber cabinet	1.40
SPEAKER AND COMPONENTS			GC0D01	GASKET-Dial (cork 12 7/8")	.08
SP4000	Speaker—4" x 6" P.M. Oval	5.70	GZ0M02	GRILLE-Metal (cu. oxide)	3.53
CS4000	CONE & V.C. ASS'Y. for SP4000 Code 252		HK0R00	RING-Knob Retainer Spring (.015)	.01
			KC0B05	KNOB-Plain Push On Brown	.15
			PI0B00	PLATE-Insulating Base Asbestos	.05
			WF0Z02	WASHER-Felt (Brown)	.16
			ZW6A02	CABINET-Walnut Table Model	24.25

*Subject to excise tax

/c—Price per hundred

Prices subject to change without notice

PRINTED IN U.S.A.

THE TELEVISION OPPORTUNITY

(From page 15)

Beginning of a Series of Articles on Installation, Servicing and Selling

television receivers. Granting this to be true and the necessity for initial effort by the manufacturers of the receivers, it still does not justify the establishment of a long-range program which is intended to freeze out the independent repair operator. As a matter of fact, it does not make sense, for in time—and it is not too far distant—the service of these people will be needed badly.

It must be borne in mind that a few of the men now active in radio work had sufficient vision years ago to acquire more advanced technical knowledge and they should be given the opportunity to participate. Many men are taking advanced training at this very moment and if their desire is to enter the repair field, they should have that right.

Instead of condemning the radio-repair industry to justify factory participation at the advent of television, it would be infinitely better to permit independent repairman participation if the organization is found capable. The entire industry as a whole would benefit greatly if it fostered the technical advancement of the radio-repair group. Manufacturers spend unlimited funds teaching their dealers how to sell merchandise. Similar efforts—or at least sponsoring of programs whereby the radio repairmen of this nation could be-

come more proficient technically—would reap untold benefits to the advantage of all concerned. In this respect the television broadcaster also can play his part. In fact, this is being done in Philadelphia where one of the broadcast stations is sponsoring a training program.

Members of the radio servicing industry of this nation are not blind to the realities of a situation. The trials and tribulations experienced during the past fifteen years have taught them that. They know that by and large they cannot make a pre-installation survey or repair a television receiver without special training. However, it is true that not much training would be needed to enable an individual or an organization to make an installation after the survey had developed the facts concerning the site. Moreover, they feel that their reputation should not be impugned, thereby causing them to lose customers who have other receivers in their home and for whom they had done work previously. The service group does not feel that the receiver manufacturers owe them a debt of gratitude. All they want is a fair shake of the dice, which in the final analysis, will prove advantageous to the manufacturer and television broadcaster.

Here, at Du Mont, for example, we are at present engaged in just such activities, and in this way are expecting to develop among dealers and service representatives whom we will certify, a substantial group of well-trained men with good backgrounds, who will become the nucleus of a new group of television servicemen. To such positions the average radio serviceman must expect to aspire if he is to hold his own in the electronic industry.

Costs and Guarantees

There are natural questions which will be asked by customers at this point, and which, of course, have to do with price. "How much will it cost to install my television set?" "What sort of guarantee will I receive with it?" "How much money will I have to lay out for service as time goes on?"

For the time being we can make only rough estimates. At the present time it is expected that installation charges may range from \$25 to \$75 depending upon location. Difficult locations will, of course, run somewhat higher, but I do believe that these figures should cover the great majority of installations.

Some manufacturers are guaranteeing their sets for a year against possible breakdown. Others are using the ninety-day RMA Guarantee for the electronic parts, and a year's guarantee for the cathode-ray tube. The ultimate decision as to which of these procedures will survive, is largely a matter of experience and competitive approach, and it is somewhat early to predict them.

The same holds true of the amount of money it will cost the average set-owner to maintain his set in good-working condition over a period of time. But at this point it is interesting to note that many of our early sets are still in daily use after eight years, and the cost of their upkeep has been relatively insignificant, considering the length of time they have given service.

If all of us realize the hurdles and difficulties that lie ahead of us, it is going to be much simpler to carry out a successful sales program which will be satisfactory to manufacturer, dealer and customer alike, than if we close our eyes at this point to these highly important problems and merely try to sell television receivers without backing the sales up with the necessary technical assistance.

2. SALES DEPEND ON INSTALLATION & SERVICING

by ERNST A. MARX*

INSSTALLATION and servicing of television receivers is a very definite and very important part of selling those receivers. In this respect, the problem differs extensively from that found in sale of radio receivers which today have been brought to such a state of technical perfection, that a customer may take his radio receiver home, plug it in, and listen to programs.

Most television receiver manufacturers are attempting to combine service and sales in various ways. Some are establishing their own service and installation departments. Others are using control and inspection groups to insure a high standard of dealer servicing. Whatever their methods, their goal is identical—to provide satisfactory television reception for the ever-increasing audience now in existence, and the vast audiences to come.

Installation crews, whether they are part of a manufacturer's, dealer's, or an

independent organization, will necessarily have to have the very best and the most complete test equipment including a small portable television receiver for survey purposes. They will require a mobile truck unit in most cases with extension power cables, antenna kits, hand and power tools, hardware, and other equipment. *All this will be in addition to the equipment necessary at service headquarters.*

Who is to organize these service organizations and train the men? The average radio serviceman, unless he has broadened his experience and education in the field of electronics and high frequency, is certainly unable to cope with television servicing. Certain manufacturers, therefore, have established free schools for their service representatives, and are careful to screen the men reporting to these schools, in such a way that only those who have had ultra-high frequency backgrounds, and have an understanding of radiation and propagation, as well as sweep circuits and synchronizing pulses, will be accepted in the course.

* Allen B. DuMont Labs, Inc.

CIRCUIT COURT

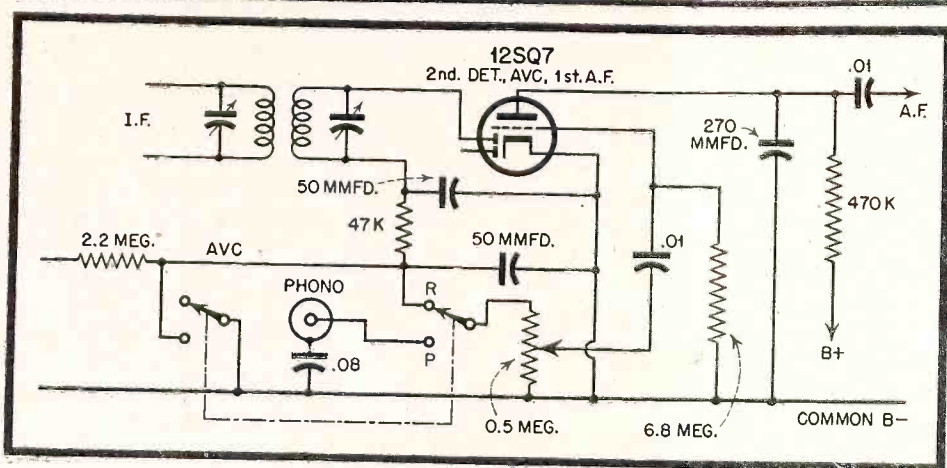


Figure 1. Ward Airline Model 54—WG2007A.

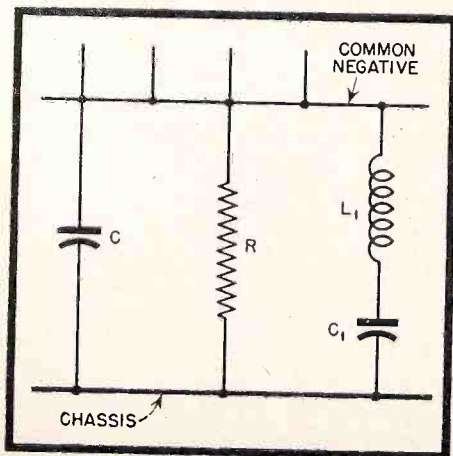
PHOTO-RADIO CHANGEOVER.

Shown in *Fig. 1* is the simple but effective Phono-Radio changeover circuit used in the Montgomery-Ward Model 54 WG-2007A. It will be noted that there is a double pole, double throw switch. One section connects the high end of the .5 meg. volume control to either the crystal pickup or the audio source of the receiver circuit. The other section of the switch has no function in the radio position, but serves to shunt the audio voltage of the radio circuit to the common ground when the phonograph is operating. This should minimize the frequent trouble found in the simpler types of circuits where there is a tendency for radio signals, particularly from strong locals, to ride through along with the record reproduction.

SENSITIVITY MEASUREMENT.

Current Montgomery-Ward service notes recommend an arrangement as shown in *Fig. 2* to determine the actual sensitivity of the receivers. It is assumed that an RF signal generator is available with calibrated output at 455 KC and 1000 KC, 30 per cent Modulated at 400 cycles.

Figure 3.



Figures are given in the notes for the input to each stage which will produce a standard 50 milliwatt output across the 3.2 ohm resistor. This output occurs with .4 volts across the load.

Several five-tube AC-DC receivers are rated at 24 to 30 microvolts at the antenna for the standard output.

UNDERWRITERS APPROVED SETS.

It is not common knowledge that many manufacturers distribute two types of most models of receivers, particularly the less expensive AC-DC sets. Some states have laws which make it necessary to have the approval of insurance underwriters before a model can be sold within the state. Others have no such ruling.

One of the differences, and one which requires a circuit variation, is the return point for common negative returns. Where underwriters' approval is not needed, these often return to the chassis proper. This makes accidental contact between chassis and ground a potential source of shock or line short if the plug is in the socket one way. With the plug reversed no potential difference would exist between chassis and external ground

Figure 4. Westinghouse Models H-125 and H-126.

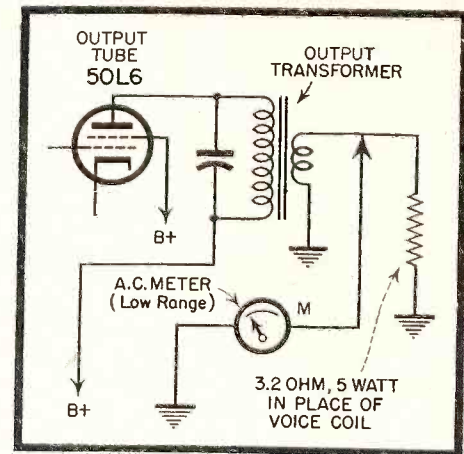
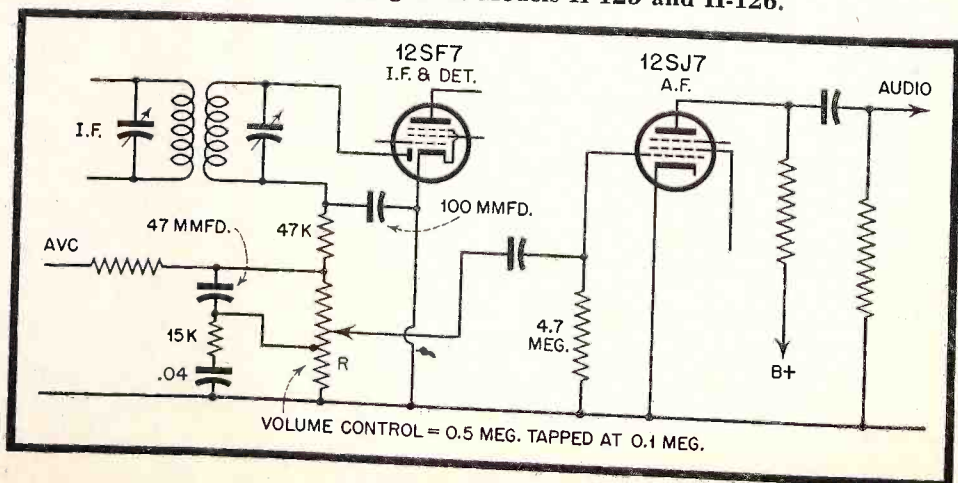


Figure 2.

so no trouble would be encountered.

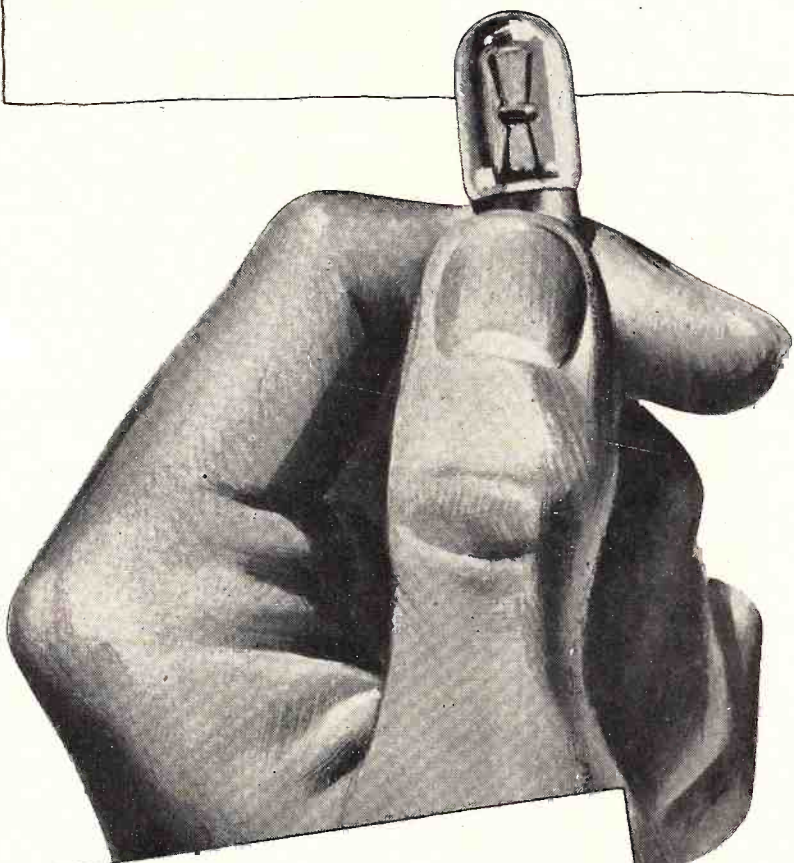
In those areas where underwriters' approval is required, it is standard practice, at some increase in cost, to return all common leads or several interconnected leads to one lug insulated from the chassis. To provide a fixed potential relation between the common negative and the chassis it is usual practice to join them with a resistor, shown in *Fig. 3* as R, which is commonly in the range around .25 megohm. This is generally shunted with a capacitor marked C₁ of .1 to .25 mfd.

Some recent models will be found with the resistor shunted by an L-C combination marked L₁ C₁, in place of the capacitor alone. This permits shunting any undesirable R.F. currents to the chassis more effectively than the capacitor alone will effect. The capacity will still be in the vicinity of .1 mfd. This is an effective short at audio frequencies and does not affect the action of the coil at radio frequencies. At least a 400-volt capacitor should be used.

TONE COMPENSATION.

The fact that low frequencies tend to fall off in relation to the middle tones
(See page 38)

It was a heck
of a note!



Radio
Dial Lights

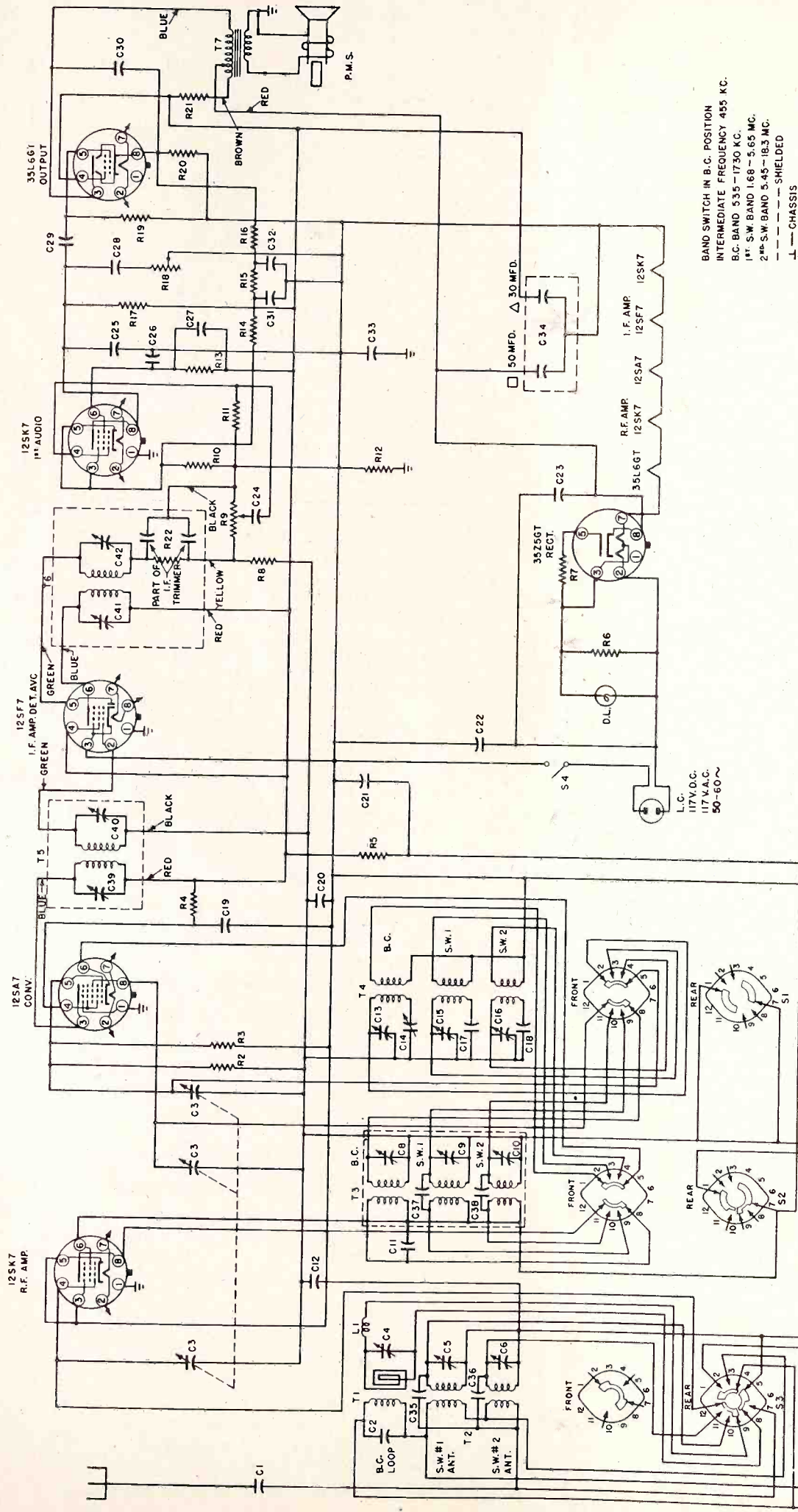
IN some types of old-style dial lights, the vibrations from certain resonant frequencies whipped the filament off its supports. General Electric Research Engineers took high-speed movies and discovered that filaments sometimes vibrated in one direction while the support wires vibrated in the opposite direction. By making filament and support vibrate in unison, they eliminated one of the main causes of early lamp failure in this type of service.

This is just one of many examples of how G-E Lamp Research constantly has improved the quality and serviceability of G-E Miniature Lamps. Features like these make it worth your while to sell G-E Lamps:

1. Dependable, trouble-free performance.
2. High level of maintained light output.
3. Low current consumption.
4. Long life.
5. Profitable to handle.
6. Greater dealer acceptance.

GENERAL  ELECTRIC

LEAR Model 661 Schematic (For alignment chart see July, 1946).



BAND SWITCH IN B.C. POSITION
 INTERMEDIATE FREQUENCY 455 KC.
 B.C. BAND 535-1730 KC.
 1ST S.W. BAND 168-5.65 MC.
 2ND S.W. BAND 5.45-18.3 MC.
 --- CHASSIS
 ⊥

DWG. SYM.	PART NO.	DESCRIPTION	DWG. SYM.	PART NO.	DESCRIPTION
T1	B22651	B.C. LOOP ASSEMBLY	R6	B55469	470 OHM 1/2W. CARBON RESISTOR
T2	B50225	S.W. BAND 182 ANT. COIL ASSEMBLY	R7	B55460	15 " " " "
T3	B50226	B.C. S.W. 18 S.W. 2 R.F. "	R8	B55491	2.2 MEG. " " "
T4	B50222	" " " " " " " " " " " "	R9, R4	D36340	300,000 OHM VOL. CONTROL & SWITCH
T5	B53360	NO. 1 I.F. TRANSFORMER	R10	B55406	820 " 1/2W. CARBON RESISTOR
T6	B53361	NO. 2 I.F. TRANSFORMER	R11	B55494	6.8 MEG. " " "
T7	B52456	OUTPUT	R12	B55485	220,000 OHM " " "
C1	B56095	220 MF. MICA CAPACITOR	R13	B55487	470,000 " " "
C2	B56093	22 " " "	R14	B55475	2700 " " "
C3	B52842	3 GANG VARIABLE " WITH PULLEY	R15	B55476	4700 " " "
C4	A52686	B.C. ANT. TRIMMER ASSEMBLY	R16	B55476	6800 " " "
C5	A52664	" " " " " " " " " " " "	R17	B55483	100,000 " " "
C6	C5585	.001 MF. 200V. PAPER CAPACITOR	R18	D56339	500,000 " " " TONE CONTROL
C7	C5585	" " " " " " " " " " " "	R19	B55487	470,000 " 1/2W. CARBON RESISTOR
C8	C5585	" " " " " " " " " " " "	R20	B55466	150 " " " "
C9	A52644	B.C. RF TRIMMER ASSEMBLY	R21	B55940	1200 " 2W. " "
C10	A52644	" " " " " " " " " " " "	R22	B55940	47,000 " 1/2W. " "
C11	B56095	47 MF. MICA CAPACITOR			
C12	C5585	.001 MF. 200V. PAPER CAPACITOR			
C13	C5585	" " " " " " " " " " " "			
C14	A52665	B.C. OSC. TRIMMER ASSEMBLY			
C15	A52665	" " " " " " " " " " " "			
C16	A52664	" " " " " " " " " " " "			
C17	A50235	1250 MF. MICA CAPACITOR, TOL. ± 5%			
C18	A50235	3900 " " " " " " " " " " " "			
C19	C56596	.02 MF. 200V. PAPER CAPACITOR			
C20	C56596	" " " " " " " " " " " "			
C21	C56596	" " " " " " " " " " " "			
C22	C56636	.05 " 600V. " " " " " "			
C23	C56596	.02 " 200V. " " " " " "			
C24	C56596	" " " " " " " " " " " "			
C25	B56095	220 MF. MICA CAPACITOR			
C26	C56603	1 MF. 200V. PAPER CAPACITOR			
C27	C56600	.05 " " " " " " " " " " " "			
C28	C56599	.004 " " " " " " " " " " " "			
C29	C56599	.02 MF. 200V. PAPER CAPACITOR			
C30	C56622	.01 " 400V. " " " " " "			
C31	C56603	" " " " " " " " " " " "			
C32	C56603	" " " " " " " " " " " "			
C33	C56631	" " " " " " " " " " " "			
C34	B5327	30-30 MF. 150V. ELECTROLYTIC			
C35	A52655	3 MF. FIXED CAPACITOR			
C36	A52655	" " " " " " " " " " " "			
C37	A52674	" " " " " " " " " " " "			
C38	A52674	" " " " " " " " " " " "			
C39	C39C40	NO. 1 I.F. TRIMMERS (PART OF ASST.)			
C40	C41, C42	NO. 2 " " " " " " " " " " " "			
C41	R1	NO. 1 I.F. TRIMMERS (PART OF ASST.)			
C42	R2	22,000 OHM 1/2W. CARBON RESISTOR			
C43	R3	15 MEG. " " " " " "			
C44	R4	22,000 OHM " " " " " "			
C45	R5	470 " " " " " "			
C46	R6	470 " " " " " "			
C47	R7	15 " " " " " "			
C48	R8	2.2 MEG. " " " " " "			
C49	R9, R4	300,000 OHM VOL. CONTROL & SWITCH			
C50	R10	820 " 1/2W. CARBON RESISTOR			
C51	R11	6.8 MEG. " " " " " "			
C52	R12	220,000 OHM " " " " " "			
C53	R13	470,000 " " " " " "			
C54	R14	2700 " " " " " "			
C55	R15	4700 " " " " " "			
C56	R16	6800 " " " " " "			
C57	R17	100,000 " " " " " "			
C58	R18	500,000 " " " TONE CONTROL			
C59	R19	470,000 " 1/2W. CARBON RESISTOR			
C60	R20	150 " " " " " "			
C61	R21	1200 " 2W. " " " "			
C62	R22	47,000 " 1/2W. " " " "			

NEW!

WESTON Mutual Conductance Tubechecker and Circuit Analyzer



MODEL 798—TYPE 3

*Outstanding
Features*

- ✓ Direct-reading mutual conductance tests, and "Good-Bad" indications.
- ✓ New patented high frequency tube testing circuit.
- ✓ AC-DC volt-ohm-milliamperere ranges.
- ✓ Tests 4, 5, 6, 7 prong octal, loctal, miniature, and acorn tubes... spare octal and miniature sockets.
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Model 798 combines broad utility, ruggedness, and dependable accuracy for maintenance of sound and electronic equipment. Detailed bulletin available. Weston Electrical Instrument Corporation, 605 Frelinghuysen Avenue, Newark 5, New Jersey.

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Shop Notes

CHECK LIST FOR AUTOMATIC RECORD CHANGERS.

A convenient check list for use in servicing automatic record changers is given below:

1. Inoperative Turntable

- a—defective switch or line circuit
- b—defective gear or belt transmission
- c—defective brushes
- d—defective field winding
- e—defective starting condenser
- f—frozen bearings
- g—check cycle

2. No Audio (receiver OK)

- a—check pickup
- b—check phono-switch and wiring

3. Chattering

- a—check rotor and pole faces for irregularities
- b—check induction disc rotors for equi-distance between poles
- c—check governor for freedom of motion
- d—check brushes for equal spring tension
- e—check commutator for wear

- f—check rubber mountings, studs, joints, levers and couplings
 - g—check gears for wear and breaks
 - h—check springs for tension
 - i—check bearings
 - j—check drive belt and tires
 - k—check cycling for intermittent operation
 - l—check lubrication
- ### 4. Wows
- a—check speed of motor with stroboscopic disc
 - b—check for bent spindle
 - c—check for unbalanced rotors
 - d—check for worn or uneven drive belts, gears or pulleys
 - e—check spring tensions
 - f—check for intermittently shorted fields
 - g—check for worn brushes
 - h—check lubrication

"clarified
schematics"

ANOTHER RIDER "FIRST"
in our continuing program of
"SERVICE FOR THE SERVICEMAN"

Is it right for you to charge a customer for the time you use in breaking down a circuit? We think not.

Yet admittedly someone must spend the time tracing out the circuit before troubles can be located—especially in a modern multi-wave receiver. For, with such receivers each turn of a switch creates an entirely different circuit and only a laborious time-consuming process of diagram tracing will show you the operative parts under each switch position.

We recognized this problem and have solved it with another Rider "First." We have eliminated the necessity of your doing this in your shop, by doing it for you in our laboratories.

We have traced through hundreds of sets under all of their varying operating conditions and prepared special schematic drawings which break down all multi-wave band jobs to show what parts are in and out of operation for each possible position of the band switch.

With these Rider "clarified-schematics" you have before you the precise circuit as it exists when the switch is thrown. You know immediately, without tracing an original schematic just which components are

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Actually a multi-wave receiver is many receivers in one; "clarified-schematics" provide you with a separate schematic for each of these many receivers. A case in point is one combination set which we have broken down into eighteen individual schematics.

Servicemen will be quick to recognize the time-saving, money-making value of this Rider "First" yet it will be made available not at added cost to you, but as a part of our program of "A Continuing Service For The Serviceman." It will be just another time-saving bonus for the loyal Rider Manual users. It will be one of the important features of Volume XV (out in January), yet only one of the many time-saving exclusives that make Rider Manuals pay for themselves many times over each year they are in use.

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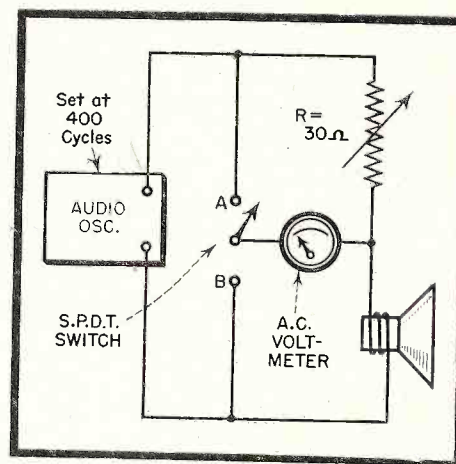


Figure 1.

MEASURING SPEAKER IMPEDANCE.

It is often required to measure the impedance of a loud speaker, particularly where exact impedance matching is necessary, and the speaker impedance data is not available. The substitution method illustrated in Fig 1. may be used for this purpose.

R is constantly adjusted until the A.C. voltmeter reading is the same for positions A and B of the S.P.D.T. switch. Inasmuch as most manufacturers rate the impedance of their speakers at 400 cycles, this frequency is used.

If it is desired to find the impedance of a speaker and its output transformer the same circuit is used, except that the connections are made across the primary of the output transformer, and R should be about 25,000 ohms.

HUM IN AUDIO AMPLIFIERS.

Hum in audio amplifier is often caused by defective ground connections resulting from loose nuts and screws on which the ground terminal is fastened. This condition gives rise to an impedance between ground returns across which the hum voltage is developed.

The best procedure to follow in these
(See page 36)

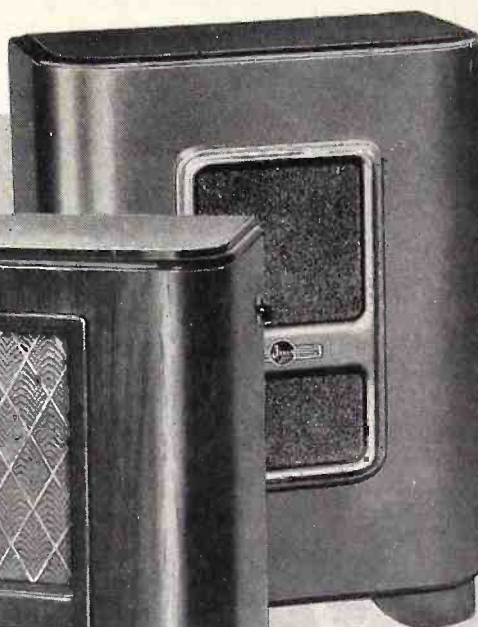
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RD-151 REPRODUCER



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Jensen High Frequency Control gives you the kind of reproduction you want when you want it . . . all the way from two-way system high fidelity to conventional single speaker performance. Now you can adjust for best results on every program, every record, every type of service.

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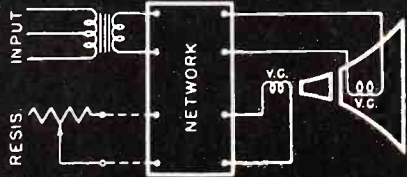


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Separate coaxially-mounted speakers for low and high frequencies, with integral two-channel network. (Range control not shown.)

USES "2-WAY" PRINCIPLE



JENSEN

BASS REFLEX

Acoustically-correct Bass Reflex Cabinet gives smoothly extended low register. Better than an "infinite" baffle . . . efficiently uses back radiation too.



SHOP NOTES

(from page 34)

cases is to check and tighten all screws and nuts; better still, add lock washers wherever possible.

Another instance of unequal ground potentials occurs when ground connections are made at different points of the chassis. This gives rise to a number of impedance paths between grounds because the chassis is not a perfect conductor. A low resistance bus-bar or strap connecting all ground points will remedy this condition.

ABSORPTION WAVE TRAP FOR LOOP RECEIVER.

R.C.A. describes a convenient circuit arrangement for connecting a wave trap to a loop-type receiver. This arrangement is helpful in locations where a powerful station causes interference and cross-modulation.

In Fig. 2, a small loop, such as the type used in "personal" receivers, is mounted adjacent to the receiver loop. Connected across the small loop is a trim-

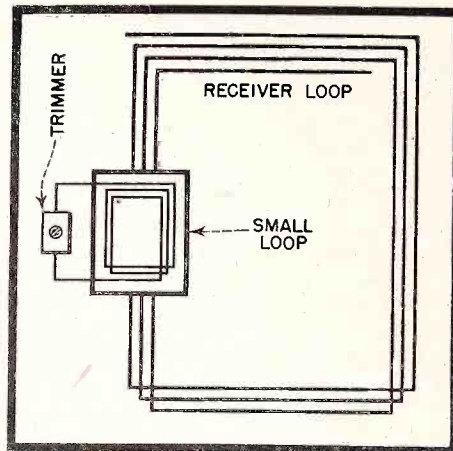


Figure 2.

mer condenser similar to those used with I.F. transformers.

The interfering station is tuned in, and the trimmer condenser across the absorption loop is adjusted to minimum signal and output. Closer coupling between both loops will render the circuit more effective. However, over-coupling will result in detuning the R.F. stage and weakened reception on other stations.

MEASURING VERY SMALL CAPACITANCES.

A vacuum tube voltmeter may be conveniently used to measure small capacitor values between 1 and 50 mmfd., by means of the circuit arrangement shown in Fig. 3.

A convenient value of frequency and

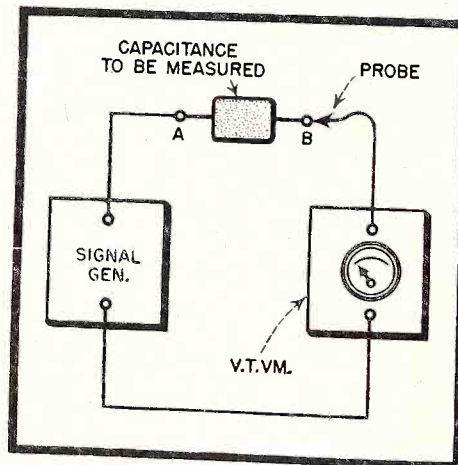


Figure 3.

attenuation is chosen on the signal generator so that the V.T.V.M. reads full scale with the probe in position A. Various capacitors of known values are then inserted in series with the probe and the corresponding V.T.V.M. readings are jotted down. A graph is then drawn of capacitance vs. voltage.

Now, an unknown value of capacitance is inserted between points A and B and the voltmeter reading noted. By interpolation, on the graph, the value of the

(See page 47)

Engineered

FOR LASTING PLEASURE

MODEL 50



WEBSTER Record Changers



MOTOR

Shaded pole, 4-pole. 62% more powerful than most record changer motors. Improved rim drive.



CHANGER MECHANISM

Sturdy two-tier bonded construction. Copper-plated steel parts. Graphite-bronze main bearing. Simplified action. Stainless steel cushioned spindle.

TURNTABLE

Full size, heavy-gauge steel for dynamic stability. Rim concentric to .015". Graphite-bronze bearing. Long pile static flock.



PICKUP ARM

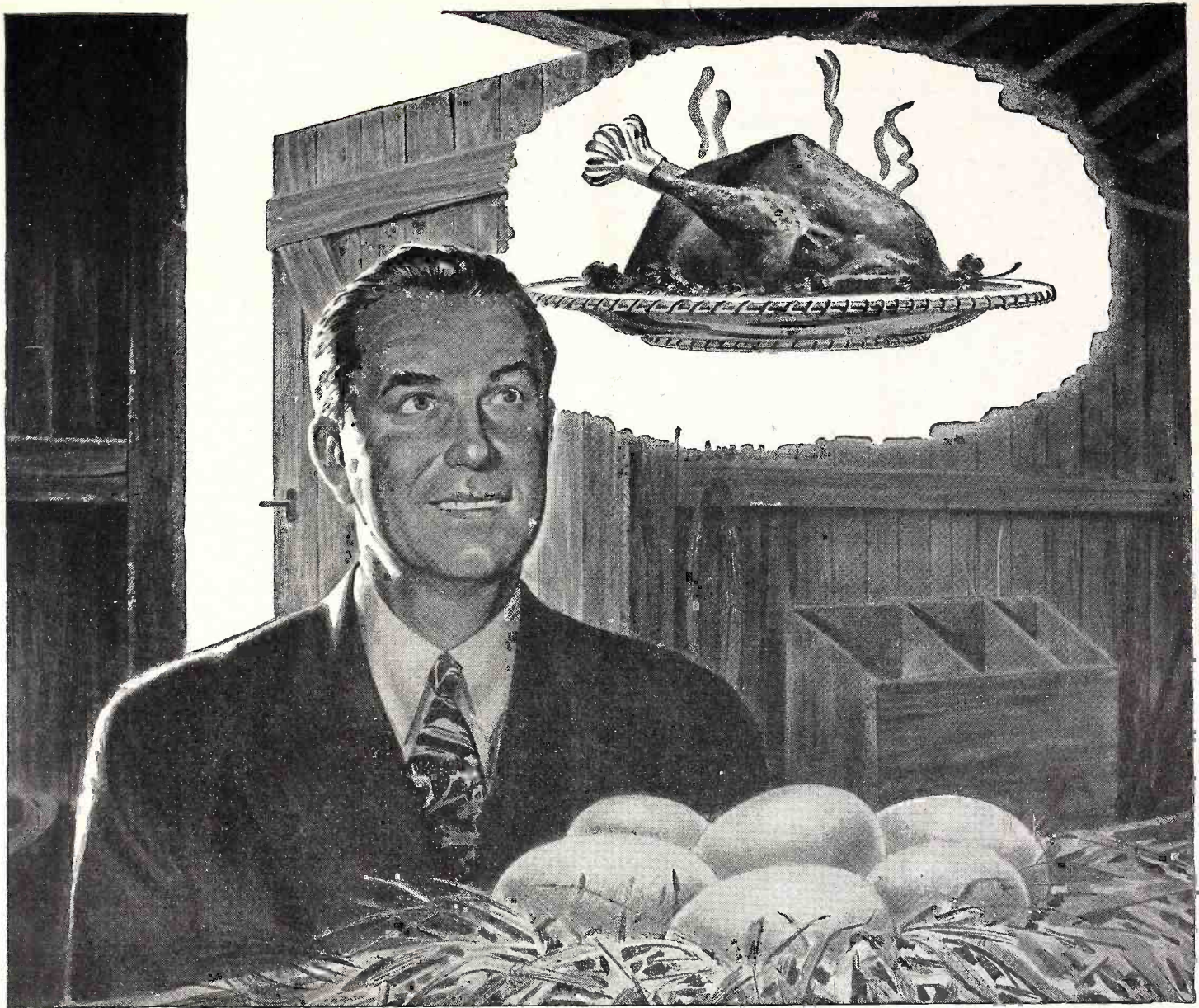
Attractively styled. Ingenious mounting gives minimum lateral and vertical needle pressure. Low fundamental frequency eliminates resonant peaks.



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It's usually a wise rule not to plan a chicken dinner before the eggs are hatched.

But not always!

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surest way to save money . . . and they've proved that buying Bonds on the Payroll Savings Plan is the easiest way to pile up dollars that anyone ever thought of.

So keep on buying Savings Bonds. Buy them at banks, post offices, or on the Payroll Plan. You'll be building real financial security for yourself, your family, and your business.

Best of all, you *can* count your chickens before they're hatched . . . plan exactly the kind of future you want, *and get it!*

SAVE THE EASY WAY... BUY YOUR BONDS THROUGH PAYROLL SAVINGS

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CIRCUIT COURT

(From page 30)

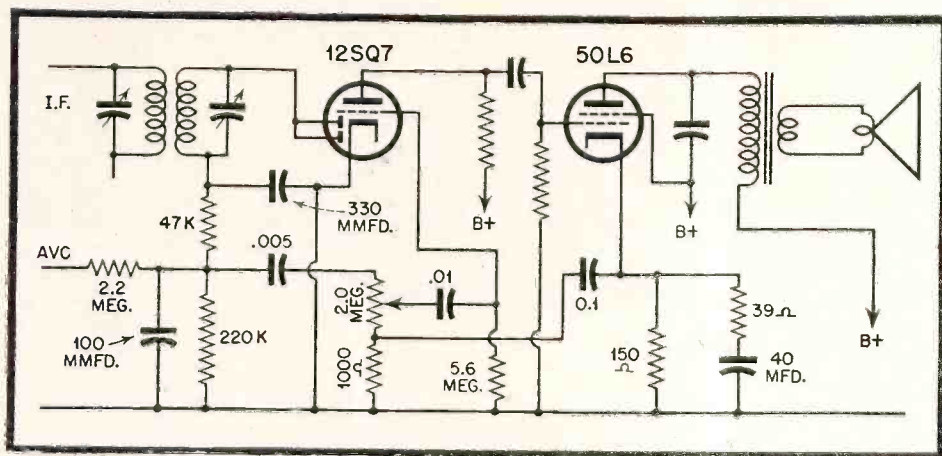


Figure 5. General Electric Models 100, 101, 103, 105.

is commonly acknowledged and compensation is widely used in good quality receivers to offset the loss. It is standard practice to tap the volume control at one or two points and shunt series R-C circuits to ground to provide the needed boost.

Not so common is the compensation for high frequency tones which also fall off as the arm is moved down the control.

Fig. 4 shows the compensation provided by a 47 mmfd capacitor from the

audio source to the compensation tap, as used in the new Westinghouse Models H-125 and H-126. Some of the highs pass around the unused portion of the control to the tap, usually placed at the most used point of control.

AUDIO FEEDBACK CIRCUIT.

A variation of inverse feedback (used in Westinghouse models above) is shown in Fig. 5. It will be observed that audio voltages appearing across the 50L6 bias

resistor are not quite all shunted by the 40 mfd. by-pass because of the 39 ohm series resistor.

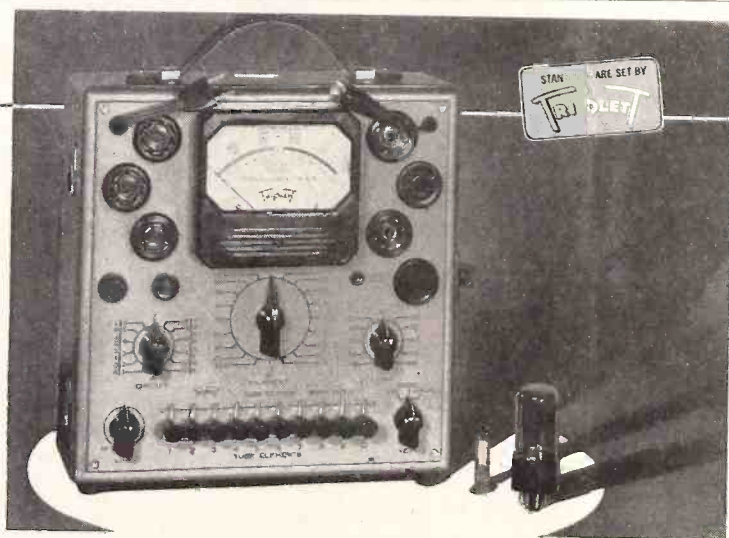
The small percentage of the audio voltage, in phase with the plate variations of the 50L6, is applied to the grid of the first audio, 12SQ7 triode section.

This application is via the .1 mfd. coupling condenser to the bottom of the volume control, which is 1000 ohms above ground.

A certain amount of bass boost should result from this method of feedback, particularly at low volume control settings. The usual reduction in distortion and hum provided by degenerative feedback should also be obtained.

Aerovox's Alexander

Widely known as "Alec" among radio-electronic and electrical manufacturers, Lou Alexander is rounding out his second decade in Aerovox sales and his third in the capacitor field, having previously sold another leading brand. He is one of the "old timers" in radio, having been active commercially since 1918 when he started with the old DeForest Radio Company.



A New TRANSCONDUCTANCE READING Tube Tester

For the Man Who Takes Pride in His Work

Micromho (Dynamic mutual conductance) readings and simplified testing—are two of the 20 exclusive features found in the new model 2425 tube tester. Transconductance readings are made possible through a simple measurement directly proportional to Gm and a properly calibrated measuring instrument. No possibility of grid overloading. "Short" and "open" tests of every tube element. Gas test rounds out full check of all tubes. New Easy-Test Roll Chart. These exclusive features, amplified by Triplett Engineering, make Model 2425 the outstanding 1947 tube tester.

Precision first

Triplett

...to last

ELECTRICAL INSTRUMENT CO. BLUFFTON, OHIO

Phase Inversion Circuits

(From page 19)

plates of the output tubes. If the voltages obtained are equal, balanced conditions will be obtained.

An interesting test is described by Reich. Connecting a pair of earphones in series with a .1 mfd. condenser across the cathode bias resistor, as in Fig. 10, we inject also an audio signal at the input terminals. If the phase and magnitude relations are correct, the return signals flowing in this resistor will cancel each other, and no fundamental component of the signal will be heard. However, any second harmonic component present will be heard, since the cathode current components of both tubes in the cathode resistor are in the same direction (Fig. 11.) If a condenser bypasses the cathode resistor it must be temporarily disconnected for these tests.

Phase measurements may be made with an oscilloscope. Connections to the push-pull grids will reveal inverted patterns if the phase relations are correct.

The quickest check, often used by experienced servicemen, is to remove one of the push-pull tubes during actual operation, observing whether or not any audible change takes place. If the tone quality is impaired, if the power supply hum becomes more audible the operation is normal and correct. If no change occurs, a defect is most likely present.

IN TRADE

(From page 12)

Park Place, New York City 7, N. Y., announces a new 16 page catalog of interest to all radio servicemen and dealers. Amongst the many products carried in stock and described are some of the latest developments in test equipment and sound apparatus, including volt-ohm-milliammeters, signal generators, tube testers, oscilloscopes, vacuum tube voltmeters, signal tracers, audio amplifiers, phonograph players, automatic record changers, loudspeakers, tubes, microphones, antenna kits, radio text books, etc.

The first is headed by Harry Adelman, well-known throughout radio circles for over fifteen years. A free copy of the booklet will be forwarded upon request.

Capacitor Bulletin

A new, illustrated bulletin, just released by the Electrical Reactance Corporation, Franklinville, New York, describes in detail the characteristics

of the company's line of Hi- Ω Silver Electrode Ceramic Capacitors. This bulletin covers the CI Type of capacitor with axial leads. It is attractively printed in color and contains diagrams showing the construction of the capacitor and photographs illustrating the various steps of manufacture and tests applied to control quality during the manufacturing process. Complete specifications and capacitance values are included, together with type designations according to JAN specifications. A bulletin may be had free upon request.

VHF Transmitter

A very high frequency transmitter for the private flyer, specifically designed to meet the requirements of the

new program of the CAA Federal Airways Service, has been announced by George Myrick, Manager of Personal Aviation Sales for the Bendix Aviation Corporation's radio division.

Long an advocate of VHF equipment for personal planes, Mr. Myrick declared that the new Bendix transmitter will permit the flyer to call a control tower or ground station on very high frequency channels instead of being restricted to the crowded low frequencies. To handle these calls, the CAA Airport Control Towers will maintain a listening watch on 131.9 Mcs., and CAA Airway Ground Stations will listen on 131.7 Mcs.

"Now that VHF transmitters will shortly become available to private

(See page 40)

NOW!

New Smart Style MASCO MODEL MPT-4 Portable Electric Phonograph with built-in amplifier



Order Now for Xmas Business

Compact! Acoustically designed for splendid performance. Modern two-tone beauty for eye appeal as well as tone appeal.

A fast moving consumer "package" item that sells off the counter and needs no installation or servicing.

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SOUND SYSTEMS and Accessories

RAvenswood 8-5810-1-2-3-4

IN TRADE

(From page 39)

flyers," Mr. Myrick said, "the CAA is hastening the conversion of equipment throughout the country. They feel that the majority of towers will be ready for this service by January, 1946, and that many ground stations will be ready by March, 1946.

"Within a relatively short period of time," he continued, "aircraft radio transmitters designed to operate on the 3105 KcK. frequency will be just another memory to the vast majority of private pilots since, with the avail-

ability of VHF equipment and the conversion of CAA towers and ground stations to the new frequencies, rapid steps will be taken to discontinue the use of the 3105 Kc. frequency."

W. L. Webb, Director of Engineering and Research at Bendix Radio, has encouraged consideration of VHF to improve communications for the private flyer for over six months, but production schedules could not be established until the present frequency assignment was made by the FCC and

the CAA program announced.

"We will soon be ready to put the Bendix transmitter design into production," declared Mr. Webb. "The new VHF transmitter is lightweight, low-cost equipment adapted to the long-term requirements of the private flyer. For two-way communication at present, it may be used in conjunction with low frequency (200-400 Kc.) receivers already installed in many private aircraft. Hence, the pilot of the plane can transmit on the very high frequencies and hear ground station replies, radio range, and broadcast on the low frequency receiver. Later, a VHF receiver and omni-directional range attachment may be added.

"Channels provided in the transmitter design are adequate for the present, and, at the same time, anticipate prospective additions to transmitting channels during the life of the aircraft," continued Mr. Webb. "The new equipment includes crystals for the two channels now assigned and provides for the addition of three extra crystals for other VHF channels which may be designated when the increased number of flyers causes radio congestion in the future. Furthermore, the choice of channels is easily handled by the pilot since the equipment is so small that it fits the front panel of the aircraft, and the crystal selector switch is within easy reach.

"To those who used VHF for air-to-ground and ground-to-air communication during the war, its many advantages over the use of low and medium frequencies are obvious. Atmosphere static is almost entirely absent, some man-made static is low, and the line of sight limitations are especially adapted for air communication because of reduced interference between stations beyond line of sight. It requires only a 26 inch vertical antenna of the rod or whip type instead of a trailing wire that has proved dangerous for the inexperienced pilot. The transmitter does not require high power and yet provides reliable communication at distances to 50 miles at 1500 feet altitude over most terrain and greater distances at higher altitudes."

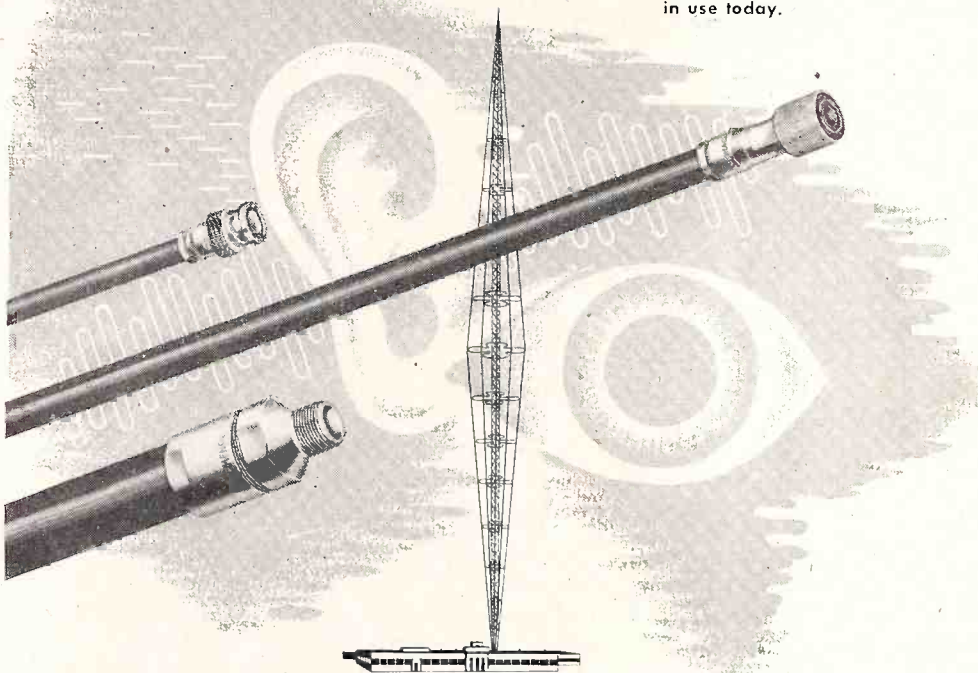
Radio Alarm

General Electric announces a bedside clock-radio set that automatically wakes you with your own brand of music. And for heavy sleepers, the set has an auxiliary resonator that sounds a few minutes after your "wake up" music comes on. The set is now in production in Bridgeport, Conn., and it is planned to make it available to the public this summer at a cost of \$27.35 except in the far west where the price will be \$28.70.

Amphenol

provides the link in **AM** **FM** **TV**

A complete range of electronic components to serve the entire range of frequencies in use today.



• As the emphasis in communications development shifts more and more to the higher frequencies — notably FM and Television — the electrical circuits and the component parts involved require ever greater accuracy in performance. Amphenol engineers have always worked to help push forward the frontiers of the science of electronics — the unrivalled production facilities of Amphenol have supplied the quality components required by new developments in this field.

Among the newest Amphenol products that will be of interest to amateurs and to manufacturers of elec-

tronic equipment are: electrically better Hi-Q tube sockets, octal angle sockets for cathode ray and other tubes — Twin-Lead parallel transmission line — several FM receiving antennas — new cables, including some special ones for Television color cameras and for Facsimile work. Write for complete information.

AMERICAN PHENOLIC CORPORATION
CHICAGO 50, ILLINOIS
In Canada - Amphenol Limited - Toronto



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

MERCHANDISE PRE-VIEWS

(from page 25)



Bendix Model 667, table radio-phonograph. AC-DC or self-contained long-life battery operation; 3 gang condensers; 5-inch Alnico V PM speaker; snap-apart cabinet. Superhet circuit, five tubes and rectifier; lucite dial and speaker grille; built-in antenna; tuned R-F amplification. Underwriters' approved.

1117-B; radio-phonograph with FM and shortwave; in mahogany swing-a-door console cabinet. Superhet circuits for AM and FM with ten tubes and rectifier. 8-button automatic tuning; built-in FM dipole plus super-signal antenna and

short-wave antenna. Full standard broadcast band; full FM reception; spread band short-wave, 6-14 mc. Push pull beam power output; tuned R-F amplification; 8 watts undistorted output; full tone feedback circuit. Automatic record changer; featherweight crystal tone arm, long-life needle. Underwriters' approved.

Model 636-A; superhet, 5 tubes and rectifier; 1-piece plastic cabinet. Full standard broadcast; all enclosed back; three gang condenser; R-F amplification. 4x6 Alnico oval speaker; two-position



Bendix Model 687-A; 3-way portable.



Bendix Model 1117-B, automatic radio-phonograph, with FM.

tone control with phono-changeover switch; phono plug-in jack connections. AC-DC operation. Underwriters' approved.

Model 1417-A; radio-phonograph with FM and shortwave in mahogany swing-a-door console cabinet. Superhet circuits for AM and FM; 13 tubes and rectifier. 8-button automatic tuning; full FM reception; full standard broadcast reception; short wave coverage, 6-14 mc. Dual coaxial speakers including 14-inch electromagnetic and 5-inch high frequency speaker; 15 watts undistorted power output with push-pull; continuous tone control for treble and continuous tone control for bass plus HF speaker switch; 3-gang condenser. Automatic record

(See page 43)



High Efficiency Auto Antennas

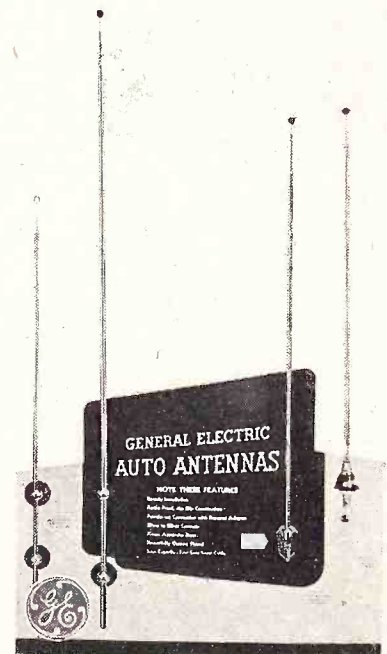
PUT more mileage on your cash register with this distinctive line of auto antennas. They're a hit with the car owner every time he hits the road. Built to pull in programs clearly, they keep noise reception at a low level. Designed to fit every car, these five models are bound to pull in profits for you. It's a self-starter program with plenty of powerful sales follow through. For more information, write: *General Electric Company, Electronics Department SD-6810, Syracuse 1, New York.*



Check and double check this list of

FEATURES:

- Completely equipped with a newly developed low capacity, low loss lead cable.
- Speedy installation, positive interference-proof, lead coupling.
- Ferrule-set connection with bayonet adapter.
- Rattle-proof, no-slip, fluid type construction.
- High efficiency, low resistant silver to silver contacts.
- Finest Admiralty brass, beautifully chrome plated.



Free display board with every order for 24 antennas.

GENERAL ELECTRIC

168-E3

Order from LAKE!
You'll Make No Mistake!

RADIO CABINETS & PARTS

NOW AVAILABLE!
Postwar 2 Post RECORD-CHANGER



with luxurious brown leatherette portable case, 15" L. x 15" W. x 10" H.

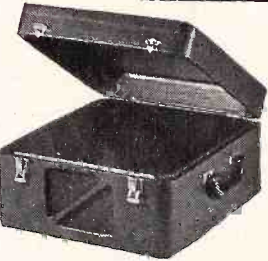
D. Latest electronic developments make this modern record-changer the finest on the market today!

Changer **\$18.50**
 Cabinet for same..... **8.95**

DE LUXE RECORD-CHANGER and AMPLIFIER CASE

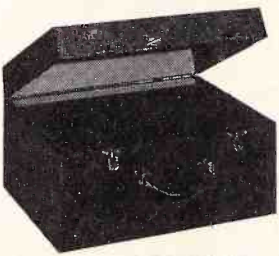
De luxe changer case with ample room for amplifier. Overall dimensions, 20" L. x 16" W. x 10" H. Sturdily built of 5/8" plywood, de luxe brass hardware throughout. Inside dimensions: 15 1/2" L. x 14 3/4" W. x 9 1/2" H.

Net **\$12.95**



DeLuxe PHONO CABINET

Covered in luxurious, genuine brown leatherette, has deluxe brass hardware throughout, made completely of plywood with brown plastic handle, has padded top and bottom. Motor board 14" x 14 1/2". Overall dimensions 16" L. x 15" W. x 8" H. Your net price..... **\$8.95**



Portable Phono-graph Case of sturdy durable plywood, in handsome brown leatherette finish. Inside dimension 16 1/2" long, 14" wide, 9 1/2" high. Has blank motor board. As illustrated. Specially priced at

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Dept. E

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615 W. Randolph Street
Chicago 6, Ill.

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(From page 41)

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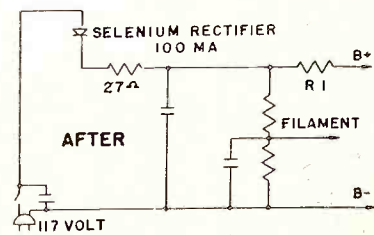
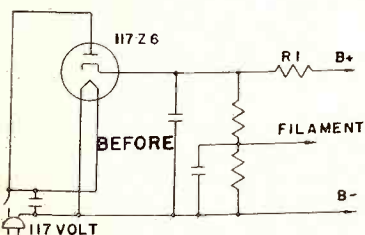
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12 issues \$2—24 issues \$3 in U.S.A. & Canada. Elsewhere \$3 per year.

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342 Madison Ave., New York 17, N.Y.

Gentlemen: Send the next issues of RADIO SERVICE DEALER for which \$..... is enclosed.

Name.....
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Zone..... State.....
Firm Employed By:.....
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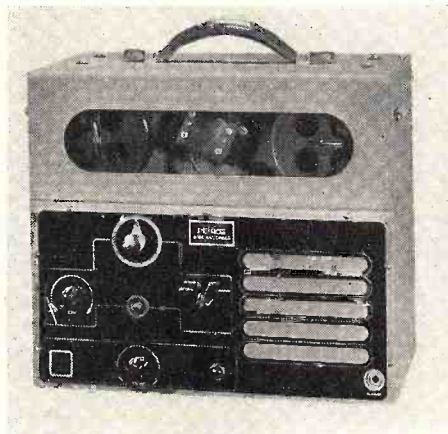
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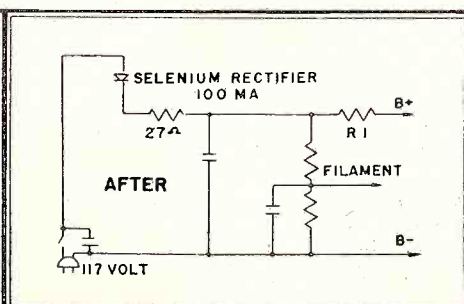
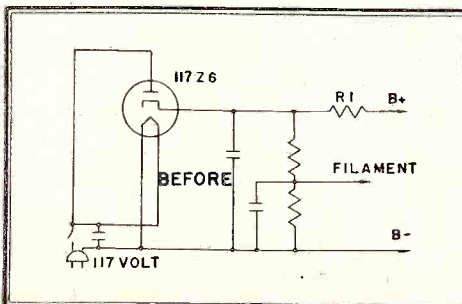
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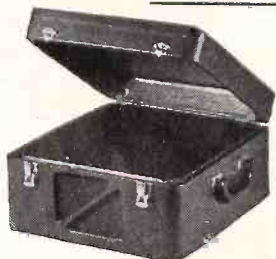
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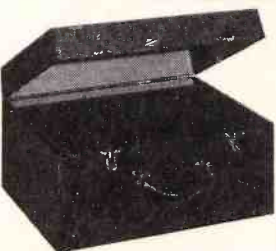
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two improved and perfected postwar models, one for all heavy-duty office, dictation, transcription and play-back purposes, the other a portable model for 2-way air communication, use by field workers, news and radio reporters, etc.

The heavy-duty business unit now has all the added features for which business men and educators have been asking, adapting it to dictation and transcription uses of all sorts. Remote control permits dictation to the Recorder from 50 to 100 feet distance . . . and in transcribing, the secretary or typist controls the Recorder by a button attached to the typewriter or by a foot pedal—leaving her hands free for her typing.

In recording, sound is "frozen" magnetically on a thin stainless steel "thread" which comes in reels weighing only a few ounces and having a capacity of 66 minutes to over 2 hours continuous recording. Anything from personal dictation to a sales meeting, a training course or even a convention can be recorded, through one mike or a

(See page 44)

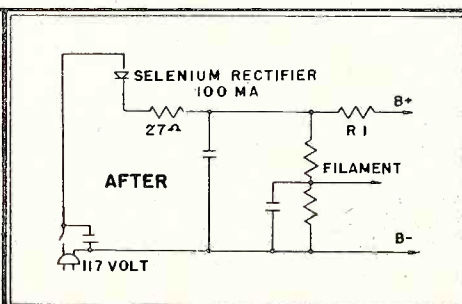
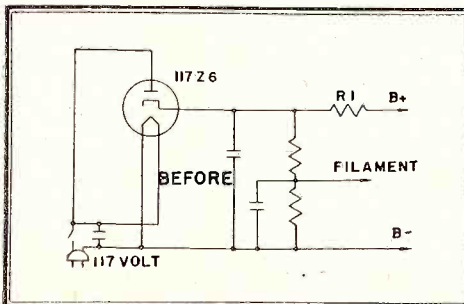
Below: Heavy Duty Wire Recorder



Selenium Rectifiers Available

Manufacture of selenium rectifiers is now in full production and all orders are being filled promptly. The serviceman can obtain these rectifiers by filling out an "order-velope." These "order-

velopes" together with descriptive broadside have been mailed out to servicemen and dealers throughout the country. This item is made by Federal Telephone and Radio Corp., Newark, N. J.



LOOK AHEAD



"RSD" publishes more authentic articles on new servicing methods and new test equipment than other magazines. Trouble shooting is made easier—time is saved—more jobs can be done at greater profit.

Merchandising guidance is given to Service Dealers—from the 1-man shop owner to the biggest establishment. It's important to know how other successful Service Dealers conduct their business.

Every issue of "RSD" carries Service Data on the popular new radio receivers now being manufactured. These Data Sheets fit into standard manuals—should be kept until new manuals are available—every technician wants this service!

"RSD" carries more advertising from more manufacturers catering to Service Dealers. Subscribe to "RSD" today.

USE THIS COUPON. RETURN IT WITH YOUR MONEY-ORDER

12 issues \$2—24 issues \$3 in U.S.A. & Canada. Elsewhere \$3 per year.

RADIO SERVICE DEALER
342 Madison Ave., New York 17, N.Y.

Gentlemen: Send the next issues of RADIO SERVICE DEALER for which \$..... is enclosed.

Name.....
Address.....
City.....
Zone..... State.....
Firm Employed By:.....
Position or Title.....

MERCHANDISE PRE-VIEWS

(From page 43)

mixer controlling 4 mikes. The pickup has extremely high sensitivity and the sound can be amplified to any de-

sired degree.

Messages may be played back as much as 100,000 times without loss of

Season's Greetings from

RADIO PARTS Company Christmas GIFT SPECIALS

RADIO CHANGER Combination

In beautiful two-tone cabinet. 5-tube A.C. Superheterodyne Radio Complete with Crescent Changer

\$69⁵⁹



APPLIANCE DEPARTMENT

TWO-BURNER ELECTRIC HOT PLATE



3 Heat. High Quality materials used throughout.
\$7.05 each

\$6.99

Lots of Six

We have a complete stock of Radio tubes and Standard Radio Parts.

Write us for any of your needs in replacement parts. Also carry a complete line of sound equipment.

Send for our latest post-war catalogue.

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Two models to choose from
Medium weight, non-automatic **\$4.45**
Rheostat controlled, light-weight **\$5.95**

FULL-SIZE BROILER

Bakes—Grills—Fries—Broils—Roasts—Toasts.
All parts rust proofed, made of High-finish heavy gauge aluminum.
High and low heat Range.
Comes complete with juice rack and cord.
\$12.60

RADIO PARTS COMPANY
612 W. Randolph St., Dept. D, CHICAGO, ILLINOIS

SPEED UP REPAIRS WITH THESE G-C AIDS!

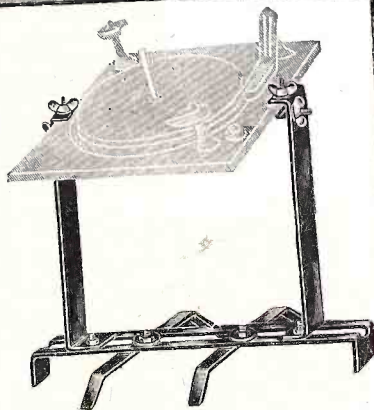


Two Popular
New Additions
to the Famous
G-C Line!

G-C De Luxe "SPEEDEX" Wire Stripper Kit
Handiest tool in the shop—the famous Speedex Wire Stripper complete with 7 interchangeable blades for stripping any size wire from No. 8 to No. 30. Put up in attractive permanent steel box. Available with Automatic or Regular Strippers.

No. 733-K Regular List Price \$15.00
No. 744-K Automatic List Price 17.00

SEND FOR
LATEST G-C
CATALOG No. 147



G-C Phono Turntable Service Stand

This quickly adjustable phono service stand supports turntable at any convenient angle. Top or bottom mechanism can be worked on with ease. Definitely saves time and prevents damage to parts. Rugged—all steel—low cost.

No. 5205 List Price \$6.65

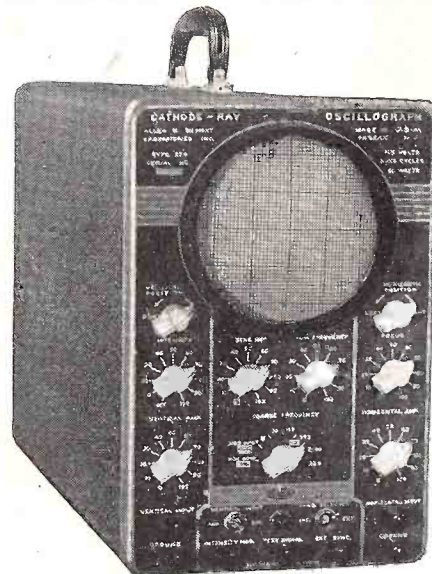


GENERAL CEMENT MFG. CO.
ROCKFORD, ILLINOIS

volume or tone quality. The record spools offer the most compact permanent method of filing important statements, and can be mailed or carried for branch or field use. "Wire letters" may be sent immediately on completing dictation, with no typing delay. There is an automatic 2-way telephone pickup.

Low Price Oscillograph

The new Du Mont Type 274 cathode-ray oscillograph answers the long-standing need for a good oscillograph for routine laboratory and production testing, and also for radio servicing, at the low cost of \$99.50. Equipped with Du-



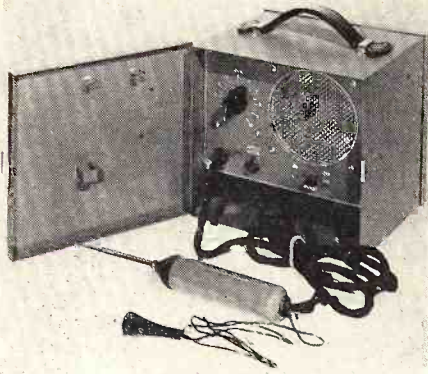
Mont Type 5BP1-A 5" tube, it is housed in a sturdy green wrinkle-finish steel cabinet with plastic carrying handle. The modern design green front panel has white lettering and black knobs. Measurements are: 14" h., 8 $\frac{5}{8}$ " w., 19 $\frac{3}{8}$ " d., weight 35 lbs.

The linear time-base has a range of 8 to 30,000 c.p.s. Synchronization may be from the vertical amplifier or an external signal. Identical vertical and horizontal amplifiers have a range from 20 to 50,000 c.p.s. There is provision for intensity modulation.

Further technical details are: Input impedance: vertical-direct 5 meg. 50 micro-microfarads; vertical amplifier 1 meg. 40 micro-microfarads. Horizontal-direct 5 meg. 60 micro-microfarads; horizontal amplifier 5 meg. 40 micro-microfarads. Frequency range: Sine wave response (at full gain) uniform within plus or minus 20% from 20 to 50,000 c.p.s., down less than 50% at 100,000 c.p.s. Deflection sensitivity: Amplifiers at full gain, 65 r.m.s. volt/in; direct, plus or minus 18 r.m.s. volts/in.

Battery Operated Sig Tracer

A new portable battery operated signal tracer for radio repair technicians has been produced for sale through radio parts distributors according to E. P. Eldridge, president of Special Products Company, Silver Springs, Maryland.



Signal Tracer

The new SPECO instrument housed in a sturdy gray crackle finish steel case with carrying handle, weighs only 4 lbs. 10 oz. and has an overall size of only 5 3/4 x 6 1/4 x 6 1/8 inches. The operation is said to be extremely sensitive and absolutely hum free. Low drain tubes have been used to assure long battery life.

A safety feature is found in the design of the cover which makes it impossible to close the case with the power switch on. An extra long fine probe enables the user to get at hard to reach spots in the radio circuit under analysis. Lead to the probe is of adequate length to permit the user to place the unit on a car seat while checking an auto radio. This feature means the service man need not pull the auto set out of the car to check the circuit.

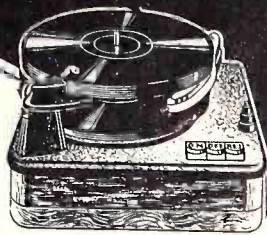


Crystal Controlled Oscillator

Bliley Electric Company, Erie, Pennsylvania, announces a test instrument, completely crystal controlled, engineered for greater proficiency and accuracy in radio alignment. This crystal controlled oscillator, known as the CCO, employs Bliley low temperature coefficient quartz crystals, stable to within plus or minus 0.1% to provide direct crystal control, with instant selection, of the five most commonly used intermediate frequencies—175 kc, 262 kc, 370 kc, 455kc and 465 kc. Direct crystal control is also provided at 200 kc for r-f alignment and at 1000 kc for short wave alignment.

(See page 46)

R-L SPECIALS FOR PROFITABLE XMAS Promotions



WIRELESS PHONOGRAPH WITH AUTOMATIC RECORD CHANGER

No wires to connect. Just plug in and play through radio. 45 minutes of uninterrupted plays of 10 or 12 inch records without reloading. For 110V. 60 cycle operation. Complete with open type walnut veneer cabinet. Shipping weight 14 1/2 lbs.

B6200 Net, **\$26.97**
Each.....



TABLE MODEL RECORD PLAYERS

Beautifully designed cabinet of matched birch veneer. Built-in amplifier. 5" PM speaker with Alnico #5 magnet. Lightweight tone arm assures longer life for records. Shipping weight 17 lbs.

B6201 Net, **\$26.97**



PORTABLE MODEL RECORD PLAYERS

Similar to model B6201, with wood case covered in smart two-tone leatherette. Shipping weight 17 lbs.

B5816 Net, **\$28.22**

Write for Free 1946 Parts Catalog

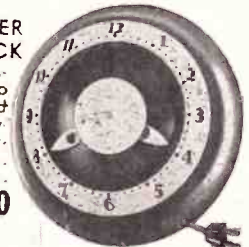


731 West Washington Boulevard
DEPT. S CHICAGO 6, ILLINOIS

AMERICAN TIMER ELECTRIC CLOCK

8 inch diameter plastic case with sweep second disc enclosed in glass face. 60 cycles-110 V. A.C. current. 12 to carton. App. weight 1 lb. ea.

B6050 Net, **\$4.20**



IMMEDIATE DELIVERY!

Clinton Walnut Automatic Radio Phonograph Combination

Model 5015

Beautiful walnut cabinet with hand rubbed piano finish, lid of seasoned walnut with core 13/16" thick, guaranteed against warping, 18 3/4" D. x 10 1/2" H. x 16" W. 5-tube radio, 6" dynamic speaker with Alnico five magnet, heavy duty power transformer, complete with tubes (6SA7, 6SR7, 6C5, 6V6, equi. 6X5) takes 12-10" or 10-12" records, automatic Crescent changer, dual volume and separate tone controls

\$56.00



Model R5515 Clinton Electrola Automatic Radio Phonograph Combination

Expensive luxurious leatherette, brass hardware throughout with saddle stitched leather handle, 15" D. x 9 1/2" H. x 21" W.

5-tube radio, 6" dynamic speaker with Alnico five magnet, heavy duty power transformer, complete with tubes (6SA7, 6SR7, 6C5, 6V6, equi. 6X5) takes 12-10" or 10-12" records, automatic Crescent changer, dual volume and separate tone controls

\$49.50

20% deposit required on all orders
Write for our new illustrated catalog;
it's FREE!

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UNION Radio Corporation

328 S. Paulina • Chicago 12, Ill.

Here's the INSIDE STORY



Clarostat MT Tube-type Resistor with casing removed, showing mica "card" support, wire windings and Glasohm for main load.

★ Clarostat originated and pioneered the tube-type or plug-in resistor. And Clarostat—is still the only one that offers these features:

- Mica Support for Windings
- Glasohms for Main Loads
- Positively Centered Support
- Windings Cannot Sag or Short
- Positively Char-Proof Throughout
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Remember this inside story when buying tube-type resistors. Don't be satisfied with less! Ask your jobber for Clarostat MT Resistors. Ask for latest catalog—or write us.



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

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NOW IN STOCK!

McMURDO-SILVER "Vomax"	\$59.85
McMURDO-SILVER "Sparx"—signal tracer	39.90
SIMPSON 215 v.o.m.	32.50
SIMPSON 260 v.o.m.	38.95
TRIPLETT 666-H v.o.m.	20.00
TRIPLETT 2432 signal generator	88.50
SUPREME 565 vacuum tube voltmeter	63.50
SUPREME 576 oscillator	68.95

Also, many, many others in stock!

14 Watt EASTERN amplifier	\$38.22
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5" PM speakers—alnico 5 magnet	1.65
5" 1000 ohm dynamic speakers	1.90

25% deposit with order, balance C.O.D.

— SEND FOR NEW FREE CATALOG! —

SCENIC RADIO & ELECTRONICS CO.
53 Park Place • Dept. S • New York 7, N. Y.

Merchandise Pre-Views

(From page 45)

An external socket is provided to accommodate special frequencies that may be required. A three position modulation selector and a five step attenuator with vernier output control from 0 to 15 volts provide finger-tip operation. Power consumption is 17 watts at 110 volts a-c or d-c. No warm-up period is necessary since the crystals are on frequency as soon as the oscillator is energized. Complete description of the unit and its use is contained in Bulletin 32, now available on request direct and from authorized distributors.

Monel Rivets

Cherry Blind Rivets are now available in Monel as well as aluminum, brass and steel. Since Monel has very high strength, remarkable ductility and excellent resistance to corrosion, the rivet is a "general purpose" rather than a "special purpose" fastener. It is made in self-plugging and pull-through hollow; in the two standard head styles, modified brazier and 100° countersunk; in 1/8", 5/32", 3/16" and 9/32" diameters; and in a wide range of grip lengths. Other head styles and 7/32" diameter are available on special order.

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For Hams and Servicemen

SPEAKERS—4" Alnico 1 oz.	\$1.59 ea.
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POTENTIOMETERS—All values, shaft lengths 1 1/2" - 2"; Mfg. Allen Bradley, IRC, Clarostat	.39 ea.
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.5 mfd.—600V	.65 ea.
Lots of 5	\$2.75
Other Sizes Available.	
CONDENSERS—Mica-Range: .00001 mfd.—.0005 mfd.	.32
Lots of 5	.08 ea.
RESISTORS—Carbon, Insulated All values	
1/2 Watt Lots of 100	\$2.70 .04 ea.
1 Watt Lots of 100	\$3.70 .05 ea.
2 Watt Lots of 100	\$7.70 .09 ea.
100 pcs. Mixed Lot of 1/2 Watt and 1 Watt	
Lots of 100	\$2.65

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SPECIAL TUBE OFFER

Carton Packed No. 80....R.C.A., Sylvania, G.E. (List Price .95 ea.)45 ea.

Write for hard-to-get requirements not listed. \$2.00 min. order. F.O.B. N.Y.C. Add postage. 50% deposit, balance C.O.D. with all orders.

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25% with order, Balance C.O.D.

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And Electrical Appliances

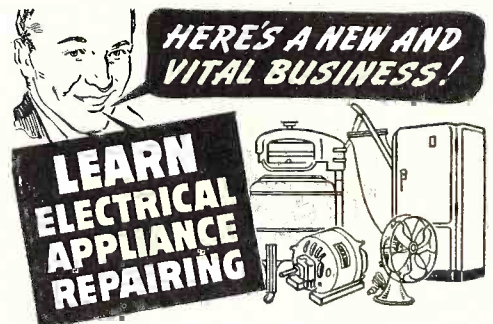
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SHEFFIELD

RADIO & APPLIANCE CO., INC.

Wholesale Distributors of
Electrical Appliances
And Radios

916 Belmont Ave., Chicago 14, Ill.

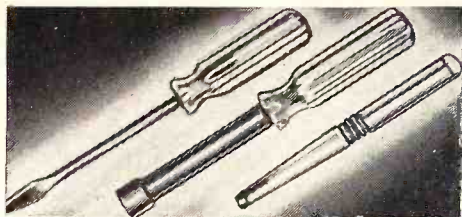


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If you are mechanically inclined—can hold and use tools it will pay you to learn electrical appliance repairing. Operate from your garage, basement, etc. Work as many hours as you wish—the appliance repairman is his own boss. On many types of repairs it is usual for a repairman to charge on the basis of \$5.00 to \$6.00 an hour!

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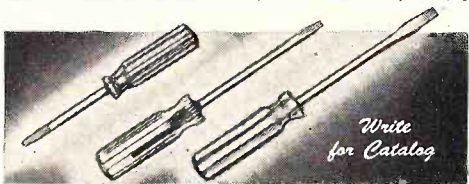


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RADIO NEED
there's a fine
VACO

Shock-Proof • Break-Proof
Amberyl Plastic Handle
SCREW DRIVER
to do the job better!
173 TYPES



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Canadian Warehouse: 560 KING STREET, WEST • TORONTO 2, ONTARIO

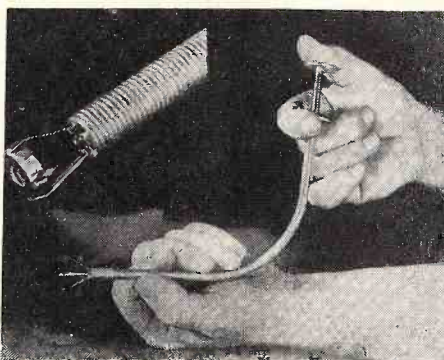


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1003	100	1 Watt Resistors, All Insulated...	4.45
1004	50	2 Watt Resistors, All Insulated...	3.98
1005	10	Wire Wound Resistors Ass'd Watts	2.98
1006	50	200 Volt Paper Condensers.....	2.48
1007	50	400 Volt Paper Condensers.....	3.49
1008	50	600 Volt Paper Condensers.....	4.25
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For further information, the company is located at 2726-28 Brentwood Blvd., St. Louis 17, Mo.



Flex-o-Claw

The Flex-o-Claw is a handy tool, made of all steel wire, 1/4" in diameter, and is made in four lengths to suit every mechanic's need. It is used to install or retrieve small parts, nuts, screws, etc., in otherwise inaccessible areas.

Descriptive literature and prices are available by writing Angelus Tool Mfg. Co., 3060 W. Pico Blvd., Los Angeles, Calif.



Small Lighter "B" Battery

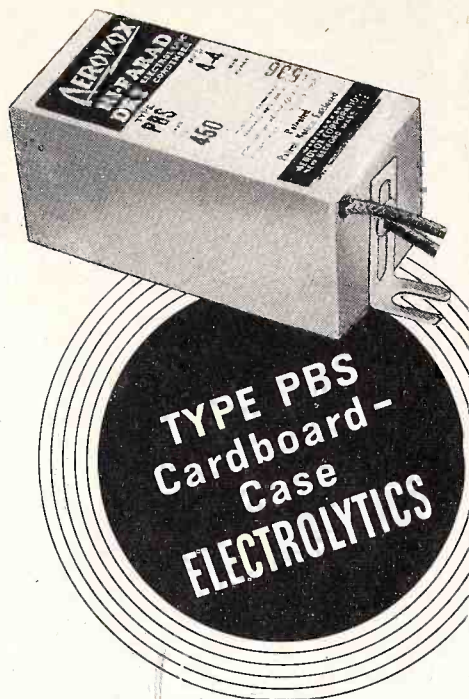
A new 45 volt B battery having an increased life but only half the weight and size of pre-war models has been developed by "Eveready" Batteries as power for the auxiliary equipment of commercial radio transmitters, as standby power for amateur radio transmitters, and for emergency mobile radio power supply. It is also useful for portable amplifiers, electronic testing and measuring equipment.

SHOP NOTES

(From page 36)

capacitor is obtained. It must be remembered that the frequency and attenuation setting on the signal generator used to obtain the graph, must be used in all subsequent measurements, otherwise the readings become meaningless.

It will be found that the higher the frequency used the smaller will the value of capacitance that can be measured.



● There are good reasons why Aerovox Type PBS cardboard-case electrolytics are so popular: (1) Exceptionally compact; (2) Can be mounted flat, on edge, upright, or stacked, by means of adjustable mounting lugs; (3) Pack a lot of working voltage capacitance, long life; (4) Low cost; (5) Choice of single-section, 450 and 600 v. D.C.W. Also in double- and triple-section, 450 v.

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Ask to see these Aerovox Type PBS cardboard-case electrolytics. Try them. Ask for latest Aerovox catalog—or write us.



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\$1.00 PAID FOR SHOP NOTES

Write up any "kinks" or "tricks-of-the-trade" in radio servicing that you have discovered. We will pay \$1 for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor," RADIO SERVICE DEALER, 342 Madison Ave., New York 17, N. Y. Unused manuscripts cannot be returned unless accompanied by stamped and addressed return envelope.

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Element cement. Withstand 3000° F. 1 lb. pkg. \$1.00; 5 lb. pkg.	3.50
Lead wire. Asbestos covered heater hook-up wire. 10 ft.	1.00
Iron Cord Sets with complete plug attach- ments. 10 for	5.00
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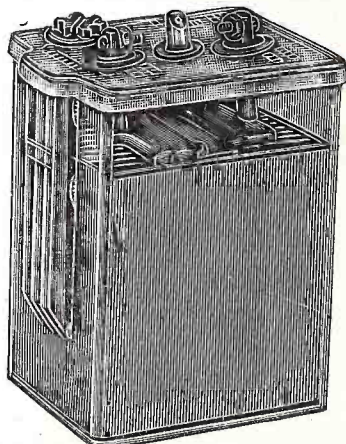


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**WILLARD Type 20-2
2 Volt STORAGE BATTERY**
at RIDICULOUS LOW PRICE



**EXACT REPLACEMENT FOR "GE"
MODEL #530 PORTABLE RADIOS**
also suitable for other types. In an attractive
Spill-Proof Clear Plastic Case, Size 3 3/8" x 3 1/2"
x 5 1/2" high. Uses regular battery electrolyte.
Every One BRAND NEW in individual cartons.
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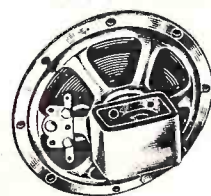
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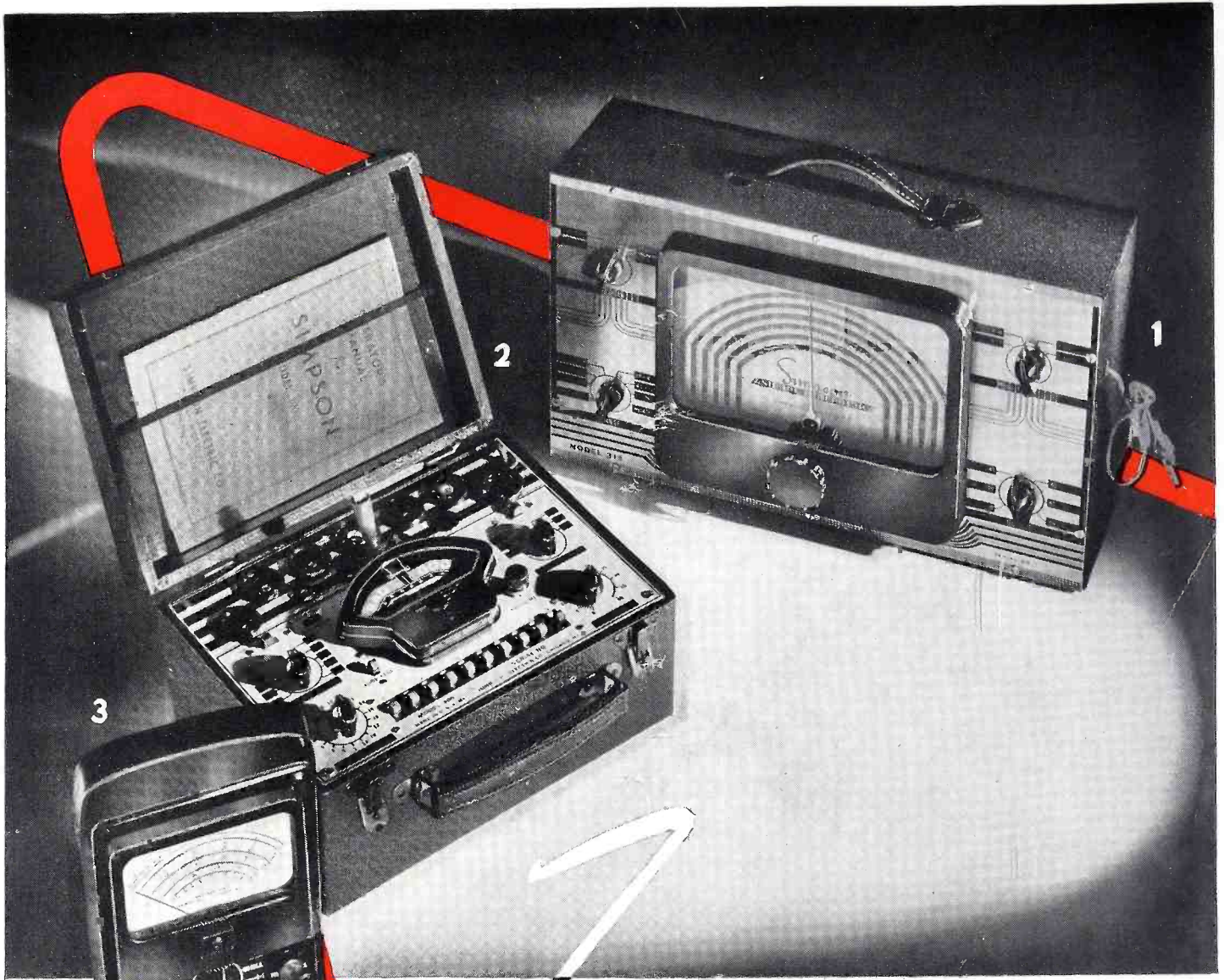
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