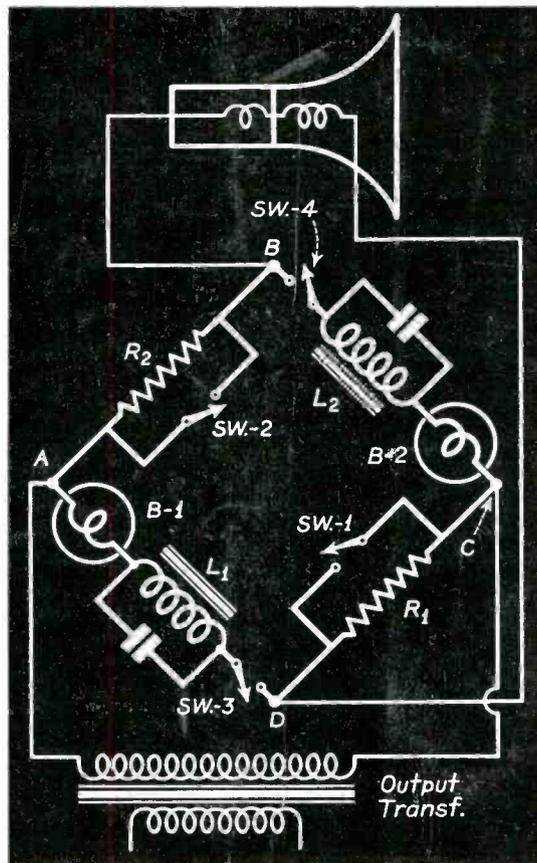


SERVICE

A MONTHLY DIGEST OF
RADIO
AND ALLIED MAINTENANCE

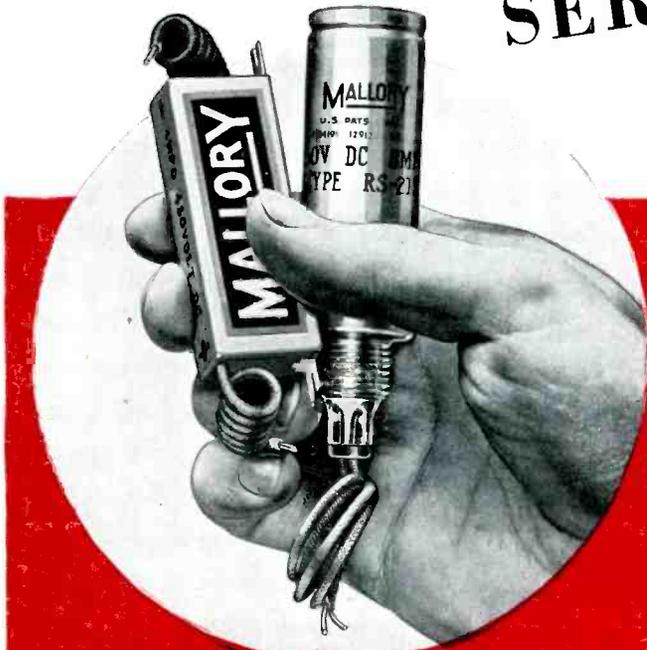


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New Volume Expansion Circuit
(See Page 102)

MARCH
1936

PRECISION ENGINEERING WORKS WONDERS for SERVICE MEN



Mallory Condensers are manufactured under
U.S. Patents 1716973, 1741191, et al.

Now... 69
MALLORY
REPLACEMENT
CONDENSERS
give universal application

You'll appreciate how precision engineering helps service men when you see how these Mallory Condensers offer practical universal mountings for both carton type and round can condensers—

- how precision engineering develops absolute protection against humidity
- how precision engineering makes practical smaller sizes with greater efficiency
- how precision engineering has with 69 condensers provided the complete answer to the condenser problems of over 29,000 service men.

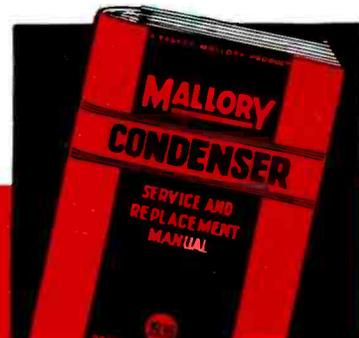
And you will appreciate just how precision engineering counts for you when you read the new Mallory Service and Replacement Manual which gives in detail the universal application of these Mallory Condensers in every day service work.

*Five you receive your copy? If not, write
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Cellophane separators—
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improvements pioneered or de-
veloped by Mallory are incor-
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Helpful Service Data + Money-Making Suggestions
 + Practical Ideas



**A MONTHLY CONSULTATION SERVICE AVAILABLE TO
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This complete, practical and handy bulletin is distributed each month by your General Electric Radio Distributor. It's filled with the kind of information most needed in your service work . . . concise, accurate service data . . . descriptions of new models and accessories . . . charts, diagrams . . . answers to your questions on service problems . . . announcements of coming Service Meetings . . . and dozens of other interesting subjects.

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GENERAL  ELECTRIC

The Original Metal-tube Radio

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONN.

SERVICE

A Monthly Digest of Radio and Allied Maintenance
Reg. U. S. Patent Office. Member, Audit Bureau of Circulations

MARCH, 1936

EDITOR
Robert G. Herzog

VOL. 5, No. 3

EDITORIAL CONTENTS

FEATURES

- Microphone Characteristics for P-A Service
By C. J. Brown..... 112
New Volume-Expansion Circuit..... 102
The Noise Silencer in Practice..... 103
Uplift in the Service Industry..... 101

ANTENNA 96

ASSOCIATION NEWS 126

AUTO RADIO

- Philco Correction..... 122
Wells-Gardner 6R..... 121

CIRCUITS

- A Noise Silencer Circuit..... 103
A Versatile Adapter for Octal Tubes..... 124
G. E. Models A-52, A-55..... 111
New Howard A-C, D-C Receivers..... 107
New Volume-Expansion Circuit..... Front Cover
RCA Victor Model D7-7..... 104
RCA Victor T 7-5, T 8-14, T 8-16, T 10-1,
T 10-3 Speakers..... 118
Stewart-Warner R-139-D..... 108
Wells-Gardner 6R..... 121
Wells-Gardner 6R Circuit Change..... 122

GENERAL DATA

- A Noise-Silencer Circuit..... 103
G. E. Models A-52, A-55..... 111
New Howard A-C, D-C Receivers..... 106
New Volume-Expansion Circuit..... 102
RCA Victor Model D7-7..... 104
Stewart-Warner R-139-D..... 106

HIGHLIGHTS..... 134-136

MANUFACTURERS..... 128-132

ON THE JOB

- A Versatile Adapter for Octal Tubes
By Al. Beers..... 124
Keeping the Iron Clean..... 124
Motorboating..... 124
Replacing the Defective Volume Control
By George Mucher..... 124

PUBLIC ADDRESS

- Microphone Characteristics for P-A Service
By C. J. Brown..... 112

RECEIVER CASE HISTORIES..... 116-118

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News for Servicemen

MR. SERVICEMAN!

**When you want to test tubes—
you want to test tubes!**

Your time is money—When testing tubes, you do not want it to be necessary to wiggle a tube to be sure it is contacting in the socket.

HERE'S AN INSIDE STORY—

About two years ago we were asked by an instrument manufacturer to please design a socket particularly for test instruments—to disregard cost—but make it so that it would last a lifetime—with just one other requirement—make it so that the tubes would slip in and out easily.

The result was the development of our floating "tuning fork" contact socket. "Inside facts" give further details.

You will find this socket on what perhaps are the leading makes of test equipment both here and in Canada—such as those that have received the award for the best electric product designing of the year.

Although we were told to disregard cost, the price is not excessive; 40c and 50c are the list price for most types and their excess cost to instrument manufacturers is probably not over five cents over the cheapest type of sockets. If your present instruments don't have this new socket, we suggest changing, so that you will not have contact failure at some inconvenient time.

Na-Ald Inside Facts on the Na-Ald Floating "Tuning Fork" Contacts

The reason for the unusual life of this new type contact is simply this. The extreme amount that the metal has to flex is never over six thousandths of an inch. If metal, no matter what kind, has to move a thirty-second or more, continual movement sets up crystallization and sooner or later results in breakage—Nearly all conventional sockets fall in life tests somewhere between 5 and 40 thousand tube insertions—A recent test on one of our 438TF sockets ran to over one and three quarter million insertions.

By punching the contact from flat stock, we can maintain the extreme precision of $\pm .0005$ of an inch. This, of course, would not be possible in any bent contact.

Now, by making the contact float, it finds the bent tube prong or the tube prong that may be improperly located. The float is most important and the contact needs to be supported from the bottom.

Another point of design is the control of the molding, so that prongs go in straight—and that the opening angle of the contact is such that no tube put in the socket at the greatest possible angle can open up or spring the contact.

In our first model of a socket for the octal base tubes, we attempted to use a contact suspended from the top of the socket—Failure to adjust itself to the irregularities in location and bent prongs found in these tubes made it unsatisfactory. We therefore changed the design to the bottom floating support as used in our other sockets.

A further precaution found in these contacts is their silver plating—this penetrates the pores—silver oxide is a conductor—thus if contacts are not used for a period of time, they contact as perfectly as a fresh contact. Furthermore, if the surface silver does wear off, there is no corrosion as the pores are filled with silver—thus perfect contact continues.

Now life tests are one thing. Service records are another. The first Na-Ald "TF" contacts were used in the 1934 season in one of our so-called combination sockets. Exact records are kept by one of the large instrument manufacturers of exactly every reported failure reported or found in any of their instruments. The reports record no failure of a tuning fork contact.

Lastly the contact metal is harder than the brass tube prongs with the result that the tube prongs wear instead of the contacts—In the life test mentioned innumerable tube bases had to be replaced in the life test machine as the prongs were worn flat where they met the contacts.

A simple contact—but a good one—"IT'S THE CONTACT THAT COUNTS."



Mounting Hole 1-3/16" Dia.
Mounting Centers 1-19/32"

Number	Type	List Price
424TF	4-Contact "T.F." Socket	.40
425TF	5-Contact "T.F." Socket	.40
436TF	6-Contact "T.F." Socket	.40
437TF	7L-Contact "T.F." Socket	.40
467TF	6-7L Contact "T.F." Socket	.50
438TF	8-Contact "T.F." Socket	.40
438TFE	8-Contact (1-11/16" centers)	.40
456TF	4-5-6 Contact "T.F." Socket	.50
467TF	6-7L Contact "T.F." Socket	.50
477TF	7L-7S Contact "T.F." Socket	.50

Have you had a chance to try—see and feel the operation of the new Na-Ald Toggle-Lock Analyzer Plug and compact Associate Adapters?

If you appreciate fine design—if you like the most convenient and efficient equipment, make sure to see it.

The releasing action of the toggle will please you. The actuating lever extends so that with just a bit of pressure, the toggle releases and off slips the adapter.

The calculation of the leverage, tension of the spring and the whole design is such that it is just a delight to put the adapter on the end of the plug, feel it slip into place, and the toggle lock click into a locking position.

There is perfect insulation between each prong, so that it will withstand a breakdown test of three thousand volts.

Incidentally, in developing this job, five complete sets of tools were made and one discarded after the other because we saw the possibilities of an improvement. We felt that we should be only justified in making this product the best that could possibly be devised.

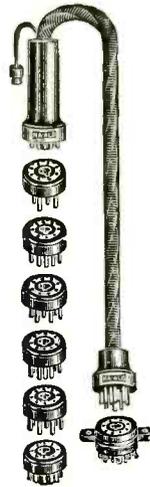
Such are some of the costs that go into Na-ald products.

YOUR TIME IS MONEY!

Thus on adapter equipment on which the tests need to be conclusive, one faulty adapter, one cantankerous piece of equipment going haywire on one job can easily offset the few cents extra that Na-ald products sometimes cost.

Now as to the Associate Adapters—

They have been made compact—less than 9/16" high. No studs on top of the adapter taking up space in the analyzer case.



No.	List Price
908	Locking Type Octal Analyzer Plug.....\$2.50 (When 5 feet of 9-wire cable is attached with 9-prong cable plug and 9-contact socket to match).....\$3.00
984TLN	8 to 4 prong Associate Locking Adapter..\$1.00
985TLN	8 to 5 prong Associate Locking Adapter..\$1.00
986TLN	8 to 6 prong Associate Locking Adapter..\$1.00
987TLN	8 to 7 Large Associate Locking Adapter..\$1.00
987TLNA	8 to 7 Small.....\$1.00
988TLN	8 to 8 Octal.....\$1.00

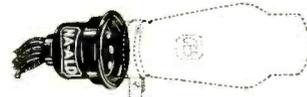
908CN Kit Complete kit as described above.....\$11.50

If you want the cheapest Analyzer Plug, yet one which has the locking feature, get our 907PTCA KIT with special Turn-Stud Lock on each of the 5 associated adapters.

Individually machine braided cable attached to plug.

Number	List Price
907PTA	Locking Plug..... .75
SMGD	Dual grid stud......10
5' 8-wire cable 1.50
974DTA	4-prong Adapter..... .50
975DTA	5-prong Adapter..... .50
976DTA	6-prong Adapter..... .50
977DTA	7-prong Adapter..... .50
978MTA	8-prong Adapter..... 1.00
907PTCA KIT	Complete.....\$5.35

EXTRA PROFIT COLUMN Here are the NEW 206FE "MAGIC EYE" Connector, Bezel, Holder and Cable.

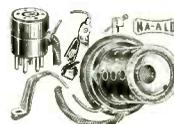


Here is the ideal complete "Magic Eye" outfit for quick installation. Put it on any receiver in a few minutes. Mounting screws easily reached from rear. Single knurled slotted nut rigidly clamps tube and connector in place and can be replaced in a few seconds. Same nut allows adjustment of angle of indicating target, also back and forth length adjustment.

Collar of connector made to protect from electrical shock. Mounting and wiring are saved by 1 megohm resistor connected across target and plate contacts in connector.

Space of mounting and connector the smallest possible to avoid pilot lights, dials and tuning condenser. Small foot that fastens holder can be rotated. Furnished with scientifically engineered escutcheon that shades the end of the tube to sharpen the contrast in the indicating sector yet provides the widest possible angle of vision of this sector. Escutcheon also covers end of tube excluding light from pilot or tubes.

206FE "Magic Eye" ConnectorList Price 25c
206FEC 206FE with CableList Price 75c
206H "Magic Eye" HolderList Price 25c
206B "Magic Eye" BezelList Price 15c
206FECB "Magic Eye" OutfitList Price \$1.15



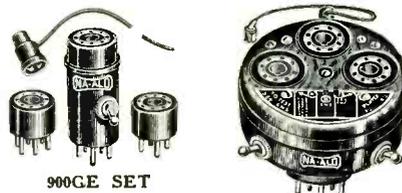
Here is the "Magic Eye" Adapter for adding the "Magic Eye" tube to any set having a. v. c. and six or 2½-volt tubes. Give tube number of output tube when ordering. List price \$3.50

METAL TUBE REPLACEMENT ADAPTERS LIST PRICE.....50c each

Servicemen now can easily modernize obsolete sets by replacing over 25 different glass tube types with new Metal Tubes by using these new tube modernizer adapters. Improves performance of sets. Order by tube number or write for catalog sheet giving complete information.



Here's the Story on Testing the New Metal Tubes



900GE SET

If your tube checker does not have the sockets required by the 900 RCA and 900 GE adapter sets, yet has a type 36 socket, get the

950GE Adapter (at right).....List Price \$6.50

If your tester can test the 37, 41, 42, 77, 78 and 80 tubes, get the

900GE Adapter Set (at left).....List Price \$4.80

TUBE CHECKER ADAPTER KIT 900-RCA

Here is the adapter kit as recommended by RCA engineers for RCA distributors and dealers. Thousands of these kits are now in use. Requires that tube tester be able to test 6A7, 42, 75, 76, 77, 78, 80 and 85 tubes to accommodate adapters.

900-RCA Adapter Kit List Price \$6.40

Na-Ald discounts to Jobbers are such as to insure your getting the fullest possible value for your money.

**Insist on genuine Na-Ald products
Write today for new 1936 general catalog**

ALDEN PRODUCTS CO.
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Brockton Mass.



ALDEN MANUFACTURING CO.



THE ANTENNA . . .

PUBLIC-ADDRESS HORIZON

THE PUBLIC ADDRESS SEASON is drawing near. With the first whiff of spring air, the public will make a dash for the great outdoors—and the public will be addressed from then on, whether they like it or not.

Public address is going to be more attractive this year than it was last. For one thing, remarkable strides have been made in the design of microphones, speech amplifiers, power amplifiers, power-supply equipment and loudspeakers. Equipment is more compact and more efficient. Frequency response has been extended and distortion has been reduced to an almost negligible quantity. Power-handling capacity has also been increased to the point where a comparatively small sized outfit will serve the average outdoor requirements.

One reason for the rapid increase in the usage of sound-amplification equipment is that it is no longer classed as a novelty. It has become a well established factor in everyday social and business relations. It has become a necessity in everyday life just as the radio and the automobile have become necessities.

Few people are better equipped to handle the installation and the rental of public-address equipment than the Service Man. He has the necessary technical knowledge to handle the jobs and he is always close at hand to take care of emergencies or breakdowns. As a business for the Service Man, it is a natural.

The p-a business is going to be particularly large this year, and the season is going to be longer. Intensive political campaigns in every city and town in the country are going to be carried on right through to election day, and plenty of p-a equipment will be needed. The rental business will be greater than ever.

Don't lose any time in getting lined up for the season. Get all the available dope on new equipment and accessories and get right in the rush with aggressive selling campaigns.

NOISELESS RECEPTION

WE ALMOST HAD THE noise problem licked until the all-wave receiver came along. Now conditions are worse on the short-wave bands than they were originally on the broadcast band.

There are thousands of people who get a tremendous amount of pleasure out of international short-wave reception, but their pleasure is quite often short-lived if they chance to live in a noise zone.

Properly installed noise-reducing antenna systems are a great help under such conditions; noise filters for connection between power line and receiver are also of great help if noise impulses are reaching the receiver through the feed wires. The Lamb noise silencer can relieve some pretty tough interference if the silencer is properly installed and adjusted.

But there are innumerable instances in which noise interference is best eliminated by filtering household equipment. We venture to say that at least 75 percent of such cases can be traced to sewing machines, vacuum cleaners, heating pads, etc., located within 100 feet or so of the receiver. These are the devices that raise havoc with short-wave reception.

No doubt there are thousands of people who would gladly pay a fair sum to have some local interference stilled. Of course, if the source of the interference

turns out to be a neighbor's sewing machine, it is probable that the owner of the sewing machine won't pay for the installation of a filter. But, one such machine located in an apartment house can ruin reception in a flock of receivers, and it seems reasonable to believe that the owners of the receivers would be willing to chip in and pay for the filter. The cost per person on this basis would certainly be low.

The only way to get this business is to go out after it. If Mr. Smith is bothered by noise interference he will in turn bother the landlord, the local power company, or the Federal Communications Commission. It will never occur to him that the noise may come from a nearby oil furnace or a set of electric trains—and it will never occur to him that the fellow who can help him in his difficulties is the radio Service Man.

You've got to do a bit of campaigning on your own hook before this sort of business will assume any appreciable proportions. You've got to let the radio public know that you are equipped to function as a noise detective. You've got to contact landlords and the local power company with a view to making arrangements with them to turn over to you the complaints they receive relative to radio program interference.

When you go out on a job of noise hunting, find out from your client if any of his neighbors are bothered by similar interference—then, when the noise has been located, tackle the lot of them on the idea of clipping in. Don't try to sell a filter installation to the person owning the offending electrical device, except as a last resort. The sale should be made to the person or persons anxious to have the interference eliminated. The owner of the interfering device doesn't come under this category.

• • •

BATTERY CHARGERS

ALONG ABOUT APRIL many car owners take their automobiles out of storage, dust them off, and—discover their battery dead.

A little salesmanship, and it would require only a little, and these car owners could be persuaded to buy chargers to pep up that old storage battery. Stress the fact that the added drain on the battery, what with the radio, cigarette lighters, etc., would undoubtedly run the battery down in short time necessitating another two dollar expense. It doesn't take many of these to pay for the charger in full.

• • •

TUNING INDICATORS

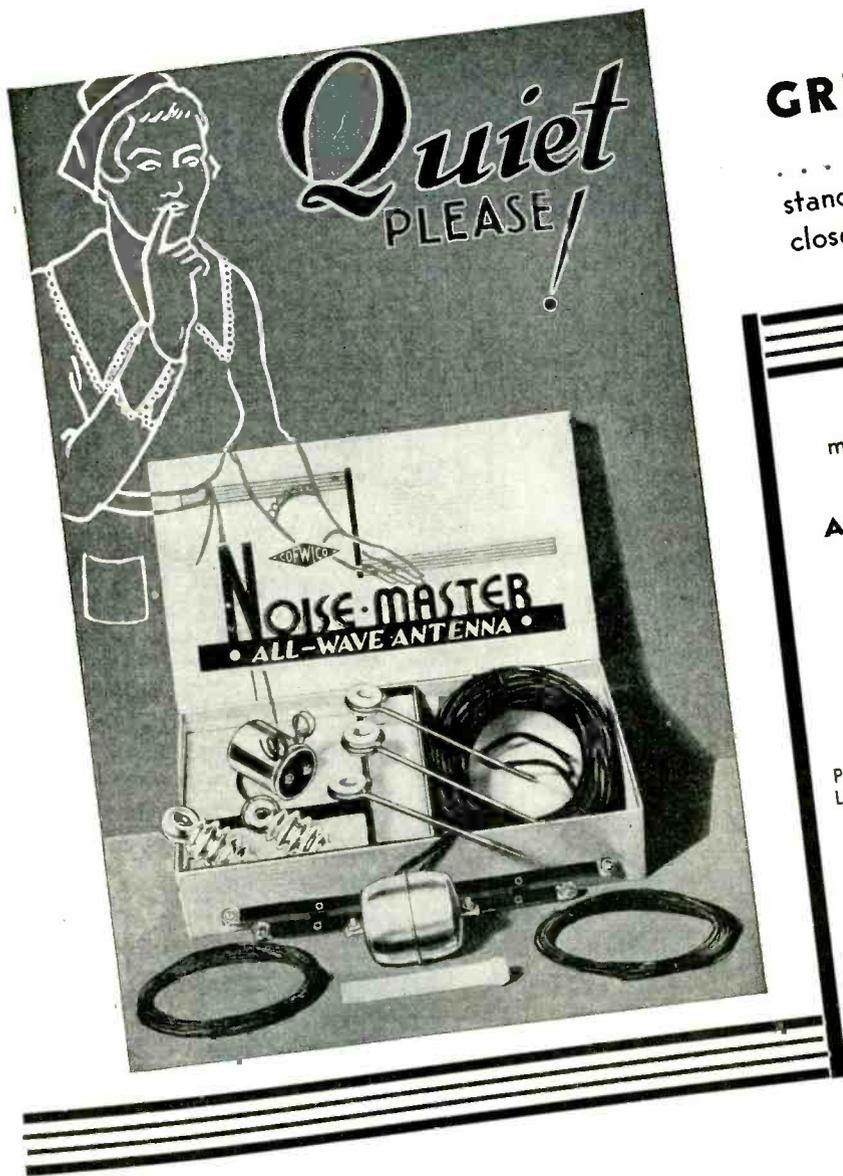
YOU CAN PERFORM a real service to owners of AVC receivers by installing electron-ray tuning indicators.

The installation is neither difficult nor costly and offers, aside from a bit of the theatrical and an insurance against mistuning, the very worthwhile feature of silent tuning.

Silent tuning is possible with a receiver having a resonance indicator since the indicator itself denotes the presence of a station carrier. Consequently, station tuning can be accomplished with the volume control turned down.

Don't forget the tuning indicator the next time a customer complains of between-station noise in an AVC receiver without automatic squelching.

• SERVICE FOR



GREETINGS, I. R. S. M.

... from an organization which understands your problems and is working closely with the Service Fraternity.

"NOISE-MASTER"

makes every receiving set a BETTER set

Electrically
AUTOMATIC
in Operation

List Price
\$6.75

with special transformers for European broadcast bands... List \$7.00

Also

"EMPEROR"

Cat. No. 11
Price List **\$4.30**

"CONQUEROR"

Cat. No. 12
Price List **\$3.40**



has always stood as a symbol of **QUALITY** and scientific precision. No better antenna materials or radio wire can be had at any price.

NOISE-MASTER ALL-WAVE ANTENNA

This problem of NOISE, Public Enemy No. 1 to All-Wave Reception, is ours and yours alike. With the splendid "NOISE-MASTER" unit, you can really build QUIET into any set, anywhere. "NOISE-MASTER" picks up and strengthens weak oversea signals, eliminates "man-made" static, improves broadcast as well as short-wave reception. It is the most flexible and effective unit of its kind, and should be in your "bag of tricks." May we suggest that you specify this remarkable aid to good radio performance on your next installation.

Write for Special Antenna Literature

CORNISH WIRE CO.
30 Church Street
New York City



Most Complete Transformer
Line in the World

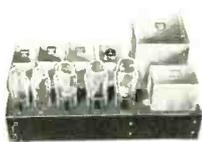
QUALITY · RELIABILITY



CK-1 AMPLIFIER KIT

The CK-1 amplifier has a power output of 10 watts normal—14 watts peak using 2A3 or 45 tubes in a prime operation. The overall gain is 48DB. Two push pull stages using 56's, or 2A3's makes possible a humfree high quality amplifier.

	List	Net
CK-1 transformer kit mounted on chassis	\$27.00	\$16.70
AK-1 accessory kit includes all necessary resistors, condensers, sockets, terminal strips, hardware, AC cord and plug, ready to wire....	5.75	3.45



CK-2 AMPLIFIER KIT

The CK-2 amplifier kit is designed for use with crystal microphones. The gain is in excess of 100 DB and the power output is 10 watts. Only four tubes are used, including the rectifier. The plates of the first 6A6 tube are cascaded to permit very high amplification and stable voltage transfer to the second 6A6 driver tube. The first 6A6 is arranged for push pull class B operation.

	List	Net
CK-2 transformer kit with CS-35 output, including chassis.....	\$19.50	\$11.70
AK-2 accessory kit includes all necessary resistors, condensers, sockets, terminal strips, hardware, AC cord and plug, ready to wire....	10.50	6.30



CK-7 METAL TUBE PREAMPLIFIER KIT

The CK-7 preamplifier kit uses two metal 6C5 tubes in cascade amplification. A 6C5 is used as a rectifier. Careful placement of parts and shielded components is responsible for the extremely low hum and noise level in the CK-7 preamplifier. The overall gain is 55DB.

	List	Net
CK-7 transformer kit mounted on chassis	\$16.00	\$9.60
AK-7 accessories includes all necessary resistors, condensers, sockets, AC-DC cord and plug, hardware, wire	6.00	3.60



CK-8 METAL TUBE SUPER POWER AMPLIFIER

35 watts undistorted output; will handle up to 20 dynamic speakers. 8 tubes used; 3-6C5 triodes, 4-6F6's in Pentode A prime connection. 1-5Z3 rectifier. 95DB gain. Input of amplifier will match crystal or ribbon mike outputs, also adapted for carbon or dynamic mikes through external transformer input.

	List	Net
CK-8 transformer kit mounted on chassis	\$34.00	\$20.10
AK-8 accessory kit for above—includes all necessary resistors, condensers, sockets, terminal strips, AC cord and plug, hardware, wire.	11.00	6.60

Here's what you
get for only 25c...

The NEW UTC Circular Slide Rule

The most useful instrument a radio engineer could have. Here are some of the electrical and mathematical problems to which it gives direct answers: MULTIPLICATION . . . DIVISION . . . PROPORTION . . . RECIPROCAL . . . SQUARES . . . SQUARE ROOTS . . . VOLTAGE DROP IN RESISTORS . . . WATTAGE IN A RESISTOR FOR GIVEN VOLTAGE OR CURRENT . . . IMPEDANCE OF AN INDUCTANCE AT ANY FREQUENCY . . . IMPEDANCE OF A CONDENSER AT ANY FREQUENCY . . . RESONANCE CALCULATIONS . . . EFFECTIVE CAPACITY OF CONDENSERS IN SERIES . . . EFFECTIVE RESISTANCE OF RESISTORS IN PARALLEL . . . CALCULATION OF BIAS RESISTORS . . . POWER LEVEL CONVERSION TO DB . . . VOLTAGE OR CURRENT RATIO CONVERSION TO DB GAIN . . . SOUND AND LIGHT CALCULATIONS . . . CIRCUMFERENCE AND AREA OF CIRCLES . . . STROBOSCOPE FOR CHECKING 33-1/3 OR 78 RPM TURNTABLES. Due to its 16 inch effective length, the accuracy of this rule is greater than many of the standard rules selling at 30 times its price.

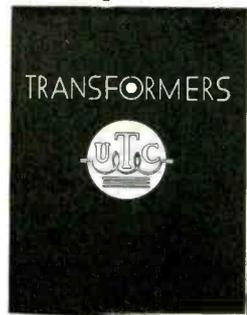
NEW UTC Transmitter Bulletin

Covering circuits and laboratory built transmitters from 5 watts to 1,000 watts output.

A.I.L. Laboratory Circuits

As they are released over a period of one year covering new amplifiers and variactor controlled carrier RF transmitters.

NEW 48 Page Technical Bulletin



which includes data and circuits on amplifiers from 1/2 watt to 1,000 watts output, chapters on audio transformer design, application of power transformers and filters, also charts on decibel conversion in terms of watts and conversion of power or voltage ratios to DB, reactance data, filter ripple calculations, etc.

SEE US AT THE
IRSM SHOW—BOOTH 71

Six national representatives in constant attendance to give you all the information you may want.

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Wholesale Radio Service Co., 219 Central Ave., Newark, N. J.
Wholesale Radio Service Co., 430 W. Peachtree St., N.W., Atlanta, Ga.
Wholesale Radio Service Co., 911 Jackson Blvd., Chicago, Ill.
Sun Radio, 227 Fulton St., New York, N. Y.
Gross Radio, Inc., 51 Vesey St., New York, N. Y.
Leeds, 45 Vesey St., New York, N. Y.
Mohawk Electric Co., 1335 State St., Schenectady, N. Y.
Walter Ashe, 1100 Pine St., St. Louis, Mo.
Radio Shack, 46 Brattle St., Boston, Mass.
Harty and Young, New Haven and Hartford, Conn.
Marine Radio Co., 124-13 101st St., Richmond Hill, N. Y.

Film et Radio, 5 Rue Denis Poisson, Paris, France
Hall's, 35 So. Cameron, Harrisburg, Pa.
Herbach & Rademan, 438 Market St., Philadelphia, Pa.
Radio Electric Service, 7th and Arch Sts., Philadelphia, Pa.
Cameradio Company, 603 Grant Street, Pittsburgh, Pa.
W. H. Edwards & Co., 32 Broadway, Providence, R. I.
Seattle Radio Supply, Inc., 2319 Second Ave., Seattle, Wash.
San Francisco Radio Exchange, 1284 Market St., San Francisco, Calif.
Peterson Lumber & Supply Co., El Paso, Texas
Rissl Brothers, 5027 Hamilton Ave., Detroit, Mich.
Amateur Radio Equipment, 138 East Butler Ave., Memphis, Tenn.
Northeastern Radio, 281 Columbus Ave., Boston, Mass.
Springfield Radio, 397 Dwight St., Springfield, Mass.
Kraus & Co., 89 Broadway, Providence, R. I.

Braid Electric Co., 107 Ninth Ave., Nashville, Tenn.
Wisconsin Radio Supply, 434 W. 8th St., Milwaukee, Wis.
Bruce Company, 206 E. Monroe, Springfield, Ill.
Beaulatre Company, 223 Broadway, Rochester, N. Y.
Dallas Electric Supply Co., Dallas, Texas
Strauss, Frank Co., San Antonio, Texas
Strauss, Frank Co., Houston, Texas
South West Radio Supply Co., 107 South St. Paul St., Dallas, Texas

SOUTHERN CALIFORNIA
Pacific Radio Exchange, Inc., 729 S. Main St., Los Angeles
Radio Supply Co., 912 S. Broadway, Los Angeles
Zack Radio Co., 1000 S. Broadway, Los Angeles
Radio Television Supply Co., 1701 S. Grand Ave., Los Angeles
Radio Specialties Co., 1816 W. 8th St., Los Angeles

UNITED TRANSFORMER CORP.

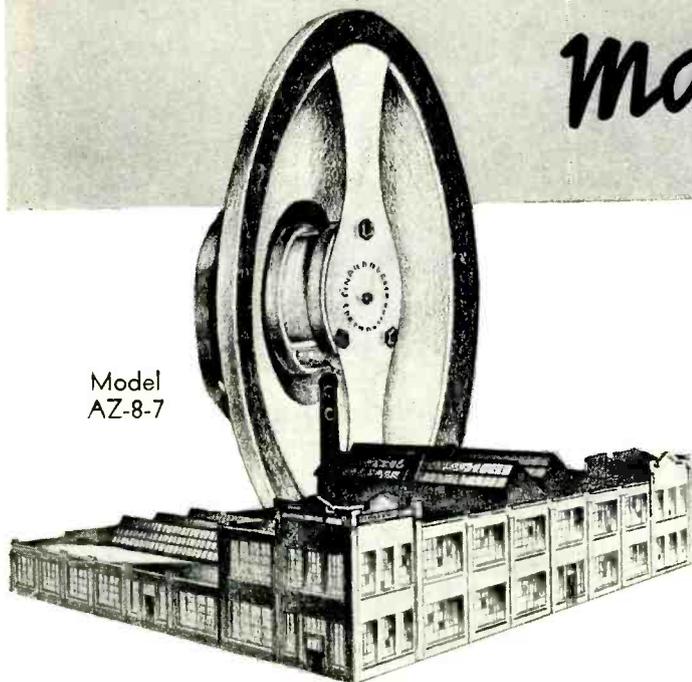
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NEW YORK, N. Y.

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The CINAUDAGRAPH

Magic Magnet^{*} SPEAKER



Model
AZ-8-7

TODAY, there is a *Magic Magnet Speaker*. Months ago, engineers dared visualize it. In the Cinaudagraph Laboratories, they conceived a speaker years ahead of its time; the first speaker to offer in combination five basic developments never seen or heard of before.

ASSEMBLED under one roof, in one of the largest, most modern speaker plants in the world, all parts required in the manufacture of the *Magic Magnet Speaker* are produced by or under the strict control of Cinaudagraph engineers. The *Magic Magnet* comes to you not only as the most remarkable speaker value in the world—but as the greatest MONETARY value as well!

WIDE-awake service men are going after Public Address work and going after it hammer and tongs with the new *Magic Magnet Speaker*. This is going to be a Public Address year—a *Magic Magnet* Public Address year—make no mistake about that! Cash in now—write for full description of the 8, 10, 12 and 18 inch *Magic Magnet Speaker* line!

★ "NIPERMAG"—the *Magic Magnet*, used exclusively in Cinaudagraph Speakers, should not be confused with other permanent magnet alloys now available on the American market. It is an exclusive Cinaudagraph product.

DESTINED TO REVOLUTIONIZE CONVENTIONAL SPEAKER CONCEPTS

In every detail of its design, its construction, its materials, the *Magic Magnet Speaker* is new.

• *It's New* in Cone Construction

A new polyfibrous material, developed and manufactured by Cinaudagraph exclusively, is presented for the first time in the *Magic Magnet Speaker*. Constructed so as to present a varying density of composition, this cone will transmit voice coil oscillations with uncanny fidelity. Shallow construction, overall speaker depth of 8 inch model only 2 $\frac{3}{8}$ "', makes it particularly suited for auto receivers.

• *It's New* in Magnetic Material

"NIPERMAG" a permanent magnet alloy presented for the first time in American speakers by Cinaudagraph engineers, has been and is being used extensively with great success in Europe. "NIPERMAG" reduces battery consumption, simplifies hook-up, (only two wires to attach), and makes humless reproduction possible in any application. It is the ideal speaker for farm receivers.

• *It's New* in Voice Coil Construction

A core of quartz silicate, a non-elastic, extremely dense mineral is used in the construction of the voice coil. The voice coil is designed so as to transmit frequencies without losses or deviations and to operate under adverse climatic conditions.

• *It's New* in Spider Construction

A centering device, an exclusive Cinaudagraph development, consists of an interlaced net, the extreme flexibility of which makes a really low note obtainable.

• *It's New* in Baffle Construction

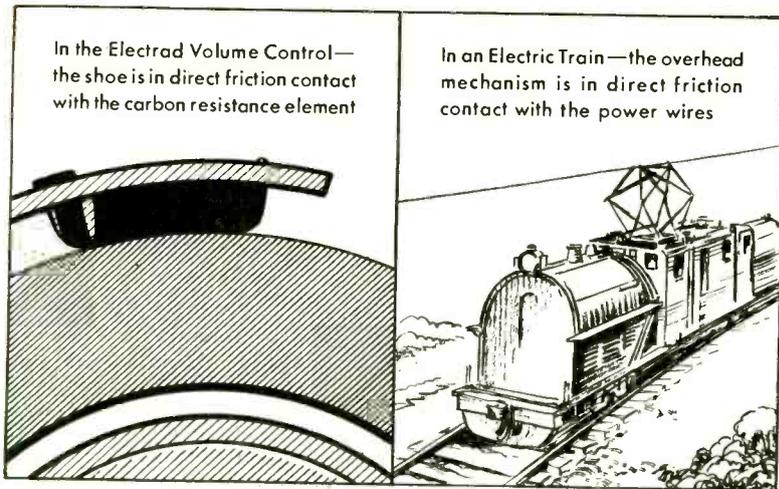
The Cinaudagraph *Magic Magnet Speaker* is designed to operate within an Infinite Baffle. This Infinite Baffle absorbs rear radiation, and allows only true, undistorted tones to emanate from the front of the speaker.

These five major engineering improvements contribute largely to the attainment of an extraordinarily flat frequency response of from 30 to 15,000 cycles. Extreme flexibility of the poly-fibrous cone makes possible the production of speakers to individual frequency requirements.

CINAUDAGRAPH CORPORATION

SPEAKER DIVISION—DEPT. A.

STAMFORD, CONN.



In the Electrad Volume Control—the shoe is in direct friction contact with the carbon resistance element

In an Electric Train—the overhead mechanism is in direct friction contact with the power wires

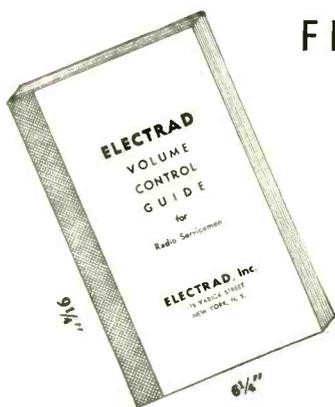
Not FRICTION-LESS but FRICTION-RIGHT

The direct friction contact principle used in the Electrad Carbon Volume Control is the basic reason for its smooth, quiet, electrically perfect operation.

Contact with the carbon resistance element is uniform and uninterrupted. There are no gaps to cause noise or stuttering. You can actually feel this steady, even contact as you turn the shaft.

Moreover, this friction contact has a self-cleaning and self-polishing action on the resistance element. The longer an Electrad Volume Control is used, the quieter it gets!

Use an Electrad on your next replacement job—and you'll have no kick back! Long aluminum shaft easily cut to required length, standard end covers instantly interchangeable with power switch assembly. All Electrad controls noise tested at the factory and fully guaranteed.



FREE—100 Page VOLUME CONTROL GUIDE

100 pages, listing in alphabetical order all receiver models for which Electrad standard or special replacement controls are made. Gives names of receiver manufacturers, model numbers, resistance values and list prices.

Mailed FREE if you send us the carton of any new type Electrad Carbon Volume Control, together with your business letterhead or card.

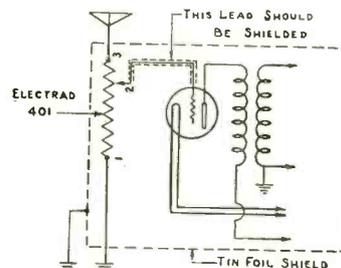
Address Electrad, Dept. S3
175 Varick St., N. Y. C.



Volume Control Hints for the Radiola 17 Receiver Using the Electrad 401 Control

Considerable difficulty has been experienced with the earlier models of the Radiola 17 receivers due to improper shielding. The volume control is connected in the antenna circuit and in sections where high signal levels are encountered, the volume of the receiver cannot be reduced sufficiently due to pick-up by the R. F. coils. In some cases, there is sufficient pick-up by even the third I. F. tube to cause difficulty.

A satisfactory solution may be found by lining the inside of the receiver cabinet with tin foil and grounding this. The lead from the rotating arm of the volume control to the grid of the first 26 tube is then shielded. This procedure will eliminate all pick-up and assure satisfactory volume control operation.



ELECTRAD

RESISTOR SPECIALISTS IN RADIO AND ELECTRICAL INDUSTRY SINCE 1923

SERVICE

A Monthly Digest of Radio and Allied Maintenance

FOR MARCH, 1936

UPLIFT IN THE SERVICE INDUSTRY

HOW do Service Men get that way? In answer to our query in December SERVICE, many Service Men have told us how and why they went into business. Several representative letters were published in Forum in our February issue. Ex-electricians, troubleshooters, graduate technicians with a yen for tinkering—they all drifted into servicing. Many considered it as a branch of electrical work or as a sideline to tide over seasonal slack in other lines. Others, stung by the radio bug, became Service Men when the depression forced them out of other jobs.

DEFINITE IMPROVEMENT SHOWN

Their early operations showed the results of this approach to their work. They were individualistic, sporadic, and somewhat inefficient. They bear the same relation to the present-day Service Man that Robert Fulton's Claremont bears to the ultra-modern Normandie. This is brought out by several significant developments.

The ever increasing registration for radio service courses in the R. C. A. Institutes, F. L. Sprayberry's, Capitol Radio Engineering Institute, etc., shows that the Service Man grew up, perfected his craft, and began to acquire the airs of a semi-professional.

The increasing demand for more intricate test equipment among Service Men is another indication of his improvement in technique and ability.

Although the radio union is not really a Service Men's organization—their refusal to become a branch of the electricians' union, demanding a separate organization, shows at least that radio men in general are aware of their separate identity and interests.

Another indication of the Service Men's improvement is the phenomenal growth in the attendance of the National Radio Trade Shows. As mentioned elsewhere in this issue, so great

have been the reservations for the 1936 event, that the IRSM has been forced to secure more space.

RCA ISSUES 3 POINT SERVICE

Should one still doubt these evidences that the Service Men, as an industry, is growing in size, dignity, and public consciousness, let him read a booklet entitled "101 Service Sales Ideas."

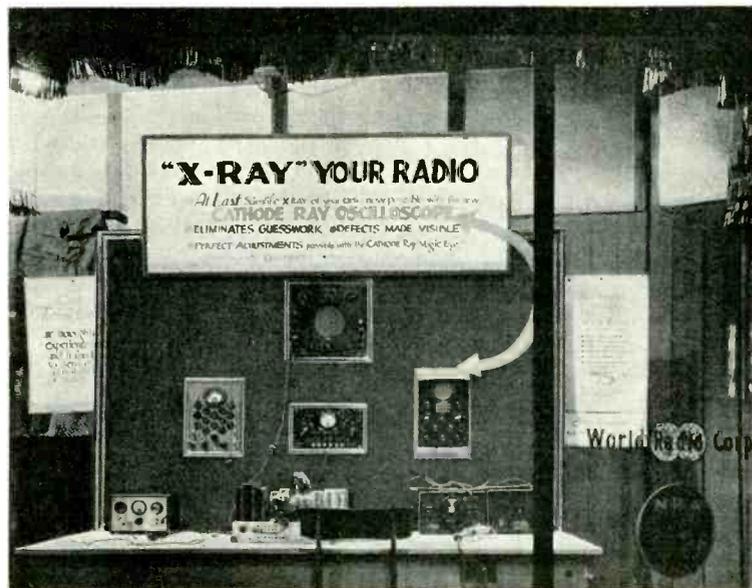
This booklet is one of a three-point service issued by R. C. A. Manufacturing Co., Inc. The others are a 200-card trouble locator, and a booklet on "Radio Service Business Methods" (by John F. Rider).

The "101 Service Sales Ideas" is a booklet which is just brimful of sound, ingenious, workable suggestions for getting and keeping customers, effective advertising hints, and other valuable

business-building material for the Service Man.

Unlike many publications of a similar nature, it does not appear to have been written by educated theoreticians as a result of the study of graphs and charts. Every idea or suggestion emanated from the successful experience of practical Service Men. The booklet does not presuppose that the average Service Man has at his command the budgetary resources to engage in a national advertising campaign of U. S. Steel proportions. It keeps within his modest limitations. The general tenor of the ideas is to raise the level of the Service Man to the dignity of a professional.

The Service Man as a professional is advised to join organizations, be a



An effective window display showing a neat service bench. Attention is directed to the modern service facilities.

good fellow, a factor in the community. He is imbued with a high ethical code, and a professional sense of public service. It is this sense of service which pervades all his business-getting activities and advertising. His aim should ever be to render satisfactory service, and to follow up and see that his clients receive such service.

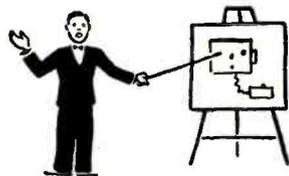
How the spirit of deluxe service should pervade all activities is illustrated by a suggested sign on the Service Man's truck: "We Are On Our Way to Render First Class Radio Service . . ." instead of the usual prosaic sign. (Suggestion 63.)

A postcard with the caption "What do you feed your radio set?" has proven profitable for one Service Man. In the text he stressed the importance of the antenna as the mouth of the receiver, naming some typical troubles caused by poor antennas. By guaranteeing to eliminate most of these troubles at a definite price, a large amount of business was obtained. (Suggestion 67.)

Radio equipment, instead of being merely used for their utilitarian purpose, should be kept surgically immacu-

late, and be made to play an important role in dramatizing the value and dignity of the job for the benefit of the client. (Suggestion 53.)

When soliciting business, folders playing up the completeness of test equipment, with photos where possible, are suggested. This not only impresses the prospective client but also gives the Service Man an edge over his com-



petitors, who might not possess the equipment. (Suggestion 100.)

Service Men should endeavor to initiate and organize various Radio clubs and arrange to give talks and lectures designed to promote an interest in the subject. This activity will not only repay them in added calls for service, but will add to his prestige in the

community as well. (Suggestion 33).

There is one Service Man who refuses to call his work radio repairs, but insists on writing "radio reconditioning," in all his advertising.

To our mind this is a healthy sign—it shows which way the wind is blowing. The Service Man has come out of the back shop. He is no longer a grubbing individualist; he organizes with his fellows to form Service Associations. He no longer depends upon hunches to find what is wrong with a receiver—he is acquainted with the latest scientific equipment, which he uses in his work.

R. C. A. deserves special commendation for compiling and publishing this valuable data and making it available for all.

For in the modern scientific world, no longer is it necessary for every man to learn by his own experience, he can profit by the collective experience of all—and in compiling and making this material available to all Service Men, R. C. A. again shows itself in the very forefront of the modern scientific movement.

NEW VOLUME-EXPANSION CIRCUIT

(See Front Cover)

LAST month we published a short description of the new volume expansion system developed by Crosley, known as the "Auto-Expressionator". We are indebted to Mr. H. B. Roese, of the Engineering Department of the Crosley Radio Corporation, for a more detailed explanation of the operation of this new system, and for the complete circuit.

THE CIRCUIT

Referring to the circuit on the front cover, the component parts are arranged to form a Wheatstone bridge. At most frequencies the impedance of L_1 and L_2 is so low that for purposes of explanation we may for the moment consider them to be short circuited. The two expressionator bulbs B-1 and B-2, because of their special thermal characteristics, cause an increase in current through the resistor legs R_1 and R_2 of the bridge as the volume increases, thereby effecting a much greater increase in the loudspeaker output.

When the Auto-Expressionator control knob is on the "off" position, SW-1 and SW-2 are closed, shorting out R_1 and R_2 , and SW-3 and SW-4 are open which connects the output transformer directly to the voice coil of the speaker. When the control knob is in the "On"

position, SW-1 and SW-2 are opened and SW-3 and SW-4 are closed, making it necessary for the current flowing from the output transformer to flow through the bridge circuit before reaching the voice coil of the speaker. The resistances of R_1 and R_2 are slightly less than the cold resistance of B-1 and B-2, so that the bridge is permanently out of balance by a slight amount. Now, as the signal from the output transformer increases, the resistance of the expressionator bulbs B-1 and B-2 increases quite rapidly due to their change in temperature, thereby throwing the bridge further out of balance. The effect is accumulative since, when the bridge is thrown out of balance, a greater portion of the total signal will be heard at the speaker.

TIME LAG

In order to make expression smooth and pleasing, a definite amount of time lag in the heating and cooling of the expressionator bulbs is necessary. If they heat and cool too fast, their change in resistance and the corresponding change in the balance of the bridge will actually take place within a low-frequency cycle, thereby introducing distortion predominately of a third harmonic nature. However, if the time lag

of the filament is within the range of $1/10$ to $1/5$ second, this distortion is completely eliminated. Furthermore, in any volume expander it is desirable to have a slight amount of time lag so that the expansion is not of a harsh, abrupt nature. The thermal inertia of the expressionator bulbs governs the time lag.

BASS COMPENSATOR

As music becomes softer and softer the lowest frequency tones drop below the range of audibility before the higher frequency tones. To counteract this effect the Auto-Expressionator incorporates an automatic bass compensator which does not permit the volume suppression of extremely low-frequency tones. As the volume level increases the compensation gradually disappears so that there is always a pleasing balance between the low and high-frequency tones.

Referring to L_1 and L_2 and their respective shunt condensers, it will be seen that their purpose is to provide permanent unbalance of the bridge independent of the expressionator bulb temperature at a low frequency of about 40 cycles. The result is that when the Auto-Expressionator is switched on there is a decided boosting of extreme bass apparent at low volume levels.

THE NOISE SILENCER IN PRACTICE

The ground has been broken. A complete analysis of the noise problem is available. A method has been suggested to overcome this problem. It remains only for some enterprising radio genius to make this idea into a workable commercial reality.

THERE has been so much said about the Lamb noise silencer, but on the whole it has been too well said. Screaming scareheads in magazines and newspapers throughout the country announced that the demon of radio reception, that ever persistent viper "Noise" had finally been routed. So convincing is the general propaganda concerning this device, that in spite of normal skepticism on the part of an oft fooled public, great enthusiasm was evidenced. The public was fully convinced, even though it took more to convince them than it does newspaper reporters.

LAMBS CLAIMS CONSERVATIVE

In Mr. Lamb's original publication of the noise silencer circuit he was rather enthusiastic, but he gave no basis for the extravagant claims that flashed across the country. It probably was these claims that brought forth the statement in a subsequent issue of QST:

"It is not possible to go quite as far in noise silencing action on broadcast reception, . . . Adjustment of the noise threshold control is considerably more critical for maximum results than with code reception. If the control is advanced too far, the carrier will block itself off, leaving only a few sidebands to break through. These are of course unintelligible. Furthermore, the control cannot be advanced quite to the point of cut-off, as in code reception, because doing so would cause the up-modulation peaks to be cut off, resulting in lop-sided modulation and distortion. Hence the residual noise may be slightly louder when the control is correctly adjusted for broadcast reception than for code reception of a carrier of equal strength."

QST DESERVES CREDIT

From this statement it is plainly evident that the noise silencer, while helpful, does not cure the persistent evil. Indeed, a good sensitivity control will do much more for the quiet reception of stronger signals, and a good "noiseless" antenna system by far outclasses the silencer on weaker signals.

Let us not, however, be too critical. The silencer is a great step forward. QST deserves additional credit for an

accurate analysis of the noise problem. That the solution of the noise problem may be along the lines suggested by the silencer, cannot be overlooked.

SUGGESTIONS FOR EXPERIMENTS

In view of the great amount of available information concerning the technical operation of the silencer, no attempt is made, here, to cover that phase of the device. However, a few suggestions to the experimentally-minded Service Man will not be amiss. In many of the articles published noise silencing "adapters" were suggested. In every case, not only was plate and filament power, for the operation of the silencer, taken from the receiver proper, but a bleeder circuit of over 10 ma was also included. It is a safe bet that no existing commercial receiver could stand this added drain. To overcome this a-c, d-c circuits were suggested by some writers. The difficulty here lies in that the negative return of such a circuit is directly connected to the house mains. Since this return must be grounded to the re-

ceiver chassis there is danger of short circuiting the mains.

INCORPORATED IN ORIGINAL CIRCUIT

From these considerations it seems that the only method through which the silencer can be used is by inclusion in the original circuit. In this event smoother operation of the threshold control can be obtained by using a low wattage carbon control of about 25000 ohms connected to the voltage divider, as indicated on the accompanying illustration. Since the adjustment of the noise threshold voltage is comparatively critical it is important that enough current is bled to maintain this voltage constant despite variations in the receiver due to avc action etc. Screen supply for both the 6L7 and the 6J7 can be obtained from the usual tap on the divider without necessitating additional dropping resistors. The noise amplifier tube as well as the 6L7 must be controlled by the regular receiver avc so that the threshold voltage relationship should remain unchanged during normal avc action.

Further experimentation is necessary before the noise silencer can become a commercial reality.

Should the Service Man have a yen for experimenting with this circuit, additional information may be obtained from the editor.

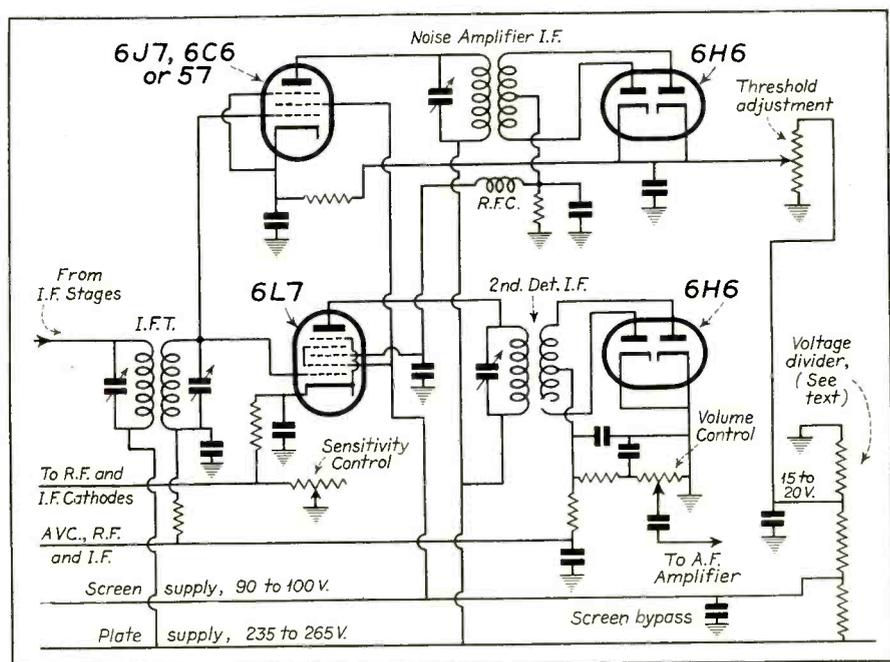


Fig. 1. The noise silencer circuit.

General Data . . .

AUDIO SYSTEM

RCA Victor Model D7-7

The conventional superheterodyne type of circuit shown in Fig. 1—consisting of an r-f stage, a combined first-detector—oscillator stage, a single i-f stage, a diode-detector automatic-volume-control stage, an audio voltage amplifier stage, an audio power output stage and a high-voltage rectifier power-supply stage, is used.

TUNED CIRCUITS

The antenna coil system and the detector coil system each consist of a single primary and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is similarly wound on a single form. A range selector switch (S-1) is used for connecting the various sections of these three coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable, three-section gang condenser having trimmer capacitors in shunt with each section. There are additional trimmer capacitors across the section of each coil used for Band "A." A series trimmer is also associated with the Band "A" oscillator coil.

The intermediate frequency amplifier system consists of a 6K7 in a trans-

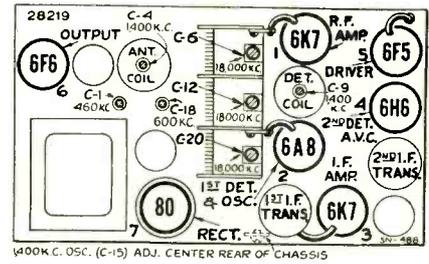
mer-coupled circuit. This stage operates at a basic frequency of 460 kc. Each winding of both i-f transformers (input and output) is tuned by an adjustable trimmer.

DETECTOR AND AVC

The modulated signal as obtained from the output of the i-f stage is detected by a 6H6 twin-diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R-8, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes through a suitable resistance filter circuit. The second (auxiliary) diode of the 6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R-8 and R-9, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the avc diode takes over the biasing function.

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio-voltage-amplifier tube. This control has a tone compensating filter connected to it so that the correct aural balance will be obtained at different volume settings.

Resistance-capacitance coupling is used between the first audio stage and the power output stage. The output of the power amplifier is transformer-coupled into the dynamic speaker. High frequency tone control is effected by a



dial reading at which it is best received.

(h). Tune the low-frequency trimmer, C-18, of the oscillator Band A coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations. The adjustment of C-20, C-12, and C-6 should be corrected at 18,000 kc as in (b), (c), and (d); also C-15, C-9, and C-4 should be corrected at 1,400 kc as in (f) to compensate for any changes caused by the adjustment of the low-frequency oscillator coil trimmer.

SOCKET VOLTAGES

The voltage values indicated from the socket contacts to chassis in Fig. 3 will assist in the location of causes for faulty operation. Each value as specified should hold within $\pm 20\%$ when the receiver is normally operative at its rated supply voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. The voltages given are actual operating values and do not allow for inaccuracies which may be caused by the loading effect of a voltmeter's internal resistance. This resistance should be duly considered for all readings. The amount of circuit resistance shunting the meter during measurement will determine the accuracy to be obtained, the error increasing as the meter resistance becomes comparable to or less than the circuit resistance. For the majority of readings a meter having an internal resistance of 1000 ohms per volt will be satisfactory when the range used for each reading is chosen as high as possible consistent with good readability.

WAVE-TRAP ADJUSTMENT

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave-trap trimmer to the point which causes maximum suppression of the interference. This trimmer is adjusted to 460 kc during manufacture; however, local conditions may require a readjustment, depending upon the interfering frequency.

New Howard A-C, D-C Receivers

The following data covers Models 47A, 50, 50SW, 57A, 57-AUS, 60, 60SW, and E57, the diagrams for which are shown on the opposite page. The diagrams carry the voltage readings and, where the receivers are superheterodynes, the i-f peaks are given.

MODELS 57A AND 60SW

In servicing one of these chassis, it

is important to check the position of the pilot light socket brackets and be sure they do not touch the speaker cone on the edges or at any point. They should be in such a position so as not to be forced against the cone by the cabinet panel when installed back in the cabinet.

The pilot light leads running from the sockets to the resistor should be kept high and away from all nearby wires to avoid hum pick-up.

The short-wave models attain the range by the use of shunt coils across the r-f and oscillator secondaries, as shown in the diagrams.

The intermediate-frequency transformers should be aligned to 456 kc.

When the gang condenser is at full capacity (all the way to the right) the dial pointer should be set on the horizontal dividing line.

The rear section of the two-gang condenser is the oscillator section and the trimmer should be peaked at 1400 kc. The front section, r-f trimmer, should be peaked at 1400 kc after the oscillator trimmer has been set.

MODEL E-57

The notes on the Model 57A given above also apply to the Model E-57 in general. The procedure in aligning is the same except that the regular broadcast band of 540 to 1500 kc must be aligned before the long-wave band.

The broadcast band oscillator padding condenser on this model is located near the center of the chassis and mounted through the back side.

To align the 150 to 350-kc band, set the dial pointer to 300 kc and peak oscillator trimmer to 300 kc. This trimmer is the one behind the variable condenser and under the 6A7 tube.

Peak the r-f trimmer to 300 kc after the oscillator trimmer has been set. The r-f trimmer is the one near the top of the chassis directly over the variable condenser.

Rotate dial to 150 kc and peak oscillator padding condenser to 150 kc. This is the condenser mounted through the front of the chassis below the dial.

MODELS 47A, 50, 50SW

The various voltages at the sockets are shown in the diagram. These are taken from ground with a high-resistance voltmeter with line voltage at 115. For Model 47A the voltages will average as follows:

Tube	Plate	S. G	K.
6D6	110	112	15*
6C6	30		3
43	105	112	

*With volume control at Min.

The two trimmers on the variable gang condenser are aligned at 1400 kc on Models 47A, 50 and 50SW.

When the gang condenser is at maximum capacity (all the way to the right) the dial pointer should be set above the horizontal dividing line about $\frac{1}{8}$ ", or so that the opposite end of the pointer is on 1700 kc. The pointer is adjusted by the set screw and collar on the variable condenser shaft.

The same data relative to the pilot light socket brackets also applies to these models.

Stewart Warner R-139-D

The R-139-D radio chassis is used in receiver models 1391-D and 1395-D. It is a 6-tube, battery-operated, single-band superheterodyne with a tuning range extending from 530 to 1800 kc.

Filament current for this receiver may be obtained from either of three different types of A battery. They are: (1) air-cell, (2) three-volt dry-cell A pack and (3) two-volt storage battery. The type 1G1 regulator tube controls the voltage applied to the tube filaments when the air-cell type A battery, or the large three-volt dry-cell A pack are used. Because of its lower voltage when a two-volt storage battery is used, the 1G1 tube should be removed and the large socket contacts connected together with a short length of wire.

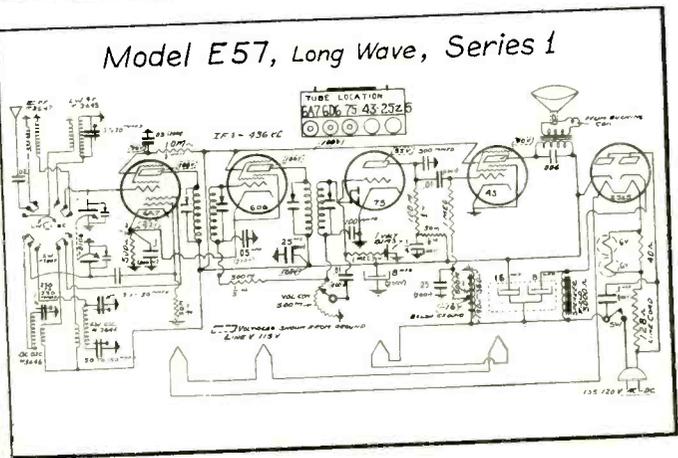
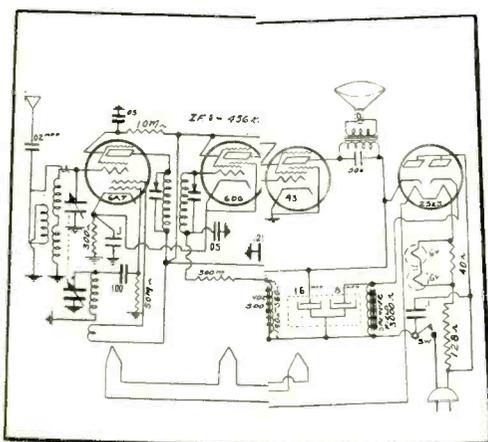
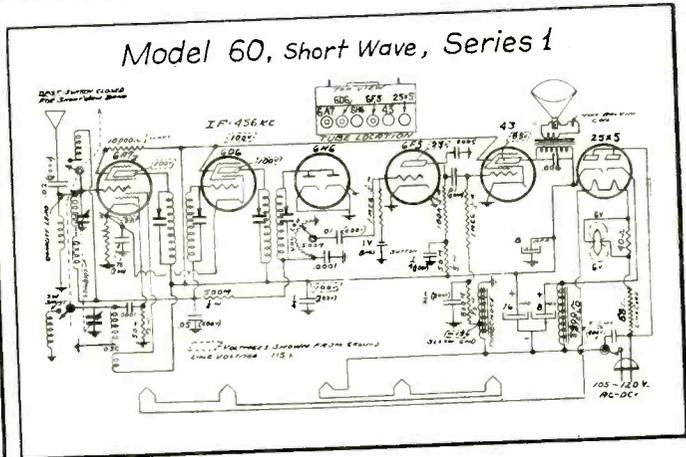
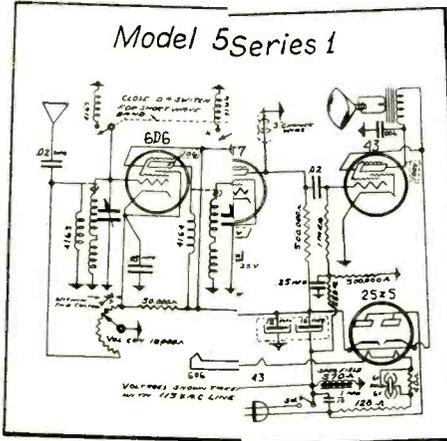
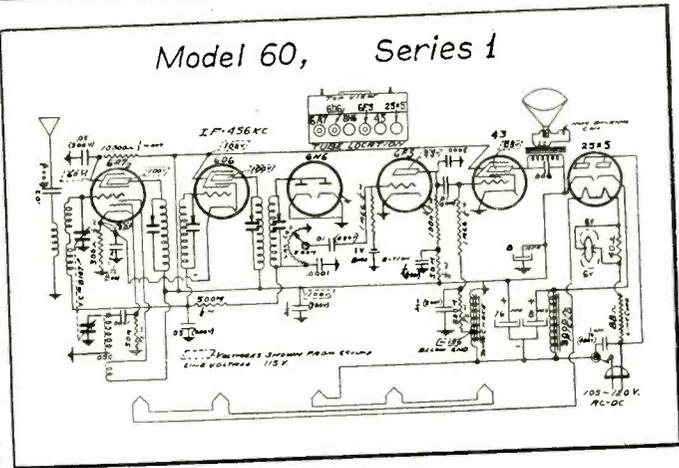
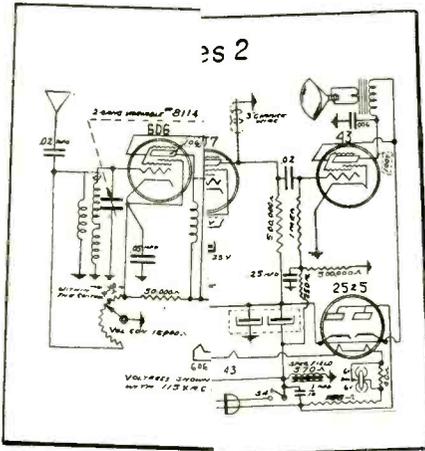
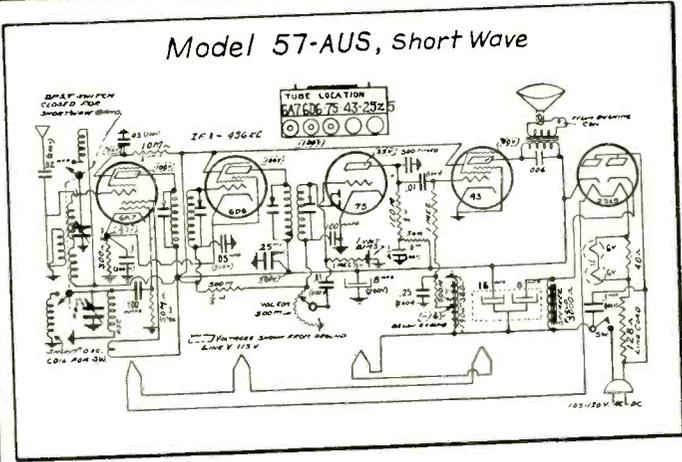
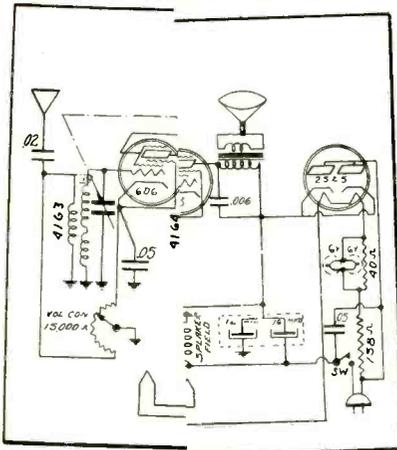
Three 45-volt B batteries and two 4½-volt C batteries are also required. The Burgess G-90-D6 plug-in B and C pack may be used by replacing the regular battery cables with the special cables No. 85938 and No. 85939. When installing these cables the green C plus lead is omitted since this connection is made inside the unit.

THE CIRCUIT

The r-f signal is picked up by the antenna, tuned, and applied to the control grid of the 1A6 tube, where frequency conversion takes place. The converted signal is amplified in the i-f stage, which employs a 34 type tube, and is passed on to the 1B5 combination second detector, amplifier, and avc tube.

For avc action a portion of the i-f signal is passed from the second i-f transformer to one of the diode plates through condenser No. 10 (see Fig. 1). Rectification takes place and the d-c voltage developed across the load resistor No. 9 (Fig. 1) is applied through a resistance capacity filter to the grid returns of the 1A6 and 34 tubes. A slight delay bias is obtained for the avc action by using the diode

GENERAL



GENERAL DATA—continued

plate closest to the positive leg of the filament.

Rectification also takes place in the other diode section of the 1B5 tube and any desired portion of the modulated d-c potential developed across the volume control No. 12A (Fig. 1) may then be applied to the grid of the triode section of this tube. The triode is resistance coupled to the type 30 driver tube which in turn is transformer coupled to two type 30 tubes operating in push-pull class A prime.

ALIGNMENT PROCEDURE

Preliminary to alignment, remove chassis from cabinet, connect output meter across primary of output transformer on the dynamic speaker (yellow wires), connect the antenna lead to the chassis, and turn the volume control on full. Turn on set and test oscillator and allow a few minutes to warm up.

I-F ALIGNMENT

(1) Adjust the test oscillator to 456 kc and connect its output to the control grid (cap) of the 1A6 tube and the chassis.

(2) Adjust all four i-f trimmers, located on the top of the i-f transformer, located on the top of the condenser section closest to output meter, keeping the volume control nearly as possible in the center of the scale by reducing the oscillator output meter on the scale by means of the attenuator.

No inward or sideward adjustment should be applied to the antenna lead or the condenser may spring to a different setting when the test oscillator is adjusted.

(3) Repeat all four adjustments, the changing of one trimmer affects the others to a certain extent, necessitating readjustment.

R-F ALIGNMENT

(1) Turn the gang condenser to the mesh and note whether the oscillator is on the line, directly on the control shaft, indicating 540 kc.

(2) Connect the test oscillator to the chassis, using a 400-ohm resistor in series with the antenna lead, and ground the output.

(3) Adjust the test oscillator to 1400 kc. Repeat entire r-f alignment procedure.

(4) Turn the receiver dial to 600 kc the receiver to the signal.

(Continued on page 111)

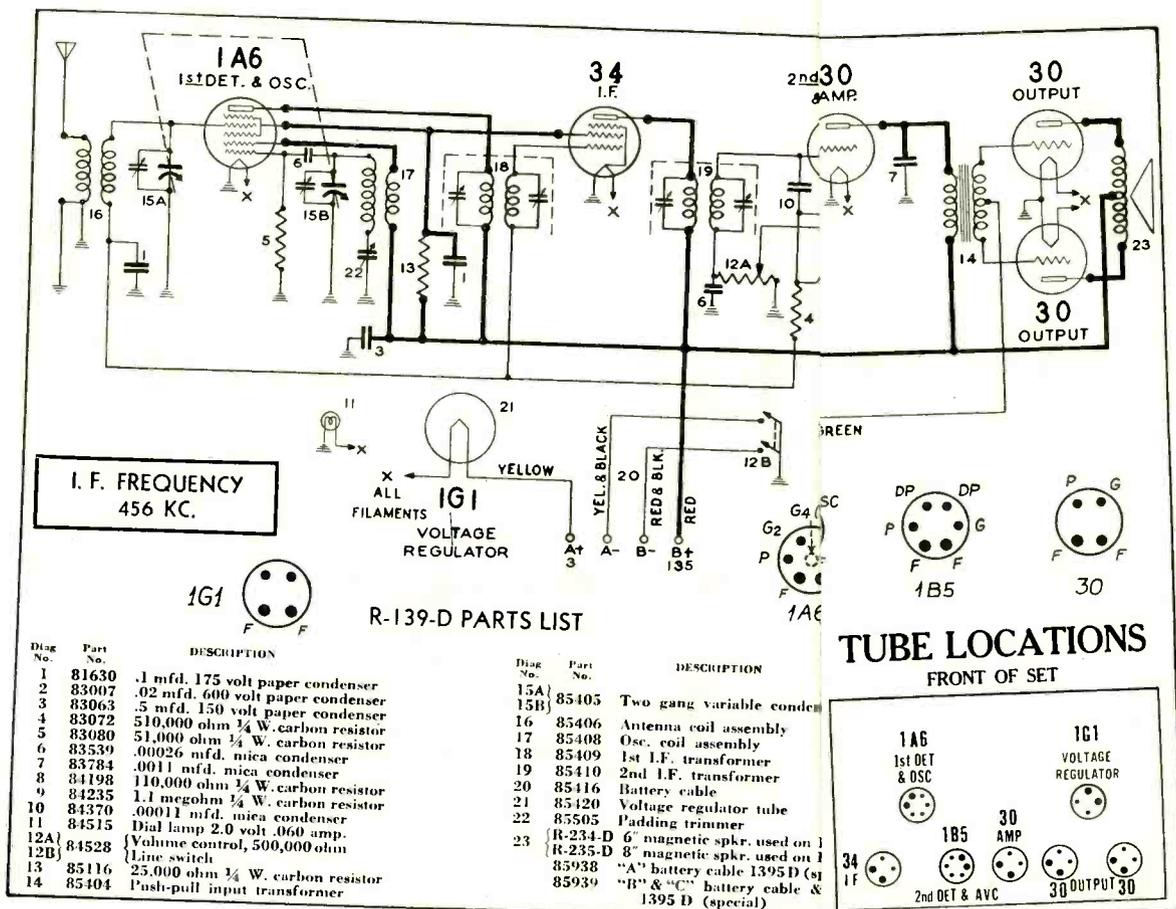


Fig. 1. Circuit diagram of the Stewart W

Filament Return Selector

Filament Return Selector "Old Man Obsolescence"

The *only* answer to "Roaming Filaments"

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L. R. S., Mansfield, O.

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"My motto in the purchase of test equipment is to see that one gets dollar for dollar in value, and in the 385 Automatic one certainly does."

C. E. J., Nelson, Wis.

"I would like to state that the 385 Automatic is most certainly the best investment I have made in test instruments. Its performance has been perfect."

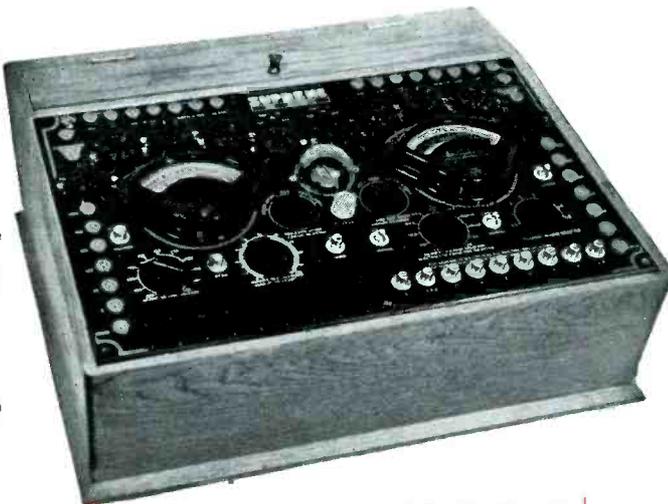
H. E. B., Islip, N. Y.

"I would not consider radio servicing without Supreme instruments."

D. B. S., Pensacola.

"Again I say, my vote goes to Supreme for its wonderful accomplishment in this 1936 385 Automatic."

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The complete knockout of Public Enemy Number One, "Old Man Obsolescence," has been officially reported by Radio Servicemen. It was a "supreme" victory for the Filament Return Selector Switch, on all Supreme Testing Instruments, one of the greatest proofs against obsolescence ever devised. The Filament Return Selector enables servicemen to test all types of tubes without adapters—regardless of construction or filament terminations.

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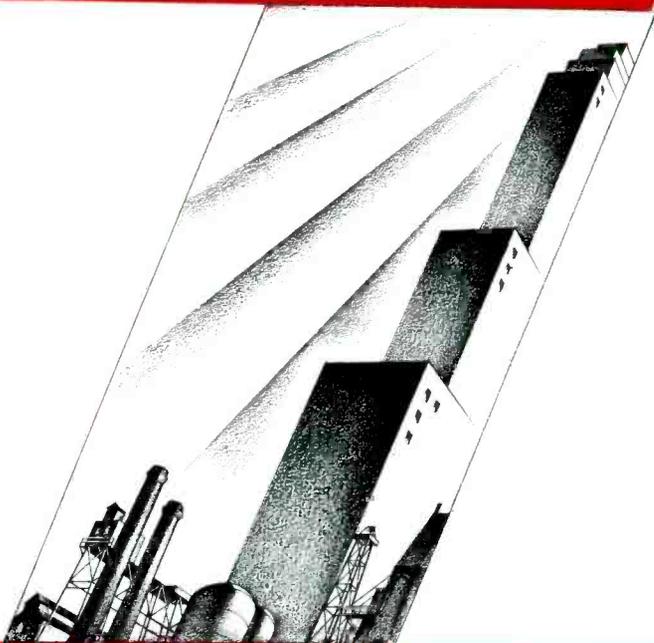
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GENERAL DATA—continued

G. E. Models A-52, A-55

This five tube, two band, metal tube, superheterodyne chassis is used in the G. E. mantel model A-52 and the A-55 console. The complete circuit diagram is shown in Fig. 1. For additional convenience an underchassis view is given (Fig. 2) showing the location of the trimmers and the voltages encountered at the various socket prongs etc. These voltages are measured with the volume control on full and the antenna disconnected. A 1000 ohm-per-volt voltmeter was used.

THE CIRCUIT

The 6A8 mixer-oscillator feeds the single i-f stage which uses the 6K7 tube and a doubly-tuned, shielded, i-f transformer. The plate of the 6K7 feeds the unshielded, primary-tuned, second i-f transformer which in turn supplies the signal to the diode plates of the 6Q7. The diode section of the 6Q7 provides avc to the 6K7 i-f and the r-f section of the 6A8, as well as detection. The a-f signal developed across R_4 is applied through C_{27} to the grid of the triode section of this tube from the variable arm of R_4 which constitutes the

volume control of the receiver. The signal is further amplified by the resistance-coupled 6F6 output stage. The 6F6 pentode furnishes the power to operate the dynamic speaker.

A special feature of this circuit is the wave trap L_7-C_7 , resonant at 465 kc, to minimize interference from code signals with frequencies around 465 kc.

ALIGNMENT PROCEDURE

With the tuning condenser plates fully meshed, line up the pointer and the dial by adjusting the dial set screws so that the line at the extreme end of the dial is indicated.

Turn the band switch clockwise to the broadcast position, set the volume control at maximum, and short circuit the antenna and ground leads.

Turn on the receiver and the test oscillator, allowing a few minutes to warm up. Tune the receiver to a quiet point and ground the chassis.

I-F ALIGNMENT

Connect the test oscillator output to the control grid of the 6A8 tube and the chassis. Connect the output meter across the primary of the speaker trans-

former. Tune the test oscillator to 465 kc and adjust its output so that the output meter reads in the center of the scale.

The three i-f trimmers are adjusted in the following sequence:

- (1) Primary trimmer on the second i-f (C_{10} Fig. 2).
- (2) Secondary trimmer on the first i-f (See Fig. 2).
- (3) Primary trimmer on the first i-f.

The same procedure should be repeated as a final check. Throughout all adjustments the output meter should be kept in the center of the scale by reducing the test oscillator signal as the various stages are brought into alignment.

WAVE TRAP ALIGNMENT

With the test oscillator still tuned to 465 kc connect its terminals to the antenna and ground leads of the receiver. Increase its output until a reading is obtained on the output meter. Adjust the wave trap trimmer (C_1 Fig. 2) for *minimum* output; increasing the oscillator signal if necessary to obtain a better adjustment.

(Continued on page 114)

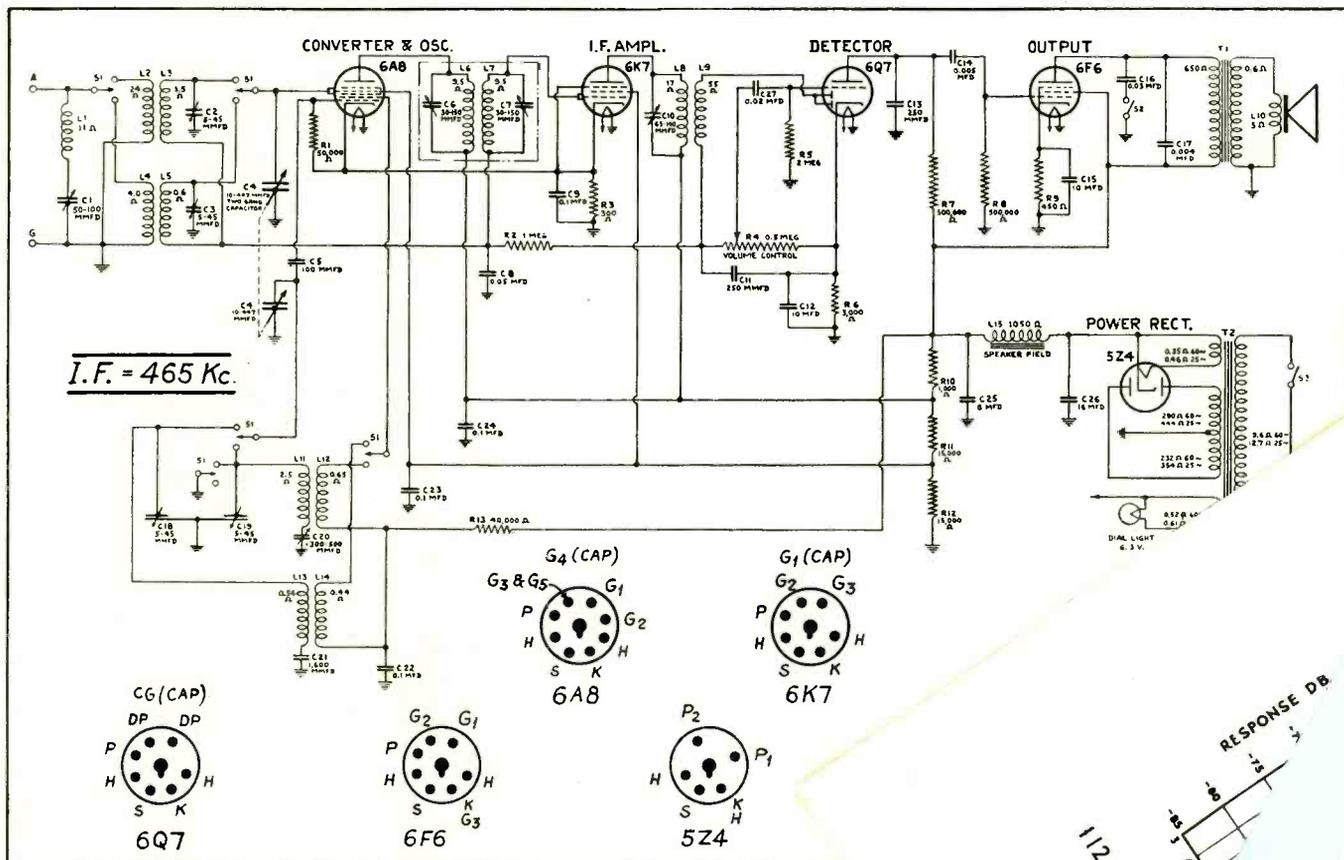


Fig. 1. Circuit diagram of the G. E. Models A-52

Public Address . . .

MICROPHONE CHARACTERISTICS FOR P-A SERVICE

By C. J. BROWN*

THERE are available today, for public-address service, an extensive variety of microphones. A number of basic types have made their appearance in recent years and these basic types are sub-divided by their respective proponents into still further types. The p-a operator and user quite often finds himself in a quandary, over his conscientious effort to select the correct microphone for a given service and the varied claims made by the manufacturers do not particularly assist in clarifying the issue. The object of this article will be to analyze briefly the various and sundry claims of the respective manufacturers, in the light of an extensive field experience and to outline, as clearly as possible, operating requirements, that should govern the choice of the p-a microphone.

MANUFACTURERS' RESPONSE CURVES

A number of characteristic response curves are given herein. It may appear somewhat strange to the reader that we should have taken these curves as they are presented in the various manufacturers' published literature. This is, however, much more desirable than an attempt to make individual sound pressure curves of each type. This particular technique is not standardized to any great degree and it is much safer, for the purposes of this analysis to give the manufacturer every benefit and assume that he is certainly "putting his best foot forward" in the data he releases.

The present-day types may be divided basically into (1) the velocity or ribbon type, (2) the dynamic diaphragm type, (3) the sound cell type,

*Morlen Electric Co.

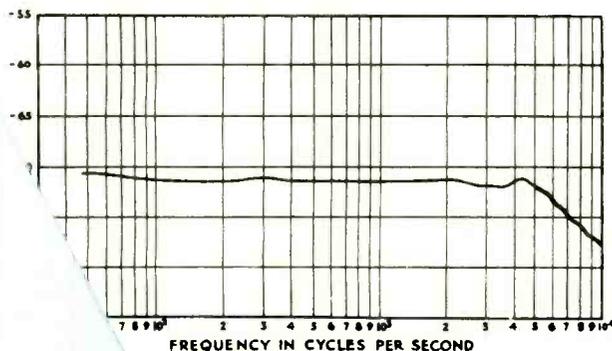
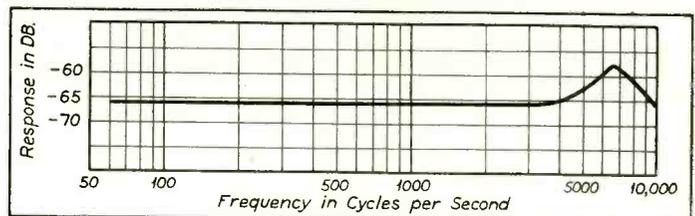


Fig. 1. Response curve of the velocity microphone.

which has a further modification (3A), the sound cell diaphragm type. These divisions are not intended to cover the various mechanical forms that are available in each basic type. For example, there are lapel microphones in practically all types, there are 'now spherical and non-directional models,, there are high impedance and low-impedance and in some cases there is still the integral amplifier-microphone combination such as the condenser

Fig. 2. Characteristic wave response of the sound-cell microphone.



microphone. In considering the response of these various types we shall deal with the basic types first.

THE VELOCITY MICROPHONE

Fig. 1 is the published response curve of a well-known velocity microphone. It will be observed that in the range from 50 to 7,000 cycles the overall variation is within 4 d-b. This is not exactly a "flat" response but it comes within the general meaning and understanding of that term. It is also interesting to note the "character" of the response. It follows a gradual downward slope almost from the 50 cycle point and runs that way to 7,000 cycles except for a minute elevation indicated around 4,500 cycles. The valley preceding that point should be particularly noticed. We shall return to this

feature. The velocity microphone has many advantages. It is primarily a low-impedance microphone and as such very long lines of properly shielded cable can be run without difficulty or the need of a local pre-amplifier. It has a directivity characteristic of the bi-directional type which is oftentimes of great help in p-a service but also sometimes a detriment against high noise levels. For example, if a speaker is using the velocity type microphone and the crowd facing him is noisy, and microphone will pick up practically as much crowd noise as speaker "noise" and intelligibility will be seriously interfered with. Where the crowd is quiet, if such a crowd can be found, the velocity type has much in its favor from an installation standpoint.

THE SOUND CELL MICROPHONE

Fig. 2 is the response curve of the sound cell type microphone. Due to

its peculiar makeup, this type of microphone has, as shown, an absolutely flat response up to 3,500 cycles and at that point a rise begins reaching a maximum at 6,800 cycles, and then declines again. It is interesting to compare this response with the velocity curve shown, since the high-frequency response of the two microphones is wholly different and it is clearly evident that there would be a difference in the audible output of systems using these two types. It should be borne in mind, however, that differences of as little as two decibels will barely be noticed by the average ear and in most cases it requires as much as four decibels to produce a noticeable variation in audibility. This is particularly true at the higher frequencies, from 4,000 cycles up. Another factor enters into the proper pickup of voice and music at these frequencies which is the "masking" that occurs from abnormal strength of lower frequencies. This also has quite a serious effect on speech intelligibility.

DYNAMIC MICROPHONES

Fig. 3 illustrates several types of dynamic microphones and we see here for the first time in our analysis a quite different type of response curve. It will be noted that the curves shown could not be considered "flat" in any

• SERVICE FOR

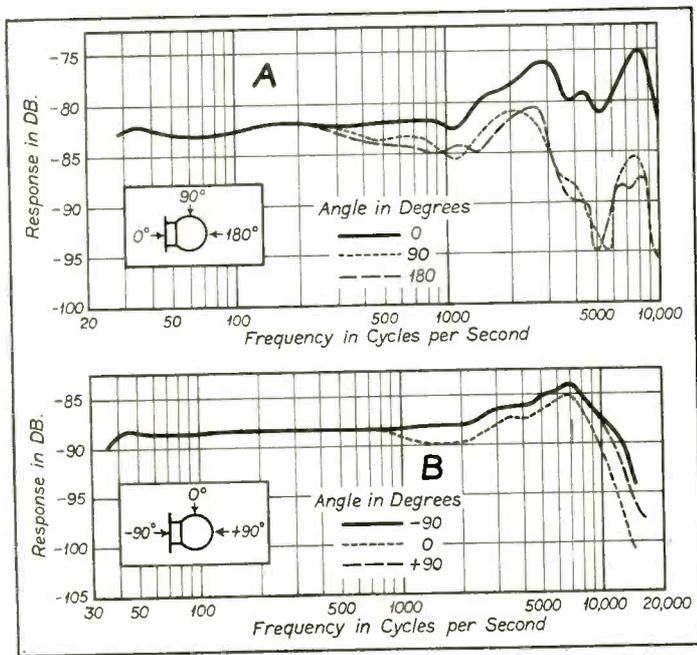


Fig. 3. Dynamic microphone response curves.

sense of the word, but nevertheless quite satisfactory results can be obtained with this type microphone in p-a service, especially from the type shown in Fig. 3A. A close inspection of this curve reveals an interesting matter. From 1,000 to 3,000 cycles there is approximately a 6-db rise, and according to our previous remarks, such a rise would be distinctly noticeable in comparative tests. The response is allowed to drop around the 5,000 cycle mark but it is even higher at 7,000 and 8,000 cycles than at 4,000 cycles. Let us see what bearing this might have on good speech quality, especially in p-a service.

THE DIAPHRAGM SOUND CELL

Fig. 4 may give us some help. This is the response curve of a diaphragm type sound cell microphone which is offered by the manufacturer as a "communications" type microphone. In the literature on this microphone we find the following statement: "The frequency characteristic above . . . reduces the low-frequency voice components which are undesirable in speech communication systems . . . the resulting signals are clear and powerful, effectively over-

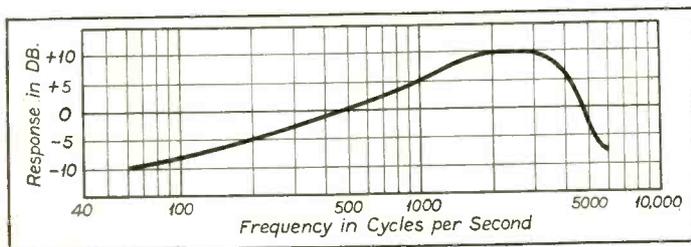
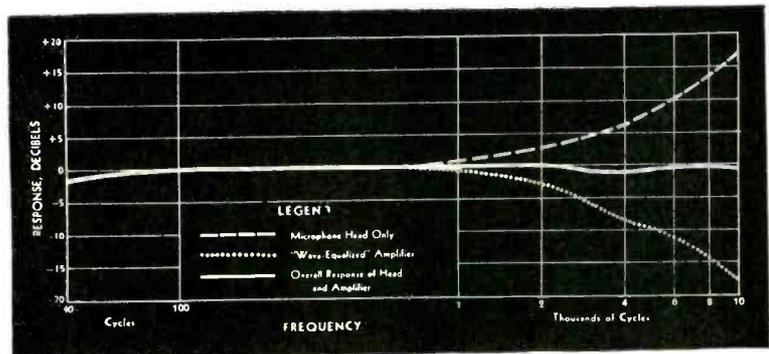


Fig. 4. Response curve of diaphragm sound cell.

riding noise and static." If these remarks are carefully considered the serious-minded p-a engineer cannot help but wonder why, if a rising response is desirable in a so-called speech communication system, is it not just as desirable in a p-a system. The truth

Fig. 5. Response obtained through equalization in amplifier.



is that such a response is desirable and if careful comparative tests between the various basic types are made, those that favor the high-frequency end will be preferred to any other type for p-a service.

RISE BETWEEN 1,000 & 4,000 HELPFUL

This rise has its peculiar points, however. It must occur between 1,000 and 4,000 cycles. A rise commencing

at 4,000 or 5,000 cycles, means little and will be found to have little practical value. A response, such as that illustrated for the p-a type velocity microphone is by comparison useless where clear and crisp speech is desired. There is ample physiological proof of what the response should be. The frequencies for maximum intelligibility lie in the band from 1,000 to 4,000 cycles. The frequencies above this contribute to naturalness but not to intelligibility, and since the projection of speech in an outdoor system is usually over considerable distances, the presence of 5,000 and 7,000 cycle components will not make much difference in the effect on the listener. Field tests have proven that people want to understand, as well as hear, the speaker, and that can only be accomplished by accentuated pickup in this "intelligibility band."

It is interesting to observe that these results cannot be obtained by equalization in the amplifier. Fig. 5 is shown to illustrate an attempt on the part of one manufacturer to accomplish something along these lines. He unquestionably improved what might be termed the "ultra-high" audio band, but as far as better speech quality for p-a

service, it would be found on comparison, that a response similar to Fig. 3A was much to be preferred. In selecting his microphones the p-a erator, particularly the rental should consider the intelligibility of the speaker's mount importance.

make simple switching fr with sc write w

the average listener will still continue to select the speech type microphone for music reproduction in nine cases out of ten. The reason this occurs is somewhat involved but basically it can be stated that where the system is not a truly wide range system, such for example as the auditory perspective system of the Bell Telephone Laboratories, the inclusion of frequencies above 4,000 cycles does not seem to impress the listener so much as does the rising frequency characteristics we have outlined. It can be further observed that from 1,000 to 4,000 cycles

is two octaves, whereas from 4,000 to 8,000 cycles is only one octave and to 6,000 cycles, but a half an octave, if such a designation is permissible. Hence the ear does not find that degree of balance that is pleasing in the added partial octaves and will prefer a balanced reproduction in the band to which it is most sensitive.

LONG LINE LOSSES

A great deal of attention has been paid to the losses occurring in the long lines of high-impedance microphones.

One reads often of the urgent need of minimizing cable loss at 10,000 cycles. Here again, as the response curves show the p-a man is led on a "technical detour." He will be safe in ignoring these allegedly important losses and looking for four or six decibels rise around 3,000 to 4,000 cycles.

It should be understood that this information applies only to public address applications of microphones, which are currently offered as "the last word." This writer does not dispute their possible application to radio broadcasting or sound recording.

GENERAL DATA—continued

G. E. Models A-52, A-55

(Continued from page 111)

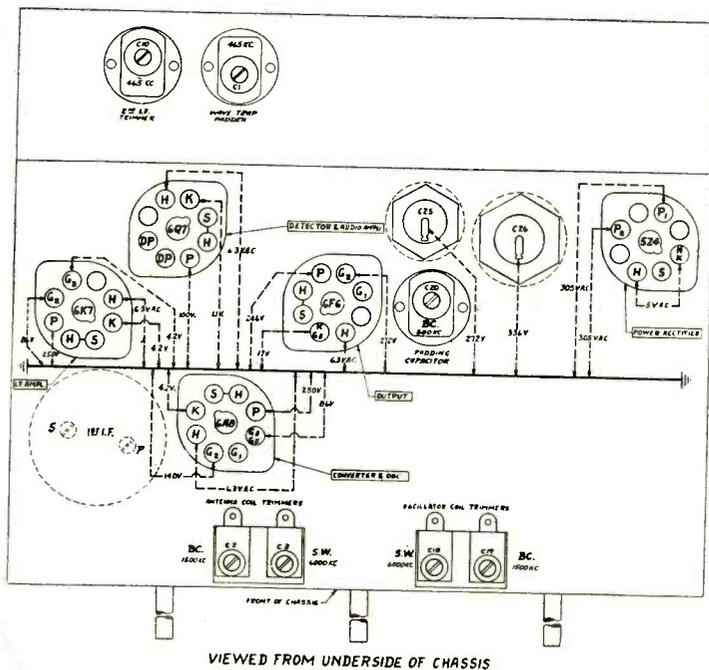
R-F ALIGNMENT

Broadcast Band

With the test oscillator connected to the antenna and ground leads of the re-

ceiver, tune the oscillator to 1500 kc. Set the receiver dial to 1500 kc. Adjust the broadcast oscillator trimmer (C₁₉ Fig. 2) for maximum output. Next, set the r-f trimmer (C₂ Fig. 2) for maximum output. After these adjustments tune the set and the test oscillator to 580

kc. Adjust the broadcast padding condenser (C₂₀ Fig. 2) for maximum output, while rocking the tuning condenser back and forth until maximum output is obtained. The dial setting, after this adjustment, may not exactly agree with the frequency but this is of no importance. To complete the broadcast band line up repeat the adjustment at 1500 kc as before.



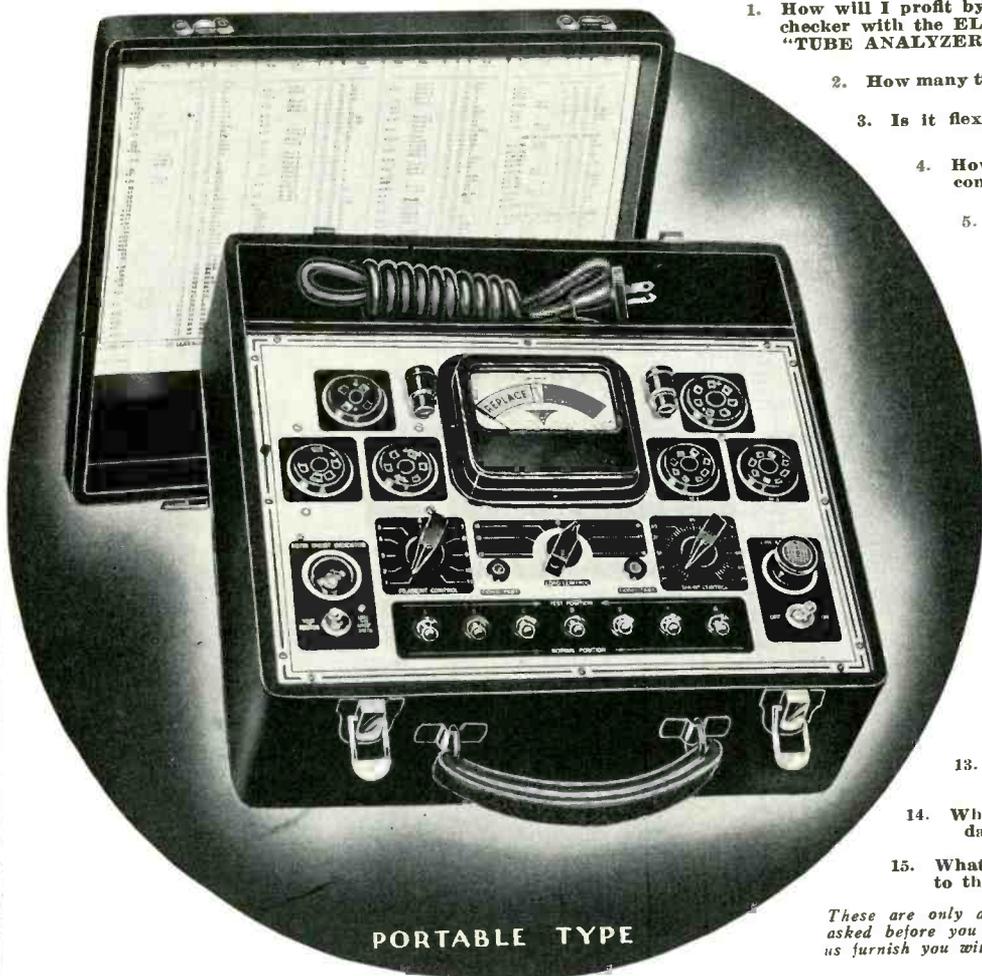
2. Sub-chassis of the G.E. A-52, A-55, showing trimmer locations.

Short Wave Band

With the frequency band switch in the counterclockwise position set the receiver dial to 6.0 mc. Set the test oscillator at 6000 kc and adjust the short-wave oscillator trimmer (C₁₈ Fig. 2) for maximum output. Next, set the short-wave r-f trimmer for maximum output. Repeat these adjustments a second time. After aligning the sw band, turn the test oscillator to 6930 kc with the receiver dial still on 6.0 mc. Increase the test oscillator output until a signal is heard in the neighborhood of 6930 kc. This is the image frequency and if the set has been properly aligned the sensitivity to this signal will be much less than for the 6.0 mc signal. In the event that the image cannot be found, the alignment at 6.0 mc should be rechecked. It will be noticed that the oscillator trimmer will have two peak positions. The position which gives the lower trimmer capacity, obtained by turning the trimmer screw counterclockwise, is the proper adjustment.

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14. What provision is made against damage to the tube under test?
15. What provision is made against damage to the instrument?

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"Precision" engineers have emphasized the fact that simplicity of operation and clearly marked test results are most essential for the benefit of both the customer and service man. Results are plainly marked so that anyone may see whether tubes are good or bad.

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Atwater-Kent 89 (Early Model)

Oscillation: Caused by 425-ohm bleeder resistor (No. 4) having decreased in value. Replace with a 1-watt unit.

D. C. Sprong.

Automatic Electric Phonograph (Induction Disc Motor)

Hum: This can be eliminated in induction disc motors by making the following adjustments. Tighten the iron-core laminations; securely fasten the motor to the motor board (in some cases it will be necessary to place a piece of felt between the motor and the motor board); tighten screws holding coil on top plate. Loose coil windings on the iron-core coil will often cause hum. To remedy this latter condition, force a small wood wedge between the outside of the coil and the core. Sometimes it will be necessary to wedge both the upper and lower section of each coil.

Mechanical noises: Sources are often governor springs, thrust bearing or spindle rod, governor driving gear, turntable spindle and disc. If the spindle is bent, it should be replaced.

George F. Baptiste.

Automatic Phonograph

Failure to start, failure to stop: May be caused by open circuit in power supply, defective switch or relay, shorted or open condenser or defective needle switch. If the needle switch cup does not rise after the needle has left the switch, or if the needle does not push the switch down sufficiently to stop the mechanism, stretch the spring on the needle switch or remove coils, whichever may be necessary to secure proper tension.

George F. Baptiste.

Bosch 58

Inoperative: Facing rear of chassis, touch lead to control grid of first r-f (24) on the right side next to the 27. If signal comes through, check variable condenser No. 1 for shorted plates. Rotor plates of condenser are held to shaft by small cap screws. These screws are not centered until rotor plates touch or all of stator plates.

Al. Beers.

Phonograph Pickup

To determine if an electric pickup is in good working order, pro-

ceed as follows: First, place the instrument in operation. Having allowed a sufficient warm-up period, lightly tap the needle on the pickup arm, first on one side and then on the other. Each time the needle is tapped a click should be heard in the loudspeaker. If the click is louder for one side of the needle than the other, the pickup unit is out of adjustment. To adjust pickup unit, remove the metal case and determine if the vibrating arm is properly centered (adjustment may be made by means of the small clamp or nut).

However, if no click is heard in the loudspeaker when the needle is tapped, place a record on turntable and put instrument in operation. Put the tips of a pair of earphones across the volume control connections of the leads running from the pickup unit. The record should be heard but at a very low volume. If no sound is heard at this point check for open circuit from this point to the pickup arm. Also determine if contact on tone arm is in proper position.

George F. Baptiste.

Grunow Models 700, 701 (Chassis 7A)

Intermittent decrease in volume, set occasionally inoperative on high-frequency end of dial: Usually, shifting waveband switch from broadcast to short wave and back again will correct trouble temporarily. Generally caused by defective 2150-mmfd mica condenser (located on blank lug attached to oscillator coil in shield can farthest from front of chassis).

D. C. Sprong.

Majestic 70

Installing drive cable: When installing

a drive cable on the Majestic 70, first pull the chassis and set it on end. Next place the device shown in the accompanying illustration on the shaft. This permits the shaft to be held in any position. When using this device the author has experienced no trouble due to the cable unwinding, and the implement also serves as a handle for testing the installed cable.

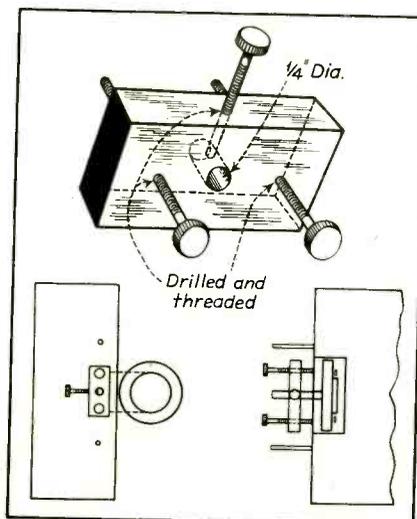
August H. Ketelhut.

Motorola Interference Data

Intermittent ignition interference: Interference of this type may be encountered in the older model cars of composite body construction and is seldom in perfect timing with the firing of the spark plugs. It may easily be recognized by its erratic popping and cracking.

If this interference is present in an appreciable value at the point of contact of the interference feeder it will of course be balanced out in the normal balancing procedure of the Magic Eliminode. If, however, it is due to an r-f voltage produced by the interference building up in poorly grounded sections of the metal car body and then discharging at irregular intervals, the balancer of the "Magic Eliminode" will not eliminate it and it will be necessary to secure a better ground on these body sections affected.

In such cars as the '29 and '30 Oldsmobile and the '29, '30 and '31 Chevrolet, this condition may be remedied by shielding the aerial lead-in to a point within 5 or 6 inches of the car aerial and grounding this shield to the steel body brace in the right or left top corner of the car. Also connect a bond to the header bar mounting bracket, and to one of the tabs holding the body sheet metal to the upper front door sill of the car. Return these bonds to a point where the lead-in shield is grounded. Do the same work in the opposite front corner, and if necessary, extend a conductor of 3/8-inch shielded braid from the common ground of these three points down to the instrument panel, ground it there and extend it to the dash or bulkhead. This method of grounding these metal body sections will give the equivalent of an all-steel body and will eliminate the intermittent ignition interference. In some extreme cases it is also well to secure a better ground of the car body to the car chassis by flexible bonds.

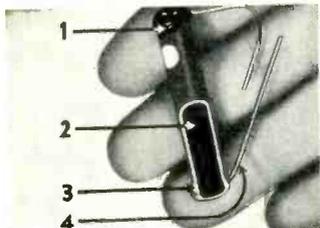


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RESISTORS Bulletin 104



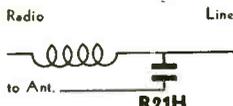
Cut-away view of a CONTINENTAL Carbon 2000-volt ceramic insulated resistor.

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- 2—Solid molded carbon resistance unit.
- 3—Contact soldered to coppered carbon.
- 4—Ductile tinned copper 1-1/2" lead wires.

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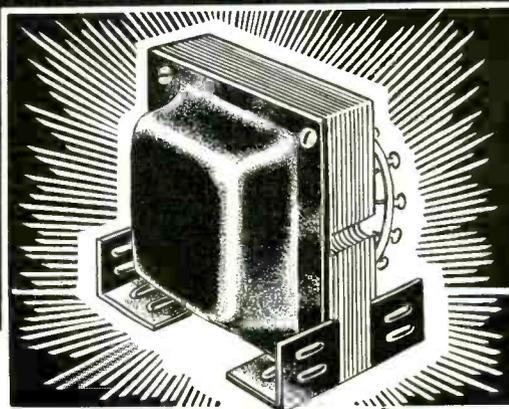
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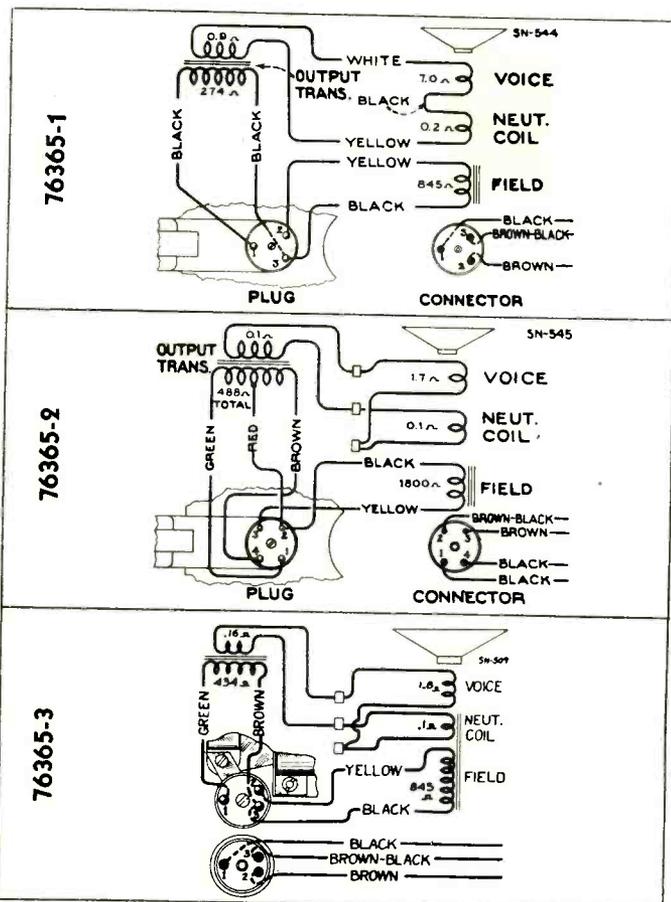


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RECEIVER CASE HISTORIES—continued



Speaker wiring diagrams for RCA Victor models using speakers 76365-3, 76365-2 and 76365-1. See accompanying text.

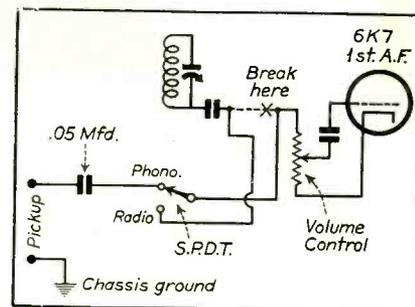
This change was made in later production of Models 1928, 1978 to minimize the effect that tube variations have on the sensitivity of the receiver.

Sparton 28

Noise, intermittent reception near 600 kc: Check for loose variable condenser plates. Secure plates to shaft with brass pins.
Clifford W. Johnson.

Stromberg-Carlson 84

Installing phono pickup and switch: Break connection between high side of volume control and coupling condenser from last i-f secondary. Run two shielded leads, as shown in the accompanying illustration, to a single-pole,



double-throw toggle switch. With this circuit the radio volume control also controls the phono volume.

E. M. Prentke.

U. S. Radio and Telephone 80 (Apex)

Weak reception: If jarring of receiver brings reception back to normal, check a-c receptacle of dynamic speaker. A loose connection may result in speaker receiving no excitation.
Al. Beers.

Westone 20 (Pacific Radio Corp.)

No broadcast reception: The chassis in this 4-tube midget is held in cabinet by a single bolt, located in center at rear of chassis. If the chassis shifts 1/8 inch, bolt will touch contacts on short-wave switch and ground broadcast sections of both r-f coils. Tape or put fibre bushing around bolt.
Al. Beers.

Zenith 750

Motorboating: Generally caused by the 0.5-mfd capacitor which bypasses the first detector and i-f tubes. In early models the 89 tube will often be found to be weak on low frequencies. This latter condition can usually be cured by reversing the primary of the i-f transformer. Later production models have this change made at the factory.

Andrew Toman
in RCA Service Tip Files.

RCA Victor T 7-5, T 8-14, T 8-16, T 10-1, T 10-3

Speakers: On receiver Models T 7-5 and T 8-14, three different type speakers are used: (1) RL 63-4, (2) 76365-1 and (3) 76365-3. On Models T 10-1 and T 10-3, two different type speakers are used: (1) RL 63-5 and (2) 76365-2. On receiver Model T 8-16, two different type speakers are used: (1) RL 63-4 and (2) 76365-3.

The internal connections and replacement parts for speakers RL 63-4 and RL 63-5 are given on the schematic. The accompanying illustrations indicate the color code and wiring to the plug and connector for speakers 76365-1, 76365-2 and 76365-3.

Silvertone 1905, 1915, 1955, 1965

Elimination of hum: Objectionable hum can be eliminated from these models as follows: Replace the present 14-mfd electrolytic condenser (the insulated one) with a 25-mfd condenser, part No. R13903.

Silvertone 1923, 1933, 1983, 1993

Changes: Original production of these receivers used a chassis known as "334." Circuit changes were incorporated into later production of these models and the chassis designation was changed to "334X." These receivers can be identified through the fact that the chassis is rubber stamped "334X." The circuit changes are as follows:

1. Addition of a 0.5-mfd, 200-volt condenser, C-29, from the 1C6 filament to ground.
2. Addition of a 0.5-megohm, 1/3-watt resistor, R-20, from the 951 screen to ground.
3. Change of R-13 from 5 megohms to 1 megohm.
4. A decrease in the inductance of the r-f choke L-1.

Silvertone 1928, 1978

Changes: The value of R-7 has been changed from 5 megohms to 1 megohm. Also, a 0.5-megohm resistor, R-12, has been added from the screen of the detector tube to ground.



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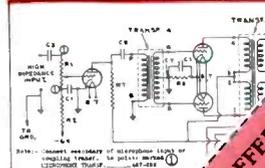
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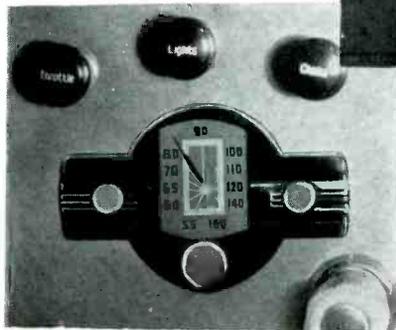
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Wells-Gardner 6R

This model is a 6 tube auto receiver with a tuning range from 530 to 1650 kc. The circuit is shown in Fig. 1. There is a 6D6 r-f amplifier; a 6C6 combination first-detector, oscillator; a 6D6 i-f; a 75 dual diode-triode as the second detector, avc tube, and audio amplifier; and a 41 output tube. The avc voltage is applied to the control grid circuits of the 6D6 r-f and i-f tubes. The manual volume control varies the audio signal applied to the triode grid of the 75 tube. A dynamic speaker is used.

The use of a vibrating interrupter in the primary circuit and a high ratio transformer results in the application of high voltage a-c to the rectifier plates. An 84 tube with a suitable filter network converts this a-c to d-c to be used as plate supply throughout the receiver.

ALIGNMENT PROCEDURE

The output meter is connected across

the primary of the speaker transformer. Turn on both the receiver and the signal generator. Short out the oscillator section of the tuning condenser. Set the volume control at the maximum position.

I-F ALIGNMENT

Connect the antenna lead of the signal generator through a .05 mfd condenser to the stator of the first detector section of the tuning condenser. (See Fig. 2.) This can be done by pushing a wire between the stator plates or by extending an insulated wire through the hole in the shield over the stator and pushing the wire through the hole in the lug which extends up from the insulated stator assembly.

Connect the ground lead of the signal generator to the chassis ground. Set the signal generator to 175 kc.

Attenuate the signal from the generator so that the output meter reads in the center of the scale. The signal in

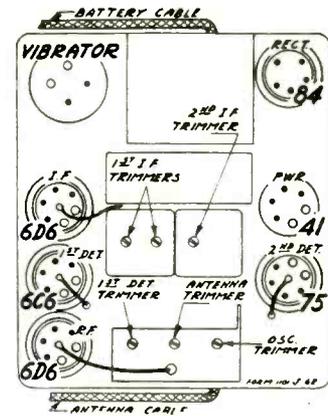


Fig. 2. Chassis of Wells-Gardner 6R, showing trimmer locations.

the speaker should be audible but not loud.

Adjust the three i-f trimmers until maximum output is obtained, keeping the signal low at the signal generator. Repeat this adjustment.

1650 KC ADJUSTMENT

Set the signal generator for 1650 kc. Turn the rotor of the tuning condenser to the full open position. Con-

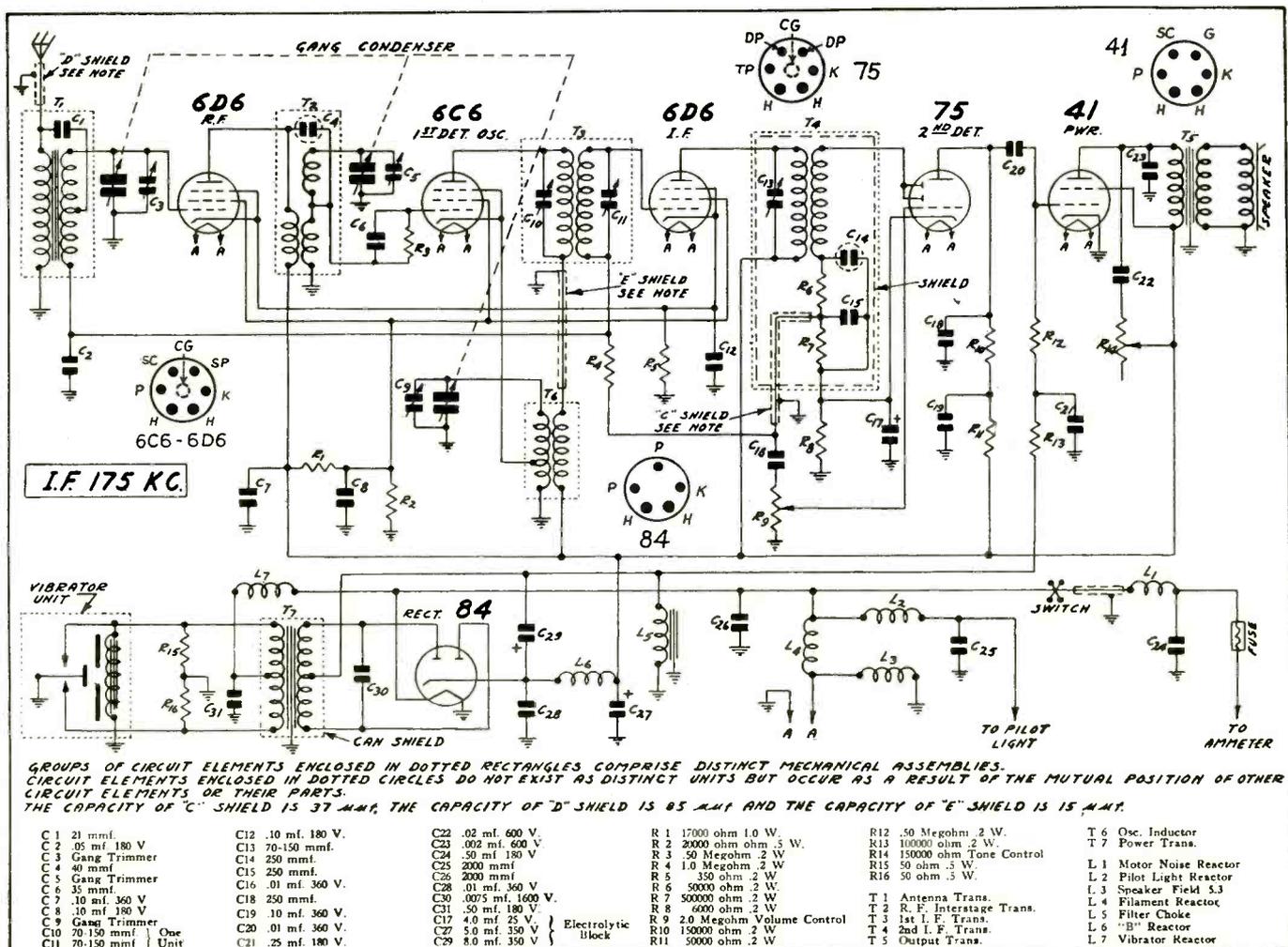


Fig. 1. Circuit of the Wells-Gardner 6R car receiver.

nect the shielded antenna lead from the chassis through a 150 mmf condenser to the antenna post of the signal generator.

Adjust the trimmer of the oscillator section of the three gang condenser until maximum output is obtained, keeping the output meter on the center of the scale by means of the attenuator on the signal generator.

1400 KC ADJUSTMENT

Set the signal generator to 1400 kc. Tune the rotor of the gang condenser carefully until maximum output is obtained.

Adjust the first detector and antenna trimmers for maximum output. Do not change the setting of the oscillator trimmer.

ADJUSTING THE ANTENNA TRIMMER

After the receiver is installed and the car antenna is connected it will be nec-

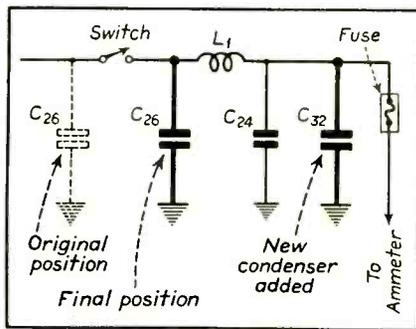


Fig. 3. Schematic of circuit change in more recent models.

essary to adjust the antenna trimmer. Tune in a weak signal between 1200 and 1400 kc, keep this signal audible but not loud. Remove the cover of the chassis case. The antenna trimmer is on the center tuning condenser section (see Fig. 2). Turn the adjusting screw of this condenser up or down until the signal is loudest. Do not touch any of the other trimmers for this adjustment.

CALIBRATING THE DIAL

Another adjustment required after the receiver is installed in the car is the calibration of the dial. Tune in a nearby station of known frequency at about the center of the dial. At the back of the unit is a calibration screw. Remove the pilot light assembly. The calibration screw will be seen at the bottom of the receptacle from which the pilot light assembly is withdrawn. Insert a screwdriver and turn this screw

Fig. 5. Voltage chart.

VOLTAGES AT SOCKETS						
Antenna Disconnected		Battery 6 Volts Under Load				
Type of Tube	Function	Across Heater	Plate to Ground	Screen to Ground	Cathode to Ground	Cathode Current M. A.
6D6	R. F. Amp.	5.8	220	90	4.5	6.3
6C6	1st Det. Osc.	5.8	220	90	0	2.4
6D6	I. F. Amp.	5.8	220	90	4.5	6.3
75	2nd Det.	5.8	130(1)		1.2	0.3
41	Power	5.8	210	220	16(2)	25.7
84	Rectifier	5.8				50.0

(1) With 250,000 Ohm Meter
(2) As read across filter choke.

until the dial pointer indicates the proper frequency for the station being received. The knob must be held during this adjustment.

In the case of the General Motors control unit turn the dial until it is set at the frequency of the particular station. Push in the spring at the back of the unit; this keeps the dial from rotating, and tune the receiver until the station is received.

INSTALLATION AND NOISE SUPPRESSION

The necessary information for installation of this receiver and for the suppression of ignition and generator interference is contained in any auto radio installation manual. A few items regarding reduction of noise can be mentioned here: Be sure that the cover is well grounded to the chassis case—clean off paint or particles of dirt which may prevent a good ground.

In some cases it will be necessary to solder a pigtail to the end of the pilot lamp cable shield at the chassis. This pigtail can then be grounded under one of the nearby screws which hold the chassis to the case.

In the later production of this series a change and an addition in the A line filter circuit should be noted.

Referring to Fig. 3, condenser C₂₄-

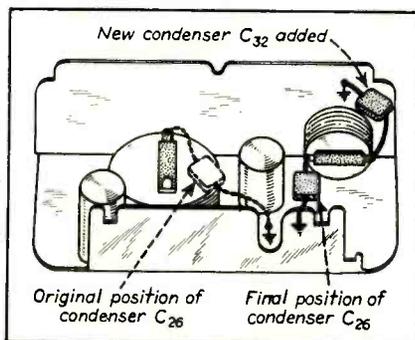


Fig. 4. Picture of recent change.

.002 mfd is moved to the opposite side of the switch as indicated. A new condenser C₂₂-.002 mfd is added as shown. The actual points at which these condensers are connected are shown in Fig. 4.

Receivers of this series having this change incorporated will be identified by a green paint mark on the battery lead. There will also be a letter "C" stamped on the chassis.

The above mentioned changes are not required for most car installations and are made only to take care of extreme cases of motor noise.

It will be necessary in many Ford V8 installations to take the steps described above. If motor noise persists after the regular procedure has been followed, make this change in the A line circuit in Ford V8's or any other cars.

If motor noise still persists, it may be radiated through the openings in the chassis case on the tuning condenser side. Remove the chassis from the case and solder a piece of tin plate on the inside of the case over the openings on the tuning condenser side to completely cover these openings.

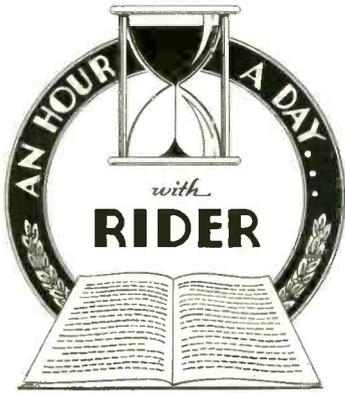
VOLTAGES AT SOCKETS

In the voltage chart given in Fig. 5 the measurements are made with all the tubes in the set in operating condition. The antenna should be disconnected.

Philco Correction

Due to an error in makeup, the circuits of the Philco Models FT9 and CT11 were interchanged.

The circuit shown on page 21 of the January issue of SERVICE is that of the Ford Philco FT9. The circuit on page 62 of the February issue of SERVICE is that of the Chrysler Philco Model CT11.



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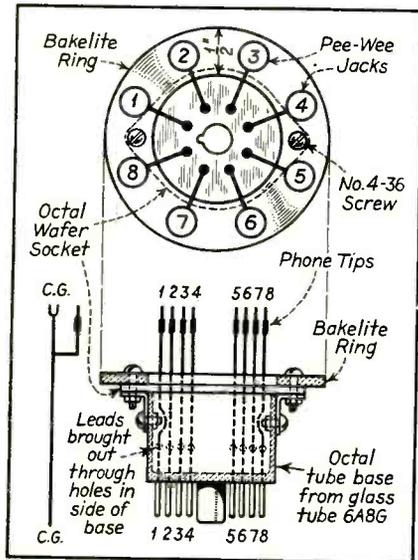
THE RADIART CORPORATION
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ON THE JOB . . .

A Versatile Adapter for Octal Tubes

It is beginning to appear that the Service Man is in for some more fun regarding the manner in which the elements will be brought out at the base of the octal tubes. In any case, a simple way of overcoming the situation is shown in the accompanying self-explanatory illustration. With this device the base of any octal tube may be matched to the tube tester (providing the tube tester is equipped to handle present-day tubes) regardless of the manner in which the elements may be brought out at the base.

For example, assume the following base line-up: No. 1 pin, screen grid; No. 2 pin, plate; No. 3 pin, oscillator grid; No. 4 pin, anode grid; No. 5 pin, one heater leg; No. 6 pin, control grid; No. 7 pin, shield; No. 8 pin, second heater leg; top cap cathode. Now to match this tube to the tester all that is necessary to do is to plug the phone tips in the pee wee jacks as follows: No. 4 phone tip (screen grid) in No. 1 jack; No. 3 tip (plate) in No. 2 jack; No. 5 tip (oscillator grid) in No. 3 jack; No. 6 tip (anode grid) in No. 4 jack; No. 2 tip (one heater leg) in No.

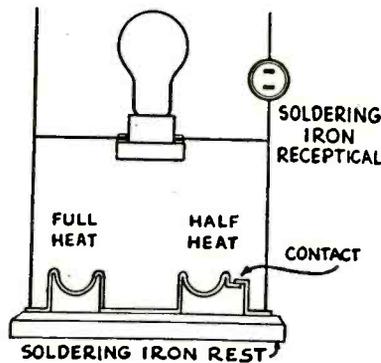


5 jack; control grid in No. 6 jack; No. 1 tip (shield) in No. 7 jack (for short tests); No. 7 tip (second heater leg) in No. 8 jack; No. 8 (cathode) to top cap. The tube is now tested as a 6A8 which type it would naturally be. The same system can be used for matching the analyzer to any type socket by the use of jacks at analyzer panel and banana plugs on cable.

Al. Beers

Keeping the Iron Clean

A clean soldering iron is an essential to good soldering, and of course an iron that is left on all the time will pit and blaken. To avoid this, a switch, as pictured in the accompanying illustration,



that shorts out an electric light bulb in series with the iron, is used. For a 75 watt iron, a 60 watt bulb, will hold the iron at a stiff soldering temperature so that it will heat up in about ten seconds. Of course as soon as the iron is picked up full voltage is applied, and the bulb is shorted during the active period of soldering.

R. C. A. Radio Service Tip File

Motorboating

In receivers using triode output tubes (45, 50, or 2A3) a peculiar condition may be encountered. The trouble manifests itself by a very loud low frequency oscillation, similar in sound to motorboating. The set seems to play quite normally until an especially loud signal is applied to the output stage, or until some disturbance in the plate supply voltage causes this noise to start. The trouble surprises one because it can not be stopped by the volume control, or by removing any of the tubes up to the output stage.

This condition has been caused by low filament voltage on the output tubes. Majestic models with the separate power supply are especially prone to this oscillation if the power tubes are old. In these models, it can generally be corrected by tightening up the nuts on the terminal strip in the power unit. The tubes should then be checked and replaced if necessary. Check the voltage regulator in these cases. The cure for a condition is obvious when the cause is known.

A possible explanation of this oscillation is offered. The plate impedance of

the tube is increased very greatly with age and the emission reduced, the tube is therefore more sensitive to filament voltage variations.

R. C. A. Radio Service Tip File

Replacing the Defective Volume Control

When replacing defective volume and tone controls, the Service Man should take into consideration several important factors if a satisfactory job is to result. These factors are:

(1) Consider the circuit in which the control is to function and the total resistance to be included.

(2) The maximum current the control must carry.

(3) Use a control that is noiseless in operation, both mechanically and electrically.

(4) All of the foregoing is taken care of by knowing the exact make and model of the set, as well as the exact function of the unit to be replaced and then referring to a reliable volume control replacement guide.

(5) When replacement is for a C-bias circuit, use a fixed resistance at the clockwise end of rotation. Such a fixed resistance is generally between 200 and 400 ohms. The value is not so critical, so that a resistance of about 300 ohms will be satisfactory. A resistor of 300-ohm value, should be attached to the right-hand terminal (looking at the shaft end of unit) when circuit calls for fixed bias resistance. By using this minimum resistance outside, the control increases in rotation which in turn results in better volume control. It also helps to increase the safe load capacity, because part of the load will be dissipated in the external resistor.

(6) In volume control listings it will be noted that there are exact duplicates precisely matched both electrically and mechanically with the original unit being replaced, and standard units more or less approximating the requirements so that they can be installed with a minimum amount of change and trouble. The exact duplicate should be employed wherever possible.

Inasmuch as it takes a great amount of time, trouble and expense to work up a representative line of exact duplicate volume controls, there are many listings which are mainly suggestions as to standard units that may possibly be applied. The Service Man will do well to distinguish between exact duplicates and standard units. The former are in accordance with the original specifications of the set designer and manufacturer; the latter are simply improvisations.

George Mucher

CHIEF ENGINEER, CLAROSTAT MFG. CO.

Here's
"BIG" News



The New 1936 Centralab Volume Control Guide

is off the press . . . more listings . . . way ahead . . . and up to the minute, including 1935 data never before shown. All listings "checked and double checked" and will be found extremely accurate.

Keep abreast with this new Guide . . . and keep abreast with CENTRALAB Volume Controls and Fixed Resistors for ALL replacement jobs. Get a FREE copy from your jobber.

NEW! Up-to-the-minute



Centralab

MILWAUKEE, WIS.

RADIOHMS SUPPRESSORS
FIXED RESISTORS
WAVE CHANGE SWITCHES

CONVERSION RESISTOR

PLUG



Converts 2-volt dry battery sets into "Air Cell" Receivers

TWO-VOLT receivers equipped with ballast tubes for dry "A" battery operation now can be converted into "Air Cell" Receivers by means of a simple, inexpensive conversion resistor plug. Simply remove the ballast tube, plug in the conversion resistor plug in the ballast tube socket, and the receiver is ready for Eveready Air Cell Battery operation. Unlike the ballast tube which it replaces, the conversion resistor plug is inexpensive and it does not wear out. On a 2-volt dry battery set drawing 6/10 ampere "A" current, the cheapest dry "A" pack will give about 320 hours of service for a cost of \$3.20, or 1c per hour. On the same receiver, with a conversion resistor plug, the Air Cell Battery will give at least 1000 hours of service, *over three times as much*, for a cost of only \$5.95, or less than 6/10c per hour. In the life of one Air Cell Battery costing \$5.95, three dry "A" packs, costing \$9.60 would be used. Changing to Air Cell Battery operation not only saves money, it does away with the bother of frequent "A" battery purchases, and it eliminates the weakening reception which takes place as the dry "A" pack's voltage runs down.

Conversion resistor plugs are made and sold by most resistor manufacturers. Only seven types required to convert over 50 different makes and models of ballast tube receivers. Send the coupon for data sheet giving complete information.

SEND FOR FREE DATA SHEET

NATIONAL CARBON Co., Inc., P. O. Box 600,
Grand Central Station, New York, N. Y.

Please send me the Conversion Resistor Plug Data Sheet.

Name _____

Street _____

City _____ State _____ S-3

ASSOCIATION NEWS . . .

INSTITUTE OF RADIO SERVICE MEN REPORTS

FOURTH ANNUAL IRSM CONVENTION AND TRADE SHOW

More than 25000 Square feet of floor space, not counting the numerous demonstration rooms through the hotel, will be used for the Fourth Annual National IRSM Convention and the 1936 National Radio Trade Show which will be held at the Hotel Sherman at Chicago, March 27 to 29.

Exhibits of a versatile nature, designed to be of value to the Service Man, amateur, engineer, distributor, sales representative, and every other participant in the radio industry will occupy the booths in the Exhibition Hall and on the Mezzanine.

The exhibition space was absorbed in record time, and letters keep pouring in from all parts of the country, each closing with the remark, "I'll see you at the Show." These letters come from those in all branches of the industry.

The exhibiting manufacturers have inaugurated another feature in the form of company meetings. Sales Representatives will go into session with the companies they represent. Visiting distributors will confer with their sources of supply.

Especial attention is being given to the amateurs at the 1936 Show. Inasmuch as nearly all of the manufacturers exhibiting their products are interested in the "ham" field as well as service, arrangements have been made to invite the amateurs in for the event.

The Eastern and Western Divisions of the Sales Managers Club will hold a joint meeting, tentatively scheduled for 1:00 p.m., Saturday, March 28.

The Service Section of the Radio Manufacturers Association will go into session at 2:00 p.m., also on Saturday.

The parts distributors and the sales representatives will hold meetings during the Convention period, but the date had not been set at press time.

Registration will start at 10:00 o'clock, Friday morning, March 27. The doors to the Trade Show will open officially at 2:00 o'clock in the afternoon. The technical sessions—the Convention proper—will convene at 7:00 in the evening in the Grand Ball Room.

Throughout Friday the Board of Trustees of the Institute will hold its regular meeting and elect the national officers for the ensuing year. Other sessions of the membership are arranged, but the time will be announced at a later date.

Among the speakers on the technical program will be such well-known persons as G. McL. Cole, "Sandy" Cowan, Jerry Golten, Ralph Glover, Charlie Herbst, Walter Jones, Harold Kadell, Harry Kalcker, Ernest Kohler, Bill MacDonald, Harold Olesen, Frank Sprayberry, Al Stobbe, and Fred Wenger. A wide variety of subjects will be covered by the speakers—interference, test apparatus and its use, circuits, microphones, public address, and many other subjects of vital interest to the technical branches of radio.

There is no registration fee. The Radio Trade is cordially invited.

CLEVELAND CHAPTER IRSM

The Cleveland Chapter of the Institute of Radio Service Men held their Annual Election and Initiation of Officers at a banquet, February 17, 1936.

The new officers, elected for the coming year by the 50 members present, are: Chairman—Albert J. Theriault; Vice-Chairman—Edward George; Secretary—L. Vangunten; Treasurer—Roy McClosky. The chairman of standing committees are: Clark T. Quinn, technical; Maynard Elliot, publicity; and Neal Bear, social events.

• • • •

NATIONAL RADIO SERVICE ASSOCIATION

The National Radio Service Association has been passing through the formative stages for several years. After much labor creating local, state, and district organizations, a national organization was born in August 1935, through the cooperation of thousands of Service Men, their local organizations, manufacturers, jobbers, and others interested in the radio industry.

The South was the first to have a solid sectional group of organized Service Men, later followed the northwest group, the eastern group, the pacific group and various local and state organizations scattered throughout the country,—till finally in August of last year, representatives from various groups assembled for a national conference, resulting in a national organization, in which each state had equal proportional representation to a National Board of Directors.

It is hoped that this board in the near future will become a "National Congress of Radio Service Men."

The National Board of Directors will be composed of Service Men only—not lawyers, doctors, shopkeepers, etc. They will represent the several states of the union and will be elected from their respective state organizations.

The National Radio Service Association is still a young but mighty healthy child—may it grow and gain power.

•

THE R.T.G. OF NEW ENGLAND

Month after month the "R. T. G. News," published in Boston by the Radio Technician's Guilds, finds its way through the mails. Now in its second volume, The News, edited by C. W. Saunders, 87 Marshall St., Medford, Mass., lives up to its name. It prints the news, all of it, of the Guild's numerous chapters throughout New England.

The R. T. G., formed in 1931 and chartered in 1933, with general headquarters in the Hotel Lenox, Boston, Mass., maintains a library, for the benefit of its members, at these quarters.

A price list on radio repairs has been agreed upon and is published in the January News. The members no longer guess at a price. The customer is referred to the list as from an authoritative source.

The Guild's advertising committee advertises the organization, accepts service calls,

and distributes them among the members in accordance with location.

A "Grand Get-Together and Radio Equipment Exposition" is planned for April 27, at the Boston headquarters.

The Handiprobe Corp. has promised to give away fifty Handiprobes as door prizes, which should induce many Service Men to attend. The idea in mind is to have the manufacturers or their distributors have booths about the hall with a display of their merchandise so that the Service Man can see the progress made to date in equipment and parts. This should bring sales to the various displayers. There has never been a show of its kind in Boston.

•

R. S. P. A. MEETINGS

The Radio Servicemens Protective Association of Houston, Texas, reports regular meetings are held the last Friday of each month. A definite educational program or demonstration of the use and operation of test equipment, such as signal generators, oscilloscopes, etc., is scheduled for each meeting. The secretary, Mr. C. J. Melvill, assures us that the increasing membership is largely due to these programs.

•

N. R. I. ALUMNI NEWS

Only three National Officers of the Association were reelected—P. J. Dunn, E. Bennett, and E. Merryman.

Ed J. Meyer, St. Louis, Missouri, a new Vice-President, proved his popularity from the start. Ed wants to open an Alumni Chapter there.

The very popular Ed. Witherstone, Sec.-Treasurer of the Toronto Chapter and editor of their magazine, the *Canadian Radio-Trician*, "crashed through" at the recent elections to become the second Canadian to be elected a vice-president of the association.

Philadelphia-Camden Chapter

The Philadelphia-Camden Chapter is mighty happy these days—C. Stokes of that chapter was elected vice-president by a large majority.

Earl Merryman has the honor now of being the oldest officer of the Alumni Association. He has been Secretary since the association was organized in 1929.

Chicago Chapter

The race between local chapter editors for bigger and better bulletins is getting interesting. C. B. Morehead, editor of the *Chicago Chapter Chatter*, turned out a bulletin last month that may cause no little envy in other alumni circles. It was a swell job and showed evidence of careful thought and preparation.

Meetings will be continued on the regularly scheduled dates, the first and third Fridays of the month. Place: The Sherman Hotel. Objectives: education, association, reciprocation, recreation—and every N. R. I. man in the Chicago area is urged to pay a visit.

• SERVICE FOR



Resistance Maintained

The Ward Leonard policy of conservative Watt Rating is a protection to you. When you do a job with Ward Leonard Resistors it stands up . . . no burn-outs of the resistors themselves or any other parts that take the load when resistors fail. Furthermore, because they are wire wound on porcelain tubes and have all joints silver soldered, they maintain their resistance values. Why jeopardize your reputation and profits by fooling around with "unknowns" when you can get Ward Leonard resistors? Send for the new price list.

SEE OUR EXHIBIT
AT THE
SERVICEMEN'S SHOW

WARD LEONARD

RELAYS « RESISTORS « RHEOSTATS

WARD LEONARD ELECTRIC CO.
South St., Mount Vernon, N. Y.

Please send me Bulletins Nos. _____

Name _____
Firm _____
Address _____
Town _____ State _____ S

MARCH, 1936 •

SAY YOU SAW IT IN SERVICE

SYLVANIA

ANNOUNCES . . .

THE NEW TECHNICAL MANUAL!



BIGGER . . . BETTER . . . MORE COMPLETE IN EVERY DETAIL. NO WIDE AWAKE RADIO MAN WILL WANT TO BE WITHOUT IT!

● It's half again as big as the old one. A new index. New appendix. It's improved in a dozen different ways. Here are a few of the subjects covered by this valuable book:

1. A 50% increase in contents.
2. 141 tube types will be listed with important circuit application information given on each type.
3. Characteristics on all types will be the very latest. In other words, our book will be up-to-date including all the standard types of metal tubes.
4. A section on circuits has been increased to include 13 typical radio receiver and amplifier circuits which show proper use of the most popular types of tubes now being employed.
5. Curve data on ballast tubes for battery sets.
6. The convenient pocket size has been retained in spite of the large increase in material.

Send 15c for this new Technical Manual NOW!
It will mean cash in your pocket.

See us at the I. R. S. M. Show—Chicago. Booths 59 and 60.

Hygrade Sylvania Corporation, makers of Sylvania Radio Tubes and Hygrade Lamps. Factories at Emporium, Pa.; Salem, Mass., and St. Mary's, Pa.

SYLVANIA

HYGRADE SYLVANIA CORPORATION
Emporium, Pa.

S-36

Please send me the new Sylvania Technical Manual. I enclose 15c in stamps.

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ADDRESS _____
CITY _____ STATE _____

THE MANUFACTURERS . . .

KAY ANNOUNCES NEW UNIVERSAL REMOTE CONTROL

Kay Products of America, Inc., 560 DeKalb Ave., Brooklyn, N. Y., presents a new modern auto-radio remote control unit embodying "wrist-watch" finger control, full airplane dial calibrated in kilocycles, escutcheons with chromium knobs harmonizing with all car interiors.



This new Kay control permits easy custom-instrument panel installation of all makes and models of auto-sets without the necessity of cutting the dashboard or difficulties in fitting. There are no visible bolts or screws. Adaptor couplings are supplied for all cables.

Kay controls are supplied in various gear ratios to fit any auto-radio receiver. Escutcheon plates supplied additionally matching the dash finish of all 1935-1936 cars.

Write to the manufacturer for complete illustrated catalog with prices listed.

NEW HICKOK APPLIANCE TESTERS

The Hickok Electrical Instrument Co., Cleveland, Ohio, announces a new series of a-c wattmeters. These instruments are mounted on bakelite bases for portable use. The equipment is complete, with double-end attachment cord and plugs, as shown



in the accompanying illustration. They are listed as "Handy Appliance Testers."

A uniform meter scale over the entire range provides the same accuracy from one watt to maximum. Case design makes the instrument both dustproof and moisture-proof. Service Men may find application for such testers as a method of testing through watt load indications as compared with rated specifications.

These testers are also available for 220 v. single phase as well as in higher watt ranges.

ARCTURUS "CORONET" METAL TUBE REPLACEMENT LINE WELL RECEIVED

Orders and letters of commendation from distributors and servicing organizations in all parts of the country speak most highly of the opinion of the trade of the new Arcturus "Coronet" Metal Tube Replacement Line.

As a starter 13 new metal tubes corresponding with the numbers of the glass tubes of the same types, and directly interchangeable with them, have been announced by the Arcturus Radio Tube Corp. of Newark, N. J. They are being built in the exclusive Arcturus "Coronet" Metal Tube construction, as these are the types most widely used in receivers constructed during the past five years. Same type numbers are used as their glass equivalents but the word "Coronet" is added to denote a metal tube replacement. Other tube types will be added to this new line from time to time, as the demand warrants.



These new tubes have the regular octal 8-prong base. To permit their regular interchange with the corresponding glass tube, modernizers have been developed by Arcturus. These are being supplied with 4, 5, and 6 prong connections for adapting the old socket to an eight-prong socket which will accommodate the metal tube base.

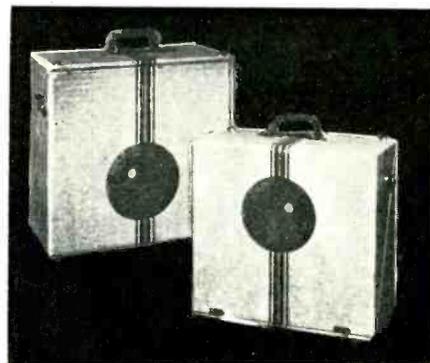
Complete literature on the new line will be supplied by the manufacturer on request.

ACRATEST 15-WATT PORTABLE AMPLIFIER

Federated Purchaser, Inc., 25 Park Pl., New York City, now have available the Acratest 15-watt portable amplifier. The amplifier is suitable for orchestras, sales meetings, political gatherings, etc.

The entire equipment is contained in two airplane-luggage cases, selected for the light-weight of the wood used and measuring only 17 inches long by 17 inches high and only 7 inches deep.

One case contains the 15-watt amplifier and one dynamic speaker. It divides diagonally and separates into two distinct sections, each capable of standing on its flat surface. A single flexible cable, 25 feet long, attached to the speaker is fitted with a plug and connects directly to the amplifier unit. An exact duplicate of the amplifier case and dividing diagonally into two sections also houses two additional dynamic speakers. One half has a cable



of 25 feet in length, which plugs into the four-prong socket on the first speaker. The other half also has a 25-foot cable which plugs into a socket on the second speaker. This half of the dual speaker case contains a field exciter supplying excitation current to the two dynamic speakers, supplied with an a-c line cord made of heavy rubber cable. Enough room is provided in the speaker case so that a crystal or velocity microphone can be self-contained.

The manufacturer claims an overall gain of 130 db for the five audio stages, a frequency range from 50 to 10,000, plus or minus 2 db, with only 5.5% distortion at 15 watts and 2% at 10 watts. Additional information may be obtained from the distributor.

MYSTIC EYE TUNING UNIT

The Empire Radio Corporation of 1217 West Washington B'ld, Chicago, Ill., present the "Mystic Eye Tuning Unit" using the 6E5 cathode-ray tube. The unit is furnished complete with the 6E5 tube and a simple escutcheon which matches any front panel.

A 24-inch five-wire cable makes for simplicity in installation on any receiver having a-c and using 6.3-volt tubes. Where a 6.3-volt supply is not afforded a small step-down transformer can be used.

AUDAX CUTTING HEAD

The Audax model 7B cutting head for instantaneous recording, although only recently introduced, is already in use in many of the leading recording studios. It is



stated to be the best "cutter" yet developed for such work.

The 7B cutter is the latest addition to various other models made by the Audax Company, 500-S-Fifth Avenue, New York City. Complete information will be mailed upon request.

**ONLY SPRAGUE
BRINGS
YOU
THESE**



**SUPER
SERVICE FEATURES**

- 1** Important new developments in "EC 600 Line" condensers. Practically short-proof. **NO NEED TO CHECK SURGE VOLTAGES.** You KNOW they're right!
- 2** ... Famous TC Cartridge By-Pass Tubulars. ... "Not a failure in a million!" Finest tubulars on the market. One standard voltage for all jobs—the highest you ever need!
- 3** Many new low prices and new units in standard items including Wet and Dry Electrolytics—High Capacity, Low Voltage Condensers — Midgets — Vibrator and Auto Radio Units—Transmitting Condensers, etc.
- 4** A COMPLETE LINE of the finest replacement condensers for EVERY NEED — at the lowest prices in Sprague history!

5 Complete program to help servicemen win **NEW PROFITS** from interference elimination. The Sprague Interference Analyzer makes it easy to eliminate radio noises. Our sales helps enable you to get this business. Get full details on this plan!

6 The Sprague Way for making *all types* of duplicate condenser replacements—quicker, easier and better. **ANY COMBINATION AVAILABLE** from standard Sprague units in the new square designs. Mounting straps furnished.

7 **NEW UNIVERSAL FLANGE MOUNTINGS**—the finest ever developed for mounting replacements in the original chassis holes. No lost time!

GET THE NEW SPRAGUE CATALOG! . . . It describes all of these developments—and many more—in full detail. It will help you build a larger service business—and a better, more profitable one!

SPRAGUE PRODUCTS CO., North Adams, Mass.

SPRAGUE CONDENSERS
TRY SPRAGUES . . . **AND NOTE THE DIFFERENCE**



"Multi-Tap"

TRADE MARK

POWER TRANSFORMERS

(Pat. No. 1992415)

**Stock of Only 5 Transformers
Services 95% of All Radios!**

Renews perfect original performance in both current and orphaned radios where trouble occurs in the transformer—the heart of the radio.

REMEMBER!—“MULTI-TAP” Transformers are the service engineer’s small-investment emergency stock. To give immediate service you don’t need forty-eleven kinds and sizes of transformers on the shelf—when 5 do the trick.

Exact duplicates ELECTRICALLY

The wide range of adaptability of only five models “Multi-Tap” universal Power Transformers is made possible thru various taps in these units which may be used singly or in combinations. The required current values can be delivered to each of the several leads in the set with any combination of tubes, as accurately as by the original power units. Easily installed.

Universally adaptable PHYSICALLY

The extremely wide range of adaptability physically is made possible with the scientifically staggered mounting slots in the several sides of the frame. This is very essential in many installations to avoid re-drilling and defacing the mounting panel.

IMPORTANT: Fully shielded for radios having Underwriters Lab. approval. Protects set owners’ fire insurance policy. No extra unused leads to become shorted.

Extra windings to meet emergency requirements are embodied on the coil. The extra 2.5 volt winding is essential for sets using 26 type tubes. The same applies to the extra 2.5 and 5.0 volt taps.

GENERAL TRANSFORMER CORP. • 502 S. Throop St. • CHICAGO, ILL.



FOR PERMANENT HI-QUALITY PERFORMANCE IN ALL CLIMATES

throughout the world, insist on GTC Transformers—PULL-PUSH MOISTURE-PROOFED, and packed in black and orange cartons as shown at the left.

**PULL-PUSH
MOISTURE PROOFED**

Free for the Asking!

Send for the FREE Bulletins listed below:

- | | |
|--|---|
| <input type="checkbox"/> "PROGRESSIVE" Transmitter Units for Amateurs—Form 20. | <input type="checkbox"/> "STENTORIAN" Sound Amplifier Nuclei—Form 23. |
| <input type="checkbox"/> GENERAL'S 1935-36 Catalog—Form 21. | <input type="checkbox"/> Voltage Regulating and Voltage Changing Transformer—Form 24. |
| <input type="checkbox"/> "MULTI-TAP" Universal Guide—Form 22. | <input type="checkbox"/> Auto-Radio Vibrator Guide—Form 25. |



Sound and Service Engineers may obtain "Multi-Tap" in 5 models—a addition to the "Multi-Use" transformers below.

“MULTI-TAP” Transformers are built with a low loss high permeability silicon steel core of sufficient stack to leave a factor of safety over the highest rating specified for the unit. In many instances several tubes might be added to each rating with safety were there no fluctuation of supply current.

A Static Shield, while not needed in many sets, is incorporated in all “MULTI-TAP” coils to overcome annoying line hum, interference from oil burners and the like. The “MULTI-TAP” is built with ample margin of safety for quality performance and dependability in over 95% of all receiving sets manufactured since 1927—both current and orphaned models.

“Multi-Use” Transformers

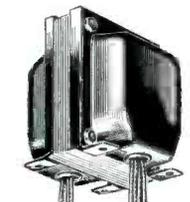
For lower priced units to be used on specific ratings General’s “MULTI-USE” Power Transformers are supplied.

“MULTI-TAP” and “MULTI-USE” Transformers illustrated are typical of the GTC group of power—audio—output—filament—line—mike—amateur—class “B” transformers, chokes, auto-radio “B” units and vibrators. The most comprehensive line of replacement units in the industry—they answer every need of the Sound and Service Engineer.

The progressive Service and Sound Engineer knows that “Safety First on QUALITY” is the quickest and surest way to build up a profitable business.



Type “F”



Type “F-4”



Type “G”



Type “P”



RADIO ENGINEERING

Covering the design, production, engineering and test of Radio Receivers, Tubes, Parts, Amplifiers, Recording and Sound Projection Equipment. Published monthly.

Subscription, \$2.00 Yearly
(Foreign, \$3.00)



COMMUNICATION AND BROADCAST ENGINEERING

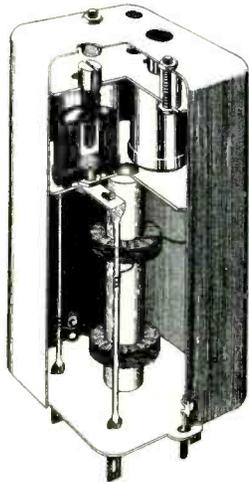
Covering Radio Communication, Broadcasting, Police, Marine and Aeronautical Radio, Telephony and Telegraphy, Facsimile and Television. Published monthly.

Subscription, \$3.00 Yearly
(Foreign \$4.00)

BRYAN DAVIS PUBLISHING CO., INC.
19 EAST 47th STREET, NEW YORK CITY

MEISSNER AIR-TRIMMER I-F

This new air-trimmer will give a micro-meter adjustment not previously attainable in this type of work. The conventional air-trimmer has 180 degrees of rotation, or one-half turn. The new Meissner air-trimmer by its unique design will have



10 complete 360 degree turns to cover the capacity range of the condenser.

These new I. F. transformers will be made with either air-core or the Meissner Ferrocarr iron core coils.

Deliveries will start to the general trade about April 1st.

NEW BRUSH MICROPHONES

Engineers of The Brush Development Company, Cleveland, Ohio, have just introduced a lapel microphone that permits lecturers, convention and after-dinner speakers to move about on the platform—from reading desk to maps, charts, exhibits, etc., without interfering in any way with the response.

The lapel microphone, known as the BL1, is extremely small—only 1½ inches by 1¼ inches in cross section, by ¾ inches

thick. It weighs less than 1 oz. and is provided with an ingenious hooking attachment that enables it to be fastened securely to the clothing. Exceedingly satisfactory reproduction is secured without requiring the speaker to raise his voice above normal conversational levels.

Special cushioning of the internal members and the use of a protecting rubber jacket on the case insures quiet operation. The company reports that there is no interference from breathing noises, cable rattling, the rub of clothing, etc. All the advantages of Brush sound cell operation are secured in the BL1. Output level minus 72 db. Furnished complete with 15 feet of light-weight rubber covered shielded cable.

A new spherical microphone has also been introduced. This meets the demand for a good, all-round, but low priced, general purpose microphone for station announcement, p-a, police, commercial interstation and amateur transmission work. The microphone cases resemble those introduced more than a year ago and still used on the company's expensive laboratory microphones. These are of wire mesh construction—finished attractively in dull chromium.

The microphones like all other Brush microphones produced during the last 3 years are non-directional. Sound waves emanating from any direction can pass through the mesh to the internal members without interference. There is no distortion from close speaking.

Brush spherical, or BR2S microphones, as they are called, require no input transformers nor elaborate stand mountings. They operate directly into the grid of the first amplifier tube. The microphones are assembled integrally with a Brush three-prong locking type plug—and are furnished with sockets for either suspension or stand mounting as the customer may desire. Size 2⅝ inches in diameter. Output level minus 66 db. Full details will be found in Brush Data Sheet No. 13. Copies may be secured from The Brush Development Company, Cleveland, Ohio, on request.



Right: Brush lapel microphone.
Left: Brush spherical microphone.



WEBSTER-CHICAGO COMBINATION 6 V OR 110 V MOBILE SYSTEM

Webster-Chicago offers combination 6 Volt D. C.—110 Volt A. C. operation in their new Model MP-420. To change from one supply to the other simply pull out 6 Volt plug pack and plug in 110 Volt pack. Can be purchased with either pack or both. Most ideal for sound systems when conditions vary. Adequate volume for large indoor or out-of-doors installations. System includes Webster phone pickup and electric phonograph turntable.

This system being either battery or a-c operated has application either for permanent or mobile installation. Suitable for dance halls, sports arenas, sound trucks, political gatherings, indoor and outdoor.



Will handle outdoor gatherings to 5,000, many more under favorable circumstances. Will handle indoor crowds of 10,000.

The manufacturers specifications are as follows: Power output, undistorted, 20 watts; gain, 115 db; hum level 26 db below zero level; No. stages 4; speakers, 2 twelve in permanent magnet dynamics; microphone, crystal, with shielded jack plug handle detachable for stand mounting.

HYGRADE SYLVANIA TYPE 6R7

Hygrade Sylvania Corporation announces type 6R7, the second duplex type in the Sylvania group of metal tubes. It is similar in structure to the preceding duplex metal tube, type 6Q7, both being of the double diode triode design. Type 6R7 is similar in characteristics to type 85 of the glass tube group, and therefore will be applied in like circuits. The base pin arrangement is the same as that for type 6Q7, base diagram 7-v. The overall size is the same as that of other topcap metal tubes.

Hygrade Sylvania Corporation also announces type 1F4, a new battery operated Power Output Pentode in the Sylvania glass tube group.

THE CINAUDAGRAPH

The Cinaudagraph Corp, Long Island City, N. Y. introduce a new development in permanent magnet dynamic speaker design. The Cinaudagraph has practically nothing in common with previous speakers. Its manufacturers claim to have overcome every known defect—in other words they claim to have a perfect speaker.

The speaker is manufactured in various sizes, ranging from 8 to 18 in. in cone diameter. The eight inch model, with an overall depth of only 2¾ inches, should be of interest for auto radio use, while the larger sizes are well suited for use in the larger home receivers. The eighteen inch speaker is intended especially for theatre or p-a work.

(Continued on page 136)

• SERVICE FOR

CLAROSTAT
VOLUME
CONTROL
Replacement
GUIDE

*Here's that
DATA
you've been
waiting for!*

Most extensive compilation yet made available. Engineers spent months gathering data. Checked and rechecked. Fully dependable.

Covers all sets . . . alphabetically listed . . . right up to the minute.

Specifies composition - element and wire-wound controls, impartially. Best type for each service job.

Also general data on controls and applications . . . typical circuits . . . taper curves . . . formulae.



Send for Your Copy Just write name and address on top of CLAROSTAT Volume Control carton, or write on your business letterhead, asking for our Bulletin No. 3. Because of cost, distribution is limited to radio service men and their jobbers.



CLAROSTAT
MANUFACTURING CO., Inc.
285-7 N. SIXTH ST. :: BROOKLYN, N. Y.



*EXACT
DUPLICATE*

ELECTROLYTIC CONDENSERS

Cut Your Servicing Time

Each label bears complete color code information permitting fast installation! Basic stocks of these TOBE Condensers are available at leading jobbers everywhere.



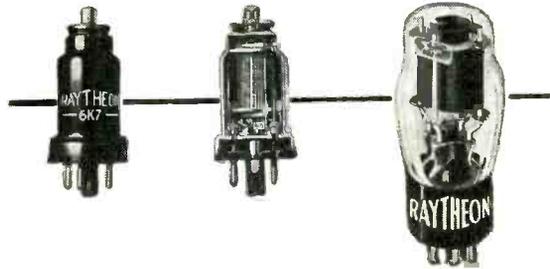
Coming . . . !

*See It at the
I.R.S.M. Show . . .*

*The newest form of
Bridge and Component
Part Tester*

TOBE DEUTSCHMANN CORP.
CANTON, MASSACHUSETTS

RAYTHEON
TRADE MARK
4-PILLAR GLASS AND
ALL-METAL RADIO TUBES



**"Radio will elect the
next President"**

CARRY ON WITH RAYTHEON!
The Raytheon Line is complete... 4-Pillar Glass, "G" Type and All-Metal Tubes... Raytheon's 1936 Sales Campaign will help you sell tubes . . . at a PROFIT!

Visit with Raytheon at Booth 15, in the 4th Annual National Convention and Radio Trade Show, Hotel Sherman, Chicago, Ill., March 27, 28 & 29.



TECHNICAL DATA CHART

Raytheon has distributed hundreds of thousands of the previous 8 editions. The NEW NINTH EDITION will be off the press soon! This chart gives all the important characteristics of types formerly listed; includes information on all the new tubes and other valuable reference data — it's NEW! It's UP-TO-DATE! It's FREE!

Headquarters for Tube Information

RAYTHEON PRODUCTION CORP.

30 EAST 42nd STREET NEW YORK, N. Y.
55 CHAPEL STREET NEWTON, MASS.
445 LAKE SHORE DRIVE CHICAGO, ILL.
555 HOWARD STREET SAN FRANCISCO, CAL.
415 PEACHTREE STREET, N. E. ATLANTA, GA.

RAYTHEON PRODUCTION CORP.

Dept. F3B, 30 East 42nd St., New York, N. Y.

Please send NEW 9th Edition Tube Chart, FREE!

Name PLEASE PRINT

Address

City

HIGHLIGHTS . . .

CORNELL-DUBILIER BOOSTS PRODUCTION FACILITIES

In anticipation of a real Spring auto-radio season, the Cornell-Dubilier Corporation, 4377 Bronx Boulevard, New York, has materially increased its production facilities for the manufacture of spark suppressors and ignition interference filter condensers. One of the important additions to their production line has been the installation of a sixty-foot conveyor-belt system.

ATLAS SOUND CORP ORGANIZED

Robert C. Reinhardt and Carl R. Blumenthal, formerly co-partners doing business as Macy Engineering Co., have now incorporated under the name Atlas Sound Corporation. Mr. Reinhardt and Mr. Blumenthal have the capacities of president and secretary-treasurer, respectively, in the new corporation.

The Atlas Sound Corporation designs, manufactures, and deals in a complete line of sound reproducing equipment of the same high quality as the Macy Engineering Company has offered in the past.

The Atlas Sound Corporation is operating at the same business address, 1451-39th Street, Brooklyn, N. Y., and has recently made an addition of factory space to provide increased manufacturing facilities.

TRUCK CARRIES COMPLETE LINE OF RADIO REPLACEMENT PARTS

Dealers may make quick selection of radio parts and accessories from bins and shelves installed in the Ford V-8 truck shown here, operated by the Hoosier Radio Supply Company of Indianapolis. The truck reaches dealers as much as fifty miles distant from the supply house. H. Robert Uhl, president of the company, reports the plan is working out very satisfactorily.



Radio accessories are sold directly from the bins in this truck.

WANTED—OLD COPIES OF SERVICE

In order to complete their files, the New York Public Library is anxious to obtain the following back copies of *SERVICE*: Volume 1, Numbers 1, 2, 7, 10, 12; Volume 2, Number 1. All correspondence should be addressed to H. M. Lydenberg, Director, The New York Public Library, Fifth Avenue and 42nd Street, New York City.

OXFORD-TARTAK CORP MOVES

On March 1 the Oxford-Tartak Radio Corporation, manufacturers of Oxford speakers and accessories, moved to their new and enlarged plant at 915 W. Van Buren St., Chicago.

Coincident with this new move, Mr. Tartak announces the development of a new and improved type of speaker which will answer a replacement problem often encountered by Service Men and dealers.

A new exponential horn has also been scientifically designed for use with a special cone type trumpet unit for PA work. It is constructed of fabricated acoustic material, weatherproof and waterproof.

Oxford-Tartak products include theatre and public address reproducers, console electrodynamic reproducers, trumpet cone reproducer units, midget and mantel electrodynamic reproducers, replacement electrodynamic reproducers, official "all star junior" speakers, magnetic speakers, field exciter units, "dynatest" universal test speakers, output and line transformers.

Stocks are carried by radio parts jobbers throughout the country.

WHOLESALE RADIO "HAMFEST"

More than 2,300 radio amateurs and short-wave fans jammed the grand ballroom of the Hotel Pennsylvania, New York, Monday evening, February 3rd, 1936, to attend the second "hamfest" sponsored by Wholesale Radio Service Co., Inc., of 100-6th Ave., New York, N. Y. This is said to be the largest individual

turnout of radio amateurs on record in the metropolitan area.

Exhibits of new apparatus by five manufacturers and a series of interesting talks by well-known technical speakers kept the crowd occupied from 6 P. M. until midnight. The featured talker of the evening was Robert S. Kruse, engineering editor of "Radio," who gave an illustrated lecture on radio-frequency amplifier design and operation.

More than one hundred prizes were given out at the end of the evening, the winners being selected through drawings of door stubs. The prizes ranged from small resistors to an expensive velocity microphone.

BRAIN CELLS INCREASE LOAD BY OVER 800%

Rapid changes and developments in receiver construction during the past three years are concretely illustrated by the new types of test and servicing instruments which are urgently called for by the complicated servicing problems of today.

What is not so readily recognized is the vast increase in *mental* equipment, which is just as essential to the technician in the proper servicing of today's receivers. What with the new tubes, superhets, AVC, noise suppression, all-wave, auto-radio, cathode-ray, etc., this mental equipment requires a thorough knowledge of all the latest and most approved test and repair methods, familiarity with all test instruments, records of innumerable "Case Histories," and even a sound background in sales and advertising principles! The extent of this increased mental load is graphically illustrated by a comparison of two well-known books. One is Ghirardi and Freed's original "Radio Servicing Course," published in 1932. The other is Ghirardi's complete revision of that book under the title of "Modern Radio Servicing," published a few months ago by Radio & Technical Publishing Co. of New York. The first book, which was very complete at the time, contained only 182 pages and 109 illustrations. "Modern Radio Servicing" contains 1300 pages and 706 illustrations (to say nothing of a 245-page Supplement)—and it is written in the same concise style as the former book without one single wasted word. The difference in size and amount of information contained in these two books may be considered a true scale to measure the enormous increase in information which the Service Man of today must have at instant command.

REDUCED PRICES ON TRANSMITTING CONDENSERS

Substantial reductions in list prices of round-can oil-filled transmitting condensers are announced by Aerovox Corporation, Brooklyn, N. Y. The popularity of these units has permitted volume production with resultant economies.

Aerovox round-can transmitting condensers are available in 1000, 1500 and 2000 volt ratings, and capacities of 1 and 2 mfd. for all three voltage ratings, and an additional 4 mfd. for the 1000-volt rating. These units are standard Aerovox grade, with the usual label, voltage rating and guarantee.

• SERVICE FOR

DO A "RIGHT JOB"! Replace Burn Outs with STANCOR EXACT DUPLICATE TRANSFORMERS

When you use STANCOR EXACT DUPLICATE TRANSFORMERS you are saving yourself labor, turning out a better looking and more satisfactory job for which you can get more money and on which you can earn a legitimate profit. 1063 types carried in stock at all times, exact duplicates of original transformers, mechanically and electrically.



See the STANCOR exhibit at Booth 17 or write for complete catalog and special service man's price list today.

STANDARD TRANSFORMER CORPORATION
852 Blackhawk St. Chicago, U. S. A.

MORLEN

A complete line of ultra-modern public-address amplifiers, with *all-metal amplifier tubes*. The circuit is the exclusive MORLEN "Power Driver" system that gives greater power output, *over a wider frequency range* than any other method.

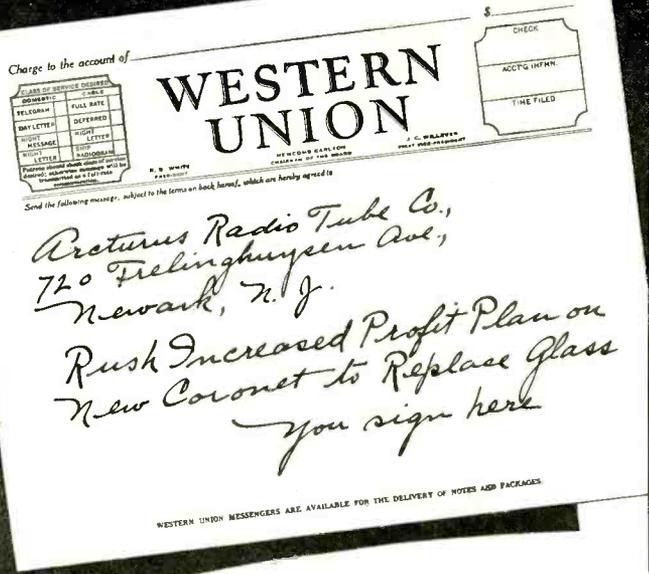
The MC 38, illustrated, has two individual inputs, mixer controlled, plus main volume control; an overall gain of 128 d-b; dual output impedances of 500 ohms and 15 ohms tapped at 8 and 4 ohms. Nine other important conveniences. An ideal, all 'round, dependable amplifier.

For complete information and engineering service, write Dept. S-3.

MORLEN ELECTRIC COMPANY, Inc.
60 WEST 15th STREET, NEW YORK, N. Y., U. S. A.



MC38 P.A. Amplifier, 38 - 45 watts output.



- These 'CORONET' TUBES replace glass tubes of the same type number:
- 2A6 'Coronet'
 - 24 "
 - 27 "
 - 51(35) "
 - 55 "
 - 56 "
 - 57 "
 - 58 "
 - 75 "
 - 77 "
 - 78 "
 - 80 "
 - 85 "

Also 'CORONETS' for the new metal-tube sets.

Pick up the phone. It will pay you to send the above wire immediately. We'll have full details of the new 'CORONET' METAL TUBE for replacing glass tubes in your hands by return mail. 'CORONETS' will put your TUBE SALES on a paying basis! Here's a *perfected* Metal Tube which will modernize and rejuvenate glass tube sets made during the past 5 years—the tube 25 million radio owners have been looking for. Send that wire TODAY! Don't let the other fellow beat you to it. Get in on this easy, highly profitable replacement business right at the start. The volume is BIG—the margin GENEROUS. Competition is NIL—for Arcturus, and only Arcturus OFFERS your customers a metal tube for their glass tube radios. Act now! Send that wire! Get full particulars of this unusual opportunity to increase your profits in 1936!

At the Show!

If you attend the I.R.S.M. Convention at the Hotel Sherman, Chicago, March 27th, 28th and 29th, be sure to see the ARCTURUS EXHIBIT Booth No. 9.



ARCTURUS 'CORONET' METAL TUBES

ARCTURUS RADIO TUBE CO.
Newark, N. J.

RCA MANUFACTURING CO. OPENS EIGHTEEN DISTRICT OFFICES

In accordance with the new policy of unifying the selling activities of the RCA Manufacturing Company for more efficient operation, G. K. Throckmorton, executive vice-president, recently announced the establishment of eighteen district control offices in various parts of the country, to administrate the sales and merchandising of all of the company's diversified products. Mr. Throckmorton also announced the appointment of the executives who will be in charge of the new district offices.

The field selling forces which have heretofore been operating independently of each other for such allied products as RCA Victor Radios, Victor Records, RCA Tubes and Parts, as well as other more specialized apparatus are now consolidated under the direction of each District Manager.

The new District Managers and the cities in which they are headquartered, are as follows: Boston—J. B. Elliott; Syracuse—Herbert C. Edgar; New York—L. W. Teegarden; Philadelphia—John K. West; Pittsburgh—E. W. Butler; Washington—Roy A. Forbes; Atlanta—M. F. Blakeslee; Cincinnati—Norman Bass; Cleveland—H. A. Edwards; Detroit—Robert E. Kane; Chicago—F. H. Larrabee; Minneapolis—Fred D. Wilson; St. Louis—H. T. Stockholm; New Orleans—F. Bewsher; Dallas—James W. Cocks; Denver—Dean A. Lewis; Seattle—N. A. Woodford; Los Angeles—James E. Francis.

NEW WINCHARGER SERVICE MANUAL NOW READY

A 20-page service manual, to acquaint radio dealers and Service Men with the business possibilities and profits from the installation of Winchargers, has just been issued by the Wincharger Corporation, of Sioux City, Iowa.

Because of the increasing sales of this unit, radio dealers and Service Men are urged to write for this manual today and share in the profits from the demand for capable installers and Service Men.

NEW KEN-RAD BULLETIN

The commercial engineering department of the Ken-Rad Tube Corporation, Owensboro, Kentucky, has recently compiled a bulletin on "The Relation of Modulation Products with Multi-Tone Signal to Harmonic Distortion with Mono-Tone Signal in Audio Amplifier Analysis."

Copies of this bulletin may be obtained from Ken-Rad under the code title CEB 36-5.

FLECHTHEIM TAKES LARGER QUARTERS

The increase of business of the previous season is responsible for the removal by A. M. Flechtheim & Co., condenser manufacturers, of offices and factory to larger quarters. The plant of the Flechtheim Co. (who have been in the condenser business for 11 years) is now located at 692 Broadway, New York City.

Flechtheim Condensers are now manufactured entirely in this country and by the processes which have been responsible for their quality.

Mr. A. J. Walker formerly with the Wireless Specialty Apparatus Co. and the Dubilier Condenser Corp. is in charge of engineering and production.

WEBSTER-CHICAGO SOUND SYSTEMS LICENSED

The Webster Company, 3825 W. Lake St., Chicago, recently completed negotiations for a license to manufacture sound systems under patents of Electrical Research Products, Inc., subsidiary of Western Electric Company, Inc., and American Telephone and Telegraph Company. The Webster Company now manufactures a complete line of public address systems, sound equipment and accessories. A handsome catalogue describing all of the items in their line is now available and can be obtained free on request.

CORNISH WIRE COMPANY IN LARGER QUARTERS

Asked to comment upon business conditions in the Radio field, executives of the Cornish Wire Co., manufacturers of antenna products, 30 Church Street, New York City, simply pointed to the fact that in the past few weeks it has been necessary to double the Company's floor space. Acceptance of their "Noise-Master" unit which is said to be effective in any location, was declared to be progressing among both trade and public. "Because", as one official put it, "there really is a crying need for an all-wave antenna that will give the set owner a break on broadcast as well as short-wave bands—and this antenna delivers the goods". The company is at all times prepared to send special antenna information to Service Men and dealers.

GERALD B. MILLER APPOINTED

Gerald B. Miller, 8208 Santa Monica Blvd., Los Angeles, Cal., has been appointed to represent the Brush Development Company in Southern California. The Brush Development Company, of Cleveland, Ohio, manufactures crystal microphones, headphones, loudspeakers, oscilloscopes and vibration pickups.

NORMAN B. NEELY REPRESENTS PRESTO

Norman B. Neely, Radio Enterprises, 1656 North Serrano Street, Los Angeles, Cal. is the exclusive California representative for Presto Recording Corp., of New York City.

Due to an error the January issue of SERVICE attributed this appointment to Mr. N. F. Andruss of San Francisco.

MANUFACTURERS

(Continued from page 132)

UNIQUE UNDER-CAR ANTENNA

Greater pickup, freedom from mechanical difficulties, and rapid installation possibilities are features claimed for this novel auto antenna. The first showing is taking place at the IRSM convention, in Chicago, by Arthur H. Lynch, Inc.

The antenna is an inverted V type and attaches to the flywheel housing and shackle bolts on the rear axle. There is no portion of the antenna, however, which runs parallel to the rear axle and for that reason breakage is eliminated. The length of each leg of the antenna is about 20 feet, regardless of the type of car on which it is installed. This feature provides more pickup than would be possible with the ordinary single wire triangular antenna.

The antenna may be attached to a car

in about ten minutes, a feature long awaited by automotive radio Service Men.

The Lynch Noise Reducing Coupling System, may be used in conjunction with this new aerial, in a satisfactory manner.

ATLAS PROJECTOR HORN

The Atlas Sound Corporation of 1451 39th Street, Brooklyn, N. Y., announces a new weatherproof demountable cone speaker horn.

The projector horn can accommodate all speaker sizes up to 14 inches. The efficiency of the cone is increased considerably and the sound can be projected over extreme distances. The manufacturer states that this exponential horn is ideal for long range indoor and outdoor applications. It is finished in a brilliant aluminum, is 100% weatherproof, with a bell opening 24 by 36 inches, and a length of four feet when mounted.

The horn is shipped demounted, packed in a container 37 x 25 x 48"; shipping weight 24 lbs.

NOKOIL REPRODUCER USES ALNICO

The high flux density of the Nokoil Reproducer is furnished through the use of a new magnetic material known as Alnico.

It seems almost impossible that a speaker having no field coil such as the Nokoil Reproducer can furnish sufficient flux density through the use of a magnet to



equal the performance of the finest electro dynamic speaker of the same size, yet it is true. Circulars giving full description of this remarkable new unit will gladly be mailed to you free of charge by Wright-De Coster, Inc., St. Paul, Minnesota.

UNIQUE CORD SET

The Holyoke Company of 720 Main Street, Holyoke, Mass., presents to the trade Cord Sets with the Gilbert Plugs. Constructed of special composition, the cap mold is flattened to provide a finger grip which assists in removing the cap from the receptacle. The plug is practically unbreakable—subject it to far more severe wear than it could receive in daily use—and it remains intact.

Attaching the plug to the cord requires no tools since the blades are screwless. A patented spring action insures tight grip of blades to outlets.

These cord sets are obtainable in either



rayon or "Posj" all rubber and are approved by both the National Board of Fire Underwriters and the IES. Continuous or cut-to-length cord is also available. Samples on request.

• SERVICE FOR



"WIREWATT ENDS RESISTOR NOISES!"

says Bill Fixit

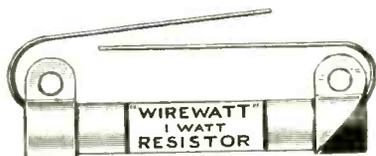
"Wirewatts sure do the trick! In fact many of my service jobs are giving better reception than ever—since I replaced composition units with OHMITE Wirewatts."

This wire-wound unit, rated at 1 watt, is one of the most practical service parts ever designed. The same size as composition units, it is usable in nearly all circuits. It's especially easy to install because of the 1½ inch tinned lead wires. The construction guarantees long-life and noiseless reception: wound over porcelain core and insulated with special insulating coating. Resistance wire is mechanically locked, then brazed to terminal lugs. Values—100 through 25,000 ohms. Ask your jobber or write for Catalog 14.

OHMITE

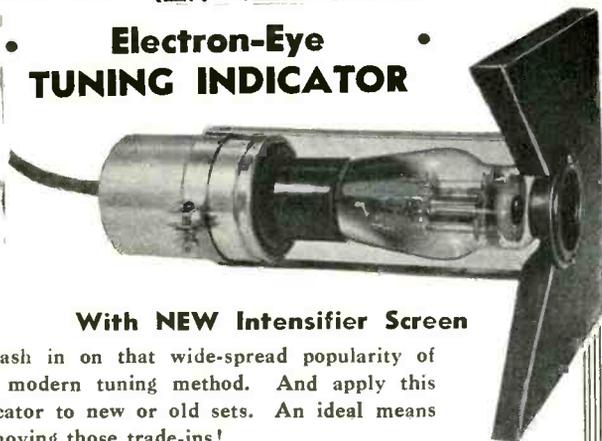
MANUFACTURING COMPANY

4827 Flounoy Street
Chicago, Ill.
Manufacturers of Resistors of All Types



TACO

Electron-Eye TUNING INDICATOR



With **NEW Intensifier Screen**

• Cash in on that wide-spread popularity of this modern tuning method. And apply this indicator to new or old sets. An ideal means of moving those trade-ins!

May be installed in any A.V.C. set, new or old.

Sells for only \$1.50 list (less 6E5 tube). Easily installed in an hour.

Provides visual, razor-sharp tuning for maximum sensitivity, selectivity, fidelity.

Demonstrate it to your customers and you'll make sales.

DATA Send for bulletin describing indicator and applications. Also display material. Meanwhile, ask your jobber to show you this item in use.

• **TECHNICAL APPLIANCE CORP.**
Pioneers in Noiseless Antenna Systems
17 EAST 16th ST. NEW YORK CITY

TACO

Now "an ALL-AROUND MICROPHONE"

Ideal for All Conditions!



- The Amperite Velocity, when in vertical position, has widest angle of pickup without frequency discrimination.
- Permits 360° pickup when lowered and tilted until parallel to floor.
- Same position provides narrow angle (X in diag.) which can be used to eliminate undesirable noises.
- Eliminates Feedback in P. A. work.

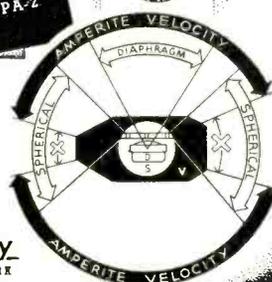
Note: High impedance model operates directly into grid.

NEW!
Positive, smooth-action stands

Write for Illustrated Bulletins PA-2



*Diagram shows angle of pickup without frequency discrimination of various types microphones.



AMPERITE Company
561 BROADWAY NEW YORK

AMPERITE Velocity MICROPHONE

Curtis
Electrolytic
CONDENSERS

Send GREETINGS to the
I. R. S. M.
CHICAGO CONVENTION

Because CURTIS CONDENSERS are
**HIGH QUALITY
LONG LIVED
DEPENDABLE**

they merit your approval and use.

"STANDARD"

6 volt to 550 volt

"BLUE RIBBON"

630 volt

Tested in Millions of Installations.
Satisfaction Guaranteed.



Patent No. 1950352

CURTIS CONDENSER CORPORATION

3088 WEST 106TH ST. CLEVELAND, OHIO

ORLEANS ST. CHICAGO, ILL.

Utah Radio

UTAH RADIO PRODUCTS CO.

URPC 820 TWS = CHICAGO, ILL.

FOR PERMANENT RELIEF FROM SERVICE HEAD-
ACHES USE UTAH REPLACEMENT PARTS STOP
ACCEPT NO SUBSTITUTE STOP COMPLETE PARTS
CATALOG FREE.

UTAH RADIO PRODUCTS CO.
-CARRINGTON

TEAR OUT THIS AD—PIN TO YOUR LETTERHEAD AND MAIL TO DEPT. S.
FOR COMPLETE DETAILS AND FREE CATALOG

IT'S EASIER AND CHEAPER TO USE **LENZ** *Wire*

There's a type especially developed for every purpose! It's easier to turn out better jobs with Lenz Wire—and it costs less to use quality wire. Be sure to get your copy of the New Service Man's Catalogs. Fill in the coupon and send it to us TODAY!

LENZ ELECTRIC MFG. CO.
1751 North Western Avenue Chicago, Ill.

JOBBERS MAIL THIS COUPON for NEW CATALOG

LENZ ELECTRIC MANUFACTURING CO.,
1751 N. Western Avenue, Chicago, Ill.

Please RUSH new Lenz Catalog No. 23 to us TODAY!

Jobbers

Name

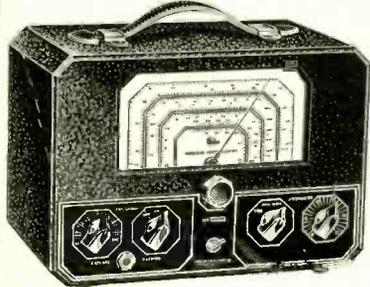
Address

City State

Buy Webber Instruments

ON THIS NEW extended PAYMENT PLAN

**No Red Tape
Easiest of Terms**



**WEBBER 1936
MODEL 20 OSCILLATOR**
Accuracy 1/2 of 1%

Your jobber can tell you how you can purchase new 1936 Webber instruments—OSCILLATORS, TUBE TESTERS—on this convenient plan. *Payments as low as \$2.93 down and then only \$1.68 weekly for 10 weeks—including low carrying charge!* Figure it out! You've always wanted fine, portable instruments like these—so buy now—make them pay you as you pay.

LOW PRICES FOR WEBBER MASTER INSTRUMENTS

Webber 1936 Model 20 Portable OSCILLATOR	\$29.95 Net
Webber 1936 Model 40 Portable OSCILLATOR	24.95 Net
Webber 1936 Model 40-A Portable OSCILLATOR	19.50 Net
Webber 1936 Model 30-A "Service Caller" TUBE TESTER	36.95 Net
Webber 1936 Model 30 Portable TUBE TESTER	31.95

See your jobber at once—or write us sending jobber's name.

JOBBERS - DISTRIBUTORS—You can make money with this new Webber Payment Plan—write for details.

EARL WEBBER COMPANY

1217 WEST WASHINGTON BLVD. CHICAGO, ILL.

A Few Desirable Territories Open for Representatives



I'M A NEW
ARRIVAL
AND I'M YOURS
FOR THE ASKING!

A long awaited event! A pleasurable thrill of anticipation! It's always the case when Wholesale Radio Service Company announces a new catalog! Catalog No. 63 is just off the press. . . . It lists hundreds of items, last minute price changes, items that sell fastest during the summer months, newest developments!

It's a book you MUST have if you want to be up to date in your business!

SPECIAL ANNOUNCEMENT

Service Equipment may be purchased on easy F. H. A. terms. Write for dope!

Address Dept. S-36

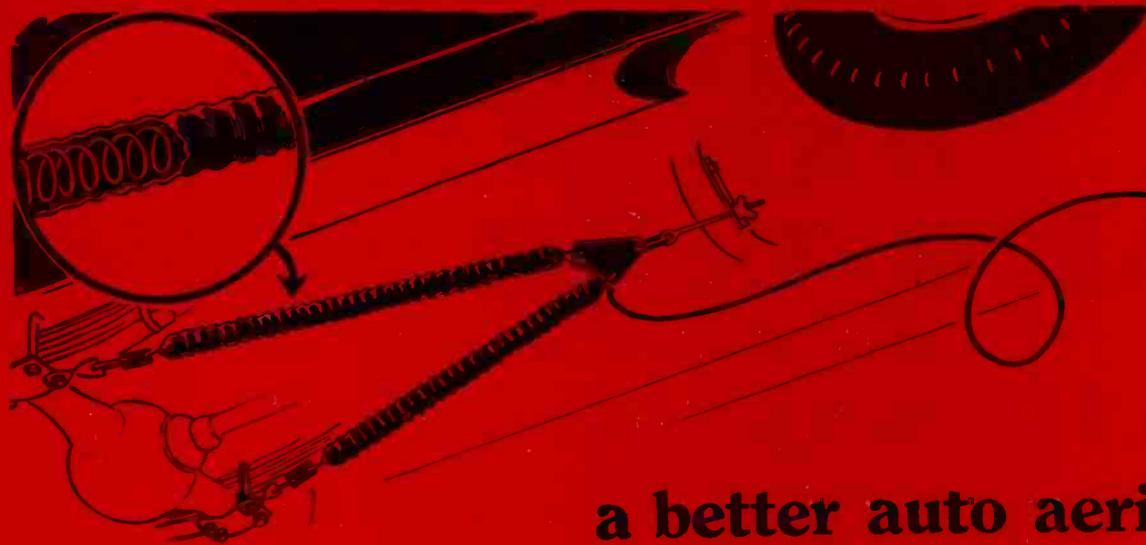


WHOLESALE RADIO SERVICE CO.

NEW YORK, N.Y.
100 SIXTH AVE.

CHICAGO, ILL. **ATLANTA, GA.**
901 W. JACKSON BLVD. 430 W. PEACHTREE ST. N.W.

BRONX, N.Y. **NEWARK, N.J.**
542 E. FORDHAM RD. 219 CENTRAL AVE.



a better auto aerial at a lower price!

- nothing else like it.
- more volume—less interference.
- one type fits all cars.
- installed in 15 minutes.
- good for all cars.
- better than any other for "Turret-Top" cars.
- protected by patents, A.A. & K., 1920162-1938092.
- satisfaction guaranteed.

More volume results from the use of stiff coiled springs made of 40 feet of heavy wire.

Springs thoroughly protected by moisture, dust, oil and grease proof covering.

Installation is extremely simple and avoids under-bar mechanism as well as mud and dirt thrown by the wheels.

The famous Lynch Noise-reducing, Impedance-matching Coupling System which improves the performance of any auto antenna can be attached very easily.

List Price **\$3.75**

See it at your jobber's—NOW

Arthur H. Lynch, Inc.

277 FULTON STREET
NEW YORK

*Pioneer of
Noise-reducing
Aerials*



1936 NATIONAL RADIO TRADE SHOW AND FOURTH ANNUAL NATIONAL CONVENTION

of the Institute of Radio Service Men

MARCH

27

28

29

FRIDAY SATURDAY SUNDAY

HOTEL SHERMAN, CHICAGO, ILL.

EXHIBITS OPEN AT NOON—PROGRAM STARTS FRIDAY AT 7:00 P.M.

REGISTRATION FREE

SPECIAL FEATURES

Hammond Organ

This electronic device is one of the wonders of the age. It will be on demonstration all three days. It is worth traveling great distances to see and hear.

Displays

Over 65 booths will be filled to overflowing with the latest developments in test equipment, parts and things of great interest to the Radio Service Industry and the Amateur.

Traveling Service Laboratory

A "Covered Wagon" house trailer shell, equipped as a Radio Service Laboratory, will be displayed. The object is to show how Radio Service can be taken to the small community at a profit.

Attendance

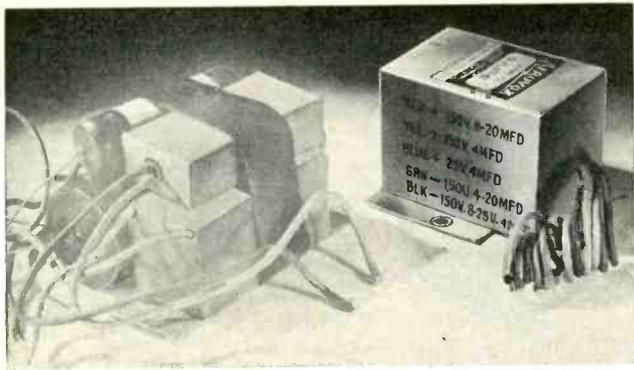
You will be able to meet Radio Service Men, Manufacturers, Manufacturers Agents, Distributors and Engineers from all parts of the Nation. This will be the greatest assembly of important personalities of the Radio Industry in 1936.

Program

There will be three days of lectures and demonstrations by the worlds best authorities on a wide variety of subjects. The March issue of the IRSM News will give the complete program. Mail your request for a copy now.

Address All Inquiries to the Institute of Radio Service Men
510 N. DEARBORN STREET, CHICAGO, ILLINOIS

THE ENTIRE RADIO TRADE IS CORDIALLY INVITED TO ATTEND



Which? MAKESHIFT OR EXACT DUPLICATE

Exact duplicates, mechanically and electrically.

Electrolytic or paper; metal can, cardboard, tubular.

Listings in catalog by set models, parts numbers, dimensions, capacities, etc.

Finest condensers obtainable for stay-put servicing.

But if you must improvise, use AEROVOX ultra-compact electrolytics.

A MESS of separate units taped together . . . jammed in place . . . results uncertain. Or an AEROVOX exact duplicate replacement . . . four sections . . . fits in place . . . functions as set designer intended. • Why improvise? Especially when exact duplicate costs less. • That's why we recommend exact duplicates.

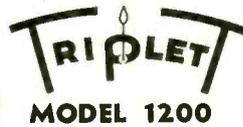
Write: New 1936 catalog contains four pages of exact duplicate replacements. Copy on request, also sample of monthly Research Worker.



CORPORATION
80 Washington Street Brooklyn, N. Y.



UNIVERSAL SERVICING INSTRUMENT



VOLT-OHM-MILLIAMMETER
Accuracy guaranteed within 2%

Reads D.C. 10-50-250-500-1000 volts at 2,000 ohms per volt; 1-10-50-250 milliamperes; 1500 ohms; 1.5 and 3 megohms; A.C. 10-50-250-500-1000 volts.

DEALER PRICE \$21.67
(Now in All-Metal Case)

NO SERVICEMAN CAN PROPERLY BE WITHOUT THIS ONE INSTRUMENT. MODEL 1200 HAS THESE FEATURES:

- SEPARATE A.C. AND D.C. METERS
- TILTING FOR ACCURATE READING
- OHMS SCALES SEPARATELY ADJUSTED
- LOW LOSS SWITCH
- ALL METAL CASE



PRECISION WITHOUT EXTRAVAGANCE

Model 1200 meets every need for measuring Volts A.C. and D.C., Milliampers A.C. and D.C. and Ohms. It is durable and compact and built in an ALL-METAL case.

See us at the I.R.S.M. Show at the Hotel Sherman, March 27-8-9. All Triplet models will be on display.

Triplet Electrical Instrument Co.
173 Harmon Drive
Bluffton, Ohio

Please send me more information on Model 1200... Model 1210-A... Model 1220-A... Model 1231... Model 1232... Model 1204... Please send new 1936 Catalogue.....

Name
Address
City State

AT LAST COMBINATION MOBILE SOUND SYSTEM



- Model M420
- 20 Watt Undistorted Output
- Phonograph Turntable and Pickup Mounted on Amplifier
- Hand Type Dual Diaphragm Crystal Microphone
- Two 12" Permanent Magnet Speakers
- Works On 110 V., A.C. or 6 V., D.C.

Fully Licensed
Strict Dealer Policy
Time Payment Plan

IDEAL for RENTALS

Here for the first time WEBSTER-CHICAGO offers the satisfactory solution to combination 6 Volt and 110 Volt operation. This is ideal for rentals BECAUSE all requirements are answered with one system. Adequate volume for large indoor or out of doors installations. Use of phonograph turntable as part of amplifier reduces bulk.

Price surprisingly low. Write for details. See your jobber. FREE—"A Short Course in Sound Engineering." Webster-Chicago is now preparing a limited edition on the above. Every sound man; jobber, dealer, service man will want one of these up-to-date pamphlets covering engineering and sales details. If you wish one, send in your name. Printing will be limited to those desiring this information.

THE WEBSTER COMPANY
3825 WEST LAKE STREET
CHICAGO, ILL.

The Webster Company
Section M5.
3825 West Lake Street
Chicago, Ill.

Please send me more information on Model M420. Please enter my name for copy of "Sound Engineering."

Name
Address
City State



Welcome to the BIG SHOW

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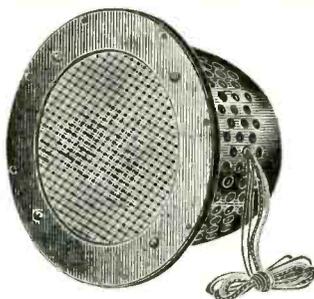
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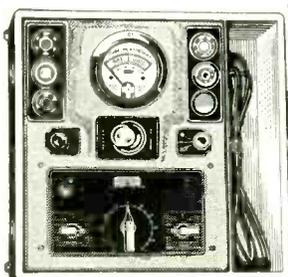
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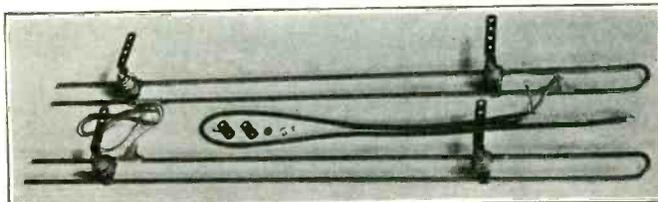
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INDEX TO ADVERTISERS

A	Aerovox Corp. 141	General Illuminating Corp. ... 146	R
	Alden Products Co. 95	General Transformer Corp. ... 130	RCA Mfg. Co., Inc. Fourth Cover
	Allied Radio Corp. 141	H	Racon Elec. Mfg. Co. 142
	Amperite Corp. 137	Hope Mfg. Co. 142	Radio & Technical Pub. Co. 143
	Arcturus Radio Tube Co. 135	Hygrade Sylvania Corp. 127	Radiart Corp., The 123
	Atlas Sound Corp. 145	J	Radolek Co., The 147
	Audak Company 142	Jackson Elec. Inst. Co. 145	Raytheon Production Corp. 133
	Autocrat Radio Co. 145	Jefferson Electric Co. 119	Rider, John F. 123
B		K	Rivard Mfg. Co. 143
Bell Sound Systems, Inc. 147		Kay Products of America, Inc. 120	S
Birnbach Radio Co. 142		Ken-Rad Corp., The 147	Solar Mfg. Corp. Third Cover
Brush Development Co., The... 146		L	Sound Systems, Inc. 145
C		Lenz Elec. Mfg. Co. 138	Sprague Products Co. 129
Centralabs 125		Leotone Radio Co. 145	Standard Transformer Corp. .. 135
Cinaudagraph Corp. 99		Lynch Mfg. Co., Arthur H. 139	Supreme Instruments Corp. 109
Clarostat Mfg Co., Inc. 133		M	Supreme Publications 145
Continental Carbon, Inc. 117		Mallory & Co., Inc., P. R. Second Cover	T
Cornell-Dubilier Corp. 110		Morlen Electric Co. 135	Technical Appliance Corp. 137
Cornish Wire Co. 97		Muter Co., The 147	Thordarson Electric Mfg. Co. ... 117
Curtis Condenser Corp. 137		N	Tobe Deutschmann Corp. 133
E		National Carbon Co., Inc. 125	Trimm Radio Mfg. Co. 143
Eastern Sound Co. 142		O	Triplett Elec. Instrument Co. .. 141
Electrad, Inc. 100		Ohmite Mfg. Co. 137	U
Electro-Voice Mfg. Co., Inc., The 143		Operadio Mfg. Co. 123	United Transformer Corp. 98
Electronic Labs., Inc. 143		P	Utah Radio Products Co. 138
F		Precision Apparatus Corp. 115	W
Federated Purchaser, Inc. 148			Ward Leonard Electric Co. 127
Flechthelm & Co., A. W. 143			Ward Products Co. 145
G			Webber Co., Earl 138
General Electric Co. 93			Webster Co., The 141
			Wholesale Radio Service Co. ... 138
			Wincharger Corp. 147
			Wright-DeCoster, Inc. 147

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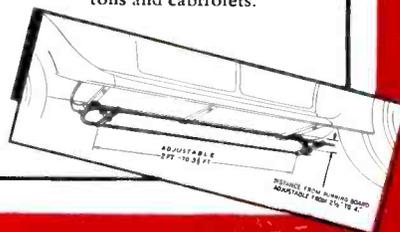
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