C tizens

RADIO CALL BOOK MAGAZINE ©

50¢

WINTER EDITION

A COMPLETE RAD O CYCLOPEDIA

Now! AC TUBES 226-227

Two New Favorites in
"The World's Largest Tube Line"
33 Distinct Types

Of course you want an A C set! *Sonatron* places at your service the two newest developments—226 A C and 227 A C. Every advantage of A C tube operation is enhanced by the superlative quality built into these two new *Sonatrons*. For best results in tone, volume and distance—see that you have a *Sonatron* in every socket! Every tube in the famous *Sonatron* line is carefully adapted to do its particular work—and do it better! Standard quality—in every way. Sold everywhere—under a remarkable guarantee!

For the latest tube information, write us for our Circular CB-1.

THE NEWEST! SONATRON 225 A

A Sensational New Tube Designed to Replace the 225 AC!

Here is the inevitable step forward in AC tubes! Has the cathode connections right on the base, replacing the prongs on top of the tube in the old style. This 3-volt transformer, AC Heater element tube can be used in all sets wired for the 225 AC.

SONATRON

This label identifies the genuine to hundreds of thousands of Sonatron enthusiasts!

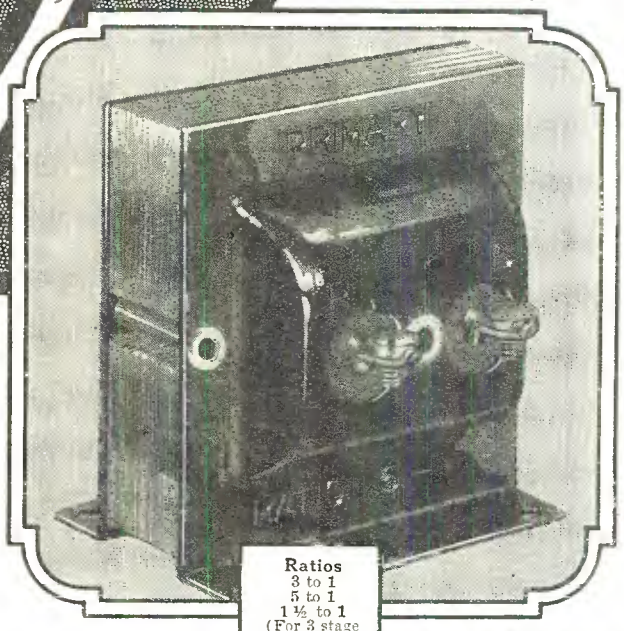
SONATRON

SONATRON TUBE COMPANY

NEWARK, N. J.
108 West Lake St., CHICAGO
320 Lafayette Building, DETROIT
16 Hudson St., NEW YORK CITY
WINDSOR, ONT., CAN.

97¢ WHILE THEY LAST

Now—thousands of fans who never felt they could afford a real audio amplifier can have one for far less than factory cost.



Ratios
3 to 1
5 to 1
1½ to 1
(For 3 stage Audio)

Fans! Here is your opportunity to save a lot of money. *Music Lovers!* Here is your chance to enjoy the kind of radio reproduction you have always dreamed about. *Professional Set Builders!* This great factory clearance sale gives you the chance of a lifetime to greatly increase your profits. For here is a high grade, heavy duty, genuine *all-frequency* transformer of exceptional musical qualities—offered to you at only a fraction of actual cost. Never before has such a value been offered. And when this stock is gone, gone too will be the biggest, best, money-saving bargain opportunity the radio industry has ever known.

The FAMOUS ILLINOIS *"All-Frequency"* AUDIO

This truly marvelous transformer, made in a slightly different manner with respect to mounting, is being used today in high priced, fine toned manufactured radio sets.

The lot which we are offering at 97c is a batch made up to the specification of a set manufacturer who proved financially unable to take them. Hence, we are making them available to fans, music lovers and professional set builders at a price which we know positively will clear the entire stock quickly. The Illinois "All-Frequency" Audio Transformer is, in every sense of the word, a $4.00 value. You get it for only 97c.

Superb Music—Real Volume

These are not old-fashioned "tin-pan" sounding transformers, but fresh, new, up-to-date units built to the highest standards of electrical excellence. The laminated core is oversize and of the finest grade of silicon steel. The windings are also oversize, and the primary winding is of a very low resistance so as to consume the smallest amount of "B" battery current. Windings are completely shielded and the binding posts are conveniently located. You will be amazed when you hear the reproduction the Illinois "All-Frequency" transformer gives you. Clear, strong, true-to-life music —from the low to the highest notes.

Beautifully Finished

The Illinois "All-Frequency" Transformer is attractively finished. It looks like the $4.00 transformer that it is. The shielding case is enameled black and highly polished. The binding posts are polished nickel. When built into a set, this transformer looks as good as it performs. Take advantage of our 97c price offer now. Mail the Guarantee Coupon from this page today.

ILLINOIS TRANSFORMER CO.
223 West Elm St. Chicago, Ill.

ORDER a PAIR AT OUR RISK

If you are a lover of music, order a pair of these famous Illinois "All-Frequency" Audio Transformers NOW, while this offer lasts. If you are a professional set-builder, order as many of these transformers as you can. Don't wait! Don't hesitate! Don't let the greatest of all bargain opportunities get by you. You take no risk. Order at once. We back every transformer and agree to refund your money promptly if you are not satisfied. Use the coupon from this page for your order blank. Pin your money order to it and mail it now —TODAY.

GUARANTEE COUPON

ILLINOIS TRANSFORMER CO.
223 West Elm St., Chicago, Ill.

I enclose $.....for which send me.....
Illinois "All-Frequency" Audio Transformers.

☐ 3:1 Ratio ☐ 5:1 Ratio ☐ 1½:1 Ratio (for 3 stage audio)
(Write in squares above, quantity of each ratio wanted)
I understand I can have my money back if not satisfied within 10 days after receipt of transformers.

Name.....

Street.....

Town.....

FIRST WITH THE LATEST

A Service That Means More Profit for Dealers

THIS year has been a difficult one for the dealer because of the many changes that have taken place in radio. But Braun dealers have been able to keep pace with every new move. When the newest A-C sets came out, we had them. And everything connected with A-C operation, the new grid tube, the newest A-C circuits and accessories, were immediately available to our dealers and customers. Braun dealers make more money by being able to keep up to date always.

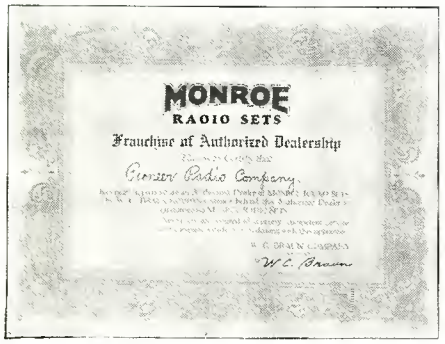
Here the retail dealer may draw upon the largest, most complete stock of radio receivers, parts, accessories and supplies. In our books will be found the latest circuits, as specified in the various radio publications. Our force of experts renders aid in selling and advertising, and more than a hundred trained specialists assemble and dispatch your orders—12 hours (or less) service on mail orders, 2-hour service on telegraph, telephone and air mail orders. Inspectors, dealers' representatives are here—the most highly organized staff ever brought together to assure quick, intelligent service and fair treatment for our dealers.

World's Largest Stock of Radio Goods—The Biggest Organization and Improved Service Facilities Help Braun Dealers Make More Money in the Biggest Year in Radio History

This has been one of the greatest years of activity in radio since its inception. With broadcast conditions vastly improved and reception apparatus largely perfected, there is a new wave of public confidence and a renewed interest in the purchase of radio apparatus. Thousands of backward fans are equipping their homes with radio this year. We are backing our dealers up in this rush of business and we are doing it daily. Nowhere else may they find such wide selections and obtain such quick service. This places the Braun dealer in a position where he easily overcomes all competition.

Every Radio Dealer Should Have Braun's Latest Confidential Wholesale Price Guide

Thousands of dealers everywhere use the Braun Book as their guide in selling and expanding their business. If you are not now on our list, write us on your letterhead. If not rated, kindly note names of two wholesale establishments from whom you now purchase. We want every established radio dealer in the country and abroad to have this guide.



New Line of Monroe Radio Receivers Prove Instantly Popular

Last season our line of Monroe sets enjoyed a phenomenal popularity in every section of the country. Into their construction we placed the very finest materials obtainable, and only the most highly skilled workmanship. As a result, these sets became very popular with our dealers, because of the lack of servicing and the trouble-free service which they gave in the hands of the users. This year these old dealers will push these sets to the very limit, and although our appointments have been very widespread there are many good districts yet open for the Monroe franchise.

W. C. BRAUN COMPANY
Pioneers in Radio
577 Randolph St.
CHICAGO
ILLINOIS

All-Electric AERO-SEVEN RECEIVER A-C

A Custom-Built, Modern, Up-to-date Receiver That Any Radio Fan Can Easily Build

THOUSANDS of radio fans the country over welcomed the Aero-Seven circuit with open arms. It was one of the really new and different circuits that the set builder could depend upon for building up business. For here was the one circuit that could be bought at a really reasonable price and that could be sold at a good profit by the set builder. And with everything to back it up—real performance, the reputation of radio's leading parts manufacturers, new ideas, good looks and a most reasonable price, it is no wonder that the fans by the thousands have flocked to the Aero-Seven.

The Aero-Seven is as up to date now as when it first came out, for it incorporated advanced ideas that are still advanced. The transformation from a battery-operated set to an A-C, all-electric set has been simple indeed.

To those fans who have not built the Aero-Seven before, and who desire the very latest in an A-C operated, socket-power, all-electric set, we recommend the Aero-Seven AC, with the assurance that it will give you every radio thrill on the books and plenty more besides.

This circuit has been developed in the laboratories of the Call Book, under expert engineering supervision. It is really marvelous in its simple, easy, smooth and quiet operation and in its power to deliver the purest, sweetest tones you ever heard, reaching out, as it does, from coast to coast and with a 10-kilocycle selectivity that is a real fact.

If you want full value for your money and still keep the cost down to rock-bottom, get the parts listed here and build the Aero-Seven, the Wonder of the Air.

Mail the handy coupon below and get complete information and facts before you at once

Official List of Parts
Aero A. C. Seven

1—Aero-Seven Foundation Unit	$12.00
1—U-12 Aero R. F. Transformer Kit	12.00
1—60 Aero R. F. Choke Coil	1.50
1—Amsco .0005 mfd. 3 Gang Variable Condenser	11.25
1—AA-17 Aero Antenna Adaptor	1.75
1—669 Yaxley Cable Connector with Phone Jacks	3.25
1—Carter .0005 mfd. Fixed Condenser	.40
1—Benjamin 5 Prong Socket	1.20
6—Amsco Sockets @ 50c	3.00
1—Amsco 2 megohm Grid Gate and Mounting	.80
1—Amsco .5 megohm Grid Gate	.50
1—Amsco .25 megohm Grid Gate	.50
3—Amsco .1 megohm Grid Gates @ 75c	2.25
1—Amsco 1 megohm Grid Gate	.50
3—RC-1 Amsco Resistor Couplers @ 1.25	3.75
1—Carter .2 ohm Rheostat	.75
1—Silver-Marshall Drum Dial	3.00
1—Carter 110 volt Switch	.75
2—Carter 1 mfd. By-Pass Condensers @ $1.25	2.50
1—Carter .001 mfd. Fixed Condenser	.50
1—Carter .00025 mfd. Fixed Condenser	.40
1—Carter 6 ohm Sub-Panel Mounting Potentiometer	1.00
1—Carter 300,000 ohm Variable Resistance	2.00
1—Yaxley 500 ohm Fixed Resistance	.25
2—Yaxley 3 ohm Fixed Resistances @ 15c	.30
1—Silver-Marshall .00025 mfd. Midget Condenser	1.50
2—Yaxley 10 ohm Fixed Resistance @ 15c	.30
9—XL Binding Posts	1.35
Total List Price	$69.25

AERO PRODUCTS, Inc.

1768 Wilson Ave., Dept. 1011 Chicago, U. S. A.

Associated Manufacturers

Amsco, Aero, Carter, Westinghouse-Micarta, Silver-Marshall, X-L

AERO PRODUCTS, INC.
1768 Wilson Ave., Dept. 1011
Chicago, Ill.

Dear Sirs: I am taking advantage of your free offer to send me complete details and information on the Aero-Seven A-C operated radio receiver.

Your name.....

Address.....

City..... State.....

Citizens Radio Call Book Magazine

Established 1921

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JANUARY, 1928 Vol. 9, No. 1

CONTENTS THIS ISSUE

With the Editor

THREE things are squarely in the set building public's eye as we go to press. First, the shield grid tube, which was announced to the experimenters and set builders by this publication in its November issue; second, alternating current tubes of the heater type for complete electrification of radio sets; and third, means of adapting the storage battery receiver to light socket operation through suitable A power devices.

However, it is indicated that despite the A. C. craze, we may expect for many years a continuation of storage battery operation. This statement is based on the large area of this country which is not wired for alternating current and whose residents must depend on the storage battery tubes.

As stated in our November issue, the shield grid tube continues to give the greatest promise along experimental lines for two reasons, the chief one being tremendous amplification and the second one being absence of oscillation. Of course, to gain these two points, complete shielding is imperative.

In presenting our January issue the editors believe a wide range of subjects has been covered in our construction articles. We are always glad to have the benefit of suggestions from our readers as to the manner of presentation of these articles.

—EDITOR.

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We also publish Citizens Radio Amateur Call Book, triannual, $1.00 per copy, foreign $1.10, listing all amateur transmitting stations in the world. Subscription price, $2.50 yearly, foreign $2.75. Published September, December and March.

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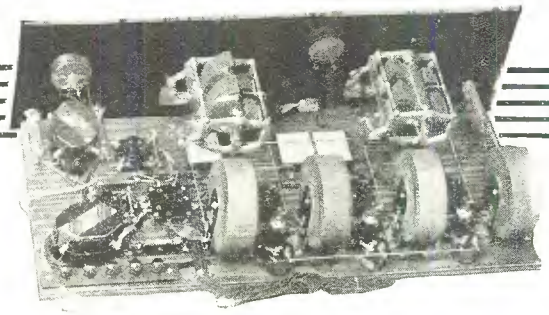
New Bremer-Tully Products Command Attention



Power Six "Electric"

The B-T Power Six, unsurpassed for three years, is now **wonderfully improved.** It was the **first circuit** to use **three stages** of tuned R. F. successfully. It has proved the best.

The new "Power-Six-Electric" uses the new AC tubes. The improved "Power-Six '28" operates on DC with regular tubes.

Complete diagrams for changing present Power-Six to AC, or building either set new (specify P-6-Electric or P-6-'28).....**$1.00**

Price of AC Kit.....**$42.00**
Price of DC Kit..... **41.50**

Uses New AC Tubes

The new B-T Audio Coupler explodes an old theory—it proves a B-T claim that "amplification curves," as a basis for comparison were never anything more than a minor factor.

"Harmonic Distortion," the real cause of poor tone, is entirely eliminated in this new Audio Coupler.

It is more than a transformer—and better!

A "constant-impedance" core—an air gap—tertiary loading coil—and finest laminations, combine to produce QUALITY UNEQUALLED anywhere, regardless of size or price.

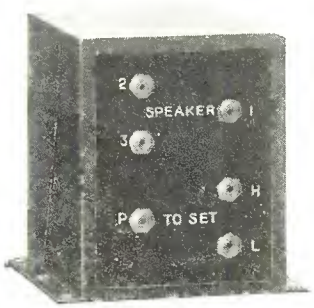
Read more in "Better Tuning"—see coupon.

B-T Audio Couplers

Two types; 3-31 for first stage; 2-22 for second stage, or for all stages when three stages are used, as in replacing resistance or impedance coupling.

Price.....**$6.00** each

If your local dealer cannot supply B-T parts, send your order direct to us

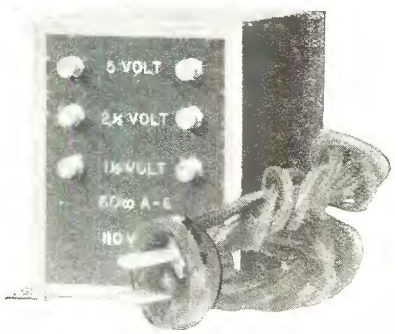


Speaker Coupler

The new B-T speaker coupler protects your speaker and prolongs its life. Connects between power tube, and speaker without tools.

A necessity with 171 or larger tubes. Gives wonderful improvement in tone quality. This is the same as used in Bremer-Tully's finest **Counterphase** receivers.

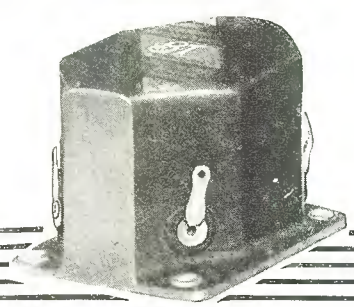
Price $7.50



"A" Transformer

For AC Power-Six "Electric." Eliminates battery and charger. Plugs into light socket. Everything, including phonograph, controlled from panel switch.

Price $7.50



"Better Tuning"

A booklet of 80 pages, answering the latest questions on radio, free upon request.

SEND THE COUPON!

Bremer-Tully Mfg. Company

520 South Canal St. Chicago, Ill.

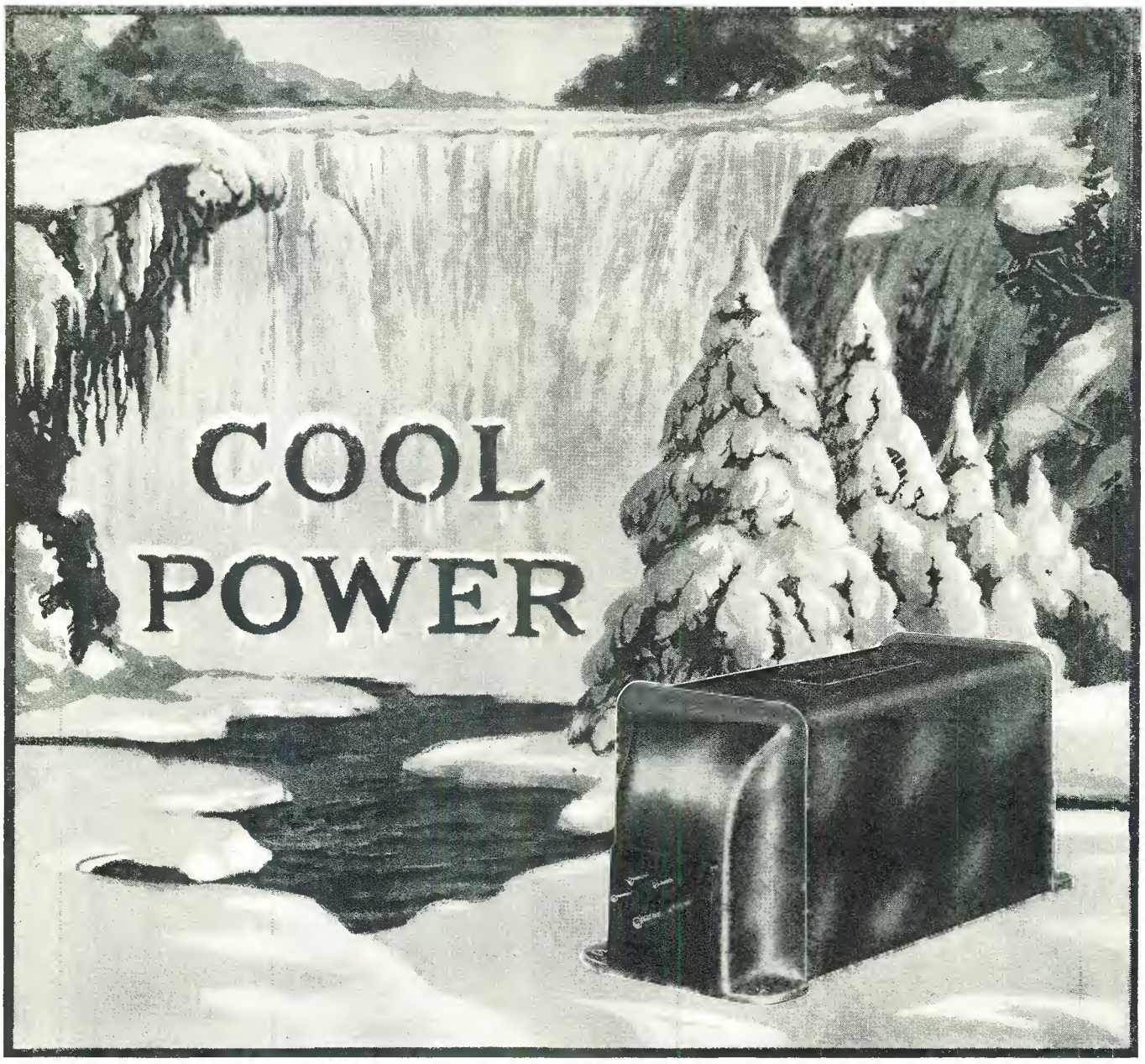
Please send 80-page booklet.

Name.....

Address.....

I am a Dealer.....User.....

CR Interested in Kit.....Parts.....Sets.....



Samson Power Block No. 210. The only block which will supply 500 volts at 80 mils to two 210 tubes

Powerize with Samson Units for Best Results

For new SAMSON Power Units insure the best there is in radio current supply by

1. Doing away with hum, motor boating and poor voltage regulation.
2. Remaining so cool after 24 hours continuous operation under full load that they will be well within the 20° rise of temperature specified by the A. I. E. E.
3. Being designed to more than meet the specifications adopted by the National Board of Fire Underwriters.
4. Insuring safety against shock because of protected input and output terminals.
5. Insuring for all tubes the correct filament voltages specified by their manufacturers.
6. Compensating for lighting circuit voltage variation by the use of a special input plug and terminal block to which is attached a 6 ft. flexible rubber-covered connecting cord and plug.
7. Being more economical in operation than other units of similar power rating.
8. Living up to the name plate rating.

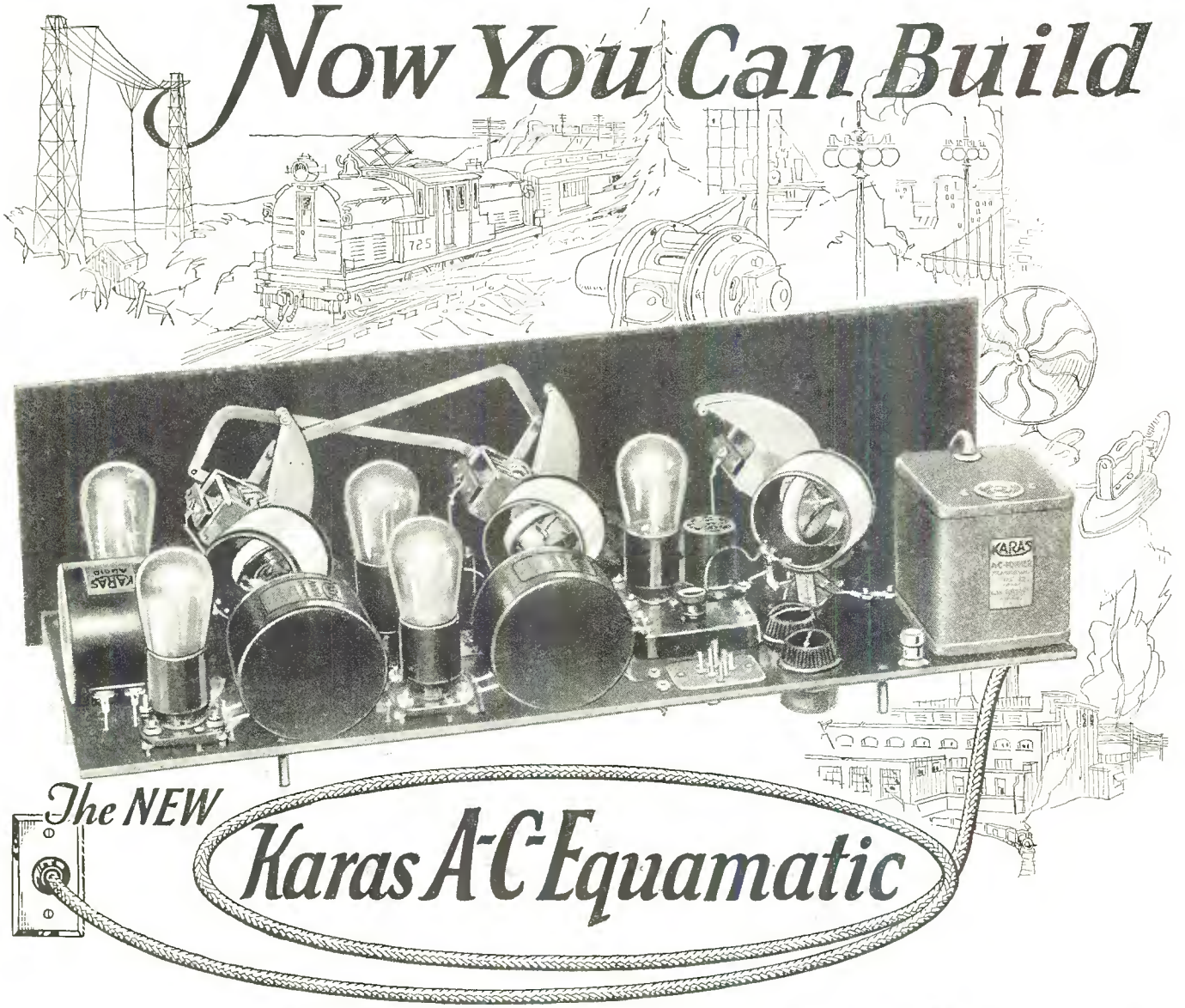
Limited space prevents us from listing the fourteen types that we make. Our Power Units bulletin, descriptive of these, is free for the asking. In addition, our construction bulletin on many different "B" Eliminators and Power Amplifiers will be sent upon receipt of 10c in stamps to cover the mailing cost.

Samson Electric Co.

MANUFACTURERS SINCE 1882

Canton, Mass.

Now You Can Build



The NEW Karas A-C-Equamatic

It operates from any 110-volt A. C. light socket

Associated Manufacturers

KARAS
Carter Radio Co. CHICAGO
YAXLEY
Hammarlund PRECISION PRODUCTS
BENJAMIN
Samson Electric Co.
ELECTRAD
DURHAM METALLIZED

THE new Karas A-C-Equamatic is the only completely balanced and perfectly neutralized 5-Tube A. C. Kit using standard Cunningham, RCA or CeCo 1½ volt, 2½ volt and 5 volt A. C. tubes. All of the "A" filament supply for this marvelous new set is furnished by the new Karas A-C-Former Filament Supply, Type 12. Those who build this great receiver will have a set that is two years ahead of them all!

The Karas A-C-Equamatic does away with all need for "A" batteries and chargers, the Karas A-C-Former providing a constant, noiseless and unvarying filament supply of correct potential for each of the A-C Tubes used in the set. And this is accomplished without the sacrifice of a particle of the matchless tone, remarkable selectivity, splendid distance-getting qualities and tremendous volume for which the Karas 2-Dial Equamatic has become famous.

The Karas A-C-Equamatic is the perfected product of the Karas Engineering laboratories, utilizing Karas parts in association with other standard parts of the Affiliated Manufacturers who have cooperated with Karas to make this great receiver what it is—the A-C-E of A-C operated sets. Because of this fact you will find this receiver extremely easy to build. It utilizes a Type 227 or 327 2½ volt A. C. detector tube, three Type 226 or 326 A-C 1½ volt amplifier tubes and a Type 171 or 371 5-volt output amplifier tube, all receiving their current supply from the house lighting circuit through the Karas A-C-Former Filament Supply.

Build this great receiver! Enjoy its freedom from "A" Battery and charger troubles! Enjoy its tone, its volume, its selectivity and simplified control. Write us TODAY for full size wiring diagrams and complete instructions, which we mail FREE on request. Begin to build this matchless A-C-Equamatic right away.

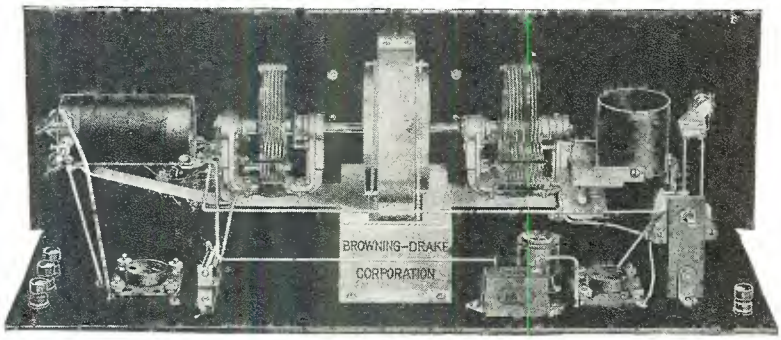
Send for Testimonial Letters Supplying Convincing Proof of the Results Achieved by This Receiver

Karas Electric Company

PRECISION ELECTRICAL APPARATUS

4026-A North Rockwell Street · Chicago

Easy to Build.... A Marvelous Unit!



The New Official Browning-Drake Two Tube Tuner

AC or Battery Operated—Single Control
With Illuminated Drum Dial
Completely Shielded

BROWNING-DRAKE fans throughout the world are welcoming the new Official Drum Dial BROWNING-DRAKE Kit now ready for distribution. Our engineering staff has developed in this new kit the foundation for building one of the most dependable sets ever assembled. Single dial illuminated drum control is used, which is operated by a knob below the dial and functions without the slightest trace of backlash. Other up-to-the-minute refinements in set engineering are incorporated in this new assembly. It presents a pleasing appearance, and its performance is, in every way, worthy of the name—BROWNING-DRAKE.

A new five-tube assembly has been designed by Prof. Browning to be used with this new unit. The two-tube assembly (pictured above), when used with the Acme Power Amplifier or other dependable power apparatus, makes an excellent combination.

New construction booklets covering the assembly of these new units are now available either from your dealer, or direct, for 25c.

NEW BROWNING-DRAKE PARTS

Official Single Dial Drum Kit	$26.00
Foundation Unit for 5-tube assembly	16.50
Foundation Unit for 2-tube assembly	13.00
Complete shielding assembly	8.00

Browning-Drake Corporation
CAMBRIDGE -:- MASS.

BROWNING DRAKE

TRADE MARK

CABINETS
PARTS

RECEIVERS
KITS

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine

After Combing the Entire Field Browning-Drake Decided on ACME

BROWNING-DRAKE have completed a new A.C. operated tuner which incorporates many important advancements. Naturally, they wanted the best A.C. amplifier that could be obtained to go with their tuner. Therefore, they chose the new Acme amplifiers on which we have just finished research and which give volume and quality such as never before believed possible in Radio.

These new amplifiers, which can be added to any set, are described elsewhere in this magazine as used with the new Browning-Drake A.C. tuner. You may choose the circuit best adapted to your requirements and after adding it to the new Browning-Drake A.C. tuner or after your present tuner you will have an amplifier which will enable you to get more amplification without distortion than ever before and radio will take a more important part in your entertainment than ever before.

The tapped transformers and impedance output devices are new Acme products which are the result of Acme's constant efforts toward Amplification Without Distortion.

All Acme apparatus is guaranteed free from defects in material and workmanship and is manufactured in a modern plant by experts long in the employ of the company.

Send the coupon below and ten cents in stamps or coin for your copy of our new booklet combining "Amplification Without Distortion" and "Power Supply for Radio Sets" which contains new and valuable information.

List of Parts for A. C. Amplifiers

Parts Required. Circuit No. 1

1 Acme AC-2 transformer.
1 Acme MA-2 transformer.
1 Acme Z-3 unit.
3 Sockets.
1 Daven No. 42 Resisto-coupler.
1 Tobe .00025 M.F. condenser.
2 Grid leak mountings.
2 50,000 ohm Bradley units.
1 200,000 ohm Bradley unit.
1 500,000 ohm Bradley unit.
2 Tobe 1 M.F. Condensers.
2 30 ohm rheostats (to be connected as potentiometers).
2 2,000 ohm rheostats.
8 Binding posts.
1 Baseboard 9"x8"x ½".
Sheet iron for shielding .020" thick.
2 UX-226 tubes.
1 UX-171 tube.

List of Parts. Circuit No. 2

1 Acme AC-2 transformer.
2 Acme Z-3 units.
1 Acme PT 1 audio transformer.
1 Acme PT 2 audio impedance.
4 Sockets.
2 30 ohm rheostats (to be connected as potentiometers).
2 2000 ohm rheostats.
2 Tobe 1 M.F. condensers.
2 50,000 Bradley units.
2 Grid leak mountings.
1 Tobe .00025 M.F. fixed condenser.
8 Binding posts.
2 UX-226 tubes.
2 UX-171 tubes.
1 Baseboard 14"x8"x ½".
Sheet iron, .020" thick, for shielding.

****Parts Required. Circuit No. 3***

2 Acme Z-3 units.
1 Acme PT 1 audio transformer.
1 Acme PT 2 audio impedance.
4 Sockets.
3 Grid leak mountings.
3 50,000 ohm Bradley units.
8 Binding posts.
1 .00025 M.F. condenser.
2 Tobe 1.0 M.F. condensers.
1 30 ohm rheostat (to be connected as potentiometer).
1 300 ohm potentiometer.
2 2000 ohm rheostats.
1 Baseboard 14"x8"x ½".
Sheet iron for shielding, .020" thick.
2 UX-226 tubes.
2 UX-210 tubes.

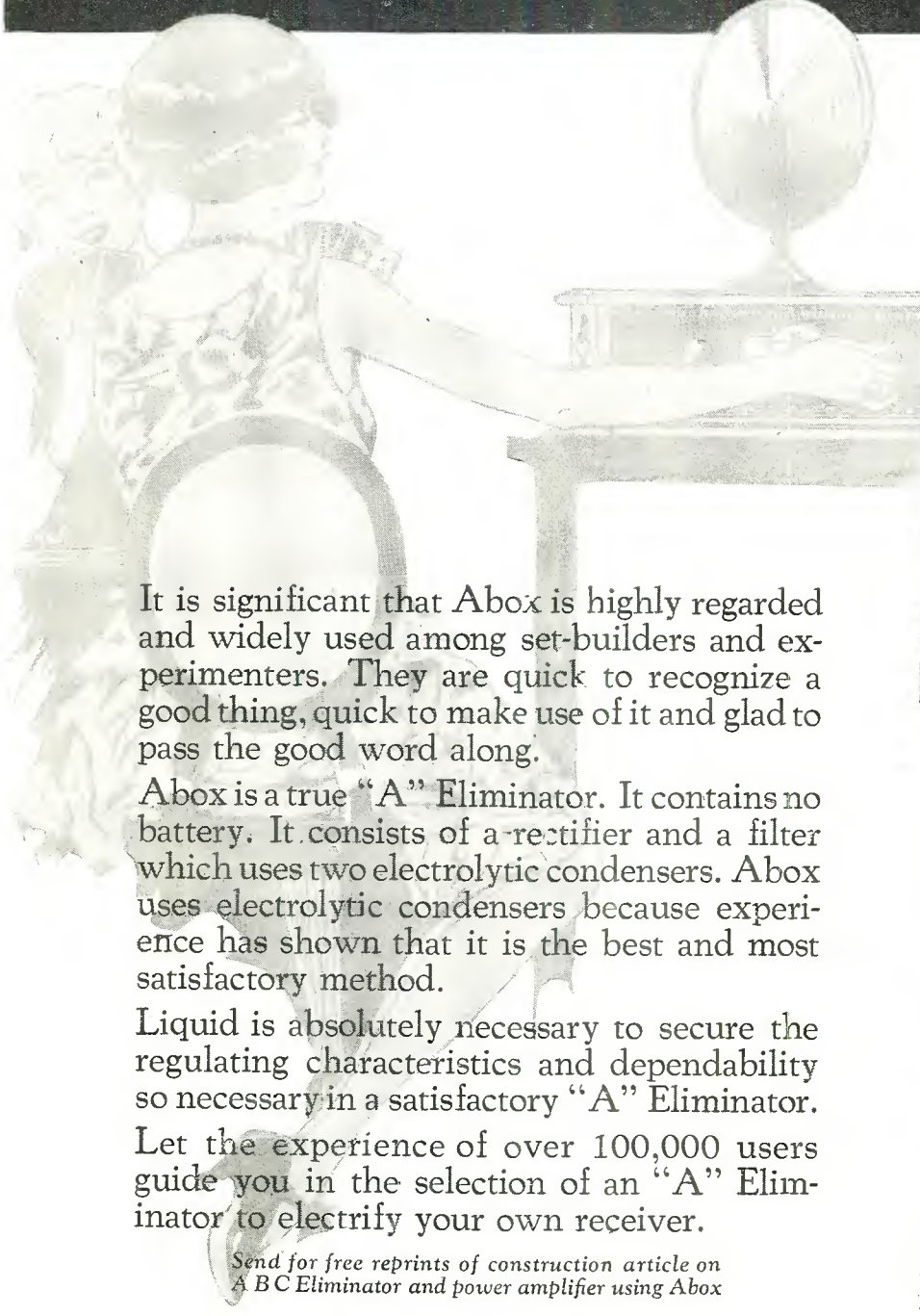
****Parts Required. Circuit No. 4***

(Power supply for circuit No. 3.)
1 Acme AC-2 trapsformer for heating filaments of UX-226 tubes.*
1 Acme BH-1 transformer.
2 Acme B-2 20 henry choke coils.
2 UX-281 rectifier tubes.
2 Sockets.
6 Tobe 2 M.F. 1000 volts filter condensers.
1 Baseboard 24"x11"x ½".

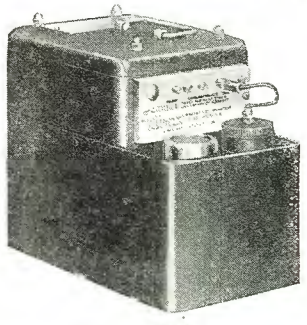
***As used with the new Browning-Drake tuner.**

Abox

"A" BATTERY ELIMINATOR



Licensed by The Andrews-Hammond Corporation, under Patent No. 1,637, 795 and applications



$32.50

Input—110 volts, 50-60 cycles A. C.
Output—6-volts D. C., 2 amperes.
This model will operate any set using eight or less standard 6-volt tubes. Not necessary to change wiring set.

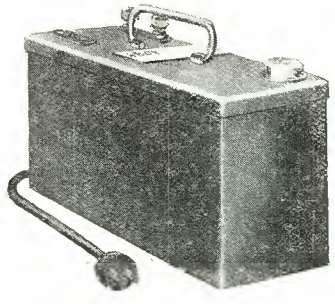
It is significant that Abox is highly regarded and widely used among set-builders and experimenters. They are quick to recognize a good thing, quick to make use of it and glad to pass the good word along.

Abox is a true "A" Eliminator. It contains no battery. It consists of a rectifier and a filter which uses two electrolytic condensers. Abox uses electrolytic condensers because experience has shown that it is the best and most satisfactory method.

Liquid is absolutely necessary to secure the regulating characteristics and dependability so necessary in a satisfactory "A" Eliminator.

Let the experience of over 100,000 users guide you in the selection of an "A" Eliminator to electrify your own receiver.

Send for free reprints of construction article on A B C Eliminator and power amplifier using Abox

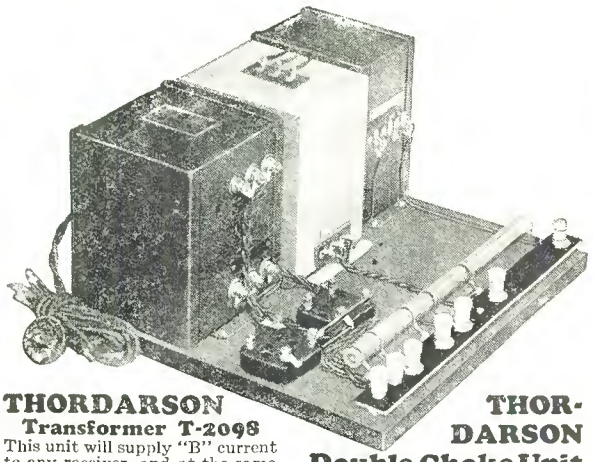


Four-volt model for sets using 4-volt tubes. Fits Radiola battery compartment. Size, 8¾ inches long, 4 inches wide, 6⅞ inches high. Output—.6 amperes, 4 volts D.C. Price **$27.50**

All prices slightly higher on West Coast

The Abox Company

215 North Michigan Avenue — Chicago, Illinois



The Magnificent TONE and Superb Volume of this amazing receiver made possible by -SCOTT- THORDARSON POWER SUPPLY EQUIPMENT

THORDARSON Transformer T-2098
This unit will supply "B" current to any receiver, and at the same time provide A, B, & C current for either a single transformer coupled stage of 210 power audio, or a stage of Push-Pull Audio using two 210 power tubes. The T-2098 makes up into a full wave rectifying system employing two UX-216B or two UX281 rectifying tubes and has a total output of 130 milliamperes at 450 volts.

TOBE Filter Condensers
Condensers of exceptional quality and electrical durability are required to withstand the load imposed upon them by this "B" supply. TOBE Condensers suit the requirements perfectly, and are therefore recommended.

THORDARSON Double Choke Unit T-2099
Consists of two individual 30 Henry chokes, each of 130 milliampere current capacity, permanently mounted together in an hermetically sealed steel case. Makes the ideal filter system for heavy current requirements.

Carter Resistances
Entirely overcome the difficulty of inconstancy with which builders have had to deal in the past when working with high voltage, heavy current "B" supply devices. Carter No. S20 Vitreous Enamel Resistance is calibrated to give the exact required voltages for each tap to the Scott World's Record Super 10.

As explained on the next page, a 210 power tube is necessary for the proper handling of the large out-put of the Scott World's Record Super 10.

The incorporation of a 210 power tube in this or in any other receiver immediately demands that the very finest type of "B" supply equipment be used.

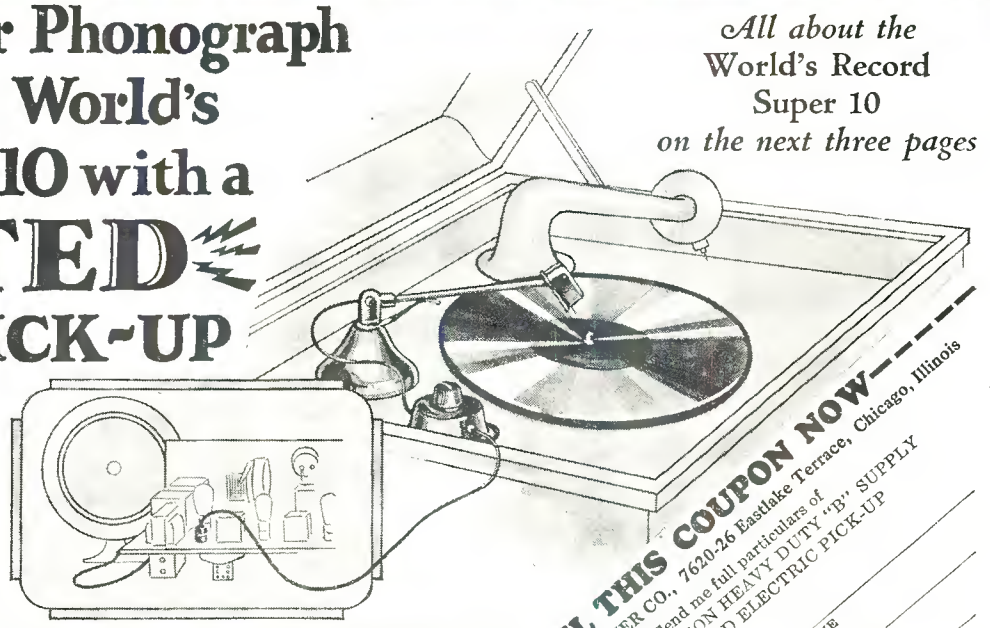
Exhaustive tests made with various types of transformers, chokes, and filter condensers put THORDARSON and TOBE units in the position of unquestionable superiority.

The "B" supply illustrated above provides an abundance of current for the operation of the Scott World's Record Super 10, including the high voltage, heavy current drain of the 210 Power Tube. *Mail the coupon at once for full particulars of this better, advanced type "B" supply, including construction details.*

The Scott World's Record Super 10

~and put your Phonograph Music thru the World's Record Super 10 with a UNITED ELECTRIC PICK-UP

All about the World's Record Super 10 *on the next three pages*

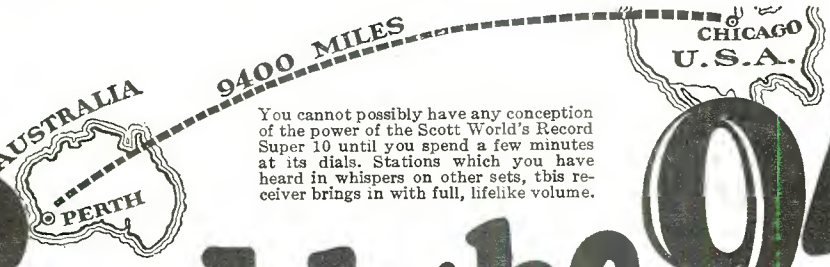


The United Electric Pick-Up, sets a new standard in the electrical reproduction of recorded sound. Compare it in operation with any that you will. As you listen, you will find yourself saying, "Here is something more, something finer and better than the industry has seen before." You will appreciate the fact that United Engineers have gone beyond the beaten path and opened for you even greater wonders in the field of electrically-reproduced sounds. You will marvel at the small compact design of the United Pick-Up—its beauty of form and finish—its light weight which means long life for your records—its dust-proof, trouble-proof construction, which insures many years of unfailing service. Richly finished in gold, silver or bronze, it matches in appearance any set on which it may be used.

The United Electric Pick-Up electrically transmits the sound vibrations from the phonograph record to the power audio system in the World's Record Super 10 (or any other set) by simply plugging the connecting cord into the detector socket in the set. Phonograph music is reproduced by this unit with new brilliance, naturalness, color and volume through your speaker. Mail coupon at once for full particulars.

MAIL THIS COUPON NOW
SCOTT TRANSFORMER CO., 7620-26 Eastlake Terrace, Chicago, Illinois
Send me full particulars of
☐ THORDARSON HEAVY DUTY "B" SUPPLY
☐ UNITED ELECTRIC PICK-UP
NAME
ADDRESS
CITY
STATE

SCOTT TRANSFORMER CO., 7620-26 Eastlake Terrace, Chicago



You cannot possibly have any conception of the power of the Scott World's Record Super 10 until you spend a few minutes at its dials. Stations which you have heard in whispers on other sets, this receiver brings in with full, lifelike volume.

Build the 9400

Read What Builders of This Set Say

"I can tune in nearly any station in Canada or any place in the United States consistently and at will, without interference from other stations."—Adrien Goulet, Montreal.

"The tone is beautiful and for DX reception no other Super I have built or heard can compare with it."—Dr. Louis Schulze, Chicago.

"Received 6. W. F. of Perth, Australia, June 25th with plenty of volume. Also have received J. O. C. K., Japan."—Virgil C. Zeis, Chicago.

"Tone is wonderful; volume enough to rattle the windows on DX like K. F. I., K. G. W., etc. The whole city is talking about it." Albert K. Saylor, Monessen, Pa.

"I can tune in station K. F. I. every evening after 9:30 p. m. having no interference from local stations and with volume equal to local stations."—W. H. Hollister, Chicago.

VERIFIED RECORDS

8,375 Miles

1. On March 17th World's Record for loop aerial reception—8,375 miles with Loud Speaker Volume.

9,400 Miles

2. On June 25th Scott World's Record Super, located in Chicago received 6.W.F., PERTH, Australia, 9,400 miles away.

6,000 Miles

3. On March 29th established new World's Record with reception of six foreign stations distant 6,000 miles or more.

6,000 Miles

4. Established new World's Record for greatest number of broadcasting stations heard, located 6,000 or more miles away.

6,000 Miles

5. Established new World's Record for most consistent reception of stations 6,000 miles or more distant—117 programmes from 19 different Foreign Stations, between December 27th and April 10th.

I GUARANTEE

That the Set You Build Will Be Every Bit as Good as My Laboratory Model

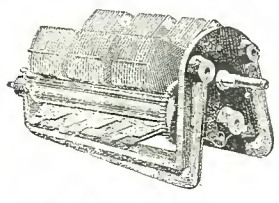
The Scott World's Record Super 10—the set which eclipsed all previous radio performance standards was not a freak. Evidence of this—and proof that the set you build will do every bit as much as my laboratory model, is the fact that builders in all parts of the country report new and greater distance records every day. Every Scott World's Record Super 10 *should* be as good as my laboratory model, because the vital parts of each kit are all matched to the laboratory standard, and the plans I furnish are so complete, precise and so easily understood that error is practically impossible.

Build the Scott World's Record Super 10 and you will have a receiver which is years ahead of the present day commercial conception of radio. Build this set and be the proud owner of the very finest receiver in your community. Real Distance—real Selectivity—and the tonal advantages of high voltage power tube amplification will all be yours in a combination that no other receiver can even approximately approach. Mail the coupon right now for the whole story of the Scott World's Record Super 10.

MR. E. H. SCOTT

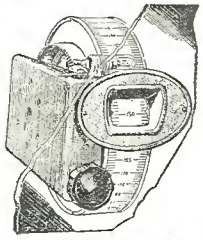
The SCOTT WORLD'S

MADE AVAILABLE TO YOU THRU THE COOPERATION



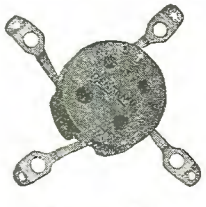
REMLER 3-IN-LINE

Mechanically, and from the standpoint of efficiency in the handling of radio frequency currents, the REMLER 3-IN-LINE is the last word in gang condenser construction. Staggered connection of plates shields each stator section, one from the other. Balancing condensers are integral with the main unit and are easily and quickly adjusted.



REMLER DRUM DIAL

A precision product in every sense, reflecting in each detail of construction, the best in engineering and manufacturing practice. So designed that it is easily and quickly attached to any standard condenser, providing very smooth condenser control. Calibrated from 0 to 200 over the whole of its 360 degree surface. Handsome bronze panel face plate furnished with each unit.

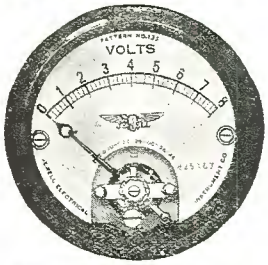


BENJAMIN SOCKET

Spring cushioned, and hence completely shock-absorbing. Eliminates much tube noise and microphonic howl. Also greatly increases tube life by preventing jarring and consequent cracking of hot filaments. Made of genuine bakelite, and so fashioned that tube contacts are positive at all times.

Thordarson R-200 Audio

Every test reveals the undisputed supremacy of Thordarson amplifying transformers. The pair of R-200 Thordarson's which are called for in the specifications of the Scott World's Record Super 10, will correctly amplify throughout the whole musical range, every audible frequency which the broadcasting station itself is able to register. To the "tweet" of the highest flute note and the "zoom" of the cello, the Thordarson R-200 instantly responds. A Thordarson R-76 out-put transformer is also specified.



Jewell Voltmeter

In the careful selection of parts and accessories for the New World's Record Super 10, it is quite natural that a Jewell Pattern No. 135 Radio Voltmeter should be chosen. The black enameled case encloses a fine, D'Arsonval, moving coil type movement, having silvered parts and equipped with a zero adjuster. The scale is silver etched with black characters.

Mile Receiver!

The First Set to *really* Combine Extreme Distance ~ *actual* 10 Kilocycle Selectivity and *absolute realism* in Reproduction

The Scott World's Record Super 10 exceeds all present day standards of receiver performance. Positively nothing else is like it. Distance? The whole world seems to be on its dials! Volume? More than enough to fill a concert hall! Tone? Absolute realism—full, round, natural!

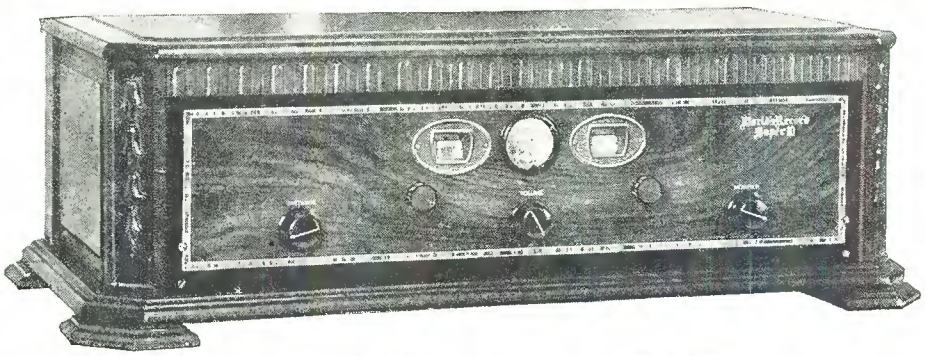
Beyond all doubt, this receiver has been the subject of more enthusiastic interest than any other ever built. It made its first bid for fame by establishing the world's long distance record for loop aerial reception—8357 miles. Since then it has piled up a host of records which would be unbelievable were it not for the authentic verifications at hand.

up to terrific volume by the amplification system of the Scott World's Record Super 10.

And for much the same reason, this amazing receiver provides actual 10 Kilocycle selectivity no matter where it is located. The intermediate amplifier is peaked to pass only a 10 Kilocycle band, and the two tuned stages which feed it, pre-sharpen the signal to a point well within the 10 Kilocycle limit irrespective of the signal's strength at the time of input. Indeed, there has never before been such a receiver as the Scott World's Record 10—never before such power—never before such sensitivity. No wonder it is the favorite in districts where broadcasting is congested. No wonder it is the favorite with those who feel that nowhere in the world is there a station too far away to get!

Easy to Build in a Few Hours

The completeness of the Scott World's Record Super 10 is the main reason for its extreme efficiency. There is a great deal to this receiver. It embodies every known facility for conserving and using the bits of energy that other receivers waste. Complete though it is—complicated as it may appear, it nevertheless is so simple to build that the most inexperienced novice can put it together quickly—and with assurance of results beyond his fondest expectations.



Super Power Audio

Most naturally nothing less capable than power audio amplification could handle the second detector output of the Scott World's Record Super 10. This was a foregone conclusion at the time this receiver was designed, and it was found, that not only was a power tube necessary, but that a 210 power tube—and only a 210 would handle all that this receiver could feed to it. Result! Clear, pure undistorted volume limited only by the size and capability of the speaker used.

Two Stages of Tuned R. F. for Correctly Amplified Input and Additional Selectivity—and Three Stages of Long Wave R. F. for Power and Extreme Sensitivity

Most superheterodyne receivers depend solely upon the intermediate amplifier for radio frequency amplification. The Scott World's Record Super 10 has two stages of high-gain tuned radio frequency amplification preceding its intermediate amplifier. Hence, the signal fed into its intermediate amplifier, instead of being merely the weak impulse picked up by the loop, is as strong as the output signal of a highly efficient 5 tube tuned radio frequency set. The signal is then tremendously amplified in the long wave amplifier, the output of which, therefore, is most naturally many, many times greater than usually obtained from other types of superheterodyne receivers. Power? Signals barely audible are built

FREE CIRCUIT DIAGRAM and Full Particulars

The far superior performance of the Scott World Record Super 10 is not happenstance. It is the direct result of coordinating many new and advanced engineering features in circuit and vital-part construction. Hence, the whole detailed story of the Scott World's Record Super 10 is one of the most enlightening radio stories ever written—and of vital, intense interest to you, whether you have a radio or not. Mail the coupon and we will send you absolutely FREE, complete circuit diagram and full constructional information. Mail the coupon Now. No Obligation.

RECORD SUPER 10

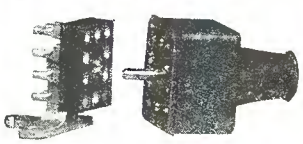
OF THESE LEADING PARTS MANUFACTURERS—

Tobe Condensers

The quality of by-pass condensers is of far more importance than the average set builder thinks. Too often, troubles which the builder cannot locate are to be found in the by-pass condensers. Hence, to insure year after year of quiet, efficient condenser performance in the Scott World's Record Super 10, TOBE Condensers were specified. These condensers, being better designed and better made of better materials, are certain in their action.

Carter Rheostats

Chosen for their unmistakable quality, smooth operation and compactness. The Carter Rheostat is an engineering masterpiece. It fits snugly up against the panel. Its sliding arm moves so smoothly and its contact is so positive that filament temperature variation is accomplished without even the slightest suggestion of attendant noise. Air cooled.



Jones Multi-Plug and Cord

The Jones 10 Contact Multi-Plug and Cord is, beyond all doubt, the finest way to connect batteries to a set, that has ever been devised. Easier and quicker than binding posts to install; all the lead wires are in one compact, neat looking braid covered cable; contacts are always tight and all the batteries can be instantly disconnected from the set by merely pulling the plug. The cable and the unit which mounts onto the set are color coded to prevent mistakes, and the plug is keyed so it can go in the right way only.

Selectone Transformers

SCOTT Selectone Long Wave Transformers are, as laboratory tests reveal, the most efficient units of their type ever produced. They afford maximum selectivity and amplification and at the same time pass the full musical band, thereby assuring perfect tonal reproduction. Laboratory matched into kits and guaranteed to hold their ideal characteristics against time.

MAIL COUPON NOW

SCOTT TRANSFORMER CO.
7620-26 Eastlake Terrace
Chicago, Ill.

Send me FREE Circuit Diagram and full particulars of the Scott World's Record Super 10.

Name.....

Street.....

City.....

State.....

These JOBBERS CARRY COMPLETE KITS FOR

The Scott World's Record Super 10

CALIFORNIA

Radio Supply Co., 920 Broadway, Los Angeles, Calif.
Offenbach Electric Co., 1452 Market St., San Francisco, Calif.
J. C. Reudler, 625 S. Main St., Los Angeles, Calif.

DISTRICT OF COLUMBIA

Star Radio Co., 409 11th St. N.W., Washington, D. C.
J. C. Rau, 524 12th St. N.W., Washington, D. C.
Radio Auto Supply, 1305 S St. S.E., Anacostia, D. C.

CONNECTICUT

Post & Lester, 33 Allyn St., Hartford.

ILLINOIS

Harry Alter Co., 18th & Michigan, Chicago, Ill.
W. C. Braun Co., 563 W. Randolph, Chicago, Ill.
Chicago Salvage Stock Store, 509 S. State St., Chicago, Ill.
Columbia Radio, 711 W. Lake, Chicago.
Electric & Radio Supply, 165 N. Wells St., Chicago, Ill.
Hudson Ross, 116 S. Wells, Chicago, Ill.
Miller Welles, 20 W. Kinzie St., Chicago.
Inland Electric Co., 20 S. Wells, Chicago.
Harco Company, 1255 S. Wabash, Chicago, Ill.
New England Mills, 849 W. Washington, Chicago, Ill.
Nelson Electric, 508 S. Dearborn, Chicago.
Newark Electric, 226 W. Madison, Chicago, Ill.
National Radio, 227 W. Madison, Chicago.
Telephone Mtc. Co., 123 S. Wells, Chicago. Ill.
Western Radio, 128 W. Lake St., Chicago.
Walter Rowan, 229 S. Peoria St., Chicago. Ill.
Shure Radio Co., 19 S. Wells, Chicago, Ill.

INDIANA

Kruse Connell Radio, 33 W. Ohio, Indianapolis, Ind.
Cummins Bros., 34 W. Ohio, Indianapolis,

IOWA

The Sieg Company, Davenport, Iowa.

MICHIGAN

Detroit Electric Co., 111 E. Jefferson, Detroit, Mich.
Koploy & Ross, 1306 Randolph St., Detroit, Mich.
Serlin & Company, 1419 Broadway, Detroit, Mich.

MASSACHUSETTS

Electrical Sales Co., 271 Franklin St., Boston, Mass.
Sager Electrical Supply Co., 201 Congress St., Boston, Mass.

Set Builders!

The World-Wide Popularity of this receiver offers you an exceptional opportunity

The Scott World's Record Super 10, as many set builders know, is without a precedent in popularity—in its class.

The results that this receiver never fails to deliver make the Scott World's Record Super 10 Kit the best proposition you could possibly tie up with. Obtain it from any of the jobbers listed on this page—or direct your inquiry to us, signifying your favorite jobber. Pin the coupon below to your letterhead and MAIL NOW.

Sager Electrical Supply Co., 349 Worthington, Boston, Mass.
F. D. Pitts Co., 219 Columbus Ave., Springfield, Mass.
U. S. Radio Corp., 320 Dwight St., Springfield, Mass.
Sager Electrical Supply Co., Worcester.

MARYLAND

Star Radio Co., 106 N. Howard, Baltimore, Md.
Jos. M. Zamviski, 111 W. Redwood, Baltimore, Md.

MINNESOTA

Minnesota Roycroft Co., 21 N. 3rd St., Minneapolis, Minn.

MISSOURI

American Auto & Radio Mfg. Co., 1416 McGee St., Kansas City, Mo.
Kansas City Radio Co., 1314 McGee St., Kansas City, Mo.
Walter Ashe Radio Co., 211 N. 10th St., St. Louis, Mo.
Van Ashe Radio Co., 10th and Pine, St. Louis, Mo.
James C. Gordon, Inc., 1213 Pine St., St. Louis, Mo.

NEBRASKA

Radio Apparatus Co., 1109 Farnam St., Omaha, Neb.

NEW YORK

Wholesale Radio Service Co., 6 Church St., New York City.
Allen Rogers Madison, 35 W. 31st St., New York City.
S. Hammer Radio Co., 303 Atkins Ave., Brooklyn, N. Y.
Barclay's, Inc., Main and Goodell Sts., Buffalo, N. Y.

OHIO

Aitken Radio Co., Superior at Jackson, Toledo, Ohio.
I. J. Cooper Rubber Co., 142 E. Gay St., Columbus, Ohio.
Hughes Peters Rubber Co., 104 E. Long St., Columbus, Ohio.
Cingel Radio, 217 W. 5th St., Cincinnati.
I. J. Cooper Rubber Co., Cincinnati, Ohio.

OKLAHOMA

Southern Sales Company, 320 Third St., Oklahoma City, Okla.

OREGON

Stubbs Electric Co., 75 Sixth Ave., Portland, Ore.

PENNSYLVANIA

Anchor Lite Appliance Co., 330 Blvd. of Allies, Pittsburgh, Pa.
Keystone Radio Co., 640 Grant St., Pittsburgh, Pa.
Keystone Radio Co., 111 N. 4th St., Philadelphia, Pa.
Lewis Radio Jobbers, 45 N. 7th St., Philadelphia, Pa.
M & H Sporting Goods Store, 512 Market St., Philadelphia, Pa.
U. S. Radio Corp., 134 9th St., Pittsburgh.
Eugene G. Wile, 7 N. 10th, Philadelphia.

RHODE ISLAND

Reliable Supply Co., 19 Broad St., Providence, R. I.

WASHINGTON

Oxo Radio Mfg. Co., 1023 Third Ave., Seattle, Wash.

WISCONSIN

Radio Parts Co., 309 State St., Milwaukee, Wis.
Samson's, 219 W. Water St., Milwaukee.

CANADA

Aikenhead Hardware, Ltd., 17-21 Temperance St., Toronto, Canada.
Radio Sales Service, 171 Cordova St. W., Vancouver, B. C.

ENGLAND

R. A. Rothermel, Ltd., 22 Maddox St., London, England.

SET BUILDERS! MAIL THIS

SCOTT TRANSFORMER CO., 7620-26 Eastlake Terrace, Chicago, Illinois
Send Set Builders' proposition on Scott World's Record Super 10

NAME

STREET

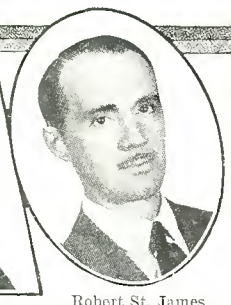
CITY

STATE

Write favorite jobber's name and city in the margin

SCOTT TRANSFORMER COMPANY
7620-26 Eastlake Terrace • Chicago, Ill.


L. L. Karas—A. C. Equamatic and Knickerbocker 4


Robert St. James
St. James Twin Four

Citizens
Radio Call Book


Arthur Lynch
All Models


E. H. Scott—World's Record Supers, Eight, Nine, and Ten


Herman Bernard—Man'g Editor "Radio World"


Merwyn Heald
Hot-Spot 14


Ernst Tyrman
Tyrman 10 and 70


T. H. H. Naken
Ultra-5


Harry Madison
Madison-Moore International

The High Frequency Laboratories for "1928 Berlin Special A. C. Nine-in-Line"

Geo. W. Walker Co. for "1928 Victoreen Universal"

These---and a host of other world famous radio engineers and designers recommend and

Specify

LIGNOLE
RADIO PANELS

"The Professional Builder's Choice" for Custom Built Sets

LIGNOLE panels are made of genuine woods, 5 ply laminated construction and finished either plain or in two-tone. The two-tone panels have a darker border separated from the body of the panel by a small vein or by a beautiful inlaid Marqueterie. This finish produces a panel that will blend and harmonize with any style or make of cabinet in which it is placed. As a di-electric, there is no better panel material obtainable. It is extremely rigid and will not warp.

Lignole Two-Tone Kit Panels

Drilled and Lettered

These panels are the same as the inlaid panels except that they have a narrow vein or line substituted in place of the Marqueterie. Panels are furnished either Walnut or Mahogany.

(All Panels 3/16-in. thick)

		List			List
St. James Twin 4	7x21	$5.00	Magnaformer	7x26	$6.00
Victoreen Universal	7x26	6.00	Karas A. C.	7x24	5.50
Madison Moore One Spot	7x26	6.00	Melo Heald 11	7x28	6.50
Madison Moore International	7x28	6.50	Hot Spot 14	7x30	7.00
Tyrman Ten (drilled only)	7x26	5.50	Hammarlund Roberts Hi-Q 6	7x21	5.00
Tyrman "70"	7x24	5.50	Camfield Duoformer	7x26	6.00
World's Record 8	7x24	5.50	Eight in Line	7x24	5.50
World's Record 9	7x26	6.00	Citizen's Super 8	7x26	6.00
World's Record 10	7x26	6.00	Citizen's Super 9	7x26	6.00
Nine in Line "1927"	7x26	6.00	Browning Drake	7x21	5.00
Nine in Line "1928"	7x26	6.00	St. James	7x24	6.00
			Knickerbocker Four	7x18	4.50
			R. G. S. Octomonic	7x21	5.00

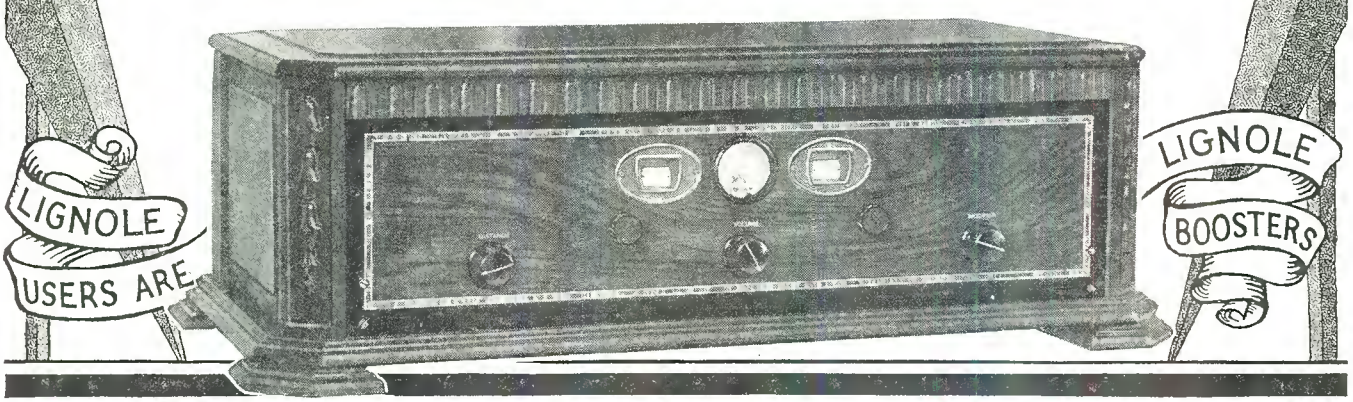
INLAID Kit Panels About $3.00 List Extra

FOR SALE BY JOBBERS EVERYWHERE

Write for Complete Price List

THE LIGNOLE CORPORATION

508 So. Dearborn Street **Chicago, Illinois**



American Broadcasting Stations

Corrected up to the moment of going to press, this list, to the best of our knowledge, is identical with that of the Federal Radio Commission's bulletins. If mistakes occur in the list, we will be glad to have notice from our readers to that effect. Address communications to the CITIZENS RADIO CALL BOOK MAGAZINE, 508 So. Dearborn Street, Chicago, Illinois

KDKA Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. 315.6 meters, 950 kilocycles, 50,000 watts. Week days, market and weather reports, 10 am, 12 noon, 4 & 5 pm. Time signals, 11:55 am; 6 pm, dinner concert. Evening program, 8 pm, Tues 7 pm. Wed, Fri, 7 & 7:15 pm, studio talks. Fri, 11:30 pm, concert. Sun, 10:45 am, church; 4 pm, organ; 4:45 pm, vespers; 6 pm, orchestra; 7 pm, church; 8:15, concert. Blue Chain Programs. Mon, 7:30-10 pm; Tues, Wed, Fri, 8-10 pm; Thurs, 8-11 pm; Sat, 8-10 pm; Sun, 8:15-10:45 pm. Eastern standard time.

KDLR Radio Elec. Co., Devils Lake, N. Dak. 230.6 meters, 1300 kilocycles, 15 watts. Daily ex Sun, 12:10 pm, weather; 6:15 pm, markets, sports, news, etc. Mon, 9:30-11 pm, studio program. Sun, 11 am, church; 4:30-6 pm, studio program. Central standard time.

KDYL Intermountain Broadcasting Corp., 1009-10-11 Ezra Thompson Building, Salt Lake City, Utah. 258.5 meters, 1160 kilocycles, 100 watts. Sun, 3-5 pm, 8-10 pm. Daily ex Sun, 10:30-11:30 am, 2-5 pm, 6-8 pm, studio programs. Mon & Wed, 8-10:30 pm. Tues, Thurs & Sat, 8-10 pm, 10 pm-12, midnight dance music. Sat, midnight-2 am. Mountain time. Slogan: "On the Air—Goes Everywhere."

KELW Earl L. White, Broadcasting Station, Magnolia Park, Burbank, Calif. 228.9 meters, 1310 kilocycles, 250 watts. Daily ex Sun. 11:00 am, 2 pm, Press hour; 6-10 pm, Studio program. Pacific standard time. Divides time with KPPC. Slogan: "The White Spot of the San Fernando Valley."

KEX Western Broadcasting Co., Terminal Sales Bldg., Portland, Ore. 239.9 meters, 1250 kilocycles, 2500 watts. Sun, 8-10 pm, sacred music & organ concert. Daily ex Sun, 9 am-12 noon, home economics; 12 noon-2 pm, music; 6 pm-12 midnight, varied programs. Pacific standard time. Slogan: "A Public Service Necessity."

KFAB Nebraska Buick Auto Co., 13th and Que St., Lincoln, Nebr. 319.0 meters, 940 kilocycles, 5000 watts daytime. Mon, Tues, Wed, Fri, Sat, 9:30-9:45 am, 10-10:30 am, 11:45 am-12:30 pm, 3:30-4 pm, 5:30-6:30 pm, 8-10:30 pm. Thurs, 9:30-9:45 am, 10-10:30 am, 11:45 am-12:30 pm, 3:30-4 pm. Sun, 9-10 pm. Central standard time. Divides time with KOIL. Slogan: "Home, Sweet Home."

KFAD Electrical Equipment Co., 312-16 N. Central av., Phoenix, Ariz. 272.6 meters, 1100 kilocycles, 500 watts. Daily ex Mon & Sun, 3-4 pm, 6-7 pm. Daily ex Mon, Thurs & Sat, 8-9 pm. Mon, Sat & Sun, 2-3 pm. Tues, Wed, Fri, Sat, 9-10 pm. Mountain standard time. Slogan: "Phoenix, Where Winter Never Comes."

KFAU High School, Boise, Idaho. 285.5 meters, 1050 kilocycles, 2000 watts night, 4000 watts daytime. Sun, 3-5 pm, musical program; 7:30-8:30 or 9 pm, church services. Mon, Tues, Wed, Thurs, Fri, 12:30-1:15 pm, weather, market reports, U. S. Dept. of Agriculture features. Tues, 7:30-8 pm, Children's Half Hour; 8-9:30 or 10 pm, entertainment, news. Thurs, 7:30-8 pm; 8-9:30 or 10 pm, news, entertainment. Mountain standard time.

KFBB F. A. Buttrey Co., Havre, Mont. 275.1 meters, 1090 kilocycles, 50 watts. Daily ex Sun, 12:30-1:45 pm, noonday program. Sun, 1-3 pm. Wed, 7:30-9 pm. Slogan: "Voice of the Treasure State."

KFBC Arthur W. Yale, M. D., and Union League Club of San Diego County, on roof of Balboa Theater Bldg., San Diego, Calif. 247.8 meters, 1210 kilocycles, 100 watts. Sun, 10-12 am. Daily ex Sun, 9:30-10:30 am, 12:45-1:45 pm, 5-10 pm. Pacific standard time.

KFBK Kimball Upson Co., 607 K st., Sacramento, Calif. 535.4 meters, 560 kilocycles, 100 watts. Mon, 7:30-9 pm, artist program & orchestra; 9-10 pm, dance program. Thur, 8-9 pm, artist program; 9-10:30 pm, dance program. Sat, 7:30-8 pm, dinner music; 8-9 pm, artist program; 9-10 pm, dance music. Pacific standard time. Slogan: "In the Heart of California."

KFBL Puget Sound Station, Leese Bros., 2814 Rucker ave., Everett, Wash. 223.7 meters, 1340 kilocycles, 50 watts. Daily, 7:30-8:30 pm. Sun, 11 am-12 noon. Mon, Wed, Fri, 6:30-8 pm. Tues, Thur, 7-8 pm, 9-10 pm. Sat, 9-11 pm. Pacific time. Slogan: "The Voice of Puget Sound."

KFBU St. Matthews Cathedral (Bishop N. S. Thomas), Laramie, Wyo. 483.6 meters, 620 kilocycles, 500 watts. Sun, 11 am, church. Daily ex Sun, 12 noon. Wed & Fri, 7:30 pm, studio programs. Mountain standard time. Slogan: "The Top of the World."

KFCB Nielsen Radio Supply Co., 311 N. Central av., Phoenix, Ariz. 243.8 meters, 1230 kilocycles, 125 watts. Sun, 9:30 to 10:30 am, Radio Community Bible Class. Mon, 7:30 to 8:30 pm, children's hour. Wed, 8 to 9 pm, musical. Thurs, 8 to 9 pm, educational program. Fri, 9 to 10 pm, dance music. Sat, 9 to 10 pm, dance music. Sun, 9:30-10:30 am, community Bible class. Mountain standard time. Slogan: "Kind Friends Come Back."

KFCR Santa Barbara Broadcasting Co., Daily News Bldg., Santa Barbara, Calif. 211.1 meters, 1420 kilocycles, 50 watts.

KFDM Magnolia Petroleum Co., Box 798, Beaumont, Tex. 483.6 meters, 620 kilocycles, 500 watts. Sun, 8-9 pm, church services. Tues & Fri, 12:35 pm, band concert. Tues, 8-10 pm, orchestra. Fri, 8-10:30 pm, band concert. Central standard time. Divides time with WTAW. Slogan: "Kall for Dependable Magnolene."

KFDX First Baptist Church, Shreveport, La. 236.1 meters, 1270 kilocycles, 250 watts. Sun, 10:45 am, 7:45 pm, church services. Central standard time.

KFDY South Dakota State College Agriculture and Mechanical Arts, Brookings, So. Dak. 545.1 meters, 550 kilocycles, 500 watts. Sun, 3:15 pm, vesper service. Daily ex Sat & Sun, 12:30-12:45 pm, markets, weather, farm talks, news, music. Tues & Thurs, 7:30 pm, music and talks. Central standard time. Divides times with WDAY.

KFDZ Harry O. Iverson, 2510 Thomas av., South Minneapolis, Minn. 215.7 meters, 1390 kilocycles, 10 watts. Central standard time.

KFEC Meier & Frank Co., Portland, Ore. 214.2 meters, 1400 kilocycles, 50 watts. Daily ex Sun, 12 n, weather reports; 4-5 pm, music: 6-7 pm, weather, crop, market reports and music. Pacific time. Slogan: "Known for Every Courtesy." Divides time with KFIF.

KFEL Eugene P. O'Fallon (Inc.), Argonaut Hotel, Denver, Colo. 247.8 meters, 1210 kilocycles, 250 watts. Sun, 8:30 am, 9-10 am, church services. Daily ex Sun, 7:15 am, setting-up exercises; 10 am-12 noon, 2-6:45 pm, station programs. Mon & Sat, 11 pm, dance program. Tues, 8-10 pm, special program. Thurs, 8 pm-12 midnight, Sleepwreckers' program. Mountain standard time. Divides time with KOW. Slogan: "The Argonaut Station."

KFEQ Scroggin & Co. Bank, Robidoux Hotel, St. Joseph, Mo. 230.6 meters, 1300 kilocycles, 1000 watts. Sun, 10:45 am, church; 11 am-12 noon, organ. Daily 5-6 pm, 6:30-7:30 pm, 8:30-10 pm, music. Mon, 11 am-12 noon, orchestra. Central standard time.

KFEY Bunker Hill & Sullivan Mining & Concentrating Co., Y. M. C. A. & Union High School, Kellogg, Idaho. 232.4 meters, 1290 kilocycles, 10 watts. Sun, 11 am-7:30 pm, church services. Wed, 7:30-8:30 pm, musical. Thurs, 7:30, health talks. Sat, 9-10 pm, dance music. Pacific standard time. Slogan: "The Voice of the Coeur d'Alenes."

KFGL N. L. Cotter, 219 W. Main St., Trinidad, Colo. 222.1 meters, 1350 kilocycles, 50 watts.

KFGQ Boone Biblical College, Boone, Iowa. 209.7 meters, 1430 kilocycles, 10 watts. Sun, 2:30 pm. Western standard time.

KFH Hotel Lassen (Rigby-Gray Hotel Co.), Wichita, Kan. 245.8 meters, 1220 kilocycles, 500 watts. Sun, 9:30-10:30 am, 7:30-9 pm, church services. Daily ex Sun, 8:30-9 am, 10-11 am, 1-2 pm, markets; 7:30-9 pm, studio program. Central standard time. Slogan: "Kansas' Finest Hotel—In the Very Heart of God's Country."

KFHA Western States College of Colorado, Gunnison, Colo. 254.1 meters, 1180 kilocycles, 50 watts. Tues, Fri, 7 pm, kiddies' hour; 7:30 pm, musical. Mountain time. Slogan: "Where the Sun Shines Every Day."

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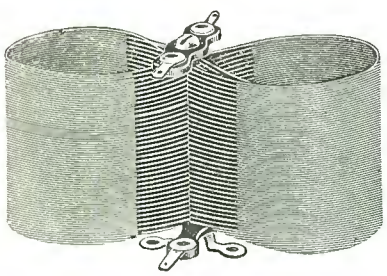

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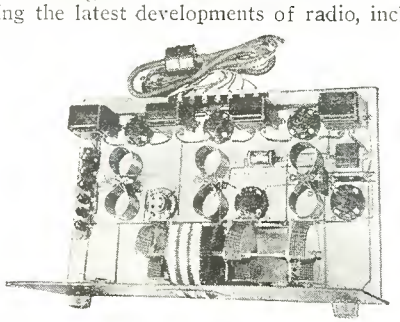
This set represents the last word in quality reproduction. Nothing can surpass it at any price. Four Twin-Eight Coils in the radio frequency unit give great selectivity and distance-getting ability. The audio amplification is built as part of the power unit, using UX-112 power tube in the first stage and push-pull amplification for the last stage with two UX-210 power tubes. This extraordinary amplification gives tremendous volume if desired, even on distant stations. The built-in phonograph turntable with electrical pick-up reproduces through the power amplifier. A revelation in phonograph reproduction. Designed and built by Bodine engineers. Complete construction blue prints are ready at the Citizens Radio Service Bureau. Write for them. Complete set full size prints, $1.50.

The New Bodine Twin-Eight Truphonic Six

For home set builders, the Bodine Electric Company has designed a new six tube T.R.F. set embodying the latest developments of radio, including



a power tube in the last stage of audio amplification. You will be amazed at the quality of its reproduction and selectivity. It is easy to build and the cost is comparatively low. Write today for free wiring diagrams. Full size blue print, $0.50.

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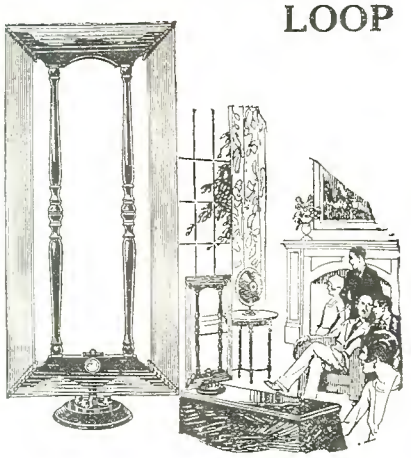

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Name..... Address..... City.....

KFHL Penn College, Oskaloosa, Ia. 212.6 meters, 1410 kilocycles, 10 watts. Central standard time.

KFI Earle C. Anthony, Inc., 1000 S. Hope st., Los Angeles, Calif. 468.5 meters, 640 kilocycles, 5000 watts. Sun. 10 am, 11 am-12:30 pm, church; 5:30-10 pm. musical program. Wed, 5:30-10:30 pm. Wed, Fri, 10:45-11:05 am. household talk. Daily ex Wed, Sat, Sun, 5:30-10 pm. Sat, 5:30-11 pm. Pacific standard time. Slogan: "National Institution."

KFIF Benson Polytechnic School, Portland, Ore. 214.2 meters, 1400 kilocycles, 50 watts. Pacific standard time. Divides time with KFEC.

KFIO North Central High School, Spokane, Wash. 245.8 meters, 1220 kilocycles, 100 watts. Fri, 8-9:30 pm. Pacific standard time. Divides time with KFPY.

KFIU Alaska Electric Light & Power Co., Juneau, Alaska. 225.4 meters, 1330 kilocycles, 10 watts. Mon, Wed & Fri, 6-7 pm, daily news items, steamer sailings, music, vocal and instrumental. Alaska time. (Note: 6-7 pm Alaska time is equivalent of 7-8 pm, Pacific standard time.) Slogan: "A Voice from the Far North."

KFIZ Fond du Lac Commonwealth Reporter, Fond du Lac, Wis. 267.7 meters, 1120 kilocycles, 100 watts. Daily, 5 to 5:30 pm, markets, weather and news. Occasional evening programs of music. Sun, 6-7 pm, dinner hour concert. Central standard time.

KFJB Marshall Electric Co., 1603 W. Main st., Marshalltown, Iowa. 247.8 meters, 1210 kilocycles, 100 watts. Daily ex Sun, 10 am, market reports; 6-7 pm, musical Tues & Fri, 8:30-11 pm, musical programs. Sun, 10 am-12 n; 7:30-9 pm. Central standard time. Slogan: "Marshalltown, the Heart of Iowa."

KFJF National Radio Mfg. Co., 406 N. Hudson st., Oklahoma City, Okla. 272.6 meters, 1100 kilocycles, 1000 watts daytime, 750 watts night time. Daily ex Sun, 9 am, 10 am, 12:30 pm, 4:30 pm, market service; 9:15 am, music; 6-7, orchestra; 7 pm, dinner musical; 9 pm, musical program. Sun, 9 am, 10 am, 11 am, 7:30 pm, 9:30 pm, church. Central standard time. Slogan: "Radio Headquarters of Oklahoma, the Tired Hand Announcing."

KFJI E. E. Marsh, Astoria, Ore. 249.9 meters, 1200 kilocycles, 15 watts. Wed, 9-10 pm, organ music. Sun, 12:30-1:30 pm. Sat, 10:30-11 pm. Pacific standard time. Divides time with KMED.

KFJM University of North Dakota, Grand Forks, N. Dak. 333.1 meters, 900 kilocycles, 100 watts. Limited coml. Sun, 10:45-12, church service. Daily, 12 n-1 pm, music records; 6-7 pm, orchestra. Central standard time.

KFJR Ashley Dixon & Son, 1350 E. 36th st., Portland, Ore. 282.8 meters, 1060 kilocycles, 100 watts. Daily ex Sun, 5-6 pm, 7-8 pm. Fri. & Sat, 4-5 pm. Mon, Tues & Sat, 9-10 pm. Mon, 10-11 pm. Tues. 10-10:30 pm, studio program. Fri, 12 midnight-1 am. Pacific standard time. Divides time with KTBR.

KFJY Tunwall Radio Co., 1004 Central av., Ft. Dodge, Iowa. 232.4 meters, 1290 kilocycles, 100 watts. Sun, 11 am, church services. Daily ex Sun, daily, 5:45 pm, market and weather reports. Mon, Wed, Fri, 10-11 am, musical. Mon, 11-12 pm, musical. Thurs, 8:30 pm, musical program. Central standard time. Divides time with KFMR.

KFJZ W. E. Branch, 3219 Avenue L, Fort Worth, Tex. 249.9 meters, 1200 kilocycles, 50 watts. Sun, 7-10 pm, 11-12:30 mornings. Daily ex Sun & Wed, 8:30-9:30 pm, 9 am to 6 pm. Central standard time.

KFKA Colorado State Teachers' College, Greeley, Colo. 249.9 meters, 1200 kilocycles, 200 watts. Tues, 10-11 am. Thurs, 8-10 pm. Mountain standard time.

KFKB Dr. Brinkley's Hospital, Milford, Kan. 241.8 meters, 1240 kilocycles, 2500 watts daytime, 1500 watts night. Sun, 8 am, 10 am, Bible lecture; 6 pm, 6:30 pm-12 midnight, concert. Daily ex Sat, 10:15 am, 12 noon, 6 pm, 10 pm, markets and weather reports; 1 pm, 6:30 pm, 10 pm, lectures; 3-4 pm, matinee program; 5:30-6:30 pm, 8-10 pm, varicty program. Daily, 12 noon-1 pm, Tiffin hour program. Tues & Thurs, 11 pm-1 am. Central standard time. Slogan; "The Sunshine Station in the Heart of the Nation."

KFKU University of Kansas, Lawrence, Kan. 254.1 meters, 1180 kilocycles, 500 watts. Mon & Thurs, 7-8 pm. (Also special broadcasting.) Central standard time. Divides time with WREN. Slogan: "Up at Lawrence on the Kaw."

KFKX Agricultural Station, Westinghouse Elec. & Mfg. Co., 509 S. Wabash Ave., Chicago, Ill. 526 meters. 570 kilocycles, 2500 watts. Daily ex Sat & Sun, 9:30 am-3 pm. Sat, 9:30 am-12:30 pm, stock, grain, weather, government reports. Central standard time. Divides times with KYW.

KFKZ State Teachers College, 107 E. Harrison st., Kirksville, Mo. 225.4 meters, 1330 kilocycles, 15 watts. Sun, 3:30 to 4:30 pm. Mon, 8-9 pm, dance music; 9 pm, radio plays. Central standard time. Slogan: "Kirksville, the Home of Osteopathy."

KFLV Swedish Evang. Miss. Church, Rockford, Ill. 267.7 meters, 1120 kilocycles, 100 watts. Sun, 10:40 am. Mon, 8:15 pm. Central standard time.

KFLX George R. Clough, 3327 Avenue P, Galveston, Tex. 270.1 meters, 1110 kilocycles, 100 watts. Central standard time.

KFMR Morningside College, Sioux City, Iowa. 232.4 meters, 1290 kilocycles, 100 watts. Commercial. Daily ex Sat & Sun, 11:40 am-12:30 noon. Tues, Wed, Thur, Fri, 7:30-8:30 pm. Central standard time. Divides time with KFJY.

KFMX Carleton College, Northfield, Minn. 236.1 meters, 1270 kilocycles, 500 watts. Fri, 8:15-8:45 pm, lecture; 8:45-9:45 pm, musical program; 10-11 pm, organ. Central standard time. Divides time with WCAL.

KFNF Henry Field Seed Co., Shenandoah, Iowa. 461.3 meters, 650 kilocycles, 1000 watts night, 2000 watts daytime. Sun, 8:30-9:30 am. 10:45-12:15 pm, 2-4 pm, 6:7 pm, 7:45-8:15 pm. church services, etc. Daily ex Sun. 6-8:30 am, 10-11 am, 12 noon-2 pm, 3-3:30 pm. 3:30-4 pm. 4:30-5 pm, 5-7 pm, varied programs. Central standard time. Slogan: "Known for Neighborly Folks."

KFOA Rhodes Dept. Store, 1321 2nd av., Seattle, Wash. 447.5 meters, 670 kilocycles, 1000 watts. Mon & Fri, 10 am-12 midnight. Tues, 12:30-11 pm. Wed, 10 am-10 pm. Thurs, 12:30 pm-10 pm. Sat. 4:30 pm-9 pm. Sun, 5:30-6:30 pm. Pacific standard time.

KFON Nichols & Warinner (Inc.), 212 Jergins Trust Bldg., Long Beach, Calif. 241.8 meters, 1240 kilocycles, 500 watts. Daily including Sun. 9:30 am-12 midnight. Varied programs. Pacific standard time. Slogan: "Where Your Ships Come In."

KFOR Howard A. Shuman, Lincoln, Nebr. 217.3 meters, 1380 kilocycles, 100 watts. Daily ex Sun, 12:05-1:05 pm, 2-2:35 pm, 6-7 pm, 8-10 pm. Fri, 11 pm-1 am, midnight frolic. Central standard time.

KFOX Technical High School, Omaha, Nebr. 258.5 meters, 1160 kilocycles, 100 watts. Daily ex Sat & Sun, 12:30-2 pm. Tues, 7:30-9 pm. Central standard time. Divides time with WNAL & KOCH.

KFOY Maurice Gordon Goldberg, St. Paul, Minn. 222.1 meters, 1350 kilocycles, 250 watts. Sun, silent. Mon, 7 pm, popular hour. Mon, Tues, Fri, 9 pm, reports. Wed, Thurs, Sat, 9 pm, reports; 9:05 pm, dance music. Central standard time. Divides times with WAMD.

KFPL C. C. Baxter, 205 Grafton st., Dublin, Tex. 275.1 meters, 1090 kilocycles, 15 watts. Sun, 7:30 am, 1:30 pm. Mon & Thurs, 8-9 pm. Central standard time. Slogan: "Baxter's Place."

KFPM The New Furniture Co., Box 628, Greenville, Tex. 230.6 meters, 1300 kilocycles, 15 watts, Sun, 11 am, services. Mon. & Fri, 8 pm, music; Wed, 8 pm, music; 7:15. sports in season; 1 pm daily ex Sun, musical program. Central standard time. Slogan: "Biggest Little Ten Watts on the Air."

KFPR Los Angeles County Forestry, Los Angeles, Calif. 232.4 meters, 1290 kilocycles, 250 watts. Irregular schedule. Pacific standard time. Divides time with KFQZ.

KFPW Lannie W. Stewart, Carterville, Mo. 263 meters, 1140 kilocycles, 50 watts. Sun, 1-2 pm, chapel service. Daily, 5:45-6:30 am. 2:30-3 pm. Central standard time. Slogan: "Keeping Pace with Christ Means Progress."

KFPY Symons Investment Co., Symons Block, Spokane, Wash. 245.8 meters, 1220 kilocycles, 250 watts. Sun, 7:45 pm-12 midnight. Mon, Tues, Wed, Thurs, Fri, 9:45-11 am. 3-5 pm, 6:15-10:30 pm. Pacific standard time. Divides time with KFIO.

KFQA The Principia, 5539 Page av., St. Louis, Mo. 234.2 meters, 1280 kilocycles, 50 watts. Sun, 11 am, church services. Fourth Church of Christ, Scientist. Central standard times. Divides time with WMAY and KWK.

KFQB Lone Star Broadcast Co., Ft. Worth, Tex. 331.1 meters, 900 kilocycles, 1000 watts. Daily ex Sun & Wed, 8-12 midnight, musical. Sun, 10 am-12 pm, 3-10 pm, church services. Central standard time. Divides time with WJAD. Slogan: "Keep Folks Quoting the Bible —KFQB."

KFQD Anchorage Radio Club, Anchorage, Alaska. 344.6 meters. 870 kilocycles. 100 watts.

KFQU W. E. Riker, Holy City, Calif. 249.9 meters, 1200 kilocycles, 100 watts. Daily ex Sun, 6:30-7:30 pm, miscellaneous. Tues, 9:30-11:45 pm, musical. Wed, Thurs, Sat. 9-10 am, lecture. Fri, 9-11:30 pm, musical. Sun. 11 am-12 noon, 9-10 pm, lectures. Pacific standard time.

KFQW KFQW, Inc., Continental Hotel, Seattle, Wash. 217.3 meters, 1380 kilocycles, 100 watts. Sun, 10 pm-12 midnight. popular prgoram. Daily ex Sun, 10-11 am, University District hour; 12 noon-1 pm, luncheon musicale; 4:30-5:30 pm, tea hour program; 5:30-6 pm, amusements; 6-11 pm, musical program. Pacific time. Slogan: "Gateway to Alaska and the Orient."

KFQZ L. E. Taft, 5653 De Longpre ave., Hollywood, Calif. 232.4 meters, 1290 kilocycles, 100 watts. Tues, Fri, 9-11 pm, musical program. Pacific standard time. Divides time with KFPR.

KFRC Don Lee (Inc.), San Francisco, Calif. 454.3 meters, 660 kilocycles. 1000 watts. Daily ex Sun, 7-9 am, musical program; 10-1 pm, studio program; 5:30-6:30 pm. children's program. Mon & Thurs, 6:30-10 pm Tues & Fri, 6:30-11 pm, concert. Wed, 6:30-12 pm. Sat, 6:30 pm-1 am, dance music. Sun, 12-1 pm, church services; 5-6 pm, organ recital. Pacific standard time.

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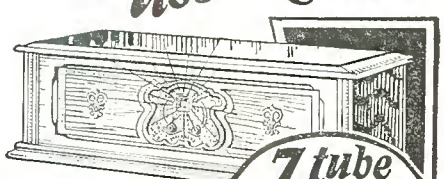

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Miraco is best set I've ever heard. It's just the set I've always wanted and I've had so many sets I got just a little hard-boiled about believing there were any sets perfect. I sure got my wish. I've had just 104 stations. There's about a station to each number on dial. I get KFI (Cal.) every night. Had PWX last night and got 6KW tonight good and loud.—FRANCIS ARMBRUSTER, Cleveland, Ohio.
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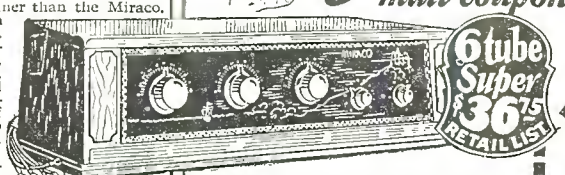
I have built radios since they first made their appearance and it has been my pleasure to build, repair and sell them. For quality, selectivity and sensitivity it is my firm belief that the Miraco cannot be excelled. I have proven beyond any shadow of doubt that it will outperform any other radios. I bring in the farthest distance with little or no effort. The Miraco also gives me tone quality.—URBAIN BARIL, Jr., Fall River, Mass.

MIRACO EXCELS EXPENSIVE RADIOS
The Miraco set and loud speaker beat anything around here, regardless of price. Have tried them out against a $200 outfit. Have logged 140 stations, coast to coast.—E. J. CARRIERE, Bathgate, N. D.

HEARS CUBA, CANADA, MEXICO
A friend visited here that has close to $300 in a radio—but no better tone and no plainer than the Miraco. Have gotten 118 stations. We get Mexico City, Winnipeg, Canada and Havana, Cuba—all of these so plain.—MRS. CLEM CORRELL, Morristown, Ind.

CUTS THRU NEW YORK LOCALS
I can get distance thru the locals when they are all on early in the evening.—J. F. LOGAN, Rockaway Beach, New York.



Another Big Bargain! Famous powerful big Miraco Super 6, 1928 model—ultra selective! Thousands find it outperforms sets of much higher price. **30 Days' Trial Free. Fully Guaranteed.**

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BEAUTIFULLY ILLUSTRATED CATALOG AND AMAZING SPECIAL OFFER

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Electrify Any Radio *with* MIDWEST NO-BATTERY "AC" Light Socket Power Units

"A", "B" and "C" power, direct from light socket, without batteries! Write for Midwest prices and discounts. Midwest Units are highest grade—lastingly dependable, quiet in operation, fully guaranteed.

BIG DISCOUNT TO User-Agent

MIDWEST RADIO CORPORATION
Pioneer Builders of Sets
531-K Miraco Building, Cincinnati, Ohio.

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Without obligation, send free catalog, AMAZING SPECIAL OFFER, testimony of nearby Miraco users. ☐ User ☐ Agent ☐ Dealer

NAME

ADDRESS

KFRU Stephen's College, a Junior College for Women, Columbia, Mo., "The Athens of the West." 249.9 meters, 1200 kilocycles, 500 watts. Sun, 7:30 am, sunrise service; 9:20 am, Burrall class; 7:30 pm, church services. Daily ex Sun & Sat, 8:30 am, public school convocation; 4:30 pm, popular program; 6 pm, dinner hour. Wed, 9 pm, musical program. Thurs, 10 pm, musical program. Sat, 4:30 pm, popular program; 6:15 pm, weather news. Central standard time. Slogan: "Where Friendliness is Broadcast Daily."

KFSD Airfan Radio Corporation, U. S. Grant Hotel, San Diego, Calif. 440.9 meters, 680 kilocycles, 500 watts. Sun, 3-4 pm, musical program; 6:15-10 pm, musical program. Daily ex Sun, 6:15-11 pm, musical program. Pacific time.

KFSG Angelus Temple, 1100 Glendale blvd., Los Angeles, Calif. 275.1 meters, 1090 kilocycles, 500 watts. Sun, 10:30 am-12:30 pm, 2:30-4:30 pm, 6:30-11 pm. Tues & Wed, 10:30 am-12:30 pm, 2:30-4:30 pm, 6:30-9:30. Thurs & Fri, 10:30 am-12:30 pm, 2:30-4:30 pm, 6:30-11 pm. Sat, 10:30 am-12:30 pm, 2:30-4:30 pm, 6:30-9:30 pm. Church services, organ recitals, band concerts, sacred and classical musicales. Slogan: "The Church of the Air."

KFUL Thos. Goggan & Bro. Music Co., 2126 Market, Galveston, Tex. 258.5 meters, 1160 kilocycles, 500 watts. Daily, 1-2 pm. Mon & Fri, 8 pm. Central standard time. Slogan: "The City of Perpetual Sunshine."

KFUM W. D. Corley, Mining Exchange Bldg., Colorado Springs, Colo. 282.8 meters. 1060 kilocycles. 1000 watts. Sun, 11 am. Mon & Fri, 5-7 pm. Tues & Sat, 8-10 pm. Thurs, 8 pm-12 midnight. Mountain standard time. Divides time with KFXF. Slogan: "Known For Unsurpassed Mountain Scenery."

KFUO Concordia Seminary (Lutheran), St. Louis, Mo. 545.1 meters, 550 kilocycles. 1500 watts daytime, 1000 watts night. Sun, 3:30 pm, 4 pm, Shut-in Hour, 9:15 pm. Mon, 9 pm, young people's hour. Fri, 6:30 pm, children's hour; 9 pm, Bible class. Central standard time. Divides time with Station KSD. Slogan: "The Gospel Voice."

KFUP Fitzsimmons General Hospital. Educational & Recreational Dept., U. S. Army, Denver, Colo. 227.1 meters, 1320 kilocycles, 100 watts. Mountain time.

KFUR Perry Building Co., 420 Twenty-fifth st. (H. W. Peery, Mgr.). Ogden, Utah. 225.4 meters. 1330 kilocycles, 500 watts. Tues, Thurs, Sat, 9:50-11:50 pm, dance music. Mountain time.

KFUS Louis L. Sherman, 1444 Havenscourt blvd., Oakland, Calif. 256.3 meters, 1170 kilocycles, 50 watts. Tues. 2:30-3:30 pm, educational; 8-9 pm, 6:30-7:30 pm, sacred studio program. Wed & Fri, 8-9 pm, sacred program. Thurs, 4:30-5 pm, educational; 5-5:30 pm, children's program. Sun, 9-9:30 am, S.S. lesson; 3:30 4:30 pm, sacred program. Pacific standard time. Divides time with KRE.

KFUT University of Utah, Salt Lake City, Utah. 249.9 meters, 1200 kilocycles, 50 watts. Tues, Wed, Thur, Fri, 7-8 pm. Mountain time.

KFVD W. J. & C. I. McWhinnie, Venice Ballroom, Venice, Calif. 208.2 meters, 1440 kilocycles, 250 watts. Sun, 6-12 pm, dance program. Daily ex Sun, 9:30 am-12 noon, 4:30-6 pm, 9 pm-12 midnight. Pacific time. Slogan: "The Voice of the Sea." Divides time with Station KGFJ.

KFVG First Methodist Episcopal Church, 204 S. Penn. ave., Independence, Kan. 225.4 meters, 1330 kilocycles, 50 watts. Sun, 10:55 am-12:30 pm & 7:30-9:15 pm, church services. Central standard time. Slogan: "Kansas Folks Very Good."

KFVI Headquarters Troop, 56th Cavalry Brigade, 305 Sabine st., Houston, Tex. 238 meters, 1260 kilocycles, 50 watts. Central standard time.

KFVS Hirsch Battery & Radio Co., 312 S. Frederick st., Cape Girardeau, Mo. 223.7 meters, 1340 kilocycles, 50 watts. Daily ex Sun, 12:15 noon, news and markets; 6:45 pm, musical. Central standard time. Slogan: "The City of Opportunity."

KFWB Warner Bros. Motion Picture Studios, Inc., 5842 Sunset blvd., Hollywood, Calif. 361.2 meters, 830 kilocycles. 500 watts. Sun, 7:30-10 pm. Daily ex Sun, 10-10:40 am. Mon, Tues, Thurs, Fri, 11:45 am-2:30 pm. Mon, Tues, 4:45 pm-12 midnight. Sat & Wed, 11:45 am-12 midnight. Thurs & Fri, 4:15 pm-12 midnight. Pacific time.

KFWC L. E. Wall, San Bernardino, Calif. 222.1 meters, 1350 kilocycles, 100 watts. Sun, 7 pm-12 midnight. Daily ex Sun, 9 am-1 pm, 2-5:30 pm. Mon & Wed, 7 pm-12 midnight. Tues, 7-8 pm, 10 pm,12 midnight. Thurs, 10 pm-12 midnight. Fri, 8 pm-12 midnight. Sat, 9 pm-12 midnight. Pacific standard time. Divides time with KWTC. Slogan: "The Voice of the Orange Empire."

KFWF St. Louis Truth Center, 4030 Lindell st., St. Louis, Mo. 214.2 meters, 1400 kilocycles, 250 watts, non-commercial. Sun, 10:45 am, 7:45 pm, 9 pm, organ & chimes. Thurs, 10:45 am, sunshine hour; 7:45 pm, sermon; 9 pm, music. Central standard time. Slogan: "The Voice of Truth."

KFWI Radio Entertainments, Inc., 1182 Market St., San Francisco, Calif. 267.7 meters, 1120 kilocycles. 500 watts. Sun, 7:50-11 pm. Daily ex Sat & Sun, 1-1:30 pm, 5-7:30 pm, 8-11 pm (Wed. 5-7:15 pm). Sat, 5-7 pm, 8 pm-12 midnight. Pacific standard time.

KFWM Oakland Educational Society, 1520 8th Ave., Oakland, Calif. 236.1 meters. 1270 kilocycles. 500 watts night. 1000 watts daytime. Sun, 9:30-11 am, 12:30-2:30 pm, 7:30-9:30 pm. Daily ex Sun & Wed, 8-10 pm. Tues, Wed, Fri, 2-3 pm. Tues, 12:30-1:30 pm. Thurs, 12:30-4:30 pm. Pacific standard time. Slogan: "The Most Good to the Most People."

KFWO Major Lawrence Mott, 346 Claressa av., Avalon, Catalina Island, Calif. 299.8 meters, 1000 kilocycles, 250 watts. Daily including Sun, 12:30-1:30 pm, 5-6 pm, 6-7:30 pm. Tues, 8 pm-midnight. Pacific standard time. Slogan: "Catalina for Wonderful Outings."

KFXD Service Radio Co., East Main St., Jerome, Utah. 204 meters, 1470 kilocycles, 15 watts. Daily at noon with news, markets, etc. Mountain time.

KFXF Colorado Radio Corporation, Republic Bldg., Denver, Colo. 282.8 meters, 1060 kilocycles. 500 watts. Mon, Wed, Fri. Sun, 6-12 pm. Mountain standard time. Divides time with KFUM. Slogan: "The Voice of Denver."

KFXJ R. G. Howell, Olinger Gardens, Edgewater, Colo. 215.7 meters, 1390 kilocycles, 50 watts input. Daily, 2:30-4:30 pm, 6-8 pm, dinner concert; 8-10 pm, studio. Sun, 7 pm, sacred hour. Mountain standard time. Slogan: "America Scenic Center."

KFXR Exchange Avenue Baptist Church, 1818 Linden St., Oklahima City, Okla. 223.7 meters, 1340 kilocycles, 50 watts. Central standard time.

KFXY Mary M. Costigan, Flagstaff, Ariz. 205.4 meters, 1460 kilocycles, 25 watts. Tues, Thurs, Sat, 10-11 pm. Mountain time.

KFYO Kirskey Bros., Breckenridge, Tex. 211.1 meters, 1420 kilocycles, 15 watts. Sun, 10:30-11:30 am. 12 noon-1 pm. 8-9 pm. Silent Wed night. Daily ex Sun, 8-9 pm. Central standard time. Slogan: "Breckenridge, the Dynamo of West Texas."

KFYR Hoskins-Meyer, Inc., 200 4th st., Bismarck, N. Dak. 249.9 meters, 1200 kilocycles. 250 watts night time, 500 watts daytime. Sun, 10:30-12 noon, church; 3-5 pm, music. Daily ex Sun, 12:30-1:30 pm, music, weather forecast, etc. Central standard time.

KGA Northwest Radio Service Co., Spokane, Wash. 260.7 meters, 1150 kilocycles. 2000 watts. Sun, 11 am-12:30 pm, 7:30-9 pm, church. Daily ex Sun, 9-11 am, music; 11 am-12 noon; 12 noon-12:20 pm, stocks, weather, news, etc.; 12:20-5:30 pm, music; 5:30-6 pm, kiddies program; 6 pm, time signals, weather reports, etc.; 6:15-7:15 pm, organ; 7:15-10 pm. Pacific standard time.

KGAR The Tucson Citizen, 80 S. Stone av., Tucson, Ariz. 234.2 meters, 1280 kilocycles, 100 watts. Sun, 11 am-12:30 pm, 7:30-9 pm, church services. Daily ex Sat & Sun, 6-9 pm, musical program. Sat midnight frolic every 2nd week from 12 midnight-3 am. Slogan: "Way Out on the Desert."

KGBU Alaska Radio & Service Co., Ketchikan, Alaska. 228.9 meters, 1310 kilocycles, 500 watts.

KGBX Foster-Hall Tire Co., 1221 Fred av., St. Joseph, Mo. 288.3 meters, 1040 kilocycles, 100 watts. Central standard time.

KGBY Dunning & Taddiken, Columbus, Nebr. 222.1 meters. 1350 kilocycles, 50 watts. Sun, 3-5 pm, religious program. Tues, 8-10:30 pm, popular program. Fri, 6-7 pm, dinner program; 8-10:30 pm, popular program. Central standard time. Slogan: "The Voice of Shelby, in the Heart of the Corn Belt."

KGBZ Dr. George R. Miller, York, Nebr. 212.6 meters, 1410 kilocycles, 100 watts. Sun, 9 am, church services, 5 pm, alternatively. Daily ex Sun. Tues, 12:30 pm, market, livestock; 2:30 pm, musical. Thurs, Sat, 9 pm, dance music. Central standard time. Slogan: "The Swine and Poultry Station."

KGCA Chas. W. Greeley, Decorah, Iowa. 247.8 meters, 1210 kilocycles, 10 watts. Sun, 2-4 pm. Daily ex Sun, 12:30-1:30 pm. Wed. 7:30-8:30 pm. Central standard time. Divides time with KWLC.

KGCB Wallace Radio Institute, 105 W. 13th st., Oklahoma City, Okla. 215.7 meters, 1390 kilocycles, 50 watts. On air daily, programs irregular. Divides time with Station KGFG.

KGCH Wayne Hospital, Wayne, Nebr. 293.9 meters, 1020 kilocycles, 250 watts. Sun, 2:30-4 pm, 6 pm, sacred service. Tues, Wed, Thurs, Fri, 6:30-8 pm, featuring college educational and entertaining programs. Central standard time. Divides time with KGDW. Slogan: "Remember Us When U R Ill."

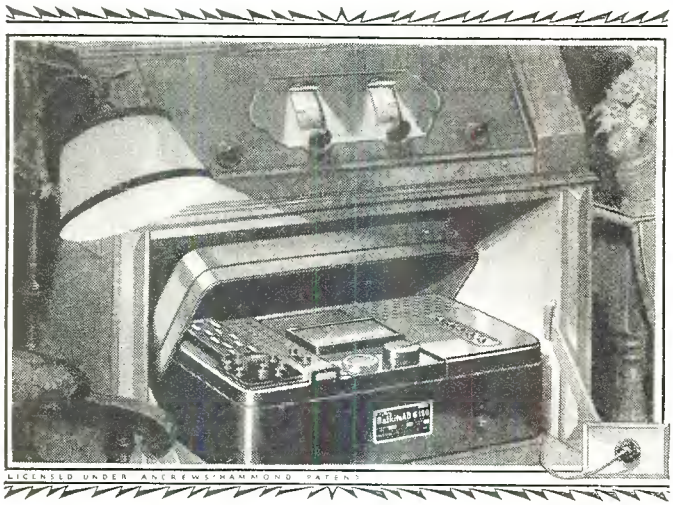
KGCI Liberto Radio Sales, San Antonio, Tex. 204.6 meters, 1360 kilocycles, 15 watts. Sun, 1:30-2:30 pm. Daily ex Sun, 9:30-10:30 am, 11:30 am-12:15 pm, 3-4 pm, 5:30-6:30 pm. Mon & Thurs, 9:30-10:30 pm. Tues, 7:30-8:30 pm. Central standard time. Divides time with Station KGRC, the Gene Roth Co., San Antonio, Tex. Slogan: "Radio Sam at San Antonio."

KGCL Piper & Taft, Inc., Sporting Goods Store, 1107 2nd Ave., Seattle, Wash. 230.6 meters, 1300 kilocycles, 50 watts. Mon, Wed. Thurs, 9 am-11 pm. Tues, Fri, Sat, 9 am-7:30 pm. Sun, 12 noon-8 pm. Pacific standard time. Slogan: "Splitdorf Radio Center." Divides time with station KPCB, the Pacific Coast Biscuit Co.

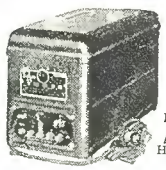
KGCN Concordia Broadcasting Co., Concordia, Kan. 208.2 meters, 1440 kilocycles, 50 watts. Sun, 11 am-12 noon. Daily ex Sun, 12:30-1:30 pm, 7:30-9 pm. Central standard time. Slogan: "KGCN—The Shamrock Station."

KGCR Cutlers Radio Broadcasting Service, 415 Main st., Brookings, S. Dak. 208.2 meters, 1440 kilocycles, 15 watts. Central standard time.

KGCU Mandan Radio Association (H. L. Dahners), Mandan, N. Dak. 239.9 meters, 1250 kilocycles, 100 watts. Sun. 11 am-12 noon, 4:30-6:30 pm. Daily ex Sun, 7-8 am, 12 noon-2 pm, 6:30-7:30 pm. Mountain standard time. Slogan: "The Voice of the West."



Now AC Electric Radio



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To owners of a "B" eliminator:

Balkite "A" is like Balkite "AB" but for the "A" circuit only. It enables you to make an electric installation at very low cost. $35.

Balkite "B"

The accepted, tried and proved light socket "B" supply. One of the longest lived devices in radio. Three models, $22.50, $35, $42.50.

Balkite Chargers

Standard for "A" batteries. Noiseless. Can be used during reception. High rate or trickle. Three models, $17.50, $9.50, $7.50.

There are special models for 25-40 cycle current at slightly higher prices. Prices are higher West of the Rockies and in Canada.

Without the uncertainty of untried apparatus

And without any sacrifice in quality of reception

Of course you want an AC electric receiver. For its convenience. Now you can have it, without the uncertainty of untried apparatus and without sacrificing quality of reception.

Simply by adding Balkite *Electric* "AB" to your present radio set. Balkite *Electric* "AB" replaces both "A" and "B" batteries and supplies radio power from the light socket. It contains no battery in any form. It operates only during reception. It makes any receiver an electric set.

This method makes possible the use in electric reception of standard sets and standard type tubes. Both are tried and proved, and give by far the clearest and truest reproduction. With this method there is no waiting for tubes to warm up. No difficulty in controlling volume. No noise. No AC hum. No crackling or fading of power. Instead the same high standard of reception to which you are accustomed.

In this method there is nothing experimental, nothing untried. It consists of two of the most dependable products in radio—a standard set and Balkite. And if you should already own a radio set, the cost of equipping it with Balkite is only a fraction of the cost of a new receiver.

By all means go to AC reception. Its convenience is the greatest improvement in radio. But be as critical of an AC receiver as you would of any other. That your AC receiver be a standard set equipped with Balkite *Electric* "AB." Then it will be as clear and faithful in reproduction as any receiver you can buy.

Two models, $64.50 and $74.50. *Ask your dealer.* Fansteel Products Co., Inc., North Chicago, Illinois.

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on the air Thursday Evenings, 10 o'clock Eastern time. Over stations WJZ, WBZA, WBZ, KDKA, KYW, WGN, WMAQ, WBAL, WHAM, WJR, WLW, WENR. 10:30 Eastern time: WEBH, KSD, WOC, WOW, WCCO, WHO, WDAF.

BALKITE HOUR

Balkite ELECTRIC AB

contains no battery

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine

KGCX First State Bank of Vida, Vida, Mont. 243.8 meters, 1230 kilocycles, 10 watts.

KGDA Home Auto Co., Dell Rapids, S. D. 254.1 meters, 1180 kilocycles, 15 watts daytime.

KGDE Jaren Drug Co., Barrett, Minn. 205.4 meters, 1460 kilocycles, 50 watts. Daily ex Sun, 12:30 pm, 4 pm, 7 pm. Sun, 10:30 am, 3 pm, 6 pm, 8 pm. Central standard time.

KGDM Peffer Music Co., 42 S. California st., Stockton, Calif. 217.3 meters, 1380 kilocycles, 10 watts.

KGDP Boy Scouts of America, Pueblo Council, Pueblo, Colo. (John D. Price), 261.7 meters, 1340 kilocycles, 10 watts.

KGDR Joe B. McShane, 206 Laurel Hgts. Place, San Antonio, Tex. 206.8 meters, 1450 kilocycles, 15 watts. Sun, 9-10 am, classical. Daily ex Sun, 4-5:30 pm, tea dancing program. Wed, 9:30-11:30 pm, frolic. Thur, 7:30-8:30 pm. Central standard time. Slogan: "The Little Station with the Big Programs."

KGDW Frank J. Rist, Humboldt, Nehr. 293.9 meters, 1020 kilocycles, 100 watts. Central standard time. Divides time with KGCH.

KGDX William E. Antony, 1513 Laurel st., Shreveport, La. 212.6 meters, 1410 kilocycles, 250 watts. Divides time with KGGH.

KGDY J. Albert Loesch, Oldham, S. Dak. 206.8 meters, 1450 kilocycles, 15 watts. Thur, 7:45 pm, 11:45 pm. Central standard time. Slogan: "The Little Brick Town on the Prairie."

KGEF Trinity Methodist Church, Los Angeles, Calif. 263 meters, 1140 kilocycles, 500 watts.

KGEH Eugene Broadcast Station, W. E. Miner Bldg., Eugene, Ore., 201.6 meters, 1490 kilocycles, 50 watts.

KGEK Beehler Electric Equipment Co., Yuma, Colo. 263 meters, 1140 kilocycles. 10 watts daytime only. Daily. 12 noon-1 pm., stock markets, lectures, etc.

KGEN E. R., Irey & F. M. Bowles, El Centro, Calif. 225.4 meters, 1330 kilocycles, 15 watts.

KGEO Hotel Yancey, Grand Island, Nebr. 205.4 meters, 1460 kilocycles, 100 watts.

KGEQ Glenwood Radio Station, 920 5th av., No. Minneapolis, Minn. 204 meters, 1470 kilocycles, 50 watts. Mon, 7-8 pm, miscellaneous. Tues, Thur, 8:30-11 pm, miscellaneous. Wed, 6:30-8:30 pm, 10-11 pm. Fri, 6:15-9 pm, music, entertainment. Sat, 4:30 pm. Children's Story Hour. Central standard time. Slogan: "In the Land and Lakes and Rivers."

KGER C. Merwin Bobyns, Long Beach, Calif. 215.7 meters, 1390 kilocycles, 100 watts. Pacific standard time. Divides time with KRLO. Slogan: "Service Club of the Air."

KGES Central Radio Electric Co., Central City, Nebr. 204 meters, 1470 kilocycles, 10 watts.

KGEU L. W. Clement, Lower Lake, Calif. 227.1 meters, 1320 kilocycles, 50 watts.

KGEW City of Fort Morgan, Fort Morgan, Colo. 218.8 meters, 1370 kilocycles, 200 watts daytime, 100 watts night. Sun, 11 am-12 noon, church; 2-4 pm, classical program. Daily ex Sat & Sun, 5:15-6 pm, markets & news. Tues, Thurs, Sat, 8-10 pm, varied programs. Sat, 12 noon-1 pm, talks. Mountain standard time. Slogan: "Fort Morgan, the City of Lights."

KGEY J. W. Dietz, Denver, Colo. 201.6 meters, 1490 kilocycles, 250 watts. Sun, 1-2 pm. Daily ex Sun, Thur, 7-8 pm. Western standard time.

KGEZ Flathead Broadcasting Association, Kalispell, Mont. 293.9 meters, 1020 kilocycles, 100 watts. Daily ex Sun, 12:30 pm-1:30 pm; 6:30-7:30 pm. Thurs, 9-10:30 pm. Sun, 11 am, church services. Mountain standard time. Slogan: "Located in the Switzerland of America—The Beautiful Flathead Valley."

KGFB Iowa City, Ia. 223.7 meters, 1340 kilocycles, 10 watts.

KGFF Earl E. Hampshire, 718 5th st., Alva, Okla. 205.4 meters, 1460 kilocycles, 25 watts. Programs irregular. Central standard time.

KGFG Full Gospel Church, "Old Glory" Station, Oklahoma City, Okla. 215.7 meters, 1390 kilocycles, 50 watts. Slogan: "The Whole Gospel to the Whole World."

KGFH La Crescenta, Calif. 223.7 meters, 1340 kilocycles, 250 watts. Divides time with KMIC.

KGFI San Angelo, Tex. 220.4 meters, 1360 kilocycles, 15 watst. Sun, 11 am-8 pm. Daily ex Sun, 10 am-12 noon, 3:30 pm, markets & weather; 8-10 pm, music. Central standard time. Slogan: "The Voice of West Texas."

KGFJ Ben S. McGlashan, Washington Blvd. & Oak St., Los Angeles, Calif. 208.2 meters, 1440 kilocycles, 100 watts. Sun, 9 am-2:30 pm. Daily, 6:30-9:30 am, 12 noon-4:30 pm, 6-9 pm. 12 midnight-6:30 am, ex Thurs when on the air 2-6:30 am. Pacific standard time. Divides time with KFVD. Slogan: "Keep Good Folks Joyful."

KGFK Hallock, Minn. 223.7 meters, 1340 kilocycles, 50 watts.

KGFL Raton, N. M. 222.1 meters, 1350 kilocycles, 50 watts.

KGFM Geo. W. Johnson, Yuba City, Calif. 211.1 meters, 1420 kilocycles, 15 watts. Daily ex Sun, 9:30-10:30 am, advertising; 2-2:30 pm, musical. Mon, Wed, Fri, 8-10 pm, entertainment. Pacific standard time.

KGFN Aneta, N. Dak. 199.9 meters, 1500 kilocycles, 15 watts.

KGFO Terre Haute, Ind. 204 meters, 1470 kilocycles, 100 watts.

KGFP Mitchell, S. Dak. 212.6 meters, 1410 kilocycles, 10 watts.

KGGH Cedar Grove, La. 212.6 meters, 1410 kilocycles, 250 watts. Central standard time. Divides time with KGDX.

KGO General Electric Co., Oakland, Calif. 384.4 meters, 780 kilocycles, 5000 watts. Sun, 11 am, 7:30 pm, church; 4 pm, 5:30-6:30 pm, concert; 9-10 pm. Daily ex Sun, 11:30 am; 4-5 pm, concert; 5:30 pm, Kiddies Klub; 6-6:55 pm. dinner concert; 9 pm, Book Review. Tues, Wed, Thurs, Fri, Sat, 9-10 pm, varied programs. Tues, Fri, Sat, 10-11 pm; Wed, 10 pm-12 midnight, dance music. Fri, 11 pm-12 midnight. Pacific standard time.

KGRC Gene Roth & Co., San Antonio, Tex. 220.4 meters, 1360 kilocycles, 50 watts. Divides time with KGCI.

KGRS Gish Radio Service, 108 E. 8th st., Amarillo, Tex. 243.8 meters, 1230 kilocycles, 150 watts. Daily ex Sun, 6:30 am-6:30 pm; 10 am, weather & markets. Mon, Wed, Fri, 9 pm. Sun, 11:30 am, 4:30 pm, 7:30 pm. Central standard time.

KGTT Glad Tidings Temple—Bible Institute, 1471 Ellis st., San Francisco, Calif. 206.8 meters, 1450 kilocycles, 50 watts. Sun, 2:30-5 pm, 8:10 pm. Mon, Tues, Thurs & Sat. 12:10-12:30, sacred. Wed, 12:10-12:30 pm, 2:30-3:33 pm, sacred. Fri, 12:10-12:30 pm, 3-4 pm, 8-10 pm, sacred. Pacific standard time. Slogan: "Knights of Glad Tidings."

KGU The Advertiser Publishing Co., 217 King st., Honolulu, Hawaii. 270.1 meters, 1110 kilocycles, 600 watts. 2½ hours later than Pacific time. Sun, 6-9:30 pm, music, lectures. church, news. Daily, 12 noon-1:15 pm, 5-6 pm. stock, weather reports, music. Daily ex Sat & Sun. 7:30-9:30 pm. Hawaiian program, news. sports, music, etc. Slogan: "In the Land of Sunshine, the Future Playground of America."

KGW Oregonian Publishing Co., Portland. Ore. 491.5 meters, 610 kilocycles. 1000 watts. Sun, 8:30-9:15 am. Aunty Blossom and Winnie Winkle; 10 am-12 noon, church; 3-11 pm concerts. Daily ex Sun, 10-11:30 am, Town Crier; 6-7 pm. concert. Mon, 7-11 pm, musical entertainment. Tues, 6 pm-12 midnight, music & educational program. Wed, 7:30 pm-12 midnight, diversified program. Thurs, 6 pm-12 midnight, concert. Fri, 7-9 pm, utility & musical entertainment; 9-10:30 pm, concert; 10:30-12 midnight, Hoot Owl Frolic. Sat, 7-11 pm, concert; 11 pm-12 midnight, dance music. Pacific standard time. Slogan "Keep Growing Wiser,"

KGY St. Martins College, Lacey, Wash. 243.8 meters, 1230 kilocycles, 50 watts. Tues, Thurs, Sun, 8:30-9:30, PST concert. Pacific standard time. Slogan: "Out Where the Cedars Meet the Sea."

KHJ Times-Mirror Co., Los Angeles, Calif. 416.4 meters, 720 kilocycles. 500 watts. Sun, 10-12 am, 7-10 pm. Daily ex Sun, Mon, 6-10 pm. Pacific time. Slogan: "Kindness, Happiness, Joy."

KHQ Louis Wasmer, Inc., Peyton Building, Spokane, Wash. 370.2 meters, 810 kilocycles, 1000 watts. Sun, 11-12:30, 6-7:30, 7:30-10 pm, church services. Mon, Tues, Thurs, Fri, Sat, 2:30-4:30 pm, matinee; 5-6 pm, service hour. Thurs, Fri, Sat, 6-7 pm, concert. Mon, Tues, 7:30-12 pm, varied. Wed, 9-10 pm, dance music. Thurs, Fri, 8-10 pm, popular; 10:30-12 pm, KGW. Pacific time. Slogan: "In the Friendly City."

KICK Atlantic Automobile Co., Atlantic, Iowa. 322.4 meters, 930 kilocycles, 100 watts daytime. Divides time with WIAS.

KJBS Julius Brunton & Sons Co., 1380 Bush st., San Francisco, Calif. 220.4 meters, 1360 kilocycles, 50 watts. Sun, 1:30-5 pm. Daily ex Sat & Sun, 9 am-12 noon, 1:30-7:30 pm. 8-11 pm. Sat, 9 am-12 noon, 1:30-7:30 pm. Pacific standard time. Slogan: "The Voice of the Storage Battery."

KJR Northwest Radio Service Co., 604 Home Savings Bldg., Seattle, Wash. 348.6 meters, 860 kilocycles, 2500 watts. Sun, 9:30-11 am, 11-12:30 pm, church; 2:30-4 pm, 7-10:30 pm, music & church. Daily ex Sun, 9 am-12 noon, 12 noon-5 pm, 5 pm-12 midnight, news, talks, music, weather reports, etc., broadcast. Pacific standard time. Divides time with KXA.

KKP City of Seattle, Harbor Department, Seattle, Wash. 265.3 meters, 1130 kilocycles, 15 watts.

KLDS Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Mo. 270.1 meters, 1110 kilocycles, 1500 watts. Sun, 8:30-11 am, 3-6:30 pm, 9 pm. Mon, silent. Tues, 6:30 am, 2:30 pm, 7 pm, 8 pm. Wed, silent. Thurs, 2:30 pm, 7 pm, 8 pm. Fri, 6:30 pm. Sat, 7 pm, 8 pm. Morning devotional, Tues & Fri, 6:30 am. Slogan: "The Station Dedicated to Knowledge, Liberty, Divinity and Service."

KLIT Portland, Ore. 206.8 meters, 1450 kilocycles, 10 watts.

KLS Warner Bros. Radio Supplies Co., 2201 Telegraph av., Oakland, Calif. 245.8 meters, 1220 kilocycles, 250 watts. Sun, 10-11 am, church services. Pacific standard time. Divides time with KZM. Slogan:: "The City of Golden Opportunity."

KLX The Oakland Tribune, Oakland, Calif. 508.2 meters, 590 kilocycles, 500 watts. Daily ex Sun. 10-11:30 am, 11:30 am-1 pm, 1-1:30 pm. 6:30-7:30 pm, 8-10 pm. Wed & Thurs. 4:30-5:30 pm. Daily ex Sat & Sun, 5:30-6:30 pm. Pacific standard time. Slogan "Where Rail and Water Meet."

KLZ Pioneer Station of the West, Shirley Savoy Hotel, Denver, Colo. 296.9 meters, 1010 kilocycles, 1000 watts daytime, 500 watts night. Sun, 9:30-10:30 am. 11 am-12:30 pm, 3-4 pm, 7 pm-12 midnight. Daily ex Sun, 9-11 am, 3-4:30 pm, 6-10 pm. Sun, Tues, Fri & Sat, 10 pm-12 midnight, dance music. Mountain time. Slogan: "The Pioneer Station of the West."

KMA Earl E. May Seed & Nursery Co., Shenandoah, Ia. 394.5 meters, 760 kilocycles, 1000 watts. Sun, 8-9 am, sacred; 11 am, church service; 12:15-2:30 pm, music; 4-6 pm, sacred. Daily ex Sun, 6-7 am, 9-10 am. 11 am-1 pm, 2-3 pm. Daily ex Sun & Mon, 5-10:30 pm. Daily, 12:20 & 6:30 pm, markets. Central standard time. Divides time with KWAH. Slogan: "Keeps Millions Advised."

KMED W. J. Virgin, Sparta Bldg., Medford, Ore. 249.9 meters, 1200 kilocycles, 50 watts. Sun, 11 am-12:15 pm, 3:30-4:30 pm, 8-9:15 pm. Daily ex Sat & Sun, 12:15-1:15 pm, 5:45-10 pm. Wed, 10-11 pm. Sat, 6:15-6:30 pm, 10-11:30 pm. Pacific standard time. Divides time with KFJI. Slogan: "See Crater Lake."

KMIC J. R. Fouch, Inglewood, Calif. 223.7 meters. 1340 kilocycles, 250 watts. Pacific standard time. Divides time with KGFH.

KMJ Fresno Bee, Fresno, Calif. 365.6 meters, 820 kilocycles, 50 watts. Mon, Wed, Fri, 7:15-9 pm. Pacific time.

KMMJ M. M. Johnson Co., Clay Center, Nebr. 285.5 meters, 1050 kilocycles. 500 watts daytime, 250 watts night. Sun, 9 pm. Daily ex Sun. 7:30-9:45 am, 11 am-12:15 pm, 1:45-3:30 pm, 6-6:30 pm, 8-10 pm. Central standard time. Divides time with WJAG. Slogan: "The Old Trusty Station."

KMO Hotel Winthrop, Tacoma, Wash. 254.1 meters, 1180 kilocycles, 250 watts. Sun, 11-12 am, 6:15-7 pm, 8-9 pm. Mon, 10-11 am, 2-4 pm, 7-8 pm. Tues. 10-11 am, 2-4 pm, 7:30-11 pm. Wed, 10-11 am, 2-4 pm, 8-9 pm. Thurs, 10-11 am, 2-4 pm, 8-10 pm. Fri, 10-11 am, 2-4 pm, 7-8 pm, 10-11 pm, Sat, 10-11 am, 2-4 pm, 6:15-7 pm, 10-11 pm. Pacific time.

KMOX "The Voice of St. Louis, Inc.," St. Louis, Mo. 299.8 meters, 1000 kilocycles, 5000 watts. Daily ex Sun, 9:40 am-12 noon, 12 noon-6 pm, educational, musical, women's & farmers' programs. Daily ex Sat. 6 pm-2 am, varied & Columbia Chain programs. Sun. 2-10 pm, featuring Columbia Chain & dance orchestras. Central standard time.

KMTR KMTR Radio Corp., 1025 N. Highland av., Hollywood, Calif. 526.0 meters. 570 kilocycles, 500 watts. Sun. 5:30-10 pm Daily ex Sun, 7 am-11 pm. Programs vary. Pacific time. Slogan: "Your Friend in Hollywood."

KNRC Clarence B. Juneau, Municipal Auditorium Bldg., Santa Monica, Calif. 374.8 meters, 800 kilocycles, 500 watts. Sun, 10:45-11 pm. Daily ex Sat & Sun, 2-11 pm. Sat, 2 pm-2 am. Pacific standard time. Slogan: "The Station With a Smile."

KNX The Los Angeles Evening Express 6116 Hollywood Blvd., Hollywood, Calif. 336.9 meters, 890 kilocycles, 500 watts. Sun, 10 am-5:15 pm, 6:30 pm. 7 pm, church; 2-4 pm, 8 pm, 9 pm. music. Daily ex Sun, 6:45-8 am, 8 am-6 pm, 6:30 pm, dinner hour concert; 7 pm, 8 pm, 10 pm. 11 pm, Mon, Tues, Wed, Thurs 11 pm. Tues, 11:15 am, 12:45 pm. Fri, 2 pm. Sat, 2:15 pm, 7:45 pm & 12 midnight. Mon, 2:30 pm, 4:30 pm. 9:30 pm. Mon & Fri, 6:45 pm. Mon, Tues, Wed, Sat, 7:30 pm. Tues, Wed, Thurs, Fri, 9 pm. Pacific standard time. Slogan: "The Voice of Hollywood."

KOA Rocky Mountain Broadcasting Station, General Electric Co., 1370 Krameria st., Denver, Colo. 325.9 meters, 920 kilocycles, 5000 watts night, 2500 watts daytime. Sun, 10:30 am; 6:30 pm, dinner concert; 7:30 pm. church. Daily ex Sun. 11:45 am, weather, news; 12 noon, time signals; 12:05 pm, organ. Daily ex Sat & Sun, stocks, markets, etc; 6:30 pm, dinner concert; 8:15 pm, studio program. Tues, Thurs, Fri, 3:30 pm, matinee. Tues & Fri, 4 pm, culinary hints; 4:15 pm, fashion review. Mon, Tues, Wed, Fri, 7:30 pm. varied programs. Thurs, 4 pm. Mountain standard time.

KOAC Oregon Agricultural College, Corvallis, Ore. 270.1 meters, 1110 kilocycles, 500 watts. Mon, Tues, Wed, Thurs, Fri, 7-9 pm. Pacific standard time. Slogan: "Science for Service."

KOB New Mexico College of Agriculture & Mechanical Arts, State College, N. M. 394.5 meters, 760 kilocycles, 5000 watts night, 7500 watts daytime. Daily ex Sun, 11:55 am & 9:55 pm, time signals; 12 noon & 10 pm, weather reports; 12:02 pm & 10:02 pm, road reports; 12:08 pm, financial reports; 12:08-12:30 pm. concert. Mon, Wed, Fri, 7:30-8:30 pm. Mountain standard time. Divides time with KWSC & KTW. Slogan: "The Sunshine State of America."

KOCH Central Radio School, Omaha, Neb. 258.5 meters, 1160 kilocycles, 250 watts. Sun, 3-5 pm, classical. Mon, Tues, Thurs, & Sat, 9-10:30 pm, musical. Central standard time. Divides time with WNAL-KFOX.

KOCW Oklahoma College for Women, Chickasha, Okla. 252 meters, 1190 kilocycles, 250 watts. Mon, Tues, Thur & Fri, 12-1 pm, educational talk and music. Tues, Fri & Sat, 8-9 pm, musical program. Wed, 10-10:40 am, chapel services; 12-1 pm, musical. Sun, 11 am-12 n, church services; 2:30-3:30 pm, musical. Central standard time.

KOIL Mona Motor Oil Co., Council Bluffs, Iowa. 319 meters, 940 kilocycles, 5000 watts. Sun, 11 am-12 noon, church services; 1-2:30 pm, 6-9 pm, 11 pm-12 midnight. Daily ex Sun & Sat, 11:45 am-2:30 pm, 6-9 pm, 11 pm-12 midnight. Mon. 6-12 midnight. Central standard time. Slogan: "The Hilltop Studio."

KOIN KOIN (Inc.), Portland, Ore. 319 meters, 940 kilocycles, 1000 watts. Daily ex Sun, 10 am-12 noon, housewife's hour; 12 noon-1 pm, organ concert; 1-1:15 pm. 3-4 pm, news; 5:15-6 pm; 6-7 pm, dinner organ concert; 7-7:15 pm, 7:15-8 pm, orchestra. Mon, Wed, Fri, 10-11:30 pm. Tues. 10-11 pm. Sat, 11 pm-1 am. Nightly ex Sat & Sun, 8-10 pm, diversified studio program. Sun, 3-4:30 pm. 6-7 pm. organ; 7-8 pm. orchestra; 8-9 pm, church services; 9-10 pm. orchestra. Pacific standard time. Slogan: "The Station of the Hour."

KOMO Fisher's Blend Station (Inc.), Seattle, Wash. 305.9 meters, 980 kilocycles, 1000 watts. Mon, Tues, Wed, Thurs, Fri & Sat, 10 am-12:30 midnight. Tues, 7-8 pm, 8-9. Sun, 10 am-9:30 pm, church service. Pacific time.

KOW The Associated Industries, Inc., Albany Hotel, Denver, Colo. 247.8 meters, 1210 kilocycles, 250 watts. Sun, 11 am-12 noon, church programs; 6-7 pm. 7:30-9 pm. Daily ex Sun & Thurs, 7-9 pm. Mountain standard time. Divides time with KFEL. Slogan: "The KOW Station Away Out West."

KPCB Snowflake Station, Central Bldg., Seattle, Wash. 230.6 meters, 1300 kilocycles, 50 watts. Sun, 8-9 pm. Daily ex Sun, 9:30-10:30 am, household talks. Mon & Wed, 5:30-6 pm, children's program; 6-6:30 pm, sport news. Mon, Wed. Thurs, 7:30-8:30 pm. Mon, Wed. Fri, 7:30 & 9:45 am. Tues. Fri. Sat, 7:30-11 pm. Evening programs, musical. Pacific standard time. Divides time with KGCL.

KPLA Pacific Development Co., Los Angeles, Calif. 252.0 meters, 1190 kilocycles, 500 watts. Daily ex Sun, 11 am-11 pm, music, educational, news, etc. Sun, 7-10 pm. Pacific standard time.

KPNP Muscatine, Iowa. 211.1 meters, 1420 kilocycles, 100 watts.

KPO Hale Brothers & The Chronicle, San Francisco, Calif. 422.3 meters, 710 kilocycles, 1000 watts. Sun, 9:45 am, church services; 5 pm, chamber music; 6-10 pm, concert. orchestra. Daily ex Sun, 6:45-7:45 am, health exercise; 8-9 am, happy hour; 10:30 am-1 pm, time signals, market reports, etc.; 1-5:30 pm, features, organ music, 6-11 pm, concerts, orchestra, studio programs. Pacific standard time. Slogan: "The City by the Golden Gate."

KPPC Pasadena Presbyterian Church. Colorado & Madison sts., Pasadena, Calif. 228.9 meters, 1310 kilocycles, 50 watts. Wed, 6:45-9 pm, mid-week service. Pacific standard time. Divides with KELW.

KPRC Houston Post-Dispatch, Houston, Texas. 293.9 meters, 1020 kilocycles, 500 watts. Sun, 7:30 pm, church services. Daily ex Fri & Sun, 7:30 pm & 9:30 pm. Mon & Tues. 8:30 pm. Wed & Sat, 8:15 pm. Thurs, 8 pm. Mon. 9:15 pm. Tues & Thurs, 9 pm. Talks. music, weather reports broadcast. Central standard time. Slogan: "Kotton Port Rail Center."

KPSN The Pasadena Star-News, 525 E. Colorado st., Pasadena, Calif. 315.6 meters, 950 kilocycles, 1000 watts. Tues. Thurs, Sat, 8-9 pm, studio concert. Sun, 10:30 am. church services. Daily ex Sun, 12:15 pm & 6:6:15 pm, news. Slogan: "Pasadena, California, Station KPSN."

KQV Doubleday Hill Elec. Co., 719 Liberty av., Pittsburgh, Pa. 270.1 meters 1110 kilocycles, 500 watts. Mon, Wed, Fri, 4-9 pm. Tues, Thurs, 4-7 pm. Sun, 1 pm, sacred music. Eastern standard time. Slogan: "The Smoky City Station." Divides time with Station WJAS.

KQW California Farm Bureau Station, San Jose, Calif. 296.9 meters. 1010 kilocycles, 500 watts. Daily ex Sun, 1-2:30 pm, music, news, etc.; 5-5:30 pm, Children's Hour; 5:30-6 pm, studio program; 6-7 pm, 7-8 pm, 8-9 pm, studio program. Sun, 10:15 am-12:30 pm, church; 7:30-9:30 pm, church. Pacific standard time. Slogan: "For God and Country."

KRAC Caddo Radio Club, State Fair Grounds, Shreveport, La. 220.4 meters, 1360 kilocycles, 50 watts.

KRE First Congregational Church and Pacific School of Religion, Berkeley, Calif. 256.3 meters, 1170 kilocycles, 100 watts. Sun, 7:30-9 pm. Mon, Tues, Wed, Thurs, 12:30 noon-1 pm. Tues, 8-9 pm. Pacific standard time. Divides time with KFUS.

KRLD The Daily Times Herald & The Adolphus Hotel, Dallas, Tex. 461.3 meters, 650 kilocycles, 500 watts. Sun, 9:30-10:30 am. 11 am-12 noon. 3-4 pm, 5:30-6:30 pm. 6:30-6:45 pm. church; 6:45-7:30 pm, 7:30-9:30 pm. 10:30-11:30 pm. Daily ex Sun, 11-11:30 am, 12:30-2 pm, 3-3:30 pm, 5-6 pm, 7-8 pm, 9:10 pm. 11:30 pm-12:30 am, varied programs. Central standard time. Divides time with WRR. Slogan: "Down Where the Blue Bonnets Grow."

KRLO Los Angeles, California, 215.7 meters. 1390 kilocycles. 250 watts. Divides time with KGER.

KRSC Radio Sales Corp., 1202 Fifth av., Seattle Wash. 211.1 meters 1420 kilocycles, 50 watts.

KSAC Kansas State Agricultural College, Manhattan, Kan. 333.1 meters, 900 kilocycles, 500 watts. Daily ex Sat & Sun, 9-10:25 pm. 12:20-1:20 pm. 4-4:30 pm, 6:30-7 pm. 7-8 pm. varied programs. Sat, 12:35 pm, 7:30-8:30 pm. Central standard time.

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KSBA Shreveport Broadcasting Association, Shreveport, La. 267.7 meters, 1120 kilocycles, 1000 watts. Sun, 11 am-12 noon, church services; 5-6 pm, musical; 7:30-9 pm, church services. Mon, Wed, Thurs, Fri, 8-9, musical. Tues & Sat, 9-11 pm, Hotel Youree dance music. Mon, 11 pm-12 midnight, organ. Daily, 9:15 am, 12:15 pm and 2:15 pm, market and weather reports. Central standard time. Slogan: "Keep Shreveport Before America."

KSCJ The Sioux City Journal, Sioux City, Iowa. 243.8 meters, 1230 kilocycles, 500 watts night, 1000 watts daytime. Sun, 11-12 am, 2-4 pm, 7-9 pm. Dailey ex Sun, 9:45-10:45 am, markets; 11:30 am-12:30 pm, noon program; 6-7 pm, dinner program; 8:30-midnight, studio program. Central standard time. Divides time with Station KWUC.

KSD St. Louis Post-Dispatch, 12th & Olive sts., St. Louis, Mo. 545.1 meters, 550 kilocycles, 500 watts. Sun. 3:15 & 4:45 pm, orchestra; 5:30 pm, religious program; 6:15 pm, Capitol family; 7:15 pm, Collier's hour; 8:15 pm, Atwater-Kent hour. Mon, 6:30-11 pm. Daily ex Sun & Mon, 7-10:30 pm. Central standard time.

KSEI KSEI Broadcasting Association, Pocatello, Idaho. 333.1 meters, 900 kilocycles, 250 watts. Sun, 9-11 pm. Daily ex Sun, 3-4 pm, 6:30-7:30 pm, 9-11 pm. Mountain time. Slogan: "Kummunity Southeast Idaho."

KSL Utah Radio Service Corp., South Temple St., Salt Lake City, Utah. 302.8 meters. 990 kilocycles, 1000 watts. Sun, 10 am, 12 noon, 1:55 pm, 4-5 pm, 7:30-8:30 pm, 9-10 pm. Daily ex Sun, 10 am-12 noon, 4-5 pm, 6:30-8 pm, 9-10 pm, 11 pm, 12 midnight. Slogan: "The Voice of the Inter-Mountain Empire."

KSMR Santa Maria Valley R. R., Santa Maria, Calif. 272.6 meters, 1100 kilocycles, 100 watts. Daily ex Sun, 6:30-10 pm, music, children's hour, home & farm, music. Sat, 7:30-8:15 pm, markets, reports, etc. Pacific time. Slogan: "Santa Maria, Calif., The Valley of Gardens."

KSO Berry Seed Co., Clarinda, Iowa. 227.1 meters, 1320 kilocycles, 500 watts, Sun, 11 am, church services; 5 pm. Mon, Tues, Wed, Thurs, Fri, 6 am, 12 noon, 6:30-8:30 pm, musical. Sat, 6 am, 12 noon, Sunday school, 7-8:30 pm. Central standard time. Slogan: "Keep Serving Others."

KSOO Sioux Falls Broadcast Association, 609 Minnehaha Bldg., Sioux Falls, S. D. 209.7 meters, 1430 kilocycles, 250 watts.

KTAB The Associated Broadcasters (Inc.), 1410 10th av., Oakland, Calif, 280.2 meters, 1070 kilocycles, 500 watts. Sun, 9:45-12:30 pm, 1:30-2:30 pm, 7-9:15 pm, varied program. Daily ex Sun, 6:45 am, 1:30 pm, 4-7:30 pm, 8-11 pm. Pacific standard time. Slogan: "Knowledge. Truth and Beauty."

KTAP Radio Service Shop, 822 W. Mulberry St., San Antonio, Tex. 228.9 meters, 1310 kilocycles, 20 watts. Sun, 4-6 pm, varied musical program; 9:30-10:30 pm. Daily ex Sun, 6:30-8:30 am, 10:30-11:30 am, 12:30-2 pm. Mon, Wed & Sat, 6:30-8:30 pm. Daily ex Mon, 9:30-10:30 pm. Varied programs. Central standard time. Slogan: "The World's Biggest Little Station."

KTBI Bible Institute of Los Angeles, 536 S. Hope st., Los Angeles, Calif. 288.3 meters, 1040 kilocycles, 500 watts. Mon, Tues, Wed, Thurs, 8 pm, musical studio program. Fri, 7 pm, Sunday school lessons. Sun, 10:45 am, 7:15 pm, church services; 6 pm, vespers. Pacific standard time.

KTBR M. E. Brown, Commodore Hotel, 16th & Morrison Sts., Portland, Ore. 282.8 meters, 1060 kilocycles, 50 watts. Sun, 10:30 am-12 noon, church; 1-7:30 pm, 7:30-9 pm. Daily ex Sun, 9-11 am, 1-3 pm, 6-7 pm. Mon, Tues, Sat, 8-9 pm. Wed, Thurs, Fri, 8 pm-12 midnight. Pacific standard time. Divides time with KFJR.

KTHS The Arlington Hotel, Hot Springs National Park, Ark. 384.4 meters, 780 kilocycles, 1000 watts. Sun, 11 am-12:30 pm, 8-11:30 pm. Mon, Tues, Fri, Sat, 12 noon-1 pm, Mon & Wed, 7:30-10:30. Tues, 6-10:30 pm. Fri & Sat, 8-11 pm. Central standard time. Slogan: "Kum to Hot Springs."

KTNT Norman Baker, Muscatine, Iowa. 256.3 meters, 1170 kilocycles, 2000 watts. Sun, 12 noon, sacred program; 2:30-4 pm, varied program. Mon, 6 am, 9 am, 11 am, 12 noon, 2-5 pm, 6:30-10 pm. Daily ex Sun. Mon & Sat, 6:30-10 pm. 6 am-5 pm, 6:30-9 pm. Sat, 6 am-5 pm. Central standard time. Slogan: "The Voice of the Iowa Farmers' Union."

KTSA San Antonio, Tex. 265.3 meters, 1130 kilocycles, 2000 watts.

KTUE Uhalt Electric Co., 614 Fannin St., Houston, Tex. 212.6 meters, 1410 kilocycles, 5 watts. Daily, 5:30-6:30 pm. Tues & Sat, 8-9:30 pm. Central standard time.

KTW First Presbyterian Church 7th av. and Spring st., Seattle, Wash. 394.5 meters, 760 kilocycles, 1000 watts. Sun, 11 am to 1 pm, 3-4 pm, 7:30-9:30 pm. Pacific time. Divides time with KWSC & KOB.

KUOA University of Arkansas, Fayetteville, Ark. 296.9 meters, 1010 kilocycles, 500 watts. Sun, 7:30 pm. Mon & Thurs. 7 pm, radio school; 8 pm, musical program. Central standard time.

KUOM State University of Montana, Missoula, Mont. 461.3 meters, 650 kilocycles, 500 watts. Mon & Thurs, 8 pm, music & popular educational talks. Sun, 9:15 pm, sacred concert & sermon. Mountain standard time.

KUSD University of South Dakota, Vermillion, S. D. 483.6 meters, 620 kilocycles, 250 watts. Mon and Fri, 6:30-7:30 pm. College events broadcast as they occur. Central standard time.

KUT University of Texas, Austin, Tex. 232.4 meters, 1290 kilocycles, 500 watts. Sun, 11 am, St. David's Episcopal Church. Mon, Wed & Fri, 8 pm. Studio program. Slogan: "Come to University of Texas."

KVI Puget Sound Radio Broadcasting Co., 15 S. Tacoma av., Tacoma, Wash. 234.2 meters, 1280 kilocycles, 50 watts. Sun, 11:30-12:45 pm, 1:30-5:30 pm, 7:30-9:30 pm. Daily ex Sun, 8-10 am, 6:15-10 pm. Pacific standard time. Slogan: "Puget Sound Station."

KVOO South Western Sales Corp., Bristow, Okla. 348.6 meters, 860 kilocycles, 1000 watts. Sun, 8 am-12 noon, church; 5:10 pm, musical entertainment. Daily ex Sun, 11 am, markets; 12 noon-1 pm, farmer's hour; 2:45 pm, markets; 3-4 pm, music; 6-10:30 pm, varied musical, Red & Blue network programs. Central standard time. Slogan: "The Voice of Oklahoma."

KVOS L. L. Jackson & L. Kessler, 1208 10th av., Bellingham, Wash. 209.7 meters, 1430 kilocycles, 50 watts.

KWBS Schaeffer Radio Co., 226 E. 41st st., Portland, Ore. 199.9 meters, 1500 kilocycles, 15 watts.

KWCR H. F. Parr, 1444 2nd av. E., Cedar Rapids, Ia. 239.9 meters, 1250 kilocycles, 250 watts. Daily, 6:30 am, chapel services; 11:30 am, music hour; 4 pm, music; 5:30 pm; 6-7 pm, dinner hour. Mon, Wed, Fri, 9 pm. Central standard time. Divides time with WJAM. Slogan: "Voice of Cedar Rapids."

KWG Portable Wireless Telephone Co., 530 E. Market st., Port Stockton, Calif. 344.6 meters, 870 kilocycles, 50 watts. Sun, 4:30-5:30 pm concert; 7:30-9:30 pm. Daily ex Sun, 4-5 pm, news; 5-5:30 pm, 5:30-6 pm., children's hour; 6-7:30 pm, dinner concert; 8-9 pm, studio; 9-10 pm, studio; 10-11 pm, studio. Pacific time.

KWJJ Wilbur Jerman Station, Route No. 1, Box 481, Portland, Ore. 228.9 meters, 1310 kilocycles, 50 watts. Studio at Broadway Theater, 220 Broadway st. Daily ex Sun, 10 am-12 noon, 3-4 pm. Mon & Wed, 5:30 pm-1 am. Tues & Thurs, 5:30 pm-12 midnight. Fri, 5:30 pm-12:30 am. Sat, 5:30-8 pm, 10 pm-12 midnight, dance music. Pacific standard time. Slogan: "The Voice from Broadway."

KWK St. Louis, Mo. 234.2 meters, 1280 kilocycles, 1000 watts night, 2000 watts daytime. Central standard time. Divides time with KFQA & WMAY.

KWKC Wilson Duncan Studios, 39th & Main sts., Kansas City, Mo. 222.1 meters, 1350 kilocycles, 100 watts. Tues, Wed, Thurs, Fri, 7-9:15 pm. Central standard time. Slogan: "Keep Watching Kansas City."

KWKH W. K. Henderson Iron Works & Supply Co., Spring & Fanning sts., Shreveport, La. 394.5 meters. 760 kilocycles, 1000 watts. Divides time with KMA.

KWLC Luther College, Decorah, Iowa. 247.8 meters, 1210 kilocycles, 50 watts. Central standard time. Divides time with KGCA.

KWSC The State College of Washington, Pullman, Wash. 394.5 meters. 760 kilocycles, 500 watts. Mon, Wed, Fri, 7:30-9 pm. Pacific standard time. Slogan: "The Voice of the Cougars." Divides time with Stations KTW, KOB.

KWTC Dr. John Wesley Hancock, 1101 N. Ross St., Santa Ana, Calif. 222.1 meters, 1350 kilocycles, 100 watts. Daily ex Sun, 6:30-7:30 pm, dinner hour; Tues & Thurs, 7:30-10 pm, studio program; Fri, 7:30-8 pm, Farm Bureau talk; Sat, 7:30-9 pm, program. Pacific standard time. Divides time with KFWC. Slogan: "The Garden of Eden Station."

KWUC Western Union College, Le Mars, Iowa. Commercial Studio, Wright Bldg., Sioux City, Iowa. 243.8 meters, 1230 kilocycles, 1500 watts. Sun. 4-5 pm. vesper service. Daily ex Sun, 9:30-11:15 am; 12:30-4 pm; 5-7 pm, musical, organ. Sat, 10 pm, college frolic. Central standard time. Divides time with Station KSCJ. Slogan: "The Station Surrounded by North America."

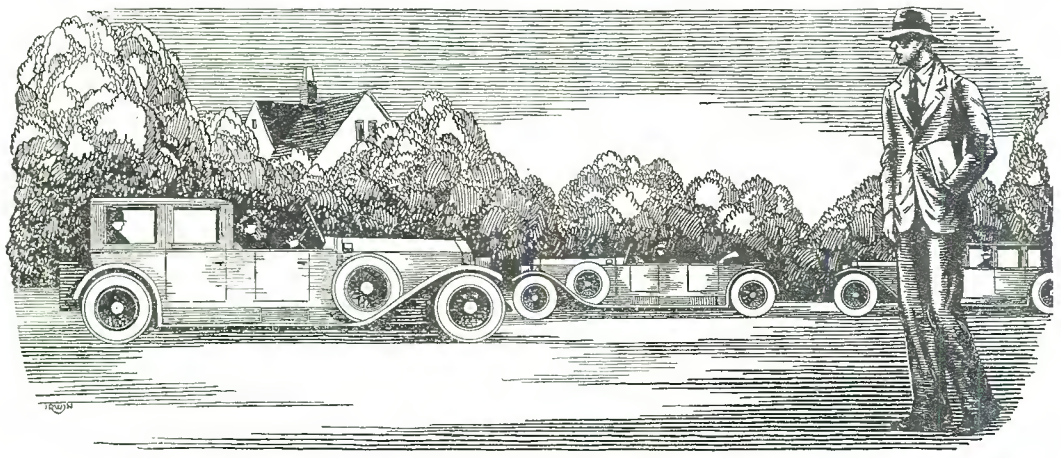
KWWG City of Brownsville, Board of City Development, Brownsville, Texas. 277.6 meters, 1080 kilocycles, 500 watts. Sun, church services at 11 am. Mon, weather and river reports, music 12-12:30; music, 6-6:30, 8:30-9:45, 12 midnight-1 am. Tues, weather & river reports, 12-12:30 pm; music, 6-6:30. Wed, Thurs, Fri, Sat, same as Tues. Slogan: "Kum to the World's Winter Garden."

KXA American Radio Telephone Co., Home Savings Bldg., Seattle, Wash. 348.6 meters, 860 kilocycles, 500 watts. Sun, 7:15-8:15 pm. Mon, Wed, Fri, 5:45-11 pm. Tues, Thurs, 6-8:30 pm. Pacific standard time. Divides time with KJR. Slogan: "Know the Charmed Land."

KXL KXL Broadcasters, Inc., 7th floor Bedell Bldg., Portland, Ore. 220.4 meters, 1360 kilocycles, 50 watts. Slogan: "The Voice of Portland."

KXRO Brott Laboratories, 609 Washington Blvd., Seattle, Wash. 227.1 meters, 1320 kilocycles, 50 watts.

KYA Pacific Broadcasting Corp., West Coast Theaters Studio, 988 Market St., San Francisco, Calif. 309.1 meters, 970 kilocycles, 500 watts. Sun, 11 am-12:30 pm, 7:30-6 pm, church. Daily ex Sun, 11 am-12 noon, 5-7:30 pm, 8-10 pm. Pacific standard time. Slogan: "At the Golden Gate."



Many times in the old days, while I trudged home after work to save carfare, I used to gaze enviously at the shining cars gliding by me, the prosperous men and women within. Little did I think that inside of a year, I, too, should have my own car, a decent bank account, the good things of life that make it worth living.

I Thought Success Was For Others

Believe It Or Not, Just Twelve Months Ago I Was Next Thing To "Down-and-Out"

TODAY I'm sole owner of the fastest-growing Radio store in town. And I'm on good terms with my banker, too—not like the old days only a year ago, when often I didn't have one dollar to knock against another in my pocket. My wife and I live in the snuggest little home you ever saw, right in one of the best neighborhoods. And to think that a year ago I used to dodge the landlady when she came to collect the rent for the little bedroom I called "home"!

It all seems like a dream now, as I look back over the past twelve short months, and think how discouraged I was then, at the "end of a blind alley." I thought I never had had a good chance in my life, and I thought I never would have one. But it was waking up that I needed, and here's the story of how I got it.

I WAS a clerk, working at the usual miserable salary such jobs pay. Somehow I'd never found any way to get into a line where I could make good money.

Other fellows seemed to find opportunities. But—much as I wanted the good things that go with success and a decent income—all the really well-paid vacancies I ever heard of seemed to be out of my line, to call for some kind of knowledge I didn't have.

And I wanted to get married. A fine situation, wasn't it? Mary would have agreed to try it—but it wouldn't have been fair to her.

Mary had told me, "You can't get ahead where you are. Why don't you get into another line of work, somewhere that you can advance?"

"That's fine, Mary," I replied, "but *what* line? I've always got my eyes open for a better job, but I never seem to hear of a really good job that I can handle." Mary didn't seem to be satisfied with the answer but I didn't know what else to tell her.

It was on the way home that night that I stopped off in the neighborhood drug store, where I overheard a scrap of conversation about myself. A few burning words that were the cause of the turning point in my life!

With a hot flush of shame I turned and left the store, and walked rapidly home. So that was what my neighbors—the people who knew we best—really thought of me!

"Bargain counter sheik—look how that suit fits," one fellow had said in a low voice. "Bet he hasn't got a dollar in those pockets." "Oh, it's just 'Useless' Anderson," said another. "He's got a wish-bone where his backbone ought to be."

As I thought over the words in deep humiliation, a sudden thought made me catch my breath. Why had Mary been so dissatisfied with my answer that "I hadn't a chance"? *Did Mary secretly think that too?* And after all, wasn't it *true* that I had a "wish-bone" where my backbone ought to be? Wasn't that why I never had a "chance" to get ahead? It was true, only too true—and it had taken this cruel blow to my self-esteem to make me see it.

With a new determination I thumbed the pages of a magazine on the table, searching for an advertisement that I'd seen many times but passed up without thinking, an advertisement telling of big opportunities for trained men to succeed in the great new Radio field. With the advertisement was a coupon offering a big free book full of information. I sent the coupon in, and in a few days received a handsome 64-page book, printed in two colors, telling all about the opportunities in the Radio field and how a man can prepare quickly and easily at home to take advantage of these opportunities. I read the book carefully, and when I finished it I made my decision.

WHAT'S happened in the twelve months since that day, as I've already told you, seems almost like a dream to me now. For ten of those twelve months, *I've had a Radio business of my own!* At first, of course, I started it as a little proposition on the side, under the guidance of the National Radio Institute, the outfit that gave me my Radio training. It wasn't long before I was getting so much to do in the Radio line that I quit my measly little clerical job, and devoted my full time to my Radio business.

Since that time I've gone right on up, always under the watchful guidance of my friends at the National Radio Institute. They would have given me just as much help, too, if I had wanted to follow some other line of Radio besides building my own retail business—such as broadcasting, manufacturing, experimenting, sea operating, or any one of the score of lines they prepare you for. And to think that until that day I sent for their eye-opening book, I'd been wailing "I never had a chance!"

NOW I'm making real money. I drive a good-looking car of my own. Mary and I don't own the house in full yet, but I've made a substantial down payment, and I'm not straining myself any to meet the installments.

Here's a real tip. You may not be as bad off as I was. But, think it over—are you satisfied? Are you making enough money, at work that you like? Would you sign a contract to stay where you are now for the next ten years, making the same money? If not, you'd better be *doing* something about it instead of drifting.

This new Radio game is a live-wire field of golden rewards. The work, in any of the 20 different lines of Radio, is fascinating, absorbing, well-paid. The National Radio Institute—oldest and largest Radio home-study school in the world—will train you inexpensively in your own home to know Radio from A to Z and to increase your earnings in the Radio field.

Take another tip—No matter what your plans are, no matter how much or how little you know about Radio—clip the coupon below and look their free book over. It is filled with interesting facts, figures and photos, and the information it will give you is worth a few minutes of anybody's time. You will place yourself under no obligation—the book is free, and is gladly sent to anyone who wants to know about Radio. Just address J. E. Smith, President, National Radio Institute, Dept. 1-D, Washington, D. C.

J. E. Smith, President,
National Radio Institute,
Dept. 1-D, Washington, D. C.

Dear Mr. Smith:

Please send me your 64-page free book, printed in two colors, giving all information about the opportunities in Radio and how I can learn quickly and easily at home to take advantage of them. I understand this request places me under no obligation, and that no salesmen will call on me.

Name .....

Address .....

Town ..... *State* .....

KYW Westinghouse Elec. & Mfg. Co., roof of Congress Hotel, Chicago, Ill. 526.0 meters, 570 kilocycles, 5000 watts, after 10 pm 2500 watts. Sun, 11 am-12:15 pm, church; 1-2, 7:15-8:15 pm, 10:55-11 pm, time signals & weather reports. Daily ex Sun, 10:55 am, time signals; 5:45 pm, markets; 6 pm, Uncle Bob's Bedtime Story; 6:30 pm, weather report. Daily ex Mon, 10:55-11:05, time signals. Mon & Thurs, 12 noon-1 pm, studio program. Tues & Fri, 4 pm, Women's Hour; 7-9 pm, program from New York; 9-10:55, musical program, etc. Thurs, 7-8 pm, studio program; 8-9:30 pm, program from New York; 9:30-10:55 pm, musical program. Sat, 7-10:55 pm, music, etc. Central standard time. Divides time with KFKX.

KZM Preston D. Allen, 13th & Harrison sts., Hotel Oakland, Oakland, Calif. 245.8 meters, 1220 kilocycles, 100 watts. Daily ex Sun, 6:30-8 pm, Hotel Oakland dinner orchestra. Sun, 8-10 pm, orchestra. Pacific standard time. Divides time with KLS.

NAA United States Navy, Washington, D. C. 434.5 meters. 690 kilocycles. 1000 watts. Daily weather broadcast 10:05 am, 3:45 pm, 10:05 pm. Regular program Tues, 7:30 pm. Daily time signals, noon & 10 pm. This station is located at Navy Yard, Washington, D. C. Slogan: "Where the Time Signals Originate."

NAA United States Navy, Radio Station, Arlington, Va. Broadcast time signals daily at noon and 10 pm on the following meters or frequencies: Meters, 25.0, 12045; 37.3. 8030; 74.7, 4015; 2678.0, 112.

WAAD Ohio Mechanics Institute, Cincinnati, Ohio. 230.6 meters, 1300 kilocycles, 25 watts. Central standard time.

WAAF Chicago Daily Drovers Journal, 836 Exchange av., Chicago, Ill. 389.4 meters, 770 kilocycles, 500 watts. Daily ex Sun. & holidays, 8:45 am, markets; 10:30 am, weather; 10:50 am, markets; 11 am, estimated receipts of following day; 12:30 pm, weather; 12:50 pm, markets; 3 pm, markets; 4:30 pm, eastern meat trade conditions. Sat, 12:30 pm, final weather & market reports. Central standard time. Divides time with WJBT and WBBM.

WAAM I. R. Nelson Co., 1 Bond st., Newark, N. J. 267.7 meters, 1120 kilocycles, 250 watts. Sun, 11 am-5:30 pm. Daily ex Sun, 7-8 am. Daily ex Sat & Sun, 11 am-1:30 pm, 4-6 pm. Mon, Wed, Fri, 7 pm-12:12 am. Tues, Thurs & Sat, 6:30-7:30 pm. Eastern standard time. Divides time wth WNJ & WBCP. Slogan: "Sunshine Station."

WAAT Bremer Broadcasting Corp., Hotel Plaza, Jersey City, N. J. 245.8 meters, 1220 kilocycles, 300 watts. Sun, 9 am, 5:30-11 pm, mixed program. Daily ex Sun, 10:30-11 am, 6-6:45 pm. Tues, Wed, Fri, 11 am. Tues & Sat, 12 noon. Mon, 8-11 pm. Tues, 7-8:45 pm. Wed & Fri, 7 pm. Thurs & Sat, 7-9 pm. Eastern standard time. Divides time with Stations WEVD & WGBB. Slogan: "The Voice at the Gate of the Garden State."

WAAW Omaha Grain Exchange, Grain Exchange bldg., Omaha, Nebr. 440.9 meters, 680 kilocycles, 500 watts daytime only. Daily ex Sun, 6 am, Oma-Tan Program Harness Bill; 9:30 am-1:40 pm, market reports; 1:30-2:30 pm, program; 5-7 pm, Oma-Tan program. Central standard time. Slogan: "Pioneer Market Station of the West."

WABC Atlantic Broadcasting Corp., Richmond Hill, N. Y. Studios, 113 W. 57th St., New York. 309.1 meters, 970 kilocycles, 2500 watts night, 5000 watts daytime. Sun, 10:50 am-1 pm, 7-9 pm. Daily ex Sun, 11:50 am-12:05 pm, weather reports & time signals, 1-2 pm. Daily ex Tues & Sun, 7:15 pm-12 midnight. Eastern standard time. Divides time with WBOQ.

WABF Markle Broadcasting Corp., 292 Wyoming av., Kingston, Pa. 205.4 meters, 1460 kilocycles, 250 watts. Sun, 9:30-10:30 am; 10:30 am-12 noon, church; 7:30-9 pm. Daily ex Sun, 12 noon-1 pm, luncheon program. Mon, 7-9, music. Wed & Fri, 7:30-9 pm, music. Eastern standard time. Slogan: "The Voice of Wyoming Valley."

WABI First Universalist Church, Park st., Bangor, Me. 389.4 meters, 770 kilocycles. 100 watts. Sun, 10:30 am-12 pm, morning services; 7:30-9 pm, evening services. Eastern standard time. Slogan: "The Pinetree Wave."

WABW College of Wooster, Wooster, Ohio. 247.8 meters, 1210 kilocycles. 50 watts. No regular schedule. Eastern standard time.

WABY John Magaldi, Jr., 930 S. 8th st., Philadelphia, Pa. 247.8 meters. 1210 kilocycles, 50 watts. Eastern standard time. Divides time with WFKD.

WABZ Coliseum Pl. Baptist Church, 1376 Camp St., New Orleans. La. 238.0 meters, 1260 kilocycles, 50 watts. Sun. 10:55 am to 12:30-7:25 to 9:15 pm. Central standard time. Divides time with WSBW. Slogan: "The Station with a Message."

WADC Allen Theatre Broadcasting Station, Towell Cadillac Bldg., Akron, Ohio. 238 meters, 1260 kilocycles, 1000 watts. Sun. 10:30-11:45 am, 12:30-1:30 pm, 3-5 pm, 8-11 pm. Daily ex Sun. 11 am-12 noon, 5:30-6 pm. Daily ex Sat, 8-11 pm. Eastern standard time. Slogan: "Watch Akron Develop Commercially."

WAFD WAFD Broadcasting Co., Addison Hotel, Charlotte & Woodward Aves., Detroit, Mich. 230.6 meters, 1300 kilocycles, 100 watts. Menu service, 2 pm daily. Dinner music, 6:45 pm. Daily studio program. 7:30 pm daily ex Sat. Eastern standard time.

WAGM R. L. Miller, Royal Oak, Mich. 225.4 meters, 1330 kilocycles, 50 watts. Sun, Mon, Wed & Fri, 8-10:30 pm. Slogan: "The Little Station With the Big Reputation."

WAIT A. H. Waite & Co. (Inc.), 32 Weir st., Taunton, Mass. 214.2 meters, 1400 kilocycles, 10 watts. No regular schedule. Eastern standard time.

WAIU American Insurance Union, Columbus, Ohio. 282.8 meters, 1060 kilocycles, 5000 watts. Daily ex Sun, 10:30 through 12 noon. Daily ex Sat & Sun. 3 pm. Mon & Wed, 6-10 pm. Tues & Thurs, 6-6:30 pm. Fri, 6-10:30 pm. Talks, music, weather reports & chain programs. Sun. 3 through 4 pm. 7:15 through 10:30 pm. Eastern standard time. Divides time with WEAO. Slogan: "The Radio Voice of the American Insurance Union."

WALK Bethayres, Pa. 201.6 meters, 1490 kilocycles, 50 watts.

WAMD Radisson Radio Corp. & Stanley E. Hubbard, Minneapolis, Minn. 222.1 meters, 1350 kilocycles, 500 watts. Sun, 10:30 am, church; 12:30, funnies; 3 pm, popular program; 5:30 pm, concert; 9:30 pm, popular. Daily ex Sun, 10:30 am, musical; 11 am, Aunt Sammy; 12 noon & 5:30 pm, organ; 6:05 pm, farm feature; 7 pm, classical hour; 8-9 pm, popular program; 10 pm, dance music; 11:15 pm, organ. Central standard time. Divides time with KFOY. Slogan: "The Call of the North."

WAPI Alabama Polytechnic Institute, Auburn, Ala. 340.7 meters, 880 kilocycles, 1000 watts. Daily ex Sun, 12-1 pm, 9-10 pm Tues, Thurs, Fri. All programs include musical numbers, educational lectures and news. Central standard time. Divides time with WJAX.

WARS & WSDA Amateur Radio Specialty Co., Hotel Shelburne, Brooklyn, N. Y. 227.1 meters, 1320 kilocycles, 500 watts. Sun, 7-9 am, 12:30-3 pm. Mon, Wed, Thurs, Fri, 7-8 am, 9-10 am. Mon & Fri, 8-10 pm. Wed & Fri, 3-6 pm. Tues & Thurs, 12 noon-2 pm. Mon. 3-7 pm. Wed. 7-10 pm. Thurs, 6-7 pm, 10 pm-12 midnight. Sat. 7-9 am, 1-3:30 pm, 9 pm-12 midnight. Eastern standard time. Divides time with WBBC. Slogan: "The Voice of the Atlantic."

WASH Baxter Launderers & Cleaners, 747 Fountain st., N. E., Grand Rapids, Mich. 256.3 meters, 1170 kilocycles, 250 watts. Sun, 11 am-12:15 pm. Daily ex Sun, 12:30-1:30, 5:30-6, 7-8 pm. Sat, 2:15 pm (football season only). Central standard time.

WATT Edison Elec. Illuminating Co., 39 Boylston, Boston, Mass. (portable). 201.6 meters, 1490 kilocycles, 100 watts.

WBAA Purdue University, West Lafayette, Ind. 272.6 meters, 1100 kilocycles, 500 watts. Daily, 11:15 am, markets, etc. Mon & Fri, 7 pm, music and talks. Athletic contests and special features as announced. Central standard time. Divides time with WRM.

WBAK Pennsylvania State Police, 18th & Herr sts., Harrisburg, Pa. 299.8 meters, 1000 kilocycles, 500 watts. Daily ex Sun, 10:30 am, police reports; 1:30 pm, 4 pm. Mon & Thurs, 7 pm,. Eastern standard time. Divides time with WPSC. Slogan: "The Voice of Pennsylvania."

WBAL Baltimore, Md. 285.5 meters, 1050 kilocycles, 5000 watts. Sun, 6:30-7:30 pm, concert orchestra; 7:30-8:15 pm, musical programs. Daily ex Sat, 3:30-5 pm, 6-11 pm. Sat, 6:30-11 pm. Eastern standard time. Slogan: "The Station of Good Music."

WBAO James Millikin University, Decatur, Ill. 267.7 meters, 1120 kilocycles, 100 watts. Mon, Wed, 7-8 pm, music & lectures. Thur. Fri, Sat, basketball & football games whenever scheduled. Central standard time. Slogan: "Millikin at Decatur."

WBAP Carter Publications (Inc.), 400 W. 7th st., Fort Worth, Tex. 499.7 meters, 600 kilocycles, 5000 watts. Sun, 11 am, church; 12:30 pm, kiddies' hour; 5 pm, sacred music, 9:30 pm, orchestra. Daily ex Sun, 6-7 pm. Daily ex Sun & Wed, 8-9 pm. Mon, Thurs, Fri. 10 pm-12 midnight. Central standard time. Divides time with Station WOAI.

WBAW Waldrum Drug Co. & Braid Electric Co., 7th av., South & Broad sts., Nashville, Tenn. 239.9 meters, 1250 kilocycles, 500 watts. Divides time with WOAN.

WBAX John H. Stenger, Jr., 66 Gildersleeve, Box 104, Wilkes-Barre, Pa. 249.9 meters, 1200 kilocycles, 100 watts. 6:30 pm, studio. Mon, 7-8 dance music. Tues, 7-9 pm, main studio; 10:30 pm. classical. Thurs, 9-10:30 pm, recital; 3:15-5 pm, lectures; 11:15-2 am, witching hour. Sat, 10-12 pm, dance. Eastern standard time. Divides time with WBRE. Slogan: "In Wyoming Valley, Home of the Anthracite."

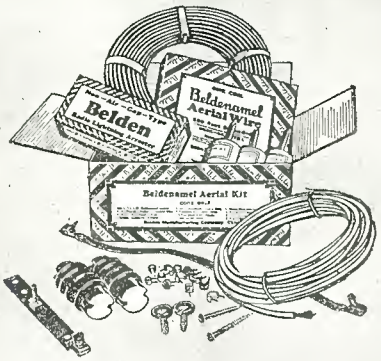
WBBC Peter J. Testan, 2123 Troy av., New York, N. Y. 227.1 meters, 1320 kilocycles, 500 watts. Tues, Thurs, Sat, 8-12 pm, musical. Eastern time. Divides time with WARS-WSDA.

WBBL Grace Covenant Presbyterian Church, Richmond, Va. 234.2 meters, 1280 kilocycles, 100 watts. Sun, 11 am-7:45 pm. Tues, 8 pm. Eastern standard time. Slogan: "Richmond, the Gateway North and South."

WBBM WBBM Air Theatre, 306 S. Wabash av., Chicago, Ill. 389.4 meters, 770 kilocycles, 5000 watts. Daily ex Sun & Mon. 12:45-2 pm, 7-11 pm. Mon, 12:30-2 pm, 6-7 pm. Sat, 12 midnight-2 am. Silent Sun. Central standard times. Divides time with Stations WJBT and WAAF.

WBBP Petoskey High School, Petoskey, Mich. 239.9 meters, 1250 kilocycles, 100 watts. Program irregular. Central standard time. Slogan: "There's Only One Petoskey."

WBBR People's Pulpit Association, 117 Adams St., Brooklyn, N. Y. 256.3 meters, 1170 kilocycles, 1000 watts. Sun, 10-12 am, orchestra, lectures, lessons; 2-4:30 pm, concert; 7-9 pm, Bible questions, music. Daily ex Sun & Sat, 2-4 pm. Mon, Tues, Thurs, Fri, 7-9 pm. Wed. 6-7 pm. Eastern standard time. Slogan: "Watchtower."



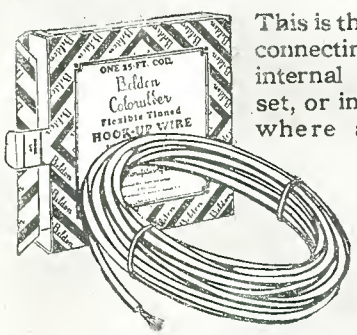
Beldenamel Aerial Kit

Includes Beldenamel Aerial Wire, Lightning Arrester, Colorubber Hookup Wire, Belden Ground Wire, as well as Lead-in Strip, Ground Clamp, Screws, Staples, Insulators, and everything needed for an aerial of enduring efficiency.

Beldenamel Aerial Wire

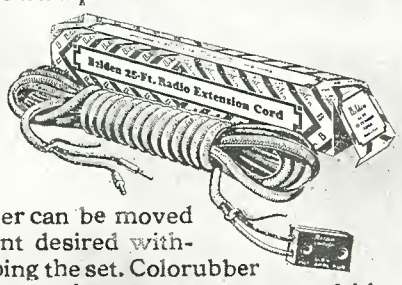
An aerial wire that is just as efficient after years of service as when first installed. Does not deteriorate in service because the copper is protected by the Beldenamel coating. Solves the aerial problem definitely.

Belden Colorubber Hookup Wire



This is the ideal wire for connecting up radio sets, internal wiring of the set, or in fact any place where a high grade wire is needed. Made with light insulation for general use and heavy insulation for A B C use.

Belden Loud Speaker Extension Cord



Multiplies the usefulness of the radio receiver. By using this cord, the loud speaker can be moved to any point desired without disturbing the set. Colorubber insulation on both conductors assures faithful delivery of signals with minimum waste.

An Extension Cord That Lies Flat Under the Rug

The Belden Flat Floor Cord passes under the rug and permits the radio set or radio power unit to be operated from an outlet on the opposite side of the room.

This remarkable cord lies so flat that it is hardly noticeable under the rug. The soft rubber insulation does not cause the rug to wear. Anybody can install the Belden Flat Floor Cord without tools. A four-foot lamp cord on one end is fitted with standard plug. A receptacle on the other end receives standard plugs. Ask your dealer about the Belden Flat Floor Cord today.

Belden Manufacturing Company

2322-A So. Western Ave.
Chicago, Illinois

Belden Lightning Arrester

The Belden Resistor Type Lightning Arrester has no air gap. The design is of the latest type and has been thoroughly tested and approved by underwriters. Can be installed either inside or out of doors.

Belden Indoor Aerial and Loop Wire

A neat indoor aerial wire that is very efficient. The neutral-colored braid is easily concealed around a window or over the picture molding. An indoor aerial of this excellent wire is very selective.

Belden Lead-in and Ground Wire

A high grade insulated wire for the ground connection. Assures a ground of permanent efficiency.

WBBW Ruffner Junior High School, Norfolk, Va. 236.1 meters. 1270 kilocycles, 100 watts. Programs vary. Eastern standard time. Divides time with WTAR, WSUF.

WBBY Washington Light Infantry, 240 King st., Charleston, S. C. 249.9 meters, 1200 kilocycles, 75 watts. Irregular through week. Sat, 7-12 pm, orchestra, vocal, instrumental and talks. Eastern time. Slogan: "The Seaport of the Southeast."

WBBZ C. L. Carrell, 36 S. State st., Chicago, Ill. (Portable). 204.0 meters, 1470 kilocycles, 100 watts. Central standard time.

WBCN Great Lakes Broadcasting Co., 306 S. Michigan Ave., Chicago, Ill. 288.3 meters, 1040 kilocycles, 250 watts. Sun, 10:30 am-12:15 pm, 4-6 pm, 7:30-9:30 pm, classical and religious. Daily ex Sun & Mon, 1-2 pm, 5-6 pm, classical; 7-8 pm, popular program. Central standard time. Divides time with WENR. Slogan: "Voice of Service."

WBES Bliss Electrical School, Takoma Park, Md. 265.3 meters, 1130 kilocycles, 100 watts. Eastern standard time.

WBET Boston Transcript Co., 324 Washington St., Boston, Mass. 288.3 meters, 1040 kilocycles, 500 watts. Divides time with WSSH.

WBIS & WNAC The Shepard Stores, Winter St., Boston, Mass. 461.3 meters, 650 kilocycles, 500 watts. Daily ex Sun, 7:45-9:30 am, 2-4 pm. Eastern standard time.

WBKN Municipal Bank Bldg., 350 Stone av., Brooklyn, N. Y. 199.9 meters, 1500 kilocycles, 100 watts. Daily ex Sun, 12 noon-1 pm, 3-5 pm. Mon, Fri, 8-10 pm. Tues, 10 pm-12 midnight. Wed, 12 midnight-2 am. Thur, 6-8 pm. Sat, 6-8 pm. Eastern standard time. Slogan: "The Voice of Community Service." Divides time with Stations, WWRL & WGOP.

WBMH Braun's Music House, Detroit, Mich. 211.1 meters, 1420 kilocycles, 100 watts.

WBMS The Union City Municipal Broadcasting Station, State-Capital Theater Bldg., Union City, N. J. 199.9 meters, 1500 kilocycles, 100 watts. Sun, 10 am-1 pm. Popular program. Daily ex Sun, 10-11 am, dance program; 5-6 pm, dinner music. Mon & Fri, 12 midnight-2 am, nut club. Tues, Thur, 8-10 pm, popular program. Wed, 6-8 pm, popular program. Sat, 10 pm-12 midnight, popular program. Eastern standard time. Sligon: "The Voice of Union City, New Jersey."

WBNY Baruchrome Corp., 400 E. 139th St., New York, N. Y. 236.1 meters, 1270 kilocycles, 500 watts. Daily ex Sun, 7-11 pm. Sun, 2:30-6 pm. Eastern standard time. Divides time with WHAP-WPUB. Slogan: "The Voice of the Heart of New York."

WBOQ New York Cty, N. Y. 309.1 meters, 970 kilocycles, 500 watts. Eastern standard time. Divides time with WABC.

WBRC Birmingham Broadcasting Corp., 1913 5th av. N., Birmingham, Ala. 241.8 meters, 1240 kilocycles, 250 watts. Sun, 10:45 am-12:30 pm, church; 6:30-7:30 pm, organ; 7:30-9:30 pm, church. Mon, Tues, Wed, Fri, 8-9 pm. Daily ex Sat & Sun, 1-2 pm. Central standard time. Slogan: "The Biggest Little Station in the World."

WBRE 16 N. Main St., Liberty State Bank & Trust Bldg., Wilkes-Barre, Pa. 249.9 meters, 1200 kilocycles, 100 watts. Sun, 9 pm-12 midnight. Mon & Fri, 6-11 pm. Wed, 6 pm-12 midnight. Eastern standard time. Divides time with WBAX.

WBRS North American Broadcasting Corp., 1062 Broadway, Brooklyn, N. Y. 211.1 meters, 1420 kilocycles, 100 watts. Eastern standard time. Divides time with WCDA-WRST.

WBSO Babson's Statistical Organization, Wellesley Hills, Mass. 384.4 meters, 780 kilocycles, 100 watts. Sun, 12 midnight, good cheer service. Daily ex Sat, Sun 4 pm. Daily, 12 midnight. Eastern standard time.

WBT C. C. Coddington, 500 W. Trade st., Charlotte, N. C. 258.5 meters, 1160 kilocycles, 750 watts night, 1000 watts daytime. Sun, 10:55 am, 7:30 pm, church; 8:30 pm, Capitol theater program; 9:15 pm. Daily ex Sun & Tues, 12:30 pm, weather reports; 7 pm. Mon, Wed & Thurs, 7:30 pm. Mon, 7:10 pm. 7:20 pm. 9:30 pm. Wed & Thurs, 8 pm. Sat, 7:45 pm, 8:45 pm. Mon, Thurs, Sat, 9 pm. Fri, 10 pm. Varied studio & chain programs. Eastern standard time. Slogan: "The Queen City of the South."

WBZ Westinghouse Electric & Mfg. Co., Hotel Kimball, East Springfield, Mass. 333.1 meters, 900 kilocycles, 15,000 watts. Broadcasts in synchronism with WBZA, Boston, Mass. Slogan: "The Broadcasting Station of New England."

WBZA Westinghouse Electric & Mfg. Co., Hotel Statler, Boston, Mass. 333.1 meters, 900 kilocycles, 500 watts. Broadcasts on a 24-hour schedule daily. Eastern standard time.

WCAC Connecticut Agricultural College, Mansfield, Conn. 535.4 meters, 560 kilocycles, 500 watts. Mon, 1-2 pm. Mon & Sat, 7-8 pm. Eastern standard time. Divides time with WTIC. Slogan: "Voice from the Nutmeg State."

WCAD St. Lawrence University, Canton, N. Y. 243.8 meters. 1230 kilocycles, 500 watts pm, 1000 watts am. Sun, 4-5 pm, organ recital. Daily ex Sun, 12:30 pm-1 pm. Wed, 8-10 pm. Eastern standard time. Slogan: "The Voice of the North Country."

WCAE The Pittsburgh Press and Kaufman & Baer Co., Pittsburgh, Pa. 461.3 meters, 650 kilocycles, 500 watts. Sun, 9:30 am-10 pm. Daily ex Sun, 6:45 am-11 pm, inclusive. Programs include exercises, educational talks, musical programs, children's periods, news & recitals. Eastern standard time. Slogan: "Where Prosperity Begins."

WCAH C. A. Entrekin, 1304 Fort Hayes Hotel Columbus, O. 234.2 meters, 1280 kilocycles, 250 watts. Sun, 11:45 am-12:45 pm, church; 12:45-1:30 pm, 6-7:15 pm, 8:45-9:45 pm, church. Daily ex Sun, Mon & Wed, 12 noon-1 pm, 6-10:30 pm. Mon & Wed, 6-7:30 pm. Sat, 6 pm-12 midnight. Eastern standard time. Divides time with WMAN.

WCAJ Nebraska Wesleyan University, University Place, Nebr. 379.5 meters, 790 kilocycles, 500 watts. Sun, 11 am, church services; 4 pm, vespers. Daily ex Sat & Sun, 10 am, convocation program; 4:30 pm, weather, news, features. Tues & Fri, 12 noon, musical half hour. Tues, 7:30 pm, Bible study; 8 pm, teachers' training course. Wed, 9 pm, musical program. Central standard time.

WCAL St. Olaf College, Northfield, Minn. 285.5 meters, 1050 kilocycles, 500 watts. Daily ex Sun & Thurs, 9:45 am, chapel service. Sunday, 8:30 am, Norwegian Church service. Central standard time. Divides time with WDGY. Slogan: "The College on the Hill."

WCAM City of Camden, Camden, N. J. 223.7 meters, 1340 kilocycles, 500 watts. Mon, Wed, Fri, 7:30-12 pm, mixed program. Eastern time. Divides time with WFAN.

WCAO Monumental Radio, Incorporated, 842 N. Howard st., Baltimore, Md. 243.8 meters, 1230 kilocycles, 250 watts. Mon, Wed, Fri, 8-11 pm. Sun, 11 am-12 noon, church services; 3-4 & 4-5 pm, Columbia Chain Program; 8-9:30 pm, church services; 9:30 & 10 pm, Columbia Chain Program. Eastern standard time. Divides time with WFBR. Slogan: "The Gateway of the South."

WCAT South Dakota State School of Mines, Rapid City, S. Dak. 247.8 meters, 1210 kilocycles, 100 watts. Daily ex Sun, 9:30-9:45 am, weather; 12:30-1 pm, weather & agrigrams. Mountain time. Slogan: "WCAT, Station of the South Dakota State School of Mines at Rapid City."

WCAU Universal Broadcasting Co., Hotel Pennsylvania, 39th & Chestnut sts., Philadelphia, Pa. 260.7 meters, 1150 kilocycles, 500 watts. Mon & Fri, 5:15 pm-12 midnight. Tues, Thurs, Sat, 5:30 pm-12 midnight. Wed, 5:15 pm-1 am. Sun, 2 pm-12 midnight. Eastern standard time. Slogan: "Where Cheer Awaits U."

WCAX University of Vermont, Burlington, Vt. 254.1 meters, 1180 kilocycles, 100 watts. Fri, 7:30-8:30 pm, education & entertainment. Eastern standard time. Slogan: "The Voice of the Green Mountains."

WCAZ Carthage College, Carthage, Ill. 249.9 meters, 1200 kilocycles, 50 watts. Daily ex Sat & Sun, 11:40 am, church services. Mon, 7-8 pm, musical program. Athletic contests at various times. Central standard time.

WCBA Charles W. Heimbach (Queen City Radiophone Station WCBA), 1350 Allen St., Allentown, Pa. 222.1 meters, 1350 kilocycles. 100 watts. Wed & Fri, 8:15-11 pm, musical programs. Sat, 9:30-11 pm, dance program. Sun, 10 am, 5:30 pm, 7 pm, church services. Eastern standard time. Divides time with WSAN.

WCBD Wilbur Glenn Voliva, Temple Site, Zion, Ill. 344.6 meters, 870 kilocycles, 5000 watts. Sun, 9-10:45 am, 2:30-6 pm, 8-10:30 pm. Tues, 8-10:30 pm. Wed, 12:30-1 pm. Thurs, 2:30-3:45 pm, 9-10 pm. Divides time with WLS, Sears-Roebuck Station, Chicago.

WCBE Uhalt Bros. Radio Co., 1219 N. Rampart st., New Orleans, La. 227.1 meters, 1320 kilocycles, 5 watts. Daily ex Sun, 11:30-12:30 pm. Sun, 12:30-2:30 pm, 7:30-8:30 pm. Central standard time. Slogan: "Second Post, U. S. A."

WCBM Hotel Chateau, Baltimore, Md. 225.4 meters, 1330 kilocycles. 100 watts. Sun, 6-8 pm, vocal & instrumental. Tues & Wed, 11 pm. Sat, 9:30 pm-12 midnight. Eastern standard time. Slogan: "At Dixie's Door." Divides time with Station WCAO.

WCBR C. H. Messter (Portable), 42 Doyle av., Providence, R. I. 201.6 meters, 1490 kilocycles, 100 watts. Daily ex Sun, 6:30 pm, 7:30 pm, 9-10 pm. Eastern time.

WCBS St. Nicholas Hotel, Springfield, Ill. 209.7 meters, 1430 kilocycles, 250 watts. Sun, 10:45 am-12 noon, church services; 12:30-2 pm, 6-7 pm. Mon, Tues, Fri, 8:30-10:30 pm, 11-12 pm. Wed, Thur, 8-11 pm. Central standard time.

WCCO Gold Medal Flour Station, Nicollet Hotel, Minneapolis, and Hotel Lowry, St. Paul, Minn. 405.2 meters, 740 kilocycles, 5000 watts night, 7500 watts daytime. Daily ex Sun. 9:30 am, 9:35 am, 9:45 am, 10:30 am. 11:30 am. 12 noon, 1:30 pm, news, markets, weather, noon concert. Mon & Tues, 6-10 pm. Wed. 6-11:30 pm. Thurs, 6-10:05 pm. Fri & Sat, 6:15-10:05 pm. Sun, 9:45 am, 4:10-11 pm. Central standard time. Slogan; "Service to the Northwest."

WCDA New York City, N. Y. 211.1 meters, 1420 kilocycles, 250 watts. Eastern standard time. Divides time with WBRS-WRST.

WCFL Chicago Federation of Labor, 623 So. Wabash av., Chicago, Ill. 483.6 meters, 620 kilocycles, 1500 watts. Sun, 11-12:30 noon, church; 2-6:30 pm, popular program; 7:45-9:15 am, Baptist Church; 9:15, Utah Hour. Mon, 10 am-2 pm, 4-6 pm, musical. Daily ex Sun & Mon, 10 am-2 pm, 4 pm-12 midnight, music and speakers. Central standard time. Divides time with WLTS & WEMC. Slogan: "The Voice of Labor."

There are many fluxes for soldering but only *one*—is safe for Radio!

FLUX for soldering is a general term; it embraces, as a class, all types of soldering fluxes. To designate a flux as safe for radio construction is specific; *it means rosin.* Chloride pastes, acids and fluid solutions are soldering fluxes, and are well adapted for certain work, but *conductive and corrosive properties forbade their use for radio assembly.* Their active elements, zinc and ammonium chlorides, display spreading, creeping tendencies that promote leakage and will eventually cause increased resistance in the wiring.

Rosin, an organic mixture, *is a non-conductor and non-corrosive.* The glass-like surface of this material does not readily lend itself to the collection of dust (carbon particles) as will the sticky organic greases of paste. Nor will rosin attract moisture from the atmosphere; the chlorides of pastes and fluids will. *Moisture plus carbon particles defeat the best insulations produced. Moisture plus chlorides direct a slow but determined corrosive attack upon supporting metals.* Such slow corrosion in wiring causes a steadily increasing resistance to the flow of electrical energy.

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WCGU Chas. G. Unger, New Perl House, Coney Island, New York. 218.8 meters, 1370 kilocycles, 500 watts. Eastern standard time. Divides time with WKBQ-WKBO.

WCLO C. E. Whitmore, Camp Lake, Wis. 227.1 meters, 1320 kilocycles, 100 watts. Sun, 2-5 pm, popular. Mon, Wed, Fri, Sat, 7 pm-midnight, popular program. Central standard time. Slogan: "The Playground of the Lake Region." Divides with WWAE and WJBC.

WCLS WCLS, Inc., 301 E. Jefferson st., Joliet, Ill. 215.7 meters, 1390 kilocycles, 150 watts. Sun, 9:30 am, services. 11 am, services; 8-11 pm, studio program. Tues, 8-11 pm, studio features. Wed, 7-8 pm, organ concert. Fri, 7-8 pm, organ & vocal; 8-11 pm, studio program. Sat, 8-11 pm, studio features, orchestra. Central standard time. Divides time with WKBB. Slogan: "Will County's Largest Store."

WCMA Culver Military Academy, Culver, Ind. 260.7 meters, 1150 kilocycles, 500 watts. Daily ex Sat & Sun, 3-4 pm, public service hour, highway reports, etc. Sun, 11 am, chapel service. Mon, 8 pm, band concert & studio. Wed, 8 pm, dance music & studio. Central standard time. Slogan: "The Voice of Culver." Divides with WOOD.

WCOA Municipal Broadcasting Station, City Hall, Pensacola, Fla. 249.9 meters, 1200 kilocycles, 500 watts. Sun, 12:30-7:30 pm. Mon, Wed, Fri, 10:30 am, 12:30-11 pm. Tues, Thurs, Sat, 10:30 am-12:30 pm. Central standard time. Slogan: "Wonderful City of Advantages."

WCOC Crystal Oil Co., Columbus, Miss. 230.6 meters, 1300 kilocycles, 250 watts. Daily ex Sun, 5-6 pm, music. Tues, 8-10 pm, vocal & instrumental studio program. Fri, 8-10 pm, dance music. Central standard time.

WCOT Jacob Conn, Olympia Theatre, Olneyville sq., Providence, R. I. 225.4 meters, 1330 kilocycles, 100 watts. Daily including Sun, 2:30-4 pm. Daily ex Sun, 7:30-9 pm. Programs varied. Eastern standard time.

WCRW Clinton R. White, Embassy Hotel, Diversey parkway, at Pine Grove, Chicago, Ill. 223.7 meters, 1340 kilocycles, 500 watts. Daily ex Sun, 1130 am-1 pm. Daily ex Mon, 6:30-7:30 pm, 9:30-10:30 pm. Sun, 6:30-7:30 pm, 10-11 pm. Central standard time. Divides time with WFKB, WPCC. Slogan: "For Your Entertainment."

WCSH Henry P. Rines, Congress Square Hotel, Portland, Maine. 365.6 meters, 820 kilocycles, 500 watts. Sun, 10:30-12 noon, 1:30-2:30 pm, 4-5:30 pm, 7:30-10 pm. Mon, 10-12 am, 12-1:30 pm, 3-4 pm, 6-11 pm. Daily ex Sun, same as Mon. Slogan: "The Voice from Sunrise Land."

WCSO Wittenberg College, Springfield, O. 256.3 meters, 1170 kilocycles, 500 watts. Mon, Wed, Fri, 7-9 pm. Tues, 6:30-7:30 pm. Sat, 2-4:30 pm. Eastern standard time.

WCWK Chester W. Keen, Fort Wayne, Ind. 214.2 meters, 1400 kilocycles, 250 watts. Sun, 10:30 am, 6:30-7:30 pm, church services. Mon, Tues, Wed, Thurs, Fri, Sat, 11 am-12 noon, musical program. Mon, 4-5:30 pm, children's hour. Tues, Fri, 8-11 pm, musical program. Central standard time. Slogan: "The Hoosier Station."

WCWS The Connecticut Portable Broadcasting Station, Danbury, Conn. 265.3 meters, 1130 kilocycles, 100 watts. Divides with WICC.

WCX & WJR Richards-Oakland Co. & Detroit Free Press, 2914 Book-Cadillac Hotel, Detroit, Mich. 440.9 meters, 680 kilocycles, 5000 watts. Sun, 10 am, church; 12:30 pm, 2 pm, 3 pm, 4:15-4:30 pm, 6-10:30 pm. Daily ex Sun, 12:30 pm, 12:45-2 pm, 4-4:30 pm, 5:45 pm-12 midnight. Mon, Wed, Fri, 10-11 pm. Mon, Tues, Wed, 12:15 pm. Music, talks, weather reports & chain programs broadcast. Eastern standard time. Slogan: "The Good Will Station."

WDAD Dad's Auto Accessories, Inc., 171-173 8th av., North Nashville, Tenn. 225.4 meters, 1330 kilocycles, 1000 watts. Sun, 3-4 pm, 6:30-7:30 pm. Mon, Wed, Sat, 11:45 am-1 pm, 3-4 pm, 9 pm-12 midnight. Tues & Thurs, 11:45 am-1 pm, 3-4 pm, 7-9 pm. Central standard time. Divides time with WLAC. Slogan: "Where Dollars Are Doubled."

WDAE Tampa Daily Times, Tampa, Fla. 267.7 meters, 1120 kilocycles, 500 watts. On air every afternoon and evening. Eastern standard time. Slogan: "WDAE, the Voice of the Times at Tampa."

WDAF The Kansas City Star, Kansas City, Mo. 370.2 meters, 810 kilocycles, 1000 watts. Sun, 3-4:45 pm, church concert and services; 7:15-9:15 pm. Daily ex Sun, 8-8:15 am, Bible lesson; 12 noon-1 pm, 3-4 pm, 5:30-10 pm; 11:45 pm-1 am, musical. Central standard time. Slogan: "Enemies of Sleep."

WDAG J. L. Martin, 605 E. 4th st., Amarillo, Texas. 263 meters, 1140 kilocycles, 250 watts. Week days, 12:45 pm, chats, markets & weather; 9-10 pm, entertainment. Fri, 8-10 pm, entertainment. Sun, 9:45 am, Bible class; 7:30-9:30 pm, church services. Central standard time. Slogan: "Where Dollars Always Grow."

WDAH Trinity Methodist Church, El Paso, Tex. 234.2 meters, 1280 kilocycles, 100 watts. Sun, 9:30 am-12 noon; 7:30-9 pm. Wed, 7:30-8:30 pm. Mountain standard time.

WDAY Radio Equipment Corp., 119 Broadway, Fargo, N. Dak. 545.1 meters, 550 kilocycles, 250 watts night, 500 watts daytime. Sun, 10:30 am, church; 2 pm, lecture; 4-6, entertainment. Daily ex Sun, 7-9 am, music, news; 10:15 am, Concordia Chapel; 12 noon-1 pm, farmers' musical hour; 1:05 pm, farm flash; 3-4 pm, women's hour, music; 3:15 pm, Aunt Sammy talk; 5:45 pm, news; 6-7:30 pm, entertainment. Daily ex Sun, 10 am, 11 am, 12 noon, 1 pm, 2 pm & 5:45 pm, markets. Mon, Wed, Thurs, 7:30-8:15 pm, college program. Central standard time. Divides with KFDY.

WDBJ Richardson Wayland Electric Corp., 106 Church st., S.W., Roanoke, Va. 230.6 meters, 1300 kilocycles, 250 watts. Sun, 7:30-8:30 pm, church services. Daily ex Sun, 12 noon-1 pm, 5:30-6 pm, 8-9 pm, musical. Wed, 9-11 pm. Fri, Sat, 9-10 pm, dance, sports, music. Eastern standard time. Slogan: "The Magic City."

WDBO Orlando Broadcasting Co., for Rollins College, Inc., Fort Gatlin Hotel, Orlando, Fla. 288.3 meters, 1040 kilocycles, 1000 watts daytime, 500 watts evening. Sun, 10:45 am, church; 4 pm, musicale; 7:30 pm, church. Mon & Tues, 8:40-10 pm. Thurs, 9:15-10:30 pm, studio program. Fri, 8:50-10:30 pm, studio program. Eastern standard time. Slogan: "The Voice of Central Florida."

WDEL Wilmington Electric Specialty Co., 405 Delaware av., Wilmington, Del. 296.9 meters, 1010 kilocycles, 100 watts. Sun, 8-10 pm. Tues, Thur, 7:30-9:30 pm. Sat, 9:30-12 midnight. Eastern standard time. Slogan: "First City of the First State."

WDGY Dr. Geo. Young's Jewelry & Optical Station, Minneapolis, Minn. 285.5 meters, 1050 kilocycles, 500 watts. Mon, Wed, Fri, 7-8 pm, 10-12 pm. Tues, 7-12 pm. Thurs, 7-10 pm. Sat, 7-8 pm. Sun, 2-6 pm. Central standard time. Divides with WCAL.

WDOD Chattanooga Radio Co., Inc., 615 Market st., Chattanooga, Tenn. 243.8 meters, 1230 kilocycles, 500 watts. Sun, 11 am, church; 5 pm, 6:30 pm, ensemble; 7:30 pm, church. Daily ex Sun, 12 noon, WDOD Trio. Mon & Fri, 6 pm, dinner hour. Tues, Wed, Sat, 6:45 pm, dinner hour & studio program. Sat, 9 pm, dance program. Central standard time.

WDRC Doolittle Radio Corp., 70 College st., New Haven, Conn. 282.8 meters, 1060 kilocycles, 500 watts. Daily ex Sat, 11 am-12 noon. Daily ex Sat & Sun, 5-10 pm, classical and popular program. Eastern standard time.

WDWF Dutee Wilcox Flint, Inc., Cranston, R. I. 260.7 meters, 1150 kilocycles, 250 watts. Eastern standard time. Divides time with WLSI.

WDZ James L. Bush, Star Store Bldg., Tuscola, Ill. 277.6 meters, 1080 kilocycles, 100 watts daytime. Daily ex Sat & Sun, grain markets, 9 am-2:15 pm, each half hour. Sat, 9 am-1:15 pm, each half hour. Central standard time. "The Buckle of the Corn Belt."

WEAF National Broadcasting Company, Inc, 711 5th Ave., New York City. 491.5 meters, 610 kilocycles, 50,000 watts. Sun, 2-11 pm. Daily ex Sun, 6:45-8:30 am, 4-6 pm, 6 pm-12midnight. Daily ex Sun, Sat, 11 am-1:15 pm. Sat, 12:45-1:45 pm. Eastern time.

WEAM Borough of North Plainfield, North Plainfield, N. J. 263.0 meters, 1140 kilocycles, 250 watts. Eastern standard time. Divides time with WJBI.

WEAN The Shepard Co., Westminster st., Providence, R. I. 275.1 meters, 1090 kilocycles, 500 watts. Sun, 10:45 am, 7-8:30 pm. Daily ex Sun, 11:55 am-1 pm, 4-5 pm, 6:30-10:30 pm. Eastern standard time. Slogan: "We Entertain a Nation."

WEAO Ohio State University, Columbus, Ohio. 282.8 meters, 1060 kilocycles, 750 watts. Daily ex Sun & holidays, 9:45 am, weather, market reports, agricultural bulletin; 11 am, market reports, music; 12:30 pm, market reports, music; 4 pm, markets. Mon, Wed, Fri, 10 am, Homemakers Half Hour. Tues, 7-11 pm, lectures, music (4 pm, Book Review). Wed, 7-9 pm, Farm Night program (4 pm, Story Hour). Thurs, 7-11 pm, lectures, music. Football and basketball games broadcast as per Ohio State schedule. Eastern standard time. Divides time with Station WAIU.

WEAR The Willard Storage Battery Co., Union Trust Bldg., Cleveland, Ohio. 399.8 meters, 750 kilocycles, 1000 watts. Daily ex Sun, 11:30 am-12:05 pm, weather, markets. Daily ex Sat & Sun, 3:30-4:10 pm, weather, markets. Eastern standard time. Divides time with WTAM and WSBT.

WEBC Head of the Lakes, Walter C. Bridges, 1225 Tower st., Superior, Wis. 241.8 meters, 1240 kilocycles, 250 watts. Sun, 10:40 am, 7:45 pm, church services. Mon, 12:15 noon, musical; 5:30 pm, organ; 6 pm, musical; 6:45 pm, news & baseball, weather; 7:15 pm, childrens hour; 8 pm, feature music. Tues, Thur, Fri. Sat, 12:15 noon, musical; 6 pm, music; 6:45 pm, news; 7 pm, childrens hour; 7 pm, weather. Fri, Sat, 9 pm, organ, dance music. Wed, 10:30 am, cookery corner; 12:15 pm, music; 1:15 pm, weather; 6 pm, music; 6:45 pm, news; 8 pm, music. Slogan: "Where Sail Meets Rail."

WEBE Cambridge, Ohio, 247.8 meters, 1210 kilocycles, 10 watts.

WEBH Edgewater Beach Hotel, Chicago Herald & Examiner, 5349 Sheridan Rd., Chicago, Ill. 365.6 meters, 820 kilocycles, 500 watts. Daily ex Sun, Mon, 7-8 pm, 9-10 pm, 11 pm-1 am (Sat, 11 pm-2 am). Sun, 10:40 am-12 noon, church service; 5-6 pm, 7-9 pm, musical program. Central standard time. Divides time with WJJD. Slogan: "Where Everybody's Happy."

WEBJ Third Avenue Railway, 2396 Third St., New York, N. Y. 256.3 meters, 1170 kilocycles, 500 watts. Wed, 7-11 pm, & Fri, 9-11 pm, popular and educational. Eastern standard time. Divides time with WBBR & WLTH.

WEBQ Tate Radio Co., 1 N. Main St., Harrisburg, Ill. 223.7 meters 1340 kilocycles, 15 watts. Daily ex Sun, 7:15-7:40 pm, local news, markets. Mon & Thurs, 7:30-10 pm, 10:45-12 midnight, musical programs. Sun, 7-8:30 pm, church services. Central standard time. Slogan: "The Voice from Egypt."

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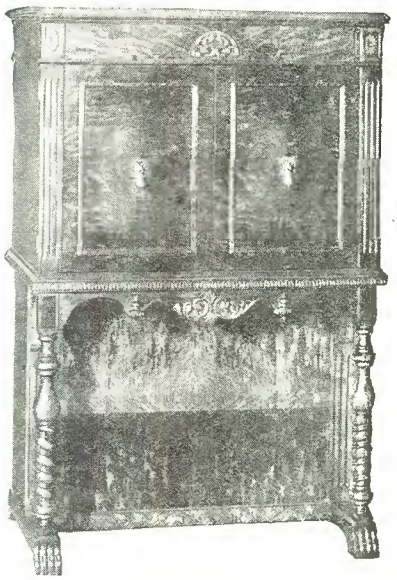

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WEBR H. H. Howell, 54 Niagara st., Buffalo, N. Y. 241.8 meters, 1240 kilocycles, 200 watts. Mon, Wed, Fri, 8:30-11 pm, Sun. church services. Thur, 10:15 pm-12:15 am. Slogan: "We extend Buffalo's Regards."

WEBW Beloit College, Beloit, Wis. 258.5 meters, 1160 kilocycles, 500 watts. Sun. 4:25-5:40 pm, vesper services. Central standard time.

WEDC Emil Denemark Broadcasting Station, 3860 Ogden av., Chicago, Ill. 241.8 meters, 1240 kilocycles, 500 watts. Central standard time. Divides time with WGES.

WEEI The Edison Electric Illuminating Co. of Boston, 39 Boylston st., Boston, Mass. 508.2 meters, 590 kilocycles, 500 watts. Sun, 10:50 am-12 noon. Daily ex Sat & Sun, 6:45 am, 9:30 am-12 noon, 2-5 pm, 5:45-11 pm. Sat, 2-5 pm, 6-10:30 pm. Eastern standard time. Slogan: "The Friendly Voice."

WEHS Victor C. Carlson, 636 Church St., Evanston, Ill. 215.7 meters, 1390 kilocycles, 100 watts.

WEMC Emmanuel Missionary College, Berrien Springs, Mich. 483.6 meters, 620 kilocycles, 1000 watts. Daily ex Sat & Sun, 7:30-9 am. Sun, 9-10 am. Mon, 7-11 pm. Tues & Thurs, 3-4 pm. Central standard time. Divides time with WLTS-WCFL. Slogan: "The Radio Lighthouse."

WENR Great Lakes Radio Broadcasting Co., 306 S. Michigan Ave., Chicago, Ill. 288.3 meters, 1040 kilocycles, 500 watts. Sun, 2-4 pm, 6-7 pm, 9:30-11 pm, classical music. Daily ex Sun & Mon, 11:30 am-12 noon. Home service feature; 12 noon-1 pm, classical program; 2-5 pm, popular request program; 6-7 pm, dinner concert; 8-9:30 pm, classical; 9:30 pm-12 midnight, popular program. Central standard time. Divides time with WBCN. Slogan: "Voice of Service."

WEPS Matheson Radio Co., Inc., Gloucester, Mass. 296.9 meters, 1010 kilocycles, 100 watts.

WEVD Union Course Laboratories, 9024 78th st., Woodhaven, N. Y. 245.8 meters, 1220 kilocycles, 500 watts. Sun, 12:30-4 pm. Mon, Wed, Fri, 1-6 pm, 11-12 pm. Tues, 1-6 pm, 9-12 pm. Thur, 1-6 pm. Eastern standard time. Divides time with WAAT & WGBB.

WEW St. Louis University, College Station, St. Louis, Mo. 352.7 meters, 850 kilocycles, 1000 watts. Daily ex Sun, 9-10 am, 2 pm, government reports. Tues, 7 pm, literary reading. Thurs, 7 pm, music, lectures. Sun, 9:35-11 am, religious services; 2 pm, difficulties in religion answered; 7:15 pm, lecture. Central standard time.

WFAA Dallas News & Journal, Dallas, Tex. 545.1 meters, 550 kilocycles, 500 watts. Sun, 1:45-6 pm, 6-7 pm, 11 pm-12 midnight. Daily ex Sun, each half hour from 6:30 am-6 pm, 7-8 pm, 9-10 pm. Tues & Sat, 11 pm-12 midnight. Central standard time. Divides time with WBAP. Slogan: "Working for All Alike."

WFAM St. Cloud Daily Times, St. Cloud, Minn. 252.0 meters, 1190 kilocycles, 10 watts.

WFAN Philadelphia, Pa. 223.7 meters, 1340 kilocycles, 500 watts. Eastern standard time. Divides time with WCAM.

WFBC First Baptist Church, Knoxville, Tenn. 234.2 meters, 1280 kilocycles, 50 watts. Sun, 10:30 am, 7:30 pm, church services; 4 pm, concert sacred music. Central standard time.

WFBE The Garfield Place Hotel Co., Cincinnati, Ohio. 245.8 meters, 1220 kilocycles, 250 watts. Eastern standard time. Divides time with WKRC.

WFBJ St. Johns University, Collegeville, Minn. 272.6 meters, 1100 kilocycles 100 watts. Wed, 8-9:30 pm. Fri, 4-5 pm. Central standard time. Slogan: "In the Heart of the Landscape Paradise."

WFBL The Onandaga Hotel, Syracuse, N. Y. 258.5 meters, 1160 kilocycles, 750 watts. Daily ex Sun, 3-3:30 pm, 6:30 pm-12 midnight. Sun, 2 pm-12 midnight. Eastern standard time. Slogan: "When Feeling Blue, Listen."

WFBM Indianapolis Power & Light Co., 48 Monument Circle, Indianapolis, Ind. 275.1 meters. 1090 kilocycles. 250 watts. Sun, 9:30-10:45 am, 2 pm, 4:45 pm, 7:30 pm, church services. Daily ex Sat & Sun, 5:30 pm, sports, stock market reports; 10 pm, orchestra. Fri, 11 pm, request organ program. Central standard time. Slogan: "The Crossroads of America."

WFBR Fifth Infantry Maryland National Guards. Fifth Regiment Armory, Baltimore, Md. 243.8 meters, 1230 kilocycles, 100 watts. Daily ex Sun, 12 noon, dance music; 7-10 pm, sporting results and news. Tues, Thurs & Sat, 12 noon, 7 pm, 10 pm, general programs. Sun, 11 am. Central standard time. Slogan: "Home of the Star-Spangled Banner." Divides time with WCAO.

WFBZ Knox College, Galesburg, Ill. 247.8 meters, 1210 kilocycles, 50 watts. Eastern standard time. Divides time with WRAM.

WFCI Frank Crook, Inc., 103 Exchange st., Pawtucket, R. I. 241.8 meters, 1240 kilocycles, 50 watts. Mon, Wed, Fri, 8-10 pm, entertainment. Eastern standard time. Divides time with WNBX. Slogan: "The City of Diversified Industries."

WFDF Frank D. Fallain, 513 S. Saginaw St., Flint, Mich. 272.6 meters, 1100 kilocycles, 100 watts. Divides time with WSKC.

WFI Strawbridge & Clothier, Market, 8th & Filbert sts., Philadelphia, Pa. 405.2 meters, 740 kilocycles, 500 watts. Daily ex Sun, 10:15 am, markets; 1-2 pm, orchestra; 3-4 pm, concert; 6:30-7:15 pm, dinner music. Tues, Thurs, Sat, 8-11:30 pm, musical program. Sun morning and evening, alternating, church services; 9:15 pm, Atwater-Kent Hour. Eastern standard time. Divides time with WLIT.

WFIW Hopkinsville, Ky. 260.7 meters, 1150 kilocycles, 750 watts night and 1000 watts daytime. Central standard time.

WFJC Akron, Ohio. 227.1 meters, 1320 kilocycles, 250 watts. Eastern standard time. Divides time with WJAY.

WFKB Francis K. Bridgman, 4536 Woodlawn av., Chicago, Ill. 223.7 meters, 1340 kilocycles, 500 watts. Daily ex Sun, 2:30-4 pm, 7-8 pm, classical; 9-11 pm, popular. Central standard time. Divides time with WCRW, WPCC.

WFKD Foulkrod Radio Engineering Co., 1510 Oxford av., Philadelphia, Pa. 247.8 meters, 1210 kilocycles, 50 watts. Eastern standard time. Divides time with WABY.

WFLA The Clearwater Chamber of Commerce, Clearwater, Fla. 516.9 meters, 580 kilocycles, 750 watts. Daily ex Sun, 8:30 pm-12 midnight, studio programs, music, weather, markets, talks, etc. Eastern standard time. Slogan: "Inviting the World to the Springtime All the Time City."

WFPG Wm. F. Gable Co., Altoona, Pa. 267.7 meters, 1120 kilocycles. 100 watts. Sun, 10:45 am, 3:30 pm, 7:30 pm, church. Daily ex Sun & Mon, 3 pm, 6:30 pm, 8:30 pm. Tues, Wed, Thurs, 12:15 pm. Fri & Sat, 9:30 pm. Thurs & Sat, 7:30 pm. Wed, 6 pm. Thurs, 4 pm, 10 pm. Fri, 12 noon, 11:15 pm. Eastern standard time. Slogan: "The Original Gateway to the West and we wish you all the very best."

WGAL Lancaster Elec. Sup. & Const. Co., 23 E. Orange st., Lancaster, Pa. 252.0 meters, 1190 kilocycles, 15 watts. Sun, 10:30 am-12 noon, church. Daily ex Sun, 9-9:15 am, talks; 12-12:05 noon, markets; 5:20-5:45 pm. Wed, Fri, 5:45-6:15 pm, dinner concert. Wed, 11:15-1 am, organ concert. Eastern standard time. Divides time with WKJC. Slogan: "World's Gardens at Lancaster."

WGBB Harry H. Carman, 217 Bedell st., Freeport, N. Y. 245.8 meters, 1220 kilocycles, 400 watts. Sun, 10:40 am-12:30 pm, 4:5:30 pm. Mon, 7-8 pm. Wed, Fri, 7-11 pm. Slogan: "The Voice of the Sunrise Trail." Divides time with Station WAAT-WEVD.

WGBC First Baptist Church, Memphis, Tenn. 228.9 meters, 1310 kilocycles, 15 watts. Sun, 9:55-10:55 am, 7:30-9 pm. Central standard time. Divides time with WMBR.

WGBF The Finke Furniture Co., 307 Upper Seventh st., Evansville, Ind. 236.1 meters, 1270 kilocycles, 250 watts. Daily ex Sun, 7:15 am, morning worship service; 12:10 pm, news, markets, weather, etc. Mon, 7-12 pm, musical program. Tues, 8-11 pm, music. Fri, 7-11 pm, musical program. Sun, 9 am, Bible class. Central standard time. Slogan: "Gateway to the South."

WGBI Scranton Broadcasters, Inc., 318 Adams Ave., Scranton, Pa. 230.6 meters, 1300 kilocycles, 250 watts. Eastern standard time. Divides time with WQAN.

WGBS Gimbel Bros., Inc., 33rd st. & Broadway, New York City, N. Y. 348.6 meters, 860 kilocycles, 500 watts. Sun, 8:30-10 pm, vocal & instrumental music. Daily ex Sun, 1:30-7 pm. Tues, Thurs, Sat, 1:30-6:30 pm, 7:30 pm-12:30 am. Programs consist of talks, vocal and instrumental selections. Divides time with Stations WIP and WOO—Mon, Wed, Fri. Eastern standard time.

WGCP Paramount Broadcasting & Artist Service, Inc., 519 Broad St., Newark, N. J. 267.7 meters, 1120 kilocycles, 500 watts. Mon, Wed, Fri. 12 noon-3 pm, 6-9 pm. Tues, Thurs, Sat, 9 am-12 noon, 3-6 pm, 9 pm-12 midnight. Sun, 12 noon-6 pm. Eastern standard time. Divides time with WNJ and WAAM.

WGES Oak Leaves Broadcasting Corp., 128 N. Crawford av., Chicago, Ill. 241.8 meters, 1240 kilocycles, 500 watts. Sun, 10:30 am-12 noon, church; 3-6 pm, 7:30-9:30 pm, 11:30 pm-1:30 am. Daily ex Sat & Sun. 4-6 pm, popular. Tues, 8:30-9:30, 10-11:30 pm. Wed, Thurs, Fri & Sat. 7:30-9:30 pm. Wed & Sat, 11:30-1:30 pm. Fri, 11:30 pm-3 am, Ozone Club. Sat, 2:30-6 pm. Central standard time. Divides time with WEDC. Slogan: "World's Greatest Entertainment Service."

WGHP George Harrison Phelps, Inc., Radio Division, Maccabee Bldg., Woodward and Putnam av., Detroit, Mich. 277.6 meters, 1080 kilocycles, 750 watts. Sun, 10:45 am-12:15 pm, 2:30-6, 9-11 pm. Daily ex Sat & Sun, 1:15-3 pm, 6-11 pm. Eastern standard time.

WGL "Public Service Station," International Broadcasting Corp., 16 E. 42nd St., New York, N. Y. 293.9 meters. 1020 kilocycles, 500 watts. Eastern standard time. Divides time with WODA.

WGM Verne & Elton Spencer, 501 Cowan av., Jeannette, Pa. 208.2 meters, 1440 kilocycles, 50 watts, Sun, 1:30-3 pm, music. Daily ex Sun, Wed, Sat, 7:30-9 pm, dance music. Popular program. Eastern time. Slogan: "Voice from the Glass City, Voice from the Hilltop."

WGMU Atlantic Broadcasting Corp., New York City. 201.6 meters, 1490 kilocycles, 100 watts. Unlimited schedule. Eastern standard time. Divides time with WRMU.

WGN The Chicago Tribune Station on the Drake Hotel, Chicago, Ill. 416.4 meters, 720 kilocycles, 15,000 watts. Sun, 12 noon-5 pm, 6:10-11 pm. Daily ex Sun, 9-10:30 am, 11-11:30 am, 12:40-7 pm. Daily ex Sun & Mon, 8-11 pm. Central standard time. Divides time with Station WLIB.

WGOP Flushing, N. Y. 199.9 meters, 1500 kilocycles, 100 watts. Eastern standard time. Divides with WWRL and WBKN.

WGR Federal Radio Corp., Hotel Statler, Buffalo, N. Y. 302.8 meters. 990 kilocycles, 750 watts. Sun, 10:45 am. church; 7:45 pm, church; 9:15 pm, concert; 10:15-11:15, concert. Mon, 12 noon, reports; 1-1:30 pm, ensemble; 2:30 pm, program; 6:30, music; 7:30, reports; 1-1:30, ensemble; 2:30 pm, program; 6:30, music; 7:30, reports; 8-11 pm, program. Wed, 12 noon, reports; 1-1:30, ensemble; 2:30 pm, concert; 6:30 pm, music; 7:30, reports; 8-11 pm, program. Thurs, 12 noon, reports; 1-1:30, ensemble; 2:30 pm, program; 6:30 pm, music; 7:30 pm reports; 8-11 pm, program. Fri, 12 noon, reports; 1-1:30, ensemble; 2:30, concert; 6:30, music; 8 pm-1 am, program. Eastern standard time. Slogan: "Key City of Industry."

WGST Georgia School of Technology, Atlanta, Ga. 270.1 meters, 1110 kilocycles, 500 watts. Mon, 9:30-10:30 pm, "Tech Nite" program. Thurs, 7-8 pm, "Artist Series" program. Central standard time. Divides time with WMAZ. Slogan: "The Southern School with the National Reputation."

WGWB Radiocast Corp. of Wisconsin, 144 Broadway, Milwaukee, Wis. 218.8 meters, 1370 kilocycles, 500 watts. Daily ex Sun, 10:30 am-12:30 pm. Sun, 10-11 am, 6-7 pm. Silent Saturdays. Central standard time.

WGY General Electric Co., 1 River Road, Schenectady, N. Y. 379.5 meters, 790 kilocycles, 50,000 watts. Daily ex Sun, 11:55 pm, 12:30 pm, 12:45 pm, 6 pm, 6:10 pm. Daily ex Sat & Sun, 6-11 pm. Mon, Tues, Thurs, Fri, 2-3 pm. Sat, 6:30 pm-12 midnight. Sun, 10:30 am-12 noon, 3-10:45 pm. Eastern standard time.

WHA University of Wisconsin, Madison, Wis. 333.1 meters, 900 kilocycles, 750 watts. Mon, Wed & Fri, 7-9:30 pm. Programs on these evenings consist of educational talks, music, athletic events, etc. Central standard time. Divides time with WLBL.

WHAD Marquette University, Milwaukee, Wis. 270.1 meters, 1110 kilocycles, 500 watts. Sun. 4:30-5 pm, organ recital. Daily ex Sat & Sun, 3:30-4 pm, 7:30-8 pm. Fri, 8-9:30 pm, musical program. Central standard time. Divides time with WSOE. Slogan: "The Voice of Wisconsin."

WHAM Stromberg Carlson Telephone Mfg. Co., Rochester, N. Y. 280.2 meters, 1070 kilocycles, 5000 watts. Sun, 10:30 am, church; 3:30-10:15 pm. Mon & Fri, 6:30-10 pm. Tues, 2:30 pm, 3 pm. Tues, Wed, Thurs, Sat, 6:30-11:05 pm. Varied studio & Blue network programs. Eastern standard time.

WHAP WHAP, Carlstadt, N. J. 236.1 meters, 1270 kilocycles, 1000 watts. Sun, 7:30-9:30 pm. Mon, Thurs, 6-9 pm. Wed, 9-12 pm. Sat, 7-11:30 pm. Eastern standard time. Divides time with stations WBNY, WPUB.

WHAR Pioneer Broadcasting Station of Atlantic City, the Hotel Seaside, Atlantic City, N. J. 272.6 meters, 1100 kilocycles, 1000 watts. Sun. 10:45-1 pm, 2:15-3:10 pm, 7:30-9 pm. Daily ex Sun & Wed, 2:15-3:15 pm, 7:45-9 pm. Eastern standard time. Divides time with WPG. Slogan: "Pioneer Broadcasting Station of Atlantic City."

WHAS The Courier-Journal Co. and The Louisville Times Co., Louisville, Ky. 322.4 meters, 930 kilocycles, 500 watts. Sun. 9:57-10:45 am, church services; 2-3 pm, 4:30-9:15 pm. Daily ex Sun, 2:15-2:30 pm, 3:30-5 pm, 7-9 pm. Central standard time. Slogan: "Old Kentucky Home."

WHAZ Rensselaer Polytechnic Institute, Troy, N. Y. 305.9 meters, 980 kilocycles, 500 watts. Mon, 8 pm. Eastern standard time. Slogan: "Transcontinental and International Radiophone Broadcasting from the Oldest College of Engineering and Science in America, Rensselaer Polytechnic Institute, Troy, N. Y." Divides with WHT and WIBO.

WHB Sweeney Automotive and Electrical School, Kansas City, Mo. 340.7 meters, 880 kilocycles. 500 watts. Sun, 9:40-10:45 am, church services; 6:30-7:15 pm, church; 11:15 pm-12:15 am, organ. Daily ex Sun, 8:25-9:25 am, 10:25-11:20 am, 12 noon-1:25 pm, 2-3 pm, Ladies' Hour; 3 pm, markets. Mon, Tues, Thurs, Sat, 7-10 pm. Wed, Fri, 7-8 pm. Central standard time. Divides time with WOQ. Slogan "Kansas City, Missouri, the Heart of America."

WHBA Shaffer Music House, Oil City, Pa. 260.7 meters, 1150 kilocycles, 10 watts. Limited commercial broadcast. Mon, 8 pm until 11 pm, musical. Fri, 9 pm until 12 pm, musical. Eastern standard time.

WHBC Rev. E. P. Graham, 627 McKinley av., Canton, Ohio. 236.1 meters, 1270 kilocycles, 10 watts. Mon, 8-8:30 pm. lecture, sermon. Eastern time. Slogan: "Dispel Ignorance."

WHBD Chamber of Commerce, 118½ N. Main st., Bellefontaine, Ohio. 222.1 meters, 1350 kilocycles, 100 watts. Sun, 10:45 am, 7:30 pm. Daily ex Sun & Sat, 7:30-9 pm. Eastern standard time. Slogan: "Ohio's Highest Point."

WHBF Beardsley Spec. Co., Inc., 217 18th st., Rock Island, Ill. 222.1 meters, 1350 kilocycles, 100 watts. Mon, Wed. 9-11 pm. Sat, 2-4, 7-9 pm. Central standard time. Slogan: "Where Historic Blackhawk Fought."

WHBL C. L. Carrell, 36 S. State st., Chicago, Ill. 204.0 meters, 1470 kilocycles, 100 watts. Central standard time.

WHBM C. L. Carrell (portable), 1506 No. American Bldg., 36 S. State st., Chicago, Ill. 201.6 meters, 1490 kilocycles, 100 watts, class A. Central standard time.

WHBP The Johnstown Automobile Co., 101 Main st., Johnstown, Pa. 228.9 meters, 1310 kilocycles, 250 watts. Daily ex Sun, 1:15 pm. Tues & Sat, 10 pm. Eastern standard time. Slogan: "The Voice of the Friendly City."

WHBQ Broadcasting Station WHBQ, Inc., Dermon Bldg., Memphis, Tenn. 232.4 meters, 1290 kilocycles, 100 watts. Sun, church services. Daily ex Sun, 7-8 pm, orchestra. Central standard time.

WHBU Riviera Theater & Bing's Clothing, 1002 Meridian st., Anderson, Ind. 220.4 meters, 1360 kilocycles, 15 watts. Daily ex Sun, 9-9:30 am, 12-12:30 pm. Wed, Fri, Sun, 7-9 pm. Central standard time. Slogan: "The Home of Chief Anderson."

WHBW D. R. Kienzle, 4916 Chestnut st., Philadelphia. Pa. 220.4 meters, 1360 kilocycles, 100 watts. Tues., Thurs, Sun, pm. Eastern standard time.

WHBY St. Norbert's College, West De Pere, Wis. Green Bay-De Pere Broadcasting Station. 249.9 meters, 1200 kilocycles, 50 watts. Sun, 10-11 am. Daily ex Sun; 6:30 pm, weather & markets. Mon, 8-10 pm, musical entertainment. Wed & Fri, 5-6 pm, dinner hour. Central standard time. Slogan: "Prepared for All Good Works."

WHDI Dunwoody Industrial Institute, 818 Superior blvd., Minneapolis, Minn. 245.8 meters. 1220 kilocycles, 500 watts. Daily ex Sun, 6:57-9:30 am. Mon, 8-9 pm. Wed, 8:30-10 pm. Fri, 9-10 pm. Central standard time. Divides time with Station WLB.

WHEC-WABO Hickson Electric Co., Inc., 36 South av., Rochester, N. Y. 254.1 meters, 1180 kilocycles, 250 watts. Sun. 10:30-12 noon, 8-10 pm. Daily ex Sun, 12 noon-3 pm. 6:30-9 pm. Fri, 10-11 pm. Eastern standard time.

WHFC The Goodson & Wilson Station, 4145 Broadway, Chicago, Ill. 215.7 meters, 1390 kilocycles, 200 watts. Sun, Tues, Wed. Thurs, Fri, Sat, Sat, 8-12 pm. Slogan: "Where Happiness First Commences." Divides with WKBI.

WHK The Radio Air Service Corporation, Inc., 1220 Huron road, Cleveland, Ohio. 265.3 meters, 1130 kilocycles, 1000 watts daytime, 500 watts night. Sun, 10 am, 5:15-9:30 pm. Daily ex Sun, 12 noon-1 pm. Mon, Tues, Thurs, Sat, 6 pm-12 midnight. Tues, Wed, Fri, 3:30-4:15 pm. Wed & Fri, 5:30-12 midnight. Eastern standard time. Slogan: "Cleveland's Pioneer Station."

WHN Marcus Loew Booking Agency, 1540 Broadway, New York, N. Y. 394.5 meters. 760 kilocycles, 500 watts. Sun, 9-11 am, 12:30-3 pm, 5-7:30 pm, 9:45 pm-12 midnight. Daily ex Sun, 1-2 pm, 6 pm-12 midnight. Eastern standard time. Divides time with WQAO and WPAP. Slogan: "Voice of the Great White Way."

WHO Banker's Life Company, Des Moines, Iowa. 535.4 meters, 560 kilocycles, 5000 watts. Sun, 10 am, 11 am, 1 pm, 6:20 pm, 8:15 pm, 9:15 pm. Tues, Wed, Thurs, Fri, 8 am through 3 pm. Mon, 8 am through 3:30 pm, 6:30-11 pm. Sat, 8 am-1 pm, 6:30-10 pm. Tues & Wed, 4-10:30 pm. Thurs & Fri, 10 pm. Music, talks, weather reports & chain programs broadcast. Central standard time. Slogan: "W-H-O, Who? Banker's Life, Des Moines."

WHPP Bronx, New York. 206.8 meters, 1450 kilocycles, 10 watts. Eastern standard time. Divides time with WMRJ-WTRL.

WHT Radiophone Broadcasting Corp., Wrigley Bldg., 410 N. Michigan blvd., Chicago, Ill. 305.9 meters, 980 kilocycles, 5000 watts. Sun, 10 am-2:30 pm, 7-10 pm. Daily ex Sun, 10 am-2:30 pm, 7-10 pm. Tues, Thur, 11 pm-1 am. Central standard time. Divides time with WIBO-WHAZ. Slogan: "Write Home Tonight."

WIAD Howard R. Miller, 1301-5 Filbert St., Philadelphia, Pa. 288.3 meters, 1040 kilocycles, 100 watts. Tues, Thurs, Fri, 2 pm-12 pm. Eastern standard time. Divides time with WNAT.

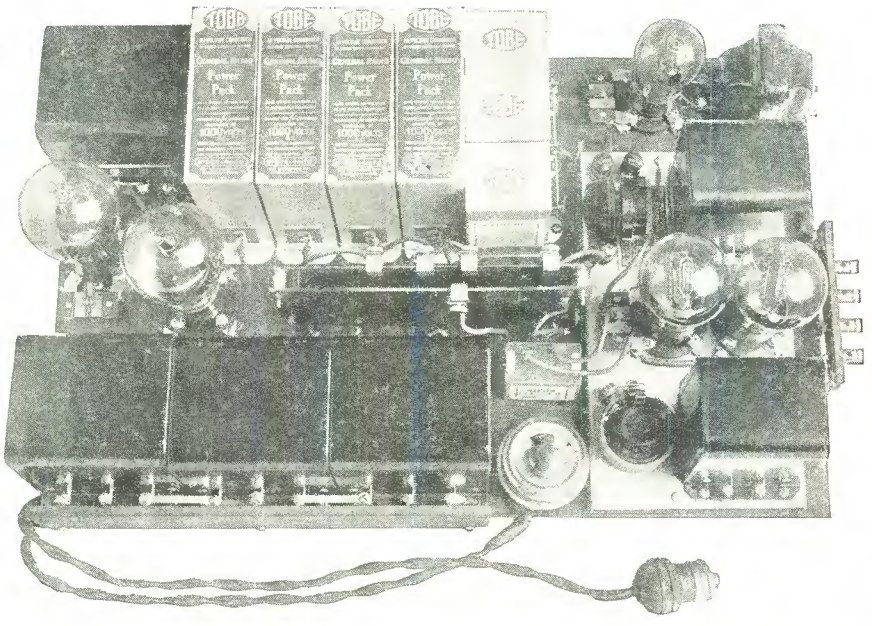
WIAS Poling Elec. Co., 218 E. Main St., Ottumwa, Ia. 322.4 meters, 930 kilocycles, 100 watts. Daily ex Sun & Tues, 12 noon-1 pm. Mon & Thurs, 8-9 pm. Wed, Fri & Sat, 8-10:30 pm. Sun, 10 am-12:30 pm, church. Central standard time. Slogan: "Burlington on the Mississippi." Divides with KICK.

WIBA The Capital Times, Strand Theater, Madison, Wis. 239.9 meters, 1250 kilocycles, 100 watts. Mon, 7-11 pm. Wed, 8-10 pm. Fri, 6-7 pm. Sat, 7-8 pm. Sun, 12-1 pm. Central standard time. Slogan: "The Four Lakes City."

WIBG St. Paul's Protestant Episcopal Church, Elkins Park, Philadelphia, Pa. 440.9 meters, 680 kilocycles. 50 watts. Sun, 10:45 am, 3:45 pm. Eastern standard time.

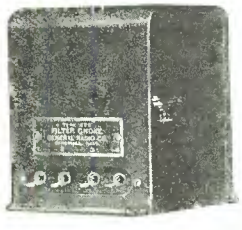
WIBJ C. L. Carrell, 36 S. State st., Chicago, Ill. (portable). 201.6 meters, 1490 kilocycles, 100 watts. Central standard time.

Quality Units for Quality Reproduction



The primary of the Type 365 Transformer is designed for a 110 volt, 60 cycle circuit. The high voltage secondary consists of two sections of 275 volts each. There is also a 7.5 volt secondary.

Type 365 Rectifier Transformer $8.00

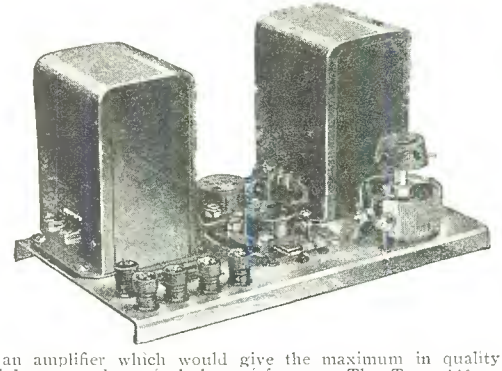


The Type 366 Choke is actually two chokes assembled in one case and is mounted in the same type and size of case as the Type 365 Transformer. The direct current resistance is low, reducing the voltage lost in the Chokes to a minimum.

Type 366 Filter Choke $8.00

A Complete A. C. Operated Amplifier Constructed with General Radio Parts

FOR those people who demand the most perfect reproduction obtainable, a power amplifier is a necessity. A power amplifier is not intended primarily to increase the volume of a set, but rather to make use of tubes capable of delivering to the speaker considerable energy. To a certain extent the greater the power output the better the quality. The Amplifier illustrated above is a complete two stage A. C. operated device constructed of General Radio units, and is capable of remarkable reproduction together with great volume. Write for folder describing this amplifier.



In a search for an amplifier which would give the maximum in quality and volume the push-pull method has proved particularly satisfactory. The Type 441 unit is licensed by the Radio Corporation of America for radio amateur experimental and broadcast reception only, and under the terms of the R. C. A. license the unit may be sold only with tube.

Type 441 Push-Pull Amplifier..... $20.00

The General Radio Type 285 Transformers are designed to have a high inductance value with a low distributed capacity. This combination sustains both the upper and lower ends of the amplification curve. These transformers are available in two ratios as follows:

Type 285-H—1 to 6.
Type 285-D—1 to 3.
Price, each..... $6.00

The Type 439 center tap resistance is adaptable to any socket in which the new A. C. tubes may be used.

Type 439 Center Tap Resistance $0.60

GENERAL RADIO CO., CAMBRIDGE, MASS.

GENERAL RADIO

LABORATORY EQUIPMENT

PARTS AND ACCESSORIES

WIBM C. L. Carrell, 36 S. State st., Chicago, Ill. 201.6 meters, 1490 kilocycles, 100 watts. Daily ex Sun, 8:45-9:45 pm. Central standard time. Slogan: "The Gypsy Station."

WIBO WIBO Broadcasters, Inc., 6312 Broadway, Chicago, Ill. 305.9 meters, 980 kilocycles, 500 watts. Sun, 8:45-10 am, Daily ex Sun, 2:30-5 pm. Daily ex Sun & Mon, 7:10-8:30 pm. 10 pm-12:30 am. Central standard time. Divides time with WIIT & WHAZ.

WIBR Tri-State Service Co. (Thurman A. Owings, Mgr.), Steubenville, Ohio. 249.9 meters, 1200 kilocycles, 50 watts. Daily, 6:30-7:30 pm. Mon & Fri, 8:30-9:30 pm. Wed, 11:15 pm-12:45 am. Eastern standard time. Slogan: "Where Investments Bring Results."

WIBS Lieut. Thomas F. Hunter (portable), 921 Edgewood road, Elizabeth, N. J. 204.0 meters, 1470 kilocycles, 250 watts, class A. Eastern standard time. Divides with WLBX & WMBQ.

WIBU The Wisconsin State Journal, Electric Farm Station, Poynette, Wis. 217.3 meters, 1380 kilocycles, 20 watts. Sun, 2-3 pm, concert; 4-5:30 pm, vesper service. Mon, 9-12 pm., community program. Central standard time.

WIBW Topeka's Own Broadcasting Station, 901-2 National Reserve Life Bldg., Topeka, Kan. 204.0 meters, 1470 kilocycles, 100 watts. Sun, 12:15-1:45 pm, dinner music; 1:45-3 pm, studio program; 6:15-7:45 pm, string ensemble. Daily ex Sun, 12:15-1:15 pm, organ music; studio program, 5-7:30 pm, organ, weather, news, bedtime story, dinner music; 8:30-10 pm, studio program. Mon, 11 pm-12 midnight. Central standard time. Slogan: "Topeka—Where Investment Brings Wealth."

WIBX WIBX, Inc., Hotel Utica, Utica New York. 238.0 meters, 1260 kilocycles. 150 watts. Daily, 9:30-10:30, 10:30-11 am, 12-1 pm, music, news, etc; 6-11 pm ex Wed night. Sun morning, church services, 6-11 pm. Eastern standard time.

WIBZ A. D. Trum, 217 Catoma st., Montgomery, Ala. 230.6 meters, 1300 kilocycles, 15 watts. Fri, 9-10 pm. Sun, 12-1 pm. Central standard time. Slogan: "We Interest Business Zeal."

WICC The Bridgeport Broadcast Station, Inc., 1044 Main St., Bridgeport, Conn. 265.3 meters, 1130 kilocycles, 500 watts. Sun, 10:50 am. church services; 2 pm. Daily ex Sun, 9 am. 12 noon, music; 1 pm. Mon. 6-11 pm. Tues, Wed, Thurs, Fri, 6-10 pm. Sat, 6-7 pm. Eastern standard time. Slogan: "The Industrial Capital of Connecticut." Divides with WCWS.

WIL Benson Broadcasting Corp., Missouri Hotel, 11th & Locust st., St. Louis, Mo. 258.5 meters, 1160 kilocycles, 250 watts. Sun, 5-7 pm. Daily ex Sun, 9:30-11:30 am, 2:45-5 pm, 8-11 pm. Central standard time. Divides time with WSBF. Slogan: "A Wave Length Ahead."

WIOD Carl G. Fisher, Miami Beach, Fla. 247.8 meters, 1210 kilocycles, 1000 watts. Slogan: "Wonderful Isle of Dreams."

WIP Gimbel Bros., Philadelphia, Pa. 348.6 meters, 860 kilocycles, 500 watts. Daily ex Sun, Mon & Fri, 6:45-7:30 am, 10-11 am, 1-2 pm, 3-4 pm, 6-7:30 pm. Tues, Thurs & Sat, 8 pm-12 midnight. Mon, Wed & Fri, 6:45-8 am, 10-11 am, 1-2 pm, 3-4:30 pm, 6-7:30 pm. Sun, 10:30 am-12:30 pm, 4-6 pm, 7-9:15 pm, 9:15 pm-12 midnight. Eastern standard time. Divides time with WOO & WGBS. Slogan: "Watch Its Progress."

WJAD Frank P. Jackson, 801 Austin av., Waco, Tex. 333.1 meters, 900 kilocycles, 500 watts. Mon, Tues, Thur, Fri, 8:30-10:30 pm, musical. Wed, 8:30-9:30 pm, musical. Central standard time. Divides time with KFQB. Slogan: "Waco, Texas, All Around It."

WJAG Norfolk Daily News, Norfolk, Nebr. 285.5 meters, 1050 kilocycles, 500 watts daytime, 250 watts night. Daily ex Sun, 12:15 pm, features, sports, word pictures, etc. Wed & Sat, 6:30 pm, dinner hour orchestra. Sun, 3 pm, musical program. Central standard time. Divides time with KMMJ. Slogan: "Home of the Printers' Devil."

WJAK The Kokomo Tribune, Kokomo, Ind. 234.2 meters, 1280 kilocycles, 50 watts. Daily ex Sun, 11:45 am, radio chapel. Mon, 7:30 pm, musical program. Wed, Thurs, 6 pm, musical program. During basketball season, Fri & Sat, 7:30 pm. Central standard time.

WJAM D. M. Perham, 322 3rd av. W., Cedar Rapids, Iowa. 239.9 meters, 1250 kilocycles, 250 watts. Daily, 9:15 am, 1:15 pm, Chicago grain & livestock markets. Daily ex Sun, 8:30 am-12:30 pm, music & talks. Mon, Wed, Fri, 7-9 pm, music. Tues, Thurs, 9-11 pm, music. Divides time with KWCR.

WJAR The Outlet Company, 174 Weybosset st., Providence, R. I. 483.6 meters, 620 kilocycles, 500 watts. Daily ex Sun, 1:05 pm, musical; 1:30, weather reports. Mon, 8 pm, 9 pm & 10 pm, musical programs & grand opera. Tues, 7 pm, 8 pm, 9 pm, musical; 10 pm, bridge. Wed, 7:30 pm, music. Thurs, 8, 9 & 10 pm, music & entertainment. Fri, 8:20, 8:30, 9 & 11 pm, music & entertainment. Sun, 7:20 pm & 9:15 pm. Eastern standard time. Slogan: "The Southern Gateway of New England."

WJAS Pickering's, 10th St. & Penn Ave., Pittsburgh, Pa. 270.1 meters, 1110 kilocycles, 500 watts. Daily ex Sun, 10:30, music; 11:15 am, 11:30, music; 12 noon, church; 12:45 pm, 1:30 pm, news, etc.; 8 pm, code lesson, music, etc. Mon, Wed, Fri, 9-11 pm, Columbia chain. Sun, 11 am, 2 pm, church; 3-5 & 9-11 pm, Columbia chain. Eastern standard time. Divides time with KQV.

WJAX Jacksonville Municipal Radio Broadcasting Station. Waterworks Park, Jacksonville, Florida. 340.7 meters, 880 kilocycles, 1000 watts. Sun, 11 am, church; 6:30 pm, dinner hour concert; 7:30 pm, church, 10-11 pm. Daily, 11:55 am, time signals; 12 noon, weather. Mon, 7:45 pm-12 midnight, musical. Tues & Sat, 8-10 pm, musical. Wed, 7-8 pm. Thurs, 7:15-11 pm, musical. Fri, 7-10 pm, musical. Eastern standard time. Slogan: "WJAX—W for Wonderful, JAX for Jacksonville." Divides with WAPI.

WJAY Cleveland, Ohio. 227.1 meters, 1320 kilocycles, 500 watts. Eastern standard time. Divides time with WFJC.

WJAZ Zenith Radio Corp., 3620 Iron st., Chicago, Ill. Studio, Chez Pierre. 263.0 meters, 1140 kilocycles, 5000 watts.. Sun, 7-9 pm. Tues, Wed, Fri, Sat, 7-8 pm, 9-11 pm. Thurs, 9-12 pm, Chez Pierre program. Divides time with Station WMBI, 8-9 pm, except Thurs, 7-9 pm. Sun, 3:30-7 pm. Central standard time.

WJBA D. H. Lentz, Jr., 301 Whitley av., Joliet, Ill. 247.8 meters, 1210 kilocycles, 50 watts. Tues, 8-11 pm. Central standard time.

WJBB The Financial Journal, Inc., Sarasota, Fla. 238.0 meters, 1260 kilocycles, 250 watts. Eastern standard time. Slogan: "The Pioneer Semi-Tropical Business Journal." Divides with WQBA.

WJBC Hummer Furniture Co., Second and Joliet, La Salle, Ill. 227.1 meters, 1320 kilocycles, 100 watts. Sun, 10-11 am, Catholic church services; 7:30-9:30 pm, Baptist church services. Mon, 8-10 pm, studio program. Tues, Thurs, Sat, 12:30-1 pm, organ concert. Sat, 1-2 pm, children's program. Central standard time. Divides time with WWAE & WCLO. Slogan: "Better Homes Station."

WJBI Robert S. Johnson, 63 Broad st., Red Bank, N. J. 263 meters, 1140 kilocycles. 250 watts. Mon, 9-12 pm. Wed, 10-11 am, 4-6 pm, 10-12 pm. Fri, 9-10:30 am, 9-12 pm. Eastern standard time. Divides time with WEAM.

WJBK Ernest F. Goodwin, 803 Congress st., Ypsilanti, Mich. 220.4 meters, 1360 kilocycles, 15 watts. Central standard time.

WJBL Wm. Gushard Dry Goods Co., 301 N. Water st., Decatur, Ill. 212.6 meters, 1410 kilocycles, 250 watts. Mon, Wed & Sat, 9 pm. Sun, 3 pm. Central standard time.

WJBO Valdemar Jensen, 119 South st., New Orleans, La. 263.0 meters, 1140 kilocycles, 100 watts. Tues & Fri, 8 pm & 11 pm, dance programs. Sun, 3-4:30 pm, classical; 5-5:45 pm, church. Central standard time.

WJBT J. S. Boyd, Inc., 306 S. Wabash, Ave., Chicago, Ill. 389.4 meters, 770 kilocycles, 500 watts. Sun, 10:30 am, 2:30 pm-12 midnight. Daily ex Sun, 11 am, 3 pm, 7 pm. Mon, 9-10 pm. Tues, 11 pm-1 am. Thurs, 12 midnight-2 am. Wed, Fri & Sat, 11 pm-12 midnight. Central standard time. Divides time with WBBM & WAAF.

WJBU Bucknell University, Lewisburg, Pa. 214.2 meters, 1400 kilocycles, 100 watts. Eastern standard time. Slogan: "In the Heart of the Keystone State."

WJBW Serve-U-Radio Co., 2743 Dumaine st., New Orleans, La. 238.0 meters, 1260 kilocycles, 30 watts. Tues, Fri, 7-8 pm, Central standard time. Divides time with WABZ. Slogan: "The Serve You Broadcasting Station at New Orleans."

WJBY Electric Construction Co., 517 Broad st., Gadsden, Ala. 234.2 meters, 1280 kilocycles, 50 watts.

WJBZ Roland G. Palmer and A. Coppotelli, 144 East 16th st., Chicago Heights, Ill. 208.2 meters, 1440 kilocycles, 100 watts. Mon & Tues, 7-10 pm. Central standard time. Slogan, "Crossroads of the Nation."

WJJD Loyal Order of Moose, Mooseheart, Ill. 365.6 meters, 820 kilocycles, 1000 watts. Children's programs from Mooseheart. Chicago programs from the Palmer House in cooperation with the Chicago Herald and Examiner. Sun, 3 hrs; Mon, 7 hrs; Tues, Wed, Thurs, 7 hrs 30 min; Fri, 5 hrs 30 min; Sat, 6 hrs 30 min. Central standard time. Divides time with WEBH. Slogan: "Every Child Is Entitled to a High School Education and a Trade."

WJKS Gary, Ind. 232.4 meters, 1290 kilocycles, 500 watts. Central standard time. Divides with WSBC.

WJPW J. P. Wilson, Ashtabula, Ohio. 208.2 meters, 1440 kilocycles, 30 watts.

WJR & WCX Richards-Oakland Co. & Detroit Free Press, 2914 Book-Cadillac, Detroit, Mich. 440.9 meters, 680 kilocycles, 5000 watts. Daily ex Sun, 12:45-2 pm, 4-4:30 pm, 5:45 pm, 12 midnight. Sun, 10 am, 12:30 pm, 2 pm, 3 pm, 4:15-4:30 pm, 6-10:30 pm. Mon, Wed, Fri, 10-11 pm. Mon, Tues, Wed, 12:15 pm. Music, talks, weather reports & chain programs broadcast. Eastern standard time. Slogan: "The Good Will Station."

WJZ Radio Corporation of America, managed by National Broadcasting Co., 711 5th Ave., New York City, N. Y. 454.3 meters, 660 kilocycles, 30,000 watts. Sun, 9-10 am, 1-10:45 pm. Daily ex Sat & Sun, 1-2:40 pm, 4:30-6 pm. Sat, 1-2:05 pm, 4:30-5:30 pm, 6 pm-12 midnight. Eastern standard time.

WKAQ Radio Corp. of Porto Rico, Telephone Bldg., San Juan, Porto Rico. 322.4 meters, 930 kilocycles, 500 watts. Wed, 7-9 pm, Municipal Band of San Juan. Fri, 7-10 pm, Studio Program. Slogan: "Porto Rico, The Island of Enchantment in the Caribbean Sea." Eastern standard time.

EXCELLO RADIO CONSOLES

in many models to suit every taste

Style R-31

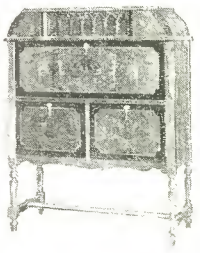
In the Excello Line you will find every modern type of Radio Console all incorporating latest features of convenience and utility.

The creation of these smart designs so closely in keeping with the present trend is an achievement to delight all radio fans and to add a beautiful piece of furniture to the home.

Style R-32

The cabinet work is of true Excello quality. Doors of 5-ply butt walnut; rich piano finish.

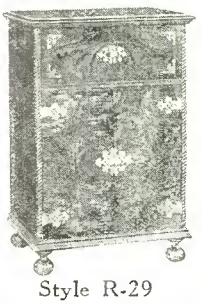
The sound chambers are above or below the set compartment. In the latter type all confusing vibrations arising when a cone is enclosed are entirely eliminated. Consoles of this type come with or without horn speaker of long air travel type and will accommodate a 22-inch cone type speaker as well as batteries, charger or eliminator.



Style R-23

Excello Cabinets with sound chamber above as in Styles R-23 or R-32 are so designed that they develop the full tonal range from lowest base to highest treble.

Special filler panels are furnished without extra charge so that any Excello Console will accommodate Atwater-Kent, Fada, Freed-Eisemann, Kellogg, Stromberg-Carlson and all other standard receivers.



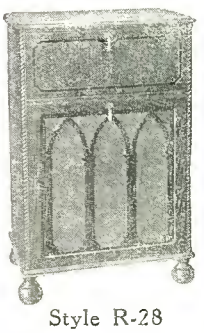
Style R-29

Style R-31. Phantom view to show location of long air travel type horn and accessories

See the new Excello Consoles at your dealer, or write us for descriptive catalog.

Dealers and distributors, write for interesting proposition on open territory

EXCELLO Radio Consoles



Style R-28

Excello Products Corporation

4820-28 West 16th Street, Cicero, Illinois
(Suburb of Chicago)

WKAR The Michigan State College, East Lansing, Mich. 277.6 meters, 1080 kilocycles, 1000 watts daytime, 500 watts night. Daily ex Sun, 12-12:30, markets, weather, educational program.

WKAV Laconia Radio Club, Auditorium of Public Service Co., Laconia, N. H. 223.7 meters, 1340 kilocycles, 50 watts. Sun, 5 pm. Fri, 7:30 pm. Eastern standard time. Slogan: "The Voice of the Winnepesaukee Lake Region."

WKBB Sanders Bros., 607 Jefferson st., Joliet, Ill. 215.7 meters, 1390 kilocycles, 150 watts. Wed, 6-8:30 pm, dinner program. Thurs, 8:30-12 pm, good time program. Sun, 3-5 pm, classical; 8:30-12 pm, frolics. Central standard time. Divides time with WCLS.

WKBC H. L. Ansley, 1428 N. 12th av., Birmingham, Ala. 218.8 meters, 1370 kilocycles, 10 watts. Tues, Thurs, Sat, 7:30-8 pm, music. Sat, Sunday school talks on lessons for Sunday. Central standard time.

WKBE K. & B. Electric Co., 59 Emerald av., Webster, Mass. 228.9 meters, 1310 kilocycles, 100 watts. Mon, 8-11:30 pm. Thurs & Sat, 8-11 pm. Eastern standard time.

WKBF Noble Butler Watson, 902 N. Meridian St., Indianapolis, Ind. 252 meters, 1190 kilocycles, 250 watts. Slogan: "We Keep Building Friendships."

WKBG C. L. Carrell, 36 S. State st., Chicago, Ill. (Portable). 201.6 meters, 1490 kilocycles, 100 watts.

WKBH Callaway Music Co., 221 Main st., LaCrosse, Wis. 220.4 meters, 1360 kilocycles, 500 watts. Daily ex Sun, 10 am, weather report, talk & music; 12 noon, weather report, farm service, music. Sun, 10:30 am, church service; 6:30 pm, classical & vesper service. Mon, Wed, Fri & Sat, 8:30 pm, studio program. Wed, 9:30 pm, dance music. Fri, 7:30 pm. Central standard time.

WKBI Fred L. Schoenwolf, Lincoln Trust & Savings Bank Bldg., Chicago, Ill. 215.7 meters, 1390 kilocycles, 50 watts. Central standard time. Divides with WHPC.

WKBL Monrona Radio Mfg. Co., 16 S. Monroe, st., Monroe, Mich. 205.4 meters, 1460 kilocycles, 15 watts. Mon, 8-9 pm. Wed, 9-10:30 pm. Thurs, 8-10 pm. Fri, 8-11 pm. Sat, 9-12 pm. Slogan: "The Most Powerful 15-Watt Station in the World."

WKBN Radio Electric Service, 17-21 N. Champion st., Youngstown, Ohio. 214.2 meters, 1400 kilocycles, 50 watts. Eastern standard time. Divides time with WMBW.

WKBO Camith Corp., Jersey Observer Bldg., Jersey City, N. J. 218.8 meters, 1370 kilocycles, 500 watts. Eastern standard time. Divides time with WKBQ & WCGU.

WKBP Battle Creek Enquirer & News, Battle Creek, Mich. 212.6 meters, 1410 kilocycles, 50 watts.

WKBQ Starlight Amusement Park, 1100 E. 177th st., New York City, N. Y. 218.8 meters, 1370 kilocycles, 500 watts. Mon & Tues, 10 am-12 noon. Tues, 1-5 pm. Tues & Wed, 9 pm-12 midnight. Thurs, 1-3 pm. Thurs & Sun, 8 pm-12 midnight. Fri, 3-6 pm. Sat, 3-8 pm. Eastern standard time. Divides time with WKBO & WCGU.

WKDR Kenosha, Wis. 247.8 meters, 1210 kilocycles, 15 watts output. Sun, 2-3 pm, religious services. Sat, 11-12:30 pm.

WKBS Galesburg, Ill. 217.3 meters, 1380 kilocycles, 100 watts. Daily ex Sat & Sun, 10-11 am, 12:30-1 pm, 2:30-3:30 pm. Sun, 1:30-3 pm, church. Mon, Wed, Fri, 7-11 pm. Tues, Thurs, Sat, 7-9 pm, 10-11 pm. Sat, 12:30-1 pm, 11 pm-12 midnight. Central standard time. Divides time with WLBO. Slogan: "The Mayflower Station in the Renowned City of Colleges."

WKBT First Baptist Church, 3436 St. Charles av., New Orleans, La. 252 meters, 1190 kilocycles, 50 watts. Sun, 11 am & 7:30 pm, church services & special music.

WKBV Knox Battery & Electric Co., 658 Main st., Brookville, Ind. 217.3 meters, 1380 kilocycles, 100 watts.

WKBW Churchill Tabernacle, 1420-28 Main, Buffalo, N. Y. 217.3 meters, 1380 kilocycles, 500 watts night, 750 watts daytime. Sun, 9:30 am, 10:30 am, 3 pm, 7 pm, 10:15 pm-12 midnight. Daily, 7:30 pm. Mon, 7:45 pm. Wed, 9 pm, civil service exams; 9:15 pm, prayer service. Fri, 7 pm, Sunday School lesson. Eastern standard time. Slogan: "Well Known Bible Witness."

WKBZ Karl L. Ashbacker, First National Bank Bldg., Ludington, Mich. 199.9 meters, 1500 kilocycles, 15 watts.

WKEN Kenmore, Buffalo, N. Y. 204 meters, 1470 kilocycles, 250 watts. Sun, 11 am-12 noon, 7:30-8:30 pm. Daily ex Sun, 6-6:45 pm. Mon, Tues, Thurs, 8-11 pm. Eastern standard time. Divides time with Station WSVS, Wed, Fri evenings, 7:30-9:30 pm.

WKJC Kirk Johnson & Co., 16-18 W. King st., Lancaster, Pa. 252.0 meters, 50 watts, 1190 kilocycles. Sun, 9:30-12 noon, 7:30-9:30 pm. Mon, Wed, Fri, 7:30-9:30 pm. Sat, 2:30-4:30 pm. Eastern standard time. Divides time with WGAL.

WKRC The Kodel Radio Corp., 507 E. Pearl st., Cincinnati, Ohio. 245.8 meters, 1220 kilocycles, 500 watts. Sun, 11 am, church; 10 pm, classical; 11:15 pm, popular. Mon, Wed, 6 pm, dinner music; 8 pm, instrumental. Mon, 12 midnight, dance music. Wed, 8:30 pm, classical. Tues, 10 pm, vocal, instrumental; 11 pm, popular. Sat, 10 pm, dance program. Eastern standard time. Divides time with WFBE. Slogan: "WKRC—K. Kodel—R. Radio—C, Corporation."

WKY WKY Radiophone Co., Huckins Hotel, Oklahoma City, Okla. 288.3 meters, 1040 kilocycles, 150 watts. Daily ex Sun, 9:45 am, Sunshine Hour; 12 noon-1 pm, organ; 6:30-7:30 pm, dinner hour; 7:30-8 pm, organ; 8 pm-12 midnight, Huckins Hotel Studio. Sun, 11 am, 7:30 pm, church; 3-4 pm, concert. Central standard time.

WLAC Life and Casualty Insurance Co., Nashville, Tenn. 225.4 meters, 1330 kilocycles, 1000 watts. Sun, 6:30-7:30 pm, church; 9:15-10:15 pm. Daily ex Fri & Sun, 6:45-8:30 am, 11:45 am-12:35 pm. Mon, Wed, Sat, 6-9 pm. Tues & Thurs, 6-7 pm, 9-12 midnight. Central standard time. Divides time with WDAD. Slogan "The Thrift Station."

WLAP Virginia Av. Baptist Church, 2600 Virginia av., Louisville, Ky. 267.7 meters, 1120 kilocycles, 30 watts night, 100 watts daytime. Sun, 11 am-12 noon, 7:30-8:45 pm. Central standard time.

WLB University of Minnesota, Minneapolis, Minn. 245.8 meters, 1220 kilocycles, 500 watts. Mon, 7:30-8 pm. Tues, 6-7 pm, 8-9 pm. Wed, 6:15-7 pm, 7:30-8:30 pm. Fri, 4-5 pm, 7:30-8 pm. Central standard time. Divides time with WHDI.

WLBC D. A. Burton, 2224 S. Jefferson st., Muncie, Ind. 209.7 meters, 1430 kilocycles, 50 watts.

WLBF Everett L. Dillard, 300-A E. 33rd st., Kansas City, Mo. 209.7 meters, 1430 kilocycles, 50 watts. Daily ex Sun, 10 am-11 pm, popular & classical; 7:30-10:30 pm, popular & classical. Central standard time. Slogan: "Where Listeners Become Friends."

WLBG R. A. Gamble, 126 N. Sycamore st., Petersburg, Va. 214.2 meters, 1400 kilocycles, 100 watts. Irregular programs daily.

WLBH Joseph J. Lombardi, Farmingdale, N. Y. 232.4 meters, 1290 kilocycles, 30 watts.

WLBI Wenona Legion Broadcasters, 107 Chestnut st., Wenona, Ill. 238.0 meters, 1260 kilocycles, 250 watts. Sun, 11 am, church. Mon, 7-11 pm, music. Wed, 7-8 pm, lecture, music, etc. Thurs, 2-3 pm, markets, etc. Fri, 7-9 pm, music. Sat, 2-3 pm, 7-9 pm. Central standard time. Slogan: "In the Heart of the Corn Belt."

WLBL Wisconsin Department of Markets, Stevens Point, Wis. 333.1 meters, 900 kilocycles, 1000 watts. Daily ex Sun, 8, 9, 10 & 11 am, 12 noon, 1 pm, markets. Thurs & Sat, 8 pm, musical program. Central standard time. Divides time with Station WHA. Slogan: "Wisconsin, Land of Beautiful Lakes."

WLBM Boston, Mass. 230.6 meters, 1300 kilocycles, 50 watts.

WLBN William E. Hiler, 339 S. Homan av., Chicago, Ill. (Portable). 204.0 meters, 1470 kilocycles, 100 watts.

WLBO Frederick A. Trebbe, Jr., 526 Monmouth blvd., Galesburg, Ill. 217.3 meters, 1380 kilocycles, 100 watts. Central standard time. Divides time with WKBS.

WLBQ E. Dale Trout, Atwood, Ill. 218.8 meters, 1370 kilocycles, 25 watts. Central standard time.

WLBR Alford Radio Co., Belvidere, Ill. 247.8 meters, 1210 kilocycles. 15 watts.

WLBT Harold Wendell, 317 E. North st., Crown Point, Ind. 247.8 meters, 1210 kilocycles, 50 watts. Central standard time.

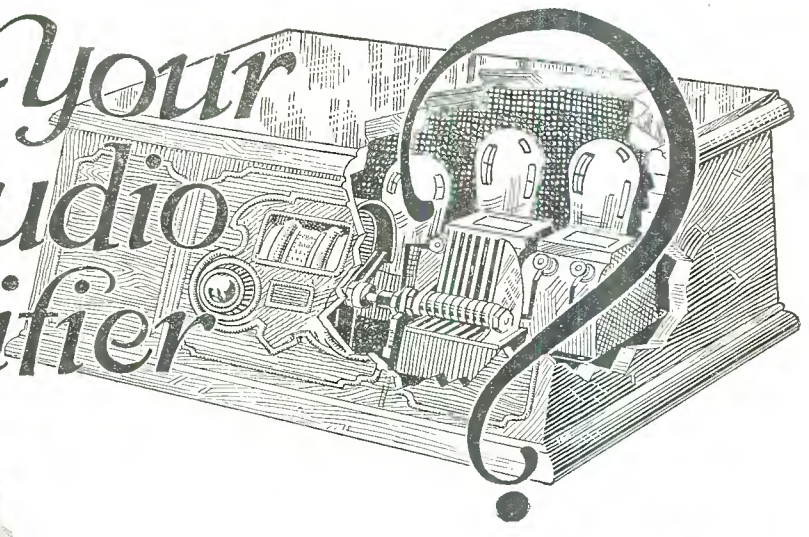
WLBV Mansfield Broadcasting Association, Chamber of Commerce Bldg., Mansfield, Ohio. 206.8 meters, 1450 kilocycles, 50 watts. Sun, 10:30-12 noon. Mon, Wed, 9 am-10 pm. Mon, 6-7 pm, dinner hour. Sat, 9:30-12 pm. Eastern standard time.

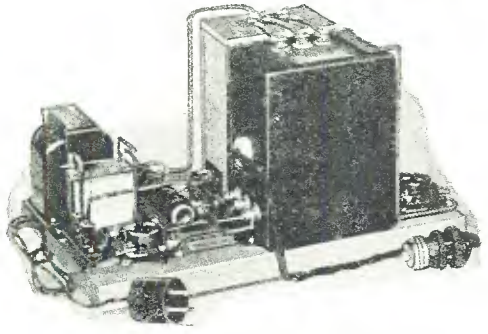
WLBW Northwestern Pennsylvania Broadcast Station, P. O. Box No. 163, Oil City, Pa. 293.9 meters, 1020 kilocycles, 500 watts. Sun, 3:30 pm, sacred. Daily ex Sun, 12:15-1:15 pm, 12 midnight. Mon, 9:30 pm, miscellaneous program. Thurs, 10 pm, miscellaneous program. Eastern standard time.

WLBX John N. Brahy, 283 Cr... Long Isla... N... meters, 1470 kilocy... ard time. Divides ...

WLBY Aimon... Iron M... 1430 kilocycles, 50 w...

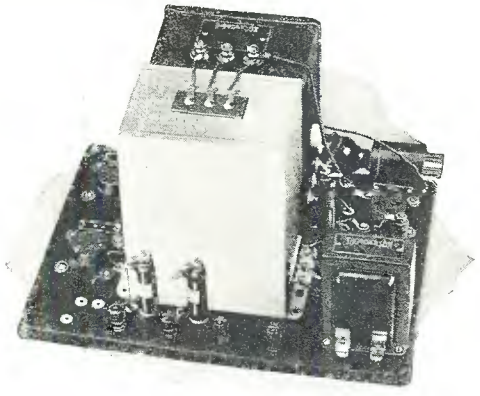
How's Your Old Audio Amplifier





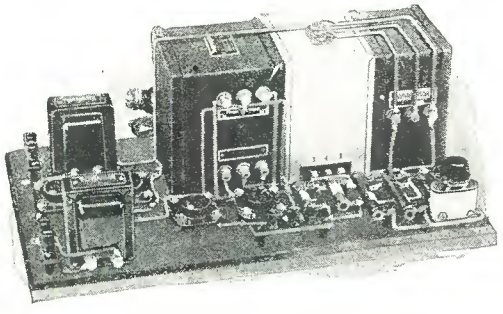
THORDARSON 171 TYPE
POWER AMPLIFIER

Built around the Thordarson Power Compact R-171, this power amplifier supplies "A," "B," and "C" current for one UX-171 power tube and B-voltage for the receiver. Employs Raytheon B. H. rectifier.



THORDARSON 210 TYPE
POWER AMPLIFIER

This amplifier, mounted on a special metal chassis, uses the Thordarson Power Compact R-210. Provides "A," "B," and "C" current for one UX-210 power tube and "B" voltage for the receiver. Employs one 216-B or 281 rectifier.



THORDARSON 210 PUSH-PULL
POWER AMPLIFIER

...vy duty power amplifier operates two 210 power ...sh-pull and has an ample reserve of power for for the heaviest drain receivers. Built with Power Transformer T-2098, and Double ...-2099.

A Home Assembled Thordarson Power Amplifier Will Make Your Receiver

A Real Musical Instrument

IMPROVEMENTS in the newer model receiving sets are all centered around the audio amplifier. There is no reason, however, why you cannot bring your present receiver up to 1928 standards of tone quality by building your own Thordarson Power Amplifier.

With a screw driver, a pair of pliers and a soldering iron you can build any Thordarson Power Amplifier in an evening's time in your own home. Complete, simple pictorial diagrams are furnished with every power transformer.

The fact that Thordarson power transformers are used by such leading manufacturers as Victor, Brunswick, Federal, Philco and Willard insures you of unquestionable quality and performance.

Give your radio set a chance to reproduce real music. Build a Thordarson Power Amplifier.

Write today for complete constructional booklets sent free on request.

THORDARSON

3572

THORDARSON ELECTRIC MANUFACTURING CO.
Transformer Specialists Since 1895
WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
Huron and Kingsbury Streets — Chicago, Ill. U.S.A.

WLBZ Thompson L. Guernsey. Dover-Foxcroft, Me. 208.2 meters, 1440 kilocycles, 250 watts.

WLCI Lutheran Association of Ithaca, Ithaca, N. Y. 247.8 meters, 1210 kilocycles, 50 watts.

WLEX Lexington, Mass. 215.7 meters, 1390 kilocycles, 5 watts. Eastern standard time.

WLIB Liberty Magazine, Chicago, Ill. 416.4 meters, 720 kilocycles, 15,000 watts. Daily ex Sun & Mon, 10:30-11 am, 11:30 am-12:40 pm, 7-8 pm, 11-12:30 am. Sun, 5-6 pm, 11 pm-12:30 am. Central standard time. Divides time with WGN. Slogan: "Liberty, a Weekly for Everybody."

WLIT Lit Bros., Philadelphia, Pa. 405.2 meters, 740 kilocycles, 500 watts, class B. Daily ex Sun, 12-1 pm, 2-3 pm, 4:30-5 pm. Mon, 12 noon to 11 pm. Tues, 11 am to 8 pm. Wed, 12 noon to 11 pm. Thurs & Sat, 12 noon to 8 pm. Fri, 12 noon to 12 midnight. Eastern standard time. Divides time with WFI. Slogan: "The Quaker City Siren."

WLOE Chelsea, Mass. 211.1 meters, 1420 kilocycles, 100 watts. Eastern standard time. Divides with WMES.

WLS Sears, Roebuck & Co., Chicago, Ill. 344.6 meters, 870 kilocycles, 5000 watts. Sun, 10:45-12:20, U. of C. church; 12:20-1, organ; 1-1:30, trio concert; 6-8, Little Brown church. Mon, markets; 9-9:10-10-10:30-11-11:30-11:45, markets every day ex Sun; R. F. D. program & markets, 12-1 pm; closing markets every day, 1:25-1:35; home makers' hour, Mon, Tues, Wed, Fri, 2:30-3:30 pm; organ every day ex Sat & Sun, 5:30. Birthday time, ex Sat & Sun, 5:45 pm. Supper bell program ex Sun, 6 pm. Sports time ex Sun, 6:30 pm. Mon, 7-10:30 pm. Tues, 5:30-8, 10:30-12:30 pm. Wed, 5:30-12 pm. Thurs, 5:30-8, 10:30-12:30 pm. Fri, 5:30-12 pm. Sat, 6-1 am. Central standard time. Divides time with WCBD. Slogans: "World's Largest Store," "Work Better, Live Better, Sell Better."

WLSI Lincoln Studios (Ind.), 335 Westminster St., Providence, R. I. 260.7 meters, 1150 kilocycles, 250 watts. Eastern standard time. Divides time with WDWF.

WLTH "The Voice of Brooklyn," Inc., Leverick Towers Hotel, Brooklyn, N. Y. 256.3 meters, 1170 kilocycles, 250 watts. Sun, 11 am-2 pm, 5-6 pm, 9-11 pm. Mon, 10 am-1 pm, 5-6 pm, 9-11 pm. Tues, Wed, Thurs, 4-7 pm. Tues, Wed & Sat, 9 pm-12 midnight. Thurs, 9 pm-2 am. Fri 5-7 pm. Sat, 4-6 pm. Eastern standard time. Divides time with WBBR & WEBJ.

WLTS Lane Technical High School, 1225 Sedgwick st., Chicago, Ill. 483.6 meters, 620 kilocycles, 100 watts. Daily ex Sat & Sun, 2-4 pm, musical & educational. Mon, 6-7 pm, musical. Central standard time. Slogan: "World's Largest Technical School." Divides time with WCFL & WEMC.

WLW The Crosley Radio Corp., Harrison, Ohio. 428.3 meters, 700 kilocycles, 52.02 meters, 5764 kilocycles, 5000 watts. Daily ex Sun, 8 am through 12 noon. Sat, 10 am through 12 noon, 12:45-11 pm. Mon, Tues, Wed, Thurs, 1:30-11 pm. Fri, 1:30-9 pm. Music, news, talks, chain programs, etc. Sun, 9:30, 11 am, church services; 3 pm, 4 pm, 7:10 through 10:15 pm. Eastern standard time.

WLWL Kearney, N. J. 370.2 meters, 810 kilocycles, 1000 watts. Eastern standard time. Divides time with WMCA.

WMAC Clive B. Meredith, Cazenovia, N. Y. 225.4 meters, 1330 kilocycles, 500 watts. Sun, 3:30 pm, choral singing; 9:30 pm, popular program. Mon, 8:30, semi-classical program; 7:30, Weekly Letter to Dad. Daily ex Sun & Mon, 7:30 pm. Tues, Autobiography of Infamous Bugs. Wed, Chats with Weatherman; 8:30, popular program. Thurs, Primer for Town Farmers. Fri, 7:30 pm, Agricultural Interview; 8:30 pm, classical program. Sat, Farm News Digest. Eastern time. Divides time with WSYR. Slogan: "Voice of Central New York."

WMAF Round Hills Radio Corp., South Dartmouth, Mass. 428.3 meters, 700 kilocycles, 500 watts. Eastern standard time.

WMAK WMAK Studios, Inc., Liberty Bank Bldg., Buffalo, N. Y. 545.1 meters, 550 kilocycles, 750 watts. Sun, 10 am-12 noon, 2-5 pm, 7-11 pm. Daily ex Sun, 11 am-12 noon, 1:30-6 pm, 6 pm-12 midnight. Eastern standard time.

WMAL Washington Radio Forum, owned & operated by the M. A. Leese Radio Co., 720 11th st., N. W., Washington, D. C. 241.8 meters, 1240 kilocycles, 500 watts. Daily, 6:45-11 pm, varied programs. Eastern standard time.

WMAN W. E. Heskett Radio Station, First Baptist Church, Columbus, Ohio. 234.2 meters, 1280 kilocycles, 50 watts. Sun, 10:30 am-12 noon; 7:30-9 pm, church services. Eastern standard time. Divides time with WCAH.

WMAQ The Chicago Daily News, 15 N. Wells st., Hotel La Salle, Chicago, Ill. 447.5 meters, 670 kilocycles, 1000 watts. Daily ex Sun & Mon, 6:30-11 am, 12 noon-3 pm, 4-6 pm, 7-10 pm. Sun, 4-6 pm, 7-10 pm. Mon, 3-11 am, 12 noon, 3 pm, 4-6 pm. Central standard time. Divides time with WQJ.

WMAY Kingshighway Presbyterian Church, St. Louis, Mo. 234.2 meters, 1280 kilocycles, 100 watts. Sun, 11 am-12 pm, 8-9 pm, church services. Central standard time. Divides time with KWK & KFQA.

WMAZ Mercer University, Macon, Ga. 270.1 meters, 1110 kilocycles, 500 watts. Tues, Wed & Thurs, 8-9:15 pm. Fri, 11 pm-12:15 pm. Eastern standard time. Divides time with WGST. Slogan: "Watch Mercer Attain Zenith."

WMBA Leroy J. Beebe, 13 Robinson st., Newport, R. I. (Portable). 204.0 meters, 1470 kilocycles, 100 watts.

WMBB American Bond & Mortgage Co., 6201 Cottage Grove av., Chicago, Ill. 252.0 meters, 1190 kilocycles, 5000 watts. Sun, 3-6 pm, popular concert program; 7:40-9 pm, Christian Science services; 9-11 pm, popular program. Daily ex Sun, Mon, 7-8:30 pm, semi-classical program; 9-10 pm, popular program. Tues & Fri, 7-10 pm, quartet. Central standard time. Slogan: "World's Most Beautiful Ballroom."

WMBC Michigan Broadcasting Co. (F. G. Siegel), Hotel Savoy, Detroit, Mich. 243.8 meters, 1230 kilocycles, 100 watts. Sun, 6:30-10 pm, dinner hour, studio program. Daily ex Sun & Sat, 6-6:30 pm, Children's Hour; 6:30-10 pm, dinner hour, studio program. Sat, 6-6:30 pm, Children's Hour, 6:30-8 pm, dinner hour. Eastern standard time.

WMBD Peoria Heights Radio Laboratory, Peoria Heights, Ill. 205.4 meters, 1460 kilocycles, 250 watts. Sun, 11 am-12 noon, church. Daily ex Sun, 6:55-7:30 pm, markets; 8-10 pm, studio program. Central standard time. Slogan: "World's Most Beautiful Drive."

WMBE Dr. C. S. Stevens, St. Paul, Minn. 208.2 meters, 1440 kilocycles, 10 watts. Central standard time. Slogan: "The Winter Garden Station."

WMBF Fleetwood Hotel Corp., Miami Beach, Fla. 384.4 meters, 780 kilocycles, 500 watts. Daily, 7-8 pm, concert orchestra; 8-9 pm, popular program; 10-1 am, dance music. Eastern time. Divides time with WQAM. Slogan: "Wonderful Miami Beach Fleetwood."

WMBG Havens & Martin, 914 W. Broad St., Richmond, Va. 220.4 meters, 1360 kilocycles, 15 watts. Daily ex Sun, 2-3 pm, 6-8 pm. Eastern standard time. Divides time with WTAZ. Slogan: "The Daytime Station."

WMBH Joplin, Mo. 204.0 meters, 1470 kilocycles, 100 watts. Central standard time.

WMBI The Moody Bible Institute of Chicago, 153 Institute pl., Chicago, Ill. 263.0 meters, 1140 kilocycles, 5000 watts. Sun, 3:30-5 pm, 5-7 pm, Bible Exposition and sacred music. Daily ex Sun, 7-7:40 am, morning worship; 10:30-11:30 am, missionary hour, Bible study; 12:30-1:30 pm, organ program; 3:30-4:30 pm, reading & music; 8-9 pm, Bible study or sacred program. Central standard time. Divides time with WJAZ. Slogan: "The West Point of Christian Service."

WMBJ Wm. Roy McShaffrey, Monessen, Pa. 232.4 meters, 1290 kilocycles, 50 watts.

WMBK John C. Slade, Hamilton, Ohio, 205.4 meters, 1460 kilocycles, 100 watts. Sat & Sun, 2:30-4 pm, 10 pm-12 midnight. Daily ex Sun, 1-2 pm, 6:45-10:30 pm. Eastern standard time.

WMBL Benford Radio Studios, Lakeland, Fla. 228.9 meters, 1310 kilocycles, 100 watts. Sun, church services, morning & evening. Daily ex Sun, 10:30 am-1:30 pm, varied program; 2:30-3:30 pm, varied; 8-9:30 pm, classical; 9:30-10:30 pm, popular; 10:30-11:30 pm, dance program. Eastern standard time. Slogan: "Lakeland—The City of Heart's Desire."

WMBM Memphis, Tenn. 209.7 meters, 1430 kilocycles, 10 watts.

WMBO Auburn, N. Y. 220.4 meters, 1360 kilocycles, 100 watts.

WMBQ 95 Leonard St., Brooklyn, N. Y. 204 meters, 1470 kilocycles, 100 watts. Eastern standard time. Divides time with WIBS, WLBX. Slogan: "The Home, Sweet Home Station of Williamsburgh."

WMBR F. J. Reynolds, 109 Franklin st., Tampa, Fla. 252.0 meters, 1190 kilocycles, 100 watts. Daily ex Sun, 1-2 pm, weather reports, organ; 7-8 pm, baseball returns, orchestra. Tues, 7-8 pm, orchestra. Wed, 9-10 pm, musical. Fri, 10 pm, fight returns. Sat, 8-10 pm, musical. Eastern standard time. Slogan: "WMBR, Everything for Radio at Tampa, Florida."

WMBS Macks Battery Service, 210 Locust st., Harrisburg, Pa. 234.2 meters, 1280 kilocycles, 250 watts. Sun, 9 am-9pm. Daily ex Sat & Sun, 6-11:30 pm. Sat, 6 pm-2 am. Eastern standard time.

WMBW Youngstown, Ohio. 214.2 meters, 1400 kilocycles, 50 watts. Eastern standard time. Divides time with WKBN.

VITROHM RESISTORS *and* RHEOSTATS

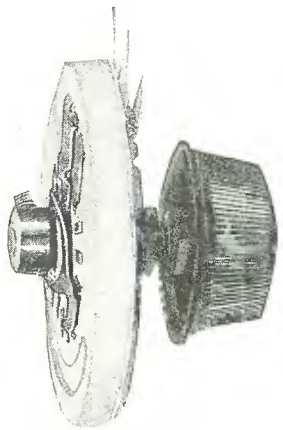
Vitrohm Radio Resistors

WARD LEONARD Resistors and Rheostats are now available to the experimenter and home constructor in 93 types and styles covering the resistance demands of ***every*** current supply circuit.

A few of these products are listed on this page. A full description is contained in Radio Bulletin 507 which will be sent you without charge.

"Vitrohm News," a monthly Bulletin covering circuits and items of interest to the radio fan, was first published in September. This copy and subsequent issues will be sent you upon request.

WL VITROHM RESISTORS



THE ADJUSTAT

The Adjustat

The Vitrohm Adjustat is a 15-step potentiometer connected rheostat adopted for use in all current supply circuits. Like all Vitrohm Products, the resistive element, wire, is embedded in and protected by fused-on vitreous enamel.

The Adjustat is priced at $3.00.

Types

507-79	1 ohm	4000 m. a.	507-81	600 ohms	180 m. a.
507-71	2 ohms	3000 m. a.	507-75	1000 ohms	125 m. a.
507-72	6 ohms	1500 m. a.	507-76	2250 ohms	90 m. a.
507-73	20 ohms	1000 m. a.	507-84	7500 ohms	50 m. a.
507-74	30 ohms	800 m. a.	507-77	10,000 ohms	40 m. a.
507-80	50 ohms	650 m. a.	507-78	25,000 ohms	20 m. a.

Resistor 507-66

Vitrohm Resistor 507-66 is a transmitting grid leak for circuits up to and including 1000 watts input. It is particularly recommended for circuits employing the R. C. A. UX852 Tube.

Total Resistance 15,000 ohms, tapped at 5000 and 10,000 ohms. $6.00.

RESISTOR 507-66

RESISTOR 507-9

Resistor 507-9

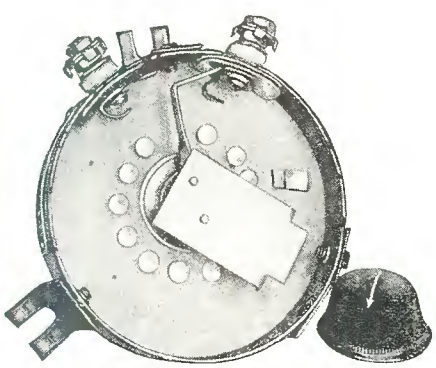
This resistor is for use in B & C Supply Circuits having an output under load of 180 volts. At this voltage, intermediate voltages of 22, 45, 67, 90 and 135 are available. Priced at $6.75.

Vitrohm
HEAVY DUTY Rheostat

The Vitrohm *heavy duty* Rheostat has 11 steps of adjustable resistance. It is particularly adaptable to use in series with transformer primaries to compensate for line voltage changes. These Rheostats are 4 inches in diameter and are arranged for either base or panel mounting. $5.50.

Types

507-83	12.5 ohms	2200 m. a.
507-59	20 ohms	2000 m. a
507-63	50 ohms	100 m. a.



VITROHM *HEAVY DUTY* RHEOSTAT

Ward Leonard Electric Company

31-41 South Street **Mount Vernon, N. Y.**

resistor specialists for more than 35 years

WMC Commercial Publishing Co., The Commercial Appeal, 30 N. 2nd st., Memphis, Tenn. 516.9 meters, 580 kilocycles, 500 watts. Sun, 11 am, church services. Daily ex Sun, 9:45 am, markets. Mon, Wed, Fri, 12 noon, music. Tues, Thurs, 12 noon, markets. Mon, 8 pm, farm talks. Tues, 7:45 pm, bridge game. Thurs, 8 pm, music. Mon, Tues, Fri, Sat, 8:30-11 pm, music, frolic. Central standard time. Slogan: "WMC, Memphis, Down in Dixie."

WMCA Hotel McAlpin (Greeley Square Hotel Co.), New York City. 370.2 meters, 810 kilocycles, 500 watts. Sun, 11 am-1 am. Daily ex Sun, 10:30 am-1 am. Eastern standard time. Divides time with WLWL. Slogan: "Where the White Way Begins."

WMES Boston, Mass. 211.1 meters, 1420 kilocycles, 50 watts. Eastern standard time. Divides with WLOE.

WMPC First Methodist Protestant Church, Lapeer, Mich. 234.2 meters, 1280 kilocycles, 30 watts. Sun, 10:30 am-1 pm, 4-5:30 pm, 7:30-10:00 pm. Daily ex Sat & Sun, 12 noon-1 pm. Mon, Tues, Wed, Fri, 7:30-10 pm. Programs include sermons, vocal, instrumental music, missionary, church & educational services. Eastern standard standard time. Slogan: "Where Many Preach Christ."

WMRJ Peter J. Prinz, 10-12 New York av., Jamaica, N. Y. 206.8 meters, 1450 kilocycles, 10 watts. Sun, 11:30 am-2:30 pm, 8:30-11:30 pm. Tues & Thurs, 8-11:30 pm. Eastern time. Slogan: "The Gateway of the Sunrise Trail." Divides with WTRL & WHPP.

WNAC The Shepard Store, Winter St., Boston, Mass. 461.3 meters, 650 kilocycles, 500 watts. Sun, 10:45 am, church services; 12:15-5 pm, concert; 7:30-9 pm, church services; 9-11 pm, Columbia chain. Daily ex Sun, 9:30-10:30 am, 10:30-11:30 am, Women's Club; 11:30-am-12:15 pm, 12:15-1 pm, church; 1-2 pm, luncheon concert; 4-5 pm, Theatre Hour, music; 6-6:30 pm, children's club; 6:30-7:30 pm, dinner dance; 7:30-8 pm, news & talks; 8-11 pm, concert; 11 pm-12 midnight, dance program. Eastern standard time.

WNAD University of Oklahoma, Norman, Okla. 239.9 meters, 1250 kilocycles, 500 watts. Mon & Thurs, 7:15-9:30 pm. Tues, 12:15-1 pm. Wed, 7:15-8:45 pm. Fri, 12:15-1 pm. Sat, broadcast of athletic events & special features. Central standard time. Slogan: "The Voice of Soonerland."

WNAL R. J. Rockwell, 5019 Capitol av., Omaha, Neb. 258.5 meters, 1160 kilocycles, 250 watts. Tues, Fri, 7:30-9 pm. Central standard time. Divides time with KOCH, KFOX. Slogan: "Pioneer Station of Omaha."

WNAT Lennig Bros. Co., Spring Garden & 9th st., Philadelphia, Pa. 288.3 meters, 1040 kilocycles, 100 watts. Tues, Wed, Sat, 8:11 pm. Eastern standard time. Divides time with WIAD. Slogan: "We Never Are Tired."

WNAX Gurney Seed & Nursery Co., Yankton, So. Dak. 277.6 meters, 1080 kilocycles, 1000 watts daytime, 250 watts nighttime. Daily ex Sun & Tues, 11 am-1:30 pm, 2:30-10 pm. Sun, 11 am-12 noon, 2-7 pm. Tues, 11 am-1:30 pm, 2:30-7 pm. Central standard time.

WNBA Forest Park, Ill. 208.2 meters, 1440 kilocycles, 200 watts.

WNBF Howitt-Wood Radio Co., Inc., Endicott, N. Y. 208.6 meters, 1450 kilocycles, 50 watts. Sun, 12:30-2 pm, 7:30-9:30 pm. Thur, 7:30-10 pm. Eastern standard time. Slogan: "The Voice of the Triple Cities."

WNBH New Bedford Hotel, Pleasant st., New Bedford, Mass. 247.8 meters, 1210 kilocycles, 250 watts. Mon, Wed, Fri, 6-10:30 pm, musical program. Tues, Thur, Sat, 7-7:30 pm, news reports, sports. Eastern standard time. Slogan: "The Gateway to Cape Cod."

WNBJ Knoxville, Tenn. 206.8 meters, 1450 kilocycles, 50 watts. Central standard time.

WNBL Bloomington, Ill. 199.9 meters, 1500 kilocycles, 15 watts.

WNBO Symplex Electrical & Radio Research Laboratories, George Washington Hotel, Washington, Pa. 211.1 meters, 1420 kilocycles, 15 watts. Sun, 11-12 noon, 10-11 pm, church services. Mon, Tues, Thur, Fri, 3:30-4:30 pm, 9-11:30 pm, orchestra, baseball, weather. Sat, 3:30-4:30 pm, 9:30-12 pm, orchestra, studio programs. Eastern standard time. Slogan: "The Voice of Washington, Pa."

WNBQ Rochester, N. Y. 205.4 meters, 1460 kilocycles, 15 watts.

WNBR Memphis, Tenn. 228.9 meters, 1310 kilocycles. 100 watts. Sun. 2:30 pm, musical program of sacred numbers. Mon, Thurs, Fri, Sat, 6:30 pm, musical program. Tues. 6:30 pm, Old Time Melody Makers. Wed, 6:30 pm, Bible talk. Central standard time. Divides time with WGBC.

WNBW Carbondale, Pa. 199.9 meters, 1500 kilocycles, 5 watts. Eastern standard time.

WNBX Springfield, Vt. 241.8 meters, 1240 kilocycles, 10 watts. Eastern standard time. Divides time with WFCI.

WNBZ Saranac Lake, N. Y. 232.4 meters, 1290 kilocycles, 10 watts. Eastern standard time.

WNJ Herman Lubinsky, 89 Lehigh av., Newark, N. J. 267.7 meters, 1120 kilocycles, 250 watts. Daily ex Mon & Thurs, 6-6:30 pm, 8:30-12 pm, dance music. Eastern standard time. Divides time with WGCP, WAAM. Slogan: "The Voice of Newark."

WNOX Peoples Tel. & Tel. Co., 313 Commerce st., Knoxville, Tenn. 265.3 meters, 1130 kilocycles, 1000 watts. Mon, Wed, Fri, 12 noon-9 pm. Central standard time. Slogan: "Smoky Mountain Station."

WNRC Wayne M. Nelson, Greensboro, N. C. 223.7 meters, 1340 kilocycles, 250 watts. Sun, 11:15 am & 7:30 pm, church. Mon & Wed, 6:45-9 pm. Tues, 7-9 pm. Thurs, 7-10 pm. Fri, 6:45-8:30 pm. Eastern standard time.

WNYC City of New York, New York City, N. Y. 526 meters, 570 kilocycles, 500 watts, class B. Daily ex Sun, 6-11 pm. Mon, Wed, Fri, 11 am-12:30 pm. Sun, irregular. Eastern standard time. Slogan: "Municipal Broadcasting Station of the City of New York."

WOAI Southern Equip. Co., San Antonio, Tex. 499.7 meters, 600 kilocycles, 5000 watts. Sun, 11 am-7:30 pm, church services. Daily ex Sat, Sun, Mon, 8:30-9:30 pm. Varied program. Central standard time. Divides time with WBAP. Slogan: "The Winter Playground of America."

WOAN The Vaughan School of Music, Lawrenceburg, Tenn. 239.9 meters, 1250 kilocycles, 500 watts. Daily ex Sun, 9-10 pm, musical. Central standard time. Divides time with WBAW. Slogan: "Watch Our Annual Normal."

WOAX Franklin J. Wolff, the Monument Pottery Co., Trenton, N. J. 239.9 meters, 1250 kilocycles, 500 watts. Daily ex Sun, 12:15-1 pm, music, weather forecast, etc. Wed, 7:30-9:30 pm, popular program. Fri. 7:30-9:30 pm, popular program. Fri, 7:30-8:30 pm. Sun, 7:30-8:30 pm, classical and dance orchestra. Eastern standard time. Divides time with WCAP. Slogan: "Trenton Makes, the World Takes."

WOBR Shelby, Ohio. 204.0 meters, 1470 kilocycles, 10 watts. Eastern standard time.

WOBT Union City, Tenn. 205.4 meters, 1460 kilocycles, 15 watts. Central standard time.

WOBU Charleston, W. Va. 267.7 meters, 1120 kilocycles, 50 watts. Eastern standard time.

WOC The Palmer School of Chiropractic, 1002 Brady st., Davenport, Iowa. 374.8 meters, 800 kilocycles, 5000 watts. Sun, 11 am-12:15 pm, church; 12:15 pm-3 pm, WJZ & WEAF programs; 4:30-5:30 pm, WEAF program; 7-8 pm, church; 8:15-9:15 pm, Atwater-Kent hour; 9:15-10:15 pm. Daily ex Sun, 7-8 am, 9:45-10 am, 5:45-6 pm. Wed, Thurs, Fri, 10-10:15 am, 10:15 am-12 noon. Mon & Tues, 11 am-12 noon. Sat, 11-11:15 am, 12:57-1 pm, 7-9 pm. Wed, 4-5 pm. Mon & Wed, 7-10:30 pm. Tues, 7-9:30 pm. Thurs & Fri, 7-10 pm. Daily ex Sat & Sun, 1:57-3:30 pm. Music, weather reports, talks, chain programs broadcast. Central standard time.

WOCL A. E. Newton, Jamestown, N. Y. 223.7 meters, 1340 kilocycles, 25 watts. Sun, 10:30 am & 7:30 pm, church service. Mon, 9-9:15 pm, 9:15-12 midnight, educational feature popular program. Eastern standard time.

WODA The O'Dea Temple of Music, 115 Ellison st., Paterson, N. J. 293.9 meters, 1020 kilocycles, 1000 watts. Sun, 10:30 am, 7:30 am, church services. Daily ex Sun, 12-1 noon; 5-7 pm, studio; 8-11 pm, studio. Tues, 11:30-12:30 am, Nite Club. Thurs, 11-12 midnight, Nite Club. Fri, 10:30-11:30 pm, dance; 11:30-12:30 am, Nite Club. Eastern standard time. Divides time with WGL. Slogan: "The Voice of the Silk City."

WOI Iowa State College, Ames, Iowa. 265.3 meters, 1130 kilocycles, 2500 watts night time, 5000 daytime. Daily ex Sun, 7 am, 7:30 am, 8:45 am, 9:30 am, 10 am, 10:30 am, 12:10-12:45 pm, 1 pm, music; 1:30 pm, 9:30 pm, market reports, weather, varied programs. Mon, 7-9 pm. Mon & Thurs, 7:30 pm, 7:45 pm, 8 pm. Sat, 4:15 pm. Talks, music, etc. Sun, 10:45 am, chimes; 11 am, church; 3:15 pm. Central standard time.

WOK & WMBB Neutrowound Radio Mfg. Co., Homewood, Ill. 252.0 meters, 1190 kilocycles, 5000 watts. Daily ex Sun, 6-7 pm, 8-9 pm, 11 pm-12:30 am. Sun, 6 pm-12 am, orchestra & popular program. Central standard time.

WOKO Harold E. Smith, Peekskill, N. Y. 215.7 meters, 1390 kilocycles, 250 watts. Mon, Thur, Sat, 7-12 pm. Tues & Fri, 7-12 pm, non-regular. Eastern standard time.

WOKT Titus-Ets Corp., 608 Terminal Bldg., Rochester, N. Y. 209.7 meters, 1430 kilocycles, 500 watts. Sun, 11 am-12:30 pm, religious. Daily ex Sun, 11:30 am-12 midnight, musical and educational programs. Eastern standard time. Slogan: "Where the Better Programs Are Broadcast From."

WOMT The Mikadow Theater, Manitowoc, Wis. 222.1 meters, 1350 kilocycles, 100 watts.

Announcing New and Improved

AERO COIL
SUPER-SENSITIVE
INDUCTANCE UNITS

New AERO Circuits For Either Battery or A. C. Operation

Once more improved! These two popular Aero kits, for the improved Aero-Dyne 6 and the Aero Seven, are now adaptable to either battery or A. C. operation. Proper constants have been satisfactorily studied out and A. C. blue prints packed with each foundation unit. These blue prints may also be obtained separately by sending 25c for each direct to the factory.

Code No. U-16

The AERO Universal Tuned Radio Frequency Kit
Kit of 4 Coils (For Improved Aero-Dyne 6)

Kit consists of 4 twice matched units—adaptable to 201-A, 199, 112 and the new 240 and A. C. tubes. Tuning range below 200 to above 550 meters. This kit will make any set better in selectivity, tone and range. Will eliminate losses and give the greatest receiving efficiency. Each kit is carefully matched at both ends of the broadcast range.

For .0005 Condenser, Code No. U-16 ..... Price $15.00
For .00035 Condenser, Code No. U-163 ..... Price 15.00

The AERO Universal Tuned Radio Frequency Kit
Kit of 3 Coils (For Aero-Seven)

Kit consists of 3 twice matched units—adaptable to 201-A, 199, 112 and the new 240 and A. C. tubes. Coils are wound on Bakelite skeleton froms, assuring a 95% air di-electric. Range from 200 to above 550 meters. Each kit carefully matched at both ends of the broadcast range.

For .0005 Condenser, Code No. U-12 ..... Price $12.00
For .00035 Condenser, Code No. U-123 ..... Price 12.00

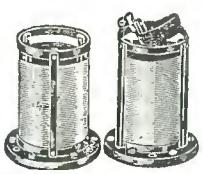
Code No. U-12

AERO Universal 3-Circuit Tuner

In the form of a 3 circuit tuner with a fixed tickler, this Aero Coil will improve any circuit. Adaptable only to 201-A, 199, 112, or the new A. C. Tubes. Has variable primary for governing selectivity.

Code U-55 (for .0005 Condenser) or Code U-553 (for .00035 Condenser)..Price $4.00

AERO Radio Frequency Regenerative Kit



The supersensitive kit used in the new Aero 4 and The Chicago Daily News Receiver will improve the efficiency of any circuit for use with 201-A, 112, 199, and the new A. C. Tubes. Used as .0005 variable condenser to tune fixed tickler.

Code U-95 (for .0005 Condenser) or Code U-953 (for .00035 Condenser) ..... Price $8.00

AERO Universal Antenna Coupler

A highly efficient low-loss and antenna coupler with variable primary, adaptable to 201-A, 199, 112, 240 and the new A. C. Tubes.

Code No. U-96 (for .0005 Condenser) or Code No. U-963 (for .00035 Condenser). Price $4.00

AERO Universal Wave Trap Unit

Makes an excellent wave trap due to low distributive capacity and low high frequency resistance. Helps greatly in eliminating interference. Can also be used to improve efficiency of Crystal Sets.

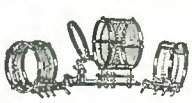
Code No. U-4 (for .0005 Condensers) or Code No. U-43 (for .00035 Condenser) ..... Price $4.00

AERO "No-Skip" Choke 60

Has uniform choking action over a wide range of wave lengths. Eliminates customary "holes" in the tuning range—so common with ordinary chokes. You will find the Aero "No-Skip" Choke 60 perfect in every respect.

Price each $1.50

AERO Short Wave Kit



The most efficient and satisfactory short wave kit ever offered. Completely interchangeable, and covers U. S. Bands range 15 to 130 meters. Kit consists of 3 coils and base mountings.

Code No. L. W. T. 125 ..... Price $12.50

AERO Transmitter Kits

An interchangeable Transmitter Kit at last. Kit 2040-K has range of 16.5 to 52 meters. Kit 4080-K has range of 36 to 90 meters. Kit includes two mounting bases and two choke coils that are interchangeable.

Price (each kit) $12.00

AERO "No-Skip" Choke 248

Designed for use with Aero Transmitter Kits and other circuits. Prevents a high impedance over usual amateur wave lengths.

Price each $1.50

IMPORTANT NOTICE

We furnish foundation units, drilled and engraved by Westinghouse Micarta for the Aero Short Wave, Aero 6, Aero 7, Aero 4, and The Chicago Daily News 4 tube circuits. This is a special service for the home set builder. Full working blue prints with each unit. Dealers may secure samples of blue prints to show their trade for 25c each.

Any of these Aero Kits, Coils and Chokes should be available at your dealer's. If he cannot supply you, order direct from the factory. Be sure to specify code or key numbers when ordering.

AERO PRODUCTS, Inc., Dept. 113
1772 Wilson Avenue Chicago, Ill.

WOO John Wanamaker, Philadelphia, Pa. 348.6 meters, 860 kilocycles, 500 watts. Daily ex Sun, 11 am, music; 11:30, weather; 11:55 am, time signals; 12 noon, music; 4:40 pm, news reports; 4:45 pm, musical; 9:55 pm, time signals; 10.02 pm, weather report. Mon, Wed, Fri, 7:30-11 pm, concerts. Sun, 10:45 am or 7:45 pm, 2:15 pm, Sunday school musical program; 6 pm, organ recital. Eastern standard time. Divides time with WIP & WGBS.

WOOD Walter B. Stiles, Inc., Hotel Rowe, Grand Rapids, Mich. 260.7 meters, 1150 kilocycles, 500 watts. Sun, 9-10 pm. Daily ex Sun, 9-11 pm, popular request programs, vocal and dance programs. Central standard time. Divides time with WCMA. Slogan: "The Voice of the Whispering Pines."

WOQ Unity School of Christianity, 917 Tracy av., Kansas City, Mo. 340.7 meters, 880 kilocycles, 500 watts. Sun, 11 am-12:30 pm, 2:30-3 pm, 7:45-9 pm, church. Daily ex Sun & Thurs, 6-7 pm, concert; 11 pm, prayer service. Mon, 9-10 pm. Wed & Fri, 8-10 pm, concert. Sat, 10-11 pm, healing service. Central standard time. Divides with WHB.

WOR L. Bamberger & Co., 46 Bank st., Newark, N. J. New York Studio, 1440 Broadway, New York City. 422.3 meters, 710 kilocycles, 3500 watts. Mon, 3:45 pm, 5:15-12 pm. Tues & Thurs, 5:15-7:30 pm. Wed, 5:15-11 pm. Fri, 5:15-6:30 pm. Sat, 3 pm, 6:30-12 pm. Eastern standard time.

WORD International Bible Students Association, 2150 Lincoln Park West, Chicago, Ill. 252.0 meters, 1190 kilocycles, 5000 watts. Sun, 6-7:10 pm. Daily ex Sun, Mon, 6-7:10 pm. Mon, 6-7 pm. Central standard time. Slogan: "The Watch Tower, Radio WORD."

WOS Missouri State Marketing Bureau, Board of Agriculture, Jefferson City, Mo. 422.3 meters, 710 kilocycles, 500 watts. Daily ex Sun, 9 am, 10 am, 11 am, 12 noon, 1 pm, 2 pm, 7 pm, 7:15 pm. Markets, weather reports, bonds, stocks, news, etc. Central standard time. Slogan: "Watch Our State."

WOW The Voice of the Woodmen of the World Life Insurance Association, Headquarters Bldg., Omaha, Neb. 508.2 meters, 590 kilocycles, 1000 watts. Sun, 9-11 am, 2-3 pm, 4-5:30 pm, 6-11 pm. Daily ex Sun, 8-9 am & 10-11:30 am, stock reports and commercial instructions; 12:30-2 pm, 3-5 pm, stock reports, news period & musical program; 6-7 pm, dinner concert; 7-11 pm, chain & other concert programs. Central standard time. Slogan: "The Omaha Station."

WOWO The Main Auto Supply Co., 215 W. Main st., Fort Wayne, Ind. 228.9 meters, 1310 kilocycles, 2500 watts night, 5000 watts daytime. Sun, 4-5 pm, church; 8-10 pm, Columbia chain. Daily ex Sat & Sun, 10:30 am-12 noon, news, reports, music, etc. Daily ex Sun, 12 noon-1:30 pm, musical program. Mon, 6:15-8 pm, 10-11:30 pm. Wed, Thurs, Fri, 7-8 pm. Mon, Wed & Fri, 8-10 pm, Columbia chain. Wed, 10-11 pm. Thurs, 8-9 pm, 9-11 pm. Sat, 6-6:45 pm, news, etc. Central standard time.

WPAP & WQAO Palisade Amusement Park, Cliffside, N. J. 394.5 meters, 760 kilocycles, 500 watts. Eastern standard time. Divides time with WHN.

WPCC North Shore Congregational Church, Chicago, Ill. 223.7 meters, 1340 kilocycles, 500 watts. Central standard time. Divides time with WFKB & WCRW.

WPCH Eastern Broadcasters, Inc., Park Central Hotel, New York City, N. Y. 325.9 meters, 920 kilocycles, 500 watts. Mon, 7-9 pm, 10 pm-midnight. Tues, 4-7 pm. Wed, 6-10 pm. Thurs, 4-12 pm. Sat, 4-7 pm, 11 pm-2 am. Sun, 6:30 pm-midnight. Eastern standard time. Slogan: "Voice of Central Park." Divides with WRNY.

WPEP Waukegan Pep Station; 140 Hazel Court, Waukegan, Ill. 215.7 meters, 1390 kilocycles, 250 watts. Sun, 3-5 pm, 7:30-9:30 pm, 10-12 pm. Daily ex Sun, Mon, 7:30-9:30 pm, 10-12 pm. All programs popular and semi-popular. Central standard time. Slogan: "Where Pep Entertains Public."

WPG Municipality of Atlantic City, Atlantic City, N. J. 272.6 meters, 1100 kilocycles, 5000 watts. Sun, 3:15 pm until 12 midnight. Mon, Tues, Thurs, Sat, 1:30 pm midnight. Eastern standard time. Divides time with WHAR.

WPRC Wilson Printing & Radio Co., 1740 5th st., Harrisburg, Pa. 209.7 meters, 1430 kilocycles, 100 watts. Sun, 9-11 pm. Eastern standard time.

WPSC Pennsylvania State College Dept. of Elec. Engineering, State College, Pa. 299.8 meters, 1000 kilocycles, 500 watts. Mon, Wed & Fri, 7-11 pm. Eastern standard time. Divides time with WBAK. Slogan: "The Voice of the Titany Lion."

WPSW Philadelphia School of Wireless Telegraphy, 1533 Pine St., Philadelphia, Pa. 206.8 meters, 1450 kilocycles, 50 watts. Wed, 7 pm, radio questions & answers. Fri, 7 pm, talks on radio, care & operation. Eastern standard time. Slogan: "First Wireless School in America."

WPTF Raleigh, N. C. 545.1 meters, 550 kilocycles, 500 watts. Eastern standard time.

WPUB Madison Square Garden, 319 W. 49th st., New York, N. Y. 236.1 meters, 1270 kilocycles, 500 watts. Eastern standard time. Divides time with WHAP, WBNY.

WQAA Horace A. Beale, Jr., Parkesburg, Pa. 215.7 meters, 1390 kilocycles, 500 watts. Eastern standard time.

WQAM Electrical Equipment Co., 42 N. W. 4th st., Miami, Fla. 384.4 meters, 780 kilocycles, 750 watts. Sun, 10:45 am-12 noon, 8-9:15 pm, church. Daily ex Sun, 11:45 am-12:15 pm, organ, time signals, weather, stock reports; 7-8:15 pm, organ, dance, orchestra, weather, baseball results & studio programs. Divides with WMBF.

WQAN Scranton Times, 222 Spruce st., Scranton, Pa. 230.6 meters, 1300 kilocycles, 250 watts. Daily ex Sun, 12:30-1 pm, 4:30-5 pm. Tues & Fri, 8-10:30 pm. Sat, 10:30-12 pm. Eastern standard time. Slogan: "The Voice of the Anthracite." Divides time with WGBI. Monday, Wed, Thurs nights & Tues, Fri, 6:45-7:55 pm.

WQAO & WPAP Calvary Baptist Church, Cliffside, N. J. 394.5 meters, 760 kilocycles, 500 watts. Wed, 8-9 pm, mid-week evening services. Sun, 11 am-12:30 pm, church services; 3-4:30 pm, Bible study class; 7:45-9:30 pm, evening services. Eastern standard time. Divides time with WHN. Slogan: "The Bible, the Whole Bible and Nothing but the Bible."

WQBA Tampa, Fla. 238.0 meters, 1260 kilocycles, 250 watts. Eastern standard time. Divides time with WJBB.

WQJ Calumet Broadcasting Co., operated by Chicago Daily News, Hotel La Salle, Chicago, Ill. 447.5 meters, 670 kilocycles, 500 watts. Sun, 10:45 am-12:30 pm, 2-4 pm, 6-7 pm, 10-11 pm. Daily ex Sun, 11 am-12 noon, 3-4 pm, 6-7 pm, 10 pm-1 am. Central standard time. Divides time with WMAQ.

WRAF The Radio Club (Inc.), 719 Michigan av., LaPorte, Ind. 208.2 meters, 1440 kilocycles, 100 watts. Sun, 10:45 am-12:15 pm, church services. Daily ex Sun, 12:15-7 pm. Central standard time. Slogan: "The Voice of the Maple City."

WRAH Stanley N. Read, 191 Alabama av., Providence, R. I. 199.9 meters, 1500 kilocycles, 250 watts.

WRAK Economy Light Co., 1105 Ludington st., Escanaba, Mich. 282.8 meters, 1060 kilocycles, 50 watts. Sun, 6:30-8 pm, classical. Mon and Fri, 10:30-11 am, household hints and weather forecast; 6:30-7:00 pm, late news and weather forecast followed by musical program. Tues & Thurs, same as Mon & Fri. Wed, 10:30-11:30 am, household hints & weather forecast. Sat, 10:30-11 am, household hints & weather forecast; 6-6:30 pm, late news & weather forecast, followed with dance program. Eastern standard time. Slogan: "The Gateway to Cloverland."

WRAM Lombard College, Galesburg, Ill. 247.8 meters, 1210 kilocycles, 50 watts. Mon, 7 pm, bedtime stories; 8 pm, educational; 9-11 pm, musical. Central standard time. Divides time with WFBZ.

WRAW Avenue Radio & Electric Shop, 460 Schuylkill av., Reading, Pa. 238 meters, 1260 kilocycles, 100 watts. Sun, 11 am, 1:30-3 pm. Tues, 8 pm. Thur, 8-10 pm. Eastern standard time. Slogan: "The Schuylkill Valley Echo."

WRAX Berachan Church (Inc.), 1608 Alleghany Ave., Philadelphia, Pa. 212.6 meters, 1410 kilocycles, 250 watts. Eastern standard time.

WRBC Immanuel Lutheran Church, Valparaiso, Ind. 238.0 meters, 1260 kilocycles, 250 watts. Sun, 7:30-9 pm, church service. Mon, 7:30-9 pm, diversified program. Central standard time. Slogan: "World Redeemed by Christ."

WRC Radio Corporation of America, 3308 14th st., N. W., Washington, D. C. 468.5 meters, 640 kilocycles, 500 watts. Sun, 11 am-12:30 pm, church services; 4-5:30 pm, church; 6:20-10:15, musical. Mon, Tues, Wed, Thur, Fri & Sat, 6:45 am to 11 pm, varied. Eastern standard time. Slogan: "The Voice of the Capital."

WRCV Radio Corp. of Virginia, Norfolk, Va. 209.7 meters, 1430 kilocycles, 100 watts. Wed, Fri, Sat, 2-5 pm, 7:30-9 pm. Sun, 10:30 am-12:15 pm, 7:15-8:45 pm. Eastern standard time. Slogan: "The Voice of the Business District."

WREC Wooten's Radio & Elec. Co., Whitehaven, Tenn. 249.9 meters, 1200 kilocycles, 100 watts. Daily, 7-8. Sun, 4-5:30 pm. Central standard time. Divides time with WSIX.

WREN Jenny Wren Co., Lawrence, Kan. 254.1 meters, 1180 kilocycles, 750 watts. Central standard time. Divides time with WFKU.

WRES Harry Leonard Sawyer, Quincy, Mass. 217.3 meters, 1380 kilocycles, 50 watts. Mon & Thurs, 8 pm, entertainment. Eastern standard time.

WRHF American Broadcasting Co., Colorado Bldg., Washington, D. C. 322.4 meters, 930 kilocycles, 150 watts. Daily ex Sun, 10-11:30 am, 6-7 pm. Eastern standard time.

WRHM Rosedale Hospital (Inc.), Nicollet & 44th st., Minneapolis, Minn. 260.7 meters, 1150 kilocycles, 1000 watts. Sun, 9:15 am, 10 am, Children's Bible stories; 11 am, church; 6:30 pm, dramatic hour; 7:45 pm, church; 9:30 pm, lecture. Mon, Wed, Fri, 9 am, Housewife's Hour. Daily ex Sun, 12 noon-2 pm, concert; 5-6 pm, Commercial Hour; 6 pm, dinner concert; 8 pm, popular; 9 pm, dance program. Central standard time. Slogan: "Welcome Rosedale Hospital, Minneapolis."

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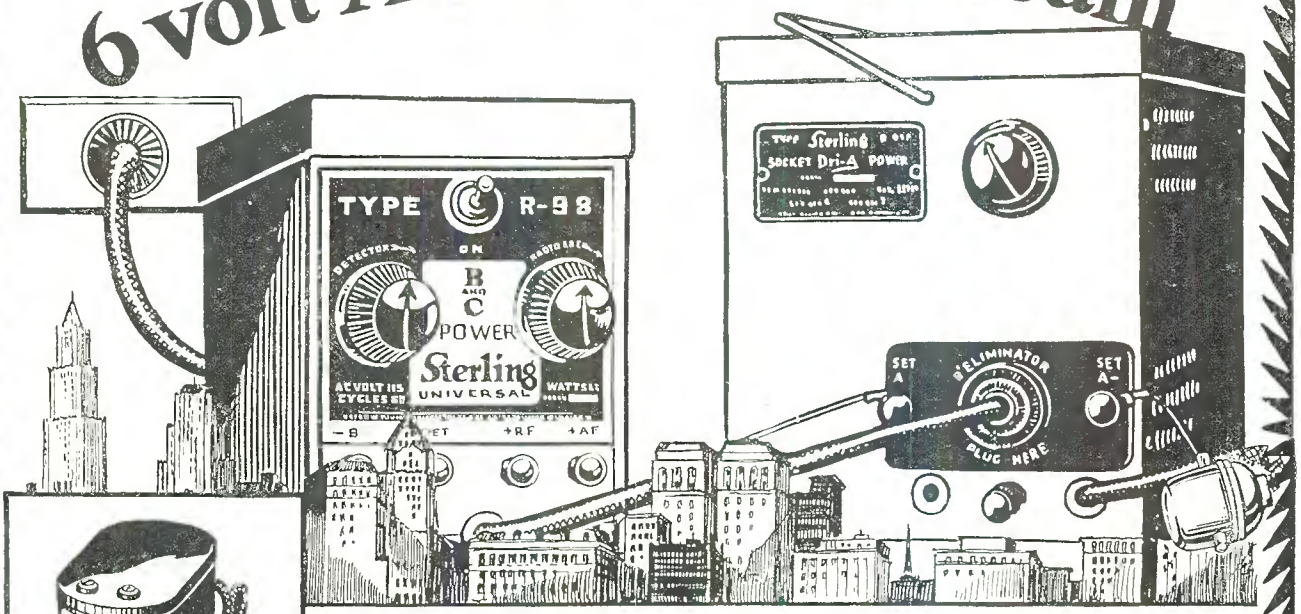

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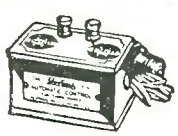

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WRK John C. Slade, Hamilton Ohio. 205.4 meters, 1460 kilocycles, 100 watts. Sun, 2-3:15 pm, church; 7-9 pm. Daily ex Sat & Sun, 1-2 pm. Mon, Wed, Fri, 6:45 pm-12 midnight. Sat, 1-5 pm. Tues & Sat, 6:45-10:30 pm. Thurs, 6:45 pm-2 am. Eastern standard time. Slogan: "The Voice of the Miami Valley."

WRM University of Illinois, Urbana, Ill. 272.6 meters, 1100 kilocycles, 500 watts. Sun, 3:45-4 pm, chimes; 4-5 pm, organ. Mon, Tues, Wed, Thurs, Fri, 5-6 pm, music & lectures. Tues, 7-8 pm, recital. Athletic events broadcast. Central standard time. Divides time with WBAA.

WRMU Atlantic Broadcasting Corp., New York City, N. Y. (Portable). 201.6 meters, 1490 kilocycles, 100 watts. Unlimited schedule. Eastern standard time. Divides time with WGMU.

WRNY Radio News, Hotel Roosevelt, 45th st. & Madison av., New York City, N. Y. 325.9 meters, 920 kilocycles, 500 watts. Sun, 10:30-1 pm, 1-7 pm. Mon, Wed, 10:30 am-7 pm. Wed, 9-12 midnight. Tues, 10:30-12. Thus, 10:30-1. Sat, 11 am-1, 7-9 pm. Eastern standard time. Divides time with Station WPCH.

WRPI Rose Polytechnic Institute, Hotel Deming, Terre Haute, Indiana. 208.2 meters, 1440 kilocycles, 100 watts. Sun, 9:30 am-12 noon, church. Daily ex Sun, 7 pm, markets. Mon, Wed, Fri, 8 pm, Popular programs. Central standard time. Slogan: "On the Banks of the Wabash."

WRR Municipal Station, Jefferson Hotel, Dallas, Tex. 352.7 meters, 850 kilocycles, 500 watts. Daily ex Sun & Wed, 11:30 am-12:30 pm, 6-7 pm, 8-9 pm. Mon & Thurs. 10-11 pm. Fri, 8:10 pm. Alternate Sun, 11 am-12:15 pm, 7:30-9 pm, every Sun, 9:30-10:30 pm. Central standard time. Divides time with KRLD. Slogan: "City of Achievements."

WRRS Racine Broadcasting Corp., Hotel Racine. Racine, Wis. 247.8 meters, 1210 kilocycles, 50 watts.

WRST Radiotel Mfg. Co., Inc., 76 Main st., Bay Shore, N. Y. 211.1 meters, 1420 kilocycles, 250 watts. Daily ex Sun, 12 noon-1 pm. Mon, Wed & Fri, 7-11:30 pm, concerts. Tues & Thurs, 8-11:30 pm. Sat, 7-11:30 pm. Sun, 11 am-12:45 pm, church services; 7-11 pm, musical concert. Eastern standard time. Divides time with WCDA-WBRS. Slogan: "Bay Shore, Garden Spot of Long Island."

WRVA Edgeworth Tobacco Station, Richmond, Va. 254.1 meters, 1180 kilocycles, 1000 watts. Mon, Wed, Fri, 12 noon-2 pm, 8 pm-12 midnight. Tues, Thurs, 12 noon-1 pm. Thurs, 8 pm-12 midnight. Sun, 11 am-1 pm, 8-10 pm. Eastern standard time. Slogan: "Carry Me Back to Old Virginny."

WSAI United States Playing Card Co., Cincinnati, Ohio. 361.2 meters, 830 kilocycles, 5000 watts. Sun, 10:45 am, church; 12 noon, concert; 4 pm, 6:15 through 10:15 pm. Daily ex Sun & Sat, 10:35 am-1:10 pm. Mon, Tues, Thurs, 3:45 through 7 pm. Wed & Fri, 3:45-4 pm. Mon, Tues, 7:30 through 11 pm. Wed & Thurs, 7 through 11:30 pm. Fri, 7 through 11 pm. Sat, 6:45 through 11 pm. Talks, music, news, chain programs, etc. Eastern standard time. Slogan: "The Gateway to Dixie."

WSAJ Grove City College, Grove City, Pa. 223.7 meters, 1340 kilocycles, 250 watts. Irregular schedule. Eastern standard time.

WSAN Allentown Call Publishing Co., Inc., Allentown, Pa. 222.1 meters, 1350 kilocycles, 100 watts. Tues, Thurs & Sats, 8:15 pm, musical. Eastern standard time. Divides time with WCBA. Slogan: "We Serve Allentown Nationality."

WSAR Doughty & Welch. Elec. Co., 46 N. Main st., Fall River, Mass. 252.0 meters, 1190 kilocycles, 100 watts. Daily ex Sun, 12-1 pm. Sun, 10:30-12 m. Eastern standard time.

WSAX Zenith Radio Corp., 3620 Iron st., Chicago, Ill. 204.0 meters, 1470 kilocycles, 100 watts. (Portable.) Central standard time.

WSAZ McKellar Electric Co., 1143 4th av., Huntington, W. Va. 249.9 meters, 1200 kilocycles, 100 watts. Sun, 9 am-1 pm, 3-4 pm, 7:30-9 pm, 10-11 pm. Daily ex Sun, 12 noon-1 pm, 5:30-6:30 pm, 9:30-12: midnight. Eastern standard time.

WSB The Atlanta Journal, care Biltmore Hotel, Atlanta, Ga. 475.9 meters, 630 kilocycles, 1000 watts. Sun, 9:30 am-5 pm, church services. 6:20 pm & 8:15 pm, chain programs. Daily ex Sun, 10 am, 1-2:30 pm, 10:45 pm. Mon, Tues, Wed, Fri, 10:30 am, public school program. Wed & Fri, 11 am. Wed & Thurs, 5 pm. Thurs, 5:30 pm. Mon, 6:30 pm. Wed, 6:15-7 pm. Sat, 6-6:30 pm & 7 pm. Thurs & Fri, 7:30 pm. Mon, Wed & Fri, 8:30 pm. Tues & Thurs, 9 pm. Tues & Wed, 9:30 pm. Daily ex Fri & Sun, 8 pm. Music, talks, news, chain programs, broadcast. Central standard time. Slogan: "The Voice of the South."

WSBC The World Battery Company Station, 1219 S. Wabash av., broadcasting from New Southern Hotel, Chicago, Ill. 232.4 meters, 1290 kilocycles, 500 watts. Sun, 5-7 pm, classical; 9:30 pm-1 am, popular. Mon, 5-7 popular program. Tues, Wed, Thur, Sat, 5-7 pm, 9:30 pm-1 am, popular program. Fri. 6-8 pm, 9 pm-1 am, popular program. Central standard time. Divides time with WJKS. Slogan: "World Storage Battey Company."

WSBF Mississippi Valley Broadcasting Co., 6th & Washington Ave., St. Louis, Mo. 258.5 meters, 1160 kilocycles, 250 watts. Sun, 9-10 pm, theater. Mon, 1 pm, 3-4 pm. Tues, 1 pm, 3-4 pm, popular. Wed & Fri, 12 noon-1 pm, 3-4 pm, music. Thurs, 12 noon-1 pm, 3-4 pm, popular. Sat, 12 noon-1 pm, 3-4 pm. Daily ex Sun, 7:30-11 pm, studio program. Central standard time. Divides with NIL.

WSBT South Bend Tribune, South Bend, Ind. 399.8 meters, 750 kilocycles, 500 watts. Sun, 11 am-12 noon, church. Mon, 7:30-10:30 pm, 12 midnight-1:30 am, popular program. Wed, 8-10 pm, 12 midnight-1 am. Fri, 7:15-10 pm, classical, 12 midnight-1 am. Central standard time. Divides time with WEAR-WTAM.

WSDA & WARS Amateur Radio Specialty Co., Hotel Shelburne, Brooklyn, N. Y. 227.1 meters, 1320 kilocycles, 500 watts. Sun, 7-9 am, 12:30-3 pm. Mon, Wed, Thurs, Fri, 7-8 am, 9-10 am. Mon & Fri, 8-10 pm. Wed & Fri, 3-6 pm. Tues & Thurs, 12 noon-2 pm. Mon, 3-7 pm. Wed, 7-10 pm. Thurs, 6-7 pm, 10 pm-12 midnight. Sat, 7-9 am, 1-3:30 pm, 9 pm-12 midnight. Eastern standard time. Divides time with WBBC. Slogan: "The Voice of the Atlantic."

WSEA The Virginia Beach Broadcasting Co., Norfolk, Va. 263 meters, 1140 kilocycles, 500 watts. Daily ex Sun, 11 am-2 pm, music; 5 pm, stocks, talks, police & weather forecast; 6 pm, news flashes; 6:45 pm, dinner music; 7 pm-10 pm, studio; 10-11 pm, organ; 11 pm-12 midnight, dance music. Sun, 3-5 pm & 7-9 pm, concerts. Eastern standard time. Slogan: "The Voice of Tidewater Virginia."

WSIX Springfield, Tenn. 249.9 meters, 1200 kilocycles, 150 watts. Divides time with WREC.

WSKC World's Star Knitting Co., Bay City, Mich. 272.6 meters, 1100 kilocycles, 250 watts. Daily ex Sun, 12 noon-1 pm, music. Tues, Thurs, Sat, 9-11 pm. Sat, 9-11 pm, 12 midnight-2 am. Sun, 11 am. Eastern standard time. Divides time with WFDF. Slogan: "Where the Summer Trails Begin."

WSM The National Life and Accident Ins. Co., Inc., Seventh av. N. & Union st., Nashville, Tenn. 336.9 meters, 890 kilocycles. 5000 watts. Sun, 6:20-9:15 pm. Daily ex Sat, Sun, 11:45-12:30 noon, 1 pm, concert. Mon, 6:15-11 pm. Tues, 7-10:30 pm. Wed, 7-11 pm. Thurs, 6:30-10:30 pm. Fri, 9 pm. Sat, 6-11:30 pm. Central standard time. Slogan: "We Shield Millions."

WSMB Saenger Theatres, Inc., & Maison Blanche Dept. Stores, 1401 Tulane Ave., New Orleans, La. 296.9 meters, 1010 kilocycles, 750 watts. Daily ex Sun, 12:30-1:30 pm, 6-7 pm. Mon, Wed, Thurs & Sat, 8:30-10:30 pm, entertainment. Central standard time. Slogan: "America's Most Interesting City."

WSMK S. M. Krohn, Jr., 20th fl. U. B. Bldg., Dayton, Ohio. 296.9 meters, 1010 kilocycles, 200 watts. Daily ex Thurs & Sun. 9-11 am, shippers guide; 12-1 noon, dinner bell program, 6-10 pm, studio program. Sat, 11 pm-3 am Sun. Central standard time. Slogan: "The Home of Aviation."

WSOE School of Engineering of Milwaukee, Oneida & Jackson sts., Milwaukee, Wis. 270.1 meters, 1110 kilocycles, 250 watts. Sun, 3:30-4:30 pm, 7:30-8:30 pm, religious program. Daily ex Sun, 1:30 pm, 2:15 pm, 2:30 pm, 5 pm, 5:50 pm, 6:15 pm, 8 pm. Thurs, 9 pm. Varied program. Central standard time. Divides time with WHAD.

WSRO Radio Company (Harry W. Fahrlander), Central & Canal sts., Middleton, Ohio. 236.1 meters, 1270 kilocycles, 100 watts. Tues & Fri, 8-10 pm. Sun, 2-4 pm. Central standard time. Slogan: "We Sell Radio Only."

WSSH Tremont Temple Baptist Church, Boston, Mass. 288.3 meters, 1040 kilocycles. 100 watts. Sun, 10:15 am-12 noon, 6:30-9 pm. Fri, 7:30-9 pm. Eastern standard time. Divides time with WBFT. Slogan: "Stranger's Sunday Home."

WSUF & WTAR Reliance Elec. Co., Inc., 519 W. 21st Ave., Norfolk, Va. 236.1 meters, 1270 kilocycles 500 watts. Daily ex Sun, 6 pm, weather, markets & news. Eastern standard time. Divides time with WBBW. Slogan: "Down in Old Virginia."

WSUI State University of Iowa, Capitol & Washington sts., Iowa City, Iowa. 475.9 meters, 630 kilocycles. 500 watts. Sun, 9 pm, hymns. Daily ex Sun, 9 am, markets, weather forecast; 10:30 am & 12:25 pm, news, music; 5:30 pm, radio review. Wed, 9:10 am, high school program. Athletic contests broadcast. Central standard time. Slogan: "The Old Gold Studio."

WSUN Chamber of Commerce, St. Petersburg, Fla. 516.9 meters, 580 kilocycles, 750 watts. Tues, Thurs & Sat, 7:30-11:30 pm. Eastern standard time. Slogan: "Sunshine City."

WSVS Seneca Vocational School, 666 East Delavan Ave., Buffalo, N. Y. 204.0 meters, 1470 kilocycles, 50 watts. Wed & Fri, 8-9:30 pm, musical program. Eastern standard time. Divides time with KFEW. Slogan: "Watch Seneca Vocational School."

WSYR Voice of Central New York, Hotel Syracuse, N. Y. 225.4 meters, 1330 kilocycles, 500 watts. Sun, 7:30 am, church services; 6:30-7:30 pm, dinner concert. Daily ex Sun, 6:20 pm-10:30 pm, Varied programs. Eastern standard time. Divides time with WMAC.

WTAD Illinois Stock Medicine Broadcasting Corp., Quincy, Ill. 236.1 meters, 1270 kilocycles, 250 watts night, 500 watts daytime. Sun, 11-12 am, 2:30-3:30 pm, 10-12 pm. Daily ex Sun, 11:30 am-12:45 pm, 6-7 pm, 9-10 pm. Central standard time.

WTAG Worcester Telegram-Gazette Broadcasting Station, 18 Franklin st. Worcester, Mass. 516.9 meters, 580 kilocycles, 250 watts. Sun, 4-10:25 pm. Daily ex Sat & Sun, 10:30-11 am, 12:30-1:05 pm, 7:30-10:10 pm. Sat, 12:30-1:05 pm, 8-11:10 pm. Eastern standard time. Slogan: "The Voice from the Heart of the Commonwealth."

WTAL Toledo Broadcasting Co., Waldorf Hotel, Toledo, Ohio. 239.9 meters, 1250 kilocycles, 250 watts. Sun. 10:45 am-9:30 pm. Daily ex Sat & Sun, 6-11 pm. Sat, 8-12 pm. Eastern standard time. Slogan: "The Gateway of the Sea."

WTAM Willard Storage Battery Co., 1100 Chester av., Cleveland, Ohio. 399.8 meters, 750 kilocycles, 3500 watts night, 5000 watts daytime. Sun, 11 am-2 pm, 3-5 pm, 5:30-6 pm-12 midnight. Daily ex Sun, 12:30-1:30 pm, 6 pm-12 midnight. Wed, Thurs, Fri, 11-11:15 am. Eastern standard time. Divides time with WEAR & WSBT. Slogan: "The Voice from the Storage Battery."

WTAQ Gillette Rubber Co., Eau Claire, Wis. 254.1 meters, 1180 kilocycles, 500 watts. Sun, 11 am, church service. Mon, Wed, Thurs, Sat, 12:15 pm, weather, news, etc. Daily ex Sun & Sat, 6 pm, markets, news, etc. Mon, Wed & Thurs, 6:30 pm, dinner hour. Tues & Fri, 12 noon, luncheon program. Mon, 7:30 pm, theater hour. Mon & Thurs, 10 pm. Tues, 9 pm, concert. Fri, 8 pm, studio program. Central standard time.

WTAR & WSUF Reliance Elec. Co., Inc., 519 W. 21st Ave., Norfolk, Va. 236.1 meters, 1270 kilocycles, 500 watts. Daily ex Sun, 6 pm, weather, markets & news. Eastern standard time. Divides time with WBBW. Slogan: "Down in old Virginia."

WTAS Illinois Broadcasting Corp., R.F.D., Elgin, Ill. 275.1 meters, 1090 kilocycles, 500 watts. Sun, 10 am-1 pm. Daily ex Sun, 12 noon-2:30 pm, 6-7 pm, 10 pm-1 am. Central standard time. Slogan: "Willie, Tommy, Annie, and Sammy."

WTAW Agricultural & Mechanical College of Texas, College Station, Texas. 483.3 meters, 620 kilocycles, 500 watts. Sun, 11 am. Mon, Tues, Wed, Thurs & Fri, 12:10 pm. Wed & Fri, 7 pm. Central standard time.

WTAX Williams Hardware Co., 115 S. Vermillion St., Streator, Ill. 247.8 meters, 1210 kilocycles, 50 watts. Mon, 8-10 pm, Studio program. Wed, Fri, 8-10:30 pm, studio program. Thur, 9-11 pm, dance program. Central standard time. Slogan: "Tappa Kugga Nails."

WTAZ Thomas J. McGuire, 48 N. Main st., Lambertville, N. J. 220.4 meters, 1360 kilocycles, 15 watts. Mon, 8-10 pm, musical. Eastern standard time. Divides time with WMBG.

WTFF Mt. Vernon Hills, Va. 202.6 meters, 1480 kilocycles, 10,000 watts. Eastern standard time. Divides time with WHBN.

WTFI Toccoa, Ga. 209.7 meters, 1430 kilocycles, 750 watts.

WTHS Atlanta, Ga. 227.1 meters, 1320 kilocycles, 200 watts. Central standard time.

WTIC The Travelers Insurance Co., 700 Main st., Hartford, Conn. 535.4 meters, 560 kilocycles, 500 watts. Daily ex Sat & Sun, 11:55 am-1 pm. Tues, 10:45-11:15 am. Wed & Fri, 10:45-11 am. Thurs, 11-11:15 am. Mon, 6:25-12 midnight. Tues & Fri, 6:25-11:30 pm. Wed & Thurs, 6:25-11 pm. Sat, 8-9 pm. Sun, 4:30-7:30 pm. Eastern standard time. Divides time with WCAC. Slogan: "The Insurance City."

WTMJ The Milwaukee Journal Station, Milwaukee, Wis. 293.9 meters, 1020 kilocycles, 1000 watts. Sun, 11 am-12 noon, organ; 12 noon-1 pm, comics; 12:30-1 pm, 2:30-3:15 pm, music; 3:15-5 pm, Litte Symphony; 6 pm, organ; 6-7 pm, dinner concert; 7-9:15, pm, music; 9:15-9:45 pm, chain program. Daily ex Sun, 10-11 am, 11-11:30 am, news, talks; 11:30 am-12:30 pm, organ; 12:30-1 pm, 2-5:15 pm, 6:15-7:30 pm, music; 8:15-9:45 pm, concert; 10:30-11:30 pm, dance music. Central standard time. Divides time with WHAD.

WTRL Technical Radio Laboratory, 28 Sicomac av., Midland Park, N. J. 206.8 meters, 1450 kilocycles, 15 watts. Sun, 2-4 pm, religious program. Tues, Fri, 7-9 pm, Sports & dance music. Eastern standard time. Divides time with WHPP, WMRJ.

WWAE C. F. Courrier, 2024 S. Wabash av., Chicago, Ill. 227.1 meters, 1320 kilocycles, 500 watts, class A. Daily ex Sun & Mon, 7-9 pm. Central standard time.

WWJ Detroit News, Detroit, Mich. 352.7 meters, 850 kilocycles, 1000 watts. Sun, 7:20 pm, WEAF program. Daily ex Sat & Sun, 6 pm, dinner concert; 8 pm, program from WEAF. Eastern standard time.

WWL Loyola University, New Orleans, La. 245.8 meters, 1220 kilocycles, 500 watts. Sat, 7:30-8:30 pm. Centarl standard time.

WWNC Chamber of Commerce, Asheville, N. C. 296.9 meters, 1010 kilocycles, 1000 watts. Sun, 11 am & 8 pm, church; 4-5 pm, musical program; 9-10 pm, organ. Daily, 1-2 pm, 7-8. Mon, 8-10:45 pm. Thurs, 8 pm-12 midnight. Eastern standard time.

WWRL Long Island Broadcast Laboratories. W. H. Reuman, Director, 4130 58th St., Woodside, L. I., N. Y. 199.9 meters, 1500 kilocycles, 100 watts. Sun, 1-10:30 pm, popular program. Daily ex Sun, 11 am. Mon, Tues, Thurs, Sat, 1 pm. Mon & Fri, 10 pm-12 midnight. Sat, 12 midnight-4 am. Tues, 12 midnight-2 am. Wed, Thurs, 8-10 pm. Eastern standard time. Divides time with Stations WGOP, WBKN.

WWVA John C. Strobel, Jr., National Road, Wheeling, W. Va. 516.9 meters, 580 kilocycles, 250 watts. Daily ex Sun, 6:45 am, 7:45 am, 2 pm, 6 pm, exercises. Sun, 3:30 pm, Y.M.C.A. Mon, 7-11 pm. Sat, 11 pm-1:30 am, Mountaineer Club. Eastern standard time.

IN THIS ISSUE we are printing on page 54 a condensed and simplified log sheet, by means of which our readers may readily mark down their favorite stations for quick reference. This log has been prepared in the form shown on page 54, because the Federal Radio Commission has decreed that there shall be 96 channels, each separated by 10 kilocycles lying between 1500 kilocycles, which is the lowest wave allocation, and 550 kilocycles, which is the highest wave allocation. Some of these 96 channels are allotted to Canadian broadcasters, while others are occupied a portion of the time by Canadian broadcasters and the remainder of the time by American stations.

In addition to serving as a ready guide for the logging of your favorite broadcast stations, this table will serve also as a kilocycle conversion chart within the broadcast band. Knowing the frequency of a given broadcast station, the meters may be readily found by looking in the meter column. Conversely, if the wavelength of a station is known, its frequency equivalent may be seen by looking in the kilocycle column.

Space has only been allowed for two dials in the belief that this is ample for the present day sets, whereas in the case of the three dial sets, the second and third dials usually track and their settings may be put down in column two.

We shall be glad to hear from our readers as to their comments on this form of a log sheet. If our readers like this particular method of logging and signify this fact to us, we shall be glad to continue it.

Address communications to the

CITIZENS RADIO CALL BOOK MAGAZINE

508 South Dearborn Street **Chicago, Illinois**

Foreign Radio Broadcasting Stations

	Call	Wave	Power
ALASKA			
Anchorage: Chovin Supply Co.	KFQD	227.1	100
Juneau: Alaska Electric Light & Power Co.	KFIU	225.4	10
ALGERIA			
Algiers: Colin & Fils	SDB	310	100
ARGENTINA			
Buenos Aires: No data. Received at Pernambuco and Valparaiso	LOO	252	1000
No data	B2	275	100
No data	LOL	236	2000
No data	LON	210	5000
Argentine Association of Broadcasters	LOR	314.8	1000
No data	LOT	400	1000
Francisco J. Brusa	LOV	261.5	1000
Graud Splendid Theatre	LOW	303	1000
Radio Cultura Magazine	LOX	380	500
Radio Nacional	LOY	315.8	1000
University of La Plata	LOP	425	1000
AUSTRALIA			
New South Wales			
Bathhurst: Mockler Bros.	2MK	275	250
New Castle: H. A. Douglas	2HD	288	20
Sydney: Burgin Electric Co.	2BE	326	20
Broadcasters, Ltd.	2BL	353	1000
Farmers Broadcasting Co., Ltd.	2FC	442	2000
Otto Sandel	2UW	263	100
Theosophical Broadcasting Service	2GB	326	1500
Trades Hall Broadcasting Station	2KY	280	300
Electrical Utilities Supply Co.	2UE	297	50
Sydney	2WA	462	100
Wagga: Otto Sandel	2UX	200	500
Victoria			
Brighton: Projected. No data	3BP	.....	.....
Melbourne: Associated Radio Co. of A. Pty. Ltd.	3AR	484	320
Broadcasting Co. of Australia Pty. Ltd.	3LO	371	1000
Druleigh Business & Tech. College	3DB	255	500
O. J. Nilson & Co.	3IZ	319	20
L. J. Hellier, Wangaratta Sports Depot	3WR	303	20
Mildura: R. J. Egge	3EO	286	20
Queensland			
Brisbane: Dr. V. McDowell	4CM	278	50
Radio Manufacturers Ltd.	4MB	337	250
Queensland Government	4QG	385	1000
Rockhampton: Ditto	4RN	323	100
Toowoomba: Gold Radio Elec. Service	4GR	294	20
South Australia			
Adelaide: Central Broadcasting Co.	5CL	395	1000
E. J. Hume. Operated by 5DN Pty. Ltd.	5DN	313	100
Millswood Anto & Radio Co.	5MA	.....	.....
Marshall & Co.	5MC	273	500
Sport Radio Broadcasting Station	5KA	250	1000
Western Australia			
Perth: Westralian Farmers, Ltd.	6WF	1250	1000
Tasmania			
Hobart: Tasmanian Broadcasters, Ltd.	7ZL	525	3000
AUSTRIA			
Vienna: Oesterreichischer Radioverkehr A. G. broadcasts three 2-hour programs daily, including music (opera and popular), weather and market reports and news. Reception reported at Antwerp, Teheran, Smyrna, Tunis	ORV	577	1500
Oesterreichischer Radioverkehr A. G. Testing; to replace above station in the near future	ORV	517.2	7000
Graz: Oesterreichischer Radioverkehr A. G.		365.8	500
Innsbruck		294.1	500
Klagenfurt: Relays Vienna		272.7	500
Linz: (Projected)		254.2	.....
Rosenhugel		517.2	5000
BELGIUM			
Antwerp: (General, 2 hours daily)		265.5	100
Brussels: Radio Belgique	BAV	508.5	1500
Liege: Radio Wallonie Station		205	100
Radio Central Station		294.1	100
BOLIVIA			
La Paz: (Irregular)		175, 300	50
BRAZIL			
Bahia: Radio Sociedade do Bahia		465	50
Bello Horizante: National Telegraph Service		400	500
Fortaleza: Radio Club		.....	30
Para		.....	80
Pernambuco: Radio Club. One hour daily and two hours three days each week		310	300
Porto Alegre: Radio Society. Broadcasts one hour daily. To be replaced by 50-watt station		380	80
Rio de Janeiro: Radio Society. Daily programs by local artists		400	1000
National Telegraph Service. Praia Vermelha Station. Operated by Radio Club. Daily news and concerts		312	500
Rio de Janeiro: No data. Phonograph records broadcast 2 to 4 pm daily, concerts from 7 to 9 pm three or four days each week		.....	10
Santos: No data		.....	10
Sao Paulo: Dias Carneiro & Co., operated by the Radio Club of Sao Paulo		380, 420	100
Radio Club of Sao Paulo Broadcasts Hotel Terminus orchestra and phonograph records daily		350	10
CANADA			
Nova Scotia			
Halifax: (Carlton Hotel station, Northern Electric Co., Ltd.)	CHNS	322.4	100
Prince Edward Island			
Charlottetown: General during winter	CFCY	312.3	100
Summerside: R. T. Holman, Ltd.	CHGS	267.7	25
New Brunswick			
Fredericton	CFNB	247.8	25
Moncton: Canadian National Railways	CNRA	322.4	500
Quebec			
Montreal: Northern Electric Co., Ltd.	CHYC	410.7	750
E. Fontaine	CHRC	347	5
La Presse Publishing Co.	CKAC	410.7	1200
Canadian Marconi Co.	CFCF	410.7	1650
Canadian National Railways. Uses equipment of other local stations	CNRM	.....	.....
Quebec	CHRC	340.7	5
Le Soleil	CKCI	347	22½
	CKCV	340.7	50
St. Hyacinthe	CKSH	312.3	50
Ontario			
Bowenville	CKCW	312.5	5000
Hamilton	CHCS	340.7	10
Jack V. Eliott, Ltd.	CFCU	340.7	500
Wentworth Radio Supply Co.	CKOC	340.7	50
Burketon Junction	CKCW	329.5	5000
Cobalt	CKMC	247.8	5
Huntsville: A. Staples	CHCO	247.8	5
Iroquois Falls: Abitibi Power & Paper Co.	CFCH	499.7	250
King: York Co.	CJCQ	291.1	1000
Kingston: Monarch Battery Co.	CFMC	267.7	20
Queens University	CFRC	267.7	500
Kitchener: O. Rumpel	CJCF	247.8	25
London: London Free Press Printing Co., Ltd.	CJGC	329.5	500
Midland: E. O. Swan	CKPR	267.7	50
Ottawa: J. R. Booth, Jr.	CHXC	434.5	250
Canadian National Railways	CNRO	434.5	500
Dr. G. M. Geldert. (For Ottawa Radio Assn.)	CKCO	434.5	100
Prescott: Radio Association of Prescott	CFLC	296.9	50
Preston: Wallace Russ	CKPC	247.8	7½
Scarboro Station	CIYC	291.1	500
Toronto: Star Publishing & Printing Co.	CFCA	356.9	500
Toronto Radio Research Society	CHNC	356.9	500
		356.9	50
Dominion Battery Co., Ltd.	CKCL	356.9	500
Canadian Broadcasting Corp. Projected	CKNG	329.5	5000
Canada National Carbon Co.	CKNC	356.9	500
Northern Electric Co. Uses equipment of other local stations	CHHC	.....	.....
Jarvis Street Baptist Church. Uses equipment of other stations	CJBC	.....	.....
Evening Telegram. Uses equipment of local stations	CJSC	.....	.....
Canadian National Railways. Uses equipment of other local stations	CNRT	.....	.....
St. Michael's Cathedral	CKSM	291.1	1000
Thorobold: D. J. Feudell. Suspended		247.8	75
Manitoba			
Winnipeg: Manitoba Telephone System	CKY	384.4	500
Canadian National Railways. Uses equipment of CKY	CNRW	.....	.....
Saskatchewan			
Moose Jaw	CJRM	296.9	500
Regina: R. H. Williams & Sons, Ltd.	CHWC	312.3	15
Leader Publishing Co., Ltd.	CKCK	312.3	500
Canadian National Railways. Uses Station CKCK equipment	CNRR	312.3	500
Sask. Co-op. Wheat Prod., Ltd.	CJBR	312.3	500
Saskatoon: The Electric Shop	CEQC	329.5	500
International Bible Students' Association	CHUC	329.5	500
Wheaton Electric Co.	CJWC	329.5	250
Canadian National Railways. Uses equipment of other local stations	CNRS	.....	.....
	CPQC	329.5	7500
Unity: Horace N. Stovin	CHSC	267.7	50
Yorkton: Winnipeg Grain Exchange	CJGX	475.9	500
Alberta			
Calgary: W. W. Grant Radio, Ltd.	CFCN	434.5	1800
The Alberta Pacific Grain Co., Ltd.	CKLC	356.9	2000
Calgary Herald	CFAC	434.5	500
Canadian National Railways. Uses equipment of other local stations	CNRC	434.5	500
Radio Service & Repair Shop	CJCJ	434.5	250
Edmonton			
Edmonton: International Bible Students' Assn.	CHCY	516.9	250
Alberta Pacific Grain Co., Ltd.	CKLC	356.9	1000
Christian & Miss. Alliance	CHMA	516.9	250
University of Alberta	CKUA	516.9	500
Radio Supply Co., Ltd.	CFCK	516.9	50
Edmonton Journal	CJCA	516.9	500
Canadian National Railways. Uses equipment of other local stations	CNRE	516.9	500
Lethbridge: J. E. Palmer	CJOC	267.7	50
British Columbia			
Burnaby: International Bible Students' Assn.	CFYC	410.7	500
Kamloops: N. S. Dagleish & Sons and Weller & Weller	CFJC	267.7	15
Mission City: E. R. Streeter	CJCU	247.5	5
New Westminster: Westminster Trust Co.	CFXC	291.1	20
Sea Island	CJOR	291.1	50
Vancouver: A. Holmstead & William Hanlon	CFDC	410.7	15
G. W. Deauville	CFCT	329.5	500
A. Halstead & Wm. Hanlon	CKWX	410.7	10
Central Presbyterian Church	CHPC	410.7	1000
Radio Corporation of Vancouver	CFYC	410.7	500
Daily Province	CKCD	410.7	1000
United Church of Canada	CKFC	410.7	50
Canadian National Railways	CNRV	291.1	500
Sprott-Shaw Radio Co.	CFCQ	410.7	10
Pyramid Temple Society. Uses equipment of other local stations	CUKC	.....	.....
CANARY ISLANDS			
La Laguna: Servando Ortoll Delmotte	EAJ5	280	50
Las Palmas: Canary Islands Radio Club		300	6
Club Radio Canarias		300	6
Teneriffe: Servando Ortoll Delmotte	EAR5	250, 350	200
CEYLON			
Colombo		800	1500

KC	Meters	STATIONS	DIALS 1	2
1500	199.9			
1490	201.2			
1480	202.6			
1470	204.0			
1460	205.4			
1450	206.8			
1440	208.2			
1430	209.7			
1420	211.1			
1410	212.6			
1400	214.2			
1390	215.7			
1380	217.3			
1370	218.8			
1360	220.4			
1350	222.1			
1340	223.7			
1330	225.4			
1320	227.1			
1310	228.9			
1300	230.6			
1290	232.4			
1280	234.2			
1270	236.1			
1260	238.0			
1250	239.9			
1240	241.8			
1230	243.8			
1220	245.8			
1210	247.8			
1200	249.9			
1190	252.0			
1180	254.1			
1170	256.3			
1160	258.5			
1150	260.7			
1140	263.0			
1130	265.3			
1120	267.7			
1110	270.1			
1100	272.6			
1090	275.1			
1080	277.6			
1070	280.2			
1060	282.8			
1050	285.5			
1040	288.3			
1030	291.1			

KC	Meters	STATIONS	DIALS 1	2
1020	293.9			
1010	296.9			
1000	299.8			
990	302.8			
980	305.9			
970	309.1			
960	312.3			
950	315.6			
940	319.0			
930	322.4			
920	325.9			
910	329.5			
900	333.1			
890	336.9			
880	340.7			
870	344.6			
860	348.6			
850	352.7			
840	356.9			
830	361.2			
820	365.6			
810	370.2			
800	374.8			
790	379.5			
780	384.4			
770	389.4			
760	394.5			
750	399.8			
740	405.2			
730	410.7			
720	416.4			
710	422.3			
700	428.3			
690	434.5			
680	440.9			
670	447.5			
660	454.3			
650	461.3			
640	468.5			
630	475.9			
620	483.6			
610	491.5			
600	499.7			
590	508.2			
580	516.9			
570	526.0			
560	535.4			
550	545.1			

U. S. Broadcasting Stations Listed by States

ALABAMA

Auburn, WAPI
Birmingham, WBRC, WKBO
Gadsden, WJBY
Montgomery, WBIZ

ALASKA

Anchorage, KFQD
Juneau, KFIU
Ketchikan, KGBU

ARIZONA

Flagstaff, KFXY
Phoenix, KFAD, KFCB
Tuscon, KGAR

ARKANSAS

Fayetteville, KUOA
Hot Springs, KTHS

CALIFORNIA

Avalon, KFWO
Berkeley, KRE
Burbank, KELW, KFLW
Crescenta, KGFH
El Centro, KGEN
Fresno, KMJ
Hollywood, KFQZ, KFWB KMTR
Holy City, KFQU
Inglewood, KMTC
Long Beach, KFON, KGER
Los Angeles, KFI, KFPR, KESG, KFXB, KGEF, KGFJ, KHJ, KNX, KRLO, KTBI
Lower Lake, KGEU
Oakland, KFUS, KFWM, KGO, KLS, KLX, KTAB, KZM
Ocean Park, KNRC
Pasadena, KPPC, KPSN
Sacramento, KFBK
San Bernardino, KFWC
San Diego, KFBC, KFSD
San Francisco, KFRC, KFWI, KGTT, KJBS, KPO, KYA
San Jose, KQW
Santa Ana, KWTC
Santa Barbara, KFCR
Santa Maria, KSMR
Santa Monica, KNRC
Stockton, KGDM, KWG
Venice, KFVD
Yuba City, KGFM

COLORADO

Colorado Springs, KFUM
Denver, KFEL, KFUP, KFXF, KGEY, KLZ, KOA, KOW
Edgewater, KFXJ
Fort Morgan, KGEW
Greeley, KFKA
Gunnison, KFHA
Pueblo, KGDP
Trinidad, KGFL
Yuma, KGEK

CONNECTICUT

Bridgeport, WICC
Danbury, WCWS
Hartford, WTIC
Mansfield, WCAC
New Haven, WDRC

DELAWARE

Wilmington, WDEL

DISTRICT OF COLUMBIA

Washington, WMAL, WRC, WRHF

FLORIDA

Clearwater, WFHH, WFLA
Gainesville, WIBN
Jacksonville, WJAX
Lakeland, WMBL
Miami Beach, WIOD, WMBF, WQAM
Orlando, WDBO, WOCB
Pensacola, WCOA
St. Petersburg, WCHB, WJBB,
Tampa, WDAE, WMBR

GEORGIA

Atlanta, WQBA, WGST, WSB, WTIS
Macon, WMAZ
Toccoa, WTFI

HAWAII

Honolulu, KGU

IDAHO

Boise, KFAU, KFDD
Kellogg, KFBY
Pocatello, KSEI

ILLINOIS

Atwood, WLBQ
Bloomington, WNBL
Carthage, WCAZ
Chicago, KFKX, KYW, WAAF, WBBM, WBBZ, WBCN, WCFL, WCRW, WEBH WEDC, WENR, WFKB, WGES, WGN, WIBL, WIBM, WIIFC, WHT, WIBJ, WIRM, WIBO, WJAZ, WJBT, WKBG, WKBI, WLBN, WLIB, WLS, WLTS, WMAQ, WMBB, WMBI, WPCC, WOJ, WSAN, WSBC, WWAE, WORD
Chicago Heights, WJBZ
Decatur, WBAO
Wenona, WLBI
Elgin, WTAS
Evanston, WEHS
Galesburg, WFBZ, WKBS, WLBO, WRAM
Forest Park, WNBA,
Harrisburg, WEBQ
Homewood, WOK
Joliet, WCLS, WJBA, WKBB
La Salle, WJBC
Mooseheart, WJJD
Peoria Heights, WMBD
Quincy, WTAD
Rockford, KFLV
Rock Island, WHBF
Springfield, WCBS
Streator, WTAX,
Tuscola, WDZ
Urbana, WRM
Wankegan, WPEP
Zion, WCBD

INDIANA

Anderson, WHBU,
Brookville, WKBV
Crown Point, WLBT
Culver, WCMA
Evansville, WGBF
Fort Wayne, WCWK, WOWO
Gary, WJKS
Indianapolis, WFBM, WKBF
Kokomo, WJAK
La Porte, WRAF
Muncie, WLBC
South Bend, WSBT
Terre Haute, KGFO, WRPI,
Valparaiso, WRBC
West Lafayette, WBAA

IOWA

Ames, WOI
Anita, KICK
Boone, KFGQ, KICK
Burlington, WIAS
Cedar Rapids, KWCR, WJAM
Clarinda, KSO,
Council Bluffs, KOIL
Davenport, WOC
Decorah, KGCA, KWLC
Des Moines, WHO,
Ft. Dodge, KFJY
Iowa City, KGFB, WSUI
Le Mars, KWUC
Marshalltown, KFJB
Muscatine, KPNP, KTNT
Oskaloosa, KFHL
Shenandoah, KFNF, KMA
Sioux City, KFMR, KSCJ,

KANSAS

Concordia, KGCN
Independence, KFVG
Lawrence, KFKU, WREN
Manhattan, KSAC
Milford, KFKB
Topeka, WIBW
Wichita, KFH

KENTUCKY

Hopkinsville, WFIW
Louisville, WHAS, WLAP

LOUISIANA

New Orleans, WABZ, WCRE, WJBO, WJBW, WKBT, WSMB, WWL
Shreveport, KFDX, KGDX, KRAC, KSBA, KWKH

MAINE

Bangor, WABI
Dover, WLBZ
Portland, WCSH

MARYLAND

Baltimore, WBAL, WCAO, WCBM, WFBR
Tacoma Park, WBES

MASSACHUSETTS

Boston, WATT, WBET, WBIS, WBZA, WEEI, WLBM, WNAB, WNAC, WSSH, WMES
Chelsea, WLOE
Dartmouth, WMAF
East Springfield, WBZ
Fall River, WSAR
Gloucester, WEPS
Lexington, WLEX
New Bedford, WNBH
Quincy, WRES
Taunton, WAIT
Webster, WKBE
Wellesley Hills, WBSO
Worcester, WTAG

MICHIGAN

Battle Creek, WKBP
Bay City, WSKC
Berrien Springs, WEMC
Detroit, WABX, WAFD, WBMH, WGHP, WJR, WMBC, WWJ
Escanaba, WRAK
Flint, WFDF
Grand Rapids, WASH, WOOD
Iron Mountain, WLBV
Lapeer, WMPC
Lansing, WKAR
Ludington, WKBZ
Monroe, WKBL
Royal Oak, WAGM
Petoskey, WBBP
Pontiac, WCX
Ypsilanti, WJBK

MINNESOTA

Barrett, KGDE
Collegeville, WFBJ
Hallock, KGFK
Minneapolis, KFDZ, KGEQ, WAMD, WCCO, WDGY, WHDI, WLB, WRHM
Northfield, KFMX, WCAL
St. Cloud, WFAM
St. Paul, KFOY, WMBE

MISSISSIPPI

Columbus, WCOC

MISSOURI

Cape Girardeau, KFVS
Carterville, KFPW
Columbia, KFRU
Independence, KLDS
Jeffersonville City, WOS
Joplin, WMBH
Kansas City, KWKC, WDAF, WHR, WLBF, WOQ
Kirksville, KFKZ
St. Joseph, KGBX, KFEQ
St. Louis, KFQA, KFUO, KFWF, KSD, KMOX, WEW, WIL, WMAY, WSBF

MONTANA

Havre, KFBB
Kalispell, KGEZ
Missoula, KUOM
Vida, KGCX

NEBRASKA

Central City, KGES
Clay Center, KMMJ
Grand Island, KGEO
Humboldt, KGDW
Lincoln, KFAB, KFOR
Norfolk, WJAG
Omaha, KFOX, KOCH, WAAW, WNAL, WOW,
Shelby, KGBY
University Place, WCAJ
Wayne, KGCH
York, KGBZ

NEW HAMPSHIRE

Laconia, WKAV

NEW JERSEY

Atlantic City, WIAR, WPG
Camden, WCAM
Carlstadt, WHAP
Cliffside, WPAP, WQAO
Elizabeth, WIBS
Jersey City, WAAT, WKBO
Kearney, WLWL
Lambertville, WTAZ
Midland Park, WTRL
Newark, WAAM, WGCP, WNJ, WOR
North Plainfield, WEAM
Paterson, WODA
Red Bank, WJBI
Union City, WBMS
Trenton, WOAX

NEW MEXICO

Raton, KGFL
State College, KOB

NEW YORK

Auburn, WKBR, WMBO
Bay Shore, WRSF
Bronx, WHPP
Brooklyn, WARS, WSDA, WBBR, WBKN, WBRS, WLTH, WMBQ, WIRC
Buffalo, WEBR, WGR, WKBW, WKEN, WMAK, WSVS
Canton, WCAD
Cazenovia, WMAC
Endicott, WNBF
Farmingdale, WLBH
Farmington, WRBL
Flushing, WGOP
Freeport, WGRB
Ithaca, WLCI
Jamaica, WMRJ
Jamestown, WOCL
Long Island City, WLB
New York, WBBC, WRNY, WBOQ, WCDA, WCGU, WEAF, WEBJ, WGBS, WGMU, WGL, WHN, WIZ, WKBQ, WMCA, WNYC, WPCH, WPUB, WRNY, WRMU
Peekskill, WOKO
Richmond Hill, WABC, WAOK
Rochester, WABO, WHAM, WHEC, WNBQ, WOKT
Saranac Lake, WNBZ
Schenectady, WGY
Syracuse, WFBL, WSYR
Troy, WHAZ
Utica, WIBX
Woodhaven, WEVD
Woodside, WWRL

NORTH CAROLINA

Asheville, WWNC
Charlotte, WBT
Greensboro, WNRC

NORTH DAKOTA

Aneta, KGFN
Bismarck, KFYR
Devils Lake, KDLR
Fargo, WDAY
Grand Forks, KFJM
Mandan, KGCU

OHIO

Akron, WADC
Ashtabula, WJPW
Bellefontaine, WIRD
Canton, WIBC
Cambridge, WEBE
Cincinnati, WAAD, WFBE, WKRC, WSAI
Cleveland, WEAR, WFJC, WHK, WJAY, WTAM
Columbus, WAIU, WCAH, WEAO, WMAN
Dayton, WSMK
Harrison, WLW
Hamilton, WMBK, WRK
Mansfield, WLBV
Middleton, WSKO
Shelby, WOBR
Springfield, WCSO
Steubenville, WIBR
Toledo, WTAL
Wooster, WABW
Youngstown, WKBN, WMBW

OKLAHOMA

Alva, KGFF
Tulsa, KVOO
Chickasha, KOCW
Norman, WNAD
Oklahoma City, KFJF, KFXR, KGCB, KGFG, WKY

OREGON

Astoria, KFJI
Corvallis, KOAC
Eugene, KGEH
Medford, KMED
Portland, KEX, KFEC, KFIF, KFJR, KGW, KLIT, KTBR, KWBS, KXL, KOIN

PENNSYLVANIA

Allentown, WCBA, WSAN
Altoona, WFPG
Bethayres, WALK
Carbondale, WNBW
East Pittsburgh, KDKA, KQV
Grove City, WSAJ
Harrisburg, WBAK, WMBS, WPRC
Jeannette, WGM
Kingstown, WABF
Lancaster, WGAL, WKJC
Lewisburg, WJBU
Monessen, WMBJ
Oil City, WHBA, WLBW
Parkersburg, WQAA
Philadelphia, WABY, WCAU, WFI, WFKD, WHBW, WIAD, WIBG, WIP, WLIT, WNAT, WOO, WRAX, WPSW, WFAN
Pittsburgh, WCAE, WJAS
Reading, WRAW
Scranton, WGBI, WQAN,
State College, WPSC
Wilkes-Barre, WBAX, WRRE
Washington, WNBO

PORTO RICO

San Juan, WKAQ

RHODE ISLAND

Cranston, WDWF
Newport, WMBA
Pawtucket, WFCI
Providence, WCBR, WCOT, WEAN, WJAR, WLSI, WRAH

SOUTH CAROLINA

Charleston, WBBY

SOUTH DAKOTA

Brookings, KFDY, KGCR
Dell Rapids, KGDA
Mitchell, KGFP
Oldham, KGDY
Rapid City, WCAT
Sioux Falls, KSOO
Vermillion, KUSD
Yorktown, WNAX

TENNESSEE

Chattanooga, WDOD
Knoxville, WFBC, WNBJ, WNOX
Lawrenceburg, WOAN
Memphis, WGBC, WHBQ, WMBM, WMC, WNBR
Nashville, WBAW, WDAD, WLAC, WSM
Springfield, WSIX
Union City, WOBT
White Haven, WREC

TEXAS

Amarillo, KGRS, WDAG
Austin, KUT
Beaumont, KFDM
Beeville, KFRB
Breckenridge, KFYO
Brownsville, KWWG
College Station, WTAW
Dallas, KRLD, WFAA, WRR
Dublin, KFPL
El Paso, WDAH
Forth Worth, KFJZ, KFQB, WBAP
Galveston, KFUL
Greenville, KFPM
Houston, KFVI, KFYJ, KPRC, KTUE, KFLX
San Angelo, KGFI
San Antonio, KGCI, KGDR, KGRC, KTAP, KTSA, WCAR, WOAI
Waco, WJAD

UTAH

Jerome, KFXD
Odgen, KFUR
Salt Lake City, KDYL, KFUT, KSL

VERMONT

Burlington, WCAX
Springfield, WNBX

VIRGINIA

Arlington, NAA
Norfolk, WBBW, WRCV, WSEA, WTAR, WSUF
Petersburg, WLBG
Richmond, WBBL, WMBG, WRVA
Roanoke, WDBJ

WASHINGTON

Everett, KFBL
Lacey, KGY
Pullman, KWSC
Seattle, KFOA, KFOW, KGCL, KJR, KKP, KOMO, KPCB, KRSC, KTCL, KTW, KVOS, KXRO
Spokane, KFIO, KRPY, KGA, KHQ
Tacoma, KMO, KVI
Walla, Walla

WEST VIRGINIA

Charleston, KOBU
Huntington, WSAZ
Wheeling, WWVA

WISCONSIN

Beloit, WEBW
Camp Lake, WCLO
Eau Claire, WTAQ
Fond du Lac, KFIZ
Kenosha, WKBR
La Crosse, WKBH
Madison, WHA, WIBA
Manitowac, WOMT
Milwaukee, WGWB, WHAD, WSOE, WTMJ
Poynette, WIBU
Racine, WRRS
Stevens Point, WLBL
Superior, WEBC
West De Pere, WHBY

WYOMING

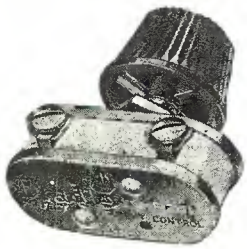
Laramie, KFBU

Resistors that Manufacturers Use for B-Eliminator Hookups

THE extensive use of Bradleyunits and Bradleyohms for B-Eliminator manufacturers demonstrates conclusively their superiority for this service. Profit by the experience of B-Eliminator manufacturers. Use Allen-Bradley resistance units to insure successful results with B-Eliminators.

BRADLEYSTAT

Perfect Filament Control



Provides the correct control for all tubes, thus making it possible to interchange tubes without difficulty. Provides accurate, stepless, noiseless control which makes it a great favorite and a very profitable, fast-selling item.

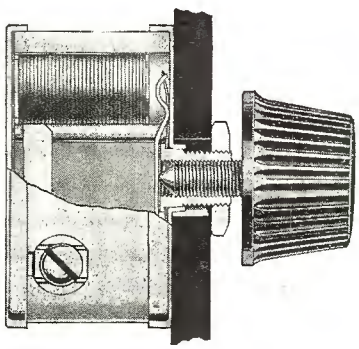
BRADLEYLEAK

Perfect Variable Grid Leak

A fast-selling item that provides the ideal grid leak resistance value for every tube. With this remarkable unit best results can be had with any tube. Push the Bradleyleak to provide perfect grid leak control for your customers and secure good profits for yourself.

BRADLEYOHM-E

This remarkable unit is used for plate-voltage control in a large percentage of the leading B-Eliminators on the market today. It is popular because of its exceptionally wide control, which is stepless, noiseless and completely dependable. Is not affected by moisture or atmospheric changes. Furnished in extremely wide range of resistance values.



BRADLEYUNIT-A

This molded fixed resistor does not deteriorate in service. It is impervious to atmospheric conditions and is not affected by moisture, temperature or age. The end caps are tinned for easy soldering and the unit is readily installed. Ideal for use in B-Eliminator hookups where a fixed resistor is required.

ALLEN-BRADLEY COMPANY
488 Clinton Street • Milwaukee, Wisconsin

Allen-Bradley

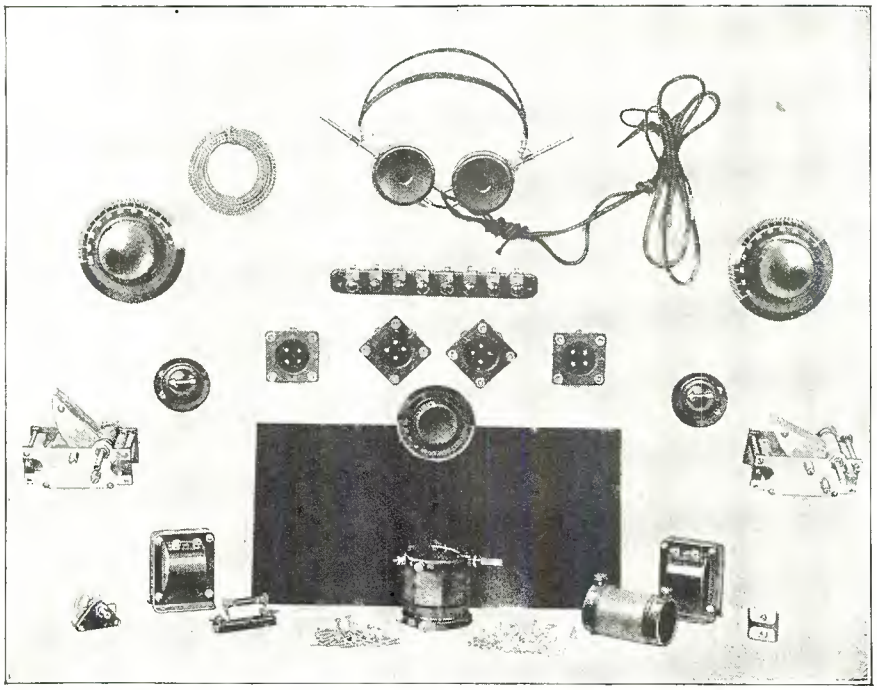
PERFECT RADIO RESISTORS

	Call	Wave	Power
CHILE			
Antofagasta: Senor J. Pedreny	CHAO	.....	.....
Concepcion	CMAI	345	1500
Santiago: El Mercurio, newspaper	CMAC	360	1200
Fratelli Castagneto	CMAD	320	100
	CMAE	280	100
Chilean Broadcasting Society	CRC	385	350
Commercial Radio Co.		350	30
Tacna: Chilean Government	CRCT	550	200
Valparaiso: Antonio Cornish		400	50
CHINA			
Shanghai: Kellogg Switchboard & Supply Co. Operates four hours daily between 9:45 am and 11 pm		365	20
(Note: Stations have been reported in other Chinese cities, but the present operation is very doubtful. The above station is the only one mentioned in more recent reports.)			
CHOSEN			
Seoul: Under construction	JODK	345	1000
COSTA RICA			
San Jose: Government. Under construction		.....	.....
CUBA			
Central Elia: Elia Sugar Co.		300	500
Salvador Rionda	7SR	350	500
Cienfuegos: Jose Gaudinxe	6BY	260	200
Habana: Cuban Telephone Co.	PWX	400	500
Bernardo Barrie	2BB	250	15
Frederick W. Borton	2BY	260	100
El Pais	2EP	355	400
Credito y Construction Co.	2HP	295	100
Jose Lora	2LR	235	50
Manuel y Guillermo Salas	2MG	284	20
Mario Garcia Velez	2OK	350	100
Columbia Radio & Cycle Co.	2OL	257	100
Raoul Karman	2RK	315	20
Roberto E. Ramierz	2TW	270	20
Benito Vieta Ferro	2UF	275	10
Santiago: Alberto Ravelo	8BY	250	100
Tuinucu: Frank H. Jones	6JK	272	100
Frank H. Jones	6KW	340	100
CZECHOSLOVAKIA			
Bratislava: Tues. Fri.	OKR	300	500
Brunn: Radio Journal	OKB	441.2	300
	OKB	441.2	500
Prague: Kbely	OKP	1110	1000
Radio Journal		384.9	5000
DANZIG			
Danzig: Relays Koenigsburg		272.7	1500
DENMARK			
Copenhagen: Radioaadet		337	2000
Hjorring: Relay station. Government		1225	250
Kallundborg (projected)		1150	7500
Lyngley: Relay station. Government		2400	.....
Odense: Relay station. Government		810	1000
Ryvang: Relay station. Government		1150	500
Soro: Ministry of War. News and weather		1153.8	1500
Viburg		1110	1000
		214.3	750
EGYPT			
Cairo	SRE	255	.....
ESTONIA			
Tallinn		1200	100
		408	500
FINLAND			
Bjorenborg: Nuoren Voiman Liiton Radioyhdistys. Daily, general		311	200
Hango: Same		260	200
Helsingfors: Civil Guard		500	1000
Mon, Wed, Fri. General		375	2000
Helsinki: Same as Helsingfors		.....	.....
Jakobstad: Irregular		275.2	200
Jyvaskyla: N. V. L. Radioyhdistis. Irregular		297	200
Lahtis: Three programs weekly		318	180
Mikkeli: N. V. L. R.		566	250
Onln		233	100
Pietrsarki: Same as Jakobstad		.....	.....
Pori		254.2	100
Tampere: Same as Tammerfors		.....	.....
St. Michael: N. V. L. R.		561	500
Tammerfors: Relays Hfors		400	250
Uleaborg: Relays Hfors		250	250
FRANCE			
Agen: Department of Lot et Garonne	2BD	297	250
Angers: Radio Anjou		275.2	500
Bezier		95	100
Biarritz: Cote d'argent		200	.....
Bordeaux: Ministry of Posts, Telephones and Telegraphs		238.1	500
Lafayette		419	1500
Caen: Radio Club		277.8	1500
Dijon		207.5	1000
Grenoble: Ministry of Posts, Telegraphs and Telephones		588.2	1500
Juan Les Pines		230	500
Issy-les-Moulineaux: Ministry of War	QGA	1800	500
Lille		287	500
Limoges		330	500
Lyon: Dubanchet & Troillet, Station Radio Lyon		291	500
Dubanchet & Trolliet, Station Radio Lyon		291.3	1500
Ministry of Posts, Telegraphs and Telephones, Station La Doua, named for suburb in which located	YN	480	1000
Marseilles: Ministry of Posts, Telegraph and Telephones		300	1000
Mont de Marsen		390	300
Montpellier: Radio Montpellier station		338	200
Nice		362	1000
Paris: Eiffel Tower station. Ministry of Posts, Telegraphs and Telephones	FL	2650	4000
Journal Petit Parisien	5NG	333	500
Lucien Levy		350	500
Petit Parisien. Reception reported at Rome Societe Francaise Radioelectrique	FL	341	1000
Societe Francaise de Radioelectrique	SAJ	1780	100
Cie. Francaise de Radiophonie. Reception reported at Teneriffe, Jerusalem, Brussels, Rome, Teheran, Smyrna, Barcelona		1750	4000
Superior School of Ministry of Posts, Telegraphs and Telephones. Reception reported at Rome		447.8	5000
Paris: Radio Paris		1750	3000
Ecole Superieure	FPTT	458	1000
Pic du Midi		350	.....
St. Etienne: Radio Club Forezien		220	50
Strasbourg: Military station		200	15,000
Radio Club	8GF	222.2	1500
Toulouse: Radio du Midi		389.6	2000
Ministry of Posts, Telegraphs and Telephones. Aerodrome station	MRD	260	1000
Radio Vitus		308	250
Reziers		178	500
GERMANY			
Berlin: Postal Authorities, Konigswusterhausen Station. Relays Vox Haus programs. Reception reported at Rome, Constantinople, Bergen, Algiers	LP	1300	12,000
Postal Authorities. Vox Haus station		507	2250
Magdeburger Platz		566	400
Konigswusterhausen Station	AFT	1250	4000
Konigswusterhausen	AFP	4000	10,000
Witzelben		483.9	4000
Wolffs Bureau		252.5	5000
Freiburg		577	1000
Bremen: Nordische Rundfunk A. G. Relays Hamburg programs		400	140
Breslau: Schlesische Funkstunde. Received at Rome		315.8	750
Cassel		272.7	750
Dortmund: Mitteldentscher Rundfunk A. G. Relays Leipzig programs		283	300
Dresden: Mitteldeutscher Rundfunk A. G. Relays Leipzig programs		294.1	700
Elberfeld		468.8	750
Frankfurt-on-the-Main: Sudwestdeutscher Runkfunkdienst		428.6	750
Freiburg i. Br.		577	750
Gleiwitz: Relays Breslau		250	750
Hanover: Nordischer Rundfunk A. G. Relays Hamburg			
Hamburg: Nordischer Rundfunk A. G.		394.7	4000
Hanover: Nordischer Rundfunk A. G. Relays Hamburg programs		297	750
Kassel: Sudwestdeutscher Runkfunkdienst		272.7	750
Kiel: Relays Hamburg		254.2	750
Konigsberg: Ostmarken Rundfunk A. G.		329.7	4000
Langenberg: Rhineland		468.8	2500
Leipzig: Mitteldeutscher Rundfunk A. G.		365.8	750
Muenster: Same		241.9	1500
Munich: Deutsche Stunde in Bayern		535.7	4000
		535.7	300
Norddeich	KAV	1800	.....
Nuremberg: Relays Berlin		303	750
Stettin: Relays Berlin		252.1	750
Stuttgart		379.7	4000
GREAT BRITAIN			
Aberdeen	2BD	500	1500
Bradford	2LS	252.1	500
Birmingham: Received at Antwerp, Brussels, Rome	5IT	326.1	1500
Bournemouth: Received at Antwerp, Teneriffe, Jerusalem	6BM	491.8	1500
Cardiff: Received at Antwerp and Rome	5WA	353	1500
Chelmsford	2BR	.....	.....
Daventry: Received throughout Europe, northern Africa and Asia Minor	5XX	1600	16,000
Dundee	2DE	294.1	200
Edinburgh	2EH	288.5	500
Glasgow	5SC	405.4	1500
Hull	6KH	294	200
Leeds-Bradford	2LS	277.8	500
Liverpool	6LV	297	200
London: Received at Teneriffe, Strasbourg, Brussels, Rome, Barcelona, Tunis	2LO	361.4	3000
Manchester: Received at Rome	2ZY	384.6	1500
New Castle: Received at Brussels, Rome	5NO	312.5	1500
Nottingham	5NG	275.2	200
Plymouth	5PY	400	200
Poldhu	2YT	.....	.....
Sheffield	6FL	272.7	200
Stoke on Trent	6ST	294	200
Swansea	5SX	294	200
HAWAII			
Honolulu: Marion A. Mulrony	KGU	270	500
HAITI			
Port au Prince	HHK	361.2	1000
HUNGARY			
Budapest: Mengeyetemi Radio Magyar Tavirati Iroda. Broadcasts market reports and news	MTL	555.6	2000
		1050	400
ICELAND			
Reykjavik		333.3	100
INDIA			
Bombay: Bombay Presidency Radio Club	2FV	387	100
Walter Rogers & Co.	2AX	320	50
Calcutta: Radio Club of Bengal	2BZ	800	500
Owner not reported	5AF	425	1500
Karachi: Karachi Radio Club		425	40
Madras	2GR	400	200
Rangoon: Radio Club of Burma and Wireless Club of Burma. Broadcasts musical programs every Sunday	2HZ	350	40
IRELAND—NORTH			
Belfast	2BE	306.1	1500
IRISH FREE STATE			
Cork	6CK	400	1000
Dublin: Government	2RN	319.1	1500
ITALY			
Genoa (projected)		272.7	1500
Milan	1MI	322.6	1500
Unione Radiofonica Italiana	1RO	320	1500
Naples: Unione Radiofonica Italiana	1NA	333.3	1500
Rome: Unione Radiofonica Italiana. Broadcasts concerts and news, 8:30 to 11 o'clock pm daily. Receptions reported at Antwerp, Jerusalem, Lille, Smyrna, Damascus, Barcelona, Tunis and Alexandria. This is at present the station best received throughout the Levant	1RO	449	3000
Palero (projected)	1CP	500	2000
Venice (projected)		254.2	1500
JAVA			
Bandoeng: Vereeninging van Radio Amateurs voor Bandoeng en Omstreken	No call	310	6
Batavia: Bataviasche Radio Vereeninging	JFC	220	40
Soerabaja: Two concerts weekly		140	500

	Call	Wave	Power
JAPAN			
Nagoya: Nagoya Radio Broadcasting Co. Broadcasts daily 9 am to 9 pm; Sundays and holidays, 12 m to 9 pm. Program consists of music, weather and market reports, etc.	JOCK	360	1000
Osaka: Osaka Radio Broadcasting Co. Programs in English and Japanese. 1500-watt station projected	JOBK	385	1000
Osaka Broadcasting station (Proj.)	JIBK	385	1000
Tokyo: Tokyo Radio Broadcasting Co. Programs in English and Japanese. 155-watt	JOAK	375	1000
JUGOSLAVIA			
Agram (Zagreb)		275.2	100
Belgrade	HFF	225.6	2000
KWANTUNG			
Dairen: Government Bureau of Communications employs a commercial station. Daily programs broadcast, consisting of music, educational and entertainment numbers	JQAK	390	5000
LATVIA			
Riga	KCX	526.3	2000
LITHUANIA			
Kovno		2000	2000
LUXEMBURG			
Luxemburg	LOAA	217.4	250
Luxemburg		1200	250
MEXICO			
Chihuahua: Federal Government State Capital station	CZF	310	250
Guadalajara: Federal Military Command	FAM	490	1000
Radio Club		280	10
Mazatlan: Castulo Llamas	CYR	475	250
Mexico City: Elfrian R. Gomez	CYA	300	500
Jose J. Reynosa, operated by El Buen Tono, cigarette factory	CYB	275	500
Miguel S. Castro, operated by Le High Life, newspaper	CYH	375	100
	CYJ	400	2000
Raoul Azcarraga, operated by Universal	CYL	400	500
Martinez y Zetina	CYO	425	100
El Excelsior—Parker	CYX	325	500
Department of Education	CZE	350	500
Monterey: Roberto Reyes	CYM	275	190
Constantino de Tarnava	CYS	311	250
Oaxaca: Frederico Zenilla	CYF	265	100
Puebla: Augustin del P. Zaenz	CYU	312	100
Tampico: El Mundo. Suspended			10
Cipriano Sagaon S en C	CYQ	322	100
Local programs	CYZ		20
Vera Cruz	CYD		
Manuel Angel Fernandez. Recently inaugurated for broadcasting advertising of an American product	CYY	548	100
Yucatan: Partida Socialista del Sureste	CYY	548	100
MOROCCO			
Casablanca: Radio Club of Morocco, Omega Station	CNO	305	2500
NETHERLANDS			
Amsterdam		760	
Antwerp		508.5	
Bloemendall		566	
DeBilt	PCFF	1100	1250
Eindhoven: Philips Lamp Works	PCJJ	30.2	
Hilversum: Netherlandsche Seintoellen Fabriek and Hilversum Dreadloze Omroep. Reception reported at Teheran	HDO	1060	1000
Scheveningen-Haven		1950	2500
NEW ZEALAND			
Auckland: Radio Broadcasting Co. of New Zealand. General, two hours daily	1YA	420	500
Christchurch: R. B. Co. of N. Z.	3AC	400	500
Dunedin: R. B. Co. of N. Z.	4YA	380	110
Gisborne: Gisborne Radio Co.	2YM	260	50
Wellington: R. B. Co. of N. Z.	2YK	295	60
NORWAY			
Oslo: Broadcasting Company A. S.		461.5	1500
Bergen: Bergen Broadcasters		370.4	1500
Fredriksstad: Relays Oslo		434.8	750
Hamar		566	750
Porsgrund. Relays Oslo		504	750
Rjukan: Relays Oslo		443	250
Trondjhem		243.9	
Notodden: Relays Oslo		447.8	
Stavanger		277.8	250
Tromso		500	
PARAGUAY			
Asuncion: General, Friday			12
PERU			
Lima: Peruvian Broadcasting Co. (Ltd.)	OAX	360	1500
PHILIPPINES			
Baguio	KZUY	359.9	500
Manila: I. Beck Dept. Store	KZIB	249.9	20
	KZKZ	270.1	100
	KZRQ	222.1	500
POLAND			
Cracow		422	1500
Lemberg: Under construction		247.9	1500
Posen		270.3	1500
Warsaw	AXO	1111.1	8000
Vilna (projected)		234.4	2000
PORTUGAL			
Lisbon: Grandes Armazenes de Chiado. Irregular	1AA	267.8	500
Monte Santo	CTV	2450	1500
PORTO RICO			
San Juan: Radio Corp. of Porto Rico	WKAQ	340.7	500
RUSSIA (Now U. S. S. R.)			
SALVADOR			
San Salvador: Govt. National Broadcasting, Mon, Wed, Fri, 8:15 p. m., C. S. T.	RUS	452	500
SENEGAL			
St. Louis: Senegal Radio Club. Projected		300	100
SIBERIA			
Tomsk	RA21	300	250

	Call	Wave	Power
SPAIN			
Barcelona: Radio Barcelona Station. Associated Nacional Radiofusion.	EAJ1	344	1000
Radio Catalana	EAJ13	277.8	1000
Bilabo: Radio Carlton Station. Radio Club Vizcaya	EAJ9	438	500
Radio Vizcaya Station. Don Armando de Otera	EAJ11	294.1	500
Vizcaya Radio Broadcasting Station, broadcasts music, provided by local talent, and considerable advertising from 12 to 12 pm daily		294.1	2000
Cadiz: Don Francisco de la Liesca	EAJ3	344	500
Radio Lehera	EAJ10	297	1000
Carthagena: Don Enrique de Orbe	EAJ16	294.1	500
Madrid	EAJ2	400	500
Don Antonio Castilla	EAJ4	275.2	3000
Radio Iberica Station	EAJ6	577	1000
Union Radio	EAJ7	375	1000
Radio Madrilena	EAJ12	306	2000
Association of Radio	EAJ15	490	1000
Radio Espana	EAJ2	393	3000
Malaga: Cia Iberia de Telecomunicacion	EAJ25	50-25	100
	EAJ20	254.2	
Oviedo: Don Arburo Cima	EAJ19	201.3	100
Salamanca	EAJ22	405	500
Saragossa	EAJ23	325	1500
San Sebastian: Don Sabino Ucelayeta	EAJ8	272.7	500
Seville: Seville Radio Club	EAJ5	400	1000
Don Manuel Garcia Ballesta	EAJ17	344	500
Don Jorge la Riva, projected	EAJ21		1000
Valencia: Radio Corporation	EAJ14	500	500
Under construction	EAJ24	360	
Zaragoza	EAJ23	566	
STRAITS SETTLEMENTS			
Amateur Wireless Society of Malaya: 2-hour program broadcast each Sunday evening, and children's concert on Wednesdays. Received at Colombo, Ceylon	1SE	330	100
SWEDEN			
Boras	SMBY	230	250
Drebo	SMTI	237	250
Boden: Radiojanst	SASE	454.5	1000
Eskilstuna: Radio Club. Relays Stockholm programs 4 days each week, broadcasts local programs other days	SMUC	275.2	250
Falun: Radio Club. Relays Stockholm programs 4 days each week, broadcasts local programs other days	SMZK	400	750
Gavle: Radio Club. Relays programs 4 days each week, broadcasts local programs other days	SMXF	204.1	250
Goteburg: Radiojanst	SASB	416.7	1000
Halmstad	SMSB	215.8	250
Helsinborg	SMYE	235	250
Hudiksvaal	SMSL	248	250
Jonkopings: Jonköpings Runradiostation. Relays Stockholm programs 4 days each week, broadcasts local programs other days	SMZD	201.3	250
Kalmar	SMSW	253	250
Kalmar	SMSN	254.2	25
Karlsborg: Radiojanst. Relays Stockholm programs 4 days each week, broadcasts local programs other days	SASF	1365	5000
Karlskrona: Relays Stockholm programs 4 days each week, broadcasts local programs other days	SMSM	201.3	250
Karlstadt: Karlstadt Runradiostation. Relays Stockholm programs 4 days each week, broadcasts local programs other days	SMXG	220.6	250
Kristinehamn	SMTJ	202.7	100
Linkoping: Radio Club. Relays Stockholm 4 days each week, local programs other days	SMUV	588.2	250
Malmo: Radiojanst	SASC	229	1000
Motala		1304.5	40,000
Norrkoping	SMVV	372.7	250
Orebro	SMTI	566	250
Osterlund		720	1000
Saffle	SMTS	252.1	500
Stockholm: Radiojanst	SASA	416.7	1500
Sundsvall: Radiojanst	SASD	545.6	1000
Trollhattan	SMXQ	277.8	1000
Uddevalla	SMZP	294.1	100
Umea: Relays Stockholm 4 days, local programs other days	SMSN	252.1	250
Uppsala		500	250
Varborg	SMSO	297	100
SWITZERLAND			
Basel	HB3	1100	300
Berne: Radio Berne Station, Radio Club of Berne	HBA	411	1500
General Post and Telegraph Office		302	1500
Geneva: Radio Broadcasting Society of Geneva. Broadcasts music and news	HB1	760	500
Lausanne: Champ de l'Air Station (Societe Romande de Radiotelephonie Lausanne)	HB2	850	600
Zurich: Hoengg Station. Radio Genossenschaft Zurich University. Reception reported at Antwerp, Brussels, Rome, Vienna	HBZ	500	1000
TUNISIA			
Carthage		100	50
Carthage		1800	5000
Tunis: French Army. Two musical programs broadcast each week	TUA-OCTU	1450	100
French Army. Two musical programs broadcast each week	OCTU	45	
TURKEY			
Osmaieh		1200	6000
UNION OF SOUTH AFRICA			
Cape Town		400	500
Durban: Town Council		400	1200
Grahamstown		400	
Jonhannesburg: Assn. Scientific and Tech. Societies	JB	438	900
Cape Town: Cape Peninsula Broadcasting Assn., Broadcasts 54 hours per week, programs by paid orchestra and local talent		375	1200
UNION OF SOVIET SOCIALIST REPUBLICS (formerly Russia)			
Kiev	RA5	775	1000
Leningrad	RA42	1000	10,000
Leningrad	RA6	940	2000
Moscow: Komitern	RDW	1450	40,000
Radio Paredatcha	RA1	420	2000
Popoff		79	
Popoff		25	
Popoff		1010	2000
Trades Union	MSK	650	2000
Nijni Novgorod	RA13	1400	1500
URUGUAY			
Montevideo	CWOR	350	500
	CWOF	300	100
	CWOG	280	10
	CWOS	380	500
VENEZUELA			
Caracas: Empress Venezolana de Radiotelefonia	AYRE	375	1000

LEARN RADIO and find



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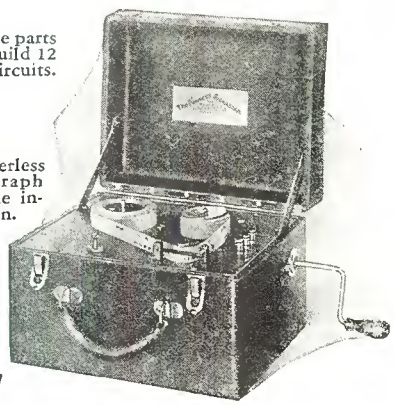

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R. L. DUNCAN, Director, Radio Institute of America. Author of several volumes on radio

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Scott Worlds Record Super Ten Has Electric Phono Pick-Up

Phonograph Reproducer and Sturdy Power Amplifier System Make This Super an Ideal Entertainment Combination

READERS of our magazine who have been following the various Worlds Record super combinations which we have described from time to time will be interested in a novel radio and phonograph combination by means of which the receiver may be brought up to the highest form of entertainment value, combining as it does an ideal trio of selectivity, tonal quality and ample volume for all purposes. Functioning primarily as a ten tube superheterodyne, excellent quality may be secured by virtue of the power amplifier used in conjunction with the receiver, this combination serving to take care of faithful reproduction of broadcast music. With an electric pick-up scheme, such as shown in Figure 1, where the United electric pick-up is utilized, the listener may bring into play phonograph music with results which were never secured under the old form of phonograph reproduction. Therefore, the phonograph-radio combination makes it an ideal one from the standpoint of the set owner who wishes to avail himself of not only the music as broadcast, but wishes to repeat at will certain selections which he may have on the phonograph and which appeal to him.

Uses Antenna Connection

In order to secure as high a degree of initial radio frequency amplification as is possible in the present design of the Worlds Record Super Ten, two stages of tuned radio frequency have been placed ahead of the first detector, energy being secured from the antenna through the primary winding of the first radio transformer, so that a fairly small antenna will suffice to deliver good signal intensity to the first detector after this energy has been amplified by the two radio frequency stages. This method of energy supply has been found quite stable and capable of giving uniform satisfaction in operation under practically all conditions. This feature of two tuned r.f. stages ahead of the detector is also responsible for the fact all stations appear at only one position on the oscillator dial.

The two radio frequently grid circuits and the grid circuit of the first detector are tuned by a three gang condenser of a .00035 mfd capacity, each of the three sections of this triple gang having a small balancing capacity across each of the major capacities. This is for the purpose of allowing the operator a chance to peak these three stages at resonance for best results. To further enable the operator to gain a degree of flexibility which might not otherwise be afforded, a .000025 mfd midget condenser has been located across the main section of the first .00035 mfd gang, so that the operator when desiring to work his receiver against interference may shift this capacity slightly and thereby gain true resonance with the incoming signal.

For tuning the oscillator, a single .00035 mfd condenser is utilized, this being the one placed on the drum dial shown at the right in the photograph, Figure 2, while the three gang condenser is attached to the drum dial shown at he left in this same photograph. The knob at the left which is labelled "distance" represents the .000025 mfd midget condenser previously referred

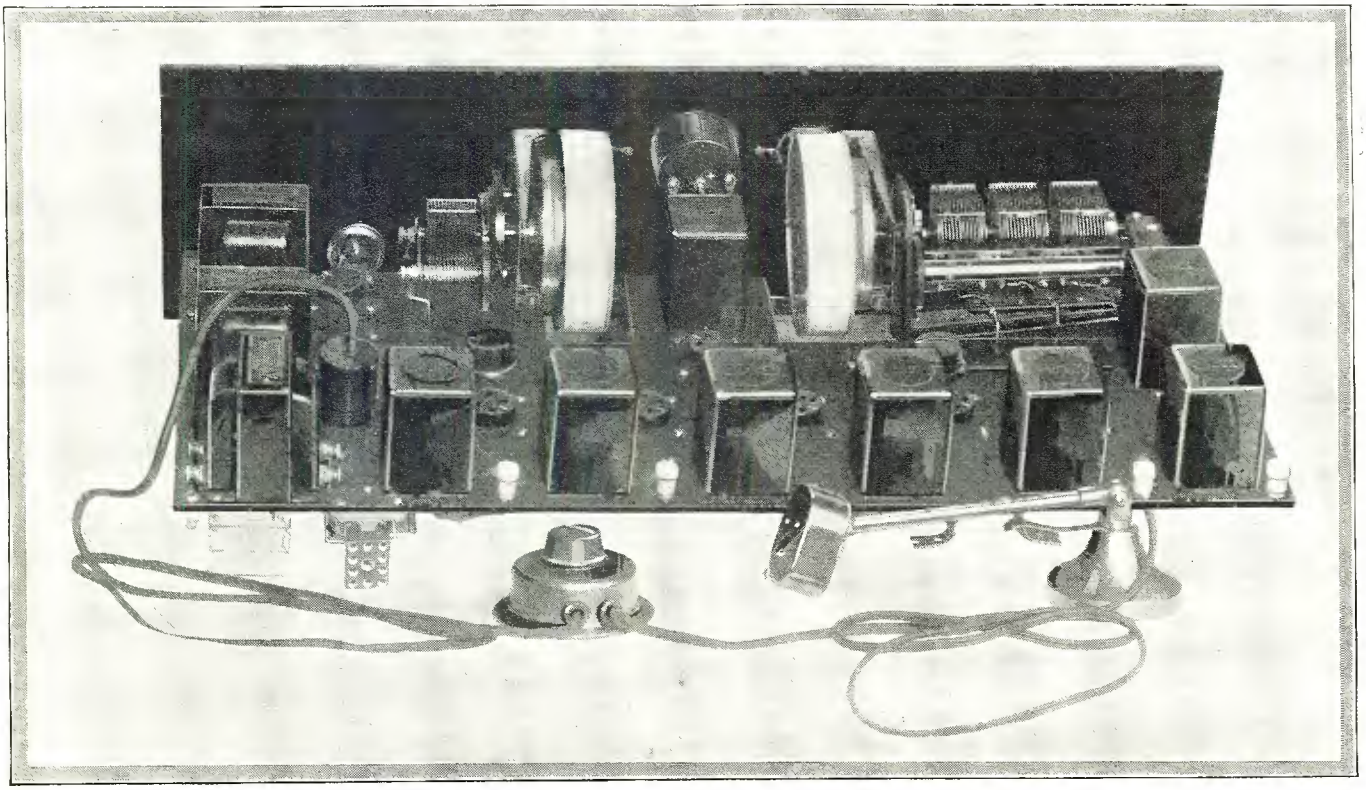


Figure 1. This photograph shows a rear view of the World's Record Super Ten with a United electric phonograph pick-up plugged in on the second detector stage. By this means it is possible to play phonograph records on the receiver

(This receiver tested and all illustrations made in our laboratory)

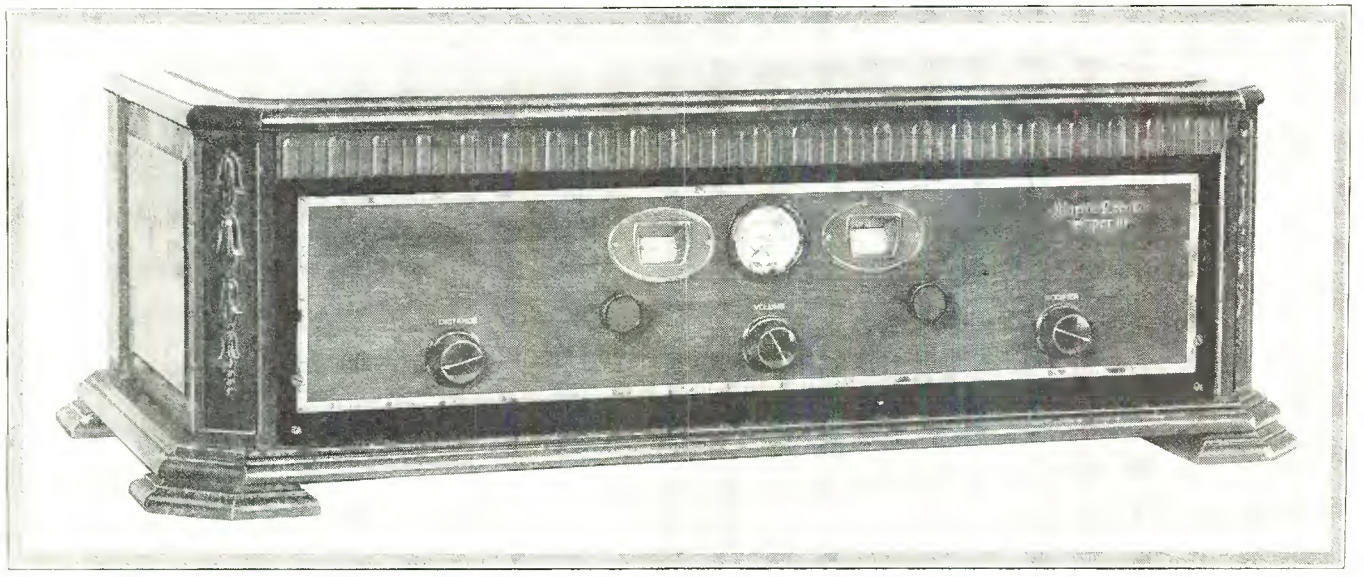


Figure 2. Above is shown a close-up view of the World's Record Super Ten in an attractive cabinet

to, while the combined 15 ohm rheostat and filament switch governing the filaments of the first and second radio frequency amplifiers is located at the center of the front panel, Figure 2, and the 400 ohm potentiometer used for biasing the grids of the first, second and third intermediate stages is located at the extreme right. The meter shown between the two drum dials on the front panel in Figure 2 is a 0-8 d.c. voltmeter located across the intermediate frequency tubes and which serves as a guide to the operator in keeping the proper voltage applied to these amplifier filaments.

Detection in the first detector is by means of a .00025 mfd grid condenser spanned by a 3 megohm leak, the grid return of this tube being to the positive side of the filament so as to afford the recommended bias for the 201-A tube. In the plate circuit of the first detector a radio frequency choke has been employed which, with a .0001 mfd bypass condenser between the plate and the filament, serves to bypass any stray radio frequency energy that has passed through the detector and which might be undesirable in the intermediate frequency train.

Four stages of intermediate frequency amplification are used with two Selectone B500 and two Selectone B510 transformers, these being of the long wave type. Close matching of the long wave Selectones gives this set an inherent selectivity and amplification. The radio frequency transformers shown in the schematic circuit as being ahead of the first detector are of the type B520, while the oscillator is a type B540.

Instead of grid condenser and leak detection in the second detector, 4.5 volt bias is used to give rectification with greater stability than the form previously mentioned. The plate circuit of the second detector is likewise protected with an r. f. choke and a .002 mfd bypass condenser.

Has Output Transformer.

In the audio end of the Worlds Record Ten two stages of amplification are used, Thordarson R200 transformers being selected for these positions, on account of their faithful amplifying properties which give the receiver an all around tone quality so widely sought after. In addition a Thordarson R76 output transformer is provided as a means of keeping the high voltage in the power stage from the winding of the speaker, which in tests made in our laboratory was a Jensen dynamic cone driven from a six volt source for the energizing windings. The full rounded tones from such a speaker makes a very desirable accompaniment for this receiver.

Radio frequency control of the receiver is by means of the 15 ohm rheostat shown in the schematic which governs the filaments of the first and second radio frequency amplifier tubes. The first detector filament control is through a 30 ohm rheostat in

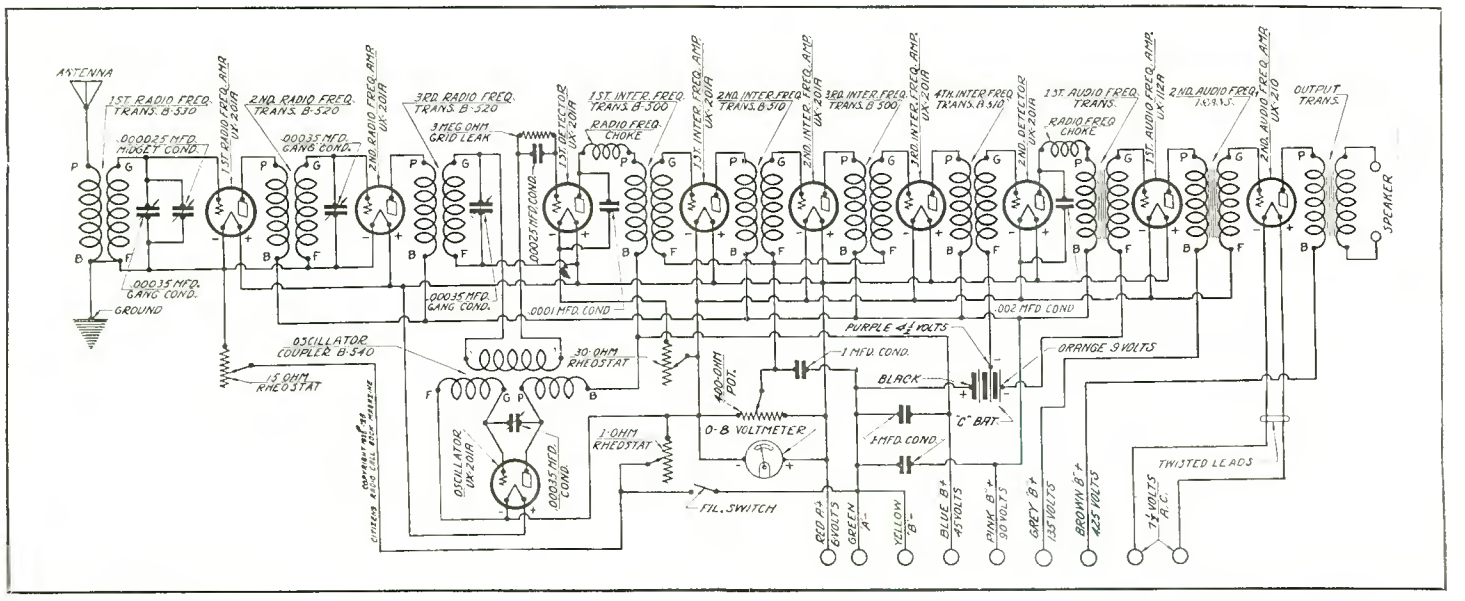


Figure 3. In this diagram is shown the schematic wiring for the construction of the World's Record Super Ten, which may be easily wired up according to the diagram or to the one shown in Figure 4

series with that tube's negative filament. In operating practice it has seldom been found necessary to alter this control, the rheostat being turned all the way on while the set is in operation and left in that position. However, it might be of advantage in the case of detector tubes with odd characteristics. A 1 ohm rheostat which is placed on the subpanel controls the filaments of the oscillator, first, second, third intermediates, second detector and first audio stages. The last stage of course is served with 7.5 volts a. c. for the filaments of the 210 power tube and no control is required for that tube, a filament winding on the power amplifier described later giving this voltage value. The filament voltage on the tubes governed by the 1 ohm rheostat is not very critical, although in operation it is found that about 4.75 to 5 volts will give excellent results. This voltage may be determined by the voltmeter on the front panel.

Sturdy Power Amplifier

Desiring a power amplifier that would give the required voltages for the receiver the Thordarson full wave power amplifier has been constructed and is illustrated graphically in Figure 6, and photographically in Figure 5. It consists of a transformer with high and low voltage windings, the former for the two 281 or 216-B tubes, the latter for the filaments of the rectifier tubes, and a separate 7.5 volt winding for the filament of the 210 tube used as a power stage in the receiver. In a separate metal container is the Thordarson filter choke, while in another metal can is the Tobe filter condenser. A single resistance with suitable taps is provided by Carter, the values of the resistance sections being shown in the graphic illustration, Figure 6. Two sockets and five binding posts comprise the balance of the material for the power amplifier which should be wired up in accordance with the graphic diagram in Figure 6. The entire power amplifier may be laid out on a wooden baseboard nine by twelve inches and the wiring quickly done if flexible conductor is used. Four plate voltages are provided by this power amplifier, these being the 45 volt value for the oscillator and first detector, 90 volts for the first and second radio frequency, first, second and third intermediate frequency tubes and the second detector, 135 for the plate of the first audio, and 425 volts for the plate of the 210 in the last stage. A bias for the grid of the 210 tube is obtained through the drop across the 1700 ohm resistor section lying between the negative B terminal and the center tap of the 7.5 volt filament winding which serves as supply for the 210 filament circuit. Thus the whole outfit is simple, compact and rugged and furnishes ample current for any purpose up to the limit of the two rectifier tubes. Either 216-B tubes or the newer 281 tubes way be used, the latter of course, giving a greater current value than the older type.

After all the wiring has been done on both the receiver and the power amplifier it may be put into commission. Of course, all of the wiring should be checked against the graphic to see that no errors have been made. Standard quarter ampere tubes go in all socket positions except the last stage where a 210 is used and the first audio where a 112 tube is used. The grid bias for the 112-A tube is secured from a 9 volt C battery while half that value, 4.5 volts, serves for the grid return of the second detector.

Smooth Volume Control

In operation turn the 1 ohm rheostat up until the meter reads 4.50 to 4.75 volts. Turn the 30 ohm rheostat on the subpanel all the way up. Turn the 400 ohm potentiometer knob about half way up, or at least until a squeal is heard, then back it down a trifle. The 15 ohm rheostat may be turned about half way on.

Then rotate the left hand drum control, keeping its value about the same as that of the right hand drum control, the latter being the oscillator condenser. The radio frequency stage settings and the settings of the oscillator will run almost true throughout a good portion of the dial travel. Tune in first on a strong station until you have adjusted the receiver to your liking, then start tuning for the weaker signals.

On the three section Remler gang condenser shown at the left of the graphic illustration, will be found three little trimmers which are located under the main capacities and which may be

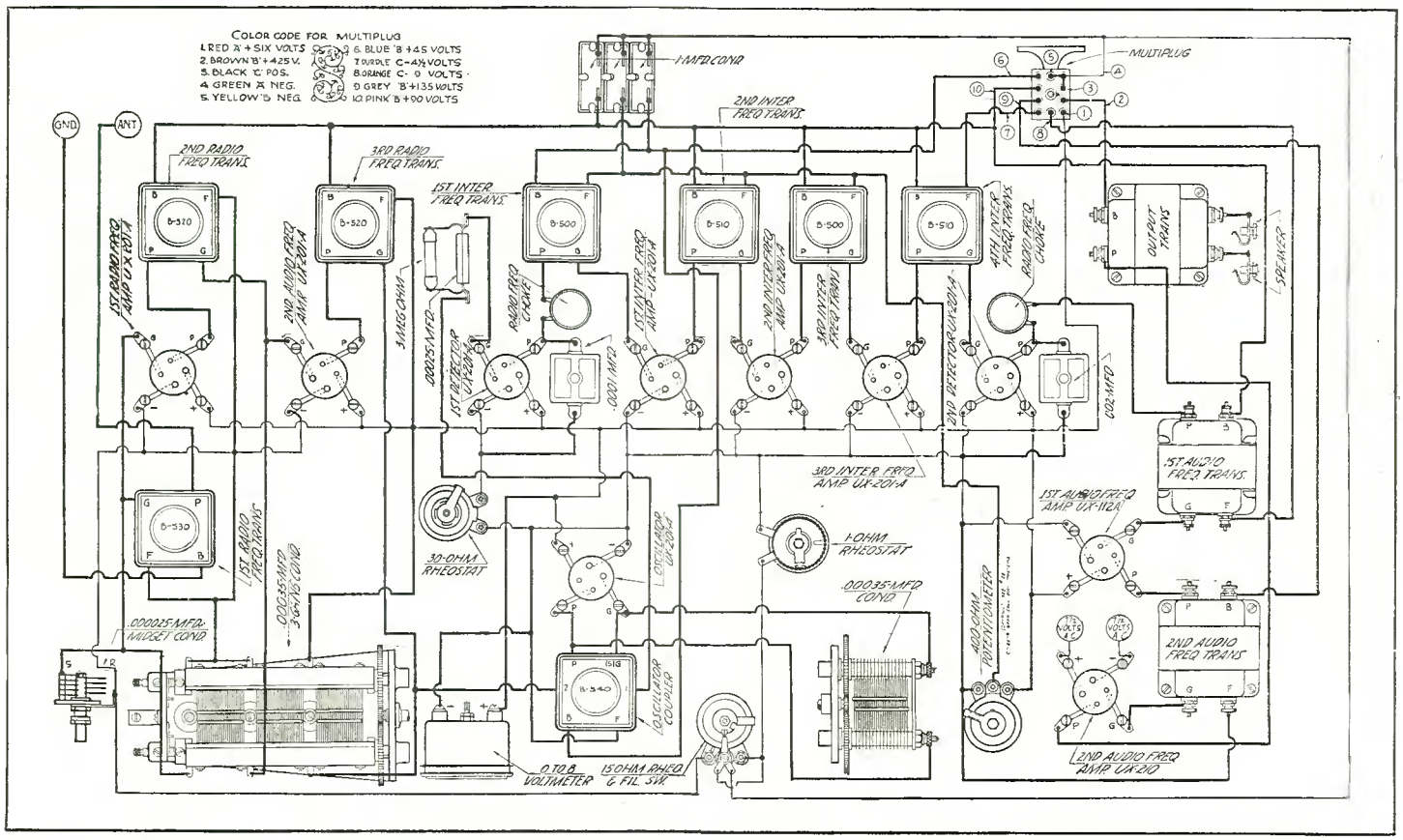


Figure 4. In this graphic illustration the set builder can readily see how simple is the wiring of the receiver described. The sub-panel is available already drilled and it is a matter of a very short time for the builder to complete the wiring of the entire receiver

shifted by means of a wooden stick sharpened like a screw driver. The one at the extreme right in the graphic picture, and the one in the middle of the three gang unit, are first shifted until the signal on that stage comes in at about the same setting as on the oscillator. Then the one to the left is shifted until greatest volume is secured. The panel midget condenser should be half-in and half-out during this adjustment. When all three trimmers are adjusted on a weak signal to give greatest volume it will be found that by use of the panel midget it will be possible to clear up interference between two stations and secure selectivity that might not otherwise be possible with fixed trimmers on those stages. In starting to trim the three gang condenser it might be easiest for the operator to screw all the trimmer capacities all the way in, then shift the middle one and the left one a little at a time until the highest volume is secured.

Getting Strongest Signal

Of course by turning these trimmers in and out it is possible to shift the appearance of a given station on the left dial either up or down by four or five degrees, and in some cases more. However, the idea should be to shift the trimmers so the left dial readings will match the right dial readings. It is advisable to do this on a station like KDKA, after which the two will track fairly well throughout the entire range. With the present broadcast situation and during the winter time the owner should be able to use a distant station like KFI as a means of balancing his receiver, assuming of course, he has average antenna and ground conditions. With the present allocations the local stations in the metropolitan centers should not prevent the reception of outside stations as long as signal intensity is at a fair level.

Using Phonograph Pickup

When it is desired to convert the radio set into an amplifier for use with the electric phonograph pickup unit such as is shown in the photograph in Figure 1, all that is necessary is to remove the second detector from its socket and insert in its place the plug for the electric pickup, this plug having the plate and filament prongs connected so the magnetic impulses from the windings of the pickup will go into the primary of the first audio and be amplified through the audio train and out into the speaker. Those who have not yet heard the electric phonograph pickups may expect somewhat of a surprise as to the tone quality that is secured through the newer form of phonograph reproduction. A suitable volume control is provided on the pickup unit by means of which the listener may alter the volume at will.

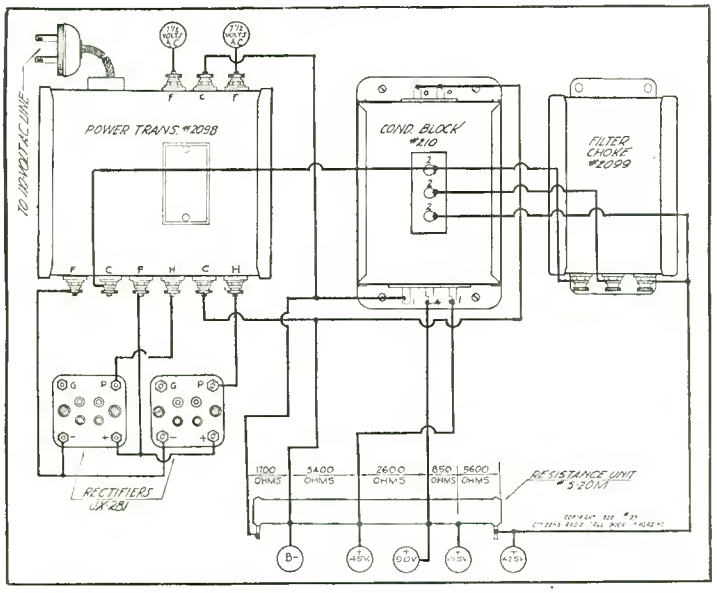


Figure 6. Placing the apparatus involved in the Thordarson power amplifier as shown in the photograph in Figure 5, the wiring of this unit may be accomplished by consulting this graphic illustration shown above. The wiring may be done with twisted insulated wire, or if the builder desires it may be accomplished with solid bus bar wire

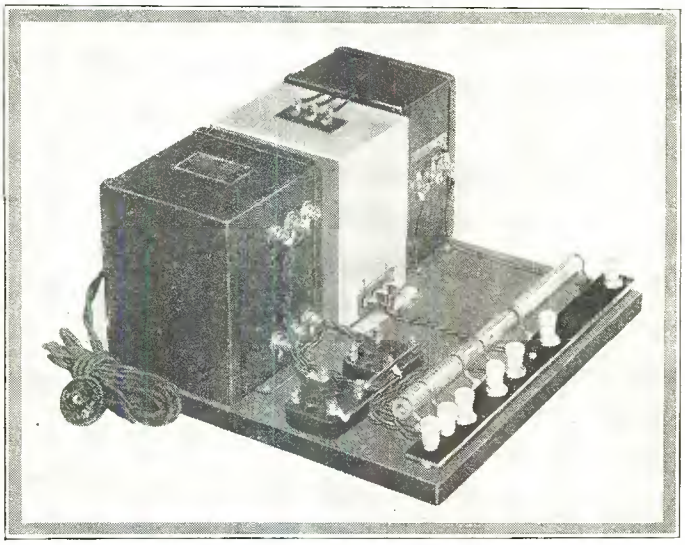


Figure 5. Above may be seen the Thordarson full wave power supply which is used for supplying receiver voltages and power voltages for the World's Record Super Ten. It should be wired up in accordance with the diagram shown on this page, Figure 6

List of Parts

Parts used in the construction of the model described in the foregoing article are as follows:—

RECEIVER

1—Remler .00035 mfd variable condenser
1—Remler 3-gang .00035 mfd variable condenser
2—Remler universal drum dials
2—35 Remler r. f. chokes
2—B500 Selectone transformers
2—B510 Selectone transformers
2—B520 Selectone r. f. transformers
1—B-530 Selectone r. f. transformers
1—B-540 Selectone oscillator
2—R-200 Thordarson audio transformers
1—R-76 Thordarson output transformers
1—Cater Imp 400 ohm potentiometer
1—Carter heavy duty rheostat, 1 ohm
1—Carter 15 ohm rheostat with switch
2—Carter tipjacks
2—Carter .00025 grid condensers
1—Carter .002 fixed condenser
1—Carter .0001 fixed condenser
1—340 S-M midget variable condenser
10—9044 Benjamin sockets
1—8629 pair Benjamin brackets
4—Tobe 1 mfd by-pass condensers
1—Tobe 3 megohm grid leak
1—Jones multiplug, 10 contact
1—135 Jewell 0-8 volt voltmeter
1—Pkg. Kester radio solder
1—Lignole 7"x26"3/16" drilled and engraved panel
1—Formica 10"x26"x3/16" drilled sub-panel
60—Kellog solder lugs
40—Ft. Acme flexible Celatsite wire
2—XL binding posts
1—Ekko ground clamp
Miscellaneous—lugs, nuts, screws, etc.

POWER SUPPLY

1—2098—Thordarson transformer
1—2099—Thordarson choke coil
1—R210 Tobe condenser block
2—530 Frost sockets
1—S-20-M Carter resistance
7—XL binding posts
1—Wood baseboard 9"x12"
1—Micarta binding post strip 8"x3/4"x3/16"

You really haven't heard radio in all its perfection until you use the

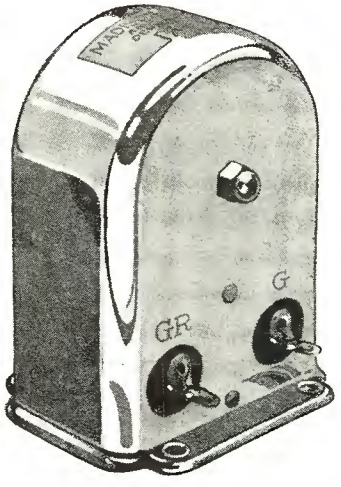
Madison-Moore
INTERNATIONAL ONE•SPOT
Batt'ry-less Transformer

TRULY, the "International One·Spot," because, in addition to reports of superb reception from all four borders of the country, we are receiving foreign countries.

These reports enthusiastically praise the MADISON-MOORE Transformer as the finest ever designed. Its tremendous, undistorted volume has been sought but never attained in any other instrument.

This "International One·Spot Transformer" operates on a frequency of 480 kilocycles and no transformer is really a "One·Spot" which operates at a lower frequency than this.

The MADISON-MOORE surpasses in ease of operation; does away with the bother of batteries. It has positively no hum. It is the ONLY true ONE·SPOT Transformer!



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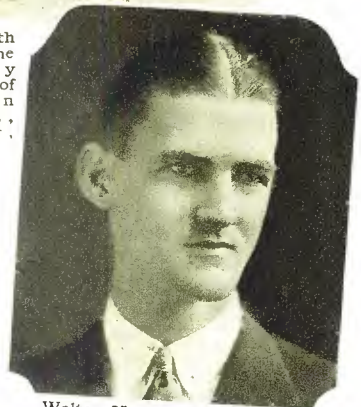
Tell 'Em You Saw It in the Citizens Radio Call Book Magazine

Patrick H. Barnes, winner of gold cup awarded to most popular announcer of 1927. He is the first announcer to win two cups, having won the silver cup as second most popular announcer of 1926. Heard from Station WHT, Chicago

Mrs. Julian Heath, who gives the daily menu talk every afternoon over WJZ, N. Y. City

Dorothy and Ruth Weidergott, The Harmony Song Birds of Station WCMA, Culver, Ind.



Walter N. Campbell, announcer and director of Station WLAC, Nashville, Tenn.

Chappie O'Donnell, who renders popular songs with Uke accompaniment over Station WHAR, Atlantic City, N. J.

Virginia Swanson, relief hostess of WOW, Omaha, Neb.

Charles Robinson, basso of the National Musical Comedy Troupe heard over the Network Stations on Saturday Nights through WEAF, N. Y. City

Chappie O'Donnell and her Sunshine Broadcasters Club, heard over Station WHAR, Atlantic City, N. J.

Norman Link, staff artist of Station WOWO, Ft. Wayne, Ind.

Joe Faassen, winner of second place in the 1927 contest for popular announcers. Heard over KSO, Clarinda, Iowa

General Leigh R. Gignilliat, Supt. of Culver Military Academy, who broadcasts regularly over Station WCMA, Culver, Ind.

Judith C. Waller, Director of Stations WMAQ and WQJ, Chicago, Ill.

Seaside Hotel Trio, heard over WHAR, Atlantic City, N. J.

Prof. R. A. Dhossche, Flute and Piccolo Soloist and Director of the Magnolia Refinery Band, Station KFDM, Beaumont, Texas

Emerson Gill, Director of the Bamboo Garden Orchestra, heard over WTAM, Cleveland, Ohio

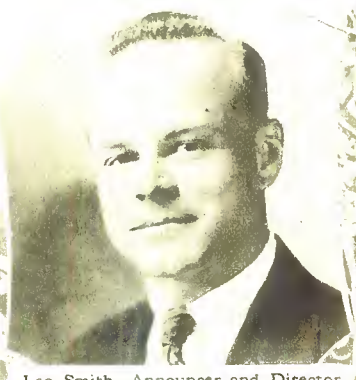
Harold E. Gray, General Manager of WJAY, Cleveland, O.

June Parker, Character Singer of Station KFWB, Hollywood, California

Albert Ryerson, Announcer and Studio Manager of Station WCAE, Pittsburgh, Pa.

Albert D. Hodges, Technical Director of Station KPO, San Francisco, California

Magnolia Glee Club, Miss Nellie Howland, Director, Station KFDM, Beaumont, Texas



Leo Smith, Announcer and Director of Station KFDM, Beaumont, Texas

Neptune Male Quartette; Carroll H. Hoagland, first tenor and director; Howard M. Talbot, second tenor; Lester A. Dick, first bass and F. Edward Fessenden, second bass. Heard over Station WHAR, Atlantic City, N. J.

"Dr Mu," Chinese Philosopher who presents the "Music and Musings of Dr. Mu" every Thursday Evening at eight o'clock through Station WABC, Richmond Hill, N. Y.

Alfredo Meunier, leader of the Capitolian Band and Concert Pianist heard over Station CKLC, Calgary, Alberta, Canada

Mabelle A. Tupper, whistler, heard over KSEI, Pocatello, Idaho

J. R. Foster, Manager and chief announcer of Station CKLC, Calgary, Alberta Canada

Hotel Winthrop Dinner Hour Trio, a feature of KMO, Tacoma, Wash.

Marie Kieny, Hostess and Studio Accompanist of Station WOW, Omaha, Neb

Clarence Crary, the entertaining announcer of KFON, Long Beach, Calif.

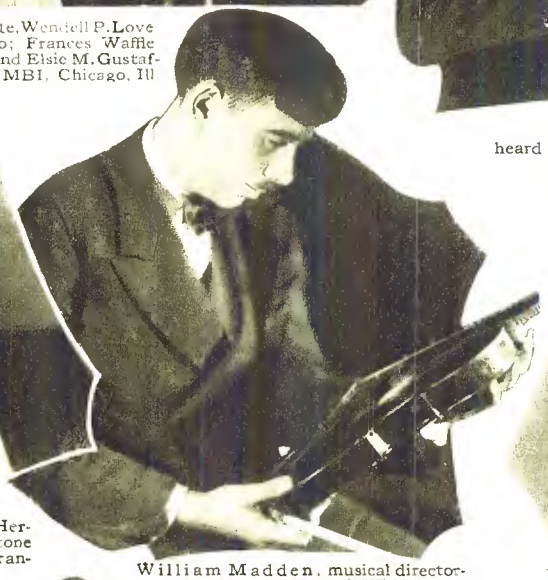
Lanney Young, crooning contralto heard over the Piggly Wiggly Station, KFON, Long Beach, Calif.

John Viking, announcer of WCBD, Zion, Ill.

The Moody Bible Institute Quartette, Wendell P. Loveless, tenor; Helen Hargis, soprano; Frances Waffle contralto; William E. King, basso, and Elsie M. Gustafson, pianist, heard over Station WMBI, Chicago, Ill

Michael Weiner,
violinist,
heard over WBAL, Baltimore, Md.

Elmer Herling, baritone of KPO, San Francisco, Calif



William Madden, musical director of WTAM, Cleveland, Ohio

John Porlier,
The Young Whispering Tenor heard over WGBS, N. Y. City

Richmond Police String Band, regular entertainers over WRVA, Richmond, Va.

Natalie Giddings, director and announcer of the Crosley Woman's Hour, every morning, from WLW, Cincinnati, O.

Stan Lee Broza, chief announcer of WCAU, Philadelphia, Pa

Volly Endriss, original crooning contralto, also hostess and program director of Station WWRL, Woodside, N. Y.

George Hartrick, popular baritone who broadcasts from Station WWNC, Asheville, N. Car.

The Ipana Troubadours, heard over the Network Stations through WEAF, N. Y. City

Curt Peterson, baritone and announcer of WJZ, N. Y. City

R. Derks, heard over Station WCAZ, Carthage, Ill.

Ruth Heizer, contralto, well known concert artist, heard over KYW, Chicago, Ill.

George Wood, announcer KOIL, Council Bluffs, Iowa

Jim Clancy announcer of the vaudeville program from the Hartford Theater each Thursday, from Station WTIC, Hartford, Conn.

Morene Ross Jacobsen, soprano, heard over KSEI, Pocatello, Idaho

Eugene Baker, assistant announcer of KEX, Portland, Ore.

Helen Remy, pianist of WLBV, Mansfield, Ohio

Ruth Kleckner, pianist of WMAK, Buffalo, N. Y.

The Bluebird Hawaiian Trio, heard over KFON, Long Beach, Calif.

Wm. Stoess, Musical Director of WLW, Cincinnati, Ohio

Norman Sweetser, announcer of WJZ, N. Y. City

Vaughn De Leath, alto, heard over Station WJZ, N. Y. City

George O'Brien, leading tenor of the National Light Opera Co. and a member of the National Light Opera Quartette, heard over the network Stations through WEAF, N. Y. City

Fred Schreiber, chief operator of Station WOWO, Ft. Wayne, Ind.

Walter B. Stiles, owner and director of Station WOOD, Grand Rapids, Mich.

Arthur Rekart, Chief Engineer of Station WOWO, Ft. Wayne, Ind.

E. F. Grossman, operating engineer of the National Broadcasting Co., making final tests of apparatus at Auditorium Theater, Chicago, from where portions of the Opera are being broadcast during the Balkite Hour, through the Stations of the Blue Network from WJZ, N. Y. City

Melville Ray, tenor, heard over WLW, Cincinnati, Ohio

KWTC Classical Trio, Santa Ana, Calif., Harold Mathews, oboe; Adeline Cochems, piano; Lyle Roberts, clarinet, and Kinsley Hancock, announcer

Marie Winters, staff pianist of Station WEHS, Evanston, Ill.

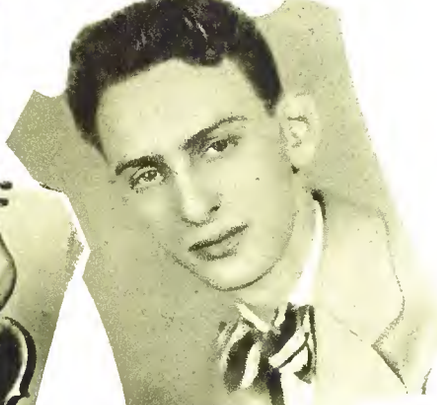
"Al and Pete," Al Cameron and Pete Bontsema, heard over KYW, Chicago, Ill

The Famous National Barn Dance Fiddlers, popular with Saturday Night Radio fans. Heard over WLS, Chicago, for over three years

Bettie Sale Stewart, who presents original negro sketches every Friday evening over KOMO, Seattle, Wash.

Olga Mundy, singer of popular and novelty songs through Station WCAE, Pittsburgh, Pa.

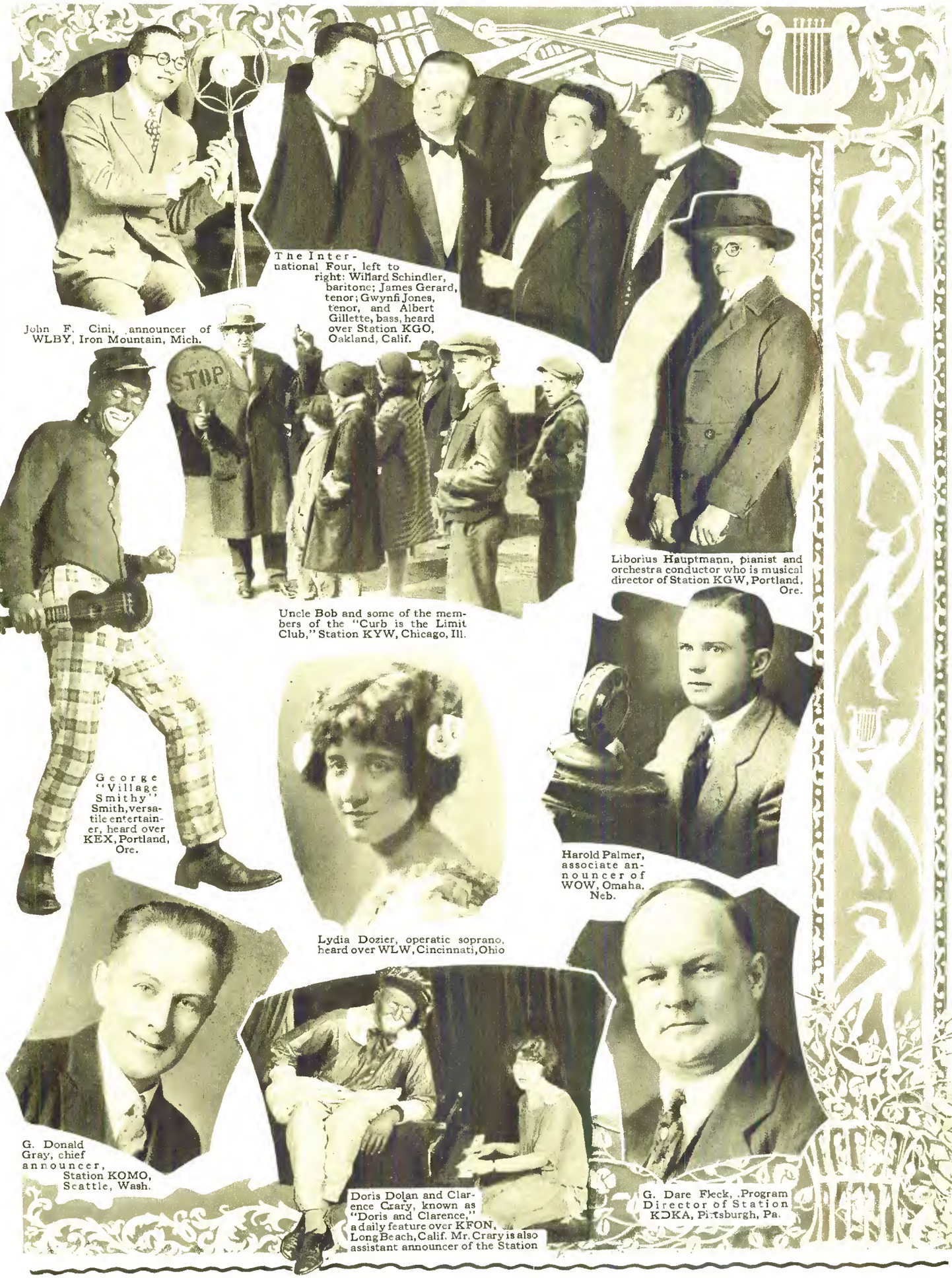
Art Billquist, baritone, exclusive artist of WCFL, Chicago, Ill.



Herbie Koch, organist, heard from Capitol Theater, Des Moines, Iowa, through Station WHO

E. Russell Wightman, announcer and manager of Station KFHA, Gunnison, Colo.

Mr. and Mrs. Fred Thieleker, Swedish artists heard over WRVA, Richmond, Va.



The International Four, left to right: Willard Schindler, baritone; James Gerard, tenor; Gwynfi Jones, tenor, and Albert Gillette, bass, heard over Station KGO, Oakland, Calif.

John F. Cini, announcer of WLBY, Iron Mountain, Mich.

Liborius Hauptmann, pianist and orchestra conductor who is musical director of Station KGW, Portland, Ore.

Uncle Bob and some of the members of the "Curb is the Limit Club," Station KYW, Chicago, Ill.

George "Village Smithy" Smith, versatile entertainer, heard over KEX, Portland, Ore.

Harold Palmer, associate announcer of WOW, Omaha, Neb.

Lydia Dozier, operatic soprano, heard over WLW, Cincinnati, Ohio

G. Donald Gray, chief announcer, Station KOMO, Seattle, Wash.

Doris Dolan and Clarence Crary, known as "Doris and Clarence," a daily feature over KFON, Long Beach, Calif. Mr. Crary is also assistant announcer of the Station

G. Dare Fleck, Program Director of Station KDKA, Pittsburgh, Pa.

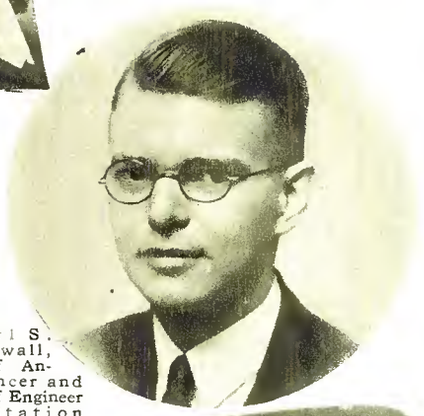
Fred Lynch, Tenof, on Totem Broadcaster Staff of KOMO, Seattle, Wash.

Dare Sisters, Harmony Singers heard over the Piggly Wiggly Station KFON, Long Beach, Calif.

Raymond J. Carr, Operator of Station WLBG, Petersburg, Va.

E. Paul Hamilton, Managing Director of Station WOR, Newark, N. J.

Earl Hoffman, leader of the Chez Pierre Orchestra heard through Station WCFL, Chicago, Ill.



Carl S. Tunwall, Chief Announcer and Chief Engineer of Station KFJY, Ft. Dodge, Iowa

Geo. H. Lawrence, Announcer Station WSIX, Springfield, Tenn.

"The Voice of Columbia," the masked announcer, heard over the Columbia Broadcasting System, N. Y. City

Austin Wylie, leader of popular dance orchestra heard over WTAM, Cleveland, Ohio

Jack W. Pilley, Announcer and Studio Manager of KFCR, Santa Barbara, Calif.

S. L. Rothafel, "Roxy," well-known to all broadcast listeners, heard over the Blue Chain Stations, through WJZ, N. Y. City

Chuck Haynes and Ray Ferris, "Harmony Slaves," who broadcast over WCFL and WQJ, Chicago, Ill.

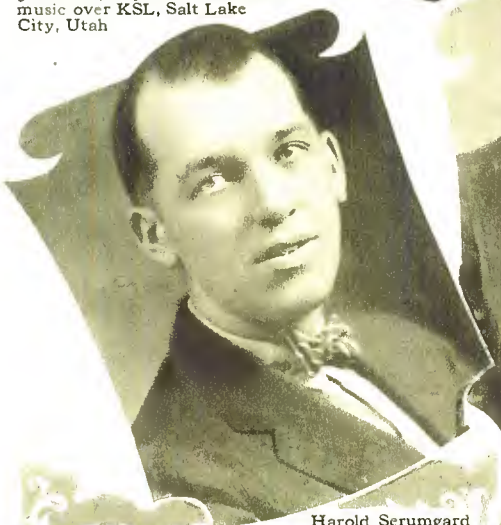
Max Steindel, director of Steindel String Quartette, heard over KMOX, St. Louis, Mo.

Billie Allen Hoff, heard over WCFL and KYW, Chicago, Ill.

Major J. Andrew White, dean of broadcasters and vice president of Columbia Broadcasting System, N. Y. City

Gerald L. King, manager of Station KFWB, Hollywood, Calif.

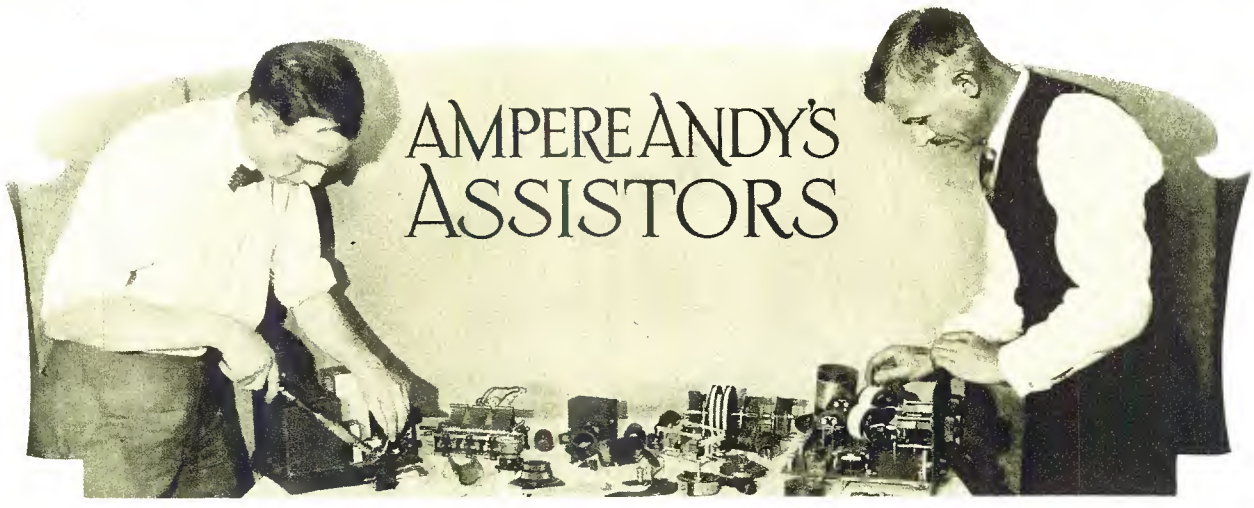
Jack Don, dispenser of Hawaiian music over KSL, Salt Lake City, Utah



Harold Serumgard announcer of KDLR, Devils Lake, N. Dak.

Stuart Barsby, announcer and business manager of KLZ, Denver, Colo.

Robert S. Childe, assistant announcer and pianist of WGHP, Detroit, Mich.

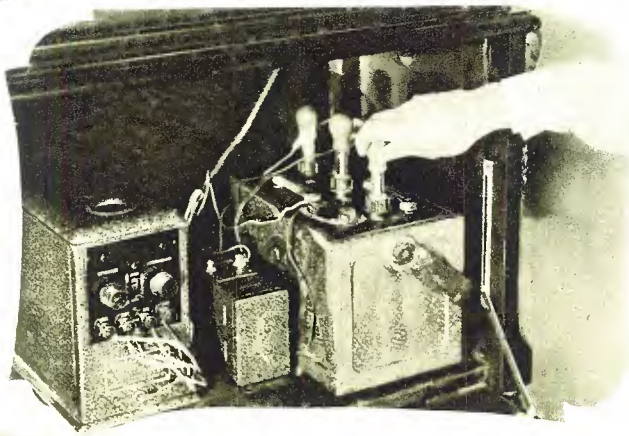


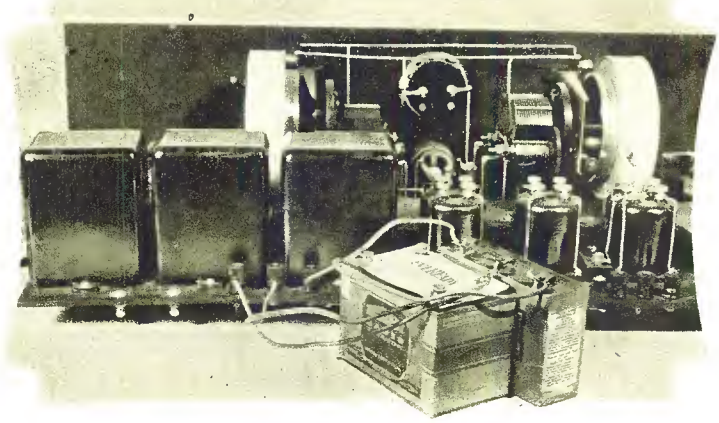
Cleaning a Storage Battery

A storage battery which has been in use for a while accumulates a considerable amount of acid impregnated dirt on its surface. Clothes, coming in contact with the battery, are often mutilated by the acid burns. A convenient method for cleaning the top of the storage battery is to place it under a hydrant and let the water run over it. This, of course, with the vent caps in place. While the water is running over the battery, vigorously scrub the surface with an old scrubbing brush, which will remove the acid and dirt. After the battery has been thoroughly cleaned with water, go over the battery again with a strong solution of ammonia or baking soda. This will neutralize any acid remaining. Flush it again with water and then set the wet battery in the sun or some place where a free circulation of air is available, where the excess water will quickly evaporate.

A Unique Hydrometer

A unique hydrometer has recently been placed upon the market, the advantages of which are immediately apparent. Unlike the average hydrometer of today, this particular device is screwed into the threaded opening in each cell, replacing the vent cap, and remains as a permanent installation. The battery is tested by squeezing the rubber bulb and allowing the electrolyte to be drawn into the glass chamber housing the float. Through an ingenious arrangement used in the construction of the hydrometer, the electrolyte slowly dribbles back into the cell and does not remain in the float chamber. Small size and perfect accuracy as to the graduation on the float characterize this new product. The hydrometer may be easily removed when filling the battery with water.



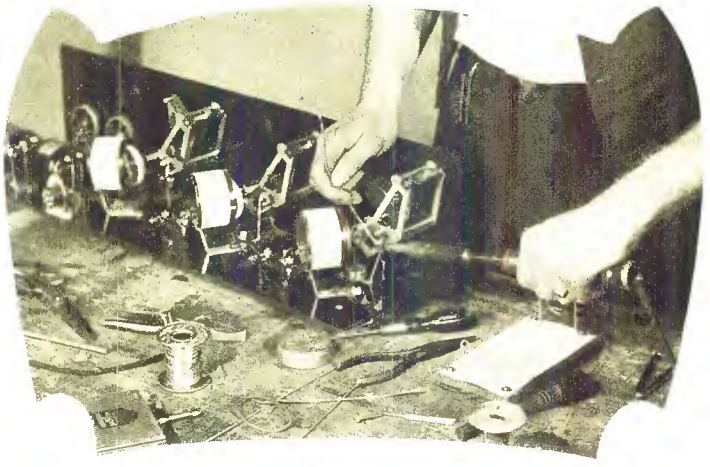


Reducing "C" Battery Voltage

It is often necessary to use another "C" battery voltage instead of the one available. Supposing a 22½ volt "C" battery is being used and it is desired to use but 18 volts. This is easily accomplished by hooking a 4½ volt "C" battery in series with the 22½ volt battery in the ordinary manner, with the following exception. Instead of connecting the positive terminal of the 22½ volt battery to the negative terminal of the additional "C" battery, connect the positive of the 22½ volt battery to the positive of the smaller battery. The total voltage across the two batteries will be but 18 volts, since the voltage in the smaller battery "bucks" the voltage in the larger battery and reduces it to the required voltage.

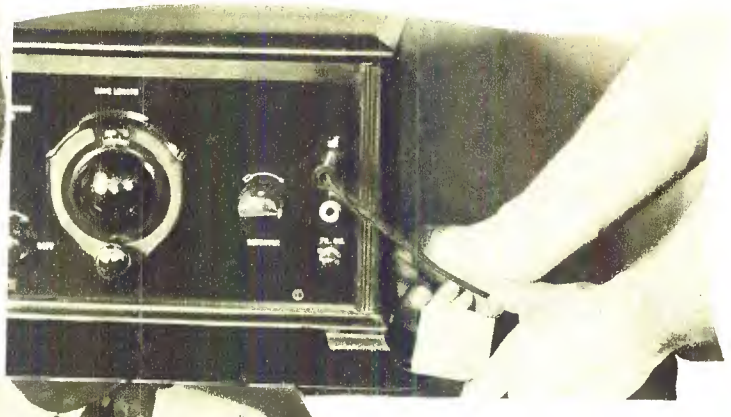
Eliminating Body Capacity in Tuning Condensers

Body capacity in the average tube operated receiver may be eliminated to a very great degree by reversing the connections on the tuning condenser with which the difficulty is experienced. The proper connection of the tuning condenser in the circuit is to have the stator plates connected to the grid of the tube and the rotor plates connected to the grid return, which is usually the negative "A". If the rotor plates are connected to the grid, the capacity effect between the condenser shaft, which is a part of the grid circuit, and the operator's hands, will cause a squeal. Sometimes it is necessary to place an insulating shaft on the tuning condenser to totally eliminate the difficulty, but this is only resorted to in extreme cases.



A Carpet Insurance

It is advisable to have a bottle of an alkaline solution, such as baking soda or ammonia, beside the storage battery. Frequent testing of the storage battery with a hydrometer will eventually get some acid on the carpet or other furnishings nearby. If nothing is done to neutralize the acid drippings, a hole will be burnt in the carpet or the floor discolored. If the bottle of an alkaline solution is handy, a liberal quantity may be placed on the acid, which will immediately neutralize it and effectually prevent any damage. A solution of baking soda of the proper strength may be made by dissolving as much baking soda as will dissolve in a quantity of water. It is best to allow a layer of the soda, about one-half inch thick, to remain at the bottom of the container.

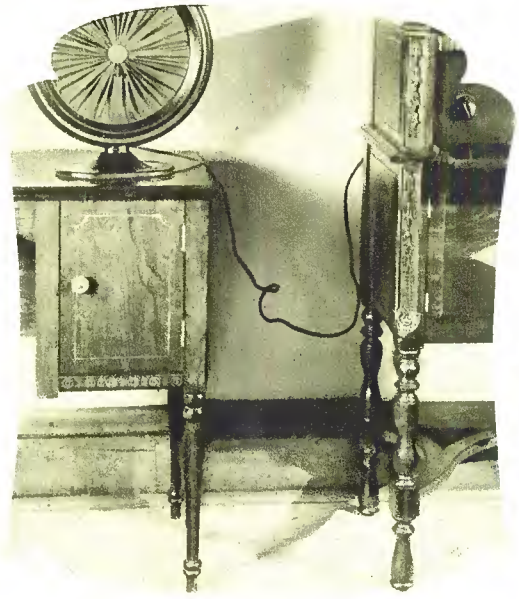


Tightening Loose Bases on Tubes

The glass portion of a vacuum tube will sometimes work loose from the Bakelite base through constant handling. While this does not impair the working qualities of the tube itself, it is a condition which is not desirable. The sealing compound, usually placed between the Bakelite base and glass bulb, will, when carefully heated, again join the two parts. However, difficulty is sometimes experienced in repairing a tube by this method. If repeated trials do not join the parts, friction tape may be resorted to by winding a number of turns around the tube, allowing a liberal overlapping of the various layers of tape. This will serve as a permanent repair and will give the

Reducing Tube Vibrations

Many radio receivers today are not equipped with a cushion socket to hold the detector tube. The socket normally holding the detector tube is rigidly fastened to the chassis of the receiver, and any vibration experienced by the receiver itself will be imparted to the detector tube. Due to its function in the circuit, the detector tube is very microphonic in character and, if passing traffic jars the building, the detector tube will vibrate and cause a ringing sound to occur in the loud speaker. This is extremely disturbing and often virtually spoils a program. An excellent remedy for this condition is to place a small piece of sponge rubber under each of the feet of the cabinet or console which will effectively absorb all vibrations causing

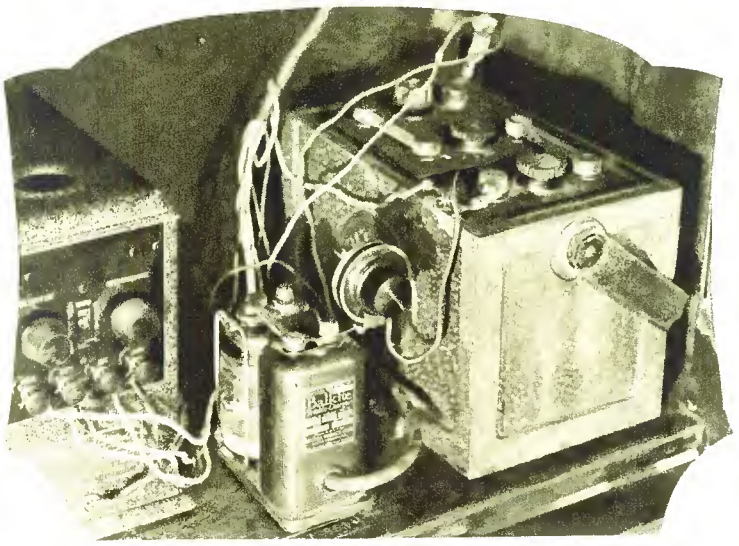


Reducing Microphonic Noises in a Receiver

The placing of a loud speaker on top of a radio cabinet or console often produces a somewhat musical hum or roar, which slowly increases in volume until it is almost unbearable to the ear. This is caused by a condition of resonance between the vibrations of the detector tube and the vibrations of the speaker. These vibrations are transmitted through the material forming the cabinet or console. Other factors also enter into the production of this microphonic hum, but the set owner can usually overcome the difficulty by removing the speaker to some remote position from the receiver itself. This may be accomplished in a number of ways, either by hanging the speaker on a wall or setting it on a nearby table or bookcase.

Reducing the Charging Rate of a Trickle Charger

It is sometimes desired to reduce the charging rate of a trickle charger. Many of the smaller receivers do not require the .4 ampere or .5 ampere charging rate, since the receiver does not draw sufficient current from the battery. In this respect the insertion of a suitable resistance in one of the charging leads will reduce the rectified current supplied to the battery, in a sufficient amount so as to charge it at the proper rate. A 6-ohm rheostat is ideal for this purpose. The resistance is varied so that the proper charging rate may be found by trial.

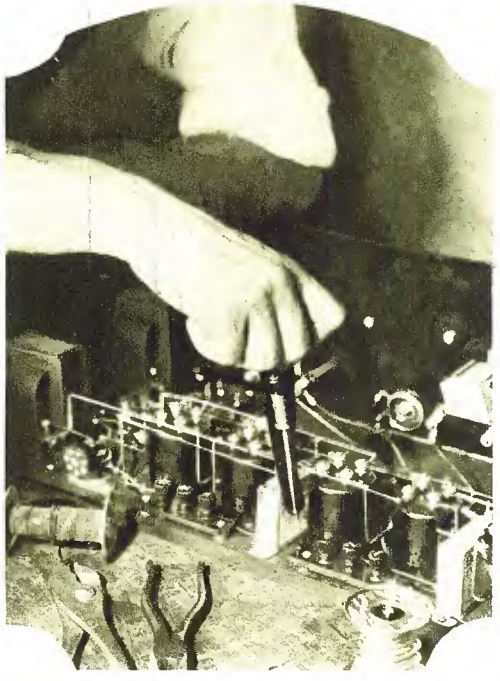


A Handy Adjunct to a Screw Driver

Difficulty is often experienced in placing a wood or machine screw through a mounting hole in some out-of-the-way corner of the receiver. At times it is virtually impossible to use the fingers or even a pair of long nose pliers for properly starting the screw. If a heavy rubber band is pierced with a hole and the screw inserted through it, the screw will be securely held to the blade of the screw driver by slipping the rubber band over the top of the handle. This will hold the screw with sufficient strength until it is properly started in the wood. The rubber band can, therefore, at that time be easily pulled off the head due to its natural resiliency.

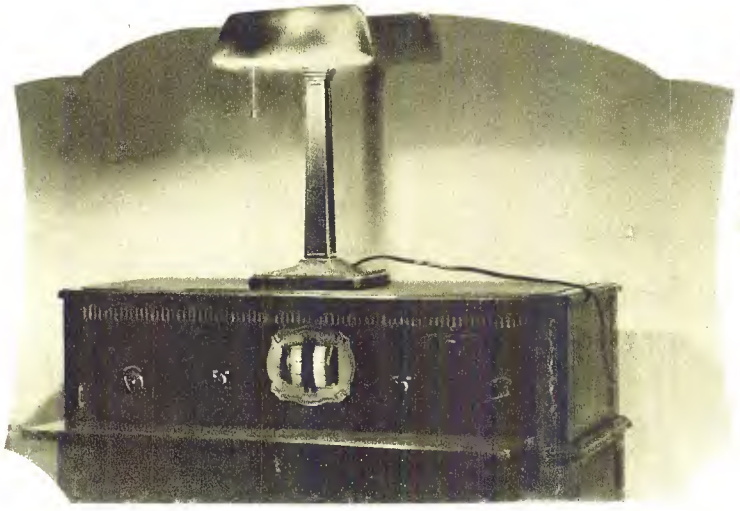
A Unique Charger

A new and novel charger has just been placed on the market by a leading transformer manufacturer. This particular charger makes use of a new cartridge rectifier, which is manufactured by an Eastern concern. The advantages in the use of this charger are manifold, notably in the total lack of attention which is required in the care and upkeep of the charger. There are no liquids, moving parts, or pastes used in this charging device, which is absolutely noiseless. The charger is capable of handling 2½ amperes of rectified current. The only replacement necessary is that of the rectifying element itself, which is only after approximately 1000 hours of continuous operation.



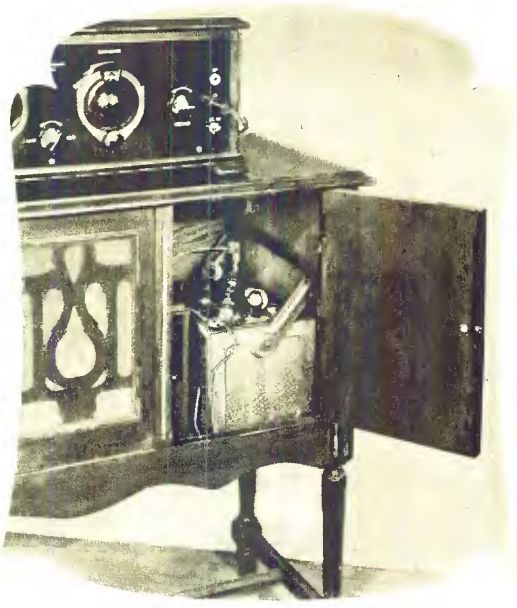
Eliminating AC Hum in a Receiver

AC hum frequently occurs in a receiver, even though the receiver is not connected to any accessories using AC power. The hum is often picked up by a lamp or conductor in the immediate vicinity of the receiver. A common practice is to place a lamp on top of the receiver to illuminate the tuning controls. Naturally the lamp, and the lamp cord supplying the AC power to it, are in close proximity to the instruments in the receiver, which, due to their sensitive nature, pick up any interference generated in the field around the conductors. It is best to investigate all lighting fixtures in the vicinity of the receiver in attempting to eliminate the hum.



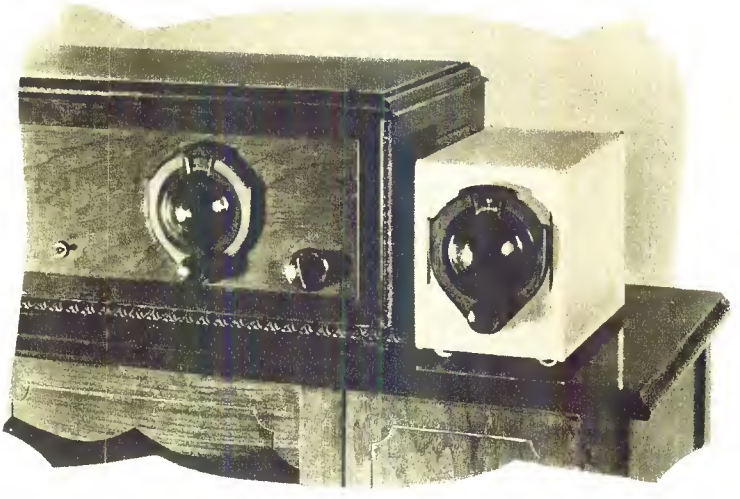
An Excellent Emergency Antenna

An excellent emergency antenna may be easily made in a few minutes with a length of spare wire. About 10 feet of insulated wire, No. 18 or larger, is wrapped around the outside of the electric light drop cord, supplying electricity to the room. Sufficient capacity between the conductors in the drop cord and the wire wrapped around it is realized, so that any radio energy picked up by the electric power lines is transferred to the emergency antenna. This particular method of installing an antenna is only recommended for temporary use, since its efficiency is not as great as an outdoor antenna.



Keep Cabinet Open While Charging Battery

It is advisable to open the doors of a console or cabinet while charging the "A" battery, so as to allow an ample circulation of air by which the gas and heat from the battery and the charger may be carried away. If the gas is allowed to collect in a close space, such as is found in a console, it becomes a source of potential danger, since it is highly inflammable. It may be easily exploded by a lighted cigar or cigarette. Heat generated by high capacity chargers will soon warp the cabinet to a very serious degree if ample ventilation is not provided.



The Use of a Wave Trap

The efficiency of a receiver may be increased to remarkable degree by the proper use of a wave trap. Sometimes local stations a short distance away have sufficient power to seriously interfere with decent reception of other stations. Condensers may be inserted in the antenna circuit to sharpen the tuning; and the antenna may be even shortened but sometimes the interference will still prevail. The use of a wave trap, however, will act as a filter, excluding the unwanted signals to a very high degree. In fact, with the proper use of a wave trap, it is possible to tune out a powerful local station but a short distance away, and receive distant stations with reasonable volume with an absolute minimum of interference.

Eliminating Rattle in Non-Adjustable Speakers

Some speakers using a non-adjustable diaphragm will rattle after being used for some time, due to the fact that the diaphragm has become bent through excessive voltages being applied to the speaker. This difficulty may be obviated to a great extent by removing the diaphragm of the unit and turning it over. . This will invariably eliminate the rattle. If, however, this is not in the way of a solution, a small paper washer may be cut to fit under the diaphragm. In making a washer of this type, do not use any material which is heavier than the brown wrapping paper commonly in use. The bearing surface, as far as the washer is concerned, need only be approximately 1/8-inch to 3/16-inch in width. If necessary, insert more than one washer.

Testing Antenna Systems

Poor efficiency is often encountered in the use of a particular antenna. Such an antenna should be immediately tested to determine whether or not it is grounded at any point. This may be easily accomplished by connecting a pair of head phones and a battery in series between the antenna and ground leads. If a click is heard in the head phones when the circuit is completed, the antenna is grounded at some point and should be carefully examined. Cracked and dirty insulators are often the cause of a grounded antenna.

Testing a Lightning Arrester for a Short Circuit

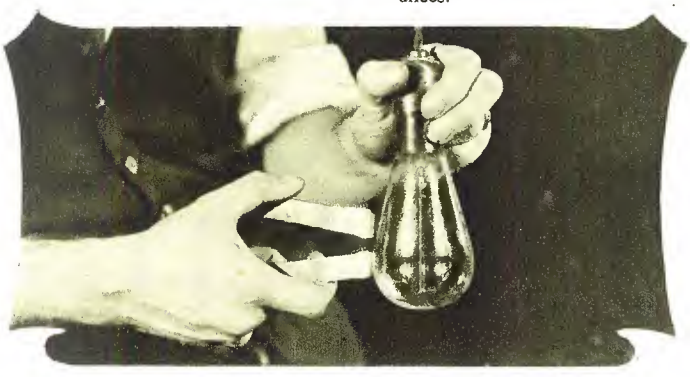
A lightning arrester may be quickly tested to determine whether or not the electrodes are short circuited by hooking it up in series with a pair of head phones and a battery, as shown in the accompanying illustration. While listening with the head phones, complete the circuit by touching one of the cord tips to the lightning arrester. If a click is heard, the arrester is defective and should be either replaced or repaired.

Eliminate Microphonic Noises in Small Tubes

Dry cell tubes are characteristic for their noisy operation as far as microphonic noises are concerned. This is especially true in respect to tubes used as detectors. If a piece of felt is wrapped around the glass portion of the tube and securely fastened in place, it will serve as a damper for vibrations, effectively preventing any sustained vibrations causing microphonic disturbances.

Determining AC or DC Current

A convenient method for determining whether the power supply is DC or AC is found in the use of a common horseshoe magnet in conjunction with an old type of carbon lamp. While the lamp is burning on the unknown power supply, bring the magnet close to the glass portion of the lamp. If the current is DC, the filament will move either slightly towards the magnet or away from it, according to the polarity of the socket. If, however, the power supply is AC, the filament will oscillate violently, beating against the walls of the lamp.



Bringing Your Infradyne Up to Its Peak Efficiency

Valuable Hints Given to Enable the Set Builder to Thoroughly Understand Set's Operation at Its Highest Value

CONSTRUCTIONAL data on the 1928 model Infradyne receiver which appeared in the September issue of the CITIZENS RADIO CALL BOOK MAGAZINE has brought in a large number of letters from individuals and set builders, who have expressed their complete satisfaction with the receiver built from these instructions. In order to answer as many of the various inquiries that have been made as is possible, we will attempt to cover in this summary some of the minor adjustments which bring the Infradyne to its peak performance.

Setting the Trimmers

In any receiver which uses tuned radio frequency controlled by a gang condenser with single dial control, complete resonance of the radio frequency circuit is of prime importance if you are to obtain maximum distance and selectivity. The instructions which accompany the new Infradyne kit do not cover as completely as may be desired, the various features of the radio frequency amplifier, with its antenna compensator. It will be noticed that in the upper shield of the Remler 710 amplifier there are three holes provided through which the small trimmers or balancing condensers, located between the sections of the main gang condenser, can be adjusted. The trimmers which balance the second radio frequency and detector circuits will maintain resonance through the broadcast band if they are once set, since there is no disturbing factor of the antenna circuit which affects them. On the other hand, the capacity of the antenna circuit does have a varying effect upon the first radio frequency circuit and provision is made in the new Infradyne for complete compensation over the entire range of the receiver. As explained in the instructions which accompany the Infradyne, the receiver should first be balanced at a wavelength of slightly above 200 meters or approximately 1500 kilocycles. It is suggested the operator tune in some local station of about this wavelength and with the antenna compensator switch set on a point three, turn the antenna compensator knob, which is the smaller of the two knobs on the antenna compensator, at about one-fourth of the arc of rotation from the extreme counter-clockwise position. Using the small wooden screwdriver which is furnished with the Remler 710 amplifier, reach down through the left hand hole in the upper shield and adjust the extreme left hand trimmer to the point of greatest selectivity, meanwhile rotating the radio frequency drum dial back and forth through a few degrees. It goes without saying this adjustment should be made while using the receiver as a five-tube single dial control and preferably using a pair of head phones plugged into the jack on the front of the receiver. After the first trimmer is adjusted, it will be found volume will increase and the selectivity of the receiver will become greater. Now, if it is possible to bring in some station 200 or 300 miles away, proceed with this same adjustment again until maximum results are obtained. Notice that no adjustment has been made of the other two trimmers, but at this time slight readjustments of both of these trimmers may be made to insure their correct setting. We must caution you as to the effect over all three of these trimmers. Very small changes in the setting are sufficient to bring the receiver completely into resonance or throw it completely out, and since the balancing condensers or trimmers are of the compression type be careful not to push down on the wooden screwdriver since this will immediately disturb the capacity of the trimmers. Now rotate the drum dial so as to tune in some station at or about 500 meters or 600 kilocycles. You will find that in order to obtain resonance at this point, it will probably be necessary to rotate the small antenna compensator knob in a clockwise direction in order to bring about complete resonance. If it is possible, tune in some station 300 or 500 miles away at this wavelength. Adjust the antenna compensator for maximum selectivity and

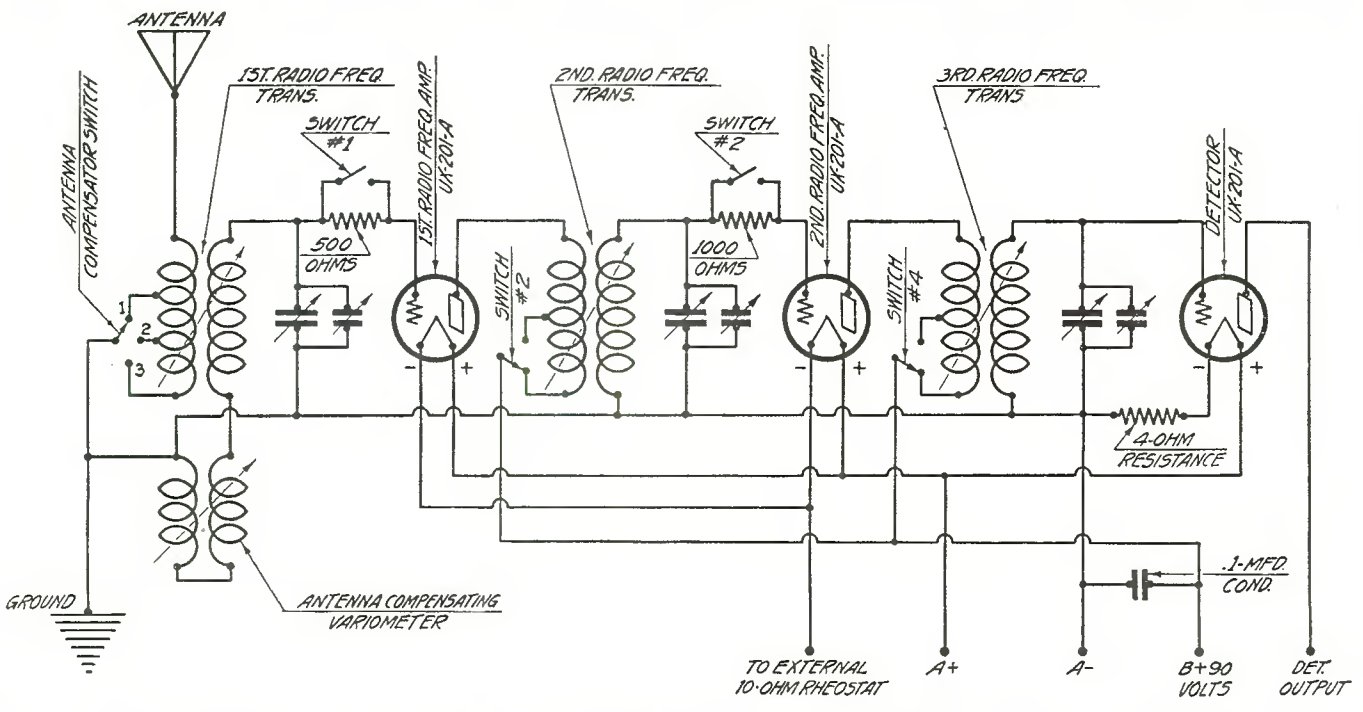


Fig. 1. Schematic diagram showing arrangement of switching controls, proper setting of which governs selectivity of the receiver

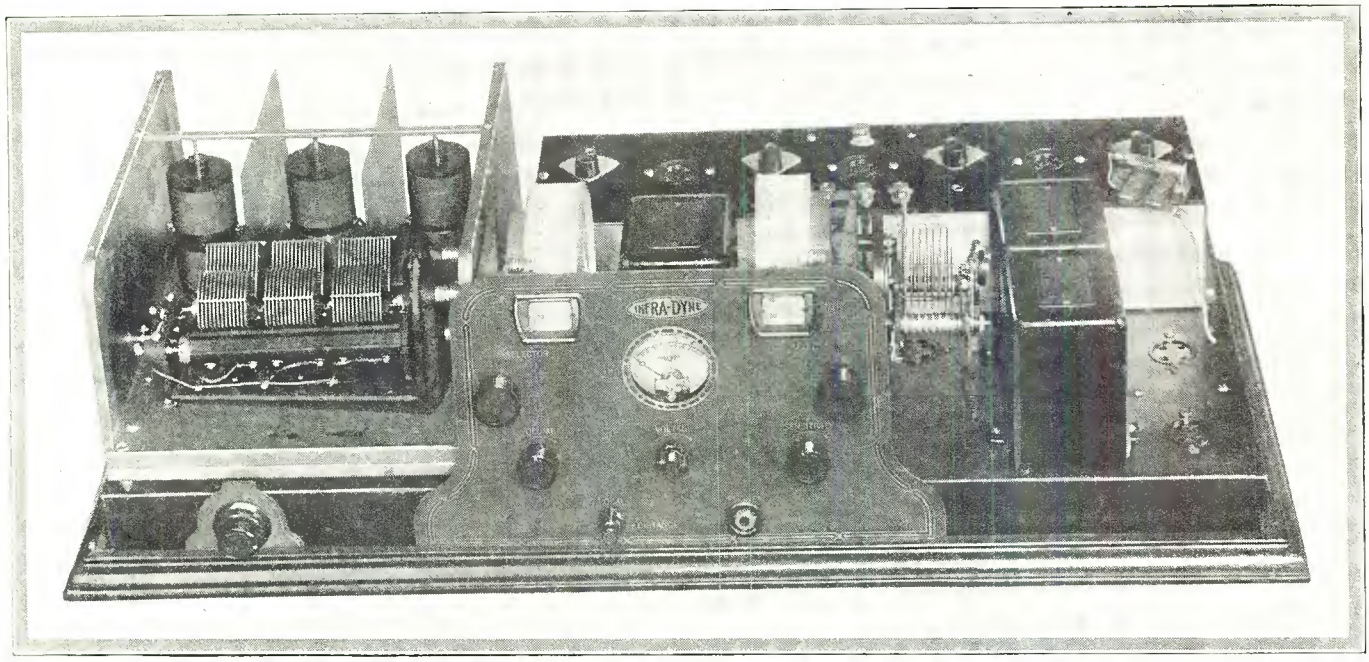


Fig. 2. Rear photograph of the completed Infradyne. This article gives intimate details of the receiver not shown in the picture

volume and then, without changing the setting of the antenna compensator, change the tuning of the r. f. circuit back to the distant station around 200 meters, and again adjust the trimmer in the first r. f. circuit for maximum selectivity and volume. This balances the radio frequency amplifier throughout the entire range and it will be found that maximum selectivity and volume will be obtained over the entire broadcast spectrum, without the necessity of adjusting the small antenna compensator knob except on extreme distant stations.

Perhaps a word might be said here to explain the system of antenna compensation used in the new Infradyne. The small knob on the antenna compensator controls a minute variometer, which is connected in the grid return circuit of the first radio frequency stage. On the lower wavelengths or higher frequencies where small changes in capacity in the tuning circuits have greatest effect, we reach resonance by means of the setting of the first trimmer condenser. On the higher wavelengths where relatively small changes in capacity do not have as great effects, resonance is secured by varying the inductance of this variometer.

The Selectivity Switches

Designers of the Remler 710 radio frequency amplifier have taken into consideration the varying degrees of selectivity which are necessary in various sections of the country, depending upon the number of broadcasting stations and their distance from the location of the receiver. By removing the top shield of the amplifier, you will notice there are four two-point switches located on the base, which have "selective" and "non-selective" positions. There are actually twenty-four different combinations of position of these four switches. You will realize that it is obviously impossible for us to describe the exact setting of these different switches in order to give you exactly the results necessary in your location. For example, if all four switches are set in the "non-selective" position, the receiver becomes completely stable, will not oscillate over the broadcast band and will give desirable performance in locations where no powerful stations are nearby. On the other hand, if the first three switches are set in the "selective" position and the fourth switch, counting from the left, is set in the "non-selective" position, the receiver can be forced into oscillation by means of the volume control rheostat and the selectivity greatly increased. If the first and third switches are set on "selective" and the second and fourth are set on "non-selective," the receiver becomes highly selective and overall amplification is greater than it is with the combination suggested above.

This particular setting gives best results in one model constructed in our laboratory, which is used on the north side of Chicago where receiving conditions are difficult due to the proximity of powerful nearby stations. On the other hand, another model of the receiver constructed in our laboratory, which is being used on the south side of Chicago where conditions are not so extreme, gives best results with the first switch set on "selective" and the other three on "non-selective." In this location and with this setting, no difficulty is experienced in obtaining 10 kilocycle selectivity on distant stations through all Chicago stations using the entire ten tubes of the receiver.

It goes without saying that it will be necessary for you to experiment with the setting of these various selectivity switches, but remember that each time you make a change the shield must be placed back on the amplifier and the receiver tuned very carefully by means of the drum dial control and the volume control rheostat. We know you will be curious to find out just what these selectivity switches actually do and a diagram of the circuit is published herewith. Switch No. 1 set on "non-selective" position introduces a 500 ohm resistance into the grid circuit of the first radio frequency circuit and in the selectivity position shorts out this resistance. Switch No. 2 set on the "selective" position decreases the number of turns in the primary of the second radio frequency transformer. Switch No. 3 is the same as switch No. 1, except that the resistor is 1000 ohms instead of 500. Switch No. 4 is the same as switch No. 2 and gives different primary turns.

Making the Dials Log

In the new Infradyne the radio frequency and oscillator dials follow each other, almost exactly or within a few degrees on the dial. It is suggested that some station be tuned in at approximately 100 on the radio frequency dial. You will notice a small compression type balancing condenser is located on the main oscillator condenser of the receiver. This is a shunt capacity and changes in the capacity of the balancing condenser will offset settings of the oscillator dial for the same station. Consequently, it follows if the oscillator condenser reads 95 while the radio frequency dial reads 100 the small adjusting screw located on the balancing condenser should be turned to the right slightly until the station is brought in with the oscillator dial set at 100. If the original setting of the oscillator dial was above 100, then the procedure should be followed in the same manner except that the screw on the small balancer should be turned to the left instead of to the right. Remember that very small changes in the capacity of this balancing condenser will move the setting of the oscillator dial several degrees. Caution: Do not tighten the adjusting screw on the balancing condenser too much or you may break the moulded bakelite part or damage the mica dielectric.

Later Developments on the Thordarson Power Amplifier

Type 112 Tube Substituted Instead of 171 and Simpler Method Found for Grid Biasing

LATER development work on the Thordarson power amplifier system described on page 121 of the November issue of the CITIZENS RADIO CALL BOOK MAGAZINE has made necessary a few circuit changes in that design if full advantage is to be taken of all its possibilities.

To gain a higher voltage amplification it has been considered advisable to use a 112 tube in the first audio stage instead of the 171, as shown in the November issue.

A simpler method of securing the desired bias on the grids of the 112 and of the two 210's arranged for push-pull amplification has been worked out and is represented in the schematic diagram shown below.

In making the change from the 171 to the 112 tube the value of the C bias resistance has been altered as shown by the schematic diagram and is now a 400 ohm variable resistance, which will enable the builder to change the biasing supply to the grid of the 112 tube. Biasing voltage to the grids of the 210 tubes is secured by the drop across the full length of the same 400 ohm resistance.

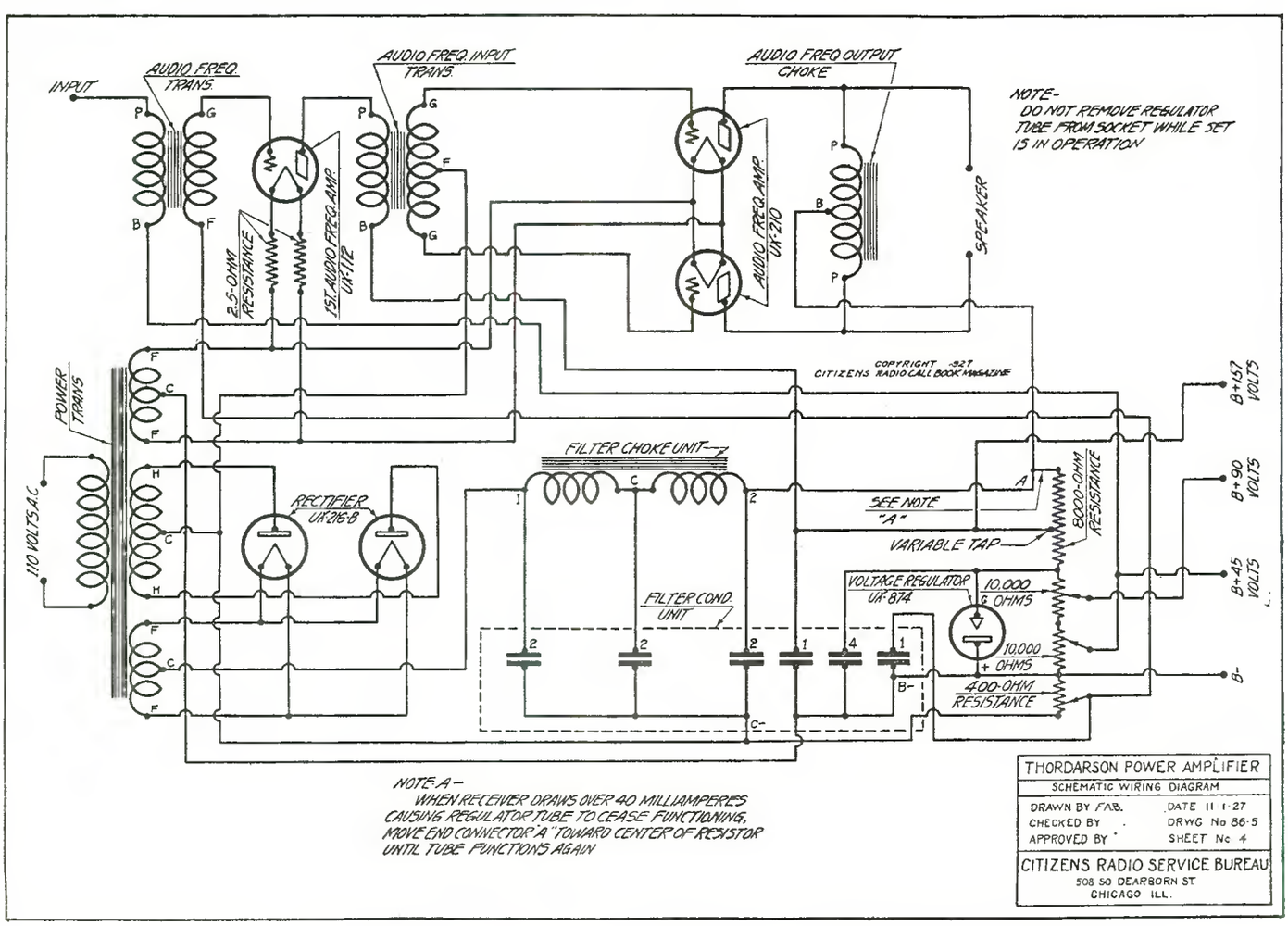
As will be noticed from an inspection of the schematic circuit, there are two negative connections used on the filter condenser unit, the C minus connection going to the bottom of the 400 ohm resistance, while the B minus connection on the filter condenser unit is connected to the B minus terminal at the juncture of the 10,000 ohm and the 400 ohm resistance.

In operation if a receiver draws over 40 milliamperes and causes the voltage regulator tube to go out, move end connector A towards center of resistance until the glow tube lights again. Also do not remove regular tube from socket while the set is in operation, as this will throw an added load on the condenser units and might damage them.

It is always considered good practice to ground the metal containers on all power apparatus, as well as the filter condenser container.

It will be observed that the codenser unit has two negatives, the one marked B minus going to the B minus terminal shown in the schematic and the one marked C minus going to the bottom of the 400 ohm resistance. In other forms of power amplifiers, these two negatives are tied together and go to the B minus connection on the amplifier; here it was desired to have a portion of the capacity across the biasing resistance.

This power amplifier unit has been found especially desirable as a means of testing electric phonographic pick-up units, as well as being used as a standard amplifier for plugging in on all types of receivers.



Truvolt B Supply Designed to Gain Receiver Stability

New Arrangement Utilizes Voltage Regulator Tube to Assure Unvarying Voltages for Best Operation of Set

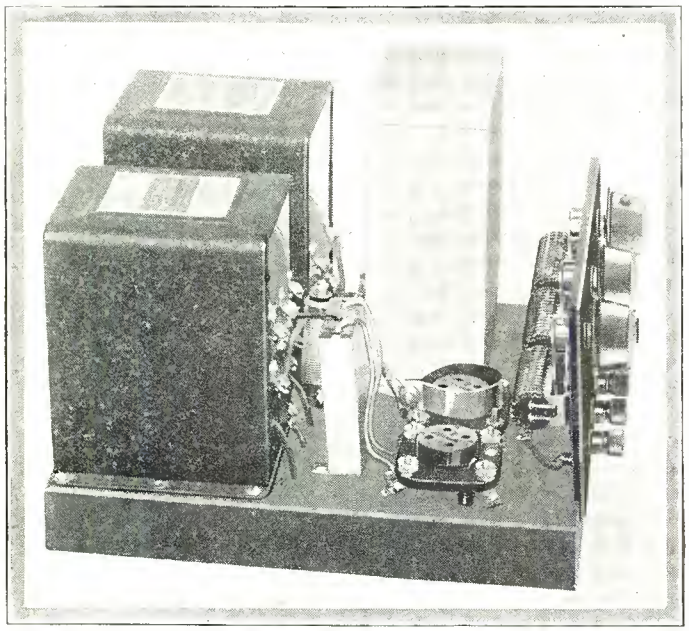


Figure 1. In this photograph is shown a side view of the Truvolt B power supply unit described in this article. Note that the second socket appears to have a metallic band around it, but this is not the case. This clip or band goes to the shell of the regulator tube type R

FOR well nigh onto three years or so home constructors and radio fans have constructed and assembled lamp socket operated B-power supply devices and eliminators. At first, the construction of such a device was quite an undertaking, and proved too much for many experimenters. In those early days of lamp socket powered radio, the home constructor had to make his own power transformers and chokes, or else use the cumbersome and costly apparatus designed for radio transmission use. Later, transformers, chokes and other essential components designed just for the purpose began to make their appearance. Then followed similar parts of improved design, improved circuits, radically new rectifiers, the voltage regulator or glow tube, special compact wire wound high ohmage resistors and a host of other such parts, until now one can easily construct, in an evening's time, with but a few simple tools and the kitchen table, a truly modern B-power supply such as illustrated in Figure 1.

The voltage regulator tube employed not only prevents any tendency toward "motor-boating" when used with sets employing resistance coupled or other such forms of audio channels, but also maintains the voltages at the various taps at constant values, regardless of the load or type of sets with which the power unit is employed. The filamentless full wave rectifier tube, the wire wound resistors, the high voltage short path condensers, all contribute to long life and freedom from trouble.

In general, B-power circuits may conveniently be divided into three parts, first, the transformer-rectifier unit, secondly, the filter unit, and finally, the vortage divider unit. Under the first classification comes the transformer which steps up the house current to a usable value and the rectifier element, commonly a tube, which alters the form of the stepped-up current from that of an alternating nature to one of a pulsating direct form. The transformer which is selected for the purpose must be so designed that when it is in operation its core laminations will not produce a 60 cycle hum, usually the result of loose assembly. The better types of transformers now available overcome this difficulty not only by substantially clamping the core-pieces together but by imbedding the entire transformer assembly in a wax compound. Of necessity the transformer should be enclosed in a metal can which acts as a shield preventing the electromagnetic lines of force set up by the transformer intercoupling with other nearby apparatus. Of late there has been manifest a trend toward the combining of the audio channel of a radio receiver with the B-power supply device. Where such a construction is attempted this last-named consideration attains considerable importance, as there is the possibility of the audio amplifying units picking up the 60 cycle disturbance where the transformer is not enclosed in an iron can. The grounding not only of the center-taps of the several transformer windings but of the transformer can itself is highly desirable and constitutes an additional safeguard against an unstable B-power supply unit.

As to the rectifier element, there are several types which may be employed, but special attention is directed to the new Raytheon BH tube which will very satisfactorily handle currents up to and including 125 milliamperes. This is an important item because the use of this tube in B-power supply devices enables the owner to operate it from the lamp socket without the probability of running the power unit at its limit of handling capacity.

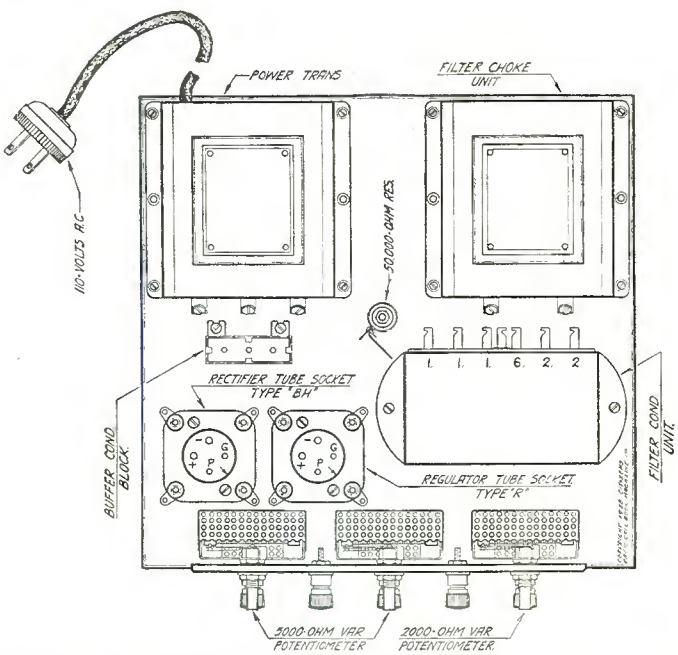


Figure 2. In this sketch is shown the manner in which the parts should be laid out for the construction of the Truvolt power supply. For wiring the reader may use either Figure 3, which is the schematic, or Figure 5, which is the graphic, the latter being generally preferred by those who are not so far advanced in the art

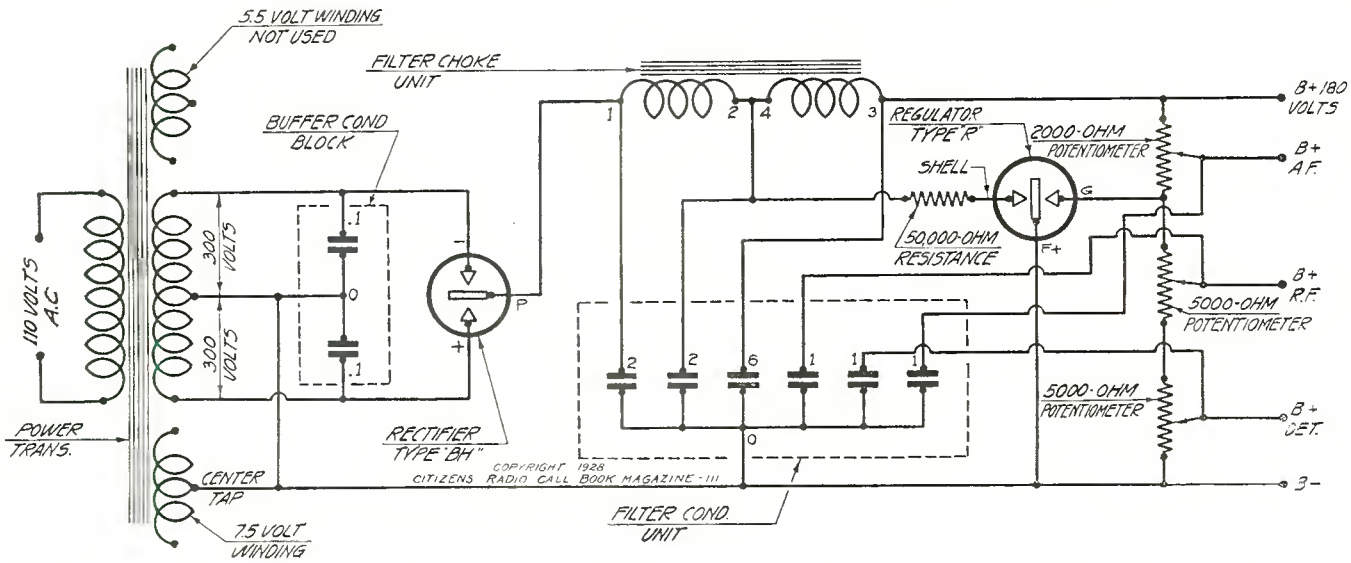


Figure 3. The electrical nature of the power supply unit under discussion is revealed in the schematic circuit shown above

The new Raytheon tube is rated at 125 milliamperes, which is 40 milliamperes in excess of the rating of the older previous BH tube, rated at 85 milliamperes. In the usual five and six tube receivers this reserve which constitutes a very large margin of safety makes for an unusually stable receiver with little chance for overtaxing the output limitations of the B-power supply device. So much for the transformer-rectifier section.

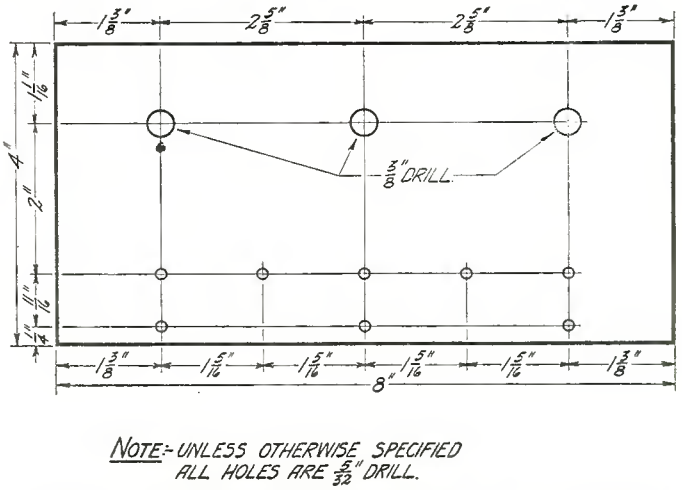
The filter section, that part of the B-power supply device which directly follows the transformer-rectifier section has as its main function the smoothing out of the many pulsations or ripples which exist in the output as it comes from the rectifier tube. The filter consists of a combination of choke coils and condensers, the chokes acting as a smoothing agent and the condensers functioning in the dual capacity of smoother and storage tank. It is the business of the chokes to retard or impede the flow of any alternating current which would manifest itself in a series of pulsations at the rectifier output.

The condensers comprising the storage tank of the filter circuit must meet certain requirements which fix their overall worth. First, they must be of the proper capacity, that is, the several condensers contained in the block must not be lower in capacity rating than the label on its front indicates. Secondly, these condensers should be of a voltage rating which makes them satisfactory for the particular type of B-power supply in which they are to be employed. This factor depends largely upon the transformer which is selected to work with the type of rectifier tube employed.

Together with the filter section of a B-power supply may very well be considered the use of another new Raytheon product, the regulator or R tube. The inclusion of such a tube in a B-supply circuit presents several advantages. First, because the tube has the property to function as part of the condenser bank in smoothing out any slight ripples which may have been incompletely filtered by the chokes and condensers, it makes possible the selection of a condenser bank with less capacity in microfarads than was formerly possible. In the older types of B-power supply units it was customary to have a condenser bank consisting of a total of 14 microfarads, as follows: 2, 2, 8, 1, 1. With the use of the R tube, which by the way is employed for an entirely different purpose, it is only necessary to use a condenser bank totaling 12 microfarads. The main use of the R tube is to maintain at a steady figure the output voltage from an intermediate tap at the output of the complete B-power supply unit, regardless of the total current drain which might fluctuate under varying conditions of load. The prevention of "motorboating" is attributed to the inclusion of a regulator tube to maintain the intermediate voltage at a steady value. Besides the usual two elements which have heretofore been found in such tubes there is now incorporated in them a third or "keep alive" element and its associated circuit. The complete keep alive circuit is a most unique one in that it consists of a tube within a tube where the inner one is operated from a point of high voltage off the filter circuit at no load and keeps the gas within the tube in an ionized state. If for any reason should the voltage across the operating electrodes fall below a value required to maintain the gas in an ionized state the potential of the third element will be sufficient to maintain ionization. A fifty thousand ohm resistor is employed in the filter connection circuit to minimize the additional drain on the rectifier and filter and limits this parasitic current to approximately three milliamperes. Unlike former types of regulator tubes the inclusion of the third element and its associated circuit in the new type of tube makes unnecessary the high starting voltage formerly required.

Like everything else which may be classed as radio apparatus, resistors suitable for use in B-power supply devices have not remained unchanged. Not being satisfied with the existing types of resistors, manufacturers have made great strides in the perfection of this very necessary piece of apparatus and this season has brought forth the wire wound, high current capacity types of resistors. Nichrome wire, it was found, contained all the essential features which were necessary to a good resistance wire and in the units employed here this wire is first wound by machine on an asbestos covered core which is in turn then wound on a slotted or grooved form of insulation material of high order. A sliding arm makes contact with the various turns of nichrome wire and insures a constant connection.

It will be observed from the circuit diagram shown in Figure 3 the complete B-power supply circuit that unlike former types of voltage divider arrangements where a single variable resistor



NOTE:- UNLESS OTHERWISE SPECIFIED ALL HOLES ARE 5/32" DRILL.

Figure 4. Dimensions for drill holes and sizes of same are shown in the above front panel layout

was connected in series with each load, the new circuit employs different resistors in "potentiometer" fashion directly across the output of the filter. The new method makes for more stable conditions, as in the old fashion any change in one of the resistance adjustments threw off all the others in the circuit. Likewise it was possible for the unskilled operator to obtain excessive voltages from some of the taps.

Mounting Instructions

Obtain from a tinsmith a piece of sheet metal which should be formed into an inverted tray, the side walls being ½ inch high and the flat surface 9½ inches wide by 10 inches long. On top of the tray or chassis, as it might be called, arrange along the rear edge the National power transformer, the Tobe condenser B block and the National filter choke, in the order illustrated in Figure 2. On a piece of ¼ inch bakelite 4 inches wide by 8 inches long mount three Electrad Truvolts, one of 2000 ohms and two of 5000 ohms. Below these resistors locate five binding posts as follows: B—, B. det., B r.f., B a.f., and B max. By means of two angles pieces mount this bakelite panel assembly on the front edge of the chassis evenly spaced in its center. At either end of the chassis and directly in front of the National apparatus fasten two sockets, the one at the left for the rectifier tube and the one at the right for the regulator tube. In the intervening space locate the buffer condenser unit and the 50,000 ohm resistor which is connected in the "keep alive" circuit of the regulator tube. The wiring is accomplished with the use of Corwico Braidite, a stranded, heavily insulated wire which when bent into position will remain that way.

The several drawings which accompany will prove helpful in the construction of B-power supply device described here.

If desired, a protective cover of perforated sheet brass, supported on a framework of ½ inch brass angle, may be constructed for the completed power unit. Such a cover will prevent anyone from accidentally touching any high voltage terminals. It will also prevent damage to tubes and other delicate parts and act as adidtional shield.

List of Parts

In the construction of the power supply unit described above the following parts were used:

1—R National power transformer
1—National filter choke
1—R Tobe filter condenser block
1—Tobe buffer condenser
2—1040 Benjamin sockets
1—T-20 Electrad 2000 ohm Truvolt
2—T-50 Electrad 5000 ohm Truvolts
1—B-500 Electrad Truvolt fixed resistance
1—B1H Raytheon full wave rectifier
1—R Raytheon voltage regulator
5—Eby binding posts
1—Metal chassis
25—Feet Corwico Braidite hookup wire
1—Fahnestock regulator tube clamp
1—Package Kester radio solder
Miscellaneous screws, nuts, lugs, etc.

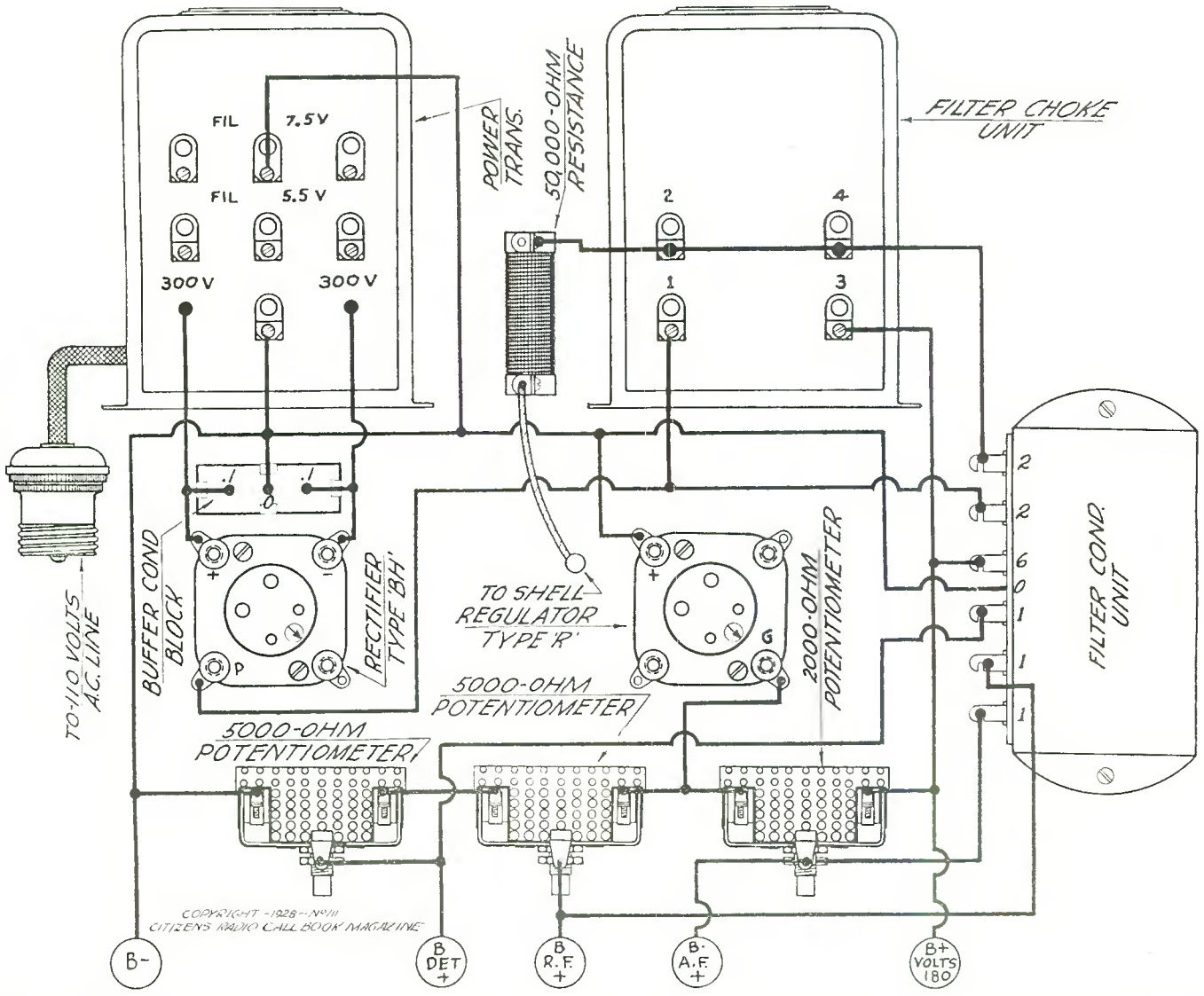


Figure 5. Graphic illustration of the Truvolt power supply is shown above. Note carefully that this diagram is only for the purpose of wiring and does not represent the actual location of the parts, for which data the reader should consult Figure 2

Harkness Counterfonic Six Uses Tuned Audio Amplification

Receiver Designed to Emphasize Reproduction of Lower Tones So Necessary to Proper Harmony

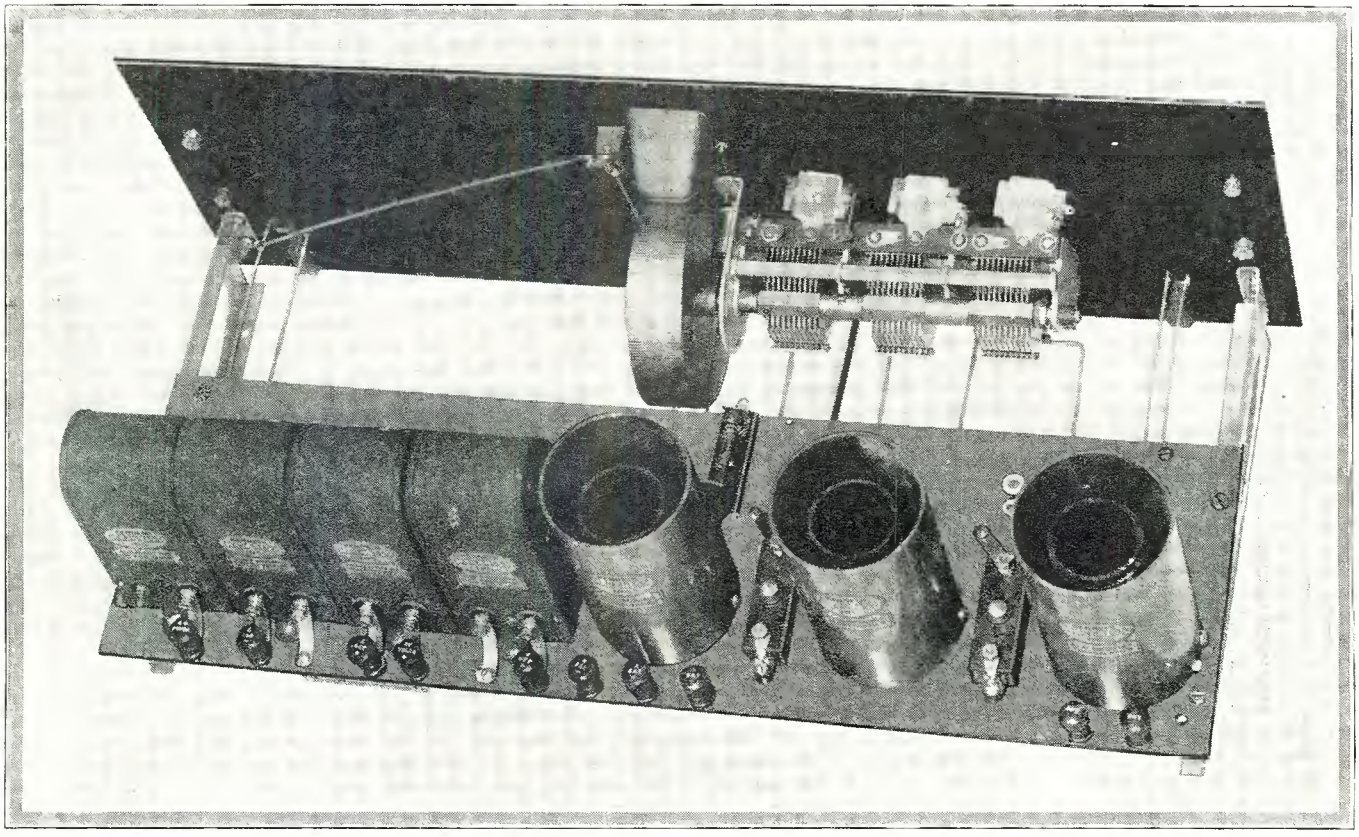


Figure 1. This photographic view shows the Counterfonic after it has been assembled and completely wired. Much time may be saved by virtue of the fact that a good deal of the apparatus is already mounted on the sub-panel

IN this article we are introducing a receiving set with tuned audio amplification, known as the Counterfonic Six, the rear of which is pictured above.

The audio amplifier of this set is tuned to emphasize the amplification of low tones below 200 cycles. The purpose of this is to compensate for the inability of some speakers to reproduce these low tones at their natural intensity. The audio amplifier of the Counterfonic supplies additional energy to the speaker at low frequencies and the fidelity of reproduction is thereby greatly improved. Low tones are reproduced at their natural volume. Low-toned instruments, so vitally important to orchestral music, contribute their true share to the resulting harmony of sound. The lower register of the piano is heard just as clearly as the upper register.

Method Is Simple

The method of tuning the audio amplifier to obtain increased amplification of low tones is simple. The tuning, of course, is not variable but is fixed by the manufacturer of the audio coupling units. The audio amplifier uses the new "double impedance" method of inter-stage coupling. This is similar to ordinary "impedance-coupling" except that choke coils, or impedances, are used as grid leaks instead of resistances. Each coupling unit contains two choke coils and one coupling or "blocking" condenser, as indicated in the schematic wiring diagram of Figure 7. Experiments with this system of amplification revealed the interesting fact that each stage of the amplifier can be tuned to resonance at any desired low frequency by varying the capacity of the coupling condenser. The resonant frequency depends upon the inductances of the plate and grid chokes and the capacity of the coupling condenser. By tuning each stage of a three-stage amplifier to a different frequency, increased amplification is

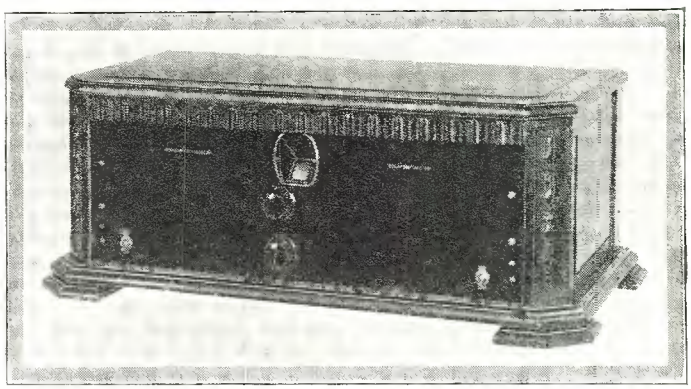


Figure 2. Placed in a Fritts cabinet the Counterfonic receiver is illustrated above

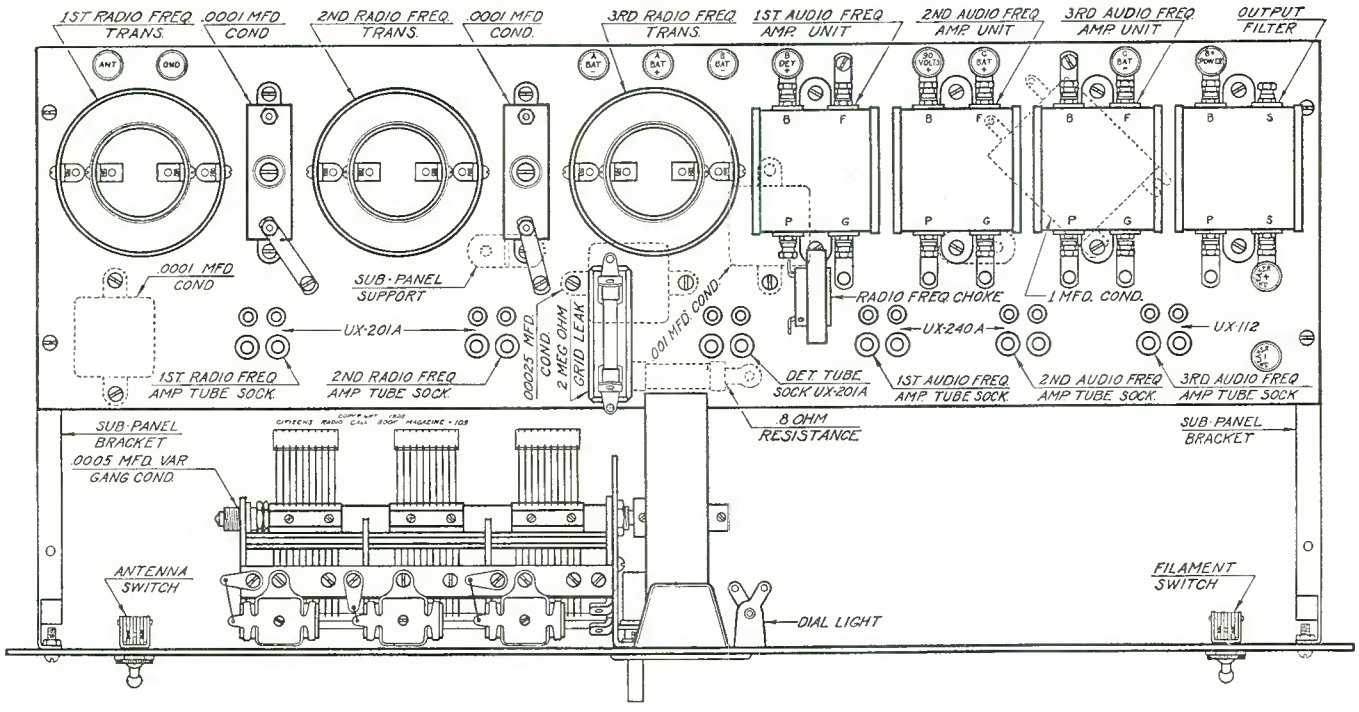


Figure 3. Layout of all parts is shown in the sub-panel illustration above and gives the builder a correct idea of what is shown photographically in Figure 1

given to a wide band of low frequencies.

In the Counterfonic Six the three double impedance audio couplers contain different values of coupling condensers; each stage is resonant at a different frequency. Combined, the three stages emphasize the amplification of frequencies between 40 and 200 cycles. The couplers are marked for use in the first, second and third stages respectively.

From the above paragraphs it will be realized that tone fidelity is the outstanding feature of the Counterfonic Six. The set was designed to give the very best reproduction which recent developments in audio amplification have made possible. When used with a good speaker the set reproduces musical sounds with a high degree of perfection. The speaker output being uniform over the entire range of audio frequencies, every tone, from the deepest bass to the highest treble, is accurately reproduced.

Large Power Output

While the tuning of the audio amplifier is partly responsible for the tone fidelity of this set, there is another important characteristic of the audio amplifier which is also responsible. This characteristic is the unusually large undistorted power output which can be obtained. It is recognized that to secure faithful reproduction of musical sounds the audio amplifier must be capable of handling a considerable amount of volume or power without overloading or introducing any other form of distortion. Some amplifiers have good "frequency characteristic curves" but cannot handle sufficient power; hence the tone quality is poor. However, the double impedance audio amplifier of the Counterfonic Six is extremely efficient in this respect.

In all other respects the Counterfonic Six is a highly efficient, up-to-date receiver. The important features of the set may be summarized as follows:

Stations are tuned in by turning a single knob. The radio frequency transformers and tuning condensers are accurately matched and tuning is reduced to a single control without loss of efficiency. After the set has been built the tuning condensers must be again balanced before the set is ready for continuous operation. Slight differences in capacity, caused by the wiring, tubes, etc., must be compensated for. Final adjustment is made with three "equalizing condensers" attached to the main three-gang condenser. With a screwdriver the equalizers are adjusted until the three circuits are in exact resonance. Thereafter no

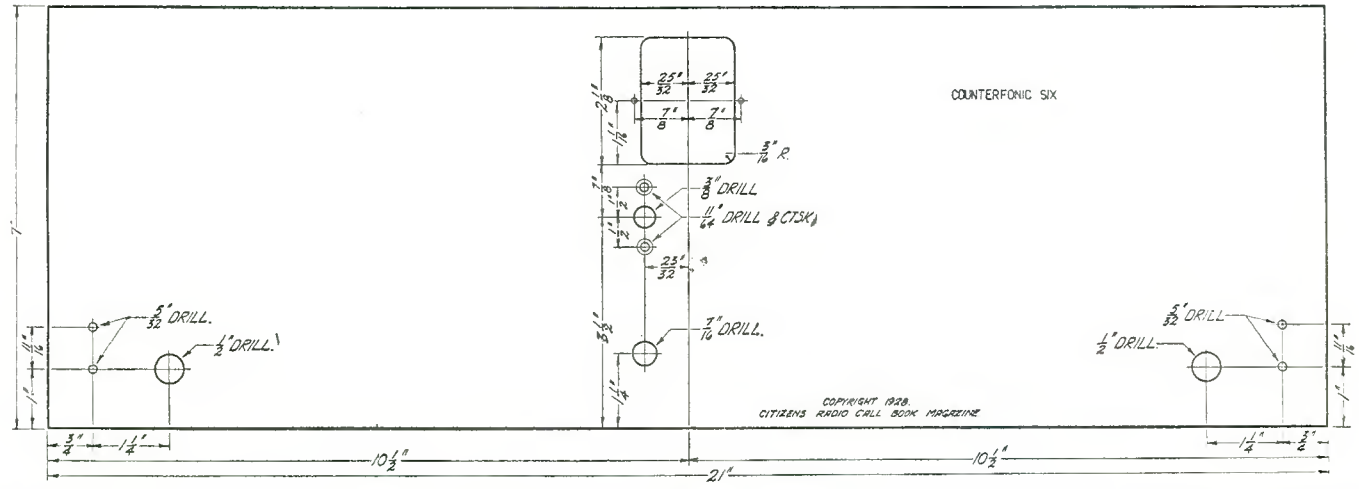


Figure 4. Front panel for this receiver may be made up from the specifications shown on the front panel sketch, although the front panels are available in drilled and engraved form, thus minimizing labor

further adjustment is required and stations are tuned in with the single control.

The Counterfonic is sharply selective. Any local station can be tuned in without interference from other stations on adjoining waves. Some distant stations can usually be tuned in while locals are on the air. The set has two stages of tuned radio frequency amplification and each r.f. transformer is shielded with copper tubing. The transformers are designed to give sufficient selectivity consistent with r.f. gain and good tone quality.

R.F. Stages Balanced

Each stage of the radio frequency amplifier is neutralized by a special system, easy to adjust. By neutralizing the r.f. amplifier much higher gain per stage is obtained. The set is neutralized by adjusting two "variodensers." The maximum capacity of each neutralizing condenser is .0001 mfd. The adjustment is not delicate. It is very easy to find and, once adjusted, the neutralizing condensers need never be varied thereafter. Slight changes in tube capacity do not affect the neutralization.

Under normal conditions the Counterfonic brings in distant stations regularly on the loudspeaker. The overall amplification of the set is unusually large. The r.f. gain per stage of the radio frequency amplifier has been made as high as possible. With high mu tubes in the first two stages of the audio amplifier the voltage amplification of this end of the set is quite high.

The Counterfonic Six can be operated with any type of B-eliminator without any fluttering or "motor-boating." This trouble is automatically eliminated by the audio amplifier of the set. It is not necessary to use chokes, resistances or condensers to stop motor-boating.

It will be noticed that an audio output filter unit is included. This is considered an essential part of the set. Useful in any receiver, a speaker filter is practically essential when tuned double impedance audio amplification is used. Similarly, the radio frequency choke in the plate circuit of the detector tube is essential to prevent r.f. currents from entering the audio amplifier. Without this choke a growling sound is heard when stations are tuned in.

The use of a 1 mfd. condenser between the 90 volt line and B minus is optional. When using B batteries it is sometimes helpful. With B eliminators it is usually not necessary.

Figure 5. This photograph shows the Counterfonic when installed in a Fritts console

It's Easy to Build

The Counterfonic is quite easy to build. The parts are arranged on the sub-base in a straight line. This method of construction makes the wiring simple. Special connection strips, supplied with the audio couplers, are used instead of wires to join the terminals of the audio couplers to the plate and grid contacts of the tube sockets and to the binding posts at the rear of the set. Most of the wiring is under the sub-base.

The set uses standard tubes and can be operated with either A or B batteries or socket-power devices. Standard tubes are recommended for the r.f. amplifier stages and detector. In the

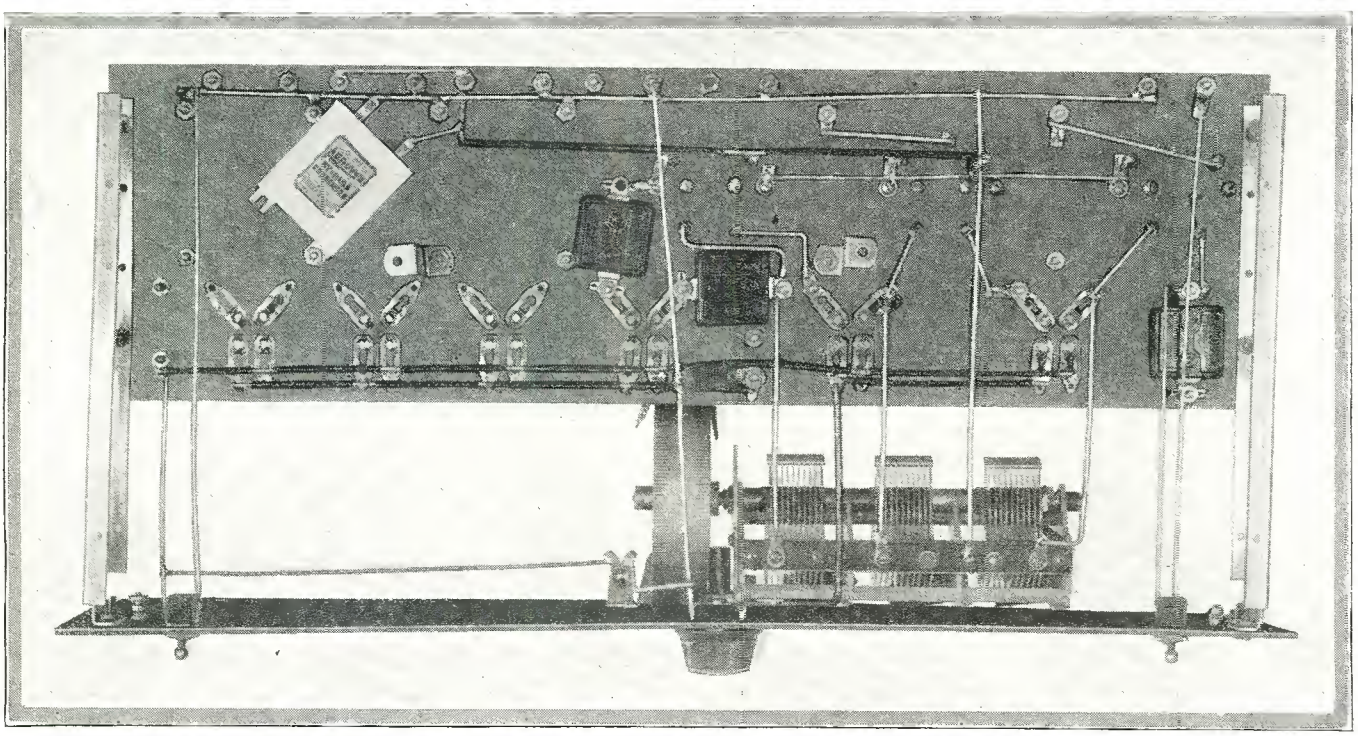


Figure 6. Practically nothing appears below the sub-panel on this receiver and the builder should have no difficulty in making a quick wiring job. For actual wiring, the novice is urged to use the graphic illustration shown in Figure 8, while the more experienced builders may avail themselves of the schematic shown in Figure 7

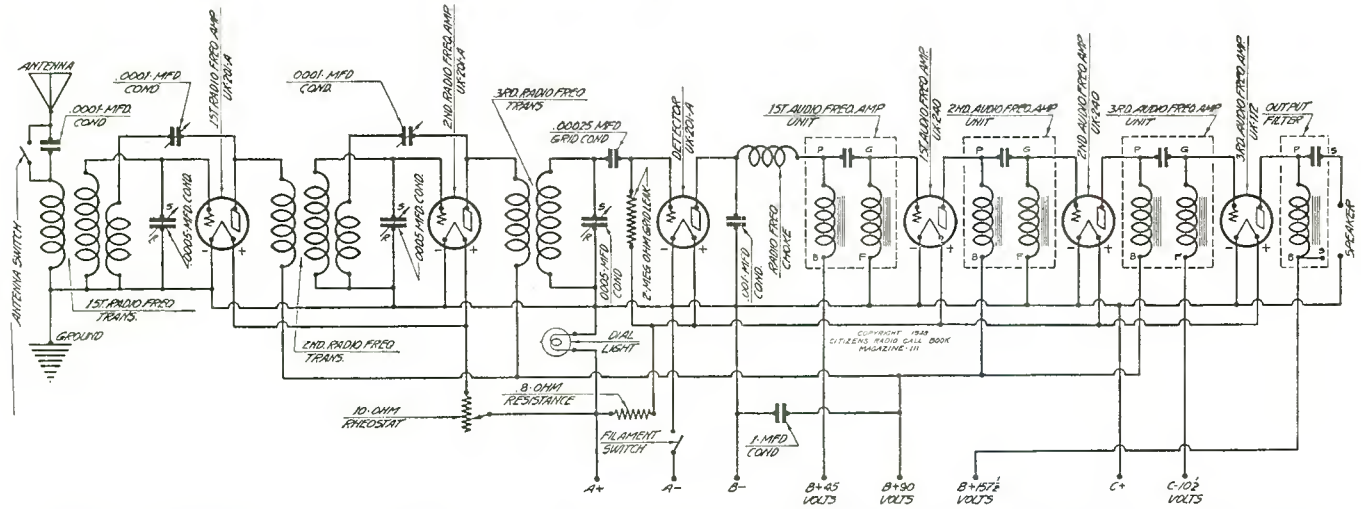


Figure 7. Extreme simplicity of connection is revealed in the schematic diagram shown here, which represents the Counterfonic Six

first two stages of audio type 301A or type 240 tubes may be used. The latter, being high-mu tubes, give much higher amplification. The use of at least one type 340 tube in the first stage is recommended. In the last stage a 112 or 171 can be used. If B batteries are employed the 212 is more economical. With a B eliminator to supply the current a 171 tube will give better tone quality.

List of Parts

Below is given a list of the parts necessary for the construction of this receiver.

1—Cortland 7x21x3/16-inch drilled and engraved panel
1—Cortland 5¾x20x3/16-inch drilled sub-base with six sockets attached.
3—Harkness Counterfonic r.f. transformers
3—Harkness Counterfonic copper shields
3—Harkness double impedance tuned audio couplers
1—Harkness audio output filter unit
1—Harkness radio frequency choke coil
2—Harkness 9½-inch brackets
1—U.S.L. .00035 mfd. 3 gang variable condenser
3—Hammarlund equalizers
1—Silver-Marshall drum dial
1—Carter 10 ohm midget rheostat
1—Carter fixed resistance 4/5 ohm
2—Saturn battery switches
1—Aerovox .0001 mfd. fixed condenser
1—Aerovox .00025 mfd. fixed condenser
1—Aerovox .001 mfd. fixed condenser
1—Aerovox 1 mfd. by-pass condenser
1—Lynch 2 megohm grid leak
1—Aerovox grid leak mounting
2—X-L .0001 maximum condensers
12—Eby binding posts
30—Feet No. 14 tinned copper hookup wire
1—Package Kester radio solder
1—Ekko ground clamp
Miscellaneous lugs, screws, nuts, etc.

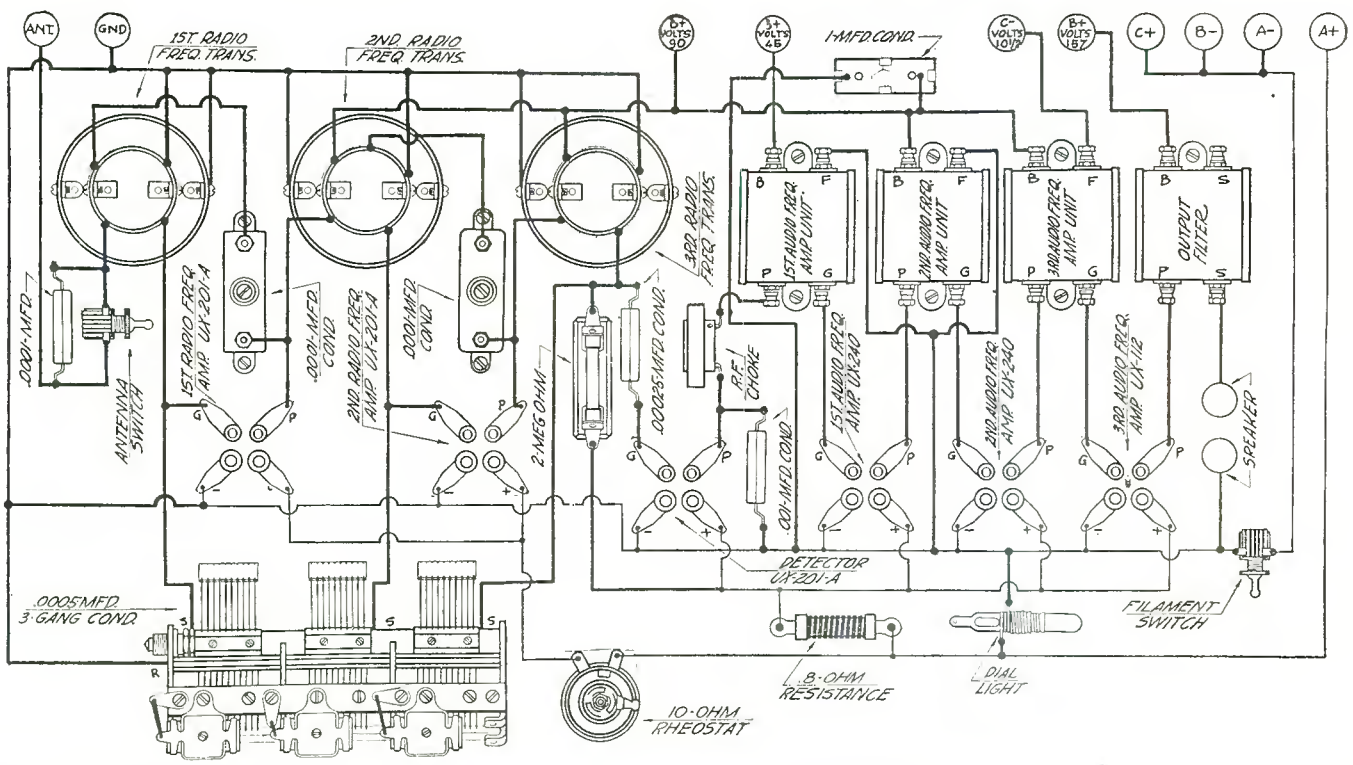


Figure 8. This is the diagram that should be used by those who are not thoroughly versed in set construction, since it shows exactly where each connection goes. Parts should not be placed in accordance with this diagram, but rather in accordance with Figure 3, which gives the physical layout of the receiver

Lynch-Hammarlund Five Is Simple and Economical Set

Low Cost Receiver Built Around Assembled Deck and Employs Roberts Circuit with Regenerative Detector

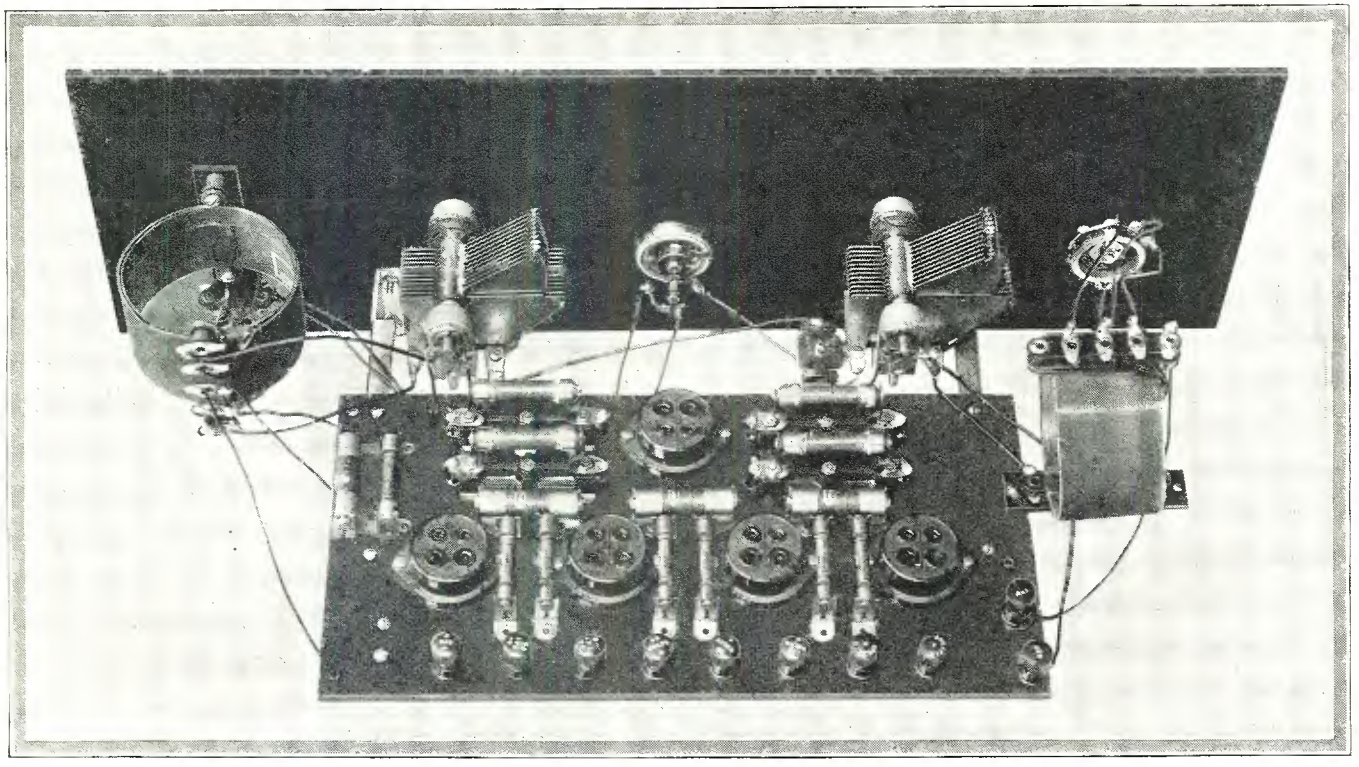


Figure 1. This photograph shows the rear view of the Lynch-Hammarlund Five, from which a clear idea may be gained of the simplicity of assembly. Everything on the sub-panel comes already assembled

OF particular interest to those who are desirous of having an efficient receiver at a low cost, the Lynch-Hammarlund Five illustrated on these pages should prove very acceptable. The receiver consists of a stage of tuned r.f., a regenerative detector and three stages of resistance coupled audio using Lynch resistors. The r. f. stage proper employs a balanced circuit of the Roberts type, whereby a small amount of energy from the plate circuit of the r. f. tube is fed to the grid circuit through a .00002 mfd condenser, which is variable to regulate the amount of feed back. Reference to the schematic circuit in Figure 2 will show on account of the point from which the plate circuit current is drawn, the feed back is reversed so the normal feed back through the capacity of the tube elements is balanced out. For this reason the circuit, when properly adjusted, will not oscillate and is extremely stable.

Simple Layout

Important considerations in this receiver are simplicity of layout, assembly, wiring and cost. Simplicity is accounted for by the fact the sub-panel or deck includes, when purchased, the five tube sockets, three coupling resistors, four grid resistors, three coupling condensers and the grid condenser. Thus the whole audio amplifier is completely assembled ready for wiring.

Tube equipment for the receiver consists of special purpose tubes throughout, Ceco type K for the r. f. tubes, type H for the detector, two type G high Mu for the first and second audio stages and a type F power tube for the last stage.

After all wiring has been rechecked, A and B supplies may be connected and tubes placed in the set. Turn the two tuning control knobs slowly and approximately together until the station is heard. Then readjust each one slightly until maximum volume is secured. Keeping the station tuned in, turn the screw of the balancing condenser in or out until a position is found where oscillation is at a minimum. During this process the two tuning controls should be varied to keep the station tuned at a maximum. During this adjustment keep the tickler coil turned all the way down (counter-clockwise), so regeneration will not be confused with r. f. oscillation in the balancing process.

This receiver is but one of the combinations that are possible utilizing the Lynch deck, also described elsewhere in the editorial section of this issue.

List of Parts

The parts used for its construction are as follows:

1—Lynch five tube De Luxe kit which includes the following:
1—Lynch .00025 mfd cartridge type fixed condenser
3—Lynch .006 mfd cartridge type fixed condensers
1—Lynch .2 megohm metallized resistor
3—Lynch .1 megohm metallized resistors
3—Lynch .5 megohm metallized resistors
5—Eby universal sockets
1—Micarta 6x12x3/16-inch sub-panel
4—Sets special mountings

All of this material is completely assembled on the sub-panel ready for wiring.

(This receiver constructed, tested and all illustrations made in our laboratory)

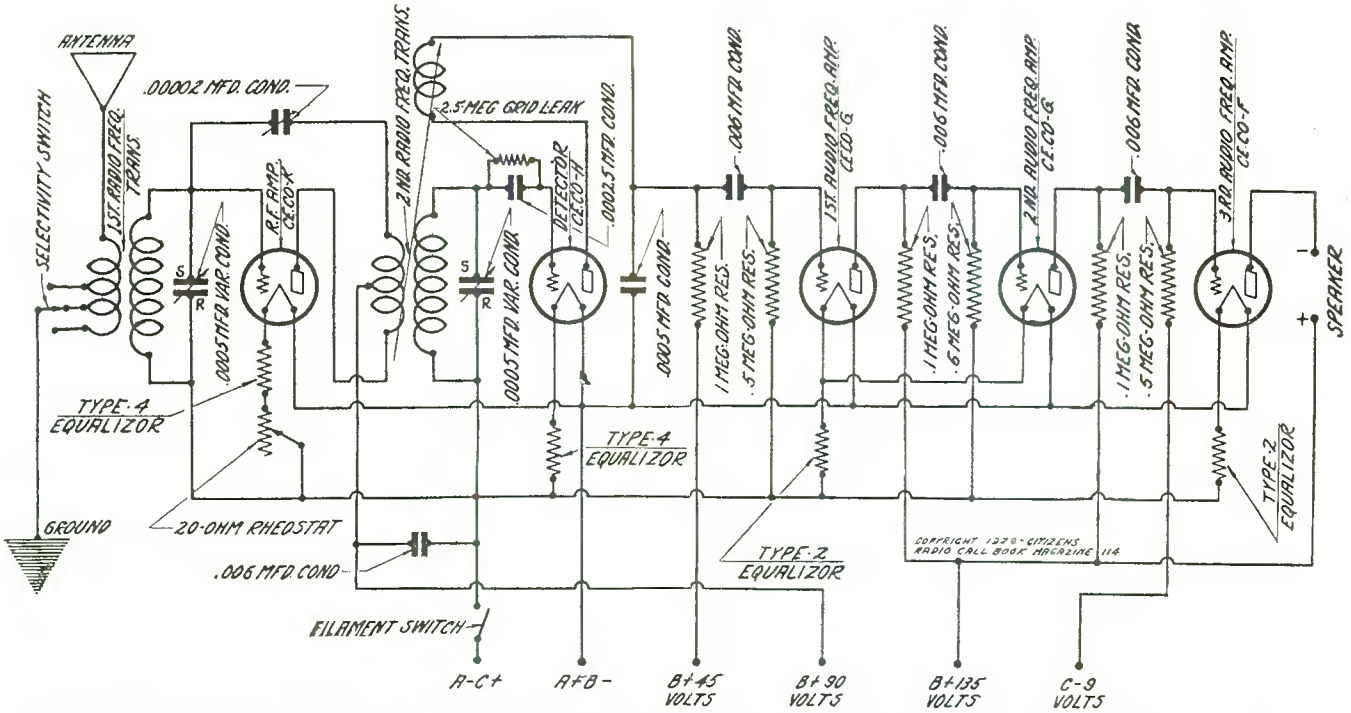


Figure 2. Schematic circuit of the Lynch-Hammarlund Five is shown in the diagram above and represents a receiver comprising one stage of tuned r. f., regenerative detector and three stages of resistance coupled audio

2—ML-23 Hammarlund .0005 mfd variable condensers
1—EC Hammarlund equalizing balancing condenser
1—601 Dubilier .0005 mfd fixed condenser
1—601 Dubilier .006 mfd fixed condenser
2—.4 Lynch equalizers
2—.2 Lynch equalizers
1—M-20-S Carter 20 ohm rheostat with switch
1—404 Carter inductance switch
1—HR-23 Hammarlund antenna coupler
1—TCT-23 Hammarlund coupler coil
1—Micarta 7-21x3/16-inch drilled and engraved panel
2—8629 Benjamin sub-panel brackets
2—192 Marco vernier dials
10—Eby engraved binding posts
20—Feet Acme Celatsite wire
1—Package Kester radio solder
1—Ekko ground clamp
Miscellaneous—screws, nuts, lugs, etc.
1—Ceco type K tube
1—Ceco type H tube
2—Ceco type G tubes
1—Ceco type F tube

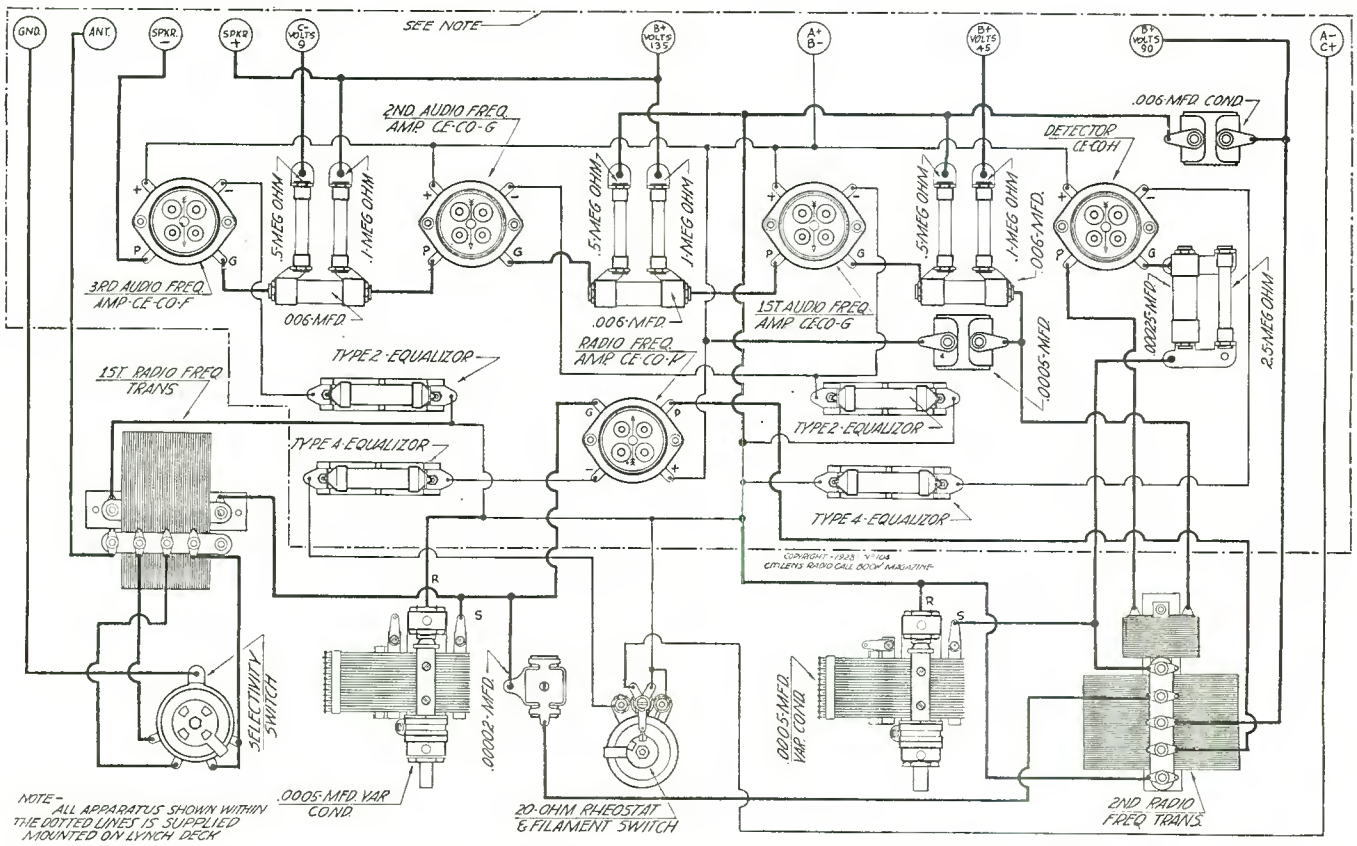


Figure 3. The above graphic diagram makes it easy for the constructor to readily wire up the receiver described in this article. All apparatus shown within the dotted lines is supplied mounted on the Lynch deck

Power Six Is Now Converted for Alternating Current Use

Popular Bremer-Tully Kit Receiver Designed for Operation from Current Mains

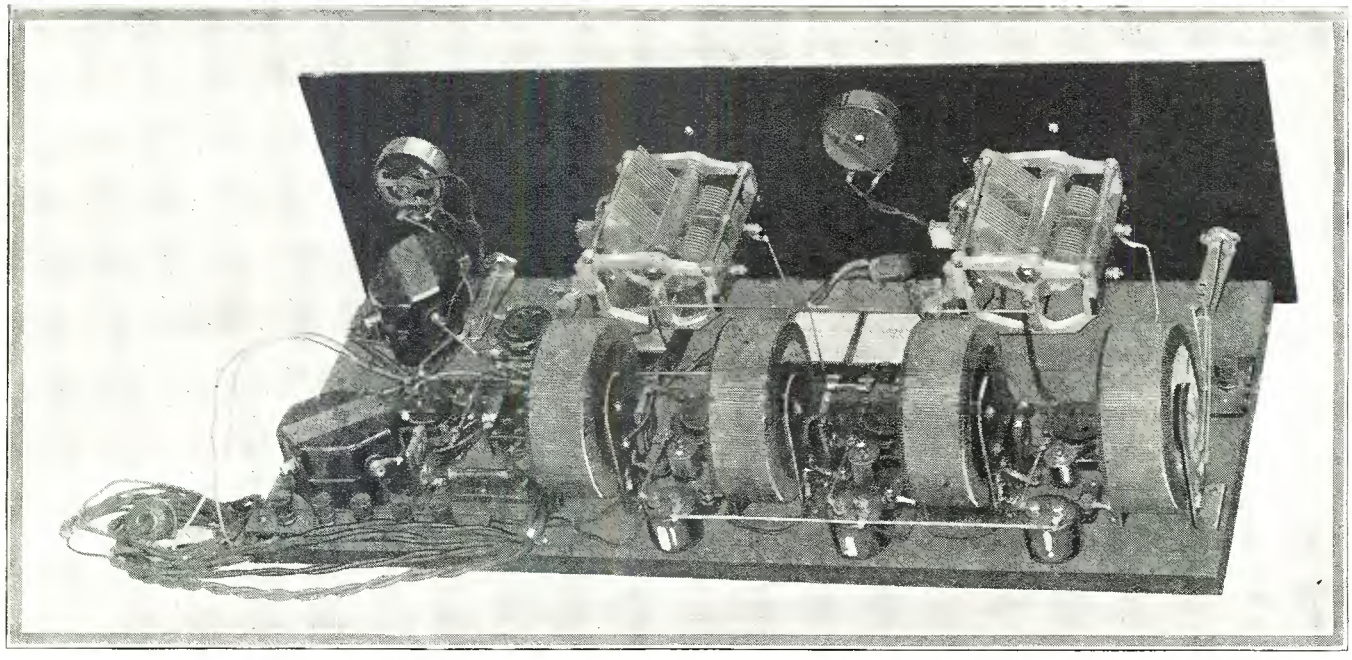


Figure 1. Rear photographic view of the Bremer-Tully Power Six Electric. The bunched wires at the left rear of the base-board are for the filament leads from the A transformer

A HOST of experimenters, fans and set builders will be interested in the recent conversion of the Bremer-Tully Power Six for electric operation, using type 226 and 227 a.c. tubes. Many of those who have constructed previous models of this receiver, which were battery operated, may find it expedient to change over to the electric form of operation as is described in the accompanying article.

With the exception of the filament wiring and the volume control, there is not a great deal of change in the standard hook-up. Of course, the detector in this receiver is a 227 type, having the heater elements and a cathode so that this particular socket position in the receiver is different from the previous type in that it utilizes a five prong base instead of the conventional four.

The older fans in the experimental field will remember the basic idea underlying the Counterphase receiver, but for the benefit of the many newcomers we will analyze the schematic circuit shown in Figure 3.

Antenna coupling to the first tube, which is a 226, is by means of a primary with two taps, one equivalent of a short antenna and the other of a long antenna. In the particular model which was tested in our laboratories the change from long to short antenna is accomplished by means of a three point jack switch. These two degrees of antenna coupling are provided to allow the operator's adjustment of his receiver to the selectivity and sensitivity requirements of his own individual locality and antenna. Since the switch controls the taps on the primary coil, it is obvious that the amount of energy fed from the antenna into the set is thereby governed. The secondary of this Torostyle is spanned by one section of a .00035 mfd tandem condenser, on which is provided a .000027 mfd compensator for balancing out any slight inequalities due to difference in wiring between the first and second r.f. tuned circuit. The secondary of the Type TA Torostyle has a tap for the use of a .00003 mfd Mikro Mike condenser in series with the counterphase winding, this auxiliary circuit serving to stay the tendency of the tube to oscillate.

Parallel Plate Feed Used

Instead of the first tube being coupled to a succeeding r.f. amplifier in the usual transformer method, this circuit makes use of an impedance coupling to a succeeding tube, represented in the schematic by a coil consisting of three windings, a .006 mfd coupling condenser and an r.f. choke. The winding of this third circuit Torostyle may be described as follows: terminal M to F is the counterphase or balancing winding, terminal P to F is the primary, while terminal G to F is the conventional secondary, of course, in this case having a tap for the counterphase circuit by means of which receiver stability is assured. Thus an examination of the schematic will show there are four tuned circuits governed by the use of two tandem condensers. Each of these sections of the tandems has its own compensator capacity, by means of which it is possible to balance all four circuits to a nicety. There are three auxiliary circuits involved in the receiver for oscillation prevention and these are represented by the M to F connection on the three Torostyles together with the three separate .00003 mfd Mikro Mike condensers, adjustment of which will be described later in the article.

Whereas in previous models the volume control has been a series resistor in the 90 volt lead to the r.f. plates, this form of control has not been found satisfactory when using alternating current tubes and as a result another method of connection has been devised and is represented in the schematic circuit by the 25,000 ohm variable resistance placed between the P terminal of

(This receiver tested and all illustrations made in our laboratory)

Figure 2. The completed receiver is shown installed in a Fritts console

the third r.f. transformer and the M terminal of the same transformer. This gives a smooth method of volume control, since the resistor is not called upon to handle any current.

In the detector circuit, where a 227 tube is used, a .00025 mfd grid condenser is used with a two megohm leak from the grid of the tube to the cathode connection, which is also common with the negative B, positive C power, ground and one end of a 625 ohm fixed resistance spanned by a 1 mfd condenser and going thence to the center tap of an 8 ohm fixed resistance placed across the 1½ volt a.c. filament terminal. This common connection also has a 1 mfd condenser between the B minus and the center of a second 8 ohm resistance placed across the 2½ volt a.c. filament terminal. The B minus connection shown in also common with the center tap of a 40 ohm resistor across the 5 volt a.c. terminals and provides the bias for the first audio stage, the bias for the second one provided through the minus C power shown in the schematic. The primary of the detector circuit is by-passed by a .006 mfd condenser from plate to B minus. Two stages of audio coupling are used, the last tube being a 112 power tube, although a 171 may be used if desired.

These two audio couplers have been somewhat redesigned so as to give a constant impedance, which effect is gained by the use of a third or auxiliary coil in the audio coupler, this serving to give greater audio amplification without oscillation or distortion. In case the 171 tube is used with the receiver in the last stage, it is recommended that a speaker coupler be used to eliminate the possibility of damage to the speaker windings on account of the high voltage. The C battery value for the operation of the 171 power tube will run between 30 and 35 volts negative, whereas with the 112 a 9 volt dry cell will suffice.

Uses Baseboard Assembly

In building the receiver the baseboard should be of dry wood, shellacked or lacquered. Inspect all sockets carefully before mounting to insure against defects. Test all fixed condensers for short circuits before connecting. Parts which are mounted on the baseboard should be placed according to the baseboard layout diagram in Figure 4, and each part should be examined carefully to make certain that all apparatus is in perfect condition before proceeding to wire. It is recommended the Torostyles be mounted last, so as to avoid damaging them while putting in the preliminary connections. Cut and fit wires carefully before soldering so as to have a neat and finished receiver. Do not rush the wiring, as haste is likely to cause carelessness and, of course, carelessness is not a desirable factor in the building of sets. In the wiring of the filament circuit no conductor smaller than No. 16 should be used. Preferably No. 16 light weight electric light cord should be employed for the leads from the A transformer. In the wiring of the receiver it will be simpler if the filament wiring is completed first. Be sure to allow sufficient length of the lamp cord for the distance from the socket to the A power transformer, but do not exceed 3 feet in length on account of the possibility of voltage drop due to the increased resistance of the longer conductor. It would be advisable to mark each cable with the proper voltage to prevent error when connecting to the A transformer.

Connect stator terminals of variable condensers to the grid terminals of the detector and r.f. sockets, as shown in the graphic, making at the same time all connections to grid terminals on all sockets. Inasmuch as all wires connected to the grid

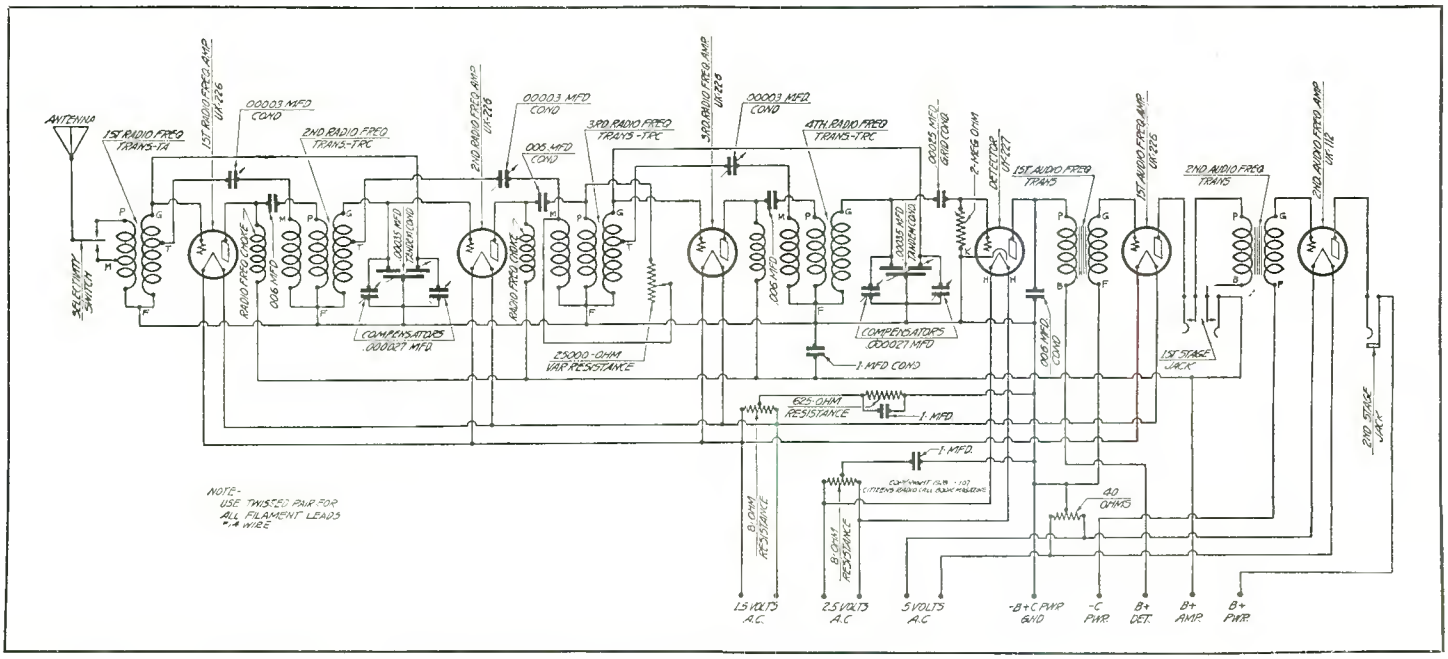


Figure 3. Above is the electric circuit for the Power Six Electric. This schematic may be used by those who are accustomed to wiring by this type of diagrams, whereas the novice should consult Figure 4 and Figure 6, the latter being the one to follow for simple wiring

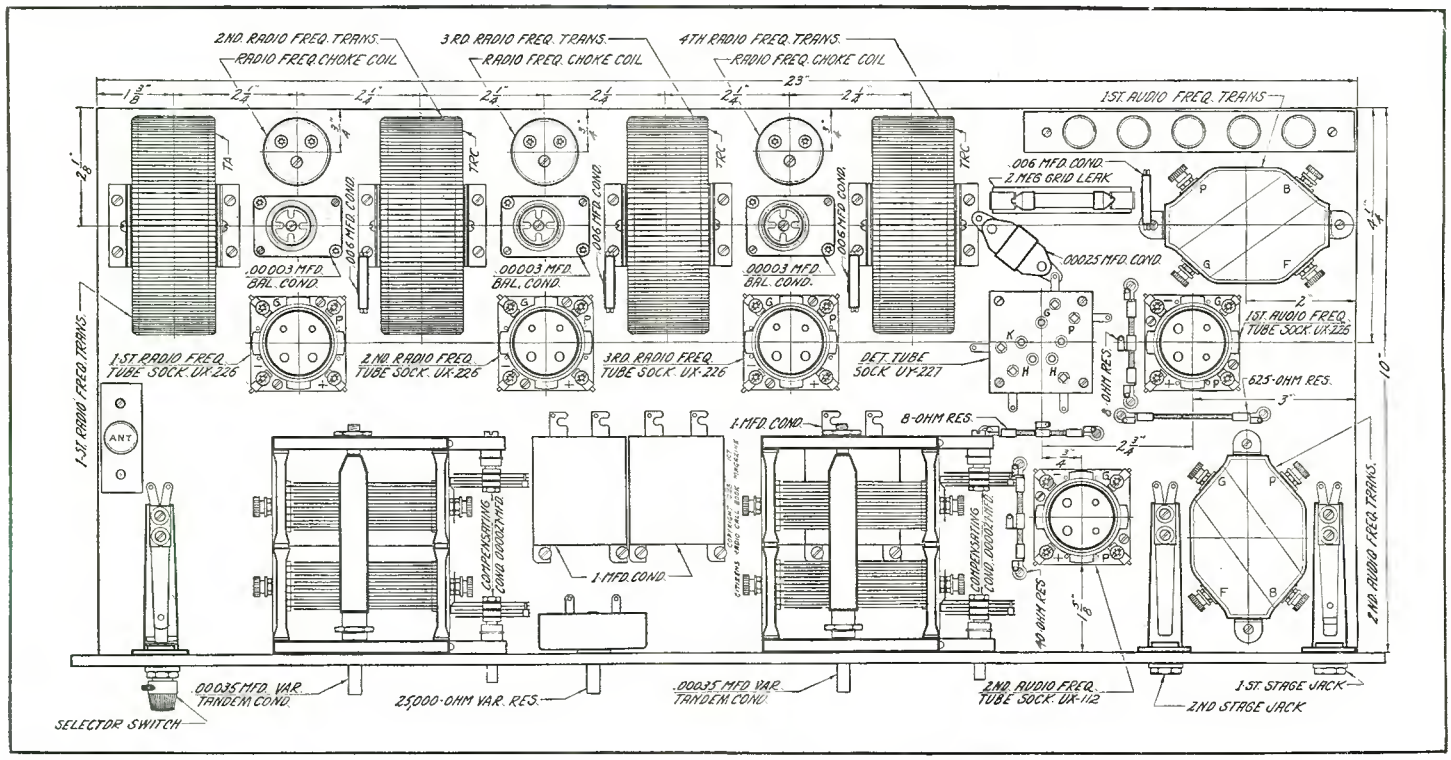


Figure 4. Baseboard layout of the Power Six Electric is illustrated in the drawing above. The front panel length is 24 inches and for that reason the baseboard should be 23 inches so as to allow a half inch at each end in case it is desired to place the receiver in a cabinet from the top. If the cabinet used is of a type where the set may be slid in from the front, then the 24 inch baseboard may be used

terminals of all sockets are highly potential, relatively, they should be made as direct and as short as possible. Also all other wires should be kept as far from grid wires as possible, especially those wires connecting to the plate terminals of all sockets. The detector grid condenser should be installed very close to the socket grid terminal, this also being advisable for the connection of grid resistance from grid to cathode.

Recheck Your Work

After the receiver is completely wired, the wiring should be rechecked very carefully before connecting to the power units. Tests against short circuits or wrong connections may be made by means of a voltmeter and a C battery, using the schematic diagram for reference. For greatest simplicity in control of the power, it is recommended the 110 volt switch for tuning on and off the power transformer be installed on the panel. The electric light cord from the B power unit should be plugged into the receptacle of the A power transformer. The set power switch will now operate to turn on and off both the A and B power units. After turning on the receiver, one tube should be inserted at a time, so in case of a wrong connection this fact may be determined before all tubes are placed in the set.

After checking all connections in your A and B power units, connect the antenna to the antenna position and connect the ground wire. Turn on power supply. Adjust volume control full on and tune in a station for rotating the two tuning dials at approximately the same reading. In order to adjust the tuning dial rotate the condenser so the rotor plates are just full in and flush with the stator plates of both condensers. With plates in this position, adjust both pointers to the maximum wavelength reading shown on the dials and attach them to the condenser shafts in this position.

After the wiring in this receiver has been made very carefully and apparatus spaced as shown in the baseboard layout, the proper setting of the Mikro Mike condensers will be approximately at full upward traveling of the inside or movable cylinders of these condensers. This inside cylinder moves freely when adjustment screw on top is turned, and great care should be exercised not to force the screw beyond the upper edge of the cylinder, which would result in injury to the condenser. Another way of easily describing the proper position for these Mikro Mikes is to state that maximum results will be secured when the lower edge of the inside cylinder is about 1/16 of an inch above the upper edge of the outside cylinder. (This will not hold true, however, if there has been a deviation in placement of parts or in wiring.) Now tune in a signal at about 400 meters and adjust all four trimmers or compensator condensers to a position where the rotors are half in and half out. Reduce volume to a low point and tune signal very carefully, adjusting rear right hand trimmer condenser from full in to full out, leaving at a position giving greatest volume. Do likewise with the rear left trimmer condenser. Adjust both of the panel trimmer condensers for greatest volume. This position may be considered permanent except for tuning of weak signals when operation of the panel trimmers will facilitate sharp tuning. In cases of interference, these panel trimmers are quite useful.

Phonograph Pickup

If desired, the set may be operated in conjunction with an electric phonograph pick-up, an open circuit jack and a volume control being required for this purpose. In this case the jack for the phonograph connection is placed with the frame of the jack being connected to the P terminal of the first audio transformer and one side of a volume control, the center of the volume control being connected to the B terminal of the first audio transformer the switch connection on the volume control goes to B+

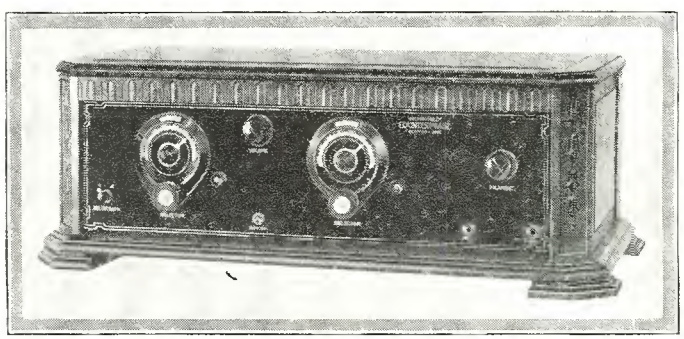


Figure 5. This photograph shows the Bremer-Tully Power Six Electric placed in a Fritts cabinet

detector, the remaining connection on the volume control going to the spring of the open circuit jack used for the phonograph pickup arrangement. This method of connection is made necessary by the fact that on account of using a five prong socket for the 227 tube, the present phonograph pickup plugs will not fit. Another virtue of this arrangement is the fact that the phonograph pickup may be permanently attached to the set and operated any time by simply turning the phonograph volume control toward the right. This volume control may be placed in the same position as used for the rheostat in the original Power Six. When the special Bremer-Tully phonograph control is turned as far as possible to the left, it disconnects the phonograph and connects the radio circuit. Referring to Figure 1 will show the builder the location of the phonograph volume control at the extreme left of the panel, looking from the rear.

While the foregoing article has been written particularly for those who are building the present kit receiver, it is felt that some mention should be made of the manner in which the Power Six can be converted for alternating current operation. Two of the chief differences between the electric model described in this article and the previous battery operated receiver, which was described sometime ago in the columns of this magazine, lie in the use of a five prong socket for the type 227 detector tube, the fifth prong representing the cathode connection on the tube, while the two filament connections are for the heater; the other variation being the elimination of the series resistance formerly used in the 90 volt lead to the plates of the three r. f. transformers and the substitution of the volume control method previously outlined in these paragraphs. Another point of departure lies in the fact that where in the battery operated receiver separate grid resistors were used in the grid circuit of the first, second and third stages, in the electric model this has not been considered necessary, since the receiver balances very easily and gives excellent radio frequency amplification. It should be noted that parallel plate feed is used in all the r. f. stages to eliminate any possibility of regeneration due to the common B supply. This feature, however, was also included in the battery operated model and its success has warranted its retention in this electric model.

In converting the battery model to the electric type, the first, second, third and fifth sockets are wired in parallel for 1½ volts a.c., with an 8 ohm fixed resistance across that supply. The fourth socket, which is the detector, is wired for 2½ volts a.c. and also has an 8 ohm fixed resistance across its supply. The sixth tube, the power stage, is wired for 5 volts a.c. and has across that supply a 40 ohm fixed resistance. By comparing the schematic circuit shown in Figure 3 the owner of a battery operated model can readily observe the points of difference between this diagram and the one by means of which he wired his previous set.

List of parts required for the construction of the receiver previously described is as follows:

1 Bremer-Tully Power Six A.C. kit consisting of:
1—TA B-T Torostyle transformer
3—TRC B-T Torostyle transformers
2—LD-17 B-T .00035 mfd tandem variable condensers
3—B-T radio frequency chokes
3—B-T .00003 mfd Mikro Mike condensers
1—B-T 625 ohm fixed resistance
1—B-T 40 ohm center tap fixed resistance
2—B-T 8 ohm center tap fixed resistances
1—K-25 B-T 25,000 ohm volume control
1—Filament cable clamp

Other parts required:
1—A B-T power transformer
1—3-31 B-T audio coupler
1—2-22 B-T audio coupler
2—B-T dials
1—104 Carter double circuit jack
1—101 Carter single circuit jack
1—Carter three point jack switch No. 3
5—Standard sockets
1—Five prong socket
1—Cortlandt 7x24x3/16-inch panel
1—10x23x½-inch wood baseboard
4—601 Dubilier .006 mfd fixed condensers
1—642 Dubilier .00025 mfd grid condenser
3—656 Dubilier 1.0 mfd by-pass condensers
1—Dubilier 2 megohm grid leak
6—Eby engraved binding posts
30—Feet Acme Celatsite wire
1—Package Kester radio solder
1—Ekko ground clamp
1—B-T S 890 phonograph control (optional)

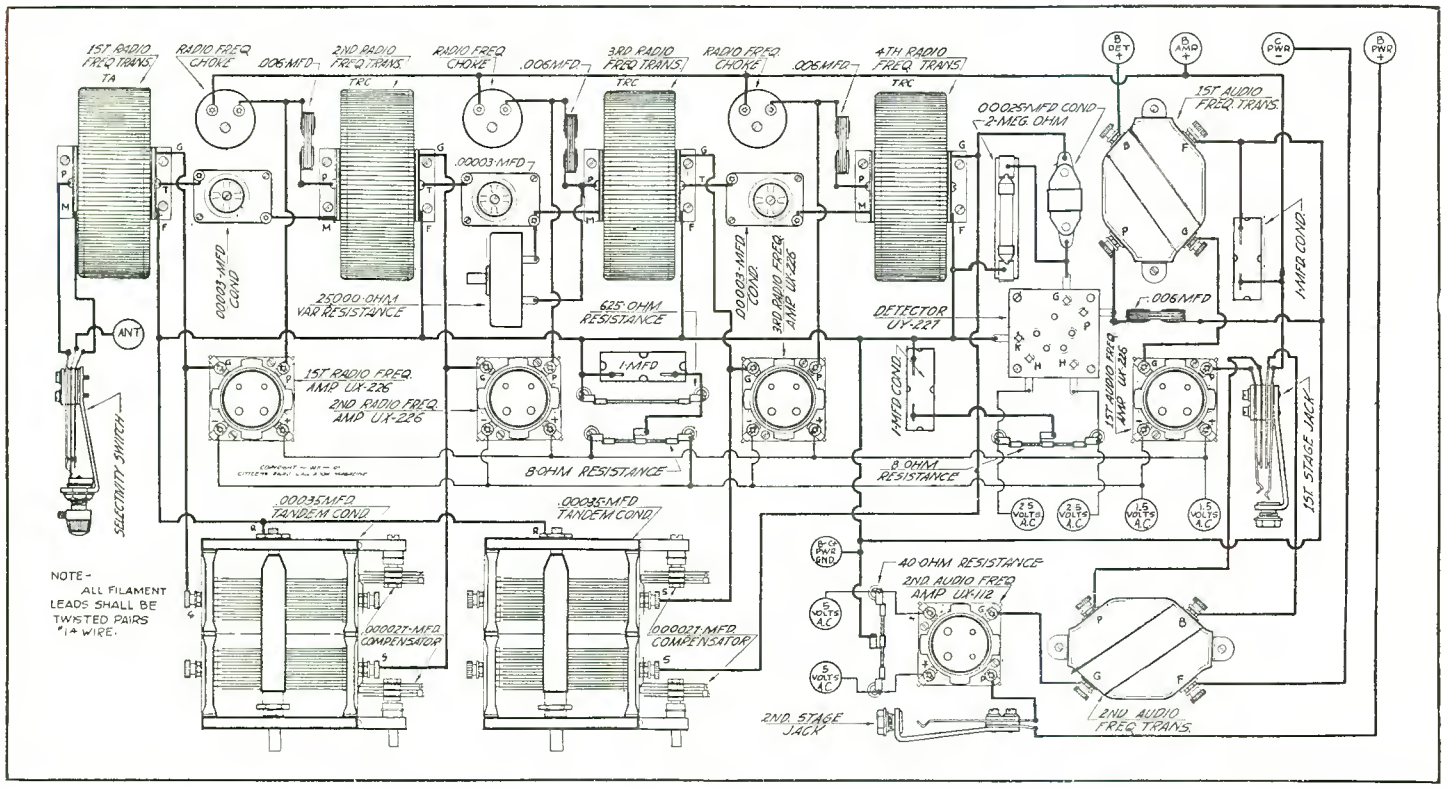


Figure 6. This graphic diagram will enable even an inexperienced builder to construct the receiver described in this article. It should be noted, however, that the parts for this set should be placed on the baseboard in accordance with Figure 4, while the set should be wired in accordance with the graphic shown above

R. F. Circuits Are Stabilized in Phasatrol DeLuxe Seven

Two-Dial Control Serves to Tune Four Radio Frequency Stages; Receiver Has Push-Pull Audio

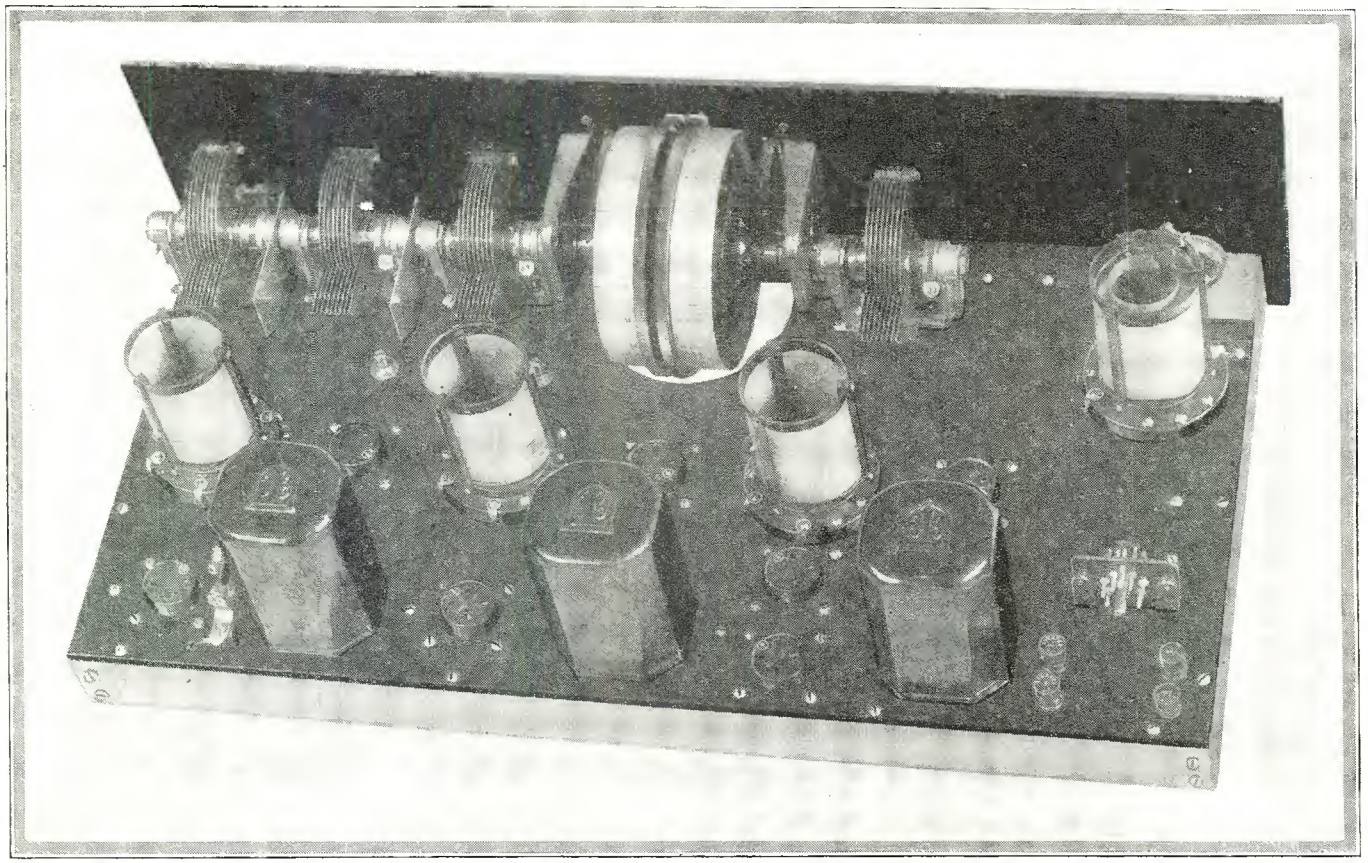


Figure 1. The above photograph shows the simplicity of assembly of this receiver. All inductances are generously spaced and electrostatic shields are provided on the three gang condenser shown at the left in the photograph

MUCH of the difficulty encountered in the operation of simple tuned radio frequency receivers has been due to the fact that when a fairly high voltage is applied to the plates of the r. f. amplifiers, these tubes exhibit a strong desire to go into oscillation. In the customary series resistance arrangement for the prevention of oscillation, the drawback has usually been the fact that not all tubes were giving their proper amplification because a single series resistance had to operate two or more tubes. The ideal condition, of course, would be a separate resistance in each radio frequency plate circuit so that full advantage might be taken of the individual amplification of each tube.

Phasatrol Used

This control is now available in the form of a Phasatrol made by Electrad and which is used with considerable success in the receiver described herein. Essentially the Phasatrol consists of a variable resistance and a fixed condenser mounted inside of a bakelite container. By its inclusion in the circuit a normal transformer coupled radio frequency transformer becomes in effect an inductive impedance coupled arrangement. Plate current reaches the tube (see schematic) through the resistance lying between terminal B and P of the Phasatrol unit, while radio frequency current passes through the fixed condenser into the primary 1 and 4, from which it is induced into the secondary circuit. In operation the Phasatrol unit for each tube is set at that value which is below the oscillation point and remains fixed for a given set of tubes. If the receiver is balanced on 45 volts and then the voltage is changed to 90, it is natural that the setting of the Phasatrol units will have to be altered. However, in the receiver described here, which has been tested in our laboratories, the plate voltage on the radio frequency stages has been kept at 90 and all balancing made for that value. As a matter of fact, the amplifiers work better when given a higher plate potential than with a lower one.

Inductances in the Phasatrol DeLuxe are the Aero radio frequency transformers and Aero antenna coupler, the latter having a variable primary so advantage may be taken of the different operating conditions and to change the selectivity of the set at will. The first tuned stage is operated from a single .0005 mfd variable condenser, while the second and third radio frequency stages and the detector are tuned by three Hammarlund .0005 mfd variable condensers ganged together on a common shaft. This gang arrangement has two electrostatic shields, which may be seen by referring to the photograph shown in Figure 1.

Has Push-Pull Audio

Audio amplification is a push-pull arrangement utilizing Tyr-

(This receiver tested and all illustrations made in our laboratory)

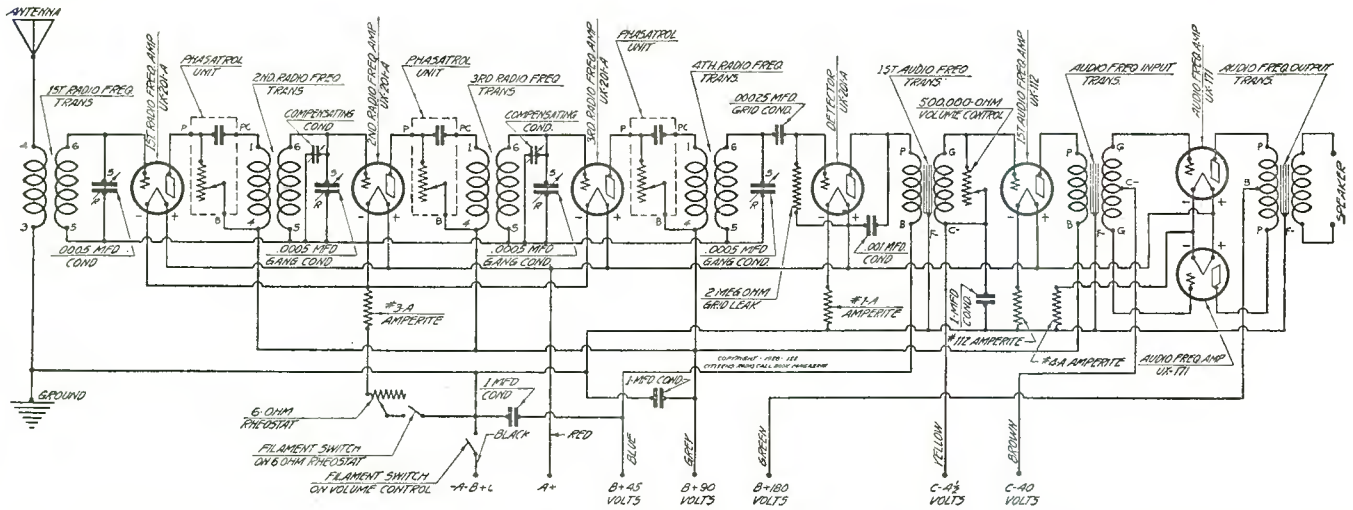


Figure 2. Electrical connections of the Phasatrol DeLuxe Seven may be found by consulting the schematic diagram given above

man input and output audio transformers, two 171's being used for push-pull in the last stage, the first audio using a 112. The output transformer, of course, has a winding from which the speaker is operated. Audio volume control is secured by means of the 500,000 ohm Tonatrol placed across the grid and C minus terminals of the first audio transformer. Since the Phasatrol units are not considered in the light of controls which are used while tuning, these have been placed on the sub-panel, where they may be adjusted and then left undisturbed. Their location is shown in the sub-panel layout illustrated in Figure 3. Inspection of Figure 3 will also show the location of the two compensating condensers which are used as a means of trimming the three stages which are ganged together on a common shaft. This balancing is necessary on account of the slight difference in wiring, but after the stages are once balanced it is not necessary to change those capacities.

Automatic Filament Control

Filament control is partly automatic and partly manual. The fixed stages are first, second and third radio frequency tubes placed on a No. 3-A Amperite in series with a 6 ohm rheostat. By this means even if the rheostat is turned all the way on, the tubes cannot be operated at a higher value than their normal filament rating. The detector circuit filament is supplied through a 1-A Amperite, the first audio through a 112 Amperite and the two 171 tubes arranged for push-pull are taken care of by a 4-A Amperite.

Plates of the radio frequency stages are furnished with 90 volts. The detector plate voltage is 45 volts. The first audio plate voltage is the same as that of the radio frequency, being 90 volts, while the two tubes arranged for push-pull feed from a 180 volt source. Only two C bias values are specified, 4½ negative being supplied to the grid of the first audio while 40 volts negative is given to the grids of the tubes arranged for push-pull.

Builders, who are interested in making this receiver, will find it is a very stable one and to possess good quality reproduction. All of the necessary parts should be placed on the sub-panel in accordance with the drawing shown in Figure 3. It will be observed that ample space is allowed between inductances and transformers, while the condensers are lined up in such a manner as to reduce as much as possible the length of leads from the inductances to the condensers. Wiring of the receiver may

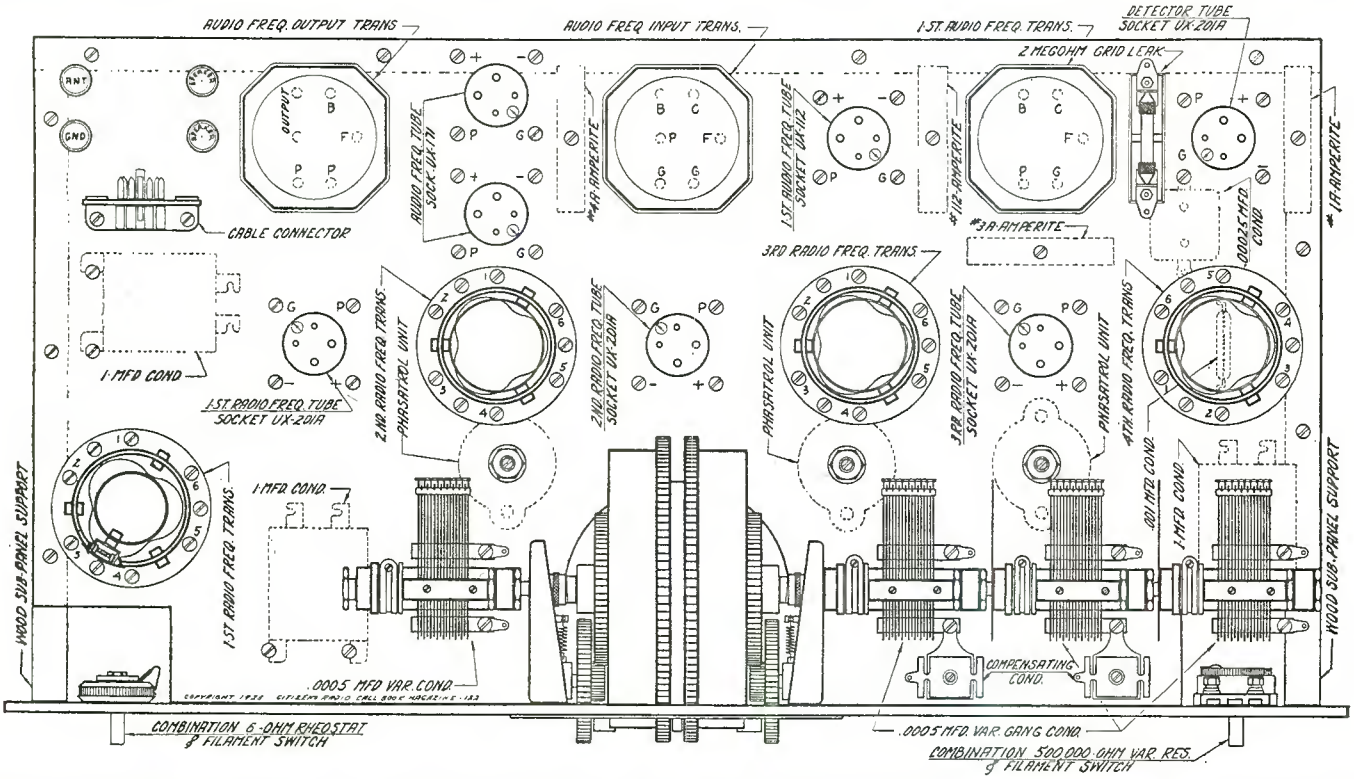


Figure 3. This illustration represents the actual placement of parts on the sub-panel and should be followed carefully as regards position of the various units

be accomplished by following either the schematic circuit shown in Figure 2 or the graphic illustration shown in Figure 7, the latter being preferable for those who are not certain as to the exact manner of hooking up the various units.

While the Phasatrols are placed underneath the sub-panel, a hole is allowed for the shaft to come up above the sub-panel, which shaft is adjusted when putting the receiver into operation by means of a small wooden rod pointed like a screw-driver. In actually connecting the Phasatrols in the circuit a wire is run from P of the desired tube to the P terminal on the Phasatrols, while the B terminal of the Phasatrol is connected with terminal four of the succeeding transformer and then connected to terminal B of the Phasatrol and terminal four of the transformer beyond. This same method of connection is carried out on all stages, so that we have in effect three resistances supplied from the single plate voltage of 90 volts. The PC connection on the Phasatrol goes to terminal one on each succeeding radio frequency transformer. The matter can be understood a little more clearly by referring to the schematic, which gives the electrical method of connection.

Flexible or Solid Wiring

Either solid or flexible wire may be used for hooking up the receiver, depending very largely upon the taste of the builder. While the laboratory model was assembled with flexible wire, it perhaps does not give as clean a looking job as if the work were to be undertaken with solid wire. However, one of the virtues of flexible wire lies in the fact that connections may be considerably shortened from point to point and in some cases this may be desirable. As will be observed by referring to Figure 4, which is the photographic view of the under side of the set, all bypass condensers, the Amperites and the Phasatrols are located on the bottom side of the sub-panel. A cutout is made on the sub-panel in order to allow the Tyrman dials to be located without touching the sub-panel. The cable plug is located on top of the sub-panel and may be seen by referring to the photograph in Figure 1, or the sub-panel layout illustration in Figure 3. The latter diagram also shows the location of the grid condenser and grid leak, the leak being above panel, while the condenser is below panel and attached directly to the grid terminal of the detector socket. Suitable binding posts are provided for antenna and ground connections, as well as the speaker connections.

Figure 5. In this photograph the completed receiver is placed in a Fritts console

It is quite necessary that care be exercised in wiring up any receiver and this set should be no exception to the rule. After all of the wiring has been done, the builder should go over every connection and check it against the graphic illustration or the schematic, depending upon his ability to read diagrams. All soldered connections should be well made and if there is any question as to the tightness of connection, it is better to do it over rather than to allow it to remain loose and a possible source of trouble later. Make sure that the iron is quite hot so that you do

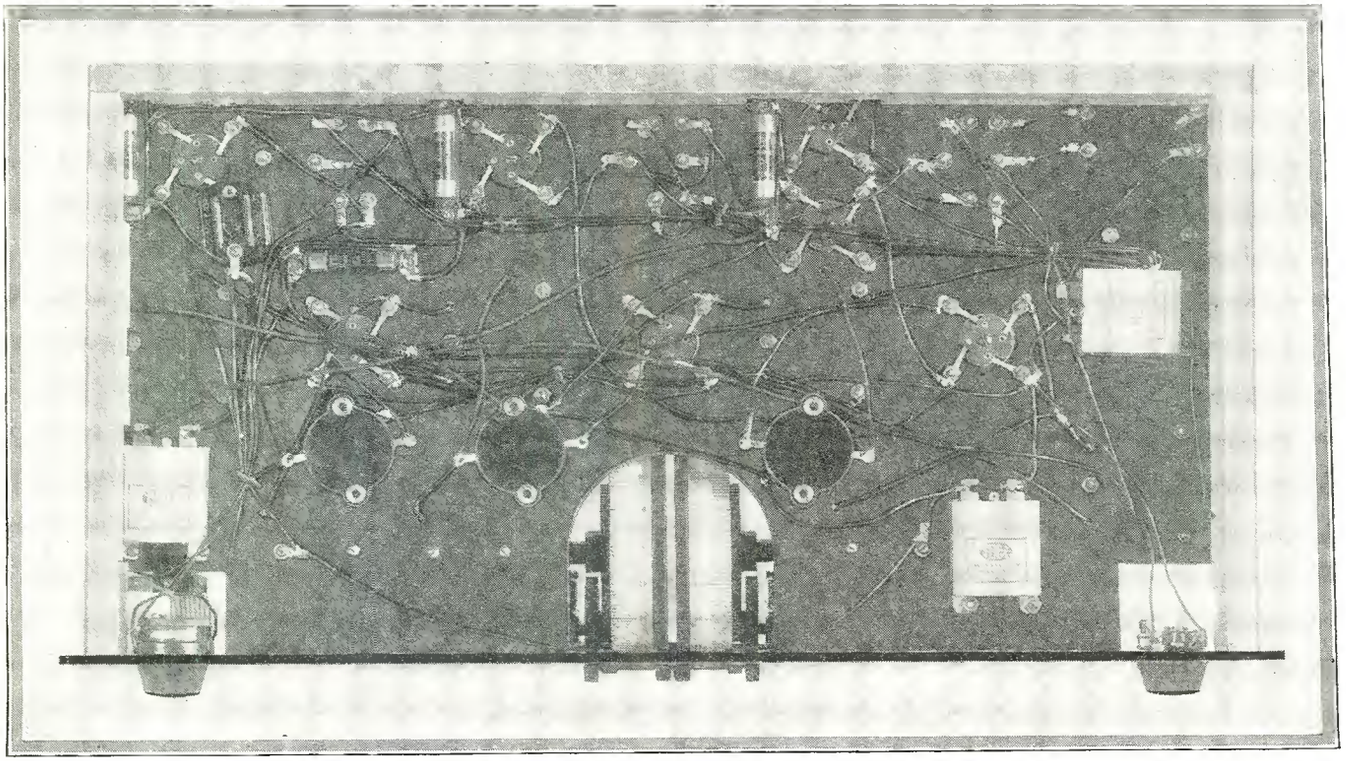


Figure 4. Photographic view of the bottom of the sub-panel. On account of flexible wire being used in this receiver, it has been possible to make connections from point to point. If solid wire is used in hooking up your receiver, the appearance of the under side would be more symmetrical but not necessarily any more effective

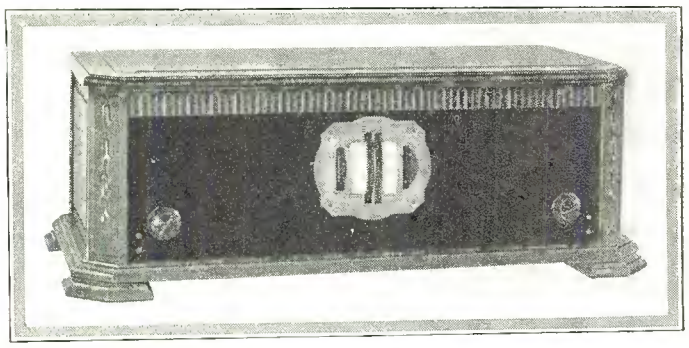


Figure 6. A Fritts cabinet is here shown with the Phasatrol DeLuxe Seven

not have what are termed "rosin joints," which appear to be solid connections but which is reality are not.

Putting Set in Operation

When operating the receiver, it will be found that the two drums are run about the same, inasmuch as the variable condensers and the inductances are pretty well balanced. However, in the case of the antenna drum, which is at the left, it is quite likely that various antenna and ground conditions may make sufficient difference in tuning, and that the first dial will either lead or lag the second one. However, this can be remedied to some extent by altering the position of the variable primary. Maximum signal strength will be secured on the antenna stage when the primary is down within the upper edge of the secondary, while least signal strength will be secured when the coil is pulled out as far as it will go. The receiver should be balanced on a station about midway between the upper and lower broadcast band, the Phasatrol units controlling each stage, being shifted one at a time until smooth operation is gained over all stages. This is a very simple matter and should not take much of the operator's time.

The parts used for the construction of this receiver are as follows:

4—Hammarlund .0005 mfd variable condensers
2—Hammarlund balancing condensers
4—Aero r.f. transformers
1—Tyrman double vernier dial
1—Tyrman audio transformer
1—Tryman push-pull input transformer
1—Tyrman push-pull output transformer
7—9044 Benjamin sockets
1—660 Yaxley cable plug
4—Eby engraved binding posts
1—Lynch 2 megohm grid leak
1—Electrad grid leak mounting
3—Electrad Phasatrols
3—Tobe 1 mfd by-pass condensers
1—1-A Amperite
1—3-A Amperite
1—4-A Amperite
1—112 Amperite
1—Sangamo .00025 mfd grid condenser
1—Electrad Tonatrol with switch
1—Carter 10 ohm Imp rheostat with switch
1—7x24x3/16-inch Cortlandt front panel
1—12x23x3/16-inch Cortlandt sub-panel
30—Feet Acme Celatsite wire
4—Sontron 201A types tubes
1—Sontron 112 type tube
2—Sonatron 171 type tubes
1—Ekko ground clamp
1—Package Kester radio solder
Miscellaneous—lugs, nuts, screws, etc.

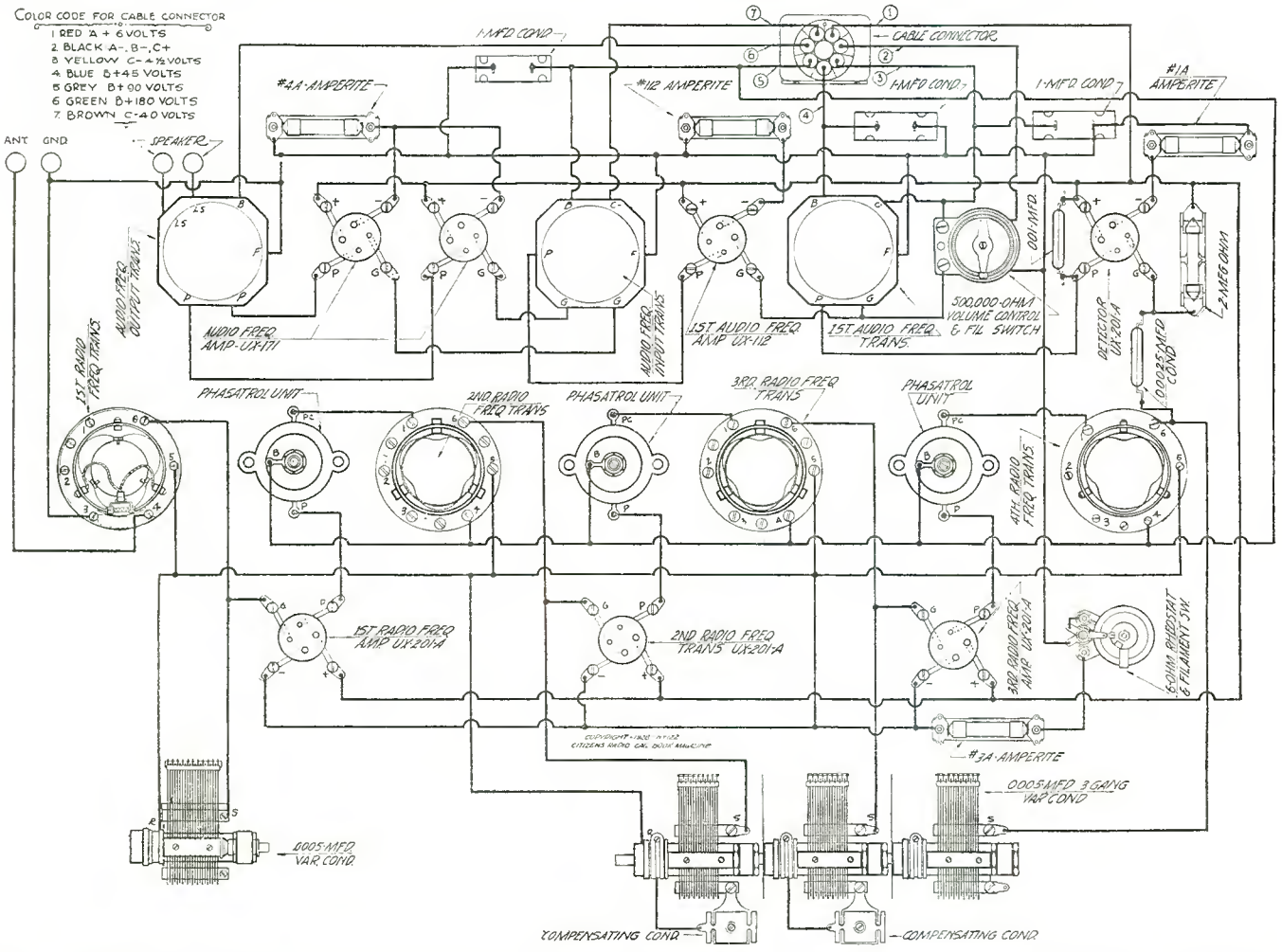


Figure 7. Above may be seen a graphic representation of the receiver. Connections should be made exactly in accordance with this diagram, although parts should be placed on the sub-panel as laid out in Figure 3

Converting Aerodyne Six to A. C.

CONSTRUCTION of the Aero-Dyne Six for use with the new 226 and 227 a.c. tubes is a relatively simple matter. By reference to the circuit diagram shown in Figure 1 it will be seen proper terminal voltage values are shown. No reference to the type of filament or plate supply unit is made. The reason for this is that individual set builders will probably have their own likes to be guided by in these items. The filament supply transformer should be one having windings giving 1.5, 2.5 and 5 volts. The unit supplying "B" voltage may be dry cell blocks or any high class type of "B" eliminator.

The wiring for the filaments of the tubes may be either twisted pair or bus bar wire. Bus bar will make a neater job and it is sufficiently large enough to carry the relatively large current without appreciable voltage drop. It will be well to run the wires parallel to each other and as close as possible.

Perhaps a word of caution regarding the filament voltages of the a.c. tubes will not be amiss. These tubes are extremely delicate and will not stand higher voltages than their prescribed rating for any length of time. It is preferable to make use of a low voltage a.c. voltmeter but in the absence of this, the minimum voltage with which satisfactory operation of the tube can be secured is used.

The layout and general construction of the a.c. operated Aero-Dyne is practically identical with that of the battery operated Aero-Dyne 6 shown in our November issue. The 6 ohm potentiometer is located on the sub-panel just behind the first condenser. The one-fifth ohm rheostat is mounted on the panel.

A Yaxley cable is used to connect the filament transformer to the appropriate circuits in the receiver. The connector plate is mounted just to the left of the 171 socket on the rear of the sub-panel. Wires colored green and slate are used for the 1.5 volt line, brown and red wires carry the 2.2 volts for the heater of the 227 and the black and yellow wires are for the 5 volt winding. The blue wire is not used.

Besides this Yaxley cable, eleven binding posts are used and they should be mounted in the order shown on the circuit diagram. The receiver has been stabilized against oscillation and the correct voltages as bias for the 226 tubes is specified as a negative 12 volt bias. If it is desired the receiver be operated nearer the oscillating state reduction of the negative bias to a value of about 9 volts should accomplish the desired result. A negative voltage of 40 is used for biasing the 171 tube.

When putting the receiver in operation, the 6 ohm potentiometer located on the sub-panel just to the rear of the first tuning condenser should be adjusted for minimum hum.

Below is a list of parts necessary for the construction of the receiver:

1—Aero-Dyne foundation unit
1—Aero U-16 kit of coils
2—S-M drum dials
2—S-M type 220 audios
5—S-M No. 511 sockets
4—Hammarlund .0005 condensers
2—Tobe 1 mfd. condensers
1—Tobe 2 meg. grid leak
1—Polymet E-Z grid leak mounting
1—.00025 mfd. Carter condenser
1—.001 mfd. Carter condenser
1—.0015 mfd. Carter condenser
1—One-fifth ohm Carter rheostat
1—0-200,000 ohm Carter variable resistor
1—Yaxley cable No. 660
2—Yaxley 6-ohm resistances
2—Yaxley 3-ohm resistances
1—Yaxley 300-ohm resistance
1—Yaxley 6-ohm potentiometer
1—Benjamin 5 prong socket
11—X-L lettered binding posts

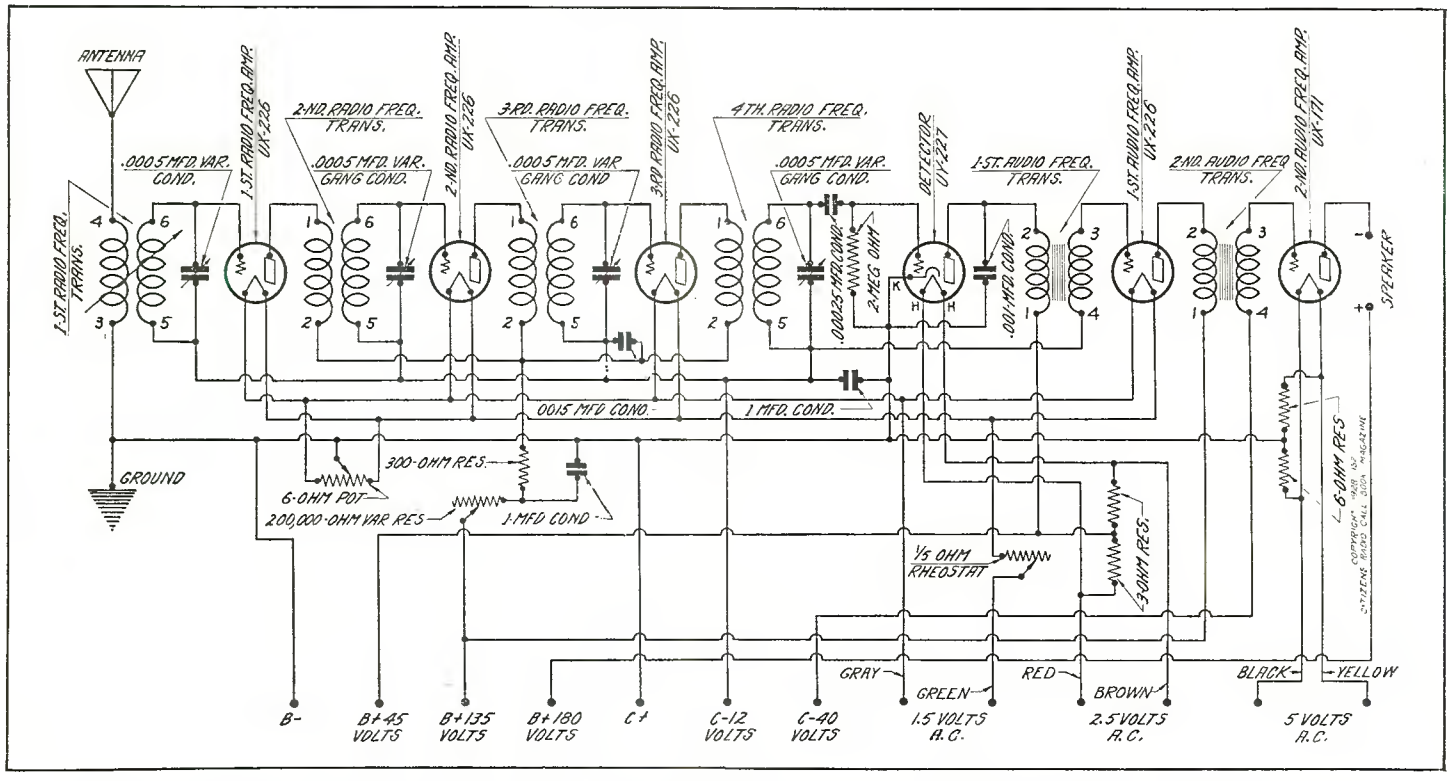


Figure 1. Schematic circuit of the Aerodyne Six arranged for electric operation is shown in the above drawing

(This receiver tested and all illustrations made in our laboratory)

Tyrman Amplimax Is Designed for New Shield Grid Tubes

First Model of Seven Tube Superheterodyne Takes Advantage of Tremendous Tube Amplification

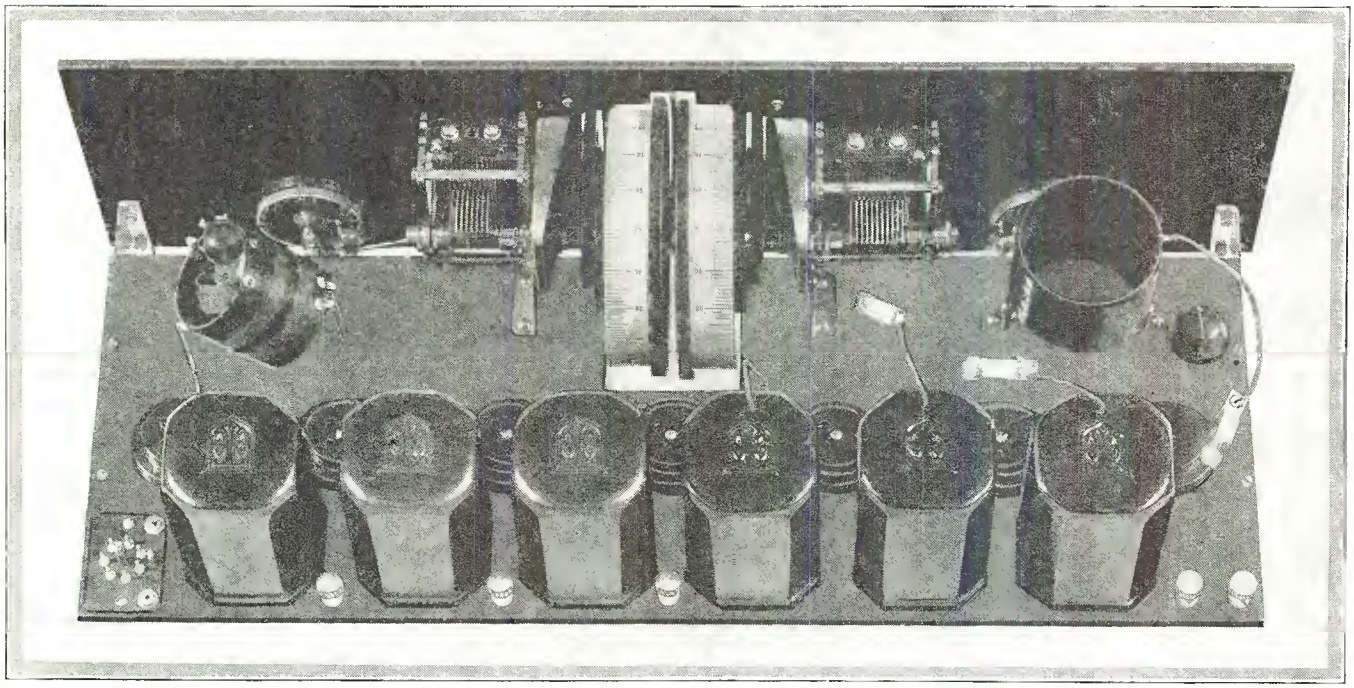


Figure 1. Rear view of the completed Amplimax Super on which extensive development work has been done in our engineering laboratories. In this photograph the tube shields are removed, to give the reader an idea of all the component parts

HAVING published the first article in the field on the actual construction of a receiver utilizing the latest tube developments in the form of the shielded grid tubes in our November issue, in the interest of superheterodyne fans we are in position to describe the first superheterodyne using this tube.

Our engineering laboratories have done considerable development work on this particular circuit and the results have been very gratifying, both from the actual operation of the receiver as well as from the standpoint of economy in the number of tubes.

In the presentation of a super of this type it has been necessary to utilize coupling forms which work with the highest efficiency in the use of the shield grid tubes. Whereas in the conventional superheterodyne intermediate stages, with which our readers are quite familiar, the transformer coupling is used, in the Amplimax it has become necessary to resort to an impedance coupling in order to take advantage of the maximum amplification of the new tubes. In addition to this it has been necessary to thoroughly shield not only the impedance units but the shield grid tubes as well. The extent to which this shielding is carried governs entirely the question of whether or not the circuit used will oscillate. Naturally oscillation is not desired and for that reason the shielding must be of a high order. On account of the average builder's inability to produce a well shielded unit from assembled parts, it has become necessary for the manufacturer to develop the complete impedance unit within its shield, this unit being shown in Figure 6. The intermediate frequency selected for operation on these impedance units is 350 kilocycles, which serves to eliminate repeat points. Also on account of the comparatively high intermediate frequency a range of only 950 kilocycles is necessary for the oscillator and for that reason a .00025 mfd condenser can be used for tuning the

Figure 2. The receiver shown in a Corbett console

(This receiver tested and all illustrations made in our laboratory)

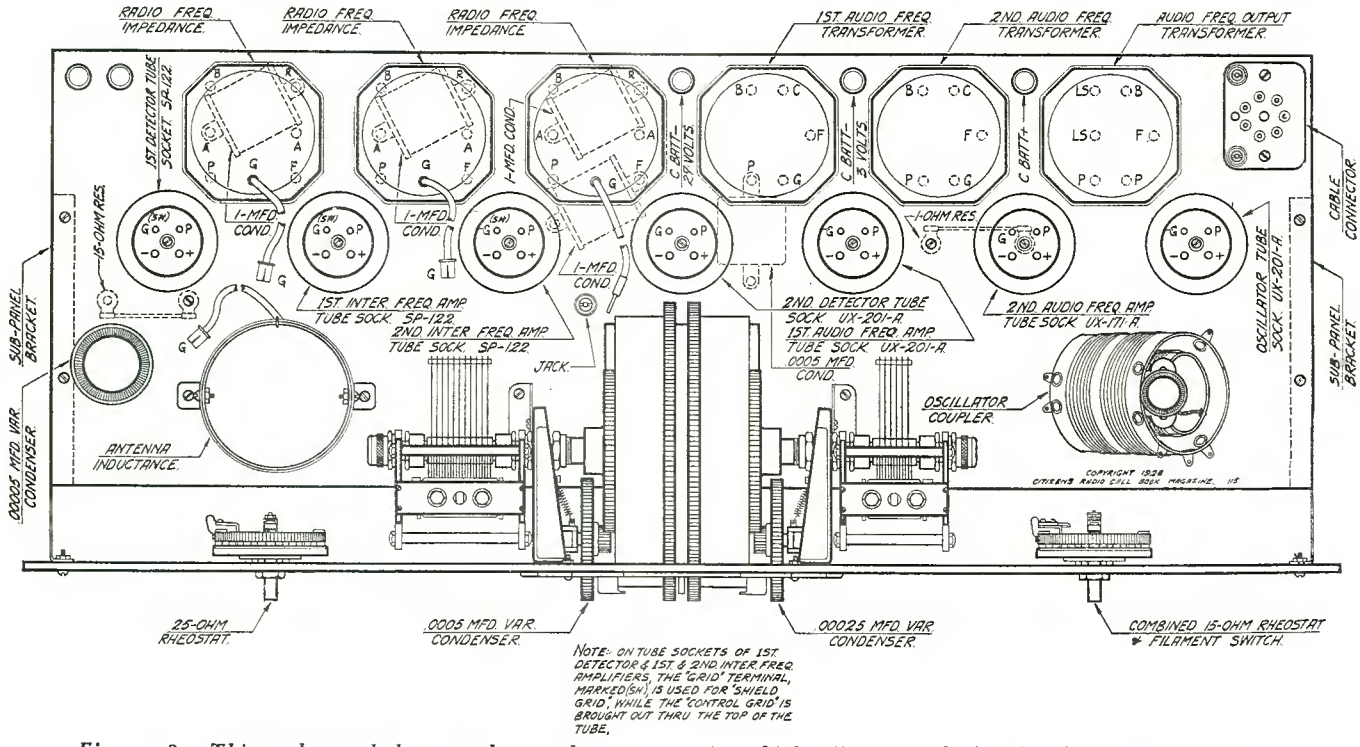


Figure 3. This sub-panel layout shows the manner in which all parts of the Amplimax are disposed

oscillator circuit.

Referring to the schematic circuit shown in Figure 7, it will be noticed that a .00005 mfd midget condenser is placed in the antenna circuit, which is necessary in view of the very short aerial which is recommended for this receiver. In laboratory tests a 2-foot antenna was found sufficient for normal purposes, while an 8-foot aerial sufficed for distance work. These values of antenna length will probably differ in accordance with the specific location in which the builder finds himself, probably a longer aerial being required for one who is in a highly shielded locality. While the ground is shown in the schematic, in some cases it is possible to work without one.

Battery consumption of the receiver is 1.35 amperes and plate drain is 25 milliamperes, when used at the voltages specified in the schematic circuit. In tests the Webster ABC unit photographed in Figure 8 was used, being a special design for operation of the Amplimax. A multiple connector is provided for attachment to the receiver, while there are two additional cords, one for plugging into the 110 volt supply and the other with a pendant switch, which may be placed in a convenient position to control both the set and the power pack. The voltages are fixed and represent the values recommended for operation with the Amplimax receiver.

On account of the extreme care used in shielding, operation of the Amplimax is very stable, it not being possible to throw the intermediate stages into oscillation. The top leads from the first, second and third impedance units are control grid leads, the ends of which have a cap to slide over the tube cap. (See Figure 9 for detail.) The third impedance unit has a longer lead which plugs into a pup jack for connecting to the second detector grid. This is also illustrated in the graphic shown in Figure 9.

If in operation the 25 ohm rheostat shown in series with the negative terminal of the first detector and the ground does not sufficiently control the volume on the first tube, it is suggested

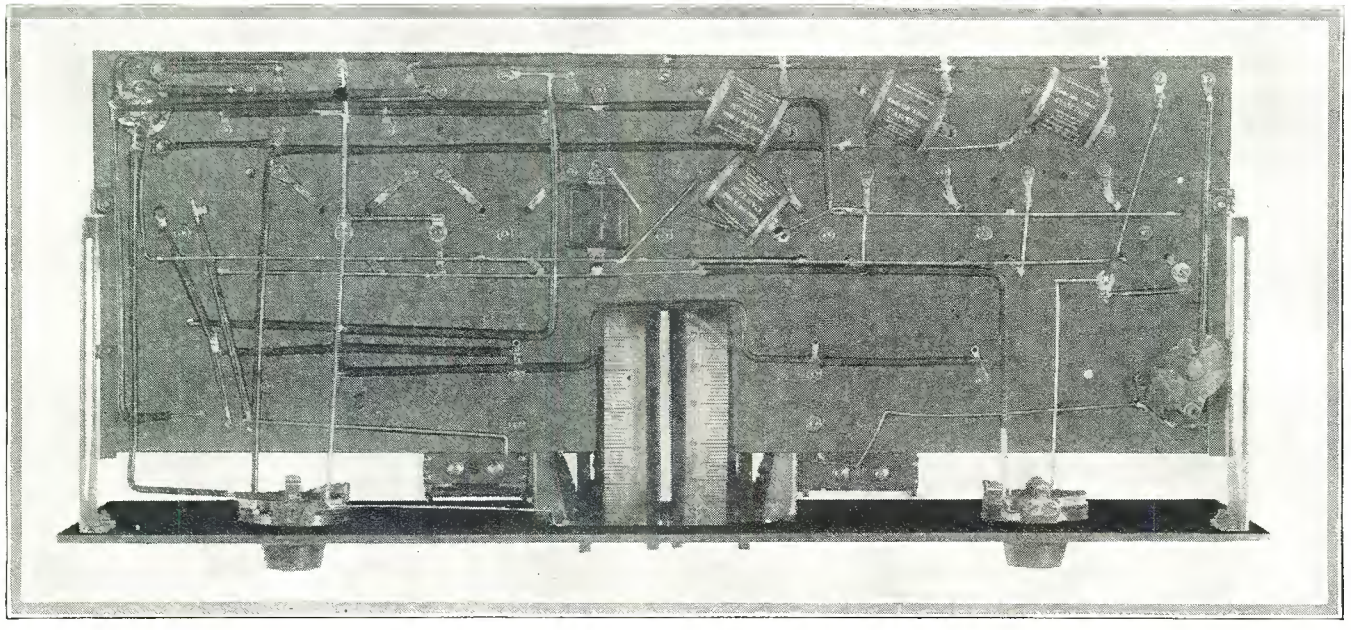


Figure 4. Bottom view of the completed Amplimax showing the wiring, fixed condensers and the .00005 mfd variable condenser, the latter at the extreme right

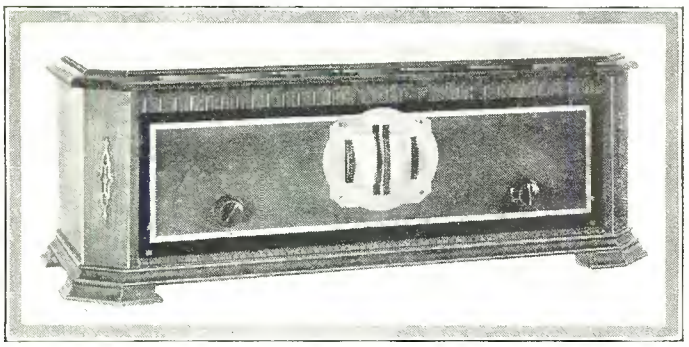


Figure 5. In this photograph the receiver has been placed in a Corbett console

that it be replaeed with a 40 or 60 ohm rheostat. When using the Webster supply connect the grid return of the seeond audio to the gray terminal on the Yaxley No. 689 base instead of to the binding posts. Reference to the graphic diagram, Figure 9, will show that in this model the gray terminal is left blank while a binding post is provided for the C minus on the seeond audio transformer. When using the power supply, it is neeessary to eonnect the C minus connection of the second audio to the unnsed gray on the Yaxley base, because of the fact that the power supply has the cable already attached. If this change is not made, the second audio will not receive any bias from the eliminator. For those who wish to use their present method of A, B and C supply, the binding post arrangement is satisfaetory.

Due to the extreme high value of intermediate amplifieation, seeured in a reeeiver, it has been felt that this super will give excellent performanee under practically all conditions and the selectivity is greatly enhaneed by the eomplete shielding. In laboratory tests it did not appear neeessary to shield the oscillator or the antenna input coil.

However, in the tuning of the antenna induetanee, it was found preferable to use a .0005 mfd variable in order to fully cover the range. As will be noted in the schematie eireuit, the pick-up eoil, 1 and 2, of the oseillator, together with the grid return of the oseillator winding, is common with the C-3 bias. Being at the

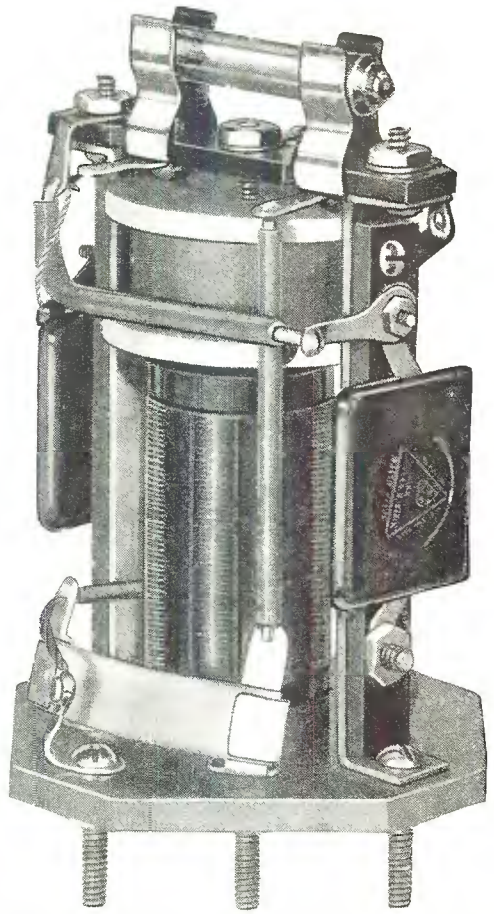


Figure 6. Component parts of the impedance coupled unit are shown in the above photograph. All of the parts shown here are those represented within the dotted lines shown in the schematic circuit, Figure 7

low potential end of the eireuit, ample energy is seeured without affecting the tuning portion of the first deteetor stage. The three 1 mfd condenser shown in the schematic between terminals

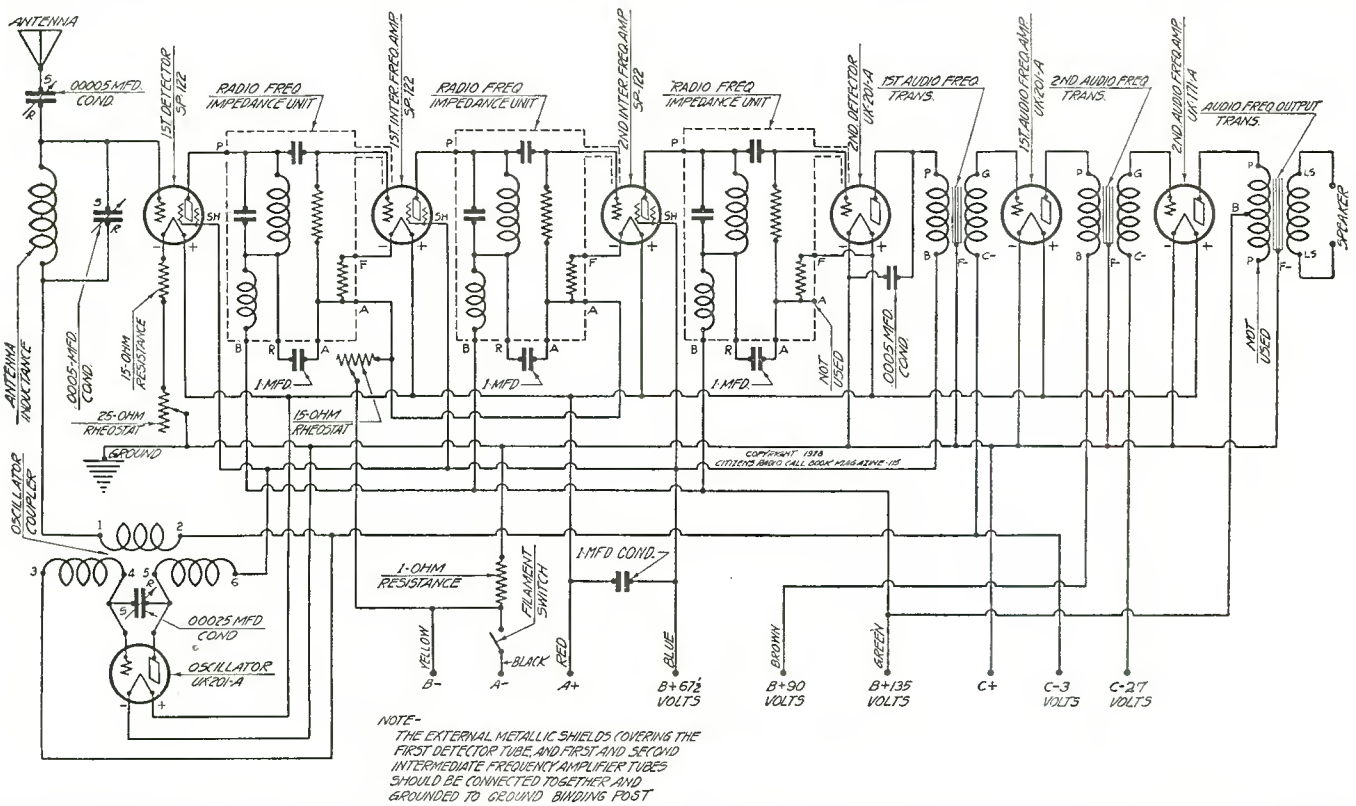


Figure 7. This schematic shows the electrical connections of the seven tube Amplimax described in the accompanying article and which may serve for those who are experienced as a means of wiring the receiver

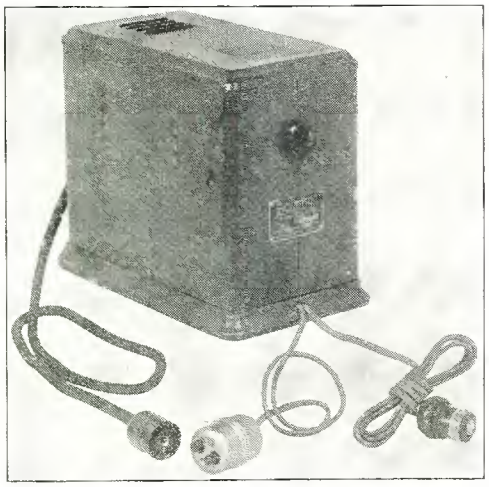


Figure 8. Above is shown the Webster AB 70, supplying filament, plate and bias current for the operation of the Amplimax. Thus the receiver may be operated very satisfactorily from the light socket

R and A of each impedance unit and placed beneath the sub-panel out of sight. The terminals marked —A of all audio stages are grounded to the negative filament wire. The shields of the first, second and third sockets are connected to the ground binding post. A Yaxley 5-L resistance should be used in the power stage if a 171 tube is used instead of the 171A tube.

Parts used in the consruction of the Tyrman Amplimax are shown in the list below:—

3—9-90 Tyrman r.f. impedances
1—9-80 Tyrman antenna inductance
2—3-30 Tyrman audio transformers
1—3-51 Tyrman power output transformer
7—Tyrman shielded sockets
1—Tyrman double vernier drum dial
1—Camfield .0005 mfd variable condenser
1—Camfield .00025 mfd variable condenser
1—622 Camfield oscillator coupler
1—915-K Yaxley 15 ohm rheostat with switch
1—4-L Yaxley resistance
1—Yaxley 15 ohm fixed resistance
1—669 Yaxley cable connector
1—Yaxley 25 ohm rheostat
1—Yaxey pup-jack
1—Hammarlund 50 mmf midget condenser
4—Carter 1 mfd by-pass condensers
5—XL binding posts
1—Carter .001 mfd fixed condenser
1—7x24x3/16-inch drilled and engraved Lignole front panel
1—8x23x3/16 drilled Celeron sub-panel
2—8629 Benjamin sub-panel brackets
30—Feet Acme Celatsite wirc
1—Package Kester radio solder
1—Ekko ground clamp
Miscellaneous lugs, nuts, screws, etc.
3—SP122 tubes
3—Ceco 201A tubes
1—Ceco 171A tube

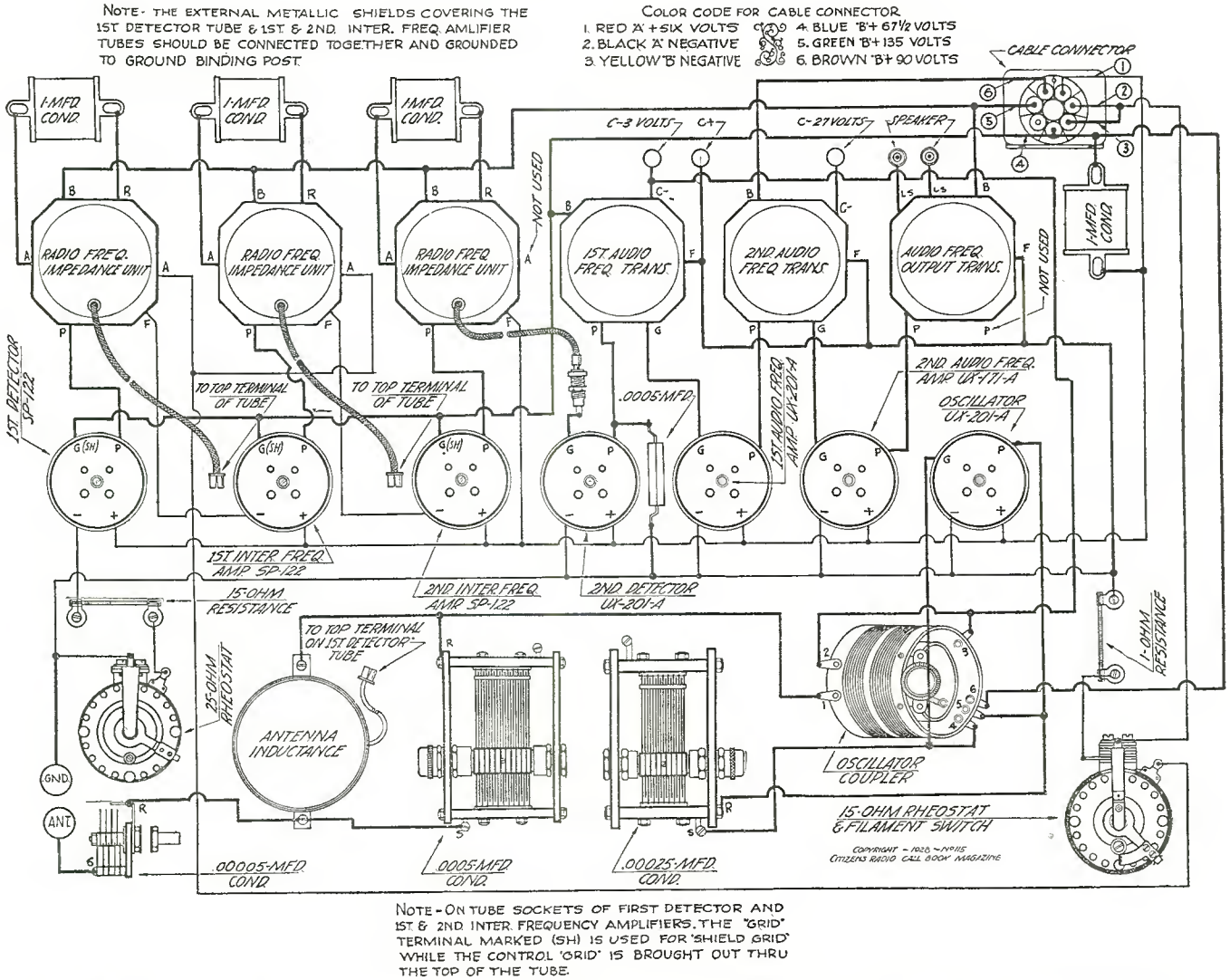


Figure 9. The graphic wiring diagram shown above will enable the builder to easily wire up the superheterodyne under discussion

Remler Amplifier and Samson Audio in Unitune Symphonic

Simple Single Control Tuned R. F. Receiver Developed in Our Laboratory for Quality Reception

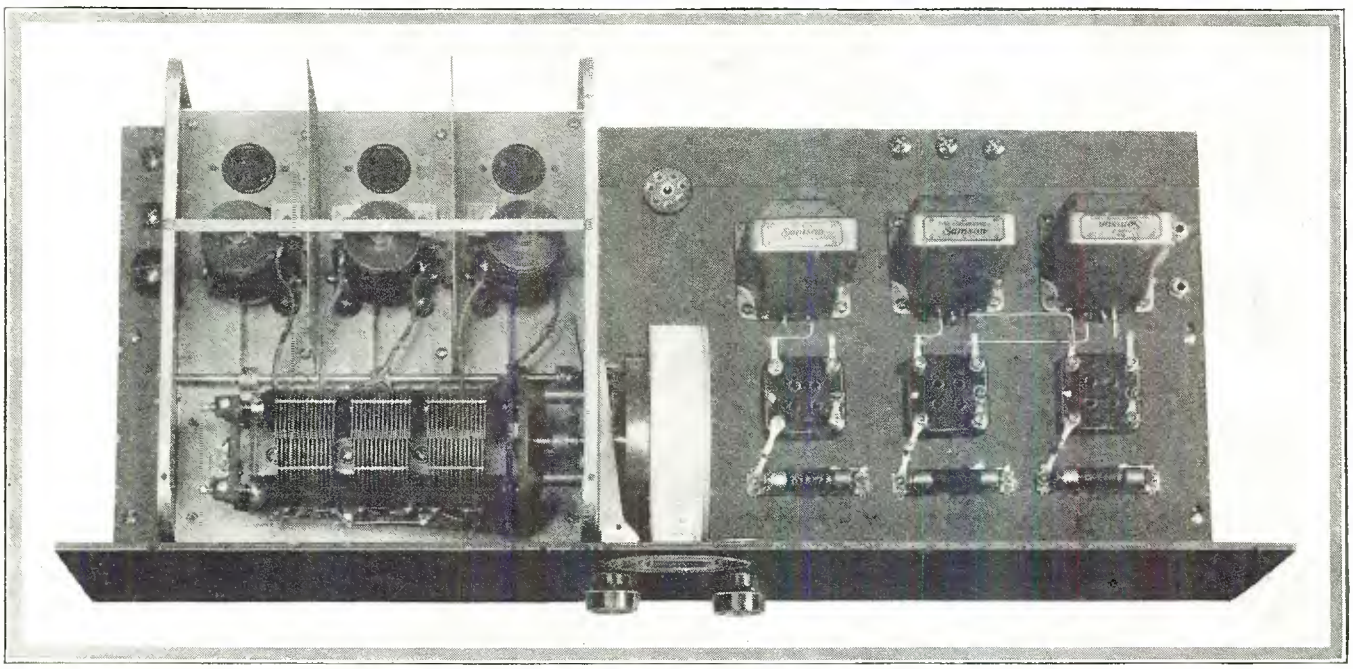


Figure 1. At the left of the above photograph may be seen the Remler 710 radio frequency amplifier unit, while at the right are the Samson push-pull audio transformers and output impedance

GOOD tuned radio frequency circuits will always be in demand by the set builder as well as the experimenter, especially when such circuits are arranged for faithful reproduction of broadcast programs. For that reason we believe the receiver to be described in this article will gain the interest of our readers, in whose behalf the laboratory has designed the Unitune Symphonic arrangement.

With the recent changes which have been made by the Federal Radio Commission in straightening out station allocations so that a minimum interference will be encountered, and the preponderance of chain program material available from almost every corner of the country, the demand for quality reproduction becomes more insistent. Taking this fact as a basis, our laboratory decided that three stages of tuned radio frequency properly balanced would feed sufficient energy to the audio input to allow for good volume in the home. For securing home volume and at the same time preserve fidelity of tone, push-pull audio using 112 tubes in the last stage was decided upon. One of the reasons for this decision lies in the fact that on account of the relatively low plate voltages required for the operation of this receiver, it would be possible for any standard B eliminator to be used for these plate voltages without running the risk of placing too great a burden upon such a plate supply. If desired, the set may be operated from dry batteries, although, of course, there are many who will prefer to use a B eliminator operating from the electric light socket.

Do Work Carefully

In beginning the construction work on this receiver, it would be well to note carefully the sub-panel layout shown in Figure 2, which will give the prospective builder an idea as to how all parts should be placed. The sub-panel used for this receiver measures 10x23 inches, while the front panel measures 24x7 inches. For the sake of symmetry it would be well to locate the center of the drum dial at the exact middle of the front panel length, this serving to throw the left hand knob for controlling the gang condenser and the right hand knob controlling the filament rheostat equidistant from the center of the panel. A suitable template by means of which the holes may be drilled for the Remler drum dial is provided with these units. Before actually going ahead with the drilling of the front panel for this purpose, it would be well to very carefully arrange the amplifier on the sub-panel and gauge the position of this amplifier unit so that when it is permanently installed the dial mechanism will run smoothly and true. Inspection of the amplifier unit will disclose the fact there are four holes, one in each corner of the amplifier can, through which the builder may mark on the sub-panel for drilling purposes. Before drilling these holes be sure to see that the amplifier unit is located properly for smooth turning of the dial, as if the amplifier unit is not trued up, there is a possibility of the dial mechanism binding.

It will be observed there are three sub-panel brackets utilized in this receiver, for the reason that it is desired to keep the sub-panel quite rigid and unless one is used in the center, as shown in Figure 2, there is a possibility of the sub-panel sagging a trifle under the weight of the apparatus. Possibly the simplest way to determine the height at which the hole should be made for the dial shaft would be to place all three sub-panel brackets on the sub-panel, affix the sub-panel to the front panel temporarily and after temporarily putting on the dial mechanism find the proper

(This receiver constructed, tested and all illustrations made in our laboratory)

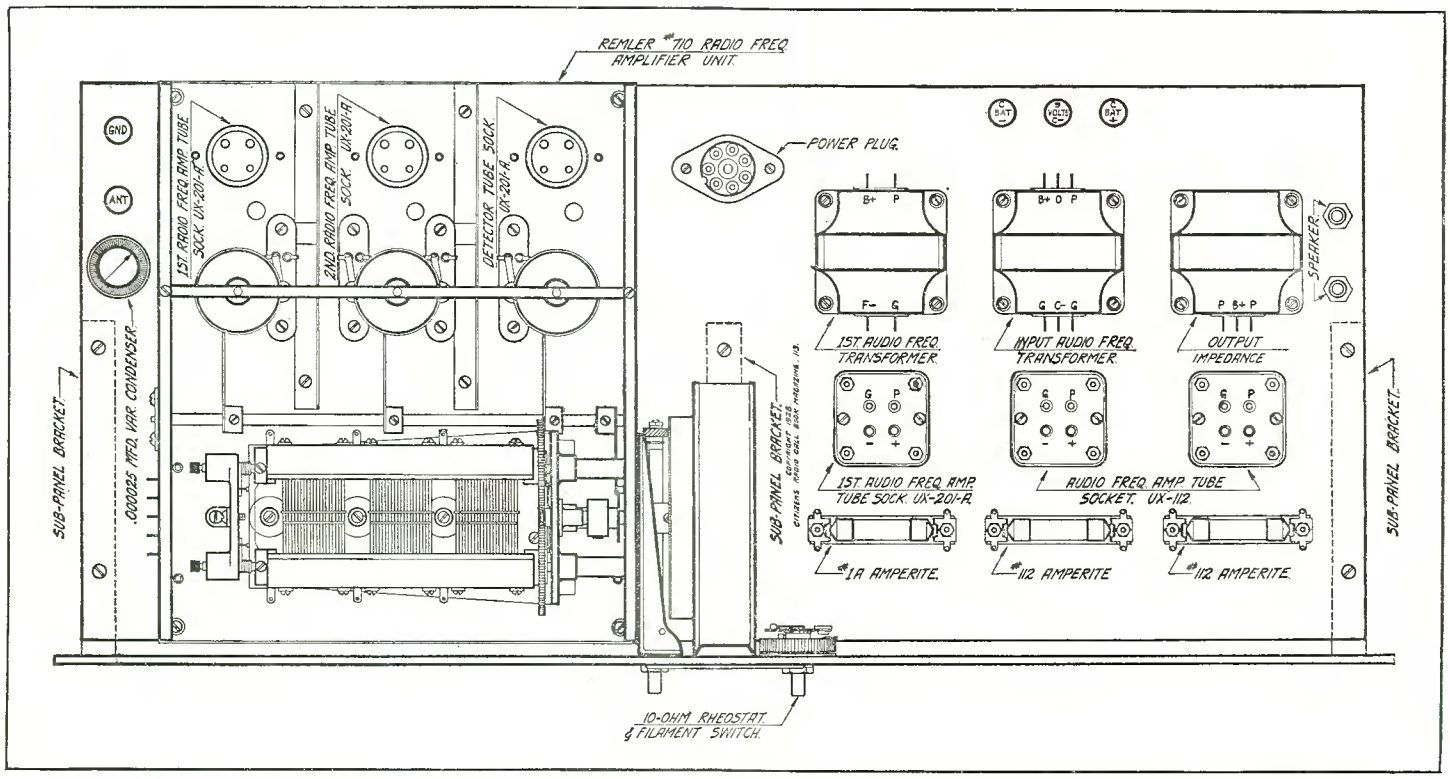


Figure 2. In this sub-panel layout may be seen the position in which each of the units is to be placed. Especial care should be exercised in locating the amplifier unit so as to allow perfect alignment of the Remler dial

height for the shaft hole. The balance of the material involved in the receiver is easy to dispose of, since an audio transformer, a socket and an Amperite are placed in three lines as disclosed in the panel layout shown in Figure 2. The power plug is located at the rear center of the sub-panel, while three binding posts are provided at the right rear. At the extreme left of the sub-panel are two binding posts and a midget condenser, the latter being in series with the antenna. At the extreme right are the two tip jacks which are used for the speaker tips.

Radio Section in Unit

The instructions given in this article are based upon a unit which is primarily easy to tune and which has a minimum number of controls. You will notice that the antenna compensator which is furnished with the No. 710 Remler amplifier is not shown in this circuit. If the individual builder prefers to obtain the greatest selectivity and distance getting abilities from the Unitune Symphonic, then the antenna compensator should be connected into the circuit as shown on page 66, in which case, the panel must be increased to 7x26 inches, although the base board remains the same. As the receiver is described in this article a reasonable number of distant stations can be received, although the performance of the receiver will not be equal to that of one using the antenna compensator.

Caution: The midget condenser shown on the left side of the panel is required only in very congested districts and under ordinary conditions should be short circuited.

Since the two stages of radio frequency amplification and detector are contained within the Remler 710 amplifier unit, the schematic circuit of this section of the set has not been given in this particular article, although if the reader is interested he may refer to Figure 1 on page 66, where a schematic is given covering this type of amplifier. As will be observed by examination of the schematic on page 66, the amplifier contains three radio frequency transformers, each with a variable primary actuated by the same mechanism which turns the three gang condenser. Each of the condensers in the three gang unit have an individual compensating section for balancing the stages at resonance. In the grid circuit of the first radio frequency tube is a 500 ohm fixed resistor, which may be shorted out when not desired and which serves to stabilize that particular stage, while in the second radio frequency grid circuit is a 1000 ohm fixed resistance, which may likewise be shorted out when its use is not wanted. Another set of switches alter the number of turns used in the plate circuit of the first and second tubes. All of these adjustments are for the purpose of giving the operator considerable flexibility for use under varying conditions as to location and proximity of high power broadcasting stations. It is believed that those who build this receiver might find interesting material in the article on page 66, since that particular description confines itself to the method by which the amplifier may be brought up to its peak efficiency.

After the parts have all been placed on the sub-panel and the controls located on the front panel, the wiring may be performed by following the connections outlined in Figure 5, which is the graphic illustration for this receiver. The ground binding post should have a short length of flexible wire with a clip so that the ground may be placed on terminals three, four or five, depending on the selectivity desired. The detector terminal at the right of the unit connects to terminal P of the first audio transformer, while the F minus terminal connects to one side of the 10 ohm filament rheostat and thence through the rheostat to one end of each of the three Amperites for governing the first and second audio stages. The A plus terminal on the unit goes to the junction of the red, or plus A,

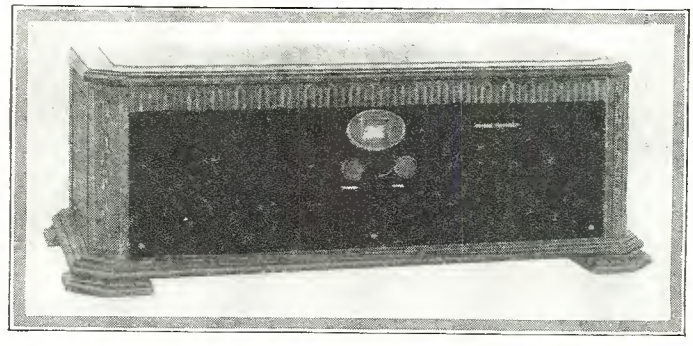


Figure 3. In this photograph the Unitune Symphonic has been placed in its Excello cabinet. The dial shown at the left governs the wavelength, while the one at the right represents a 10-ohm rheostat for controlling volume and sensitivity

terminal on the power plug, and the right hand terminal on each of the three sockets on the sub-panel. The plus 90 volt terminal on the unit goes to the pink, or B 90, terminal of the power plug and to the B terminal of the audio frequency input transformer. The C positive binding post is connected to the yellow, or B negative terminal of the power plug, which is common with green, or A negative. Bias for the grid of the 201A tube in the first audio stage is secured from the minus three binding post on the sub-panel, which binding post is connected to the F return of the first audio transformer. Bias for the two grids of the 112 tubes is secured from the 10½ volt C minus binding post, which is connected to the C minus on the audio frequency input transformer. One of the tip jacks used for the speaker is connected to the P terminal and the plate of the first 112 tube, while the second tip jack is connected to the P terminal and the plate of the second 112 tube. It will be observed, of course, that in this output stage an impedance is used as a means of coupling the speaker to the two plates. High potential for the center of the impedance coupling is secured from the B terminal of that impedance to the black or B 157 volt terminal of the power plug.

Always Recheck Work

After the receiver has been entirely wired, use the diagram shown in Figure 5 as a means of checking your work for accuracy of connections. When putting tubes into the receiver, be sure to place them in one at a time so that if any wrong connections have been made you will not jeopardize the entire lot of tubes. After using the plate voltage specified in the schematic circuit in Figure 6, the bias values for those plate voltages will be correct, but if higher plate voltages are utilized, especially in the audio frequency end, it will be necessary to change the grid bias voltages to the value specified by the manufacturer of the tubes being used at the time.

In any receiver which uses tuned radio frequency, where the tuning is accomplished by means of a gang condenser with a single dial control, it is very important that for maximum distance and selectivity the radio frequency circuits be tuned to exact resonance. While it is possible for a receiver to perform satisfactorily, even with unbalanced capacities, nevertheless when such a receiver is to be used for extreme distance work, the operator must balance the set very carefully or weak signals will not be amplified in the proportion they should. The trimmers which balance the second radio frequency and the detector circuits will maintain resonance through the broadcast band after once being

Figure 4. Here the Unitune Symphonic may be seen placed in an Excello console. Suitable A and B supplies may be placed inside the console if so desired

set, because there is no reason why a difference in antenna conditions should affect these two stages. However, in the case of the first radio frequency circuit a difference in antenna conditions will make it necessary that this stage be thoroughly compensated.

When the antenna compensator is not used in connection with the No. 710 radio frequency amplifier, the trimmer condenser located across the antenna section of the three gang condenser

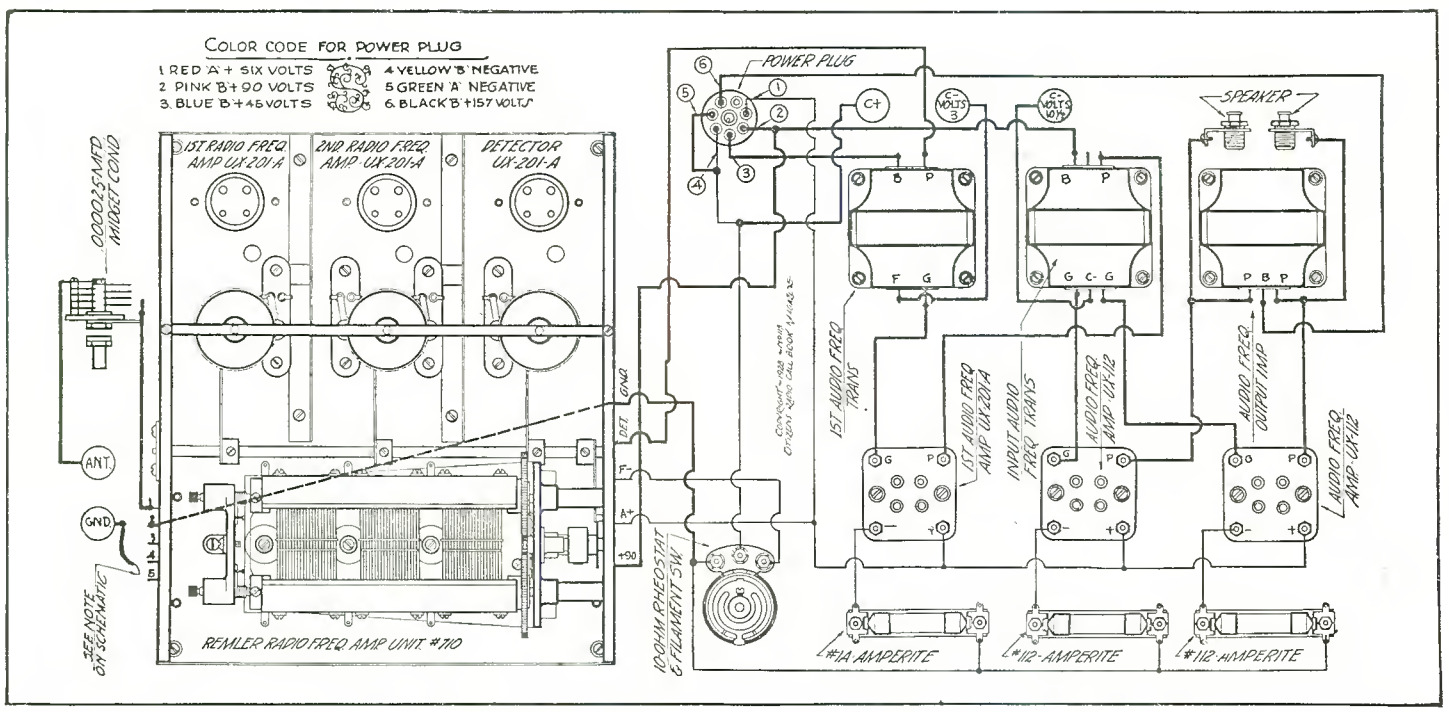


Figure 5. Graphically we are presenting above the method of hooking up the Unitune Symphonic which was developed in our laboratory. On account of the amplifier being a single unit, the wiring of the receiver is considerably simplified

must be screwed down tighter as is usually the case with the antenna compensator in the circuit. It is suggested that the balancing be done on a wave length of somewhere around 400 meters, since this will allow a compromised adjustment on both the high wave lengths and the low wave lengths. If you find that you are unable to secure high enough capacity in the first trimmer, try loosening the screws in the other two trimmers slightly and then increase the eapacity of the three gang condense by turning the knob slightly to the right.

A word or two regarding the selectivity switches may be of interest to those who are building this receiver. On removing the top shield of the amplifier, the builder will observe four two-point switches located on the base, which have selective and non-selective positions. Twenty-four different combinations of position may be secured by means of these four switches, and these combinations represent varying degrees of selectivity. If all four switches are set in the non-selective position, the receiver will be quite stable, will not oscillate over the broadcast band, and will give good results in locations away from powerful stations. If it is desired to have a greater amount of flexibility and thus permit controlled oscillation, the first three switches are set on the selective position and the fourth switch, the one at the extreme right, set on non-selective. Under this arrangement the receiver may be forced into oscillation by means of the volume control rheostat and the sensitivity greatly increased. If the first and third switches are set on selective and the second and fourth on non-selective, the receiver becomes highly selective and the overall amplification is greater than it is with the combination suggested previously. It is only natural that every individual builder will have to determine for himself the best position of these switches, since no two locations are identical and no two operationg conditions the same.

The following parts were used in the construction of the Unitune Symphonic:

1—710 Remler radio frequency amplifier unit
1—110 Remler universal drum dial.
1—Silver-Marshall .000025 midget condenser
3—530 Frost sockets
1—Samson Symphonic audio transformer
1—Y Samson push-pull input transformer
1—Z Samson push pull output impedance
2—Frost tip jacks
1—Frost 10 ohm Gem rheostat with filament switch
1—Hagel 7 contact power plug
1—1-A Amperite
2—112 Amperites
5—Eby engraved binding posts
3—Karas sub-panel brackets
1—Formica 24x7x3/16-inch front panel
1—Formica 10x23x3/16-inch sub-panel
20—Feet Belden No. 14 tinned copper hook-up wire
4—Sonatron type 201 tubes
2—Sonatron type 112 tubes
1—Paekage Kester radio solder
1—Ekko ground clamp
Miscellaneous lugs, screws, nuts, etc.

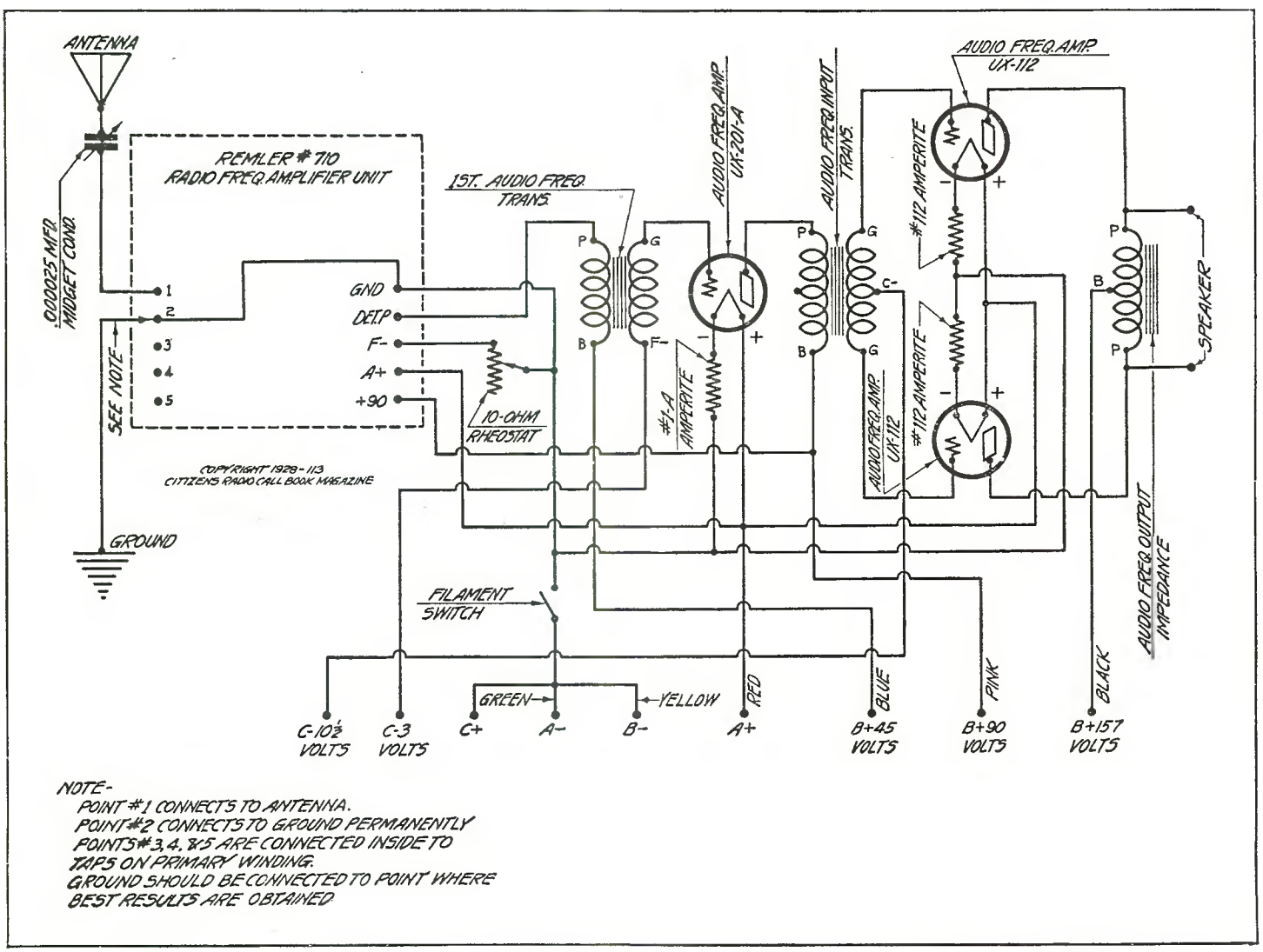


Figure 6. In the above schematic the reader will find the electrical connections for the receiver described in this article. This drawing may be used as a guide for wiring if the constructor is experienced, while for the novice the graphic shown in Figure 5 is recommended

Universal All-Wave A. C. Tuner Used With Power Amplifier

Combination Radio and Phonograph Installation Gives Sufficient Undistorted Volume for Home or Dance Hall

IN the following paragraphs is described an unusual combination of a two tube socket-powered radio set covering all wavelengths from 18 to 3,000 meters with sensitivity and selectivity sufficient to provide adequate volume over ranges of 500 to 1,500 miles under favorable reception conditions, and a socket-powered audio amplifier capable of developing sufficient undistorted volume for a small theatre, dance hall or auditorium, operating from either the Universal all-wave two tube tuner, or only standard magnetic phonograph record pick-up. The combination Unipac amplifier and and Universal all-wave tuner is especially interesting for the quality of its reproduction, and the flexibility which it allows in the matters of wavelength, and radio or phonograph use.

The combination is illustrated in the photographs accompanying this article. The Universal tuner consists of the old standby circuit of one stage of tuned radio frequency amplification and a regenerative detector, which gives very high sensitivity, extremely easy tuning, and selectivity. Two vernier drum dials control the two .00035 tuning condensers, while between these controls are the small regeneration (Gain knob) control condenser of .000075 mfd, and the volume control which varies the plate voltage of the r.f. amplifier tube. Type 227 or equivalent a.c. tubes are used in this socket-powered tuner. With the socket-powered tuner here illustrated B power (and C automatically) is obtained from the amplifier, and A power from a filament lighting transformer.

Has Ample Power

The power amplifier is a two stage, push-pull light socket-powered amplifier which could well be used with any radio set at all or as a phonograph amplifier. It contains a first audio stage consisting of one of the popular S-M 240 audio transformers and a 226 a.c. amplifier tube which feeds into a push-pull output stage through a 245 input transformer and a 246 output transformer, with a pair of 210 tubes used in this stage. All A, B and C power is obtained from a power supply consisting of a full-wave power transformer feeding 550 volts to the plates of the 281 rectifier tubes, 7.5 volts to their filaments, and to the 210 filaments, and 1.5 volts to the 226 tube filament. A total of about 460 to 500 volts is delivered at about 104 milliamperes, 44 milliamperes going to the two push-pull amplifier tubes, and 60 milliamperes to the voltage dividing resistors. Of this 60 milliamperes, up to 10 milliamperes is available at 45 volts, and up to 45 milliamperes is available at 90 volts for operation of any radio receiver. No voltage regulator tube is used, as the combination has been found to work entirely satisfactory without it in the case of this particular amplifier. Of the 460 to 500 volts available, this automatically divides up to give about the proper values of B and C potential to the 210 tubes.

The construction of both Universal tuner and Unipac is quite simple, requiring only a few tools and some simple wiring.

Assembly Simple

The assembly of both the Universal tuner and the amplifier is so simple as to require practically no description. The placement and mounting of all parts is clearly illustrated in the photographs and pictorial diagrams. In the tuner, the two variable condensers are mounted upon the drum dial brackets using the small adapting washers accompanying the dials which accommodate the oversized hole in the bracket to the single hole mounting nut of the condensers. The drums are fastened on the condenser

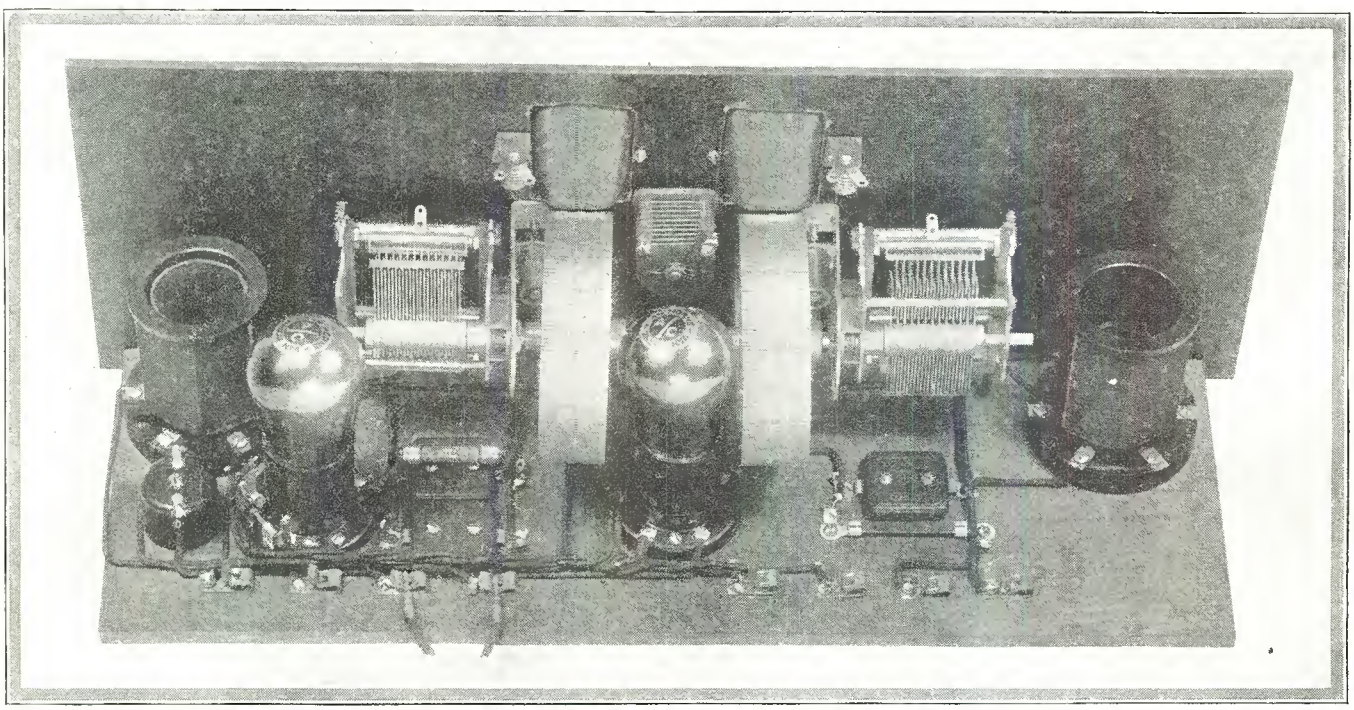


Figure 6. Rear view of the S-M Universal receiver described in this article. Note simplicity of all wiring and layout

(This receiver tested and all illustrations made in our laboratory)

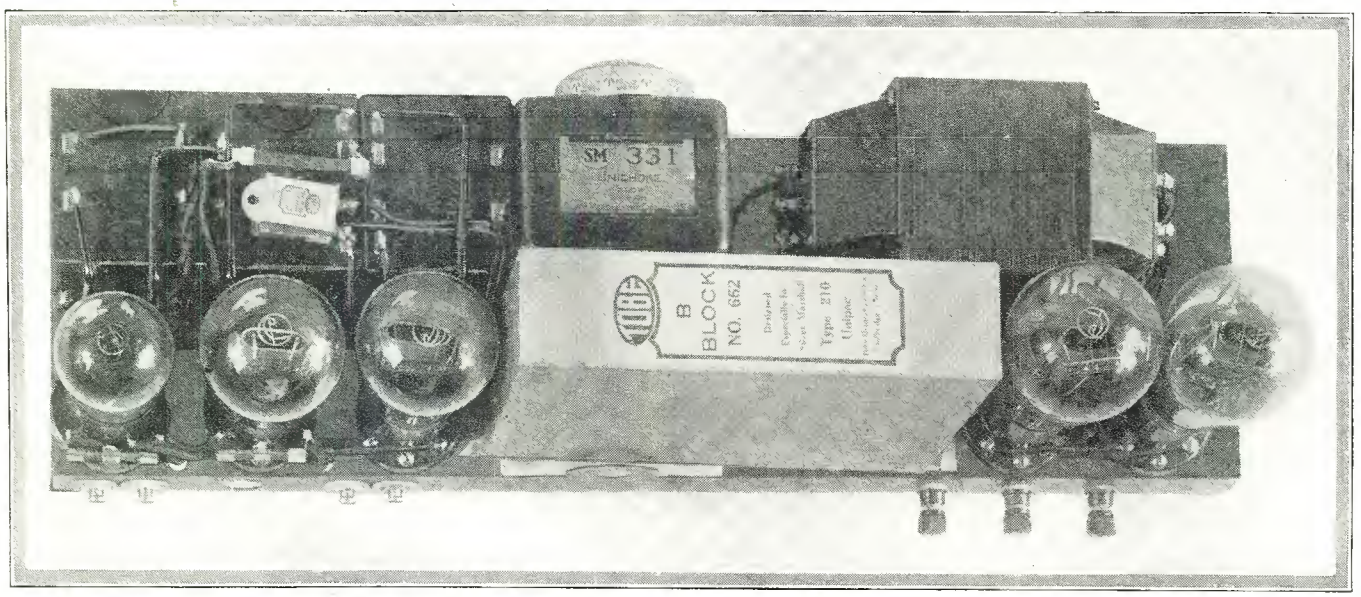


Figure 2. Full wave rectification with ample current for any conditions is obtained from the power amplifier illustrated above, which also has two 210 tubes for push-pull amplification

shafts with their edges inserted in the slots in the small drive mechanism carried in the bushing attached to the dial bracket. The brackets are fastened to the front panel by means of two screws with the drive shafts projecting through the front for knob attachment. In mounting the potentiometers, the frame should be carefully insulated from the panel, though one foot of the potentiometer, as can be seen from the diagram, is connected to the "B—" circuit which, of course, grounds to the panel. The midget regeneration condenser shaft bushing should make good contact with the panel. With these parts mounted on the panel and the latter screwed to the wooden baseboard, the various parts to go on the baseboard should be placed as seen in the photographs and drawings and screwed down.

In the socket-powered tuner illustrated and diagramed in this article, B and C power is obtained by connecting the "B—," "+45" and "+90" binding post directly to the Unipac binding posts similarly marked. A value of 2.5 volts a.c. for the heater tubes is obtained from an S-M 325 or 247 filament lighting transformer.

Amplifier construction is clearly illustrated in the photographs and drawings herewith. The various parts are mounted upon the chassis as illustrated. The small 9720 ohm section of the 651 resistor is mounted by having certain of its lugs soldered directly or through short lengths of wire to the threaded binding post shanks. The large resistor section is mounted on long screws using ¾-inch spacing collars to hold it beneath the chassis. The extreme outside lugs are unconnected electrically and are for mounting only. The inner lugs are for the electrical connections to the large resistor. A small 1500 ohm C bias resistor, as well as the Tobe stabilizing condenser, are shown mounted by having their lugs soldered directly to terminal lugs of the 245 input transformer. In assembly, the tipjacks and binding posts are insulated from the chassis by insulating washers, and the two small FT64 resistors are mounted directly on the "F" terminals of the two left-hand tube sockets. Care should be taken to see that their center taps do not "short-circuit" upon the mounting

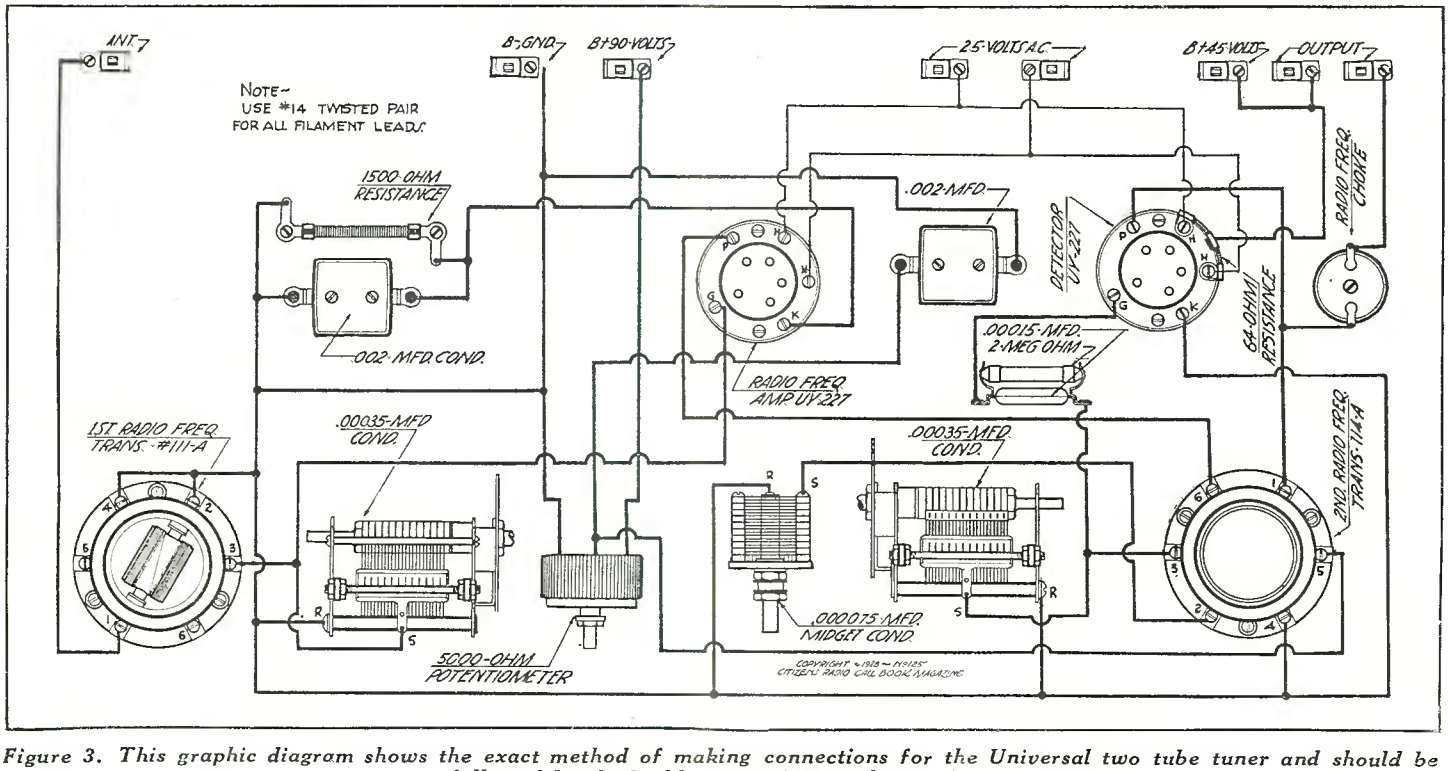


Figure 3. This graphic diagram shows the exact method of making connections for the Universal two tube tuner and should be followed by the builder in wiring up the receiver

screws of these tube sockets, which should be omitted in this particular amplifier.

Operating the Receiver

To operate the receiver it is merely necessary to connect it to the "B" binding post of the Unipac, to the filament transformer, and to a suitable antenna and ground to obtain satisfactory headphone reception. Of course, two 227 tubes must be inserted in the receiver sockets. To tune the receiver, it is merely necessary to turn the volume control all the way to the right, turn the midget condenser all in, and rotate the Selector II dial until a squeal is heard. Bear in mind that for the Universal tuner every squeal heard is a station, and once one has been located, Selector II dial should be adjusted for maximum volume of squeal followed by a similar adjustment of the Selector I dial. If the gain knob is now turned to the left slowly, to disengage the midget condenser plates, the squeal will disappear and the signal be heard, signal volume being loudest on weak stations when the midget condenser plates are just sufficiently disengaged to prevent the station being heard as a squeal. With the "A" range coils, that is, type 111A antenna and type 114A r.f. transformer, the range of the set is from 200 to 550 meters, while with other standard coils it may be extended down to 18 meters and up to 3,000.

The operation of the amplifier is equally simple. Once assembled, its cord and plug should be inserted in any 110 volt, 60 cycle light socket, and if it is to be operated for more than an hour at a time, the case should be left off entirely. Two 281 rectifiers should be inserted in the two right-hand sockets. One 226 should be placed in the left-hand socket and two 210 tubes in the middle sockets at the left end. If desired, the Unipac may be operated with only one 210 tube at first, the other being added later or only where high volume without distortion is required. The loud speaker should be connected to the right-hand pair of tipjacks on the Unipac, and the two output binding posts of the tuner connected to the two left-hand tipjacks. To operate the set, the receiver is tuned as usual. On local stations the volume obtained should be equal to or greater than that experienced with the majority of four, five or six tube sets, and the tone quality fine.

For phonograph operation it is simply necessary to remove the two connections from the tuner to the left-hand two tipjacks of the Unipac and to connect these tipjacks to the cord tips of a standard magnetic phonograph pick-up such as the United pick-up. If this is done, the unit will operate as a power amplifier and will give volume and tone equal to or considerably better than that obtained from many expensive electric phonographs. As a matter of fact, a number of these amplifiers have been used in Chicago and elsewhere for providing dance music for small auditoriums and dance halls, and with one or two loud speakers

Figure 5. In this photograph may be seen an electric phonograph with its electrical pick-up, while at the right is shown a rear view of the S-M Universal tuner. The console table is a Southern Toy product

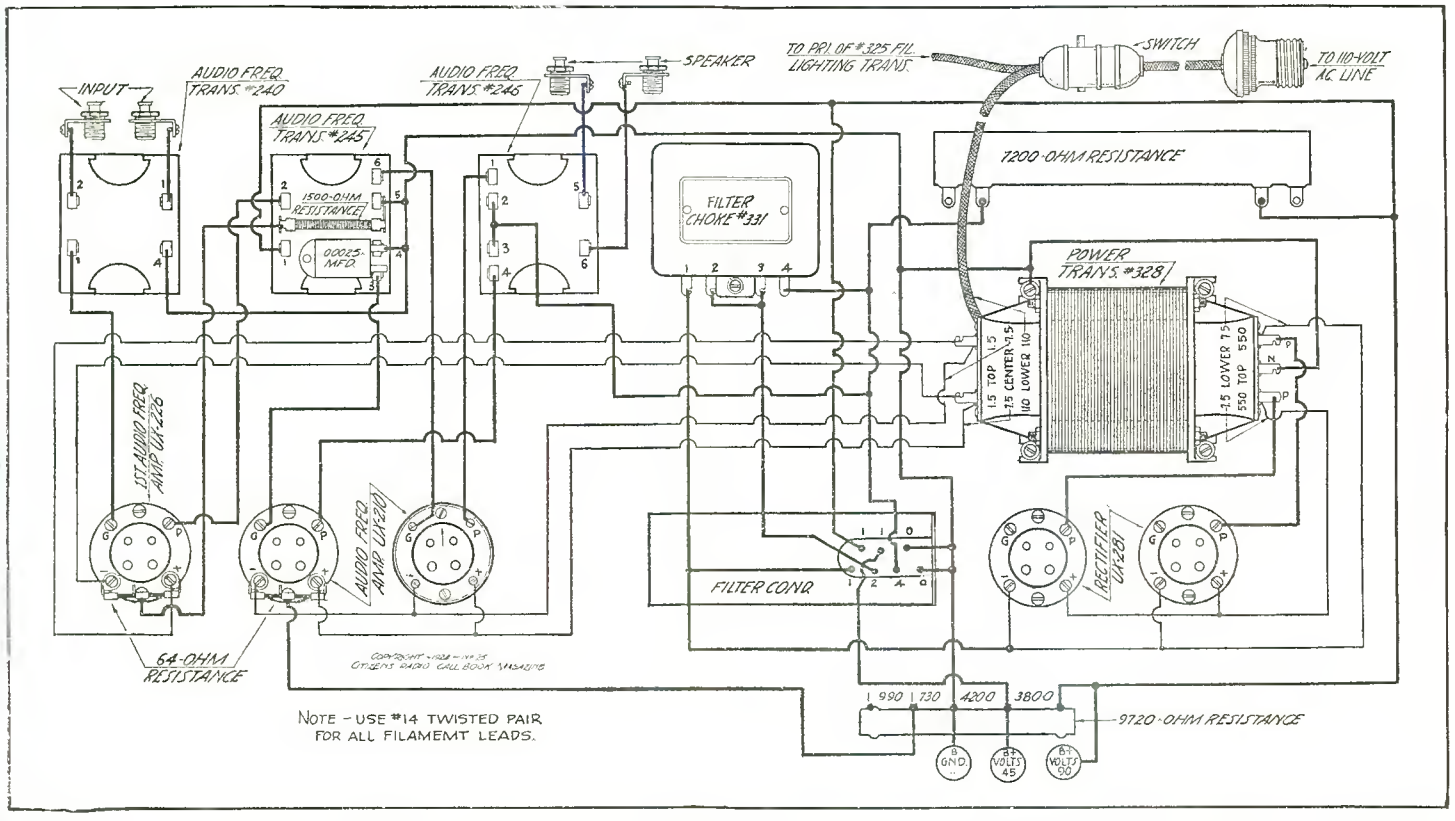


Figure 4. Above is shown graphically the method of connecting the various units in the Unipac power amplifier. Note that complete control of the receiver and power pack is secured by means of the switch shown at the top of the graphic illustration. This switch is in series with the 110 volt line, stopping and starting both the tuner and amplifier

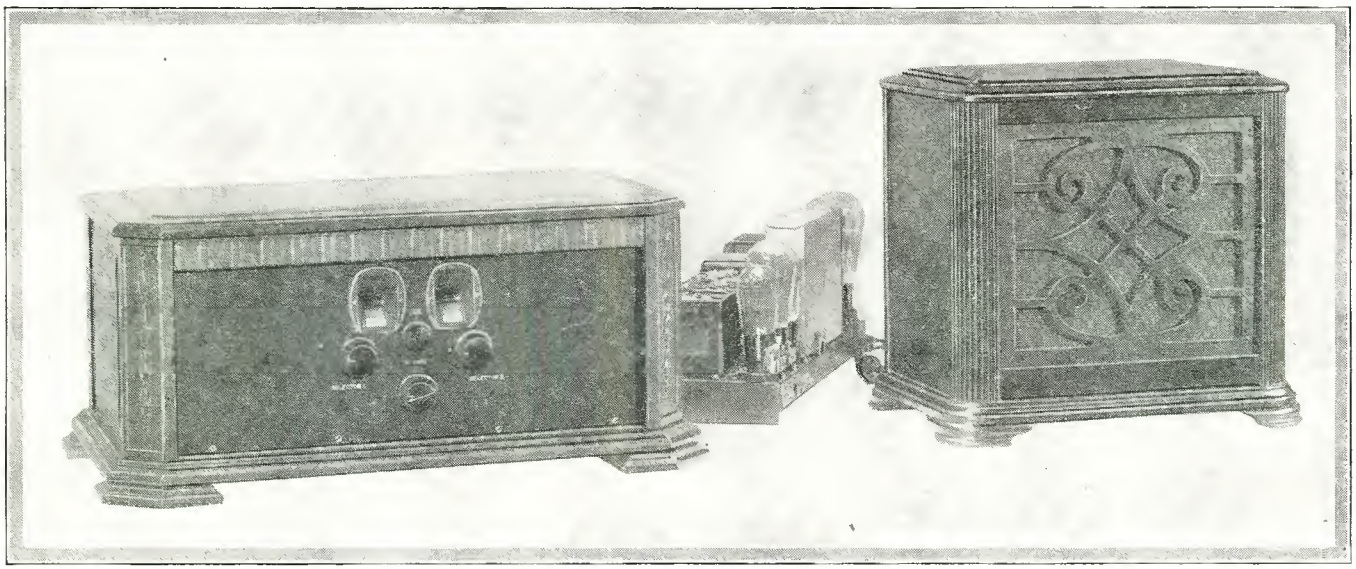


Figure 1. At the left in the photograph is shown the Universal two tube tuner operated with a. c. tubes. The power pack is shown at the center, while at the right is the Jensen dynamic cone loud speaker used for tests

connected to the output, have given ample volume.

The amplifier will produce with a standard record pick-up sufficient volume for dancing in a hall one hundred feet square, or even larger, with only one loud speaker; while with two or three loud speakers, it will give more than sufficient volume. A number of these Unipacs are used in small movie theatres with two or three loud speakers and provide phonograph music with the same volume as an original orchestra would in a theatre. Of course, the depth and richness of music delivered by the Unipac using good electrically cut records is far finer than would normally be obtained in a small theatre with the usual small theatre orchestra of a few pieces, for all of the better dance records are made with multi-piece orchestras.

Dynamic Cone Used

Using the Jensen dynamic cone loud speaker illustrated in Figure 1 at the right the reproduction of the combination for either radio or phonograph is truly pleasing. The Jensen speaker is available with a field requiring a 6 volt battery or trickle charger delivering 4/10 of an ampere to excite it, or, in another model, with a field which can be connected directly to the "B—" and "+90" binding posts of the Unipac.

To use either radio or phonograph at will, a double-pole, double-throw switch should be obtained and located where desired near the set and amplifier—the set can easily be placed in the upper portion of a phonograph console, with the amplifier parked somewhere below in the record compartment. The two blades of the switch should connect to the two left-hand tipjacks of the Unipac. One pair of switch contacts should connect to the output binding post of the tuner, and the other pair to the cord of the magnetic record pick-up. Thus, by throwing the switch either way, radio or phonograph music are on tap without a moment's delay.

Parts used in the construction of the Universal receiver and power amplifier were:

(Receiver)

2—320 Silver-Marshall variable condensers
2—805 Silver-Marshall drum dials
1—111A Silver-Marshall antenna coil
1—114A Silver-Marshall r. f. transformer
2—515 Silver-Marshall coil sockets
2—512 Silver-Marshall tube sockets
1—275 Silver-Marshall r. f. choke
1—342 Silver-Marshall midget condenser
1—Polymet .00015 grid condenser with clips
2—Polymet .002 condensers
1—Frost 1500 ohm grid resistor
1—FT64 Frost balancing resistor
1—Polymet 2 megohm grid leak
1—Frost potentiometer, 5000 ohm
8—Fahnestock clips
1—Van Doorn Universal panel 7 x 18 inches
1—8x17x½-in. Fritts baseboard with hardware such as wire, lugs, screws, etc.
1—Ekko ground clamp
1—Pkg. Kester radio solder

(Power Amplifier)

1—328 Silver-Marshall full-wave super power transformer
1—331 Silver-Marshall Unichoke filter system
1—245 Silver-Marshall transformer
1—246 Silver-Marshall Transformer
1—240 Silver-Marshall audio transformer
1—662 Tobe condenser bank (1, 1, 1, 2, 4)
5—511 Silver-Marshall tube sockets
1—651 Ward-Leonard S-M resistor kit
4—253 Frost tipjacks
1—661 Van Doorn steel chassis and cabinet with hardware
3—Eby binding posts, B—, +45, +90
20—ft. Corwico Braidite hook-up wire
2—Type CX 381 tubes
2—Type CX 310 tubes
1—Type CX 326 tube
2—FT64 Frost balancing resistors
1—F1500 Frost resistor

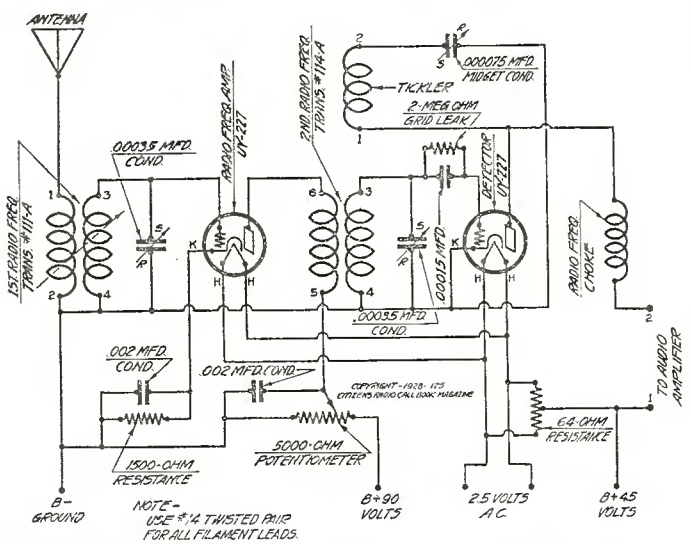


Figure 7. Above is seen the schematic circuit of the Universal tuner, which embodies a stage of radio frequency amplification and a regenerative detector. Both of the tubes used are of the 227 type, which operate from 2½ volts a. c.

Hammarlund-Roberts Hi-Q Six for the Custom Built Fan

Complete Isolation of All Tuned Stages Results in High Amplification, Selectivity and Stability

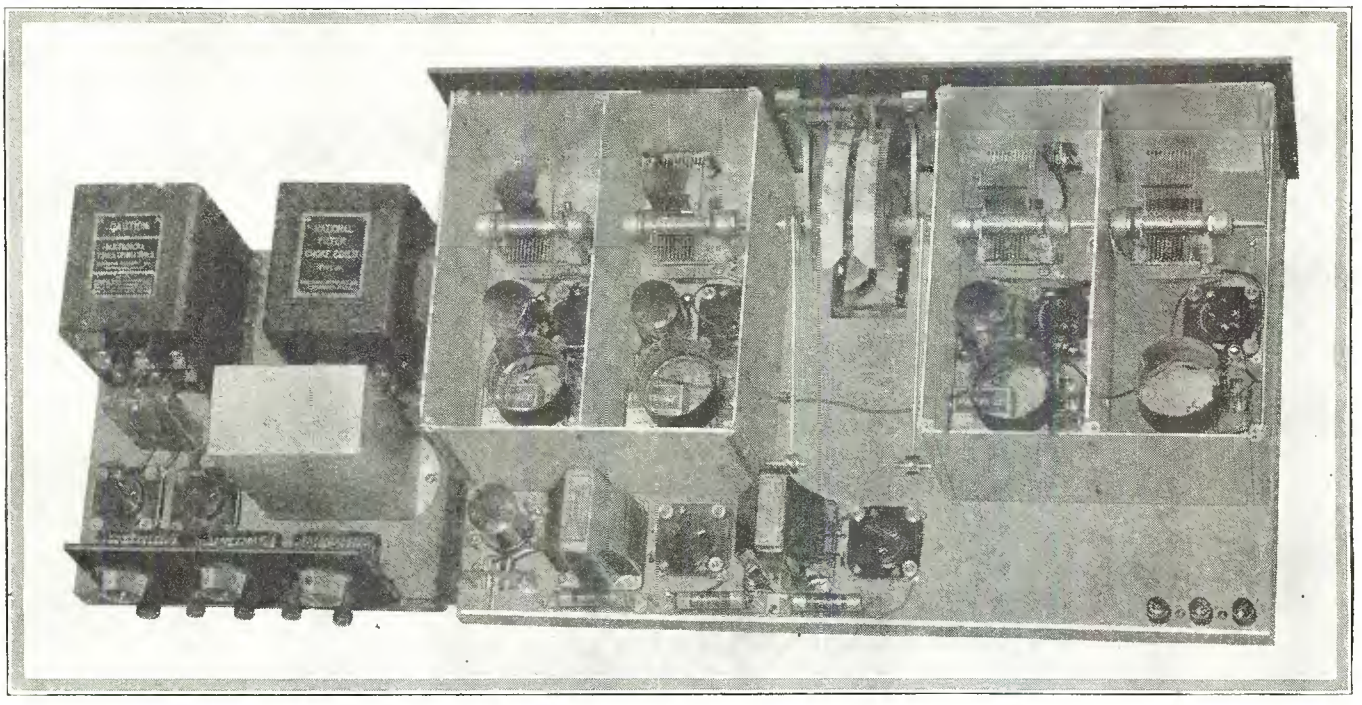


Figure 1. At the right of this photograph may be seen the latest model of the Hammarlund-Roberts Hi-Q Six assembled and tested in our laboratories. The Truvolt B Supply shown at the left of the receiver is fully described on page 69 of this issue

IN keeping with a decided trend toward the custom built receiver which is now observed in the industry, the Hammarlund Roberts Hi-Q Six has been designed to meet the requirements of those who desire a custom built receiver yielding good performance, stability and economy of cost.

Primary requirements of the modern broadcast receiver are selectivity, sensitivity and tone quality. A high degree of selectivity enables the listener to tune in without interference the program he wishes to hear. Sensitivity makes possible the reception of distant stations when the operator chooses, while tone quality means faithful and lifelike reproduction of the programs transmitted by the broadcaster.

Among several of the features of this receiver which may be mentioned are: complete isolation of each of the four tuned stages by means of chokes, bypass condensers and good shielding. This means that each stage operates independently and that highest efficiency without interaction between it and other stages is secured, resulting in higher amplification, greater selectivity and complete stability. Another feature is that of automatic variable coupling, which gives maximum and uniform amplification over the entire tuning range. Another feature is good audio amplification, which with a power tube faithfully reproduces speech and music with the timbre and character of the original music. Modern construction features are employed in the new Hi-Q receiver, consisting of a steel chassis, heavy aluminum shielding, battery cable and connector and a centrally located illuminated drum dial control.

The set employs three stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio amplification.

As shown in the schematic circuit in Figure 5, filament control on the first, second and third radio frequency tubes is by means of a fixed resistance in the negative lead of these three tubes, this resistance serving to give a proper bias to the radio frequency grids, while a 6 ohm rheostat is placed in the positive lead and allows manipulation of this control for changing the sensitivity and volume of the receiver. The detector stage and the two audio stages are controlled by individual Amperites of the values specified in the schematic.

Condensers Ganged

The first and second stages are tuned by means of a shaft linking the first two variable condensers to the left section of the drum dial, while the third radio frequency stage and that of the detector are tuned simultaneously by the right section of the double drum dial. Volume control is by means of the 6 ohm rheostat which is shown at the right in Figures 2 and 4, while the filiment switch is shown at the left in both of these photographs. Control of the receiver has, therefore, been reduced to a minimum number of operations. Each separate stage is enclosed in an aluminum housing, which is represented in the schematic circuit, Figure 5, by the dotted lines around the three radio frequency stages and the detector. The automatic coupling method consists of primary coil moving mechanism

(This receiver constructed, tested and all illustrations made in our laboratory)

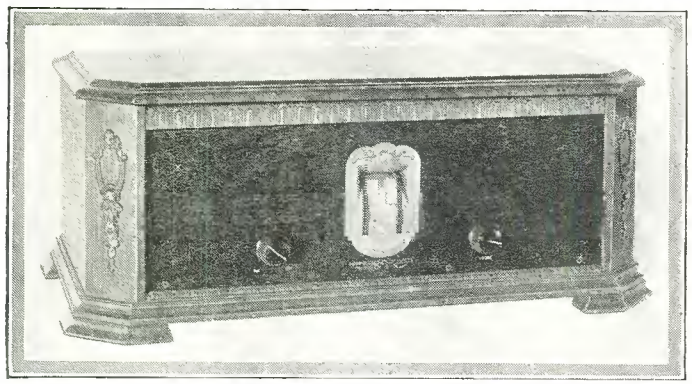


Figure 2. In this photograph the Hi-Q Six has been mounted in a Corbett cabinet

whose arms are cam operated. When the drums are turned, the cam on each shaft, working against the coil lever, raises or lowers the primaries so as to furnish a loose coupling at the shorter wavelengths and a tight coupling at the longer wavelengths, this system giving constant transfer of energy from the primary to the secondary circuits.

Assuming that the builder is ready to assemble the receiver, some attention will now be paid to this process. Note that the panel, steel chassis and shields are drilled to fit only the specified parts. This facilitates the assembly for the inexperienced builder and insures the exact placing of the specified units. It is important that the layout be followed because a change in position of some instrument may lower the operating efficiency of the receiver.

Regardless of the care taken in the manufacture and inspection of the individual parts used in this receiver, there is always a chance they may have been damaged in handling or in shipment. Therefore, before assembling any of the apparatus it is well to subject it to your own personal examination and tests. The simplest test method is to procure a 4½ volt C battery and a voltmeter or a pair of head phones. When the voltmeter is used, it is placed in series with the C battery and it will register a deflection when used for testing the continuity of a coil. It will not show a deflection when testing for short circuits in condensers unless the condenser is short circuited. In the absence of a voltmeter a pair of head phones will serve as well, in this case a click being heard in the head phones if a continuous circuit exists in a winding, whereas no click will be heard after the first contact is made when testing condensers unless the condenser happens to be shorted, in which event, of course, a click will be heard each time that the test set is shunted across the condenser. Tests should be made for continuity of winding upon all radio frequency and audio frequency transformers, resistances and radio frequency chokes. Short circuit tests should also be made on all variable and fixed condensers.

Ready For Wiring

Being satisfied that all parts are in good order, the builder may proceed with the wiring of the receiver, which should be done in accordance with the graphic circuit illustrated in Figure 6. It will be noted that because of the fact a drilled steel chassis is used, a good portion of the wiring is done beneath the sub-panel so that in effect practically the only wiring not below the sub-panel consists of the grid suppressors and leads from the secondary to the tuned condensers. Examination of the photograph shown in Figure 1 will show the small amount of wire which is placed above the sub-panel. After the receiver has been completely wired in accordance with the graphic illustration previously referred to, a systematic course of testing should be followed to make sure that not even the slightest error exists in the wiring. Push the cable plug into the cable

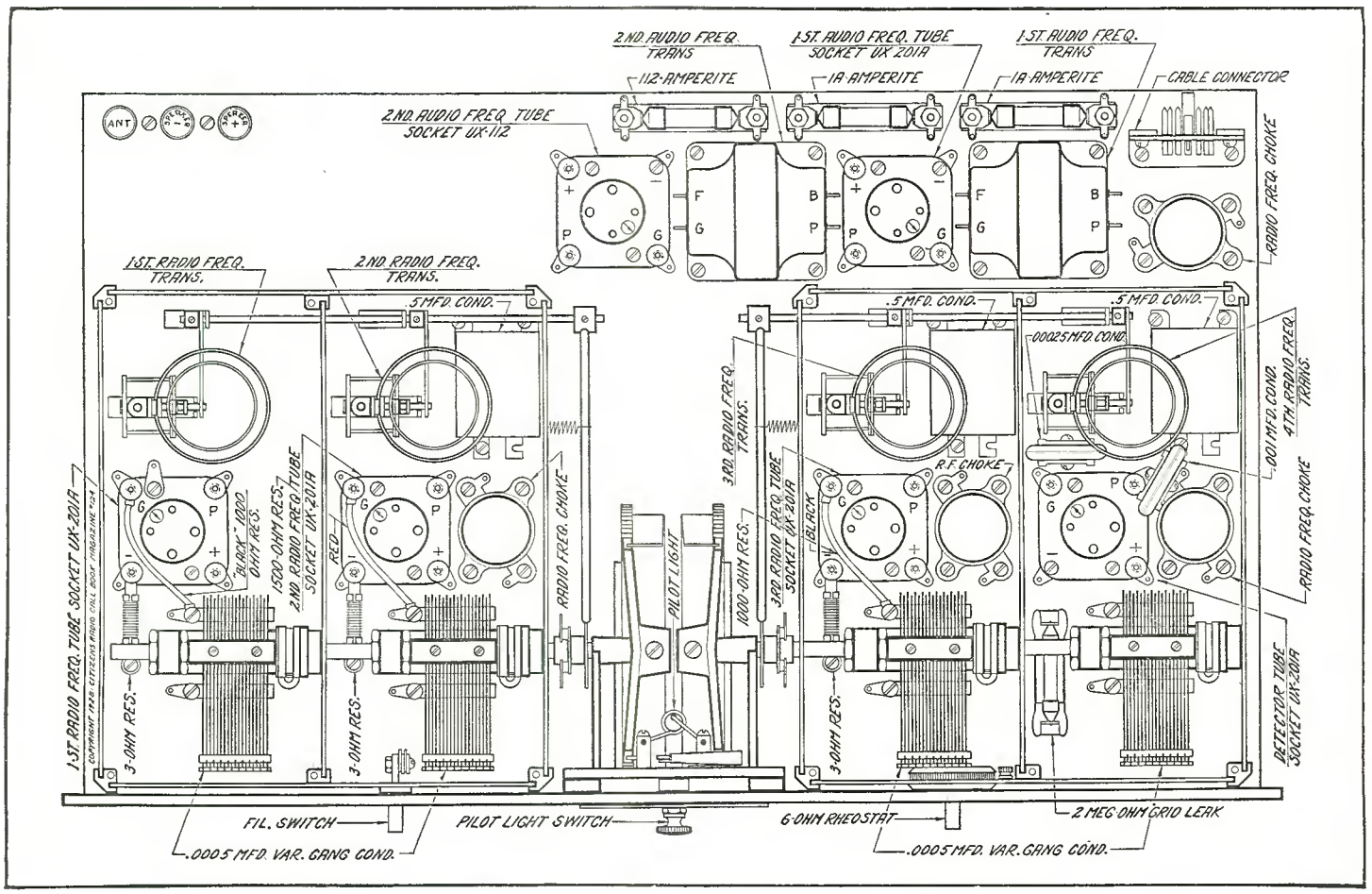


Figure 3. All parts of this receiver should be laid out in strict accordance with the sub-panel drawing shown above. Inasmuch as a suitable drilled steel chassis is provided in the foundation kit, it is only necessary to place all parts in their proper location and then begin the wiring of the receiver

connector plug, attaching the red wire of the cable to the positive terminal of the A battery. Touch the black wire of the cable to the negative terminal of the A battery. Since the tubes are not yet in the set, if a spark occurs it indicates an error in the filament wiring, which circuit should then be checked very carefully until the mistake is found and corrected. If no spark occurs when making this test, connect the black wire to the negative terminal of the A battery, turn the filament switch to the "off" position and turn the volume control to the left as far as it will go. All six tubes should now be placed in their sockets, but no tube should light. If any tube lights, it will indicate an error in the wiring, which should again be very carefully checked.

Now turn the switch to the "on" position. Tubes Nos. 4, 5 and 6 should light to full brilliancy, but tubes Nos. 1, 2 and 3 should not light at all. Failure of Nos. 4, 5 and 6 tubes to light does not necessarily indicate a mistake in wiring, as the current must pass through the Amperites in the detector and audio circuits. If any two of these tubes light and a third one does not, short circuit its respective Amperite with a piece of wire. If it does light, the Amperite is either burnt out or defective and should be replaced. If the tube does not light with the Amperite short circuited, it indicates a mistake in wiring.

Turning the volume control rheostat to the right, tubes 1, 2 and 3 should increase from dim to bright, while 4, 5 and 6 should not be affected. If the foregoing tests have been satisfactorily made, you may assume the wiring of the filament circuits is correct. With the switch in the "on" position, the volume control full on and all tubes in their sockets, remove red wire from the A battery and connect it to the plus marking of the voltmeter. Then with the wire from the negative marking of the voltmeter touch each of the remaining wires in the cable: yellow, blue, gray, green and brown. No deflection should be noticed on the voltmeter. If a movement is shown on the meter, the circuit causing this deflection should be traced and the error corrected. If no voltmeter is used and the head phones are used, a click should not be heard on any of the colored wires just mentioned unless an error has been made in the wiring. Now replace the red wire on the positive terminal on the A battery and turn the switch to the off position. After hooking up the B and C supplies, whether batteries or eliminators, turn the filament switch on, turn the volume control full on and then turn the two tuning controls simultaneously, keeping both at approximately the same settings. With antenna and ground connected, signals should have been heard. If none are heard, a pair of phones across the B and P terminals of the first audio transformer will tell whether the trouble is before or after the detector. If signals are heard in the detector circuit but none

Figure 4. This photograph represents the appearance of the receiver in a Corbett console

in the loud-speaker, it is certain the trouble is in the audio circuit and all connections therein should be checked again. If no signals are heard across the terminals of the first audio transformer, trouble is in the detector or radio frequency circuits and these should be traced until the trouble is found and corrected.

Dials Run Alike

On most wavelengths the two tuning controls should read very nearly alike and the same station will always be found at the same dial setting. These two controls are independent of each other and if a record of stations and their dial settings is kept, it is a simple matter to tune in any station within range after once determining its dial setting. (Readers may be in-

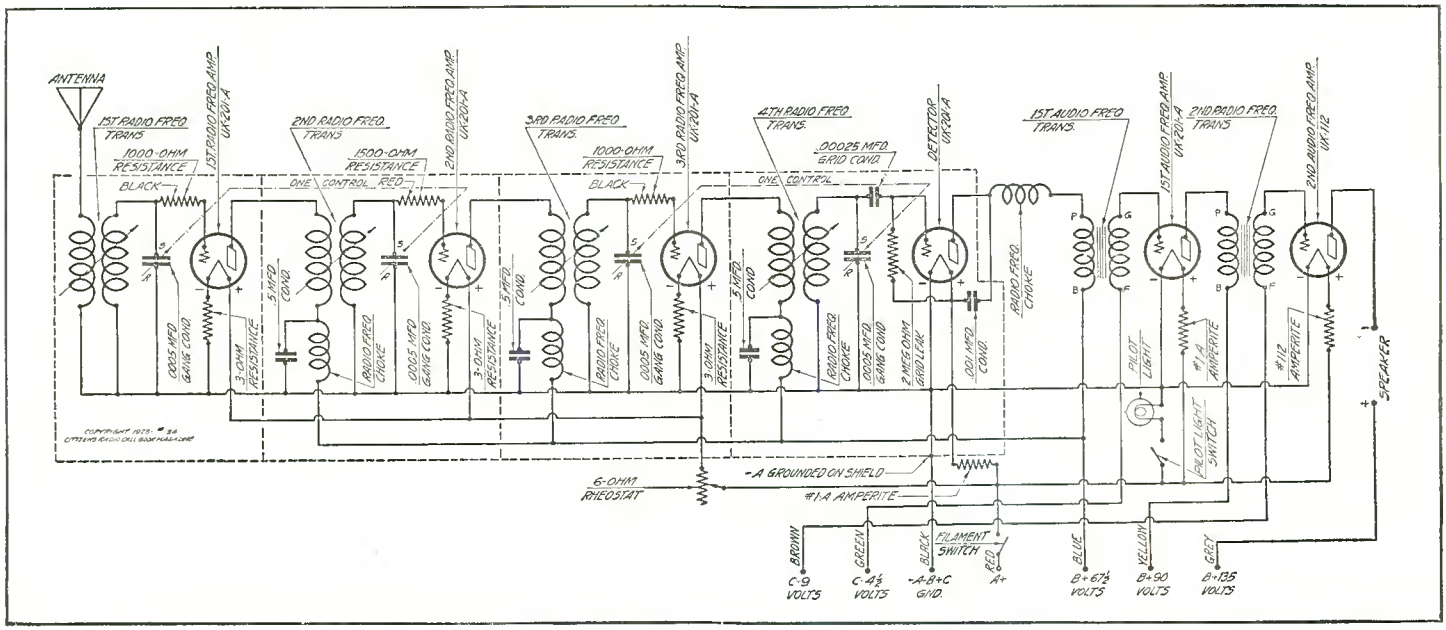


Figure 5. Inspection of this schematic circuit will give the experimenter all of the necessary data regarding electrical connections on this compact and efficient receiver

terested in the simplified log sheet which we are printing on page 54).

Voltages required for the operation of this receiver in the plate section should be 67½ for the radio frequency and detector stages, 90 for the first audio and 135 for the last audio, the latter being a 112 tube. Bias voltage for this tube is 9 volts negative and for the first audio 4½ volts negative. As previously stated, a slight bias is maintained on the radio frequency grids by means of the three biasing resistors located in the negative line of the first, second and third tubes, as shown in the schematic diagram, Figure 5.

It will be observed that A negative, B negative and C positive wires are common with the ground and the shield. Therefore, operation of the receiver without antenna should give a greatly reduced signal strength, and when the ground wire is removed a still further decrease in signal strength should be noted. Stations, especially those other than locals, will disappear entirely when antenna and ground are removed, which is an indication of the amount of shielding employed in the receiver.

In operating the set, if whistles are heard and these whistles vary in pitch after the dials are turned, it may indicate incorrect adjustment of the cam system that moves the coil primaries, and it would be well to make sure they are adjusted in accordance with the instructions accompanying the kit. This whistling is different from the steady high pitched whistles present when receiving from certain stations. Such whistles are known as "heterodyne whistles" and are due to broadcast stations on about the same waves interfering with one another. They can be recognized by the fact that although their intensity may vary after the dials are turned, their pitch remains the same. This is not a fault of the set, but rather a condition with which the government has been coping for some time and is now apparently improving.

Parts used in the receiver are:—

1—7"x21"x3/16" drilled and engraved Micarta panel
1—Drilled Van Doorn steel chassis
4—Aluminum shields
3—Grid suppressors
3—Grid biasing resistors
2—Cam operating assemblers
2—Extension shafts for condensers, ¼"
1—Binding post strip
(The above parts are included in the one foundation kit)
1—Hammarlund double dial
6—9040 Benjamin sockets
4—Hammarlund .0005 mfd variable condensers
4—Hammarlund Hi-Q r. f. transformers
4—Hammarlund r. f. chokes
3—Acme Par-Volt .5 mfd by-pass condensers
1—Sangamo .00025 fixed condenser
1—Sangamo .001 fixed condenser
1—Durham 2 megohm grid leak
1—Durham grid leak mounting
1—Carter 6 ohm Imp rheostat
1—Carter filament switch
1—660 Yaxley cable plug
2—1-A Amperites
1—112 Amperites
3—Engraved Eby binding posts
1—Ekko ground clamp
5—Ceco type 201A tubes
1—Ceco type 112 tube
1—Pkg. Kester radio solder
1—Samson Symphonic audio transformer
1—HWA-3 Samson audio frequency
1—Samson output transformer (Optional)
Miscellaneous—lugs, nuts, screws, etc.

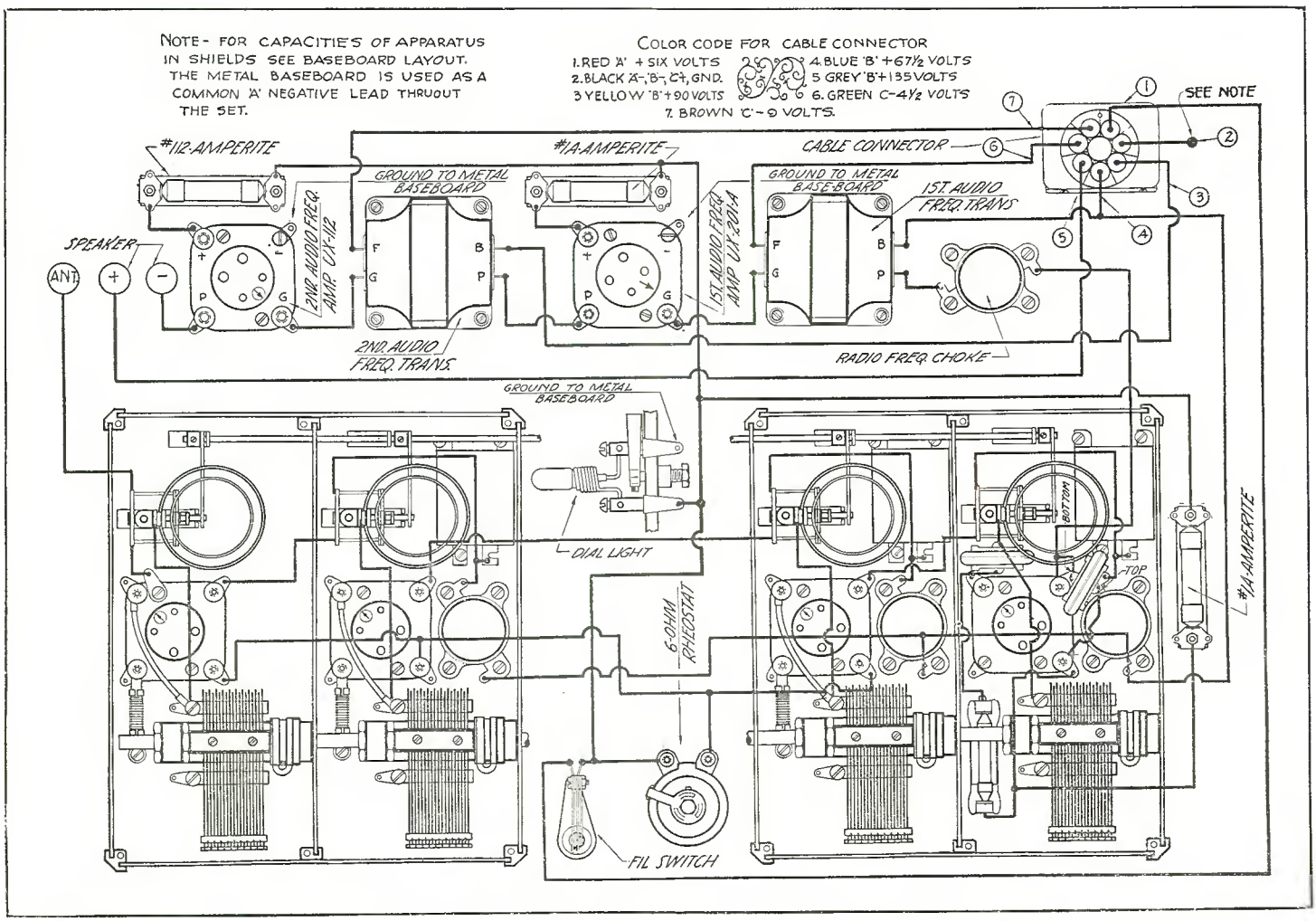


Figure 6. Here the builder may readily see how little wiring is required to connect the various units of this receiver

Automatic Coupling Makes for DX in Karas A. C. Equamatic

Receiver Functions Just Under Point of Oscillation Over Entire Broadcast Band Through Equal Energy Transfer

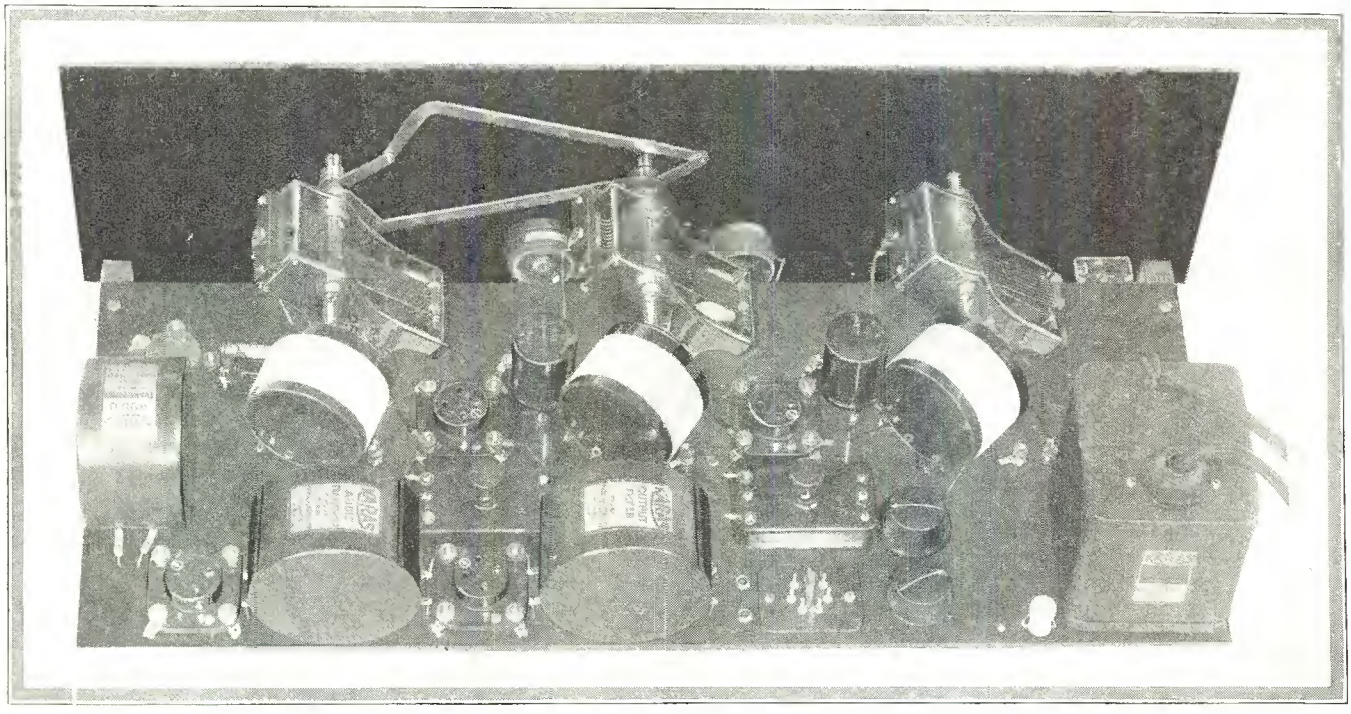


Figure 1. In this photograph may be seen the Koros A. C. Equomatic, filoment power for which is secured from the Karos A. C. Former locoted at the right in this photograph. The plug shown in the receptacle neorest the reader is that for the B power supply, while the wires furthest from the reader ore those going to the 110 volt switch on the front ponel and to the cord for plugging into the light socket

IT has always been known by radio experimenters that a proper balance of radio frequency circuits in a receiver will result in a very efficient set, but the problem has usually been to secure a balance which will remain constant over the entire wave band. In the Karas A. C. Equamatic, which is described in this article, this ideal condition has been reached by means of the constant and equal transfer of energy between the primary and secondary coils, this transfer being achieved through the mounting of the primaries on an extended shaft of the condensers so that they turn automatically with the tuning of the condenser dials. Due to the method of neutralization the tendency of the receiver to oscillate throughout the broadcast band has been stopped, and regardless of how high the radio frequency tube filaments are turned, the set will not oscillate when the operator has it properly balanced.

In addition to the fact that the receiver is stable in operation and quite sensitive to distant signals on account of its good balance, another feature may be cited, this being the fact that since the new type 226 and 227 tubes are used the operator need not worry about run down batteries. The receiver has been especially designed around alternating current tubes, so that the set delivers its maximum performance. Under average operating conditions the set should bring in good distance and should possess sufficient selectivity to enable it to be operated in the proximity of numerous broadcasting stations in the metropolitan centers.

Mechanical Coupling Device

As previously stated, a simple mechanical means enables constant and equal energy transfer between primary and secondary coils. Each secondary coil is adjusted both as to the distance from the primary coil and as to the angular relation with respect to the primary coil at any one setting. By reason of this design and its numerous adjustments it is a very simple matter to obtain an adjustment which will allow the same transfer of energy at 200 meters as at 600 meters. When the proper adjustment has been made and the dials are operated over the broadcast band, the result is a variable coupling between primary and secondary automatically changing exactly at the proper rate to maintain the tubes at their highest point of efficiency at each wave length setting. Because of this fact it is possible to do away with the

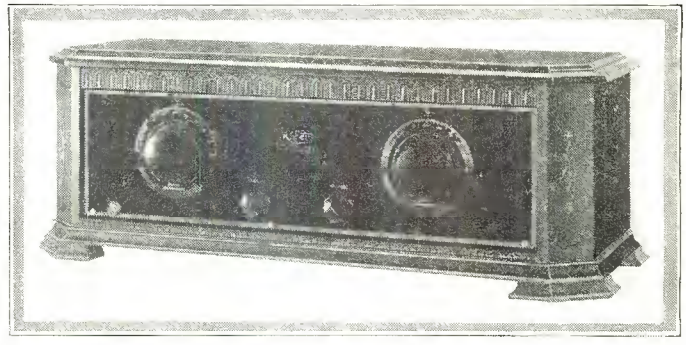


Figure 2. Koros A. C. Equomotic is here shown photogrophed in its Corbett cobinet

(This receiver tested and all illustrations made in our laboratory)

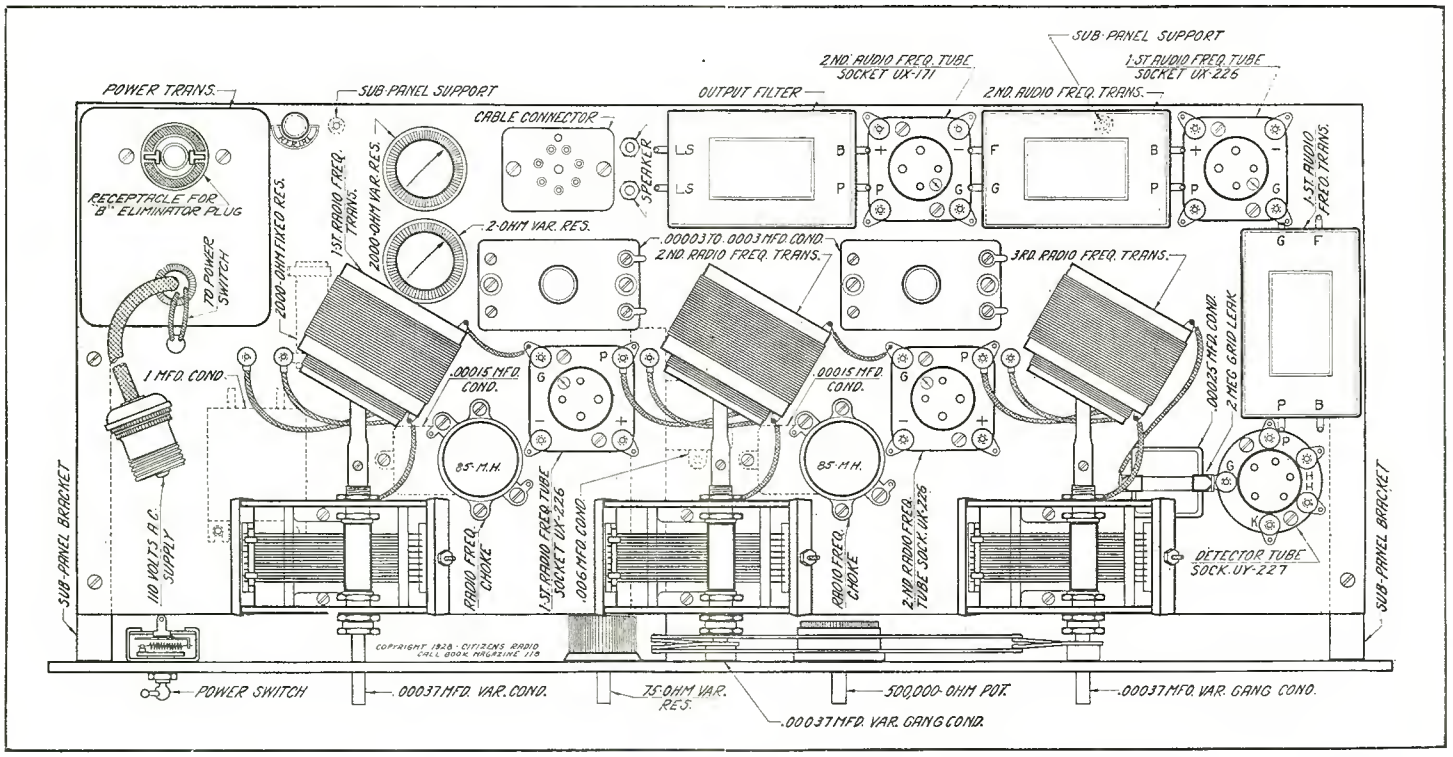


Figure 3. In the diagram printed above is shown a baseboard layout by means of which all parts in the receiver should be placed

necessity of any losser methods in either the grid or plate circuits of the radio frequency and detector circuits.

By simple adjustment of the first primary coil, the receiver will automatically compensate for any length of aerial, while due to the constant coupling between primary and secondary inductances at all dial settings the sharpness of the receiver is enhanced considerably. Stability of the radio frequency stages and the audio design permits clear tone quality and good volume.

Wiring Very Simple

Professional set builders will readily recognize the constants of the receiver when consulting the schematic diagram in Figure 4, but for the benefit of the novices or those who are just entering the popular pastime of building home constructed sets, some attention will be given in these columns to the manner in which the receiver may be wired. Reference to the graphic illustration shown in Figure 7 will disclose all connections that have to be

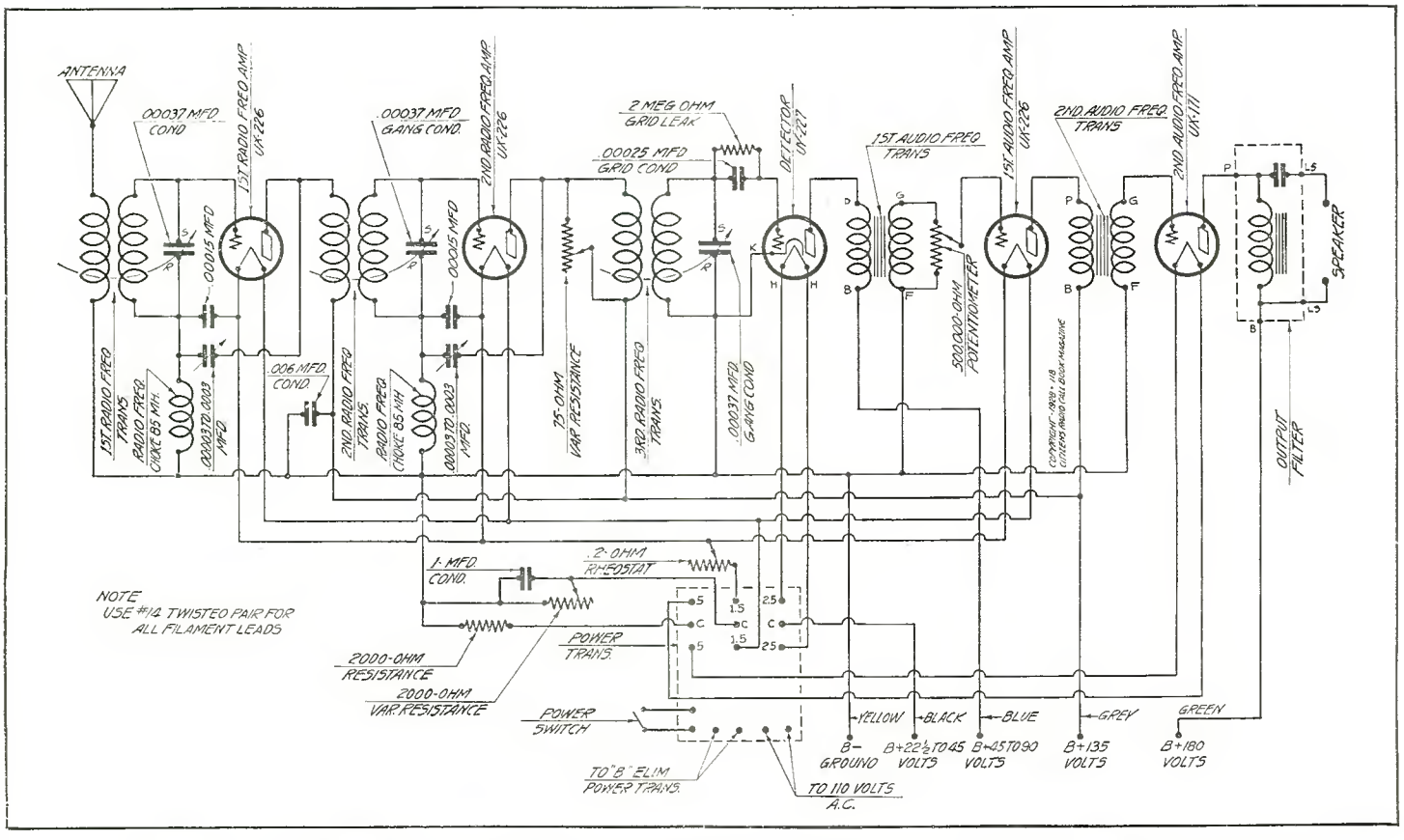


Figure 4. This schematic circuit gives the electrical connections in the receiver described in this article

made. This diagram is only for the purpose of wiring, the actual parts being placed in accordance with the sub-panel shown in Figure 3. Since the sub-panel is available already drilled and engraved (the engraved lines being those representing the angle at which the coils are to be placed), it is only necessary that the various units be placed in these holes and affixed to the sub-panel by means of their respective binding posts or nuts. After all parts have been located on the sub-panel, the home constructor may then go ahead with the wiring, which is depicted in Figure 7.

There are two neutralizing condensers utilized in this receiver for balancing it over the entire scale. The first one is located between the plate of the first radio frequency amplifier and the top of a 85 mh radio frequency choke. The second neutralizing condenser is placed in a like position in the second radio frequency stage. Two small fixed .00015 mfd condensers are used, one from the rotor of the first condenser to the negative terminal on the first socket and another from the rotor of the second variable to the negative terminal on the second socket.

Volume Control Method

As a means of governing the volume on the receiver, a 75 ohm variable resistance is placed across the primary of the third radio frequency transformer, this control being desirable for altering the radio frequency input to the detector stage. Control of the audio volume is secured by means of a 50,000 ohm potentiometer placed across the grid and filament terminals on the first audio transformer, the arm of this potentiometer leading to the grid of the first audio tube.

In the grid circuit detection is by means of a .00025 mfd grid condenser spanned by a 2 megohm grid leak. The rotor of the .00037 mfd condenser, which is ganged with the second stage, is connected to the cathode of the type 227 detector tube, which is common with the B negative and ground. In this particular detector stage it is recommended that 22½ to 45 volts positive be applied to the center tap of the 2½ volt winding, since the tube manufacturers state usually positive (or occasionally negative) biasing of the heater circuit with reference to the cathode is required for best results. This is readily accomplished by connecting the mid point of the heater winding (which in the A. C. Former is the electrical center of that particular system) to the 22½ or 45 volt B connection, as shown in the schematic diagram in Figure 4 and also in the graphic, Figure 7, where a wire is

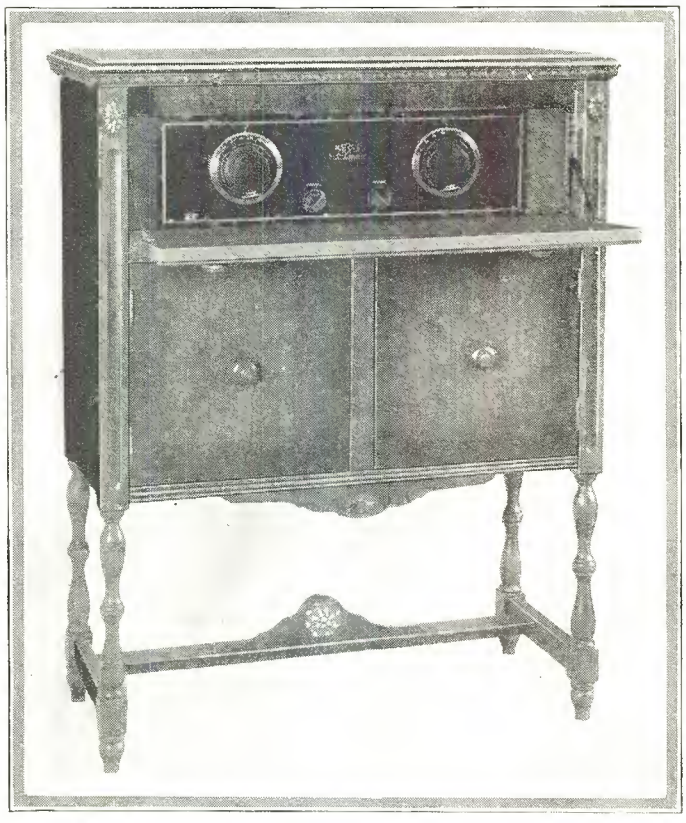


Figure 5. Illustrated above is the receiver placed in an attractive Corbett console

run from the center of the 2½ volt filament winding to the black terminal on the cable connector which, of course, goes to 22½ or 45 volts positive.

Two stages of audio transformer coupling are used with an output filter in the plate circuit of the power tube, which is a 171. The negative bias on the grid of that tube is provided by the 2000 ohm resistance in series with the center tap of the 5 volt winding. At 180 volts this will give approximately 40 volts negative bias. The negative bias on the second radio frequency is

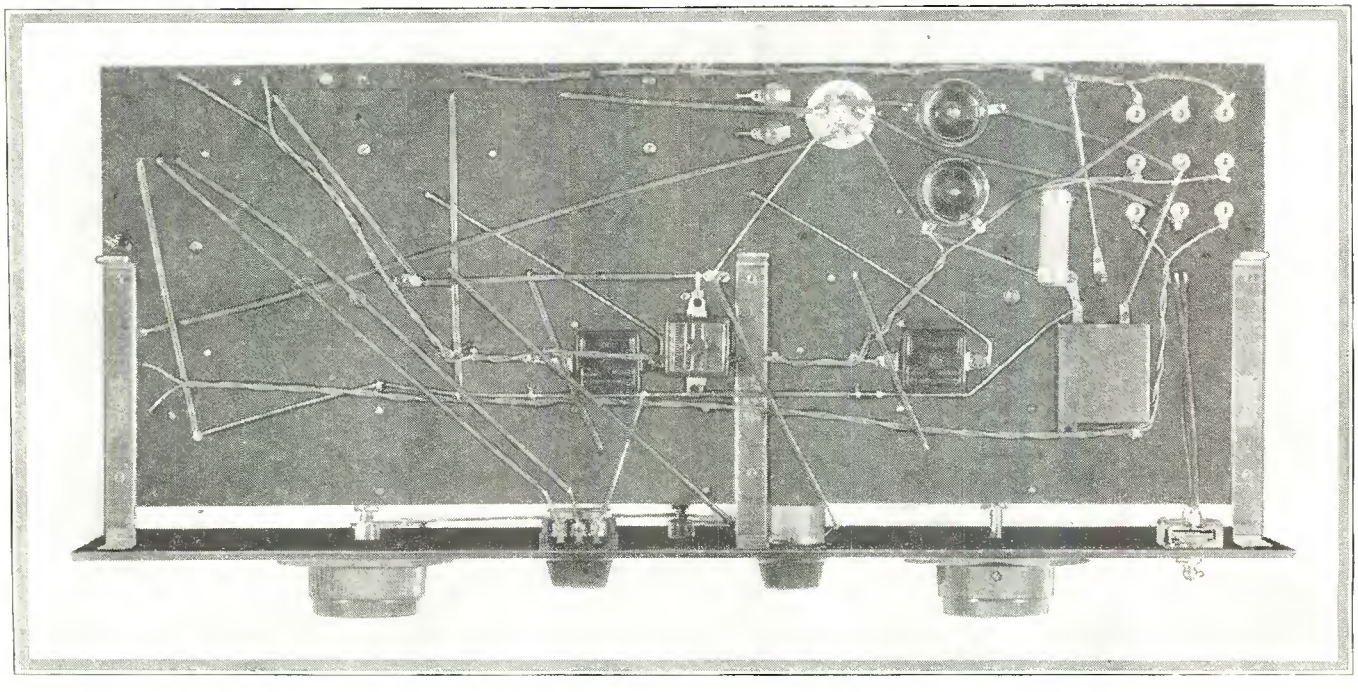


Figure 6. This photograph represents the under side of the sub-panel and shows the relatively small amount of wiring necessary for the construction of this efficient receiver. The A. C. Former has all of its connections protruding through the sub-panel so the wiring can be done below the surface. The six connections are shown in the right rear corner of the panel photographed above

provided by the voltage drop across the 2000 ohm variable resistance applied to the center tap of the 1½ volt filament windings. At 90 volts this resistance will give approximately 6 volts negative bias when the full 2000 ohms are used and, of course less depending on the setting of the rheostat. This resistance should be varied until best operation is obtained.

Balancing the Set

The receiver having been completely wired and all wiring checked to eliminate any possible errors or loose connections, the set may now be balanced for operation. With the adjusting thumb screws of the neutralizing condenser turned entirely up, tune the receiver to some high power low wave station. Set the .2 ohm rheostat so the receiver is just oscillating with the control and volume dials turned entirely up. Turn down the thumb screws a little at a time until the signal clears up. Now turn up the .2 ohm rheostat and rotate the dials back and forth across the point at which the station was tuned in. If the receiver still oscillates, make a slight adjustment on the thumb screws on both neutralizing condensers. A point will be found on these condensers at which the receiver will not oscillate when the .2 ohm rheostat is turned entirely up and the dials are turned over the entire range.

It is possible that in adjusting these neutralizing condensers to go too far, in other words to have too great a capacity. There is a point at which the exact adjustment may be found and this is not difficult to do.

The only other adjustment that may be made is on the first primary coil. This should be varied depending on the length of the aerial used with the receiver. It is sometimes necessary to provide maximum coupling on the first coil at the lower wavelengths due to the particular aerial being used. This adjustment can be made only in accordance with the particular conditions under which the set is being operated.

List of Parts

Parts necessary for the construction of this receiver are:

1—Karas A C Former
2—28 Karas audio tranformers
1—Karas output filter
3—17 Karas .00037 mfd variable condensers
3—Karas Equamatic r. f. transformers
2—Karas 0-100 Micrometric dials
3—Karas sub-panel brackets
1—Karas control system, including hardware
1—660 Yaxley cable plug
1—B-20 Electrad 2000 ohm fixed resistor
1—E Electrad Royalty variable high resistance
4—9040 Benjamin red top sockets
1—9036 Benjamin red top socket
1—Durham 2 megohm grid leak
2—85 Hammarund r.f. chokes
2—Samson neutralizing condensers
1—Carter Imp 110 volt switch
1—MW-75 Carter 75 ohm rheostat
1—MW 1/5 Carter 1/5 rheostat
1—MW-2 Carter potentiometer
1—210 Carter mfd by-pass condenser
2—.00015 mfd Carter fixed condensers
1—.006 mfd Carter fixed condenser
1—.00025 mfd Carter grid condenser with clips
2—10 Carter tip jacks
1—7x24x3/16-in. drilled and engraved Lignole or Formica front
1—9x23x3/16-in. drilled and engraved Formica sub-panel
40—ft. Corwico Bradite hook-up wire
3—Type 226 tubes
1—Type 227 tube
1—Type 171 tube
1—Pkg. Kester radio solder
1—Ekko ground clamp
Miscellaneous lugs, nuts, screws, etc.

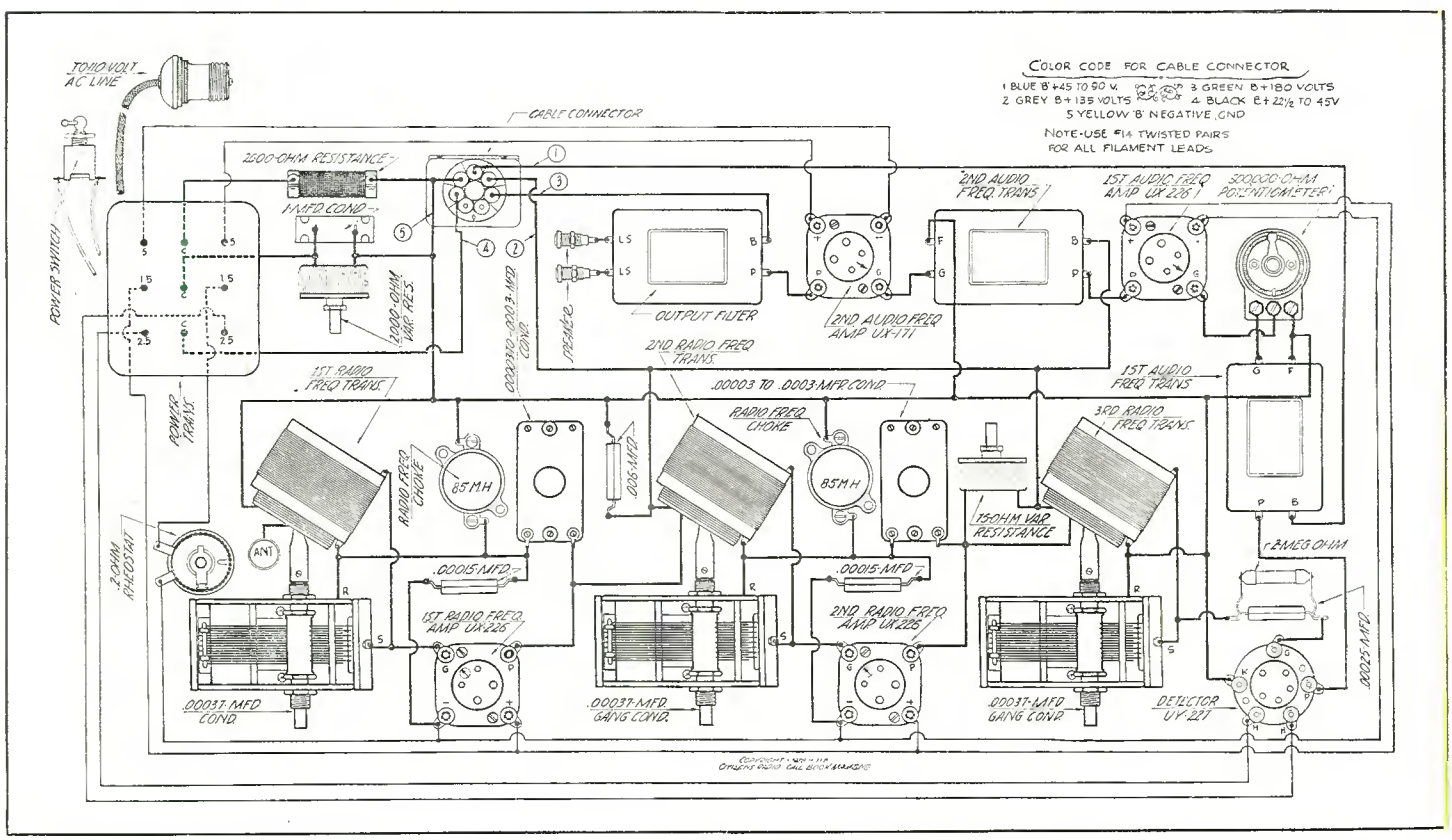


Figure 7. Even a novice may wire up a receiver such as the one here described when simple graphic illustrations like the one above are available. The power switch shown at the left rear of this diagram should be mounted on the front panel by means of a twisted pair. This controls the 110 volt line and allows the operator to turn on and off the set at will

Vitrohm ABC Eliminator for Residents of D. C. Districts

Unique Combination for Operating Any Set Has Added Feature of Push-Pull Amplifier

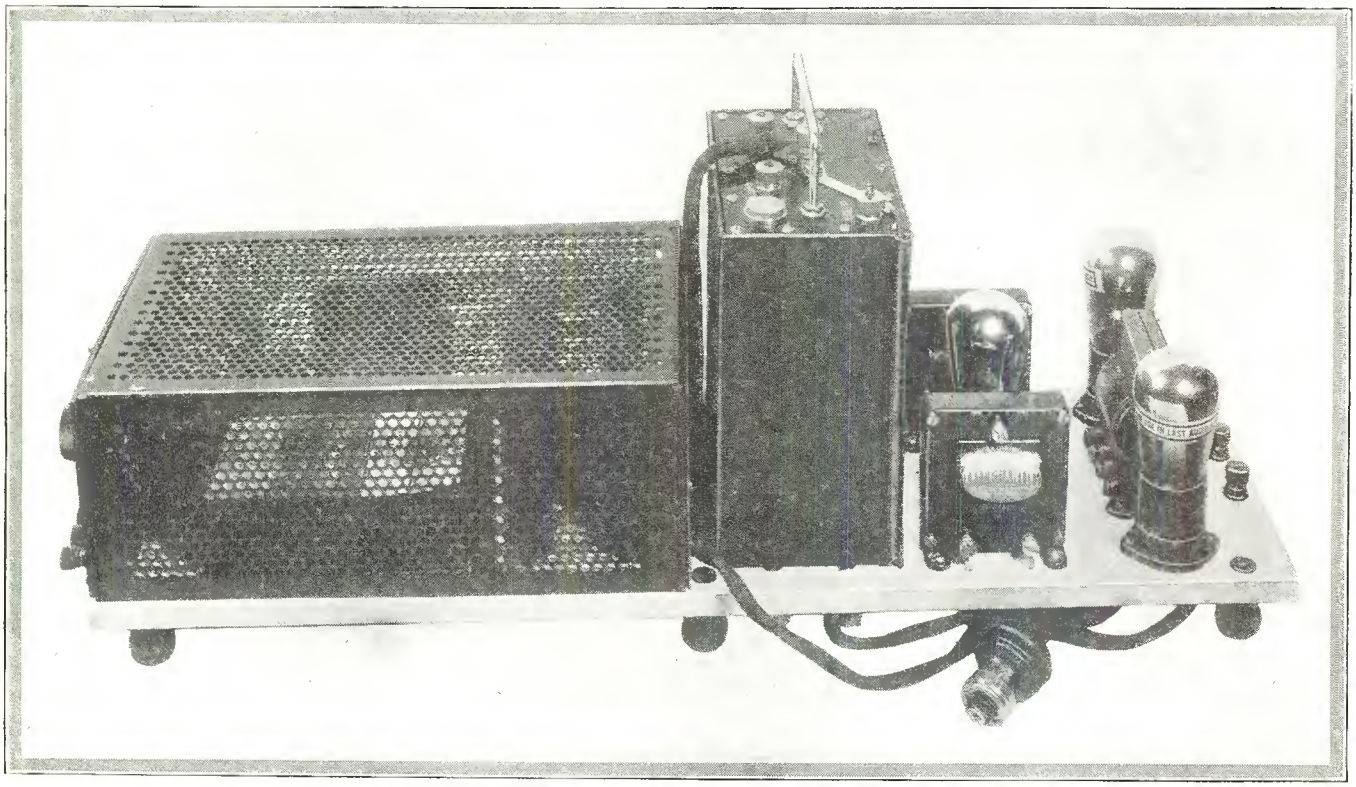


Figure 1. Shown above is the Vitrohm eliminator for D.C. districts with the push-pull power amplifier shown at the extreme right. At the left is shown the metal housing, the front of which is illustrated in the smaller photograph on this same page

FOR many years there have been thousands of individuals residing in either the downdown districts of a city or in the residential districts which are served by direct current rather than alternating current supply. During this time many have found it rather inconvenient to have a direct current source in their homes and still be faced with the necessity of using dry batteries for the plate supply and have to be constantly changing their batteries from the direct current line through a series of lamp banks. For a long time the problem of securing filament current from the direct current lines was chiefly that of having a condenser which would be of sufficient electric size to smooth out commutation ripples usually encountered in direct current lines.

New Filter Is Used

Recently with the advent of the Abox filter, an ideal combination has been worked out involving Vitrohm resistors, an Abox filter and a power amplifier utilizing push-pull audio amplification, so that with the data now available in this article residents of direct current districts may have a complete power supply which will relieve them of any necessity of further care or inconvenience.

Two factors are at once apparent in the examination of the circuits shown in this article. The first is that the cost is low on account of the relatively small amount of apparatus involved,

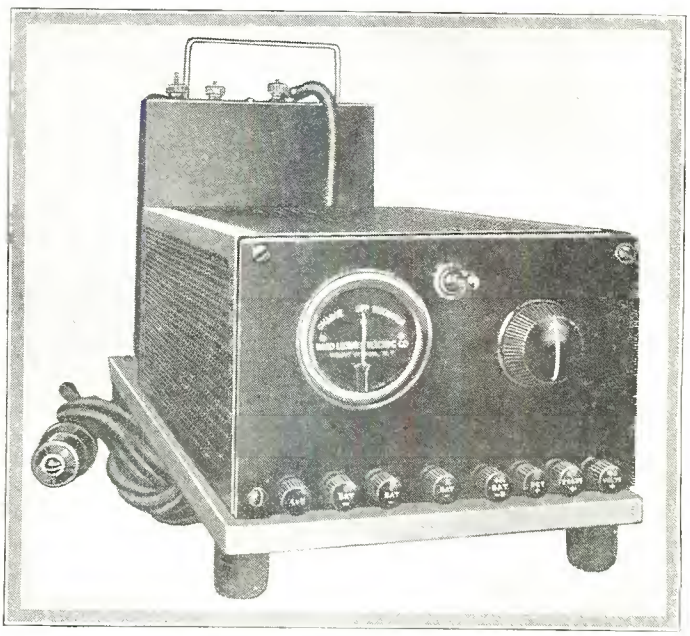


Figure 2. This is a front view of the D.C. eliminator described in this article

(This eliminator tested and all illustrations made in our laboratory)

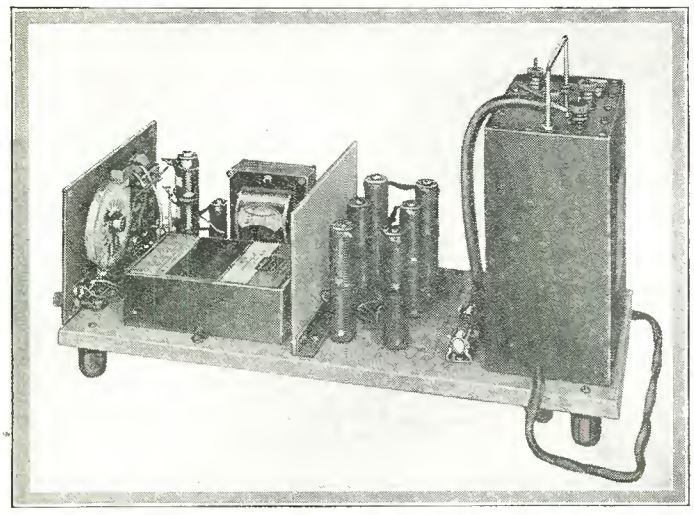


Figure 3. In this photograph is shown only the eliminator section with the housing removed

while the second lies in the fact that the construction of such an eliminator and power amplifier is quite simple and may be readily accomplished by even a novice in a very short time.

Pictures Tell the Story

The complete A, B and C eliminator is shown photographically in Figure 1. In Figure 2 may be seen the front end of this device, while Figure 3 shows a photograph of the eliminator section alone with the housing removed. On account of the current passed by the resistances in the eliminator and the fact that some heat is generated, safety would indicate that some method of protection be supplied and for that purpose a metallic housing or grating is provided. A view of the power amplifier alone is shown in Figure 5, where the two push-pull audio transformers are photographed with their push-pull output transformer.

This job may be made up in either the single eliminator system, or it may be made up as a combined eliminator and power amplifier, or the power amplifier may be made separately. Judging from correspondence we have had from our readers, it would appear that the greatest amount of interest would center around the eliminator itself, the next greatest on the combined eliminator and power amplifier, and the last on the power amplifier itself.

Schematic Shows Details

In the construction of the eliminator itself, the reader may determine from the schematic circuit in Figure 6 the parts that are required. This same information is also given in the list of parts accompanying this article. The schematic shows the eliminator to consist of, in effect, a number of fixed resistors placed in parallel, and across the 110 volt direct current source, these parallel resistors serving to drop the voltage from the 110 value to the required 6 volts, with ample current available for the operation of a receiver and its power amplifier. The filter condenser block shown in the schematic serves to iron out direct current pulsations in the supply line, and is placed with its sections going across the resistor units, which determine the voltages at the binding posts. This type of condenser is identical to that used in the ordinary power supply and performs the same work of filtering. Filtration of the A supply is accomplished by means of the Abox filter, which is shown in the schematic and which with its extremely high capacity absorbs any commutation in the low voltage section of the eliminator.

Two values of negative bias are automatically provided in this eliminator by the drop across one-half of a 5 ohm resistor located between the shell of the Abox and the negative terminal of the 110 volt d.c. supply. The C bias value secured across one-half of the 5 ohm resistor is 4½ volts negative, while the bias secured across the entire resistor is 9 volts negative. The 4½ volts bias value is used for the imput stage of the first audio transformer, if used, while the 9 volts bias is used on the input stage of the two 171 tubes arranged in push-pull and is of sufficient value for the maximum voltage supplied by the eliminator.

Eliminator

If the builder is interested in constructing the eliminator alone, the following is a list of parts required for its construction:

2—5 ampere fuses
1—B-1 Ferranti audio choke
6—B-300 Ward Leonard 300 ohm Vitrohm resistors with mounting.
1—507-52 Ward Leonard 11,000 ohm Vitrohm resistor with mounting
1—A 5 CT Ward Leonard 5 ohm Vitrohm resistor with mounting
1—Ward Leonard 10,000 ohm Vitrohm Adjustat
1—Acme Parvolt condenser block 2-2-2 .5- .5 mfd
1—Polymet .002 mfd fixed condenser
8—Eby binding posts
1—Abox filter unit (6 volts)
1—4-3/8x6-7/8x1/4-inch Transite heat baffle plate
1—7-1/4x17-3/4x1/2-inch Transite baseboard
1—5-7/8x3-15/16x1/8-inch Celeron front panel
1—Carter 110 volt toggle switch
1—Sterling polarity indicator (Charge-O-Discharge)
20—ft. Corwico Braidite hook-up wire
1—Pkg. Kester Radio solder
Miscellaneous lugs, nuts, screws, etc.
1—Sangamo .002 mfd fixed condenser

Power Amplifier

If it is desired to build the power amplifier alone, the following list of parts is necessary:

1—Ferranti type AF-4C push-pull transformer
1—Ferranti type OP-7C push-pull transformer
3—Eby sockets
2—Eby binding posts marked "Output"

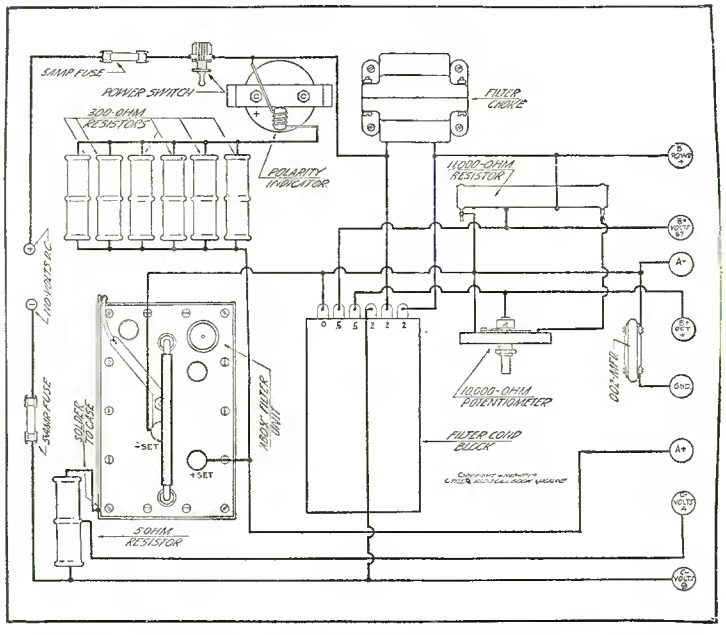


Figure 4. This is a graphic diagram of the wiring of the eliminator shown at the top of this page

1—Amperite type 1-A
2—Amperite type 112

If the builder desires to make up the entire job on a single board, the parts specified in the two lists shown above will be required, with the addition of a Transite baseboard 7-1/2x24x1/2-inch.

Freedom from Hum

Freedom from hum and troublesome noise may be attributed to the design features of the eliminator generally and specifically to the type B-1 audio choke used along with the high capacity electrolytic condenser and filter. The audio choke has a low d.c. resistance and will permit a current of over 50 milliamperes to flow through its winding. Another feature of interest in considering the Vitrohm eliminator may be learned from the fact that regardless of the number of tubes which are pulled out of the receiver, the voltage on the remaining tubes does not rise to a dangerous value. Regardless of how few or how many tubes are added in the set at anytime, the A voltages remain constant.

Satisfaction and Permanence

In designing the eliminator, the first thought was given to secure a circuit in a layout which would give entirely satisfactory performance permanently. Naturally with this in view it would not be possible to consider any apparatus that would break down, deteriorate or wear out. Examination of the schematic circuits in this article and of the photographs will show the rugged nature of all parts involved, which should be of interest to any set builder living in direct current neighborhoods.

All of the apparatus except the Abox filter and the two five ampere line fuses and binding posts is placed inside of a sturdy metal case perforated to provide ventilation. Once the apparatus inside the metal case is mounted and wired, it calls for no further attention. It is out of the way and danger of shocks, by virtue of the condensers, chokes and resistors being inside of the cage.

Divided into Three Groups

In the photograph shown in Figure 3, the reader will notice that the apparatus inside the metal case may be conveniently divided into three groups. On the left panel, which is of Celeron are mounted the Adjustat, the toggle switch to turn the eliminator on and off and the polarity indicating meter. The purpose of this polarity indicating meter is to show whether the polarity of the plug in the light socket is correct.

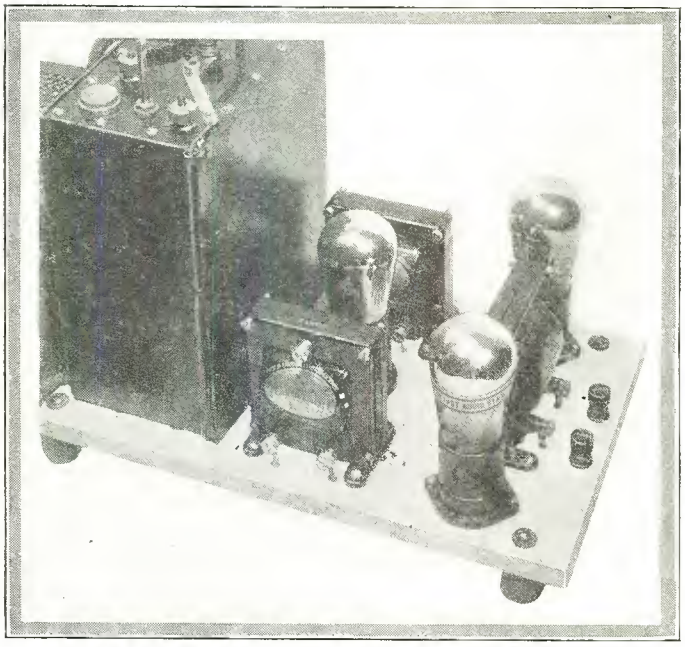


Figure 5. This photograph represents the push-pull audio amplifier end of the eliminator, whose connections are represented in the schematic circuit Figure 7 on this page

The middle section of the eliminator consists of the Parvolt filter block, the Ferranti audio choke, the two Ward-Leonard resistors 507-52, and the 5 ohm center tap resistor.

To the right of this section and extending the full width and height of the metal case is a piece of one-quarter inch Transite, effectively shielding the parts in the middle section from the six resistors mounted in parallel in the section to the right. All of the resistors in this last section are mounted in an upright position and are held securely in place by means of a star washer and a bolt running down through the Transite base.

Outside the metal case at the right in Figure 3 is mounted the Abox, which completes the apparatus required for the eliminator. Wiring of the eliminator may be accomplished by means of flexible wire or if the builder is anxious to have a clean cut wiring job, the work may be done with solid bus bar.

Reference to the graphic illustration shown in Figure 4 will show the method of connecting up the polarity indicator, which consists of three turns of wire wound around a metal loop on the back of the polarity indicating meter.

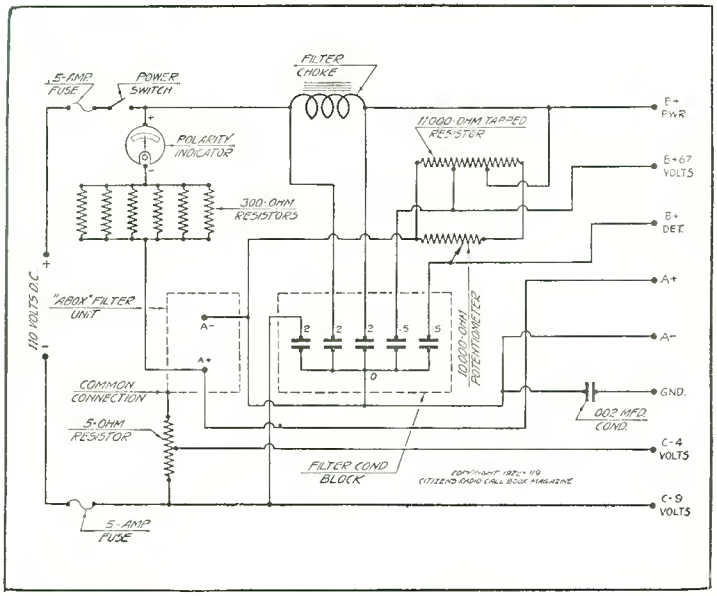


Figure 6. This schematic circuit represents the D.C. eliminator itself, while the diagram to the right represents the push-pull power amplifier. It will be noted that the binding posts are brought out so that when the two are joined together the whole unit may be readily hooked up

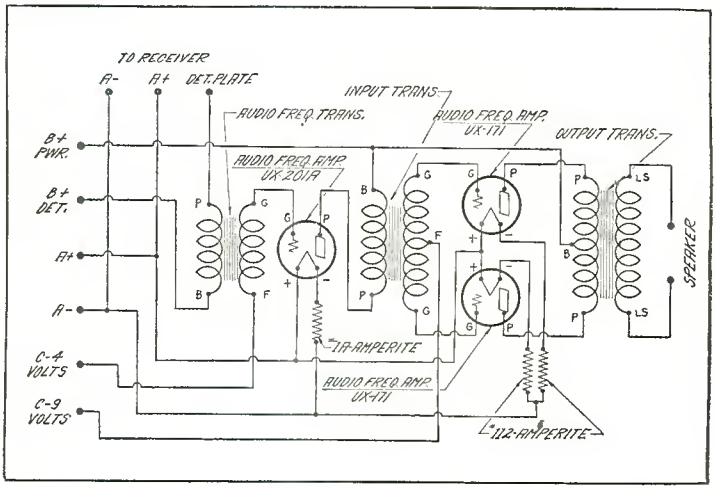


Figure 7. Schematic circuit of the push-pull audio amplifier used in conjunction with the D.C. eliminator is shown above

Bodine Twin Eight A.C. Radio-Phone Combination

Complete Batteryless Receiver Has Added Feature of Power Amplifier, Electric Turn Table and Magnetic Pick-Up

MANY radio fans who have possessed a separate set, an amplifier, a source of filament current and possibly a phonograph may have wondered whether it would be possible for a combination to be designed that would include radio or phonograph music at will and at the same time be self-contained in a suitable console for the sake of compactness and simplicity.

Recently our laboratory has tested the Bodine Twin Eight A.C. phonograph-radio combination, using a Bodine receiver, a phonograph motor made by the same concern, and a power unit known as the King Lear super power amplifier, which is assembled from standard parts.

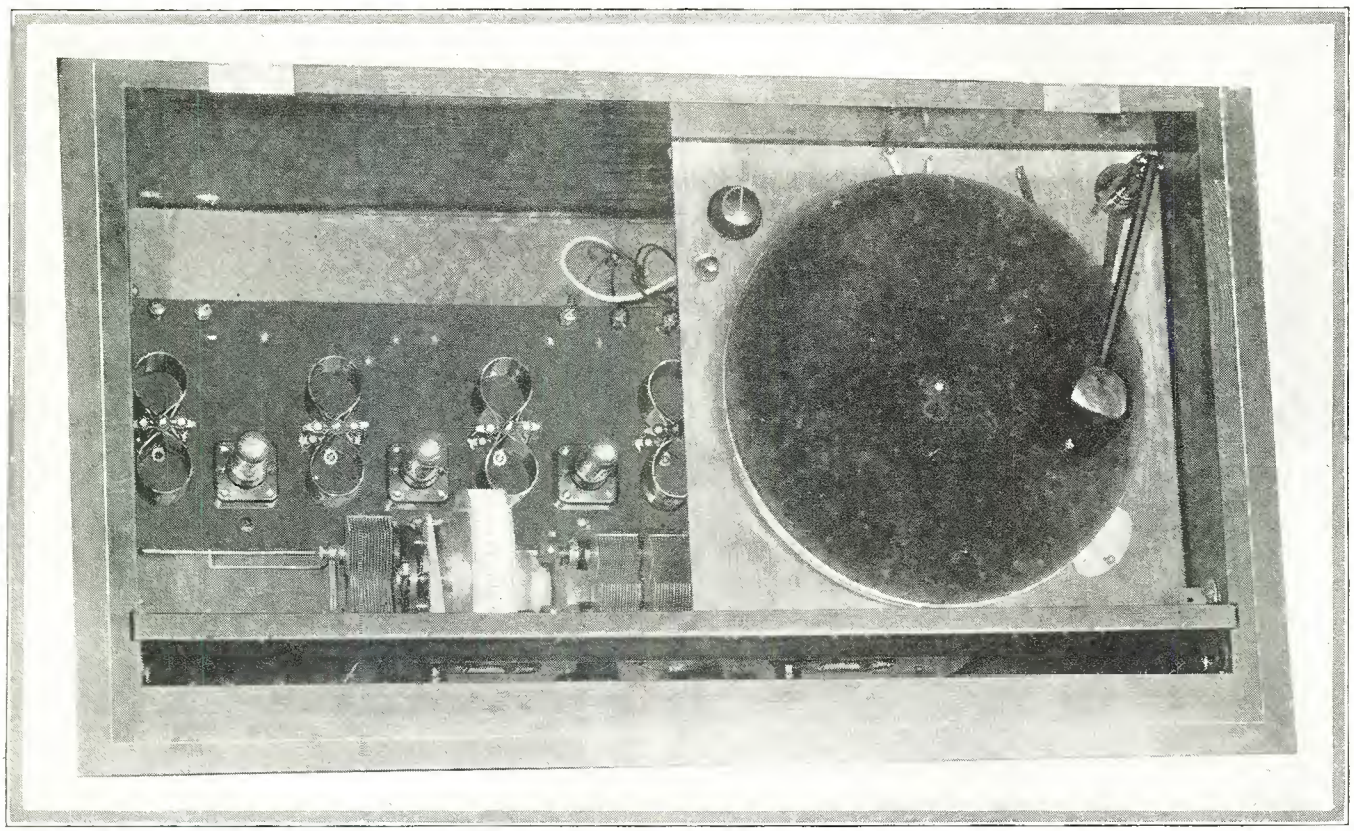


Figure 1. Shown in this photograph is the Bodine Twin Eight A.C. receiver at the left with an electric turn table and magnetic pick-up pictured at the right. These two units are placed in the top of an Excello console

Some details of the receiver itself may be gained from an inspection of the photograph in Figure 1, which is a top view of the receiver and phonograph motor. Additional details of the receiver may be learned from the baseboard layout illustration shown in Figure 3, the schematic shown in Figure 4 and the graphic in Figure 9. Frontal appearance of the receiver is indicated in a photograph in Figure 8.

Tuned R. F. Receiver

Examining the schematic circuit shown in Figure 4, we see the receiver itself consists of three stages of tuned radio frequency amplification and a non-regenerative detector, making a total of four tubes in all and these tubes being of the 199 type. The first radio frequency stage is tuned by a single .00035 mfd condenser, which may be seen in the photograph, Figure 1, and is located on the left hand drum dial. The second and third radio frequency stages together with that of the detector are tuned by a three-gang condenser of .00035 mfd per section, which is operated from the right hand drum dial. Further idea of the location of the drum dials may be secured by inspecting Figure 3, which is the panel layout, and Figure 9, which gives the actual connections to be made in hooking up the receiver. The use of these two tuning controls allows the operator to have a certain amount of flexibility in the antenna stage, where it is generally desired because of the difference in antenna and ground conditions. The three-gang condenser unit has three balancing capacities, which are located under the main capacities and which may be shifted by the operator in order to make the three tuned stages tune alike. These three trimmers are adjusted by means of a wooden stick sharpened at one end like a screw-driver. Assuming that no great deviation has been made by the builder in the wiring of the individaul stages, it is quite likely that not a great deal of balancing will be required, although in this case actual operation of the set is the only criterion.

(This receiver tested and all illustrations made in our laboratory)

Uses 100 Mil Rectifier

Going now to the description of the power amplifier, it is observed by referring to the schematic in Figure 6 that its power is derived through the use of a QRS 100 milliampere rectifier supplied with 550 volts each side of a center tap. The filament current for the four 199 tubes arranged in series is secured through a drop over the entire resistance train shown in the schematic, Figure 6. The plate voltages for the receiver and the amplifier are taken off the separate taps on this resistance train. Therefore, A B andC elimination of the receiver is readily accomplished. In the case of the filament supply for the first audio amplifier and the two 210 tubes arranged in pushpull, this comes from two separate 7½ volt filament windings located on the Thordarson power amplifier. The first of these 7½ volt windings supplies filaments of both of the 210 tubes, while it supplies the 112 tube when a 3 ohm resistance has been placed in each side of this filament line, these resistances serving to cut the voltage in that circuit to the proper operation of the 112 tube, and also the lighting of the dial lamps. Maximum voltage from the power amplifier is used for the plates of the two power tubes in push-pull, while lower voltages are used on the 112 amplifier, the detector and the three radio frequency stages. As is customary in all power amplifier installations, a filter choke unit is used with accompanying filter capacities, employed to smooth out the pulsating direct current furnished by the rectifier. Since the rectifier tube used in this installation is of the filamentless type, the filament winding on the power transformer which is usually employed to light the rectifier filament is now diverted into use as a means of lighting the 210 tubes arranged in push-pull. With this type of rectifier, it is necessary to have a buffer condenser of .1 mfd across each extremity of the high voltage winding, with its center tap made common with the center of the high voltage winding, which becomes the negative lead of the power system.

The input of the amplifier is connected through a three-point switch to the output of the receiver and to the electric phonograph pick-up unit, so that by manipulation of this switch the operator may throw the output of the receiver onto the power amplifier or use the output of the electric pick-up instead. A suitable 500,000 ohm variable resistance is provided across the phonograph pick-up terminals so that this control may govern the amount of energy fed into the primary of the first audio frequency transformer. When the radio set is being used, this variable resistance is out of the circuit and does not affect the volume of the receiver. This volume control may be seen mounted on the board which carries the Bodine phonograph motor and is the black knob at the left rear of the phonograph section. Next to it, in Figure 1, is the switch in series with the 110 volt feed to the motor, which allows starting and stopping of the phonograph turntable. At the right of the phonograph section is mounted the base for the electric pick-up unit, the two wires from which are led down through the board and connect onto the phonograph pick-up binding posts on the power amplifier on the shelf below.

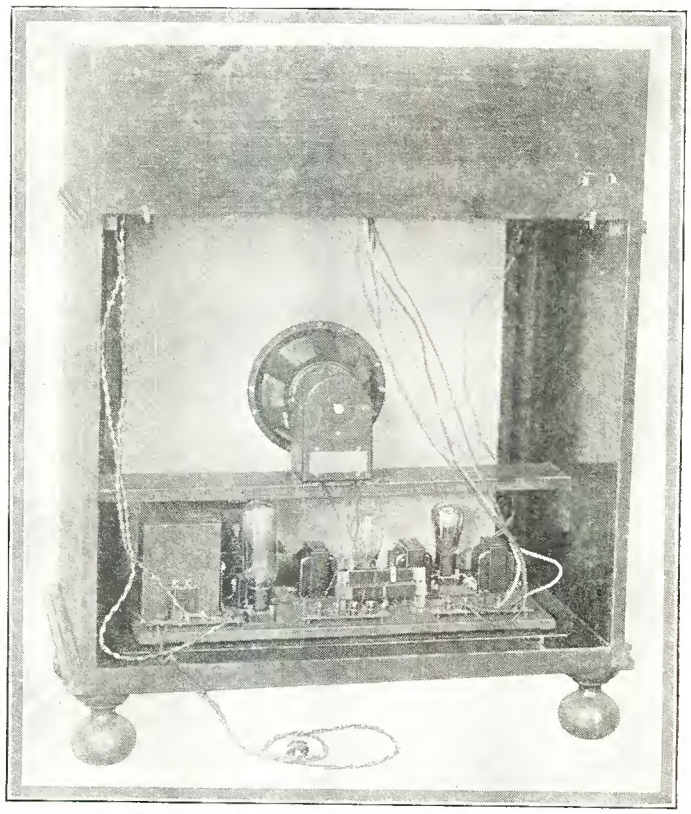


Figure 2. Rear view of the combined receiver and electric phonograph is shown above, which represents the King Lear power amplifier and a dynamic speaker mounted in the rear of the Excello console

Follow Graphic Diagrams

To insure ease of wiring and a minimum of errors on the part of the builder it is recommended that for both the receiver and the power amplifier the graphic illustrations be consulted and followed carefully. The graphic diagram of the amplifier is shown in Figure 7 and that of the receiver in Figure 9. In both of these pictorial diagrams the apparatus is placed so that all connections may be readily seen. For the positioning of the apparatus in these two units the drawings in Figure 3 and 5 should be followed, the former being the receiver layout and the latter the amplifier layout.

After the builder has completed all of the wiring in both of the units, and has checked over his work to guard against any errors, the installation may be put into commission. In the receiver four of the 199 type tubes are inserted, while in the power amplifier the 100 m.a. rectifier tube is used together with a 112 tube and two 210 power tubes. On starting the set the 2,000-ohm variable resistance should be turned so the milliammeter on the

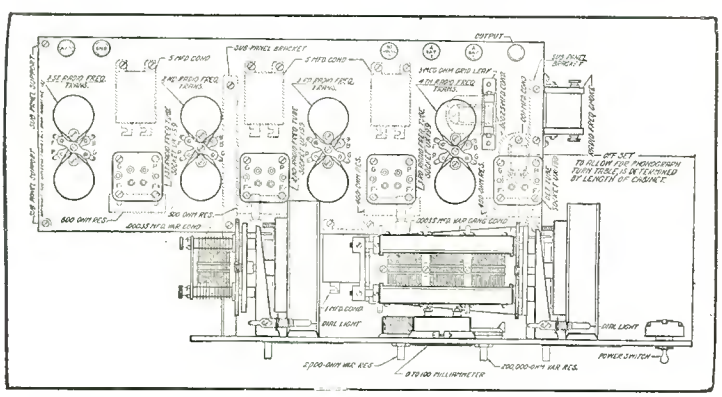


Figure 3. In the above sub-panel layout may be seen the method of assembling all parts used in the Bodine Twin Eight A.C. receiver. The space shown at the left of the drawing represents an offset, which must be provided for in order to allow the panel to be centered

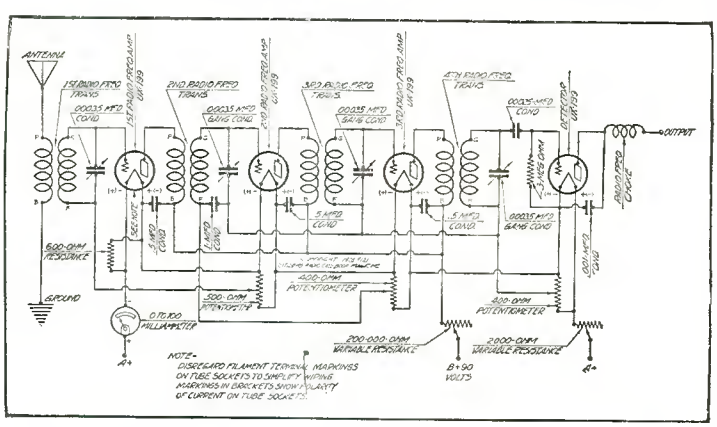


Figure 4. In this drawing the constructor will find the schematic circuit involved in the receiver described in this article

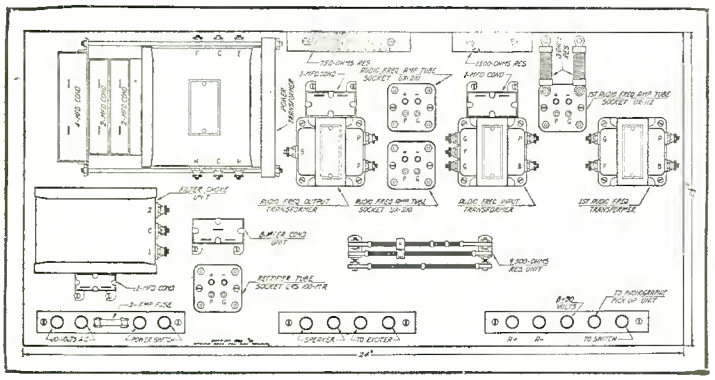


Figure 5. Above is shown a baseboard layout of the power amplifier used for providing A, B and C current in this receiver

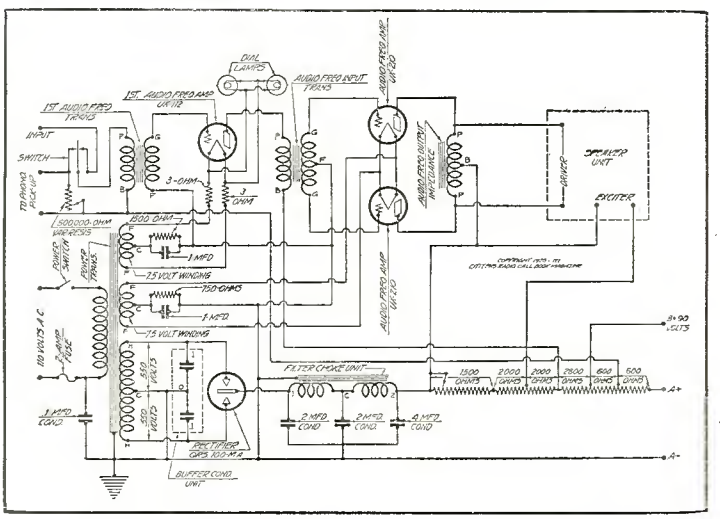


Figure 6. Electrical details of the power amplifier are set forth in the schematic diagram illustrated above

panel reads 60 to 65 milliamperes, which will furnish sufficient current for the four 199 filaments in series. The set is then tuned as any radio frequency receiver, the left dial governing the first tuned stage, and the right the remaining two r. f. stages and the detector. When a station of medium strength has been tuned in the operator may adjust the trimmer condensers on the three-section gang condenser and peak these capacities for maximum volume on the received signal. This process is so familiar to set constructors that no further description need be given.

When it is desired to operate the set as an electric phonograph, merely turn the switch on the front panel, start up the motor by means of its switch on the motor stand, put on one of the electrically recorded records, and listen to reproduction such as was never possible on the old type phonograph.

Such a combination as has been described should prove of more than ordinary interest to the enthusiast who desires all forms of entertainment combined into a single unit.

Parts used in the construction of this installation are:

(Receiver)

1—T-35 Bodine r. f. transformer
3—T-35-199 Bodine r. f. transformers
1—Remler 3 gang .00035 mfd variable condenser
1—Remler .00035 mfd variable condenser
2—110 Remler Universal drum dials
4—531 Frost sockets
1—Weston 0-100 m. a. milliammeter
3—Acme Par-volt .5 mfd. by-pass condensers
1—Acme Par-volt 1 mfd by-pass condenser
1—Sangamo .00025 mfd fixed condenser

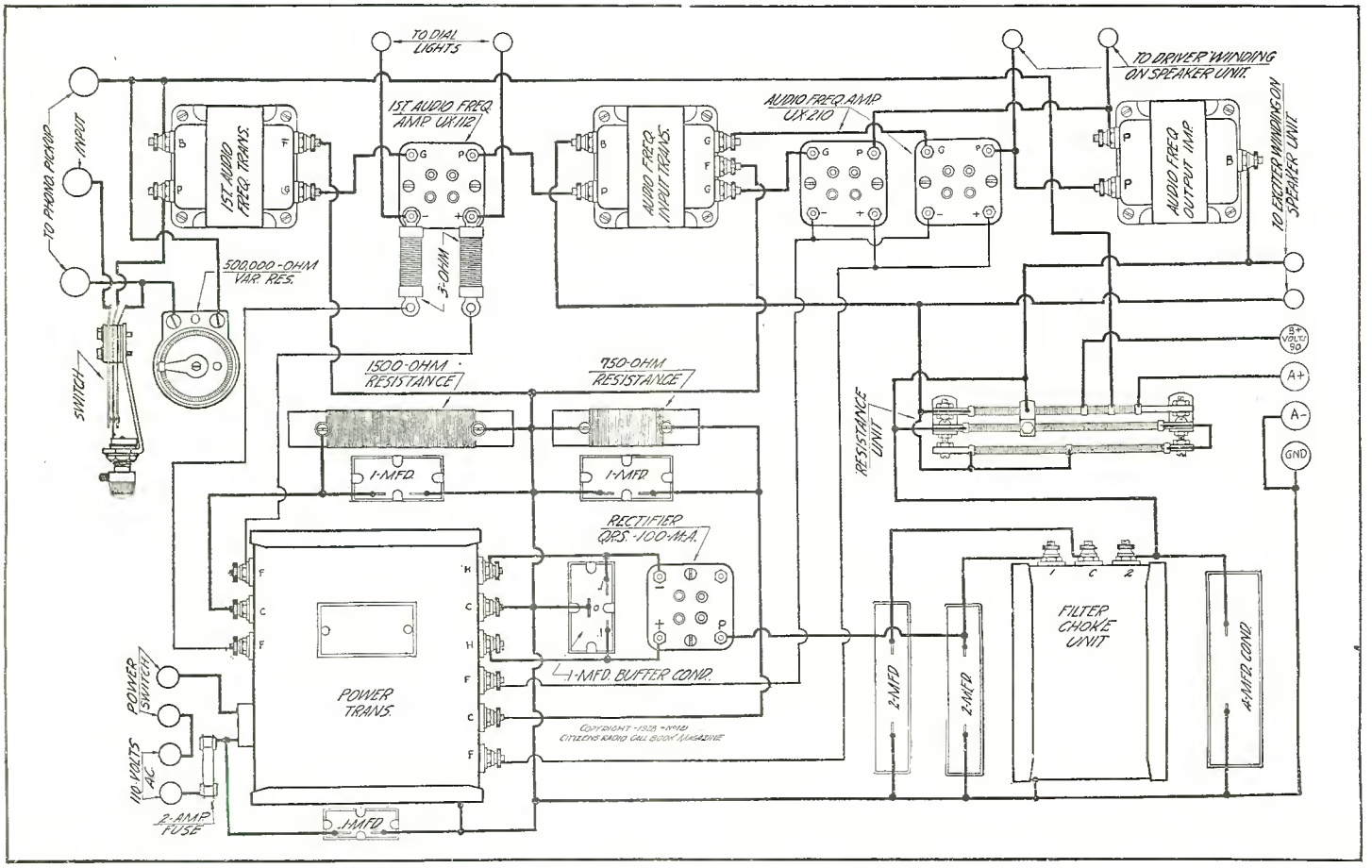


Figure 7. In constructing this power amplifier the builder would do well to follow the graphic diagram above very closely, since it shows the exact connections to be made for the power amplifier

1—Sangamo .001 mfd fixed condenser
1—Electrad 2 megohm grid leak
1—Electrad grid leak mounting
1—85 Sampson r. f. choke coil
1—Carter 0-200,000 ohm volume control
1—P-600 Carter 600 ohm fixed resistance
1—PA-500 Carter 500 ohm fixed resistance
2—PA-400 Carter 400 ohm fixed resistances
1—MW-2000 Carter 2,000 ohm variable resistance
7—Eby engraved binding posts
1—Hart & Hegeman 5-amp. 250-volt panel switch
2—Benjamin sub-panel brackets
1—7x18x3/16 inches drilled and engraved Courtland front panel
1—7x18x3/16-inch drilled Courtland sub-panel
1—Sub-panel, 7x18x3/16-inch
25—Ft. Acme Celatsite wire
1—Pkge. Kester radio solder
1—Ekko ground clamp

(Power Unit)

1—T-2098 Thordarson power transformer
1—T-2099 Thordarson choke unit
1—T-2408 Thordarson push-pull input transformer
1—T-2420 Thordarson push-pull output transformer
1—R-200 Thordarson audio transformer
4—530 Frost sockets
1—Acme Par-volt 4 mfd high voltage filter condenser
2—Acme Par-volt 2 mfd. high voltage filter condensers
1—Acme Par-volt .1-.1 mfd. buffer condenser
2—Acme Par-volt 1 mfd by-pass condensers
1—Acme Par-volt .1 mfd by-pass condenser
1—101 Carter resistance unit
2—H-3 Carter 3 ohm fixed resistances
1—P-1500-40 Carter 1500 ohm fixed resistance
1—P-750-60 Carter 750 ohm fixed resistance
15—Eby engraved binding posts
1—3 amp. fuse
2—Fuse clips
1—Jensen dynamic speaker

Figure 8. Front view of the Bodine Twin Eight A.C. is shown in this photograph, being mounted in an Excello console

25—Ft. Acme Celatsite wire
1—RC-10 Bodine phonograph motor
1—Carter 0-200,000 ohm variable resistance
1—Carter jack switch
1—QRS 100 m. a. rectifier tube

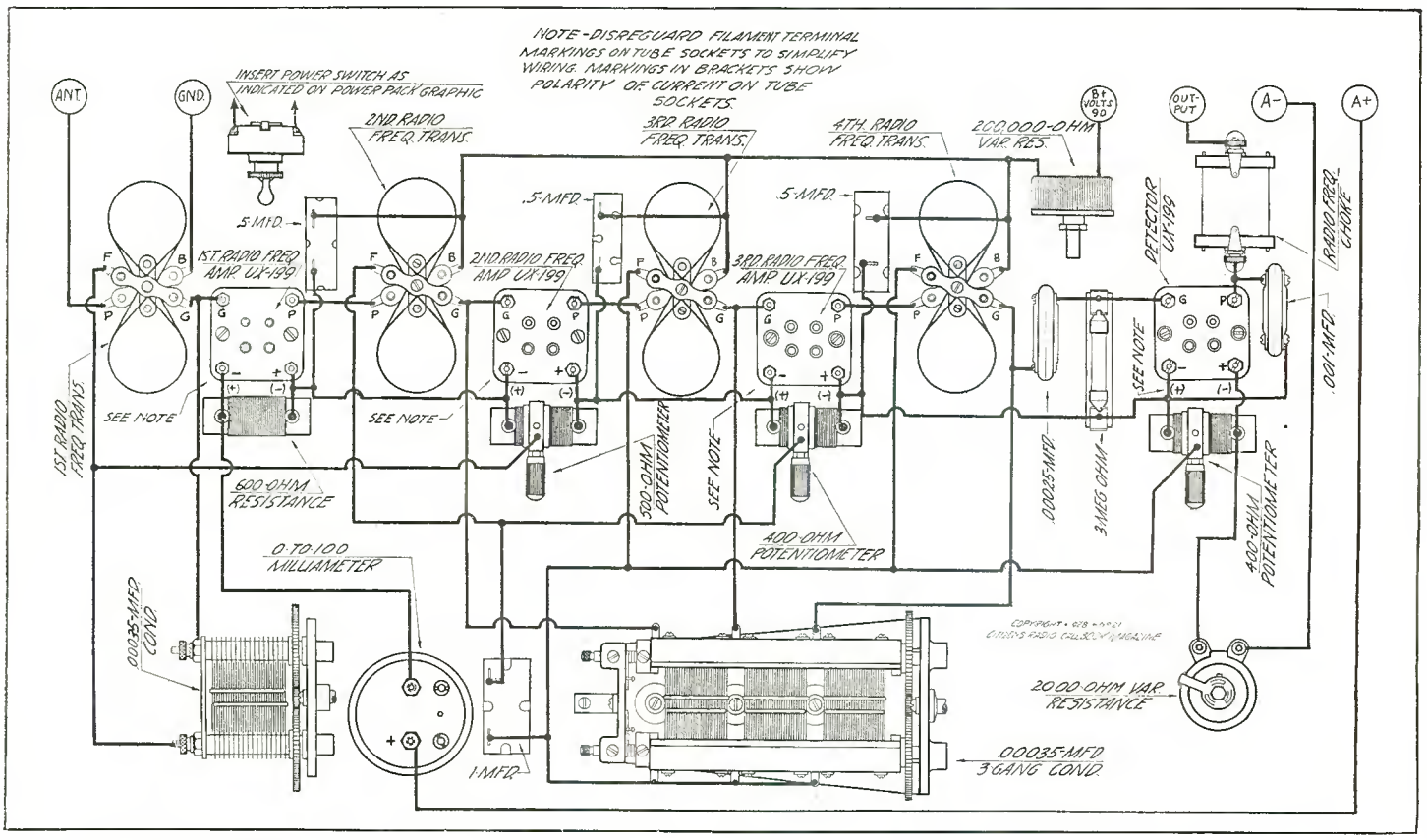


Figure 9. All wiring of the receiver may be accomplished by means of the graphic illustration shown above

Browning-Drake A. C. Operated With Acme Power Supply

Popular Receiver Converted for Alternating Current Operation with Power Supply Ample to Take Care of All Demands

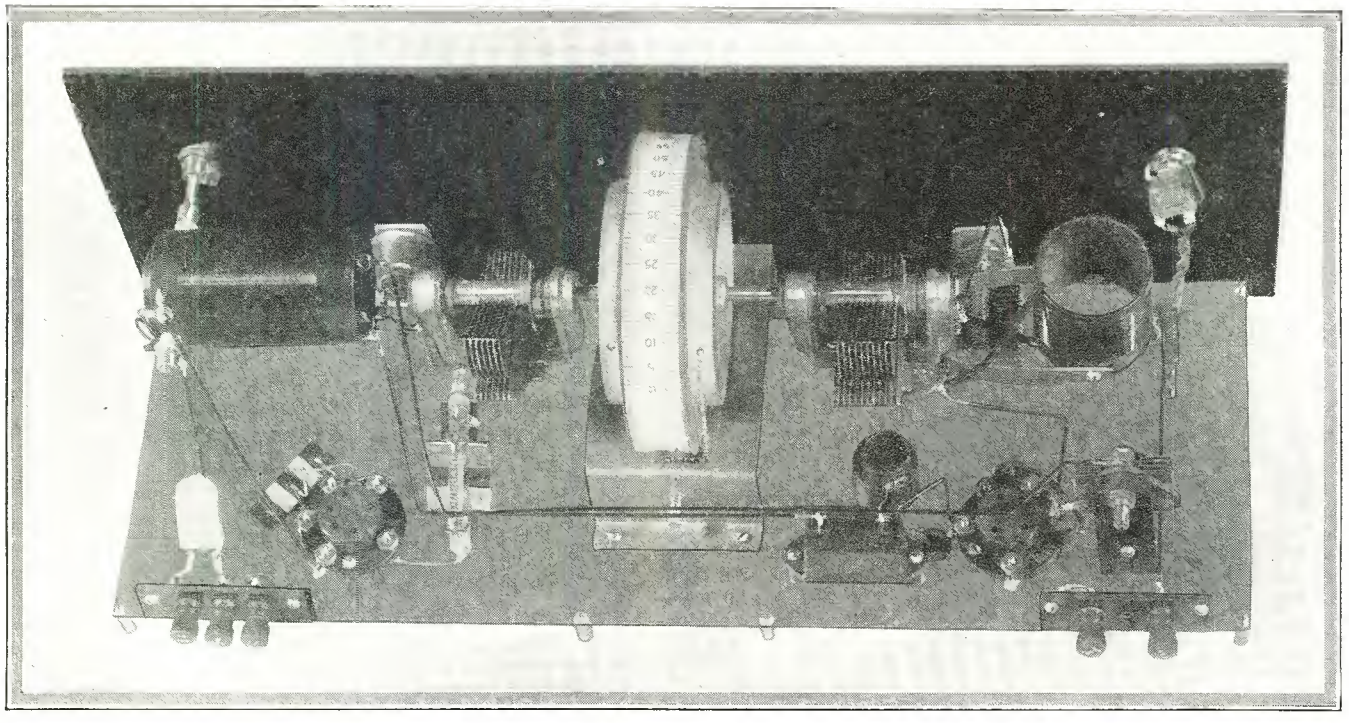


Figure 1. Rear photographic view of the Browning-Drake receiver described in this article

GREAT flexibility is the keynote in radio design today, since the consumer public has come to realize the many advantages of separate audio and radio frequency amplifiers. A brief review of these two systems will show why this is so.

Radio frequency material, that is, the tuning and amplifying apparatus, is usually of light weight. Recent day shielding has increased this weight somewhat, but nothing in respect to the weight of audio and power apparatus.

Audio frequency apparatus with the large amount of wire and iron core necessary to obtain good low tone reproduction has become increasingly heavy during the past two years. When combined with power supply apparatus the weight and bulk of this end of the receiver become a problem.

By building an r.f. amplifier separately from the a.f., the part of the receiver combination which must be in view on the table can be greatly reduced in size and weight and it is light and easily moved.

The audio end of the receiver may be put away on a shelf below the table, or it may be put in a separate cabinet or closet. This makes an admirable arrangement. Prior to this time the placing of the storage battery entered into our problem, but with the arrival of a.c. tubes and the necessary apparatus for their use this last problem of clean, efficient and flexible radio is solved.

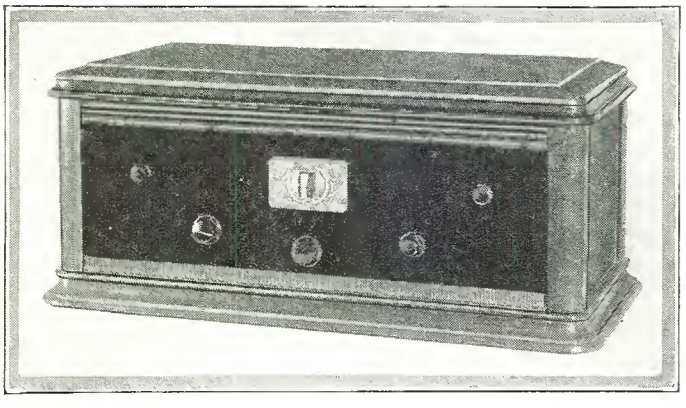


Figure 2. The receiver is here shown in an Ehlert cabinet

Well-Known Circuit

The Browning-Drake circuit is so well known to radio fans and set builders the world over that it is not necessary to go into its development in 1923 by two Harvard research fellows. Since its inception, the main circuit has been changed only in minor details, although from time to time the layout of parts and the machanical design has been brought up to date.

Now Uses Large Tubes

One change that has been made is that a neutralization system has been developed so that a large tube may be used as the r.f. amplifier. The 201-A types of tube have some advantage over the 199 tube, though really they are not more efficient amplifiers, but the life of the 199 tubes is so short that it seemed advisable to utilize if possible the storage battery type or a.c. tubes throughout. The neutralization system consists, as will be noted from the wiring diagrams, of a number of extra turns

(This receiver tested and all illustrations made in our laboratory)

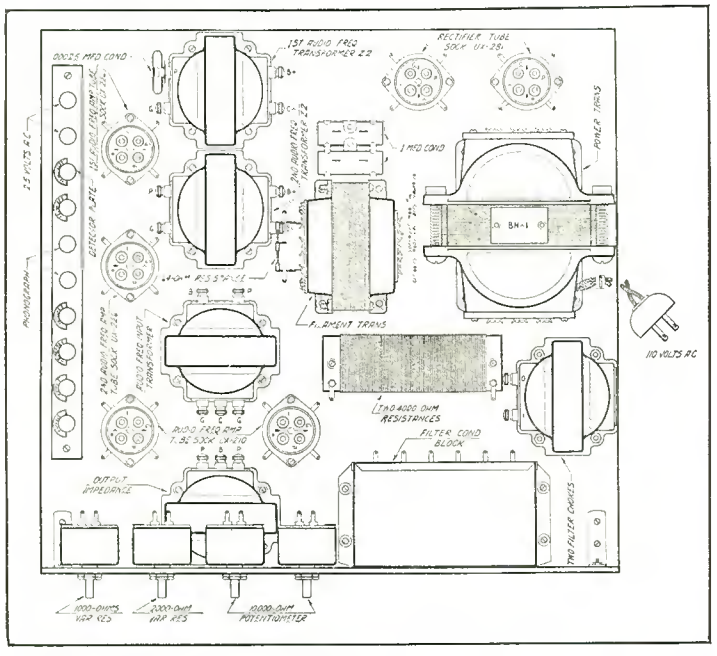


Figure 4. This is the baseboard layout of the Acme power amplifier

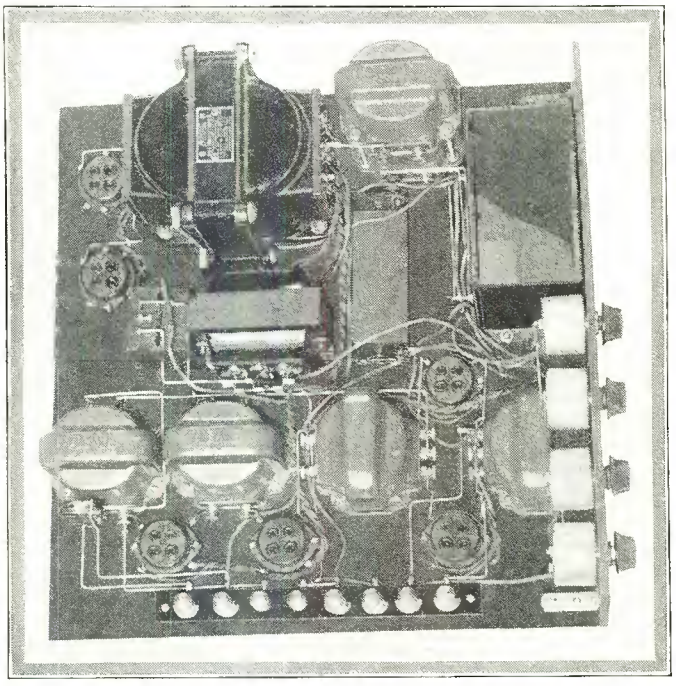


Figure 5. In this photograph may be seen the Acme amplifier after it has been completely wired

added on the secondary of the r.f. transformer and its end connected to the rotor plates of the neutralizing condenser, the stator plates are then connected to the grid of the first tube. It was also found advisable, even with this system of neutralizing, to keep all r.f. current out of the B supply. Consequently, a condenser of .5 mfd is put in the line which runs to the primary of the r.f. transformer and a parallel feed put in which incorporates a r.f. choke connected directly to the plate of the tube, the other end going to the B supply.

For the first time, shielding is being recommended for the circuit. The last official kit-set was made as sharp as possible, but when the receiver was within a radius of a mile or so of broadcasting stations, it was found that such a large amount of signals were picked up on the coils and the wiring of the set that it was extremely difficult to receive distance while the locals were on. Four or five miles away from broadcasting stations the set operated satisfactorily indeed. The set builder now has an option of whether to completely shield the receiver or not, and he should be governed in his choice by his local conditions. If he is in an extremely congested region, he should by all means completely shield the two tube tuner, while if he is in the country this will be an added expense which is entirely unnecessary. In order to facilitate the use of shields and not make the tuner two bulky in size (the shielding in all cases must be kept 1 inch away from the low potential end and 1½ inches away from the high potential end of the coils in order that their efficiency is not reduced) it was necessary to cut down the tuning coils from the 3-inch form to a 2-inch.

The kit for the new Browning-Drake might be called a single mount unit, as it has the two B-D condensers driven by the single illuminated drum dial and the two coils necessary for the circuit all mounted together. In fact, it is only necessary to secure the foundation unit which consists of front and sub-panel and a few other pieces of apparatus to make a tuner which may be used with any type of audio system. This kit may either be built with the new a.c. tubes or may be operated, as formerly, from a storage battery and a trickle charger. Or course, many set builders will desire to make the receiver operated entirely from the electric light socket, and for their information the wiring diagrams for the electrically operated tuner is given.

It is felt wise from the home constructor's standpoint to let him choose his own favorite audio systems. This is especially true as many parts manufacturers are putting out parts for complete B battery elimination and power amplification or are building power amplifiers with B supply complete as one unit.

Acme Power Amplifier

This article shows the two tube Browning-Drake tuner combined with the Acme power amplifier and B supply. The combination works out very well. As has been stated before, the tuner may be run by means of a.c. tubes from the electric light socket direct, or the constructor, if he prefers, may use the storage battery type of tubes employing a six volt storage battery with the trickle charger. In either case a B supply is obtained from the eliminator on the power amplifier. Few constructional details on the tuner are neeessary, as the units are so placed that wiring is simplified as much as possible. Of course, the high potential wires should be kept well away from each other. The .5 mfd by-pass condenser between the plate of the r.f. and the primary of the r.f. transformer should be kept well away from the shield as shown in the pictures. The lead from the extra turns on the secondary to the neutralizing or balancing condenser should be kept well away from all other connections. Also, be sure this lead is connected to the rotor plates on the neutralizing condenser and not to the stator, i.e., the stator plates of the neutralizing condenser should go direct to the grid of the first tube. The .0001 condenser in series with the antenna should be tested as to its size, if possible. In fact, it might be better, if the home constructor so desires, to put in a Precise variable .0001 and this can be adjusted to his own peculiar antenna conditions. A Precise midget condenser of 135 mmf. is placed in parallel with the first tuning condenser and it must be slightly adjusted when distant stations are received. The balancing and tuning of the receiver are exactly the same as the previous models of Browning-Drake.

Balancing the Receiver

When the set has been constructed according to the diagrams, it is ready to balance. If it is performing as it should, turning the rotor coil should give a slight "plop" whereupon touching the finger to the grid side of the radio frequency transformer—the stator plates of the second tuning condenser—the "plop" should be repeated. This is the test for oscillation in the secondary of the radio frequency transformer. With the tickler coil set in this position, station whistles should be heard upon rotating the drum dial, if any broadcast station above the noise level is operating. The receiver would then seem to be operating normally and should be balanced so that no radiation is sent out and maximum signal strength and selectivity is obtained. Tune in a local station by means of the drum dial together with the trimmer condenser and turn out the first tube, leaving it in its socket. Prob-

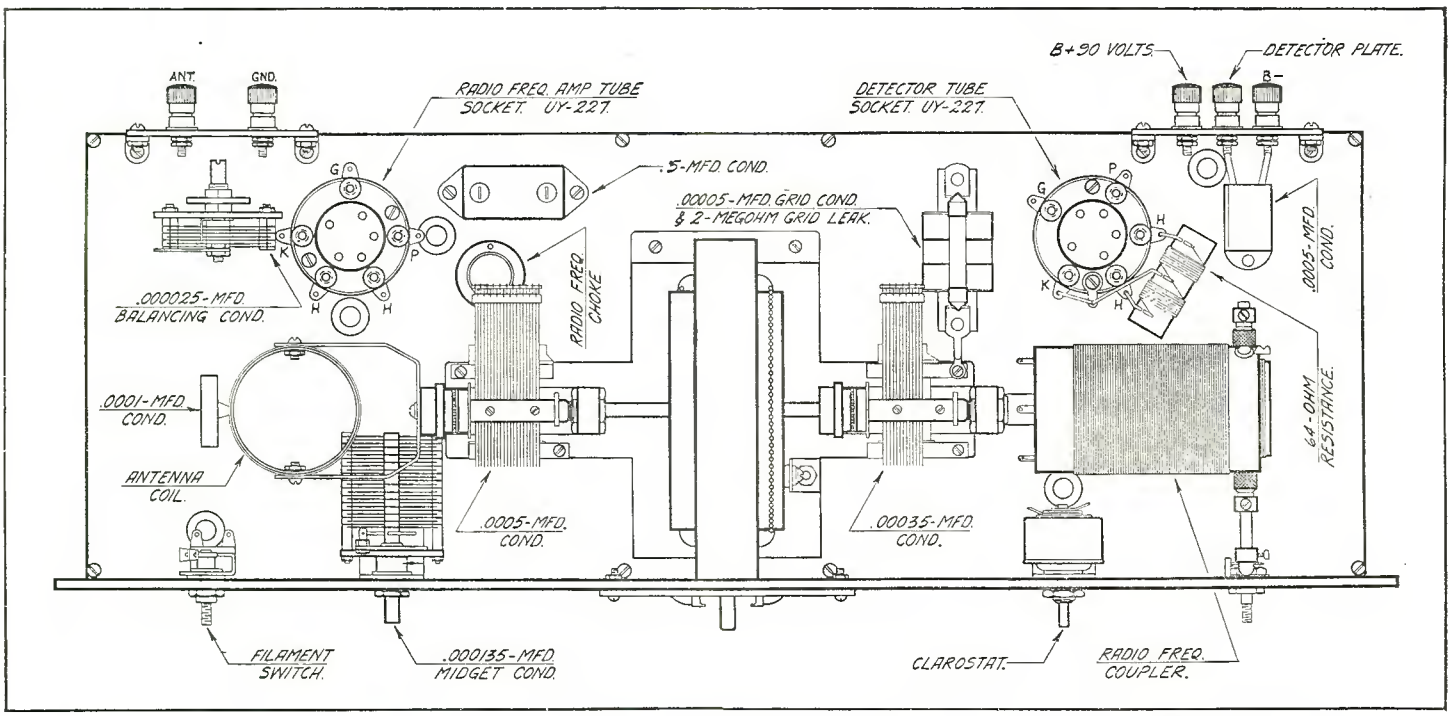


Figure 6. In this drawing may be seen the actual layout of the sub-panel for the Browning-Drake receiver

ably the local station will still be audible or can be made so by adjusting the tickler coil and turning. Now set the balance condenser in such a position that a minimum signal is obtained. The receiver is then balanced or neutralized. In case of several local stations, the one chosen for balancing should be the one operating on the lowest wavelength. Where there are no local stations, the set may be balanced by tuning in the whistle from a semi-distant station. Set the balancing condenser so that changing the tuning does not change the pitch of the whistle. Of course, the intensity or loudness of the whistle will always be affected by the thing, so do not confuse this with the pitch of the whistle.

A little experience in tuning on the part of the operator is better than detailed instructions, although a few suggestions may be useful. After the receiver has been balanced, according to the directions given, it is ready to operate. With antenna, ground, batteries, etc., connected, set the rotor coil on the B-D transformer in such a position that the secondary circuit is oscillating. Turn dial until a whistle is heard; this whistle is the carrier wave of the transmitting station beating with the oscillation of the detector tube, and will be heard if a station above the noise level is transmitting. Turn back the rotor coil so that the whistle disappears and, at the same time, adjust trimmer condenser until the signals are loudest. Readjust the tuning and the rotor coil until satisfactory volume is obtained. It will be found that the Clarostat makes an excellent volume control; it regulates the signals received without detuning the set. Always keep this Clarostat turned down as far as possible, consistent with sufficient volume. The receiver is very selective, therefore it is necessary to tune the circuits to exact resonance in order to obtain the best quality. Always regulate the volume by the Clarostat and the tickler coil—never by setting the dials off resonance. In case the builder is located in a nest of local broadcast stations, complete shield will stop any pick-up from the local stations on the coils and wires of the set so that outside stations should be easily tuned in while locals are operating.

Even an inside antenna of from 10 to 20 feet is entirely satisfactory for reception of local and semi-distant stations. As much of this as possible should be vertical. An outside antenna of 60 to 70 feet, however, is recommended for all-round purposes. The above length includes the length of the lead in. This antenna also should be as high as possible. If a tree is conveniently located, a single wire from the house to the tree is excellent. The antenna should, of course, be well insulated and located as far as possible from power lines and other electrical wires and cables. The ground connection is best made to a cold water pipe by means of a clamp. Connections to other pipes, however, such as steam or hot water heating systems, are usually satisfactory. Having the r.f. end of our combinations in working order, we proceed to our next unit, the tone quality link in our radio chain.

Parts Used

Parts used in the receiver and power amplifier construction are:

Receiver

1—Browning-Drake single mount kit
1—Browning-Drake foundation unit
1—Hammarlund .0005 mfd variable condenser
1—Hammarlund .00035 mfd variable condenser
1—Precise .000135 mfd midget condenser
1—Aerovox .5 mfd locking condenser
1—Aerovox .0001 mfd fixed condenser
1—Aerovox .00005 mfd grid condenser with prongs
1—Durham 8 megohm grid leak
1—Universal Clarostat
1—Tobe .001 mfd fixed condenser
1—Yaxley filament switch
2—Benjamin 5 prong sockets
1—Browning-Drake r.f. choke
5—Eby engraved binding posts
20—Feet Corwico Braidite flexible wire
1—Ekko ground clamp
1—Package Kester radio solder
Miscellaneous—lugs, nuts, screws, etc.

Power Supply

2—Z-3 Acme audio transformers
1—PT-1 Acme input transformer
1—PT-2 Acme output transformer
1—BH-1 Acme power transformer
2—B-2 Acme chokes
1—AC-2 Acme filament transformer

Figure 8. In this photograph the receiver has been mounted in an Ehlert console

6—Eby sockets
1—F1000 Polymet condenser block
2—Polymet 1 mfd bypass condensers

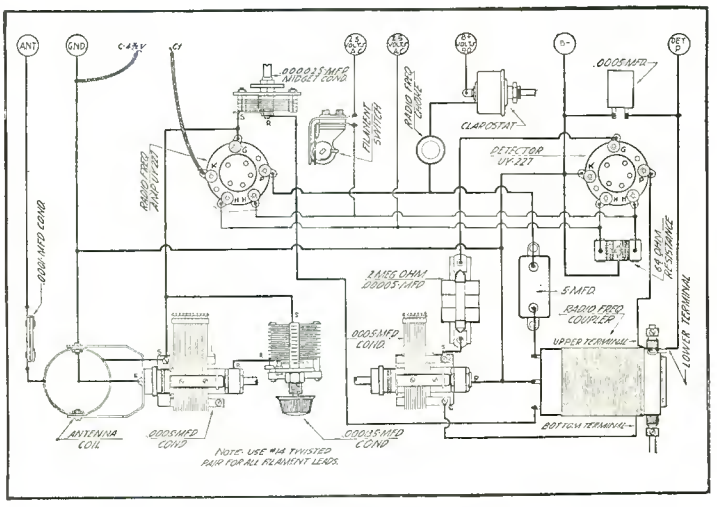


Figure 9. This is the graphic circuit by means of which the receiver should be wired

1—Polymet .00025 mfd fixed condenser
1—FT-64 Frost 64 ohm center tapped fixed resistance
2—CRL 4,000 ohm fixed resistors
2—CRL 10,000 ohm heavy duty potentiometers
2—CRL 2,000 ohm heavy duty potentiometers
1—CRL 1,000 ohm heavy duty potentiometer
8—XL binding posts
1—7x16x3/16 inch Formica panel
1—16x15x½ inch wood baseboard
30—Feet Corwico Braidite wire
1—Package Kester radio solder
Miscellaneous—lugs, nuts, screws, etc.

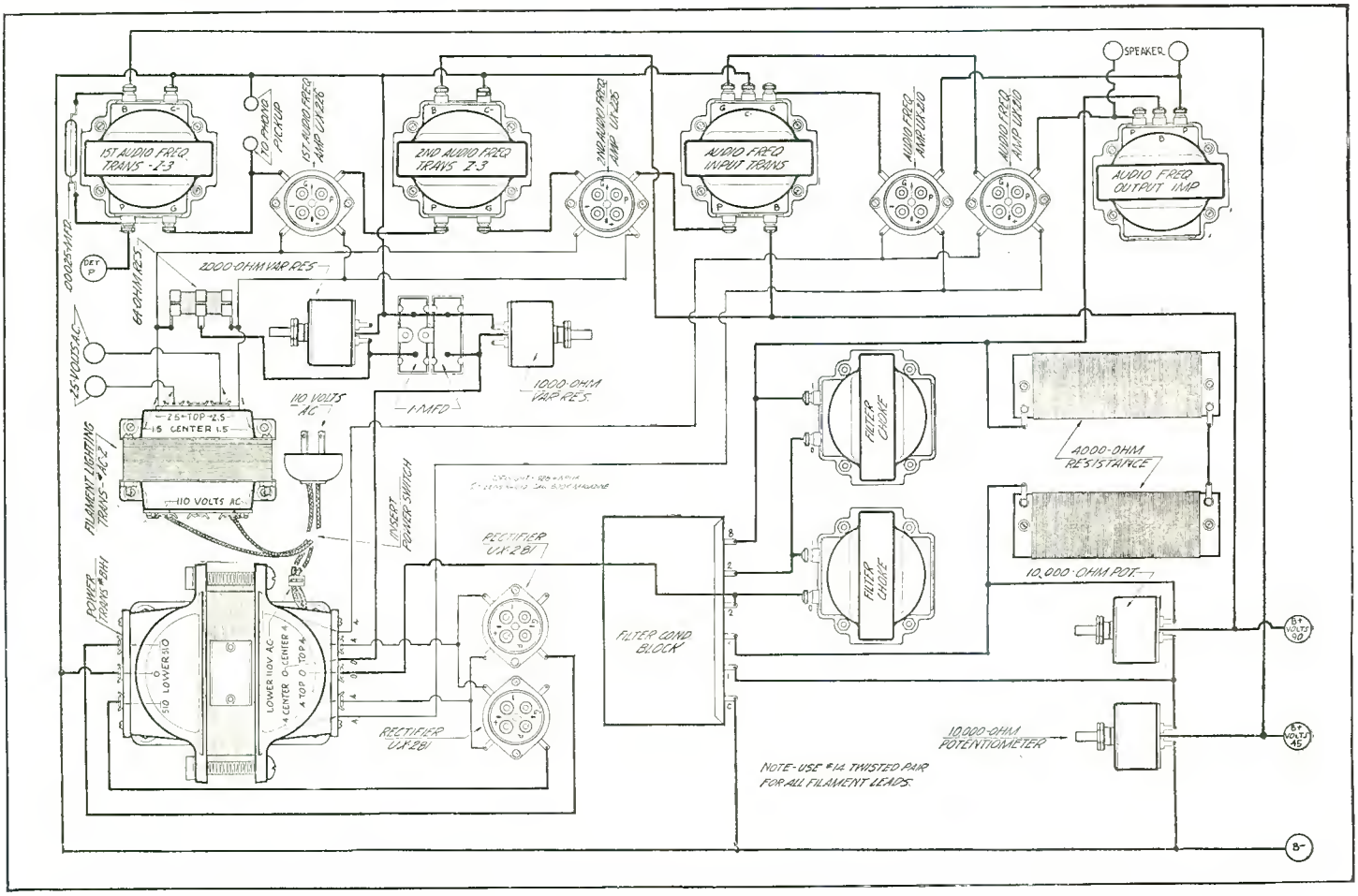


Figure 10. Above is shown a graphic representation of the power amplifier which should be followed religiously for wiring of that supply

St. James Twin Four Built U-Shaped for Compactness

Eight-Tube Superheterodyne Greatly Simplified Using Only 21-inch Panel; Intermediates Have Small Field

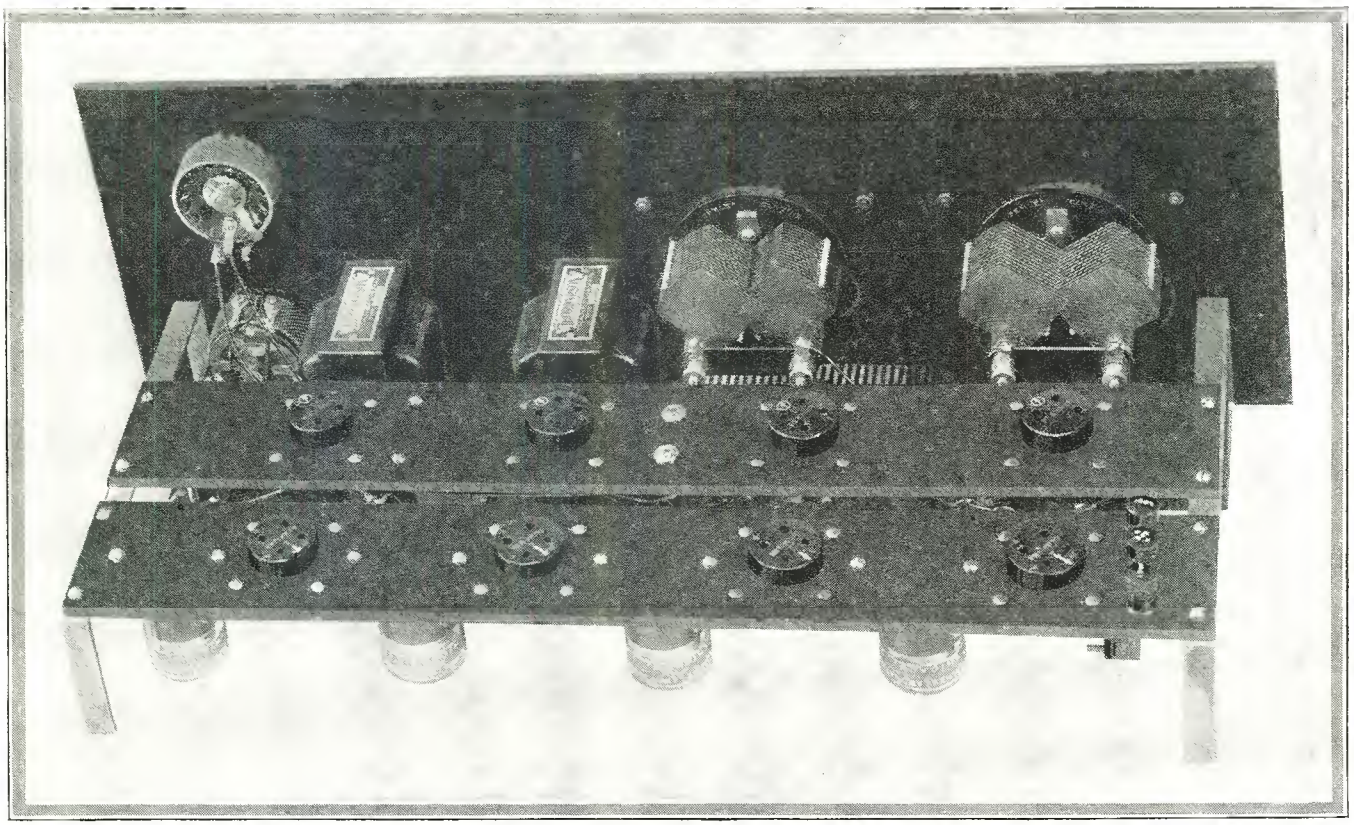


Figure 1. In this photograph may be seen the rear view of the St. James Twin Four described in the accompanying article. Note the tubes are carried on two separate strips for simplicity of wiring and compactness

READERS of all publications have been frequently exhorted to minimize the wiring involved in a receiver, because of the fact that such a receiver would necessarily function better with a small amount of wire rather than if a larger amount of wire was used. However, it is doubtful if our readers have seen many receivers in which the amount of wiring is cut down to 10 feet for all connections, which is the case in the St. James Twin Eight superheterodyne about to be described in this article. This wiring is divided into two portions, one of which is in opposition to the other. Examination of the photograph shown in Figure 1 will give the reader an idea of the U-shaped construction of the set. A still better idea may be gained from the perusal of the baseboard layout shown in Figure 2, where it will be seen that at the extreme left of the sub-panel are located the three loop terminals which lead directly to the first detector tube and to the right-hand tuning condenser. The output of the first detector is led directly into the first intermediate frequency transformer, thence into the second intermediate tube, then into the second intermediate transformer, thence to the second intermediate amplifier, into the third intermediate transformer and then into the third intermediate amplifier tube and the fourth intermediate frequency transformer. In a normal receiver the apparatus previously mentioned would be closely placed and the second detector and the ensuing material would then be extended toward the right. However, in the design of the St. James Twin Four it was deemed advisable to make a turn and continue towards the left in the form of a "U" This physical arrangement also provides that the audio frequency section of the receiver will be opposite, or nearly so, the intermediate frequency amplifier section. Therefore, taking the strip nearest the panel at the right we have the second detector tube whose plate feeds into the first audio transformer, whose output goes to the first audio tube and whose plate goes into the primary of the second audio transformer. The output of the last named transformer is led to the grid circuit of the second audio amplifier which is a 112 tube whose plate circuit is carried to a pair of tipjacks located on the sub-panel. The oscillator coupler shown in dotted lines and the oscillator socket are located at the extreme left of the sub-panel.

No Oscillator Field

Because of the exceedingly small wiring used on the oscillator and the fact that it is located extremely close to its tuning condenser, practically no energy is given off by this circuit in the form of radiation and, therefore, it does not interfere with the operation of the balance of the receiver. Another feature of the set lies in the fact that on account of the minimizing of the wiring necessary for hooking-up the receiver the inherent pick-up of the set is materially reduced. Where in some receivers it is necessary to shield the set in order to cut down local pick-up, in this particular model on test it was found to be quite insensitive

(This receiver constructed, tested and all illustrations made in our laboratory)

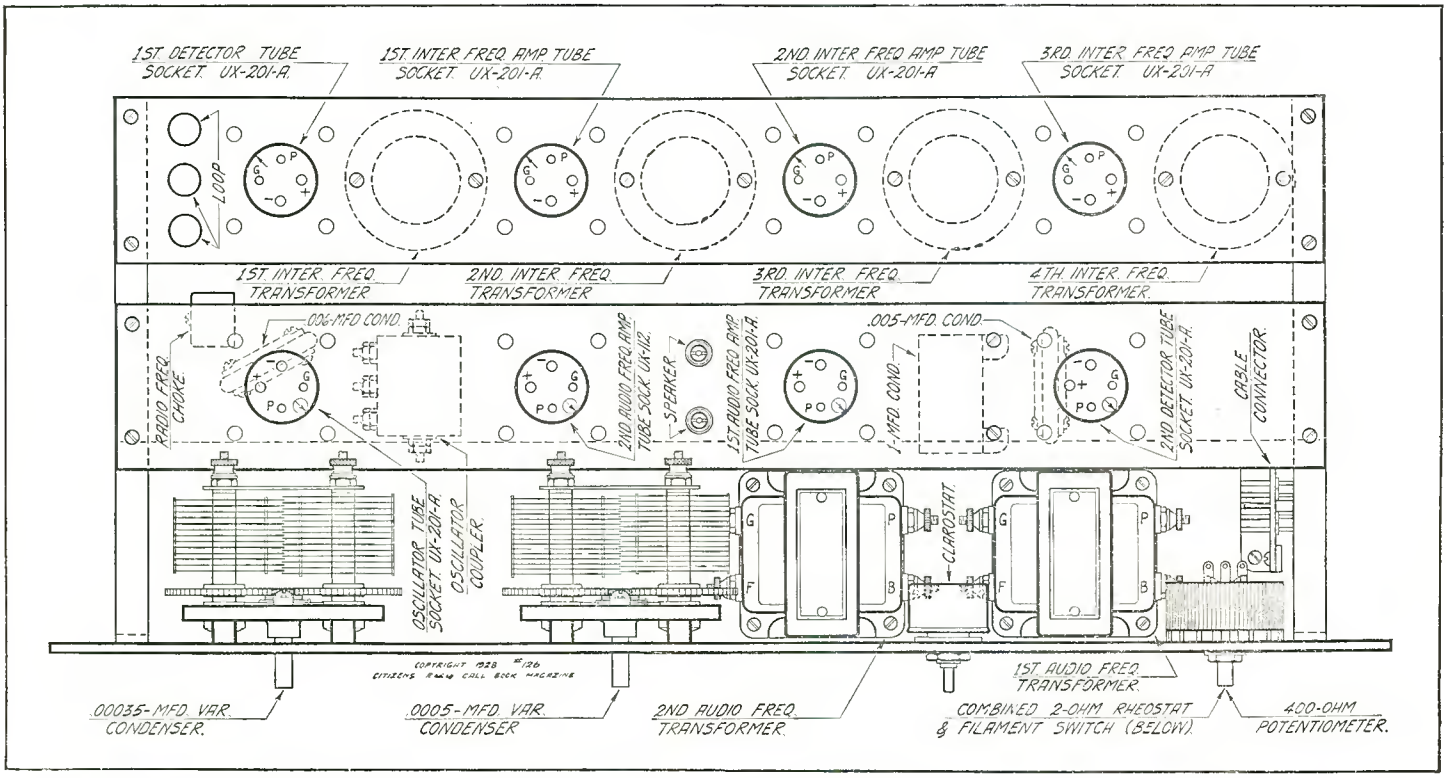


Figure 2. In this baseboard layout the reader will note the position in which each article is placed. The two audio transformers are located on a sub-panel extending across the bottom of the front panel

to local field strength and this is considered a good condition.

Vacuum Impregnated Coils

All of the intermediate transformers used in the receiver are St. James and are vacuum impregnated and also on account of their small physical dimensions do not create a disturbing field. Control of the amplifying property of the intermediate stages is by means of a 400-ohm potentiometer connected to the grid return of the first, second and third intermediate frequency transformers. Rectification in the second detector is by means of a separate 4½-volt C bias battery with its positive terminal connected to the center arm of the potentiometer and its negative terminal connected to the grid return of the fourth intermediate transformer. The 400-ohm potentiometer arm is by-passed to the negative side of the filament circuit by means of a 1 mfd condenser.

Wiring Is Very Simple

In wiring up the receiver it is best to proceed with the two strips running parallel on the sub-panel brackets. The filament connection should be wired in first, using black Celatsite for the negative and red for the positive. The pieces may be cut 12¼ inches long, stripped and by passing through holes in lugs a firm mechanical joint is made which is easily soldered. A piece of blue Celatsite may be used to connect the positive posts on the four intermediate transformer sockets.

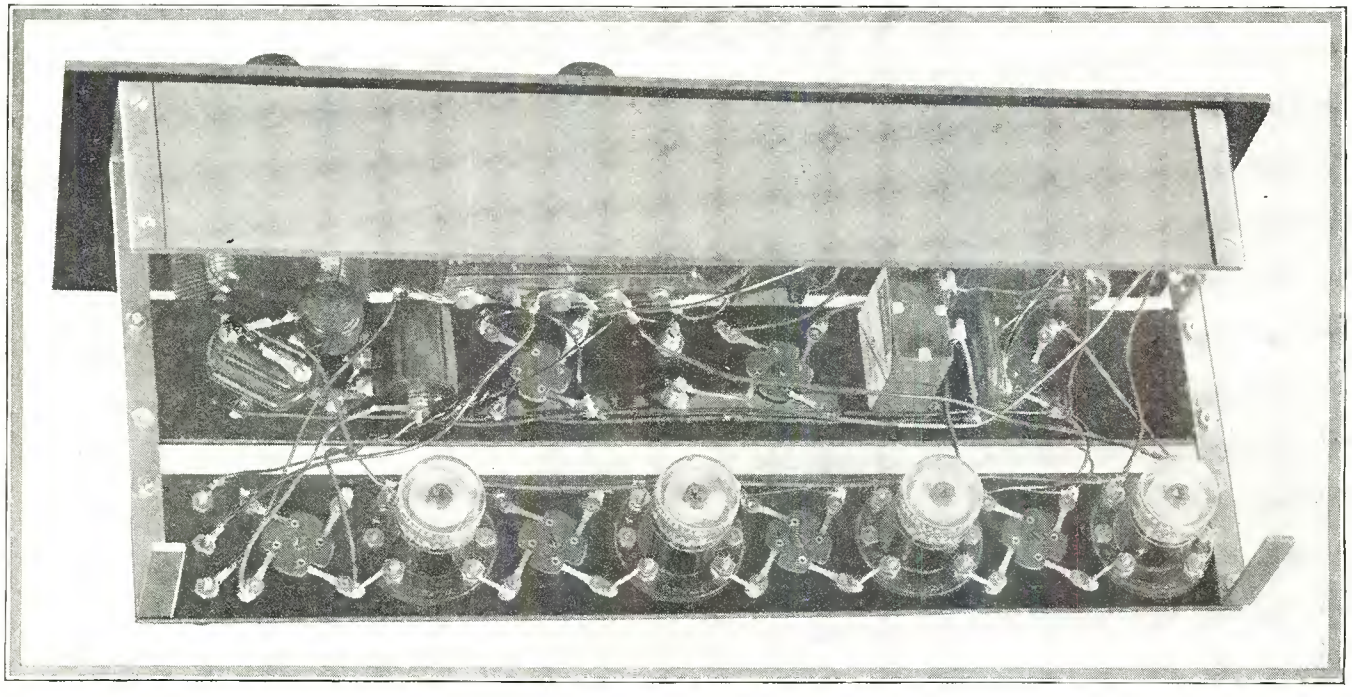


Figure 3. This photographic view shows the underside of the St. James Twin Four and gives the reader an idea as to the appearance of the set below the sub-panel

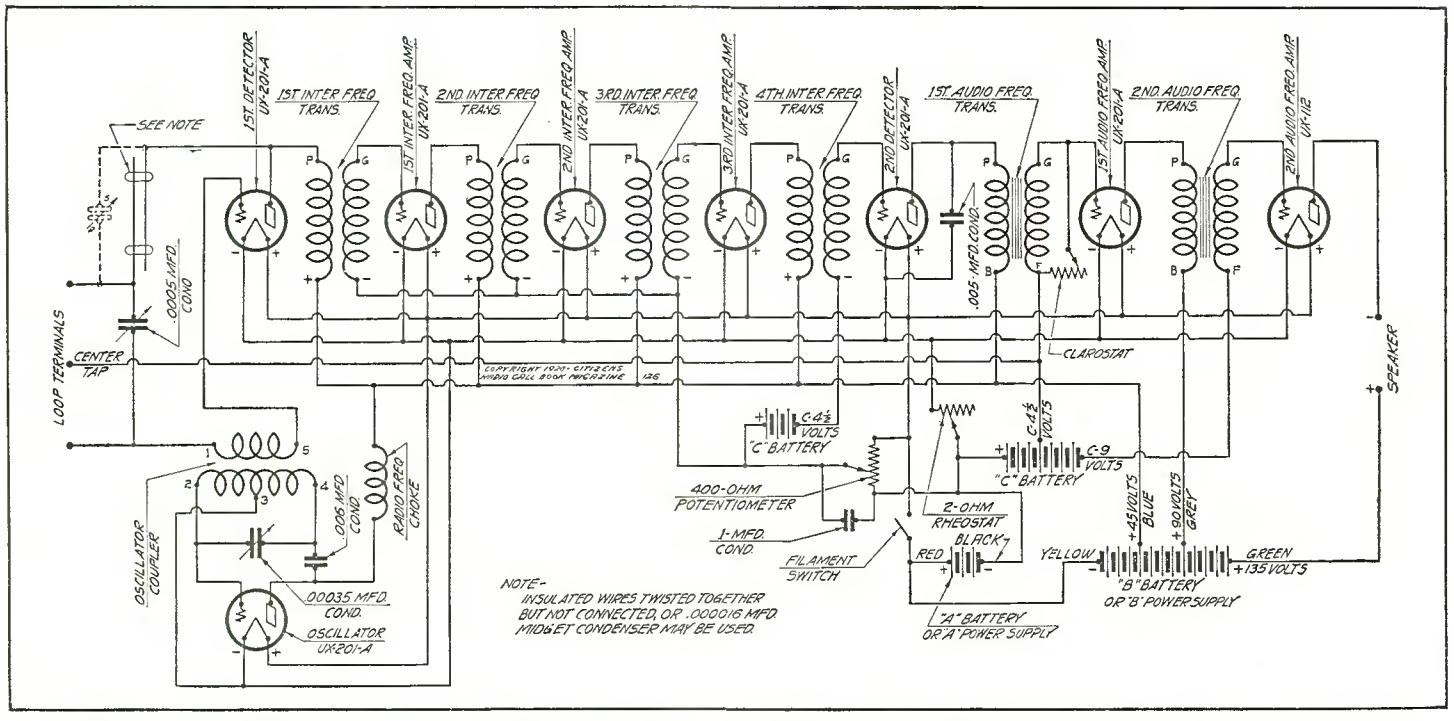


Figure 4. Schematically the receiver is illustrated above. While in the schematic two pieces of insulated wire are used as a regenerative condenser on the first detector, nevertheless for extreme flexibility it would be advisable for the builder to include a midget condenser in the receiver

A piece of yellow Celatsite may be used for connecting the negative terminals of the first, second and third intermediate sockets, leaving about a 5-inch length from the third intermediate transformer to connect later to the center arm of the potentiometer. Terminal G of the intermediate socket leads directly to the G terminal on its respective tube, two lugs usually being sufficient to reach between these points. The oscillator coupler connections are very simple and may be seen either from the graphic in Figure 5 or the detailed sketch shown in Figure 6.

The Frost 2-ohm rheostat is also a switch and is located on the front panel, this being the bottom control at the right in Figure 8. As the 400-ohm potentiometer is located above the rheostat, short connections supply it with positive and negative A current The negative should be connected to the clock-wise end. The

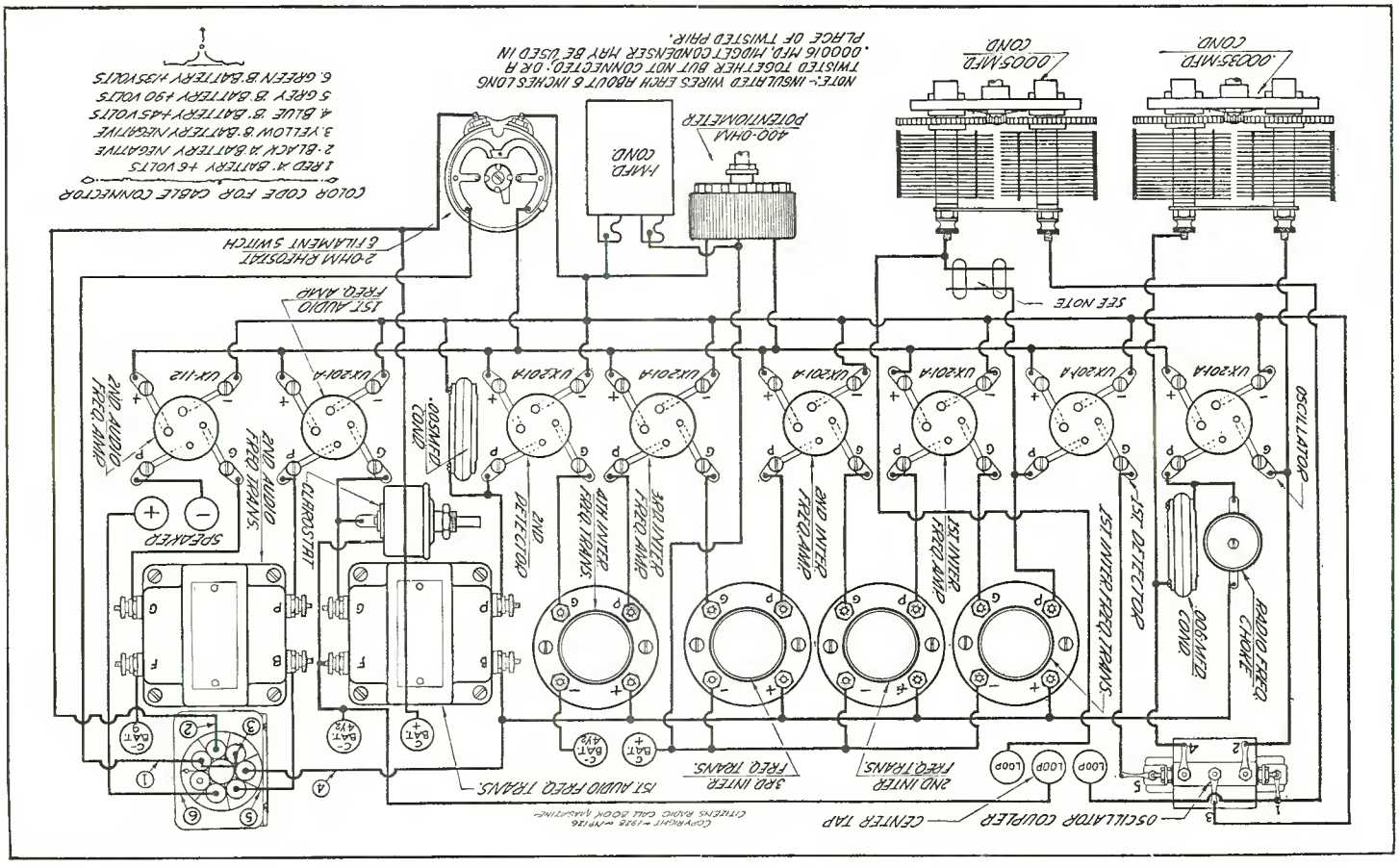


Figure 5. In this diagram is shown the graphic method of wiring a receiver, which method is exceedingly popular with the newcomers in radio. Even those experienced in set construction may be able to save some time by following this form of wiring diagram

blue terminal on the cable plug is connected to the blue Celatsite wire on the intermediates. A short lead from blue on the first intermediate goes to the r.f. choke and another from B on the first audio to blue completes this part. Lead from slate terminal of plug goes to B on second audio, and one from green of plug to one tipjack completes the plug connections with the exception of placing a short jumper between red and yellow on the plug.

All of this wiring should be done in accordance with the graphic wiring diagram shown in Figure 5, since it gives all details for hooking-up this compact receiver.

Two C batteries are shown, one for the audio frequency biasing and the other for the intermediate stage biasing. These batteries may be seen on the bottom shelf shown in Figure 3.

After tubes are inserted, cable attached to the power supply, with rheostat and switch turned off, turn on the rheostat and with the potentiometer turned to the positive side, or left side, set one dial at about the middle position of the scale, and bring the other to a point where a slight rushing noise is heard. By advancing the potentiometer to the right a point will occur where the set oscillates. Be sure to keep below this point. The filament voltage should be about 4½ volts and, once adjusted, will require no further attention. If twisted pair is used for the regenerative capacity of the first detector circuit, whistles will be heard when too much capacity is used and these whistles may be eliminated by untwisting slightly the pair of wires until the proper point is reached. If this setting is made at the higher waves it will hold over the band. This setting should be made just under the critical point. However, if a midget condenser is used and whistles are heard when the plates are meshed, the rotor should be turned out until the whistles disappear.

A little time spent in learning the proper tuning of the receiver will repay the operator in the results secured. The volume control while not essential, affords a wide variation in audio volume which often may be of advantage. The logging of stations will remain the same after these stations are once logged.

The receiver requires very little attention being limited only to the replacing of the C batteries, at the end of their life which in most cases runs between six and nine months. If B batteries of the dry type are used, their life will be prolonged to a great extent by changing them about.

Parts used in the building of this receiver are:

1—St. James upper socket strip
1—St. James lower socket strip
4—St. James intermediate frequency transformers
1—St. James oscillator
1—St. James choke coil
2—R-200 Thordarson audio transformers
1—660 Yaxley cable plug
1—1824 Frost 400-ohm de luxe potentiometer
1—S-1802 Frost 2-ohm de luxe rheostat
1—Remler .00035 mfd variable condenser

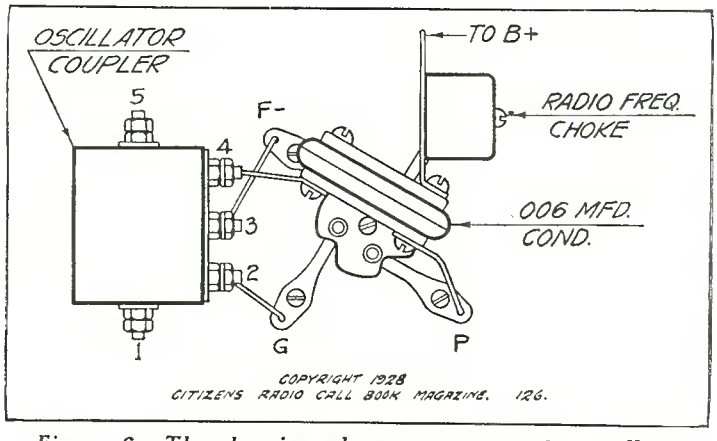


Figure 6. The drawing above represents the oscillator coupler, socket, radio frequency choke and by-pass condenser used in the St. James Twin Four. It is shown here because of its novelty and the fact that the oscillator coupler is probably the smallest in use at present and because of this fact its field is greatly reduced and does not cause inter-action with other circuits

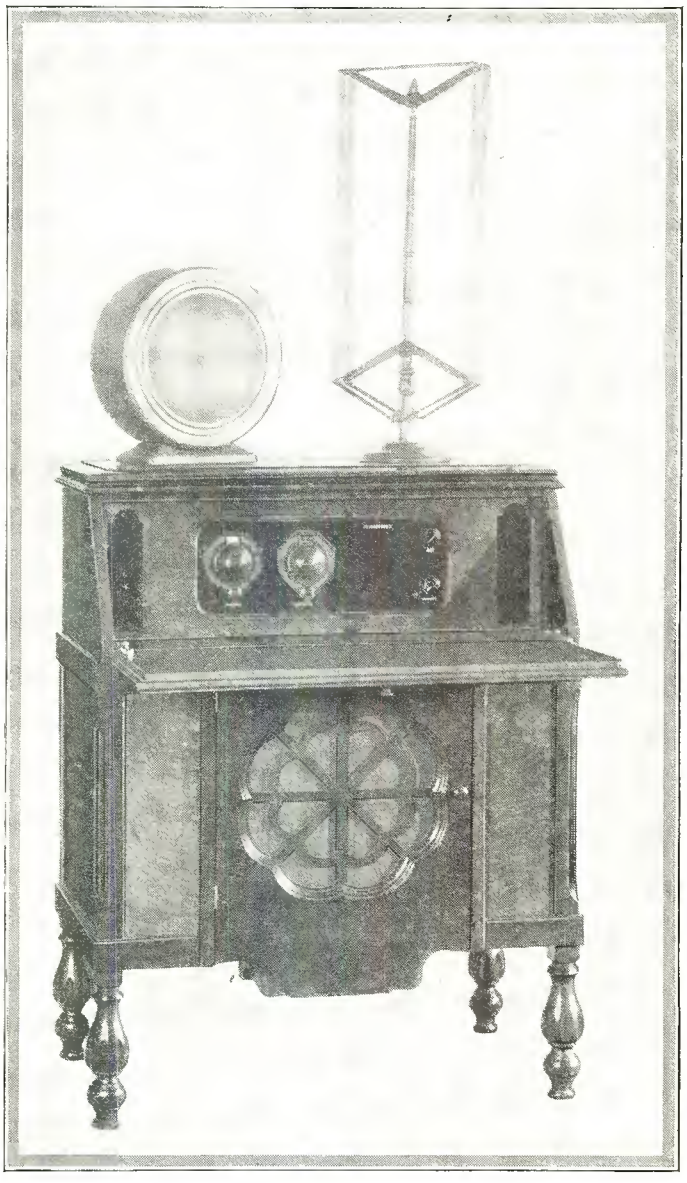


Figure 7. Above is photographed the St. James Twin Four in the Ehlert console with a Qualitone loop and a Quam speaker

1—Remler .0005 mfd variable condenser
2—Kurz-Kasch Aristocrat vernier dials
1—7x21x3/16 inch Lignole panel
1—3x8x3/16 inch Celoran strip
1—Clarostat
2—St. James special sub-panel brackets
15—Ft. Acme Celatsite wire
1—Pkg. Kester radio solder
Miscellaneous—lugs, nuts, screws, etc.

Figure 8. In this photograph the receiver has been placed in an Ehlert cabinet

Lynch-Precision Receiver Uses Resistance Coupling

This Receiver Is a Variation of the One Described on Page 76 of This Issue and Shows the Adaptability of the Lynch Deck

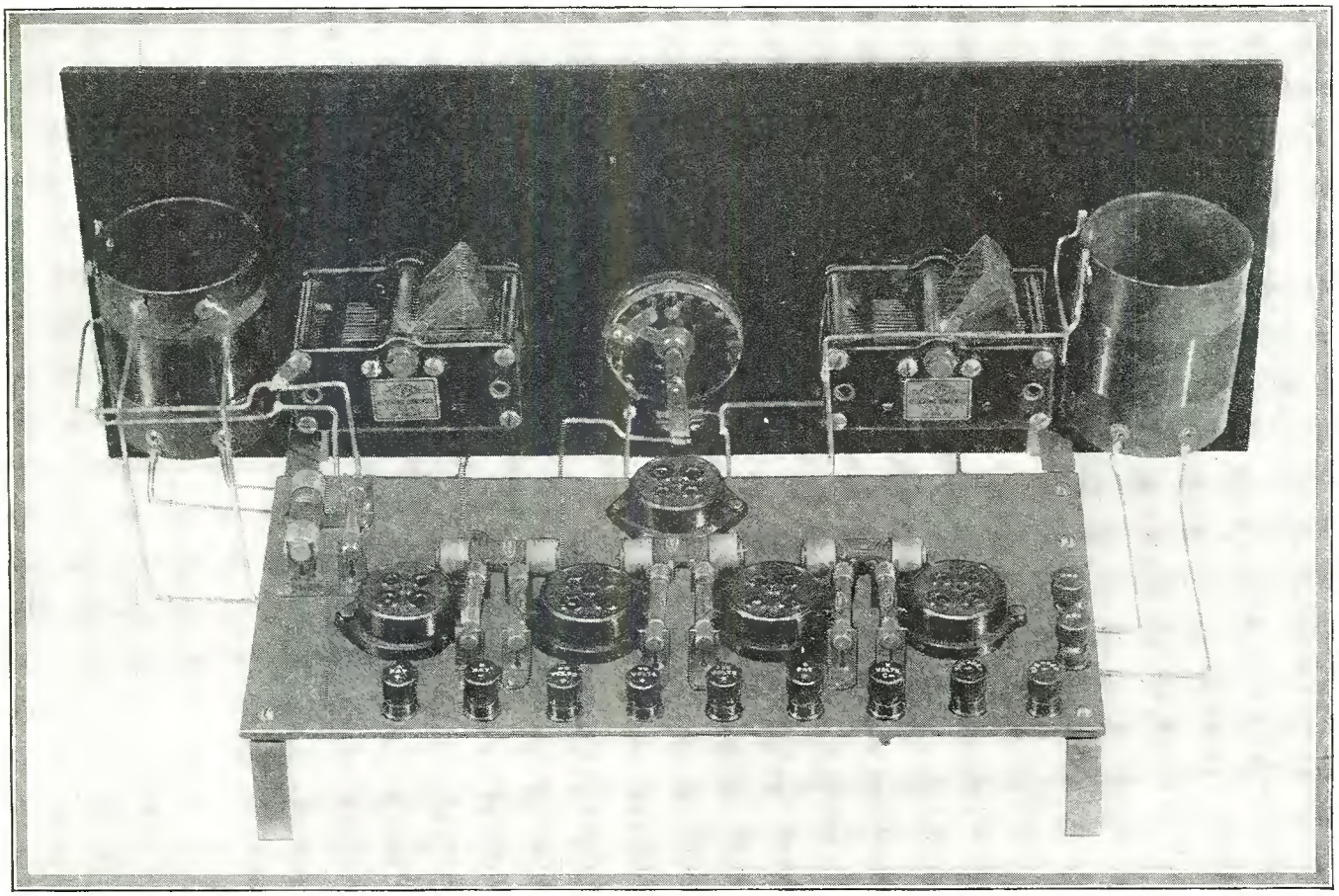


Figure 1. Rear photographic view of the receiver described in this article shows the simplicity of all parts

SHOWING the versatility of the Lynch deck which is described in another article on page 76, the present receiver utilizes the deck as the basis combined with Precision coils and Amsco tuning condensers.

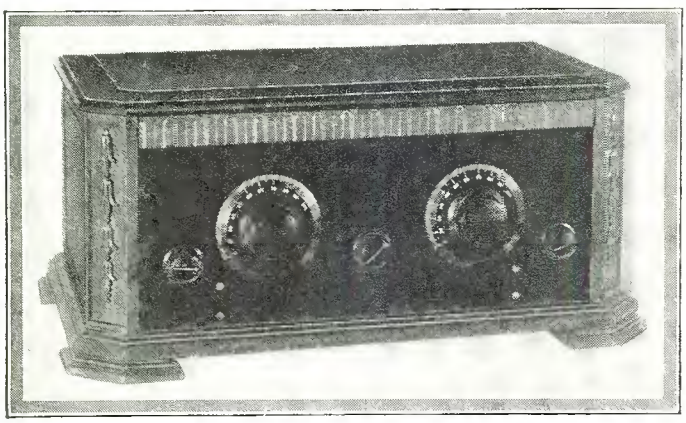


Figure 2. On completion of the receiver it has been placed in its cabinet as shown above

Referring to the schematic circuit shown in Figure 3, it will be seen that the Phasatrol is used in the plate circuit of the first tube as a means of stabilizing that tube, which is the first radio frequency amplifier. This amplifier is succeeded by a regenerative detector whose output feeds into the input circuit of the first resistance coupler. On account of using resistance coupling it has been found advisable to use high amplification tubes, and for this purpose the Ceco type G have been utilized in the first and second stages of resistance coupling, with a type F in the last stage.

Saves Building Time

In construction of the receiver, the builder will notice that considerable time is saved because of the fact that practically all of the apparatus shown in the photograph of Figure 1 is supplied already mounted on the Lynch deck. As a result the builder has only to run a few wires to the variable condensers and the inductances and the job is complete. In wiring the receiver it is strongly recommended that the graphic diagram Figure 4 be faithfully followed, since it is prepared in such a manner as to minimize the time needed for the constructor to wire it up.

Parts used in the construction of this receiver are:

1—Lynch deck

(This receiver constructed, tested and all illustrations made in our laboratory)

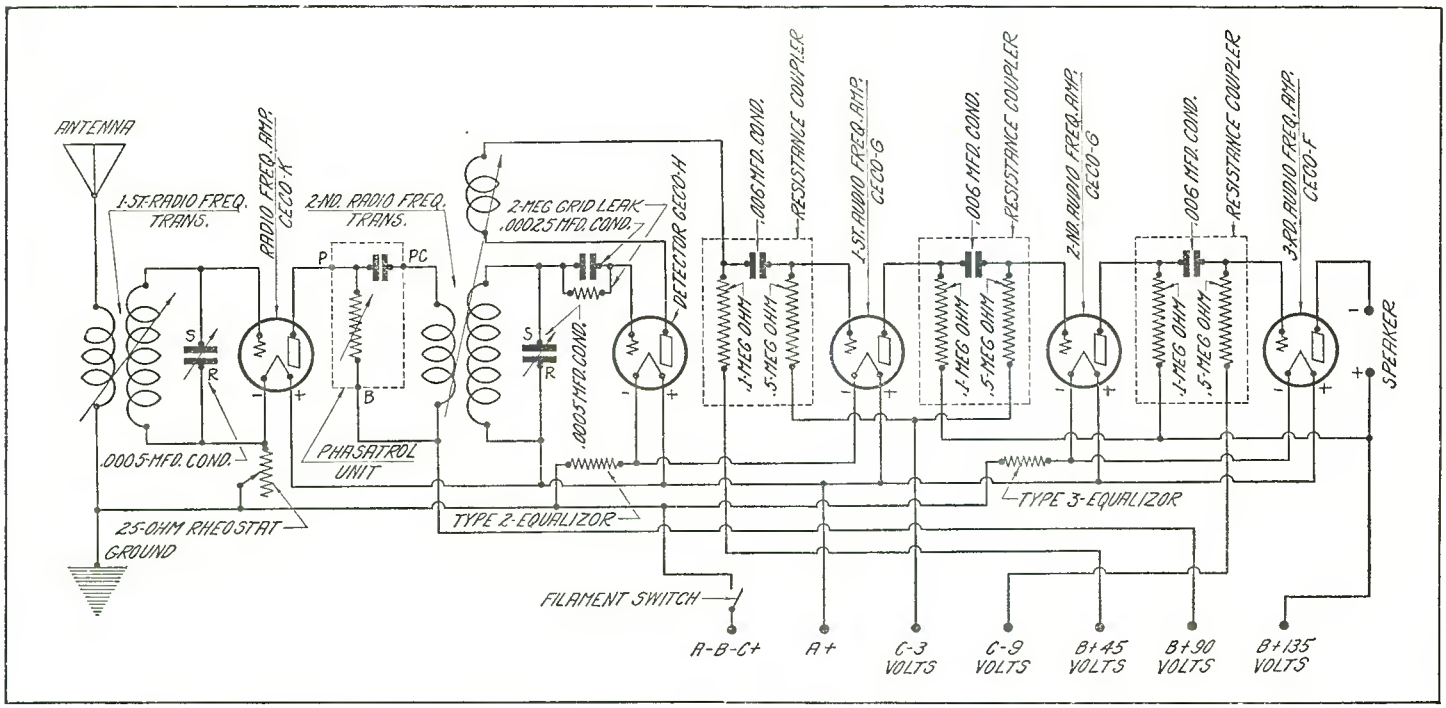


Figure 3. In this drawing are shown all of the electrical connections required for hooking up this receiver

2—Lynch equalizers
1—Electrad Phasatrol
11—Eby engraved binding posts
1—Precision antenna coil
1—Precision 3 circuit coupler
2—Amsco .0005 mfd variable condensers
1—Yaxley 30 ohm rheostat with switch
2—Kurz-Kasch plain dials
1—Formica 7x18x3/16-inch panel
18—Feet Belden hook-up wire
1—Package Kester radio solder
1—Ekko ground clamp

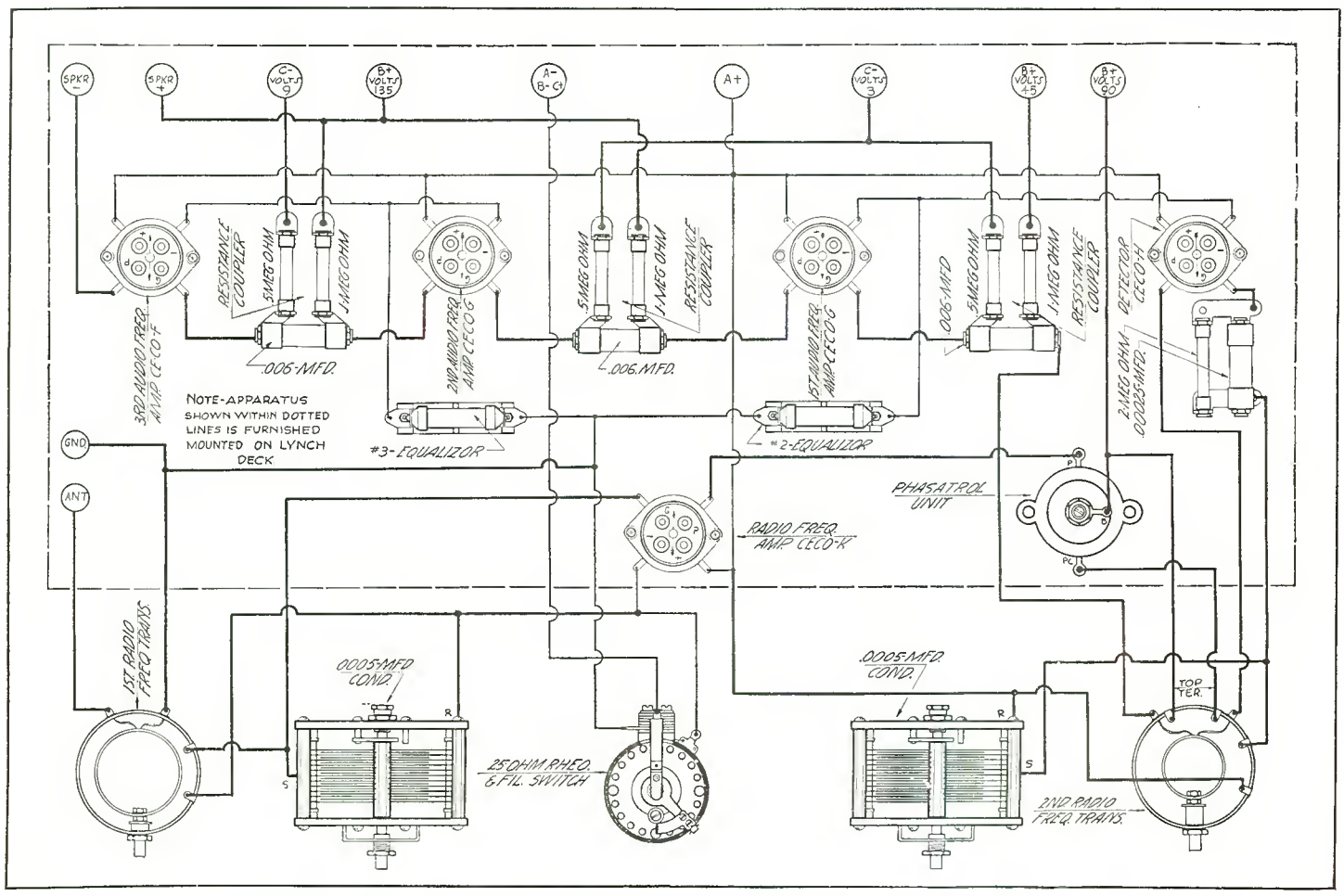


Figure 4. The above graphic diagram shows the builder how each connection is to be made. It should be noted that the apparatus within the dotted lines is furnished mounted on the Lynch deck

Aero A. C. Seven Has Three Resistance Coupled Stages

Only Few Minor Changes Are Required to Bring This Popular Receiver Up to Alternating Current Operation

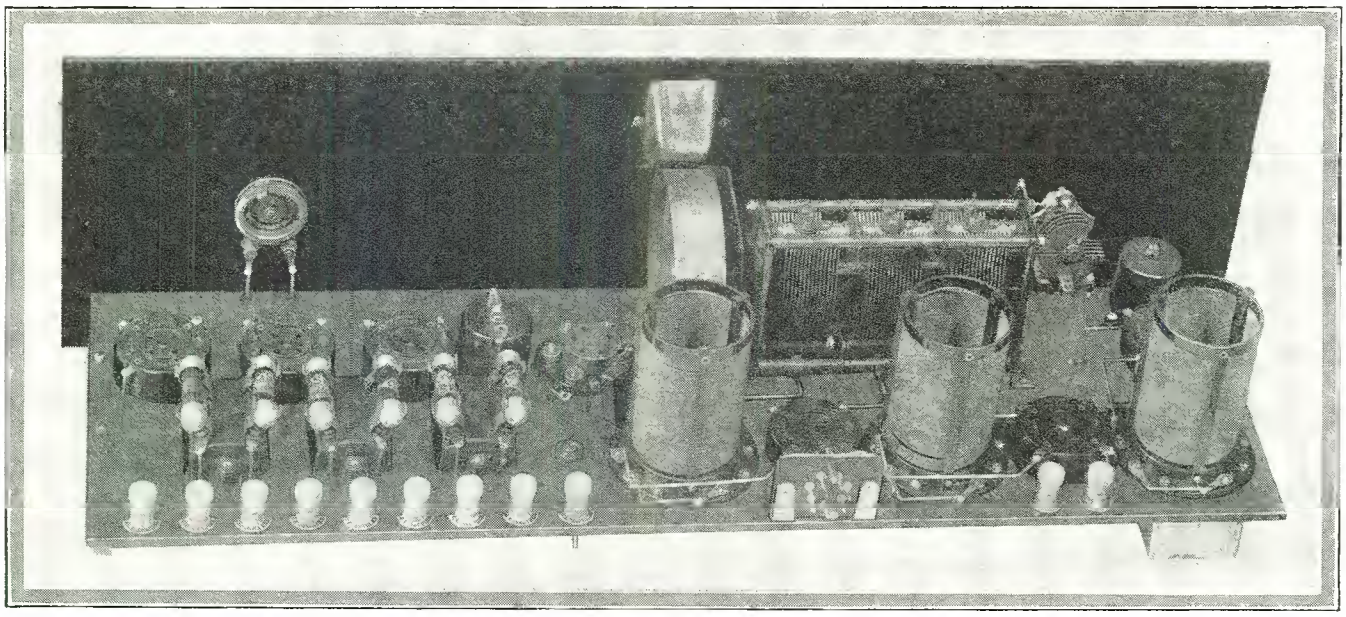


Figure 1. Rear photographic view of the Aero A.C. Seven shows the same general layout as used in our September issue, with the exception of a five-prong socket, a midget variable condenser and revised filament control for use with alternating current tubes

KNOWING the interest which set builders and experimenters have exhibited in the recent alternating current operated tubes, we believe it will be well to pay attention at this time to the conversion of the Aero Seven receiver to alternating current operation. This popular receiver was described for battery operation in the September issue of the CITIZENS RADIO CALL BOOK MAGAZINE on page 87. In this article it is photographed and illustrated as arranged for the use of type 226 and 227 alternating current tubes.

Now Uses A.C.

Whereas in the previously described article the audio end of the receiver depended for its amplification upon the use of high amplification tubes, in this model, on account of using alternating current filament supply, these tubes have been eliminated and the type 226 alternating current filament tubes substituted.

In the Aero A.C. Seven there are three stages of tuned radio frequency amplification and a non-regenerative detector. The first stage, instead of being a two-coil coupler consisting of primary and secondary, consists of a single inductance known as the antenna adoptor, this inductance having a tap on its winding for the antenna. The tuning of this circuit is accomplished by means of a .000025 mfd midget condenser located between grid and filament terminals of the inductance, the latter end being grounded and common with biasing voltage of 12 volts negative. This midget condenser is located at the extreme left in the photograph, Figure 2.

Three Stages Ganged

The second and third radio frequency stages and the non-regenerative detector are tuned by a three gang condenser operated from the single drum dial shown at the center in Figure 2. These three stages, on account of the inductance design and the matching of the tuning capacity, tune very closely provided the builder has been careful in wiring up the receiver so that excessive leads are not run from stators to grids of the tubes. The three inductances shown in the receiver are the three coils type U12. These coils are matched in kits of three at two widely separated frequencies in the broadcast band. It has been found after considerable investigation of the subject that if two or more coils matched at one wave length, they will not necessarily match at another wave length at the other end of the broadcast band. In order to prevent the receiver from falling out of tune at one end of the dial and in at the other points of the dial, the coils are matched at the factory at 250 meters and also at 500 meters. It has been found that by matching the coils in this manner they will be sure of maintaining the same inductance over the whole broadcast band. An Amsco three gang variable condenser has been used and is provided with small compensating capacities to adjust for small differences in the wiring for tube capacities of the various stages.

Antenna Detuning Solved

Some of the single control receivers have the first radio frequency transformer tuned by one of the units of the gang condenser. In spite of any care of matching the coils and condensers, there is no provision made against the detuning of the first stage by antennas of different electrical characteristics. This effect is not noted in the succeeding stages, as the other transformers each operate out of the plate circuits of similar tubes and hence similar capacities. A simple means has been resorted to in the design of the Aero A.C. Seven to eliminate this difficulty. As will be seen by consulting the schematic diagram in Figure 3, an antenna adaptor is used, across whose extremities

(This receiver tested and all illustrations made in our laboratory)

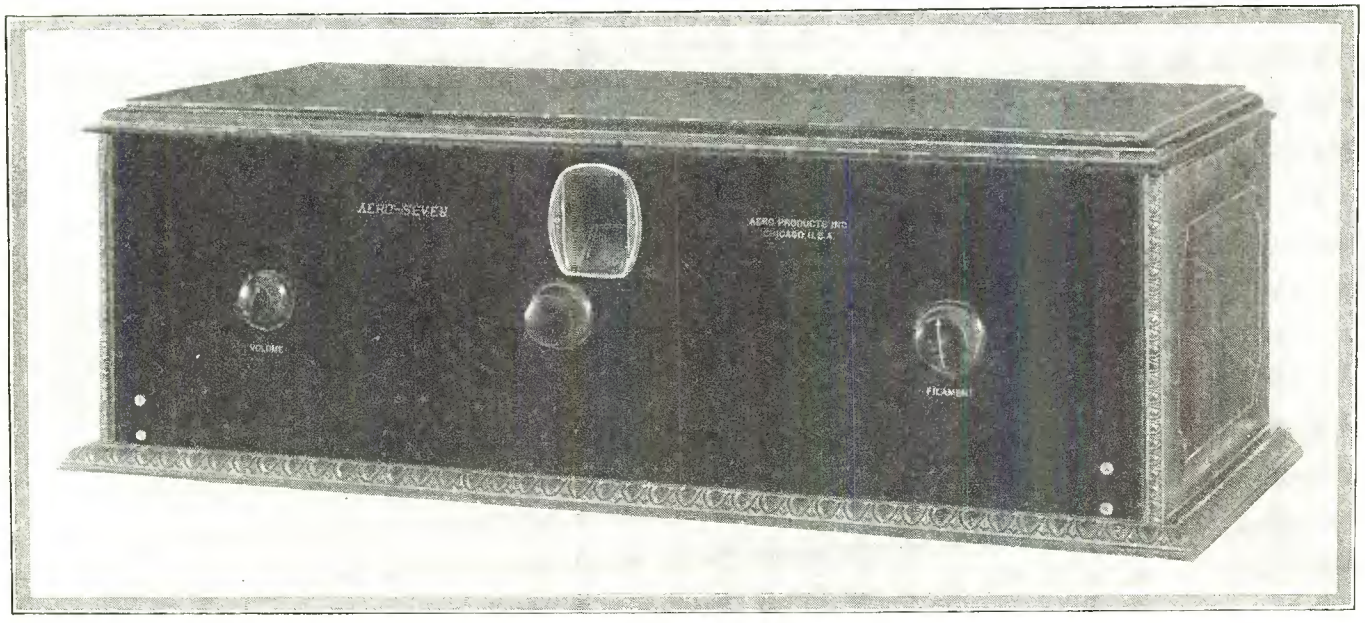


Figure 2. In this photograph the Aero A. C. Seven has been placed in a Southern Toy cabinet

is located a .000025 mfd midget condenser, which serves to tune that stage to approximate resonance, allowing the first, second and third sections of the gang condenser to work across inductances whose primaries are equal and whose plate circuits have the same capacities.

Different Turn Ratios

In considering the first, second and third radio frequency transformers, it should be noted by the builder that they are provided with several taps for securing a different turn ratio in the primary. This coil is an arrangement of an exceptionally efficient construction, with a primary giving the most effective coupling co-efficient with the secondary and taps so as to produce primary ratios of widely varying values on the different taps. The highest of these values is secured upon use of tap No. 1 as the plate and No. 4 as the B battery connection. In this particular receiver, however, tap No. 3 has been used on account of the type of tubes employed in the receiver.

Resistance Coupled Audio

In the audio end of the receiver the three stages of resistance coupling are utilized, this type of amplifier being supplied by Amsco. The input to the first resistance coupler is from the plate circuit of the detector through a radio frequency choke made by Aero, the coupling resistance in the plate circuit of this detector tube being a .1 megohm and common with the plus 45 volt terminal. A suitable coupling condenser is located inside the resistance coupler and joins the output of the plate circuit of the detector to the input of the first audio frequency amplifier. The grid biasing resistor located in the grid lead of the first audio amplifier is 1 megohm. The plate resistor of the first audio stage is a .1 megohm, which goes to the 180 volt positive terminal, while the biasing resistor in the grid of the second stage is a .5 megohm. The biasing resistors in the first and second audio grid circuits are common and go to the minus 9 volt biasing terminal. The resistance in the plate of the second audio is a .1 megohm, while the biasing resistance in the grid of the 171, which is the power tube, is a .25 megohm and leads to the C40 ½ volt terminal. Plate supply for the first and second audio tubes is 180 volts, while this same value is also applied to the plate of the last tube either directly through the speaker or through an output transformer, as may be desired by the builder.

Filaments on A.C.

Filaments of the first, second, third, fifth and sixth tubes are operated from a 1.5 volt alternating current source with a .2 ohm variable resistance in series to allow the tube the proper operating voltage. Inasmuch as these tubes are especially sensitive to an overload, the operator should assure himself of the

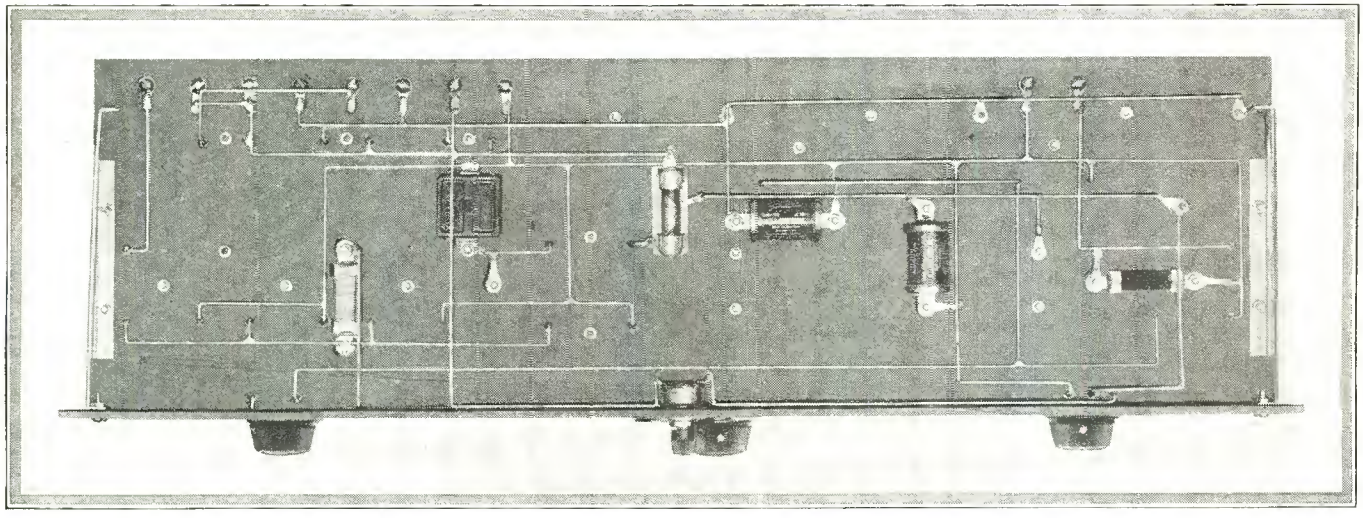


Figure 6. This photographic view of the under side of the sub-panel represents the battery operated model, in whose conversion very few changes are necessary below the sub-panel. Reference to the schematic in Figure 3 will show the actual parts required for converting this to an alternating current receiver

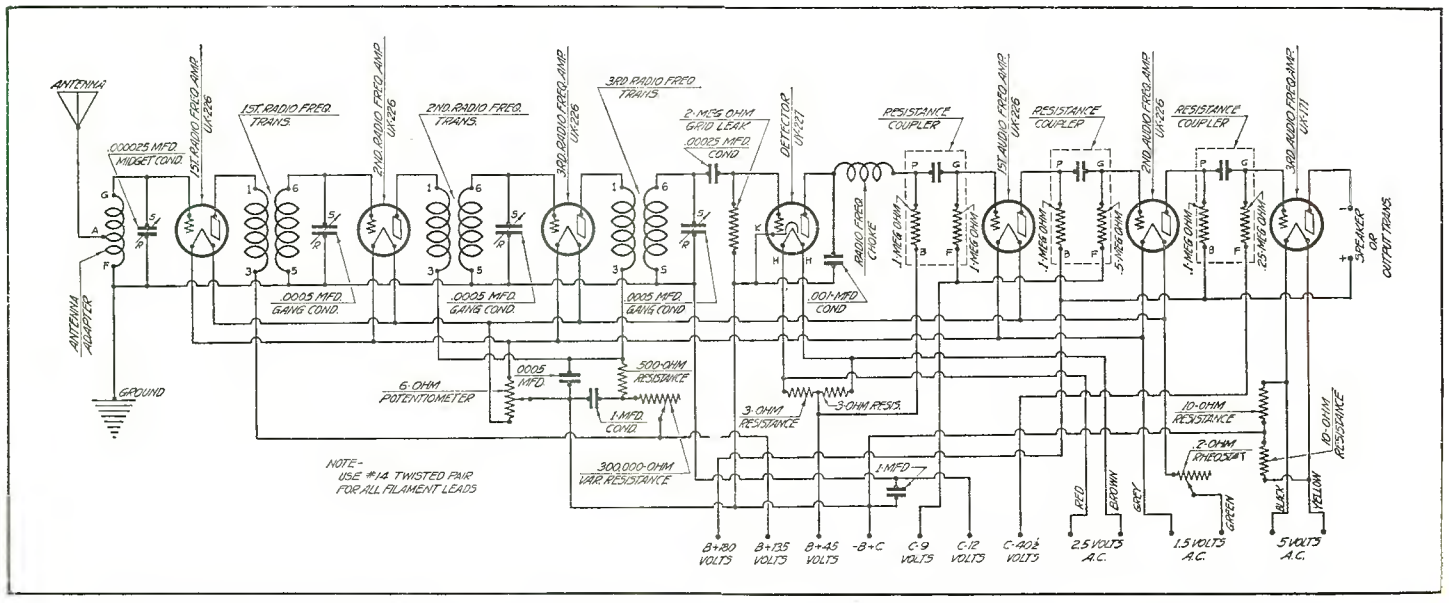


Figure 3. In this schematic are all of the details for making up the Aero A.C. Seven, or for converting the Aero Seven, which appeared in our September issue, to alternating current operation

fact that he is not using more than the rated value on these tubes. An alternating current voltmeter with a double or triple scale, on one with a total reading of 7½ volts, is worth while, in determining the actual voltage placed on the tubes. The detector tube, which is a type 227, secures its heater current from the 2.5 volt alternating current windings of a standard transformer, there being no resistance placed in this circuit. In the case of the 171 power tube, the filament supply is from a 5 volt alternating current source, which is the proper value for that tube and which does not require any change in operation.

Single Control Tuning

Looking at Figure 2, which is a front view of the receiver in a cabinet, all of the tuning is accomplished by means of a single drum dial located at the center of the receiver, while the control at the left is occasionally used for bringing the receiver into resonance at a given wave length.

In the assembly of the receiver, the sub-panel is the best starting point, as most of the work may be done on it without putting on the front panel, thus allowing the work to proceed unhampered. Figure 1 shows the rear view of the receiver. On the sub-panel are located the antenna adaptor, first, second, third radio frequency sockets, the five-prong detector socket and the three sockets for the resistance coupled stages. Between the audio sockets are located the three resistor couplers mentioned previously. In addition to this the three inductances are also placed on the sub-panel, together with the antenna and ground binding posts, the cable connector, which is used for the alternating current filament supply, and the nine binding posts required for the various voltages and the output of the last tube, where either an output transformer may be used or where the speaker may be cut in directly. All of this material may be mounted on the sub-panel first, with the midget condenser, the drum dial and the 300,000 ohm variable resistance being located on the front panel. Much of the wiring may be done on the sub-panel and then the front panel put on, or if the builder is adept at this work he may mount all the parts on the sub-panel, then put on the front panel and proceed to wire.

Follow the Graphic

In wiring the receiver is is suggested that the graphic layout shown in Figure 5 be followed very carefully, since it shows the simplest manner in which the wires may be run from one point to another.

In lining up the radio frequency stages, a screw-driver should be made from a sliver of wood or bakelite to turn the condenser screws. The midget capacity should be screwed all the way out at first and a station tuned in, preferably on the lower waves. After tuning to maximum volume the dial reading should be increased slightly. If a signal is a weak one, it will disappear by this procedure, while if a strong one it will only be diminished in volume. After this has been done, the small condensers are adjusted with the wooden screw-driver until the volume is at maximum. In the course of doing this, it may be noted that if

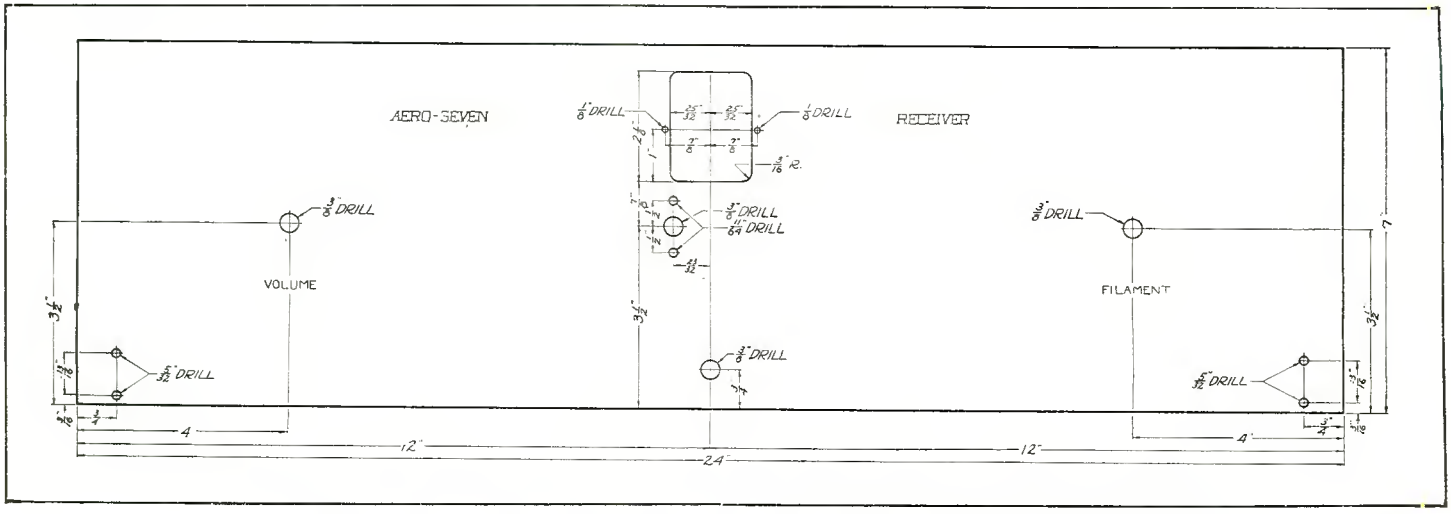


Figure 7. Front panel layout of the Aero A.C. Seven is shown in the drawing above

a perfect adjustment is approached, the receiver may oscillate. If this occurs the 300,000 ohm variable resistance located on the front panel may be changed slightly to curb the oscillatory tendency. The adjustment for maximum volume should then be completed, after which the receiver will be in condition to tune over the entire broadcast band.

List of Parts

Parts used in building the receiver described in this article are:

1—Aero 7 foundation unit
1—U-12 Aero r.f. transformer kit
1—60 Aero r.f. choke coil
1—Amsco .0005 mfd 3 gang variable condenser
1—AA-17 Aero antenna adaptor
1—669 Yaxley cable connector with phone jacks
1—Carter .0005 mfd fixed condenser
1—Benjamin 5 prong socket
6—Amsco sockets
1—Amsco 2 megohm grid gate and mounting
1—Amsco .5 megohm grid gate
1—Amsco .25 megohm grid gate
3—Amsco .1 megohm grid gates
1—Amsco 1 megohm grid gate
3—RC-1 Amsco resistor couplers
1—Carter .2 ohm rheostat
1—Silver-Marshall drum dial
1—Carter 110 volt switch
2—Carter 1 mfd by-pass condensers
1—Carter .001 mfd fixed condenser
1—Carter .00025 mfd fixed condenser
1—Carter 6 ohm sub-panel mounting potentiometer
1—Carter 300,000 ohm variable resistance
1—Yaxley 500 ohm fixed resistance
2—Yaxley 3 ohm fixed resistances
1—Silver-Marshall .00025 mfd midget condenser
1—Yaxley 10 ohm fixed resistance
9—XL binding posts

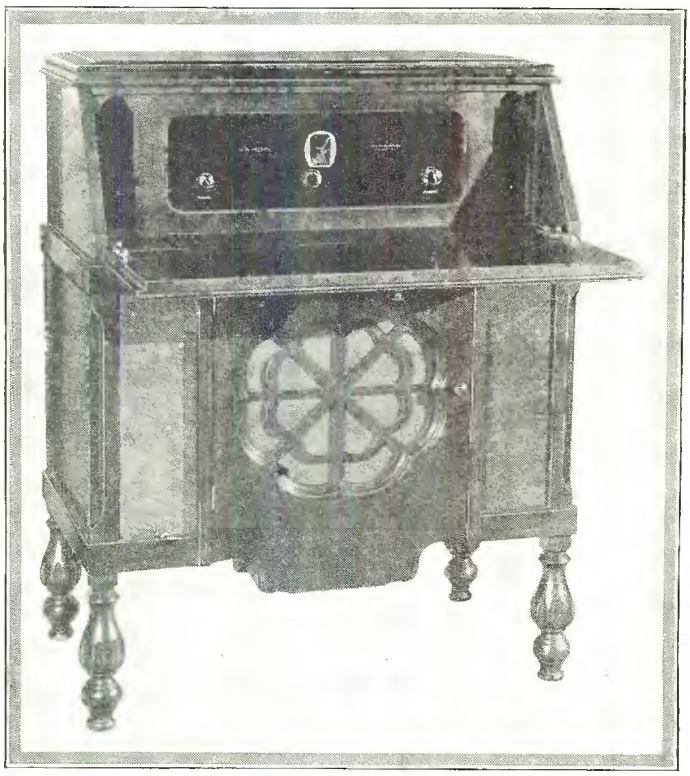


Figure 4. In the above photograph the receiver has been .. placed in an Ehlert console

30—Feet Acme Celatsite wire
1—Package Kester radio solder
1—Ekko ground clamp
1—Karas A.C. former
Miscellaneous—lugs, nuts, bolts, etc.

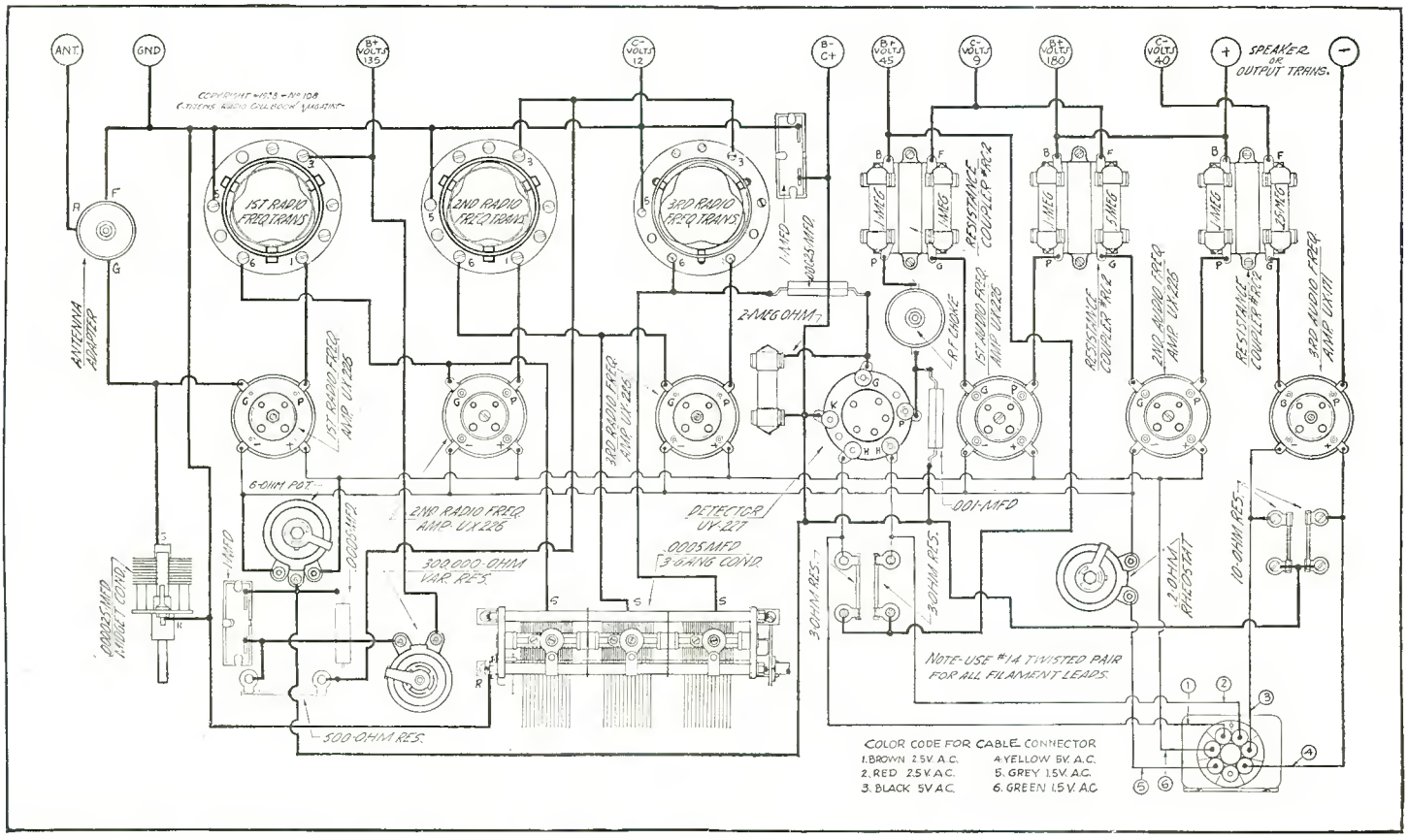


Figure 5. Set builders should use the above graphic illustration as a means of wiring their receiver, since it represents the simplest manner in which a set may be hooked up. Those who are well versed in the art may, of course, use the schematic in Figure 3, but to save time the graphic should always be followed

Operating the Madison-Moore International One-Spot

Popular All-Electric Super Fulfills Requirements of Tone Quality, Volume and Selectivity

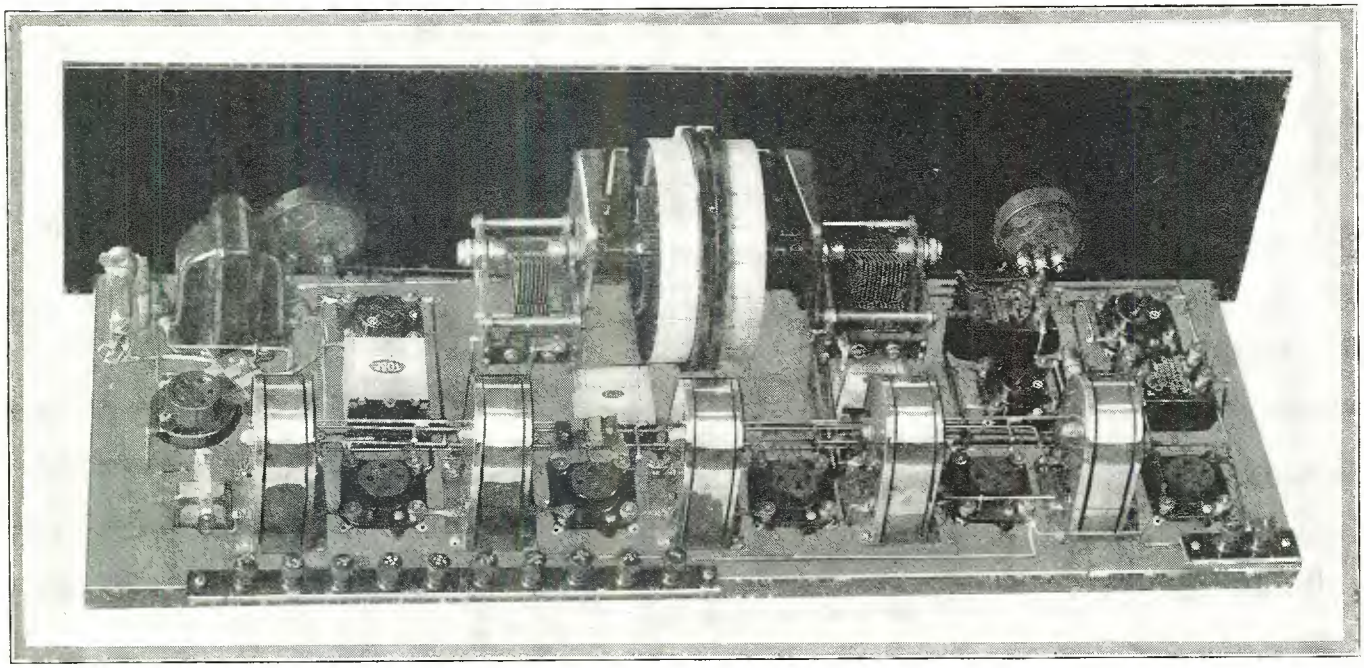


Figure 1. This photographic view shows the completed receiver after all parts have been put in place and properly wired

MEETING the requirements of tone quality, ample volume and selectivity, the Madison-Moore International One-Spot is now being operated by many fans as an electric receiver. First details of this novel receiver were given to our readers in the November issue of this magazine, where full instructions were published for the assembly and wiring of both the receiver itself and its power amplifier. In this article some data on tuning the set will be given for the benefit of those who have finished their receivers and wish to operate them at maximum efficiency.

One-Spot Well Known

The principle underlying the operation of the Madison-Moore International One-Spot is well known to our readers who have been for some time constructing these successful performers. The intermediate frequency stages are peaked at such a value that regardless of the tuning range covered by the oscillator, no repeat points will be found by the operator if the set has been properly wired. The designers of this circuit were the first ones to bring forcibly to the attention of radio fans the virtues of a superheterodyne having no repeat points. Previous models of this receiver have been constructed by many fans and are in nightly operation throughout the country. However, with the advent of alternating current tubes, many fans have become interested in the operation of their receiver direct from the light socket and as a result have centered their attention on the building of the International One-Spot. For constructional details on the receiver and the power supply we refer our readers to the November issue of this magazine.

Radio frequency amplification ahead of the first detector is secured in the latest Madison-Moore model by means of two untuned radio frequency transformer stages, the fact that these are untuned helping to minimize the controls and wiring in the receiver. Thus, a Qualitone loop, without the center tap arrangement feeds the input circuit of the first radio frequency amplifier and delivers the signal; which is then amplified through the two radio frequency stages and delivered with considerable intensity to the input circuit of the first detector. To insure stability in operation under strong signals and to curb any oscillatory condition in the first detector, a 1000 ohm fixed resistance has been placed between the grid terminal of the second radio frequency transformer and the grid of the first detector. Mixing of the oscillator frequency with that of the incoming frequency is secured through the magnetic coupling between the plate inductance of the oscillator coupler AC-1 and the plate of the first detector through the primary of the first intermediate frequency transformer AC-2. Reference to the schematic circuit in Figure 2 shows the method of connection by means of a jumper between the X terminal of the oscillator coupler and the X terminal of the first intermediate frequency transformer. This form of injecting energy into the first detector stage is a departure from conventional methods and is one that has been used with considerable success in the Madison-Moore receivers.

When first putting the receiver into commission, after all tubes have been placed in their respective sockets and the amplifier turned on, the operator should first turn the left-hand drum to a point about midway of its travel, turn up the 100,000 ohm variable resistance and the 500,000 ohm potentiometer and then turn the right-hand drum section until either a station or a very slight rushing noise is heard. If no station is heard at first in the loop

(This receiver constructed, tested and all illustrations made in our laboratory)

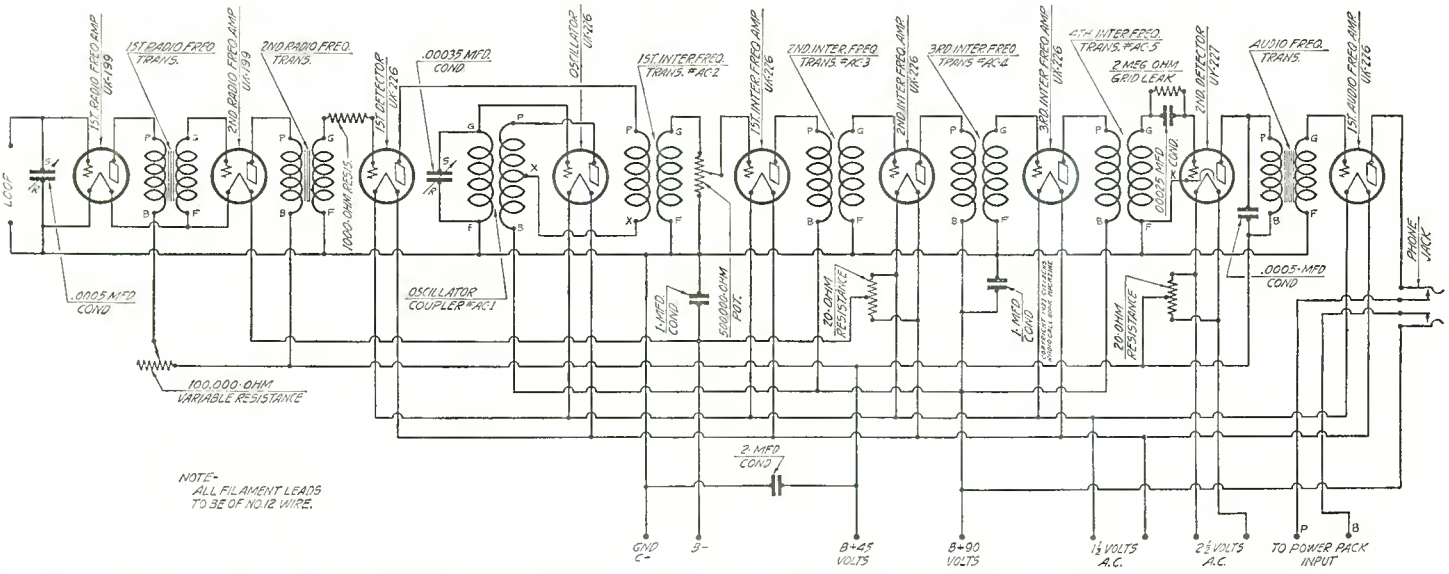


Figure 2. Schematically the circuit of the Madison-Moore International One-Spot is shown in the above wiring diagram

circuit, the dial should then be turned to another position, either higher or lower than the mid-point, and the oscillator dial turned back and forth through its travel until a condition of resonance is reached, which condition is manifest either by a slight rushing noise or the presence of a signal. For the uninitiated it would be well to tune the receiver first on a local station so as to become familiar with the operation of the receiver. After the local stations have been tuned in and logged, the operator may proceed to go after the distant ones.

Several points of interest in the operation of the receiver may be of some help to our readers. For one thing, be sure to keep the length of wire for the filament circuit of the alternating current tubes down to a minimum, so there will be no possibility of a voltage drop, which would cause these tubes to be operating below the voltage required for their best results. Also use tubes with standard characteristics so that uniform operation may be obtained throughout. This is particularly true of the two 199 stages, whose filaments are energized through the drop between the C negative terminal on the amplifier and the center of the 20 ohm resistance located across the 1½ volt alternating current filament line. It should also be noted that on account of using a heater type detector tube, it is necessary for the receiver to be in operation a minute or so before the heater has warmed up sufficiently to begin passing heat by conduction to the actual electron-emitting cathode in the tube. The operator should also experiment with different values of fixed resistances in the grid circuit of the first detector, since under different operating conditions a value of resistance other than the one specified in the schematic circuit may be required. It might be well to try values of 250, 500, 750 and 1000 ohms until the particular value which gives best operation is arrived at.

On account of the complete shielding of the oscillator and intermediate inductances, the receiver is quite insensitive under local field strength pick-up. With such a receiver the operator should have no difficulty in bringing in distant stations through local broadcast transmitters. It is suggested that a good type of speaker be utilized on the set in order to take advantage of the tone quality which the receiver is capable of producing.

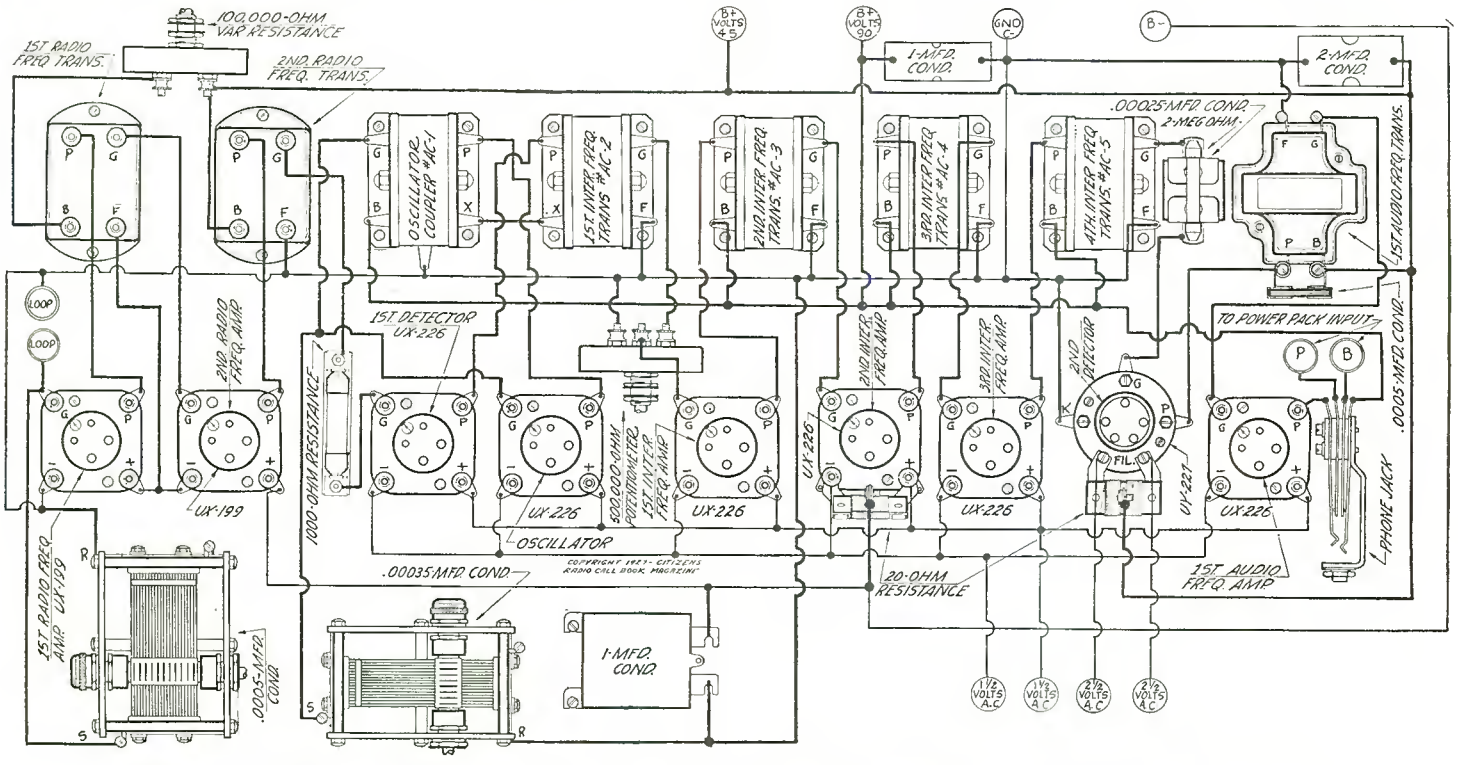


Figure 3. This graphic illustration should serve as a means of rapidly wiring up this popular receiver

Regeneration and Impedance Coupling in Everyman Four

Simplicity of Control and Good Audio Quality Are Features of the Four Tube Receiver Popular with Many

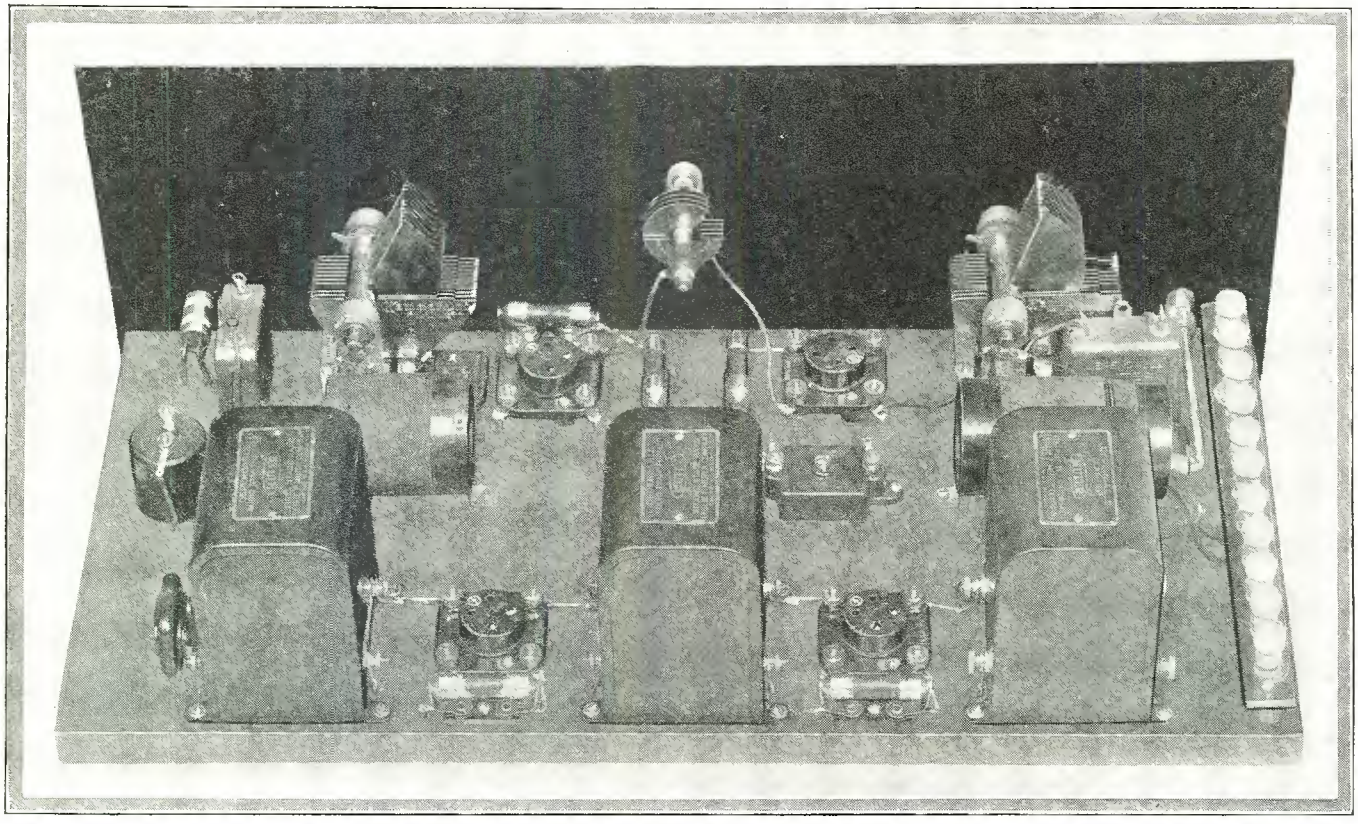


Figure 1. In the accompanying photograph may be seen all essential parts used in the construction of this receiver. Wavelength controls are those condensers located at the left and right of the front panel shown above, while regeneration control is gained through use of the midget condenser located at the center. The two audio transformers are shown, one at the left, one at the center, and the output filter is located at the extreme right

MANY who are not able to invest heavily in a receiver will be interested in the description about to be given on the Everyman Four, where simplicity of control, economy of parts and good quality reproduction may be obtained. The receiver has been designed around the fact that there are many who do not wish to go into a large expenditure of money and at the same time desire to secure as much entertainment as is possible from a radio receiver. Accordingly all controls have been simplified to a minimum and only the essentials of a good receiver have been included.

Referring to the schematic diagram in Figure 3, the reader will observe that the Everyman Four comprises a stage of balanced tuned radio frequency, impedance coupling to the grid circuit of the detector having a tuned grid input circuit of the first tube and a tuned plate circuit of the first tube, but with regenerative control for the second tube through the use of the .00005 mfd midget condenser shown in the schematic between the plate of the first tube and that of the second and represented in Figure 1 photographically as the midget condenser located at the center of the front panel. Wavelength control is by means of the two .0005 mfd variable condensers, the first located from grid to filament of the first tube and the second located across the extremities of the 66 turn radio frequency coil. The first twenty turns of this coil represent the plate section of the circuit through which 67½ volts are applied to the plate of the first radio frequency amplifier. The next twenty-three turns are utilized for a balancing coupling to neutralize the tube, this balancing being represented by the .00005 mfd balancing condenser shown between the grid of the first tube and the tap on the radio frequency coil. The remaining twenty-three turns on this inductance comprise the windings which lead through a .00025 mfd grid condenser to the grid of the detector tube. A bias voltage of 4½ volts negative is applied to the grid of the first radio frequency amplifier, while the bias for the detector grid is through a three megohm grid leak to the positive A battery. As previously stated, the regeneration control for the detector is through the .00005 mfd midget condenser connected between the plate of the first radio frequency and the detector

Uses Power Tube

In the plate circuit of the detector is located a radio frequency choke between the plate and the top terminal of the primary of the audio transformer, this primary being bypassed by a 0001 mfd fixed condenser. The first audio stage uses a 201-A tube

(This receiver constructed, tested and all illustrations made in our laboratory)

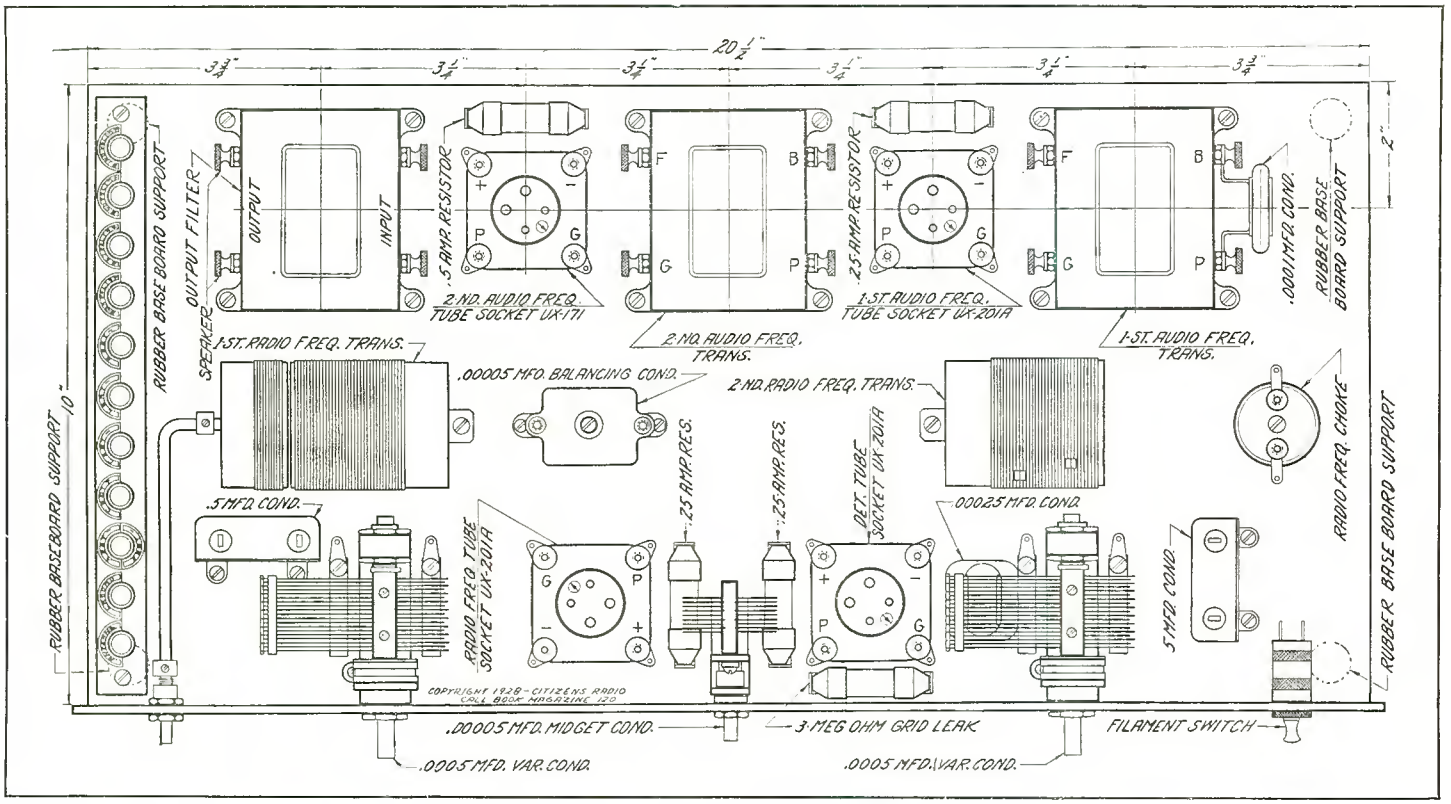


Figure 2. When laying out parts for the four tube receiver described in this article they should be placed in accordance with the baseboard assembly drawing shown above

while the second audio stage feeds into the grid of the 171 tube operated from 180 volts and with a 40 volt negative grid bias. The coupling for the speaker is secured through the audio frequency output filter represented in the schematic as comprising a choke winding with a capacitative coupling for the speaker, this insuring the operation of the reproducing apparatus without the possibility of it burning out due to the voltage used.

Filament control in the receiver is entirely automatic, being handled in the first radio frequency stage by means of a .25 ampere resistor, the same in the detector and first audio stages and in the 171 power tube stage by means of a .5 ampere resistor. This eliminates the necessity of any changes in the filament value during the operation of the set and with these resistances the tubes are supplied with their proper operating voltage, provided a 6 volt source is used across the A negative and A positive binding posts. A filament switch is located in the positive line so that the set may be turned on and off by the operator.

For actual placement of the apparatus involved in the con-

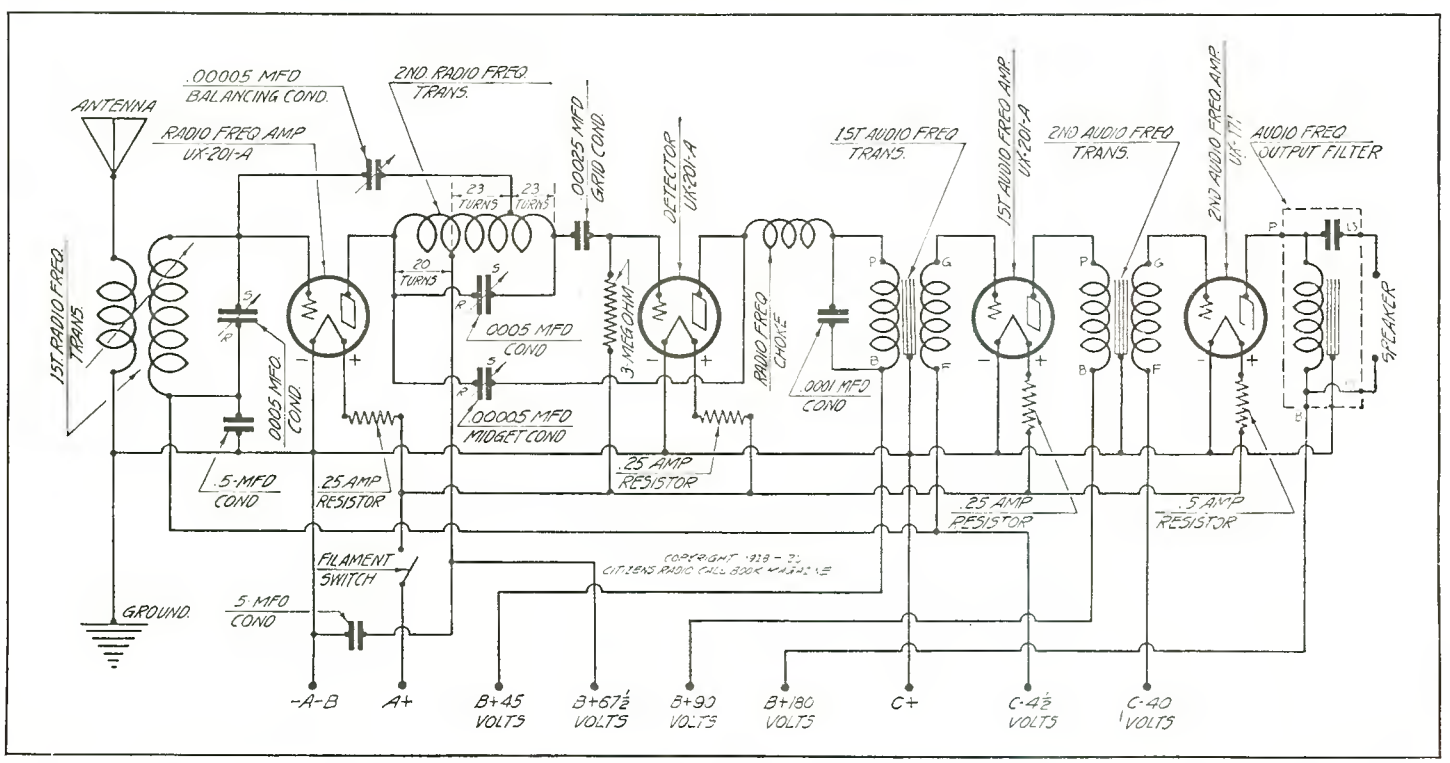


Figure 3. Schematically the wiring of the Everyman Four is illustrated above, which drawing may serve as a wiring guide for those who are accustomed to working by a schematic

struction of this receiver, the builder should follow very closely the diagram shown in Figure 2. The first radio frequency transformer which comprises a primary and secondary winding, the former being variable and extending on a movable arm to the left end control on the front panel, designated as "volume" in the photograph in Figure 5, is located far enough away from the second radio frequency transformer, which is shown at the right in the drawing in Figure 2, so that no interaction exists between these two circuits in operation. The .00005 mfd balancing condenser, which serves as a means of neutralizing the first radio frequency amplifier tube, is placed on the baseboard as shown in the baseboard layout, where it may readily be reached by the operator while balancing the set. It is suggested that the coils do not be placed closer than the distance shown in the diagram, since if they are placed closer there is a likelihood of interaction between the two circuits, which will make it more difficult for the builder to finally balance the receiver. Another reason for maintaining the coils in their respective position as shown in the diagram, Figure 2, is the fact that it is desired to keep all leads in the tuned circuit as short as possible to aid in sharp tuning and to maintain the efficiency of the receiver. Looking at the diagram in Figure 2, the builder will observe that the tuned radio stage at the left is succeeded by the detector at the right, the output of this stage going into the first audio transformer and thence towards the left until the output stage is reached in the output filter. This method of construction is a very convenient one when it is desired to hold down the physical length of the receiver and is also electrically sound because of the fact the output stage carrying audio currents does not interfere with the input stage, in which are found radio frequency currents.

Figure 4. In this photograph the Everyman Four receiver has been placed in a Fritts console

Wire Set By Graphic

In wiring up the receiver by the graphic diagram shown in Figure 6, it should be observed that the stator of the first .0005 mfd variable condenser is connected to the outside winding of the first radio frequency transformer, which is also common with the grid of the first radio frequency tube, and one side of the .00005 mfd balancing condenser which is located on the baseboard. In the plate circuit of the first radio frequency tube it will be observed that the .0005 mfd variable condenser used for tuning that particular section of the circuit is located across the two extremities of the second radio frequency transformer, with the stator leading to the right end of the radio frequency coil, and one side of a .00025 mfd grid condenser which goes to the grid of the detector, while the rotor of this tuning condenser is common with the plate of the first tube, the left end of the second radio frequency transformer and the rotor of the .00005 mfd midget condenser placed at the center of the front panel as a regenerative control. The stator of the .00005 mfd midget condenser goes to the plate of the detector and to one side of the radio frequency choke, which is located in series with the detector plate and the P terminal on the first audio transformer, this transformer winding being bypassed by a .0001 mfd condenser. In actual operation the use of this .0001 mfd condenser is not absolutely necessary because of the presence of the midget condenser located on the panel, which serves to bypass a certain percentage of the radio frequency energy present in that plate

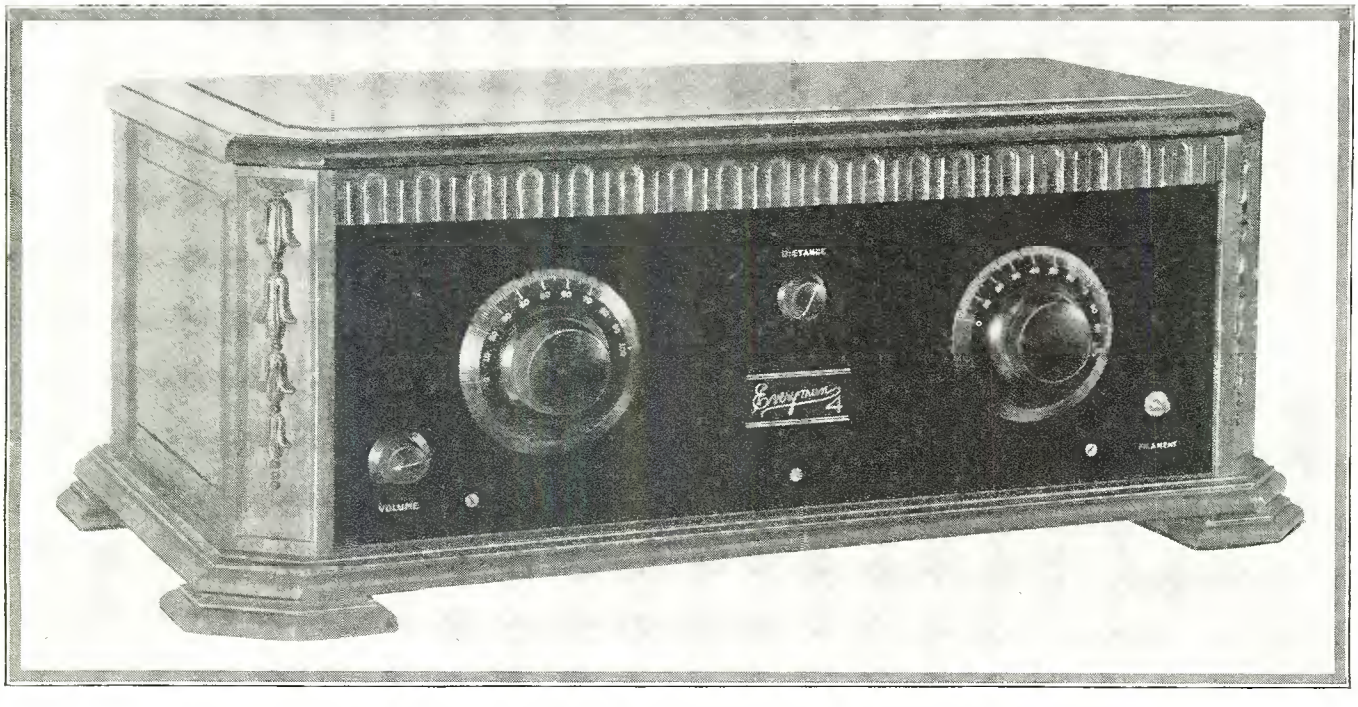


Figure 5. In this photograph is shown the Everyman Four installed in a Fritts cabinet

circuit. However, for the average builder it would be just as well to include this condenser and then if he found in practice that its employment is not necessary, it may be left out.

The remainder of the receiver is along conventional lines and should not present any obstacle to the builder. The first audio and second audio transformers are arranged at the rear of the baseboard in such a manner that grid and plate returns between these stages are very short. The fixed resistors used for filament control on the various stages are placed alongside of their respective sockets, as shown in the baseboard layout diagram in Figure 2, and these should be wired in accordance with the graphic diagram in Figure 6.

Balance Set At Mid-Band

When putting the receiver into operation, it is suggested that a station about mid way between the upper and lower broadcasting ranges be selected as the one on which the set is to be balanced. The two dials controlling the wavelength, the left hand one governing the tuned grid circuit of the first tube and the right one the tuned plate circuit, will be found to run practically alike, unless there has been a very great deviation in the amount of wire used for connecting up these two circuits. Tuning in a station at the mid point of the broadcast band, adjust the .00005 mfd balancing condenser by means of a wooden stick sharpened like a screw-driver until a point is reached where maximum volume is secured without instability or oscillation on the part of the set. During this time the midget condenser located on the front panel and which is considered a regenerative control should be set at zero, the rotor being separated from the stator. After the receiver is balanced in this fashion, the midget condenser may be turned in a trifle so as to bring up the volume through regeneration in the detector stage. After the set has been balanced at the mid point, it should be tuned to the higher and lower wavelengths to determine if it is completely balanced. It may be that some builders would prefer having a higher amount of energy at the high wavelengths, even though the set goes into oscillation at the lower wavelengths, while on the other hand there are some who would rather balance their set for the lower wavelength stations and let the amplification fall off at the upper end of the broadcast spectrum. With a little care and with familiarity on the part of the builder with the set, no difficulty should be encountered in balancing the receiver so it will give uniform performance over both sections of the broadcast band.

It will be observed that all filament and plate voltages are of a fixed nature and for that reason the (only stability control of the set is incorporated in the .00005 mfd balancing condenser located on the baseboard. Sixty seven and a half volts are used on the plate of the first radio frequency tube, 45 volts on the plate of the detector stage, 90 volts on the plate of the first audio tube and 180 volts through the output filter on the plate of the power tube, which is a 171 type. The use of this last named tube enables full advantage to be taken of the maximum audio output of the receiver without distortion and at the same time without the use of extremely high voltages. There are only two bias values provided in this receiver, one being a 4½ volt bias for the grid of the first audio tube and the other a 4½ volt bias on the grid of the first radio frequency amplifier, this value being for stability of operation and economy in current drain. The other bias voltage is 40 volts negative, which is placed on the grid of the 171 tube and is approximately the right value for the tube when used with 180 volts on the plate. If a lower voltage than the one specified in the diagram is used on the 171 tube, it

(Continued on Page 178)

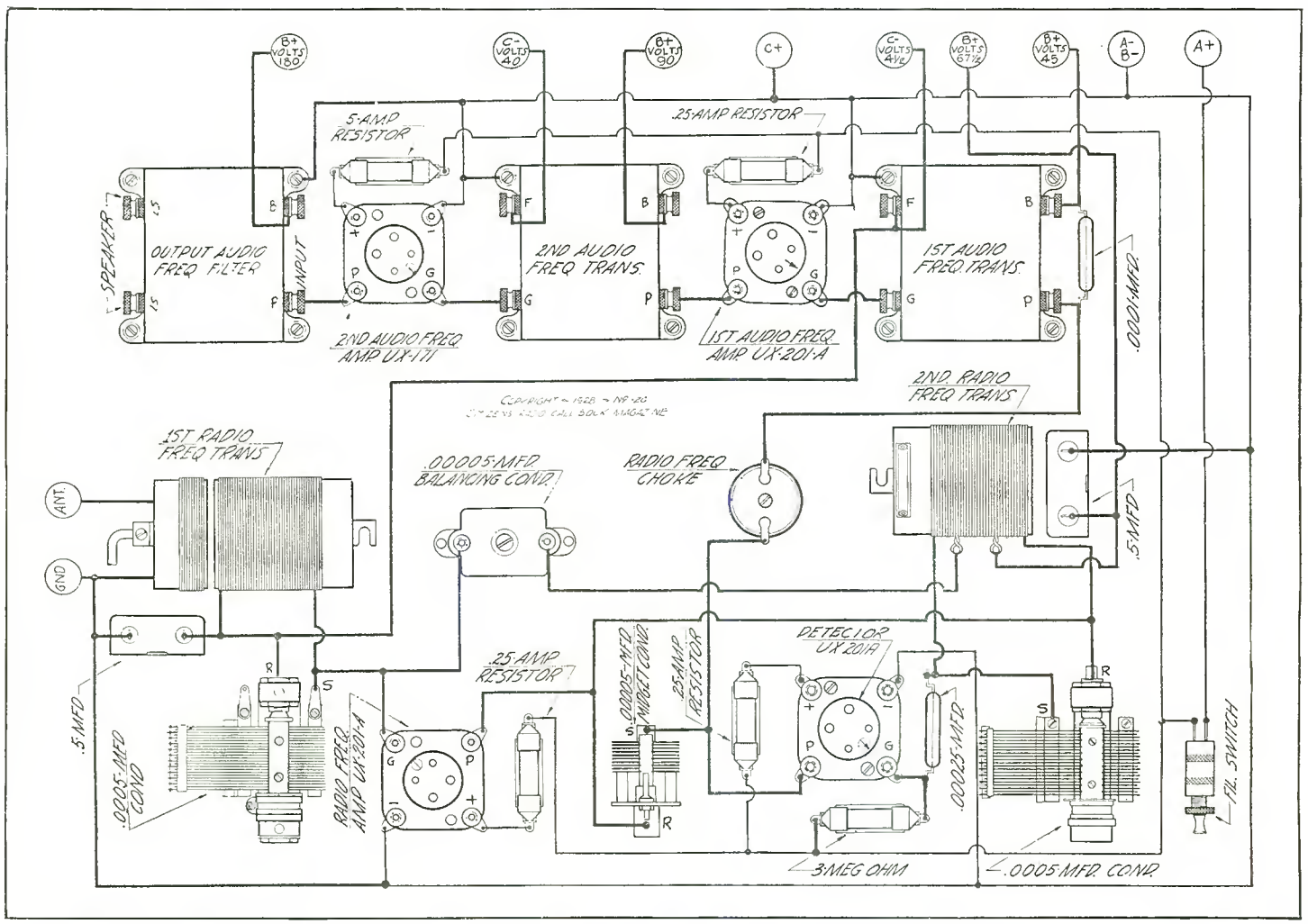


Figure 6. Those who are not acquainted with schematic wiring diagrams should utilize the above graphic as a means of wiring up the Everyman Four, the details of which are described in the accompanying article

Silver-Marshall Shield Grid Six Uses the New Tubes

Three New Type Tubes Employed in Shielded Receiver Giving Amplification Up to Noise Level

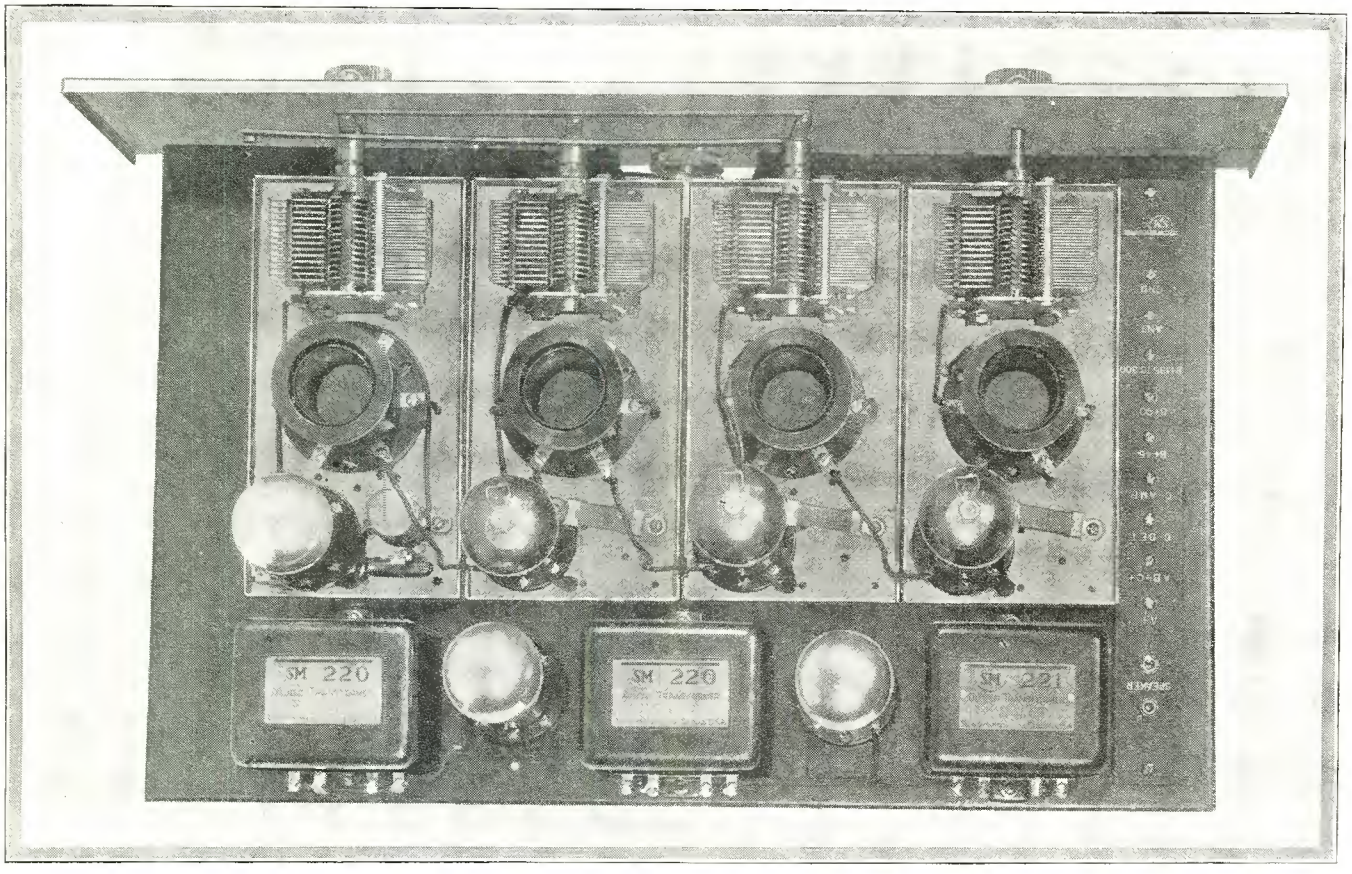


Figure 1. This photograph shows a rear view of the Silver-Marshall Shield Grid Six receiver described in the accompanying article

THE Shielded Grid Six is a six tube, completely shielded, tuned radio frequency receiver employing three r. f. amplifier stages utilizing the new shielded grid tubes, a supersensitive detector circuit employing a 200-A detector tube at highest efficiency, and an audio amplifier capable of providing fine tone quality. The receiver is completely tuned by two tuning dials and an absolutely non-critical volume control knob which is used to reduce the volume on practically all stations heard.

It is difficult to conceive of a receiver developing so much volume on even the weakest distant stations that the volume must be reduced for satisfactory home entertainment. Yet such is the case with the Shielded Grid Six, for it approaches closely the ideal radio receiver—a set which will bring in any station which is louder than the local atmospheric noise level with loud speaker volume. It can be said the receiver will bring in any signal sufficiently louder than whatever local atmospheric noise may be experienced, with ample loud speaker volume, and beyond this, receiver sensitivity is a detriment rather than an aid. The tone quality of the receiver is not sacrificed to its extreme sensitivity and selectivity and it is perfectly possible to bring in stations almost anywhere in the country with as beautiful, satisfying tone as that of the best local programs.

What It Is

The receiver consists of a heavy pressed metal chassis 12 inches deep and 19½ inches long, upon which all parts of the receiver, except the control dials, are mounted. Attached to this panel is a decorated etched bronze control panel 7 inches high and 21 inches long. On this panel are mounted two harmonizing walnut finished gold trimmed, vernier control dials marked "Station Selector I" and "Station Selector II." All tuning is done with these two dials, the settings of which are varied to tune in station after station. The dials "log" absolutely in that a station once heard at any dial setting may be brought in again at the same dial setting; and the two dials "track" sometimes within a degree of each other. In the lower center of the control panel is an absolutely non-critical volume control not affecting oscillation and serving merely to regulate the volume of received signals to a desired level. In the lower right-hand corner of the panel is an ON-OFF switch completely turning on or off all power for the entire receiver by a simple flip of the fingers. In the lower left corner of the panel is a switch of similar appearance allowing the choice of either selective or non-selective adjustments of the antenna circuit to accommodate varying lengths of antennas.

A minimum of 135 volts is required for operation and preferably 180 volts of B power. The total current consumption is very low, being only about 28 milliamperes. B batteries or a good glow-tube-equipped eliminator may be used, the B drain being very low, indeed. C batteries, as dictated by the power output tube

(This receiver tested and all illustrations made in our laboratory)

employed, are required, and a 6 volt storage battery or equivalent 6 volt A power unit. Using a standard B eliminator and A power unit, the receiver is completely light socket operated with the exception of dry C batteries which have long life and are low in cost.

Three shielded grid tubes are required for the r. f. amplifier. For the detector tube, the 200A is recommended. For the first audio amplifier, a 112 or 112A is strongly recommended, though in both detector and first audio positions 201A tubes may be used with inferior results due to overloading, so strong are the signals developed by the receiver. For both audio stages UX112A's are recommended if a plate voltage of 180 to 220 is available—as from an S-M type 652 or 652A power unit. For quality of reproduction, an S-M 675 B power unit may be employed which furnishes B power to the entire receiver at a total of 425 volts, and which is equipped with an adapter which allows the use of a UX210 super power amplifier tube in the last audio stage of the receiver.

Three stages of radio frequency amplification sharply tuned, followed by the sharply tuned detector circuit, working into a two-stage audio frequency amplifier comprise the receiver. The radio frequency amplifier circuits consist of low-loss variable condensers providing substantially even spacing of stations over the control dial scales and very low-loss, low-resistance, plug-in r. f. transformers, a condenser and a transformer being housed in each of the four r. f. stage shields. The antenna stage at the left in Figure 3 employs a special antenna coupler provided with a tapped primary allowing the use of short or long antenna at will by means of the switch in the lower left-hand corner of the panel. The three r. f. stages employ shielded grid amplifier tubes and the battery circuits of these stages are so arranged and so bypassed that, together with the effective shielding provided by the aluminum stage cans, no oscillation tendency or trouble is experienced in the receiver. A special feature of the r. f. amplifier circuit is that it does not employ the tuned impedance coupling which has been believed necessary to operation of shielded grid tubes.

The antenna stage of the receiver is tuned by the "Station Selector I," or left-hand, dial control—the left-hand variable condenser in the schematic diagram, and contained in the left-hand shield compartment of the receiver. The three variable condensers in the three right-hand shield compartments tune substantially identical circuits consisting of carefully laboratory-matched coils and condensers, and are connected together by means of a positive mechanical link. All three are tuned by the single right-hand "Station Selector II" dial. All radio frequency circuits are completely shielded, the radio frequency lead from one stage to the next passing through the small crevice between the stage compartments in slots provided in the shields for this purpose, and being insufficiently exposed to cause signal pick-up. In fact, so thorough is the shielding of the 630-SG receiver that it is practically impossible to pick up even a powerful local signal with the antenna removed; and with the two leads from the antenna coil socket to the antenna switch removed entirely, the shielding becomes completely effective.

Regulated through the use of fixed resistances, each tube has its filament voltage definitely established within correct ranges. Three separate 10 ohm resistances are used on the type UX222 tubes, and the voltage drop across each, of about 1.32 volts, is utilized for grid bias. A 2 ohm resistor, common to the filament circuits of all 222 tubes, prevents the filament voltage ever rising above 3.5 volts with a fully charged battery, while the volume rheostat of 20 ohms allows it to be turned down to a value so low as to reduce volume to practically zero. A .57 ohm resistor regulates filament voltage for the detector and two audio amplifier tubes. A "C" bias of 3 volts is used upon the detector tube (it may be increased to 4½ under certain operating conditions, or reduced to 1.5 volts for UX200A tubes) and upon the first audio tube. This low bias improves low note reproduction and handling capacity for strong signals, and, for a like reason, a plate voltage of 135 volts is employed upon the first audio stage with an optional plate voltage of from 135 to 180, 200, or even 450 on the last audio stage if a 210 output tube is used.

The stage compartments house the radio frequency portions of the circuits. Behind these compartments is the audio amplifier, progressing from right to left, with the second audio tube the left rear tube socket. The detector C bias and plate bypass condensers are contained in the detector stage compartment, as is the detector and audio amplifier resistance. The 10 ohm filament resistances for the r.f. amplifiers are contained in the compartments, and in each compartment is located, of course, a tube socket, coil socket and coil, and variable condenser. Beneath the chassis are fastened the 2 ohm resistance for the 222 tubes and the .57 ohm resistor and the two ½ mfd bypass condensers connected between the metal chassis and the +45 and +135 leads. The metal chassis is grounded to the negative side of the r.f. amplifier filament circuits and at its left end is a terminal strip carrying the loud speaker tipjacks and connection screws and connection terminals for all battery and antenna and ground lead wiring.

The wavelength range of the receiver is from 200 to 3,000 meters. Employing the standard A range coils, it is from 200 to 550 meters, and a suitable coil set consists of one 116A antenna coil and three 119A r.f. transformers. For operation from 500 to 1,500 meters, one 116D antenna coil and three 115D r.f. transformers are employed; while for operation from 1,400 to 3,000 meters, one 116E and three 115E r.f. transformers are employed. D and E range transformers are not provided with selectivity adjustment taps, since there is little congestion of stations in these higher wavelength ranges. On long waves the receiver is sensitive enough to receive European stations if any set at all can do this.

The assembly of the receiver will be quite clear upon careful inspection of the accompanying photographs which indicate the placement of all parts above and below the chassis. The 20 ohm Frost rheostat should be mounted in the hole in the projecting lip in the center of the front edge of the chassis, using the insulation washers provided to positively prevent any metallic contact between the chassis and the rheostat frame. The photographs should be carefully studied and the parts in each stage shield compartment fastened down as indicated, with care being taken to scrape bright the portion of the chassis falling beneath the stage shield pans to provide good metallic contact between shield pans and chassis. The .57 ohm resistance should have one mounting foot bent at right angles and fastened to one post of the 20 ohm rheostat. The two ½ mf. Carter condensers should be mounted in the detector stage compartment in the holes provided, using machine screws and nuts. Thus, one connection of each condenser is automatically made to the chassis. On the bottom of the chassis, a soldering lug should be placed on the front mounting screw of the 221 transformer, and under the rear mounting screw of the left-hand section of the 316B condenser, these lugs to be used for ground connections to the chassis. Under the front mounting screw-head of the "B" section 316A condenser, one end of the 2 ohm Carter resistance should be fastened, the other end of this resistance being soldered to a lug on the binding post of the Frost 20 ohm rheostat. The two mounting screws of this same variable condenser serve to hold

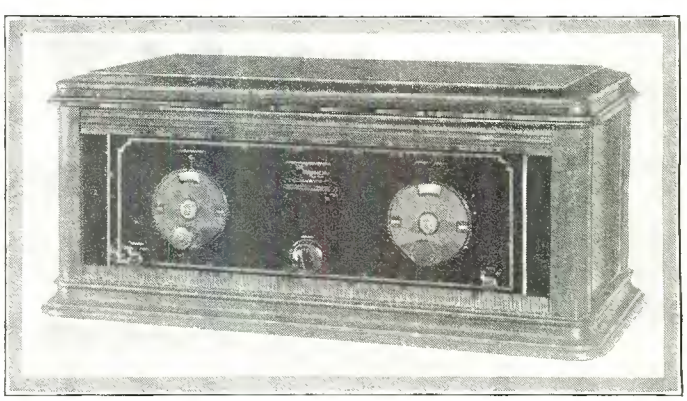


Figure 2. In this photograph the receiver is shown mounted in an Ehlert cabinet

one Fast 1 mfd condenser in position, while the two mounting screws of the left rear, or second audio tube socket, hold the second Fast 1 mfd condenser in position.

The coil sockets of the various compartments should be put in and elevated above the chassis by means of the long mounting screws and studs provided, taking care that terminal 3 of each coil socket projects directly to the right.

Before the front panel has been attached, but with all mounting done, the wiring should be put in place. It is done with flexible insulated hook-up wire, exceeping only the +A, +45 and +90 bus wires which consist of lengths of bus-bar in spaghetti. In making the connections the bus-bar should be cut to length and put in place with proper size lengths of insulating spaghetti tubing slipped over it.

Every joint to be soldered should have the wire and lug separately tinned, using the tiniest pin-point of soldering paste and an amply large drop of rosin-core solder. The wire end and lug may then be joined together, using a hot iron with a drop of solder. In the r.f. amplifier sections a 4¼ inch length of wire should be allowed to extend from terminal 3 of each coil socket, and to the far end of this wire should be fastened one of the three small clips, these clips to be fastened to the top terminals of the 222 shielded grid amplifier tubes.

Connect the antenna and ground leads to the antenna and ground binding posts upon the terminal strip. Connect the A battery to the A BAT. post upon the terminal strip, using the two heaviest wires in the battery cable. Connect the red, or + terminal of the battery to the A+ post of the receiver. Conneet the black, or negative, post of the battery to the A— post of the recciver. Insert all tubes in soekets, turn rheostat to left, and turn on ON-OFF switch. The detector and audio amplifier tubes should light to a cherry red if UX112A tubes are used. The volume control rheostat should be turned to the right gradually, and, when all to the right, the filaments of the 222 tubes should glow with a bright yellowish color. All tubes should extinguish with the ON-OFF switch turned to the OFF position. Remove the A+ lead and connect successively to all remaining battery posts upon the terminal strip. In any of these positions the tubes should NOT light and should only light with the A battery properly connected. Should the tubes light with any other connections, the receiver wiring is at fault and should be carefully checked. The 4½ volt C battery should have its + lead connected to the black, or negative, lead of the A power unit. Its —3 lead should connect to the C— det. binding post of the terminal strip. The second higher voltage C battery for the last audio amplifier stage should preferably be of about 15 volts value when using a 112A on 180 volts—an extremely satisfactory operating value for this tube. The — lead of this C battery should connect to the C-AMP. post of the terminal strip.

The operation of the receiver is simple, it simply being necessary to turn it on with an ON-OFF switch, adjust the volume knob to the maximum or full right position and tune in stations which will be received with the two dials rotating approximately alike. Volume may be regulated with the volume knob and a course regulation of the selectivity of Sclector I dial effected by throwing the antenna short and long switch from Short to Long position and vice versa. If the set is to be operated in a residential district 10 or 15 miles from a local broadcast station, the plate leads of the r.f. amplifier tubes should be fastened under terminal screws No. 2 of the coil sockets, which is the position of greatest volume together with extremely good seleetivity. Moving the three plate leads to post 4 of the respective coil sockets increases the selectivity and decreases the volume very slightly, while connecting the plate leads to post 1 of the coil sockets gives an extremely high value of selectivity at the expense of a slight decrease in volume.

The three condensers in the stage compartments should be ganged by fastening the link motion to them and adjusting it so that all three condensers begin to interleave and hit their stop rods at the same time. After the set has been in operation, the antenna length should be cut down until some station at about 300 or 325 meters is barely audible. The right-hand condenser

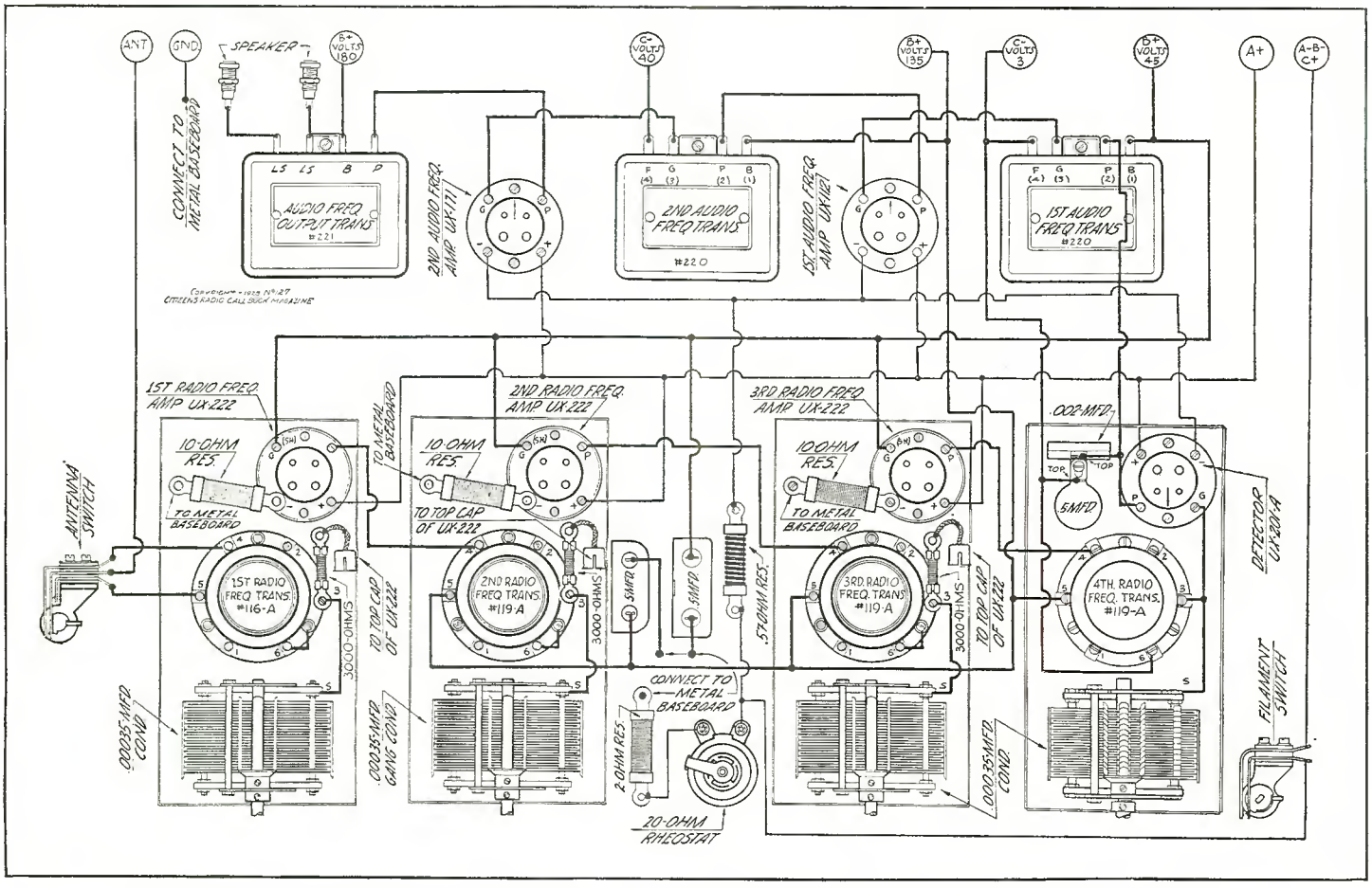


Figure 3. Wiring of the receiver may be accomplished by means of the graphic illustration shown above. This diagram should be faithfully followed by those who are not acquainted with the schematic wiring diagram

should then be loosened from the ganging and tuned individually. While the condensers are tuned together for loudest signal, the condition of loudest signal will be when the last condenser lags slightly behind the first and second condensors, and the link should be tightly locked in place at this point.

In operating the receiver, remember that it tunes exactly like any ordinary neutrodyne or non-oscillating tuned r.f. receiver and that it will not oscillate if properly assembled (except in the case of very unusual operating conditions, when it may oscillate with the plate leads connected to post 2 of the coil sockets, and with no antenna connected to the receiver). With even a 15 foot antenna connected, the set will not oscillate at any wavelength. The set in operating should give loud speaker signals upon stations barely audible upon other tuned r.f. or superheterodyne receivers, or it should give equivalent volume with far greater selectivity on any stations that may be heard with any standard tuned r.f. receiver operating on a 60 to 100 foot antenna. The Shielded Grid receiver for this test was equipped only with a 10 to 15 foot length of wire for an antenna.

For those who wish to use this receiver with a loop instead of the antenna connection, the Bodine .00035 mfd type loop is recommended and has worked very satisfactorily with this receiver. For loop operation all that is required is to omit the first stage shield 631-A, the antenna coil 116-A and the coil socket 515 in the first stage. With these parts left out, the loop should be placed across the rotor and stator of the condenser shown at the left in Figure 3, which is the first .00035 mfd tuning condenser.

This receiver has been tested for operation with UX-222, Shield plate 122, or equivalent types of screened grid tubes.

Parts used in the construction of the receiver here described are:

4—631-A S-M stage shields
2—316-A S-M variable condensers
2—316-B S-M variable condensers
4—515 S-M coil sockets
6—511 S-M tube sockets
3—119-A S-M r.f. transformers
1—116-A S-M antenna coil
2—220 S-M audio transformers
1—221 S-M output transformer
1—632 S-M triple link motion
1—105 Carter .5 mfd condenser
1—Carter .002 mfd fixed condenser
2—Fast 1 mfd by-pass condensers
1—Frost 20 ohm rheostat

Figure 4. In this photograph the Silver-Marshall Shield Grid Six is shown housed in an Ehlert cabinet

3—Yaxley 3000 ohm grid resistors
2—10 Carter tipjacks
1—Carter 2 ohm fixed resistor
3—Carter 3000 ohm grid resistors
2—Marco walnut vernier dials
3—Carter 10 ohm fixed resistors
1—Carter .57 ohm fixed resistor
1—636 S-M terminal strip with terminals
1—633 S-M drilled and engraved metal panel, 7x21 inches
1—634 S-M steel chassis, 12x19¼x1¼ inches
1—22 Carter Imp short jack
1—Carter Imp battery switch
25—Feet S-M flexible hookup wire
1—Ekko ground clamp
1—Package Kester radio solder

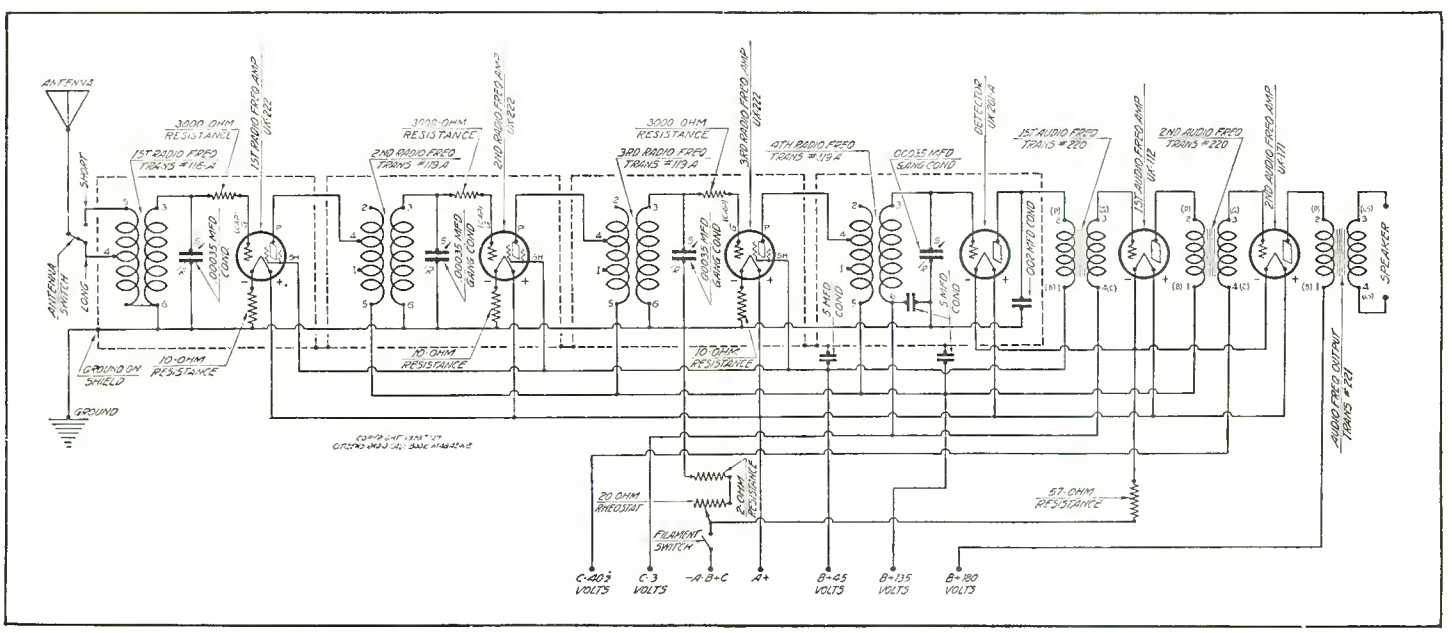


Figure 5. The electrical story of the receiver may be ascertained from the schematic diagram shown above, which may be used by those familiar with this type of drawings, although the novice is urged to use the graphic shown in Figure 3

Citizens Shielded Five Is Fine for the Experimenter

Considerable Amplification Secured with This Recent Laboratory Receiver Which Has Unique Balancing Method

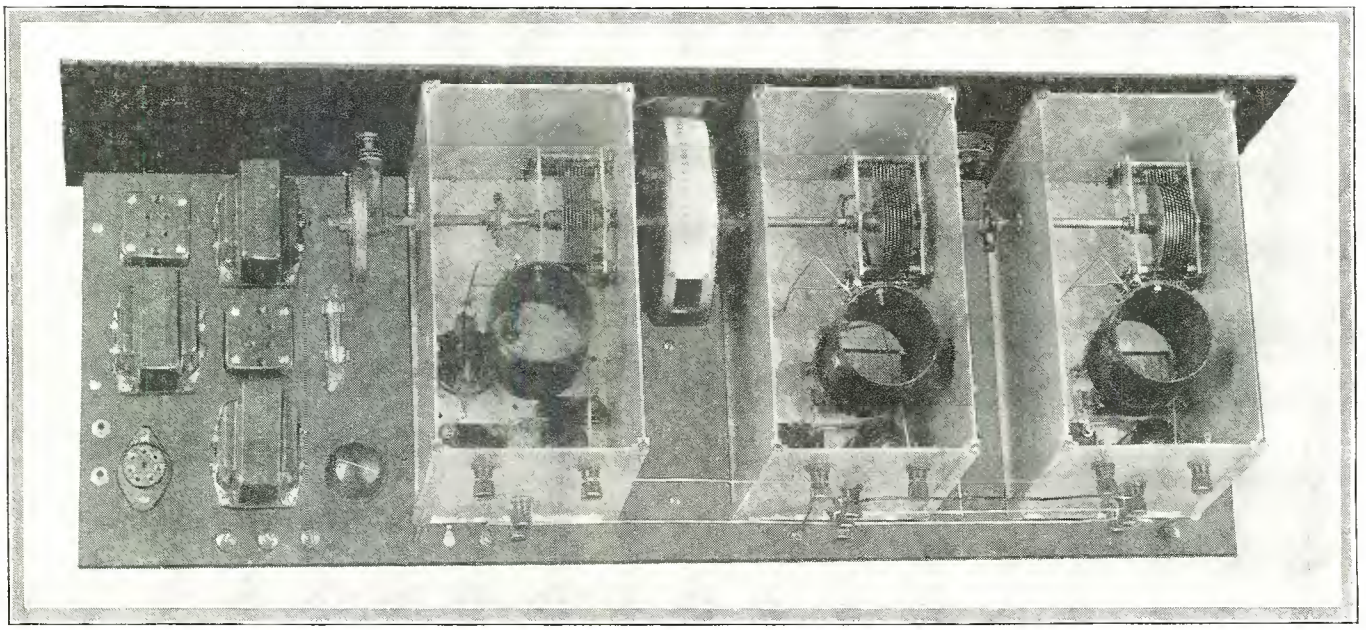


Figure 1. In the above photograph is shown the rear view of the Citizens Shielded Five described in this article

QUITE frequently the editorial and technical departments of this magazine have been requested by dyed-in-the-wool experimenters to design something which will give those who are experimentally inclined an opportunity to play with a receiver, which perhaps might be a little too complicated for the average listener.

Our Own Design

In response to these numerous requests our laboratory for some time past has been engaged in testing out the merit of various shielding systems in a tuned radio frequency amplifier and with the result that in the receiver about to be described it is felt that excellent results may be obtained from the use of a circuit, such as is shown in the schematic diagram in Figure 2 which accompanies this article.

Basically the receiver consists of two stages of tuned radio frequency and a non-regenerative detector, to which have been added two stages of quality audio amplification, using an output transformer in the last stage for protecting the speaker windings against high voltages. Three of the sections of this receiver, which comprise the first and second radio frequency stages and that of the detector, are placed inside of an aluminum housing with the necessary interconnecting binding posts located at the rear of the aluminum shields. By referring to the photograph shown in Figure 1, the builder will readily notice the binding post connections on the rear of the shields and will observe that relatively little wire is required for hooking up these three boxes. It was felt that in order to secure as great an amplification factor as is possible, that complete shielding becomes imperative.

R. F. In Shielded Sections

Referring to the schematic circuit shown in Figure 5, it will be noted that the first radio frequency transformer, the .00035 mfd tuning condenser, the tube socket, the 1000 ohm fixed grid resistance, the radio frequency choke and the .1 mfd bypass condenser are all located within the confines of the first shielded section. The second aluminum housing contains a .002 mfd fixed condenser, the second radio frequency transformer, the .00035 mfd gang condenser, the 1000 ohm grid resistance, tube socket, radio frequency choke and the .1 mfd coupling condenser. In the third shielded section, which is that of the detector stage, may be found the third radio frequency transformer, a .00035 mfd grid condenser, 2 megohm grid leak, tube socket, radio frequency choke and the .001 mfd bypass condenser. All of these shields are at ground potential, connecting in common to the negative A battery, the negative terminal of each of the three tube sockets, the rotors of each of the three variable condensers, the grid return of each of the three secondary inductances and the ground tap of the antenna coil. In addition the negative filament connection is common with the positive C battery and the negative connection of the B voltage.

Receiver Single Controlled

While it would have been possible to make a double control receiver out of this set, nevertheless it was felt that the three stages would gang sufficiently well to allow the operator to secure good results over the entire scale by connecting the three variable condensers together through the Precise drum control, which is shown at the center of the drawing in Figure 4, with the actual driving mechanism located to the right of the last can shown in this same illustration. For the sake of clarity the drum mechanism and the driving mechanism are not shown in the graphic illustration shown in Figure 6.

Audio Stages Fixed

For controlling the filament circuit of the first and second radio

(This receiver tested and all illustrations made in our laboratory)

frequency amplifiers, a 10 ohm rheostat is used, which is also a filament switch and is located at the left of the front panel shown in Figure 3. The dial at the right in the illustration just referred to represents the driving mechanism for the dial and condenser coupling. A 20 ohm rheostat in series with the filament of the detector tube is located on the sub-panel, because of the fact that after it is once set for a particular tube it does not have to be changed. Filament control of the two audio stages is automatic by means of a three-quarter ampere ballast resistor placed in the positive filament lead, going to the 201-A in the first audio stage and the 171 in the second audio stage. It, therefore, follows that there are only two controls on this receiver, if the receiver is to be made for the average listener.

New Balancing Control

However, if the experimenter is to use the set, it is recommended that an additional control be added, which is to consist of a 500 ohm variable resistance, preferably located on the front panel, and in series with the primary coil of the third radio frequency transformer, where it serves to balance the receiver to a point where a large radio frequency amplification value may be secured without distortion or instability. Further stabilization of the receiver may be observed in the use of the 1000 ohm fixed resistance in series with the grid circuit of the first and second amplifiers. At this point it should be noted by the experimenter that the primary coil of the second radio frequency transformer does not actually have battery current flowing through it. It is isolated from the plate circuit of the first stage by means of a .1 mfd condenser directly at the plate of the tube and a .002 mfd coupling condenser between the bottom terminal of the primary and the bottom terminal of the radio frequency choke coil, as shown in the schematic diagram, Figure 5. It should also be observed that the primary of the third radio frequency transformer does not have any current flowing through its windings, although it has a resistance in series with it between the lower terminal of the radio frequency choke, the primary of the third radio frequency transformer and one of the .1 mfd coupling condenser shown in the second radio frequency amplifier stage.

Figure 2. Mounted in an attractive console the receiver presents a very pleasing appearance for those who wish to have it in their living room

Values Are Critical

It is by the careful selection of the capacity value shown as the .002 mfd fixed condenser in the bottom side of the primary of the second radio frequency transformer, and the value of resistance used as a control in the primary circuit of the third radio frequency transformer that allows maximum operation of this receiver for distance, tone, stability and selectivity.

The experimenter should note that this 500-ohm variable resistance should have a minimum resistance value of not more than 50 ohms and it must necessarily be non-inductive. The use of any form of resistance other than a non-inductive one will nullify the results which are expected from the receiver. It might be interesting at this point to mention the fact that one of the manufacturers of resistances has made a special non-inductive resistance for this particular receiver design and it is shown in the list of parts which accompany this receiver.

Wire Set by Graphic

Before passing on to the actual operation of the receiver it might be well to take up the wiring of the set, which should be accomplished by means of the graphic diagram shown in Figure 6 which accompanies this article. Having assembled a portion of the aluminum housing, the builder may proceed with the placing of the tube socket, the radio frequency choke, the .1 mfd coupling condenser, the 1000 ohm cartridge resistance and its respective mounting, and the inductance. This inductance is provided with mounting feet so that it goes directly on the bottom of the stage shield. Before mounting the variable condenser located in each of the cans, it would be well to lay out the two sides of the cans for the hole through which the shaft is to be run. These holes for the condenser shafts should be alike to a high degree of accuracy so that when the shafts are located in position there will not be any possibility of their binding. As a means of coupling these shafts from section to section, there are three coupling flanges provided with the dial mechanism. These may be seen by inspecting the layout diagram shown in Figure 4.

All Shields Grounded

As previously stated, the negative terminal of all sockets in all aluminum housings is common with the bottom of the stage shield and may be connected to the shield through the mounting screw used in affixing the socket. The mounting foot on the radio frequency transformer is also connected with the shield as is the rotor of the .00035 mfd tuning condenser. This same form of connection holds true for all three stage shields.

To simplify the appearance of the diagram the binding posts on the rear of the stage shields are shown extended at the top of the graphic illustration in Figure 6. The connections as shown in this diagram are made on the inside of each rear shield. Then when the receiver is connected up for operation, busbar wire is run between binding posts at the same level, this form of connection also being shown in the graphic illustration previously mentioned.

Battery or Eliminator Operated

Filament current for operation of the receiver may be secured either from a storage battery or some standard approved form of A eliminator. There are four plate voltages used on this set, 45 volts being used on the plate of the detector which is a 200-A type. The plates of the first and second radio frequency amplifiers are given 90 volts while the plate of the first audio amplifier is given 135 volts. For the plate of the power tube which is a 171 tube a voltage of 180 is provided. Two bias voltages are available, one of 9 volts negative being used on the grid of the first audio amplifier and one of 40½ negative being employed on the grid of the power tube in the last stage.

Operating the Receiver

In operation of the receiver it will be well to tune in a local station so as to become familiar with the manipulation of the set before trying to receive distant signals. With this type of receiver stations will naturally appear only one position on the dial and after having once been tuned in they may always be found at that particular location. During the time that the receiver is operated on local stations it will be possible to adjust

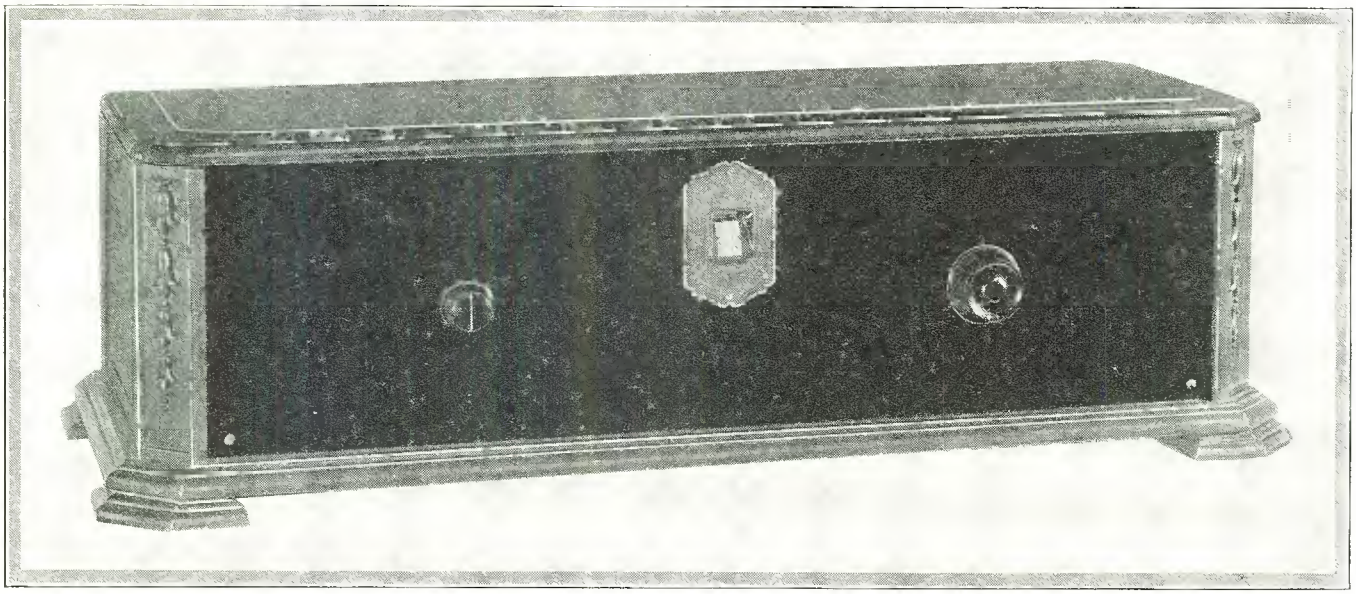


Figure 3. In this photograph the receiver is shown mounted in a cabinet for use on the table or a work bench

the 20-ohm rheostat in series with the filament of the detector tube to a point where best results are secured. It will also be necessary to change the position of the 10-ohm rheostat from time to time for either increasing or diminishing the sensitivity of the first and second radio frequency amplifier stages. Operation of the 500-ohm variable resistance, which is shown in the graphic diagram as being located on the right wall of the third stage shield should be made on a fairly weak station so that the receiver can be properly balanced. At this point it might be well to call the attention of the builder to the fact that if the balancing control is to be located in the position where it is shown in the graphic diagram it is necessary for it to be very carefully insulated from the wall of the stage shield because otherwise there is a possibility of getting a 90-volt short circuit through the arm of the resistor. For insulating it is suggested that fiber washers be secured and that an insulating bushing be placed inside of the hole through which the shaft passes.

When a weak station has been tuned in it will be found that by turning up a 10-ohm rheostat which governs the brilliancy of the first and second radio frequency amplifier tubes the sensitivity of the receiver will be very materially increased and under some conditions might go into oscillation. It is to curb the oscillatory condition of the circuit that the 500-ohm variable resistance is used. Thus by its employment it is possible to hold the amplifier tubes just below the oscillatory condition and thereby gain a very large amplification due principally to regenerative amplifying qualities of these two tubes. Of course for best results with the receiver it should be operated when all of the shields have been placed in position on the top.

For trimming the three variable condensers the operator will observe that each of these variables has a little trimmer plate located at the left of each main section which may be shifted closer or farther away from the main section of the condenser and which serves to increase or decrease the over-all capacity of these units. When lining up the condensers, the builder should be careful to see that when the shaft couplings are put on the condenser plates in each section should be either all in or all out, the former position being preferable.

Parts used in the construction of the Citizens Shielded Five are as follows:

3—Precise .0005 mfd variable condensers
1—Precise drum dial
3—Precision r.f. transformers
3—Hammarlund couplings
3—85 Hammarlund r.f. chokes
3—530 Frost sockets

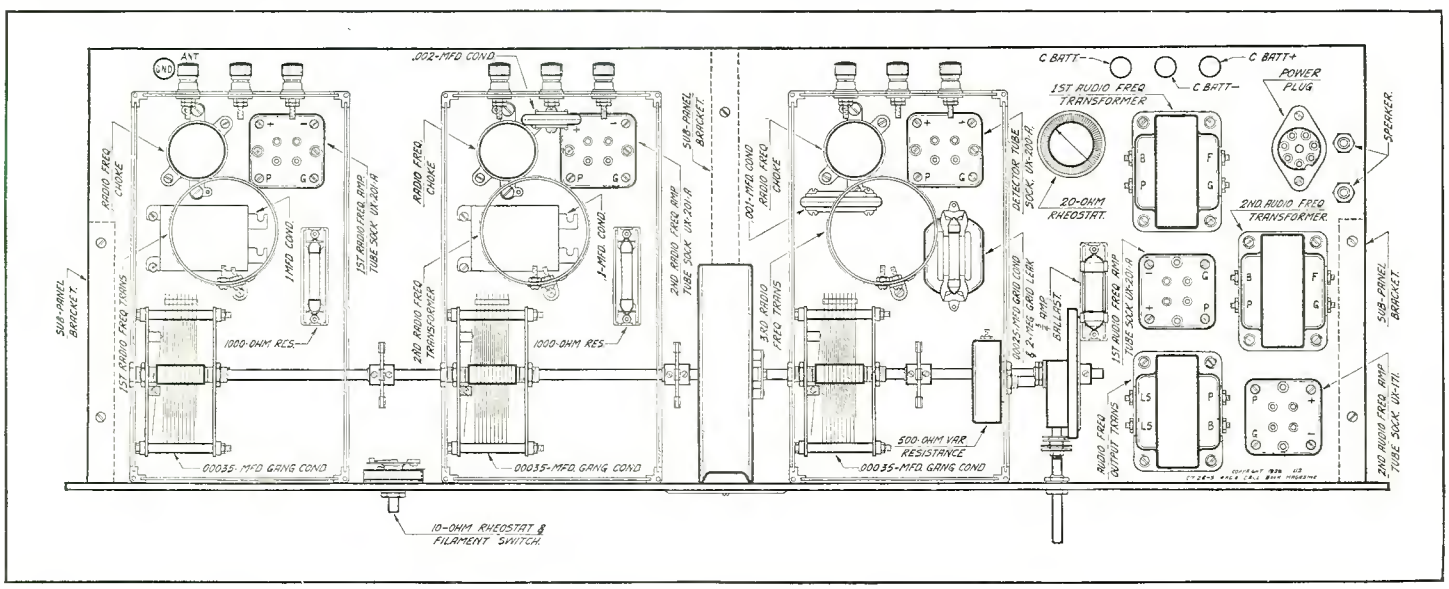


Figure 4. The diagram shown in the above drawing is one that represents the actual placement of the parts involved in this receiver. It should be noted that considerable of the apparatus is located in the shielded cans. The audio stages, however, are not shielded and are placed at the right of the sub-panel as shown above

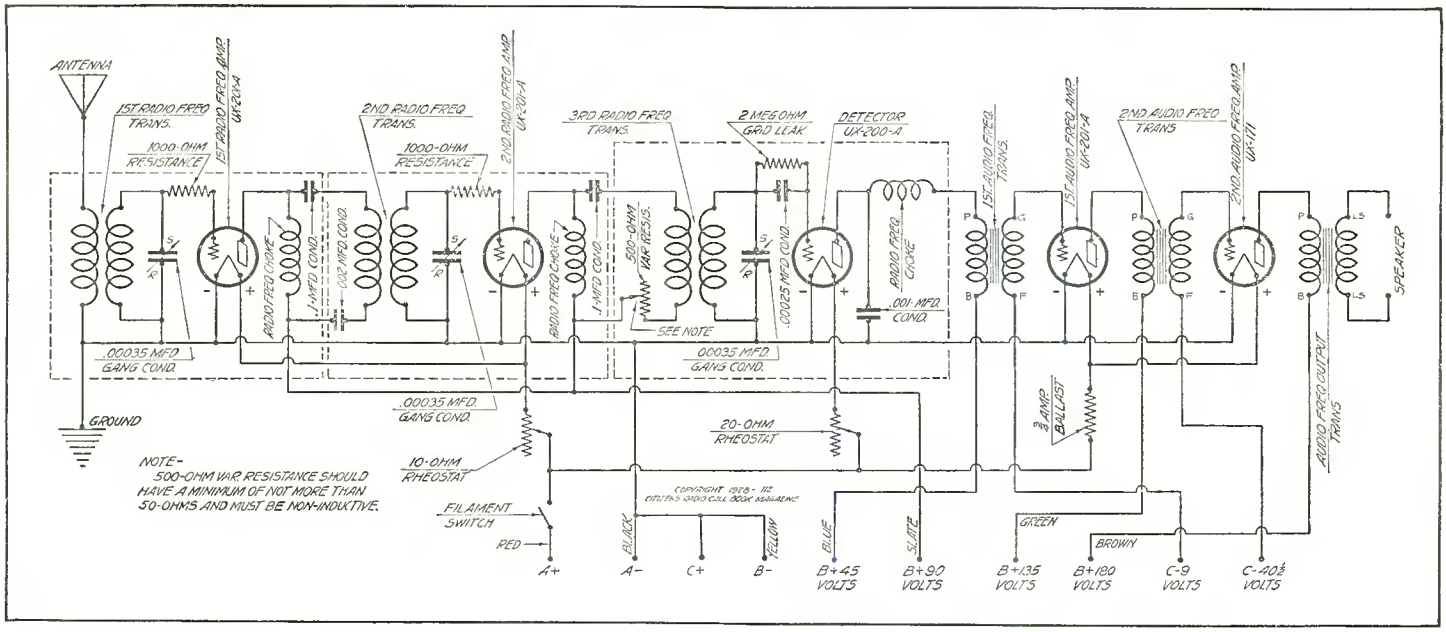


Figure 5. In this diagram are shown the electrical connections for building the Citizens Shielded Five. Those portions of the circuit which are contained within the aluminum housing are shown in dotted diagrams in this schematic circuit

2—531 Frost sockets
1—Frost 10-ohm Gem rheostat with switch
1—Frost 20-ohm Gem rhesotat
2—Frost tipjacks
2—Halldorson audio transformers
1—Halldorson output transformer
1—Hagel 7 contact power plug
2—Acme Par-volt .1 mfd by-pass condensers
1—Frost 2000-ohm non-inductive variable resistance
1—Sangamo .00025 mfd fixed condenser with prongs
1—Sangamo .001 mfd fixed condenser
1—Sangamo .002 mfd fixed condenser
2—Daven No. 50 mountings
2—Daven 1000-ohm grid resistors
1—Daven ¾ amp. filament ballast
18—Eby binding posts
3—ALCO aluminum cans
3—Karas sub-panel brackets
1—8x30x3/16 inch panel
1—10x39x3/16 inch sub-panel
30—Ft. Acme Celatsite wire
1—Pkg. Kester radio solder
1—Ekko ground clamp
1—Daven 2 megohm grid leak
Miscellaneous—lugs, nuts, bushings, screens, etc.

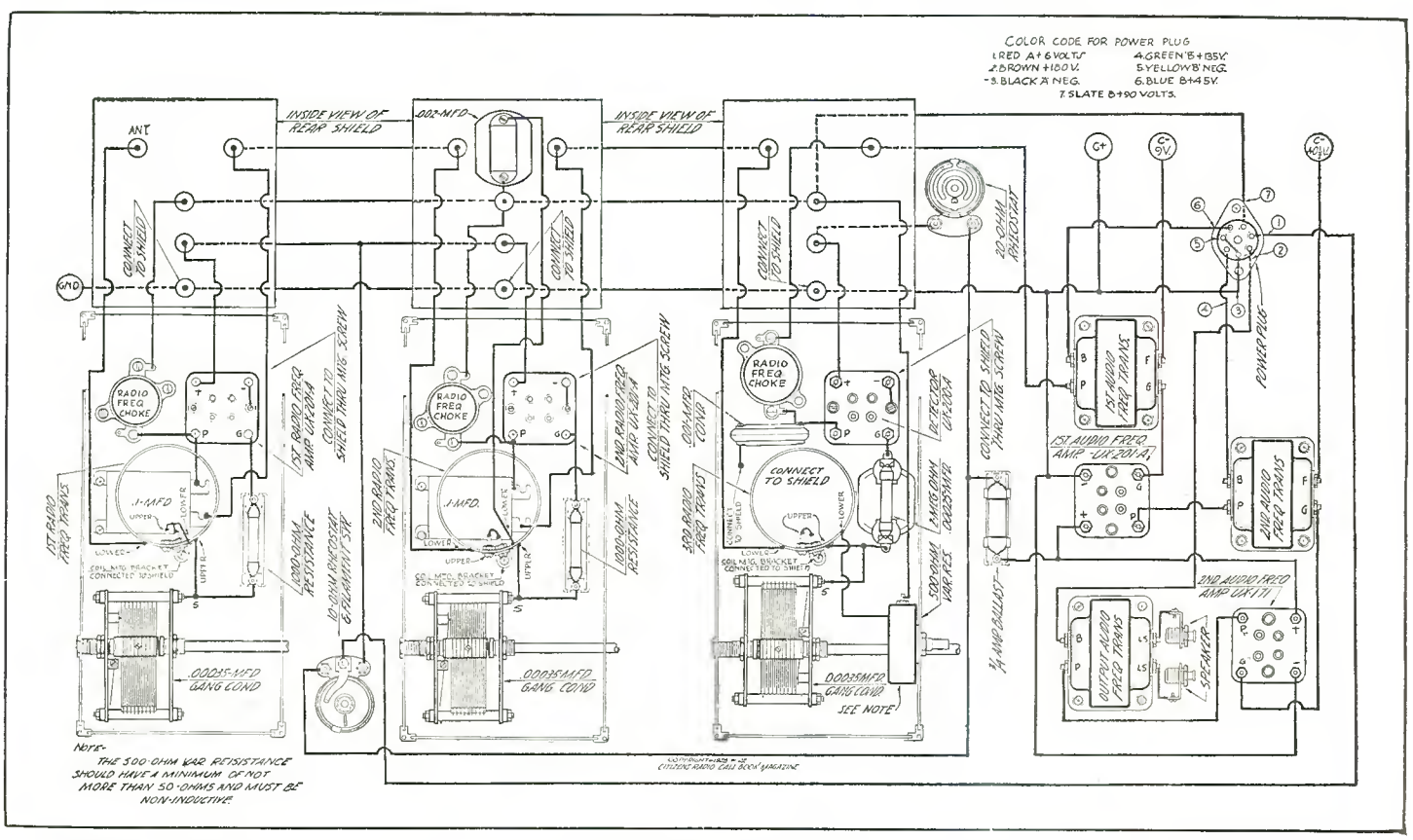


Figure 6. Actual connections for the receiver are disclosed in the above graphic illustration, which should be followed carefully by the set builder

Compact Remler Super Built for Alternating Current Operation

Popular Model of Superheterodyne Considerably Simplified When Used with A. C. Tubes

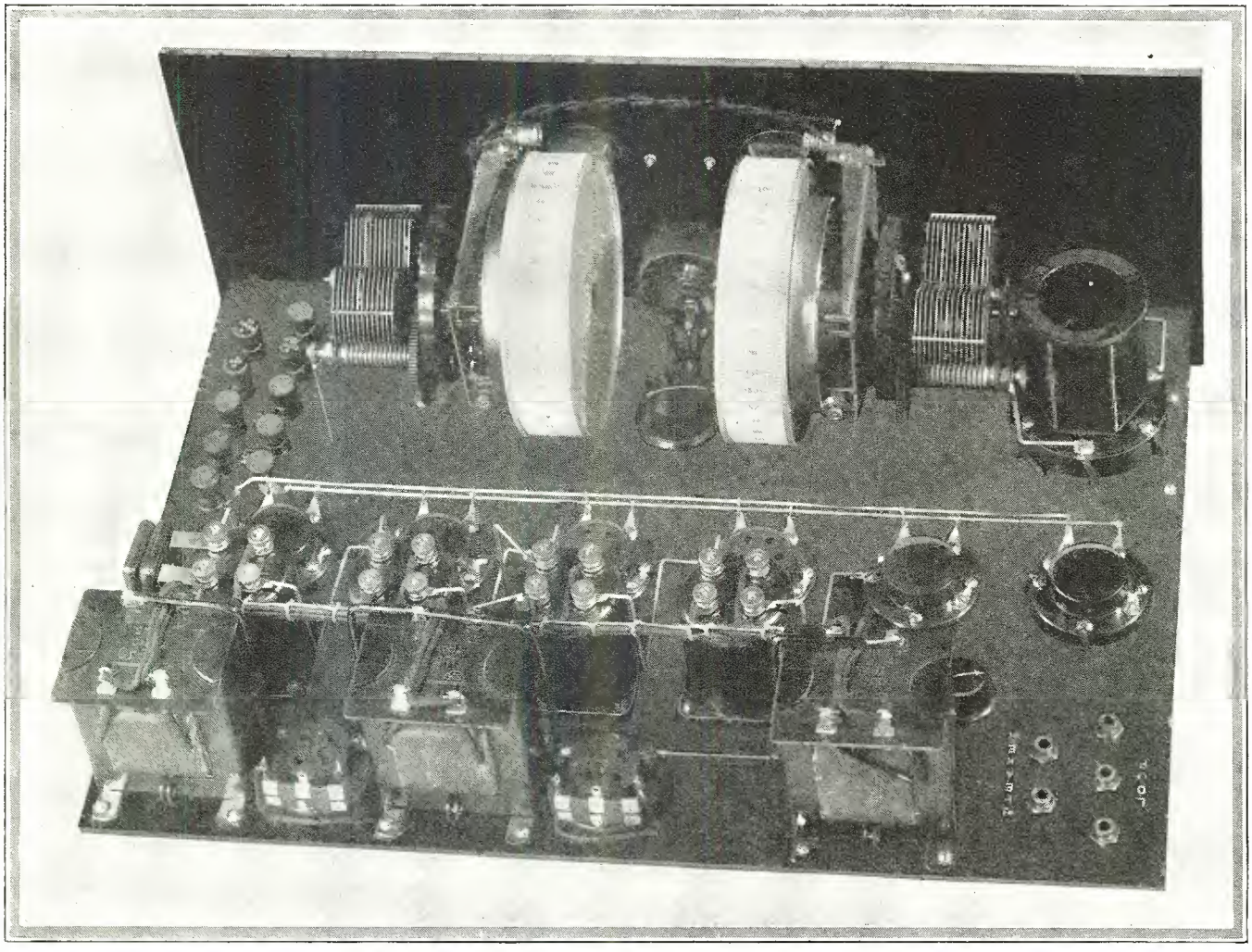


Figure 1. In this photograph may be seen the rear view of the Remler A. C. Super described in the accompanying article

READERS of this magazine remember with interest the previous versions of the Remler superheterodyne which have been printed from time to time. Present-day interest on the part of the public seems to indicate that receivers should be electrically operated, and it is in response to the demand of many fans acquainted with previous models that the Remler receiver has now been converted to alternating current operation by means of the 226 and 227 type tubes.

One of the features of the receiver that may be of interest is the fact that the tuning of it is so simple that even a novice may secure good results, while its tone quality is unusually good for a superheterodyne. A point of interest to the alternating current fans may be seen from the fact that the receiver derives all of its power from any 60 cycle alternating current home light socket. The entire set is self-contained and may be placed either in an oversized cabinet to accommodate the receiver and power amplifier, or it may be placed in a console with the receiver at the top and the power amplifier at the bottom, although for best results the power supply should not be kept too far away from the receiver on account of the possibility of voltage drop in the alternating current filament supply lines. The only external equipment required is a loop such as the Bodine, which was tested with the receiver, and a good speaker. On account of the fact there are no batteries to run down, the servicing problem becomes one of occasional tube replacement only.

In keeping with the simplicity of the receiver, the reader will observe that on account of the small number of parts, the set's initial cost has been materially reduced, so that it would appeal to those who desire a good quality receiver at a moderate expenditure of money.

A description of the individual circuit sections may be of help to the prospective builder. There are three knobs on the front panel. The two drums control the .00035 variable condensers, one for the loop and one for the oscillator, both of these drums having high reduction vernier drivers and well spaced scales numbered from zero to 200. In tuning, both of the dials track quite closely. The center knob controls volume from zero to maximum and is a 5000 ohm potentiometer governing the input to the first, second and third intermediate frequency amplifier tubes. This control is not critical after setting, but if turned too far to the

(This receiver tested and all illustrations made in our laboratory)

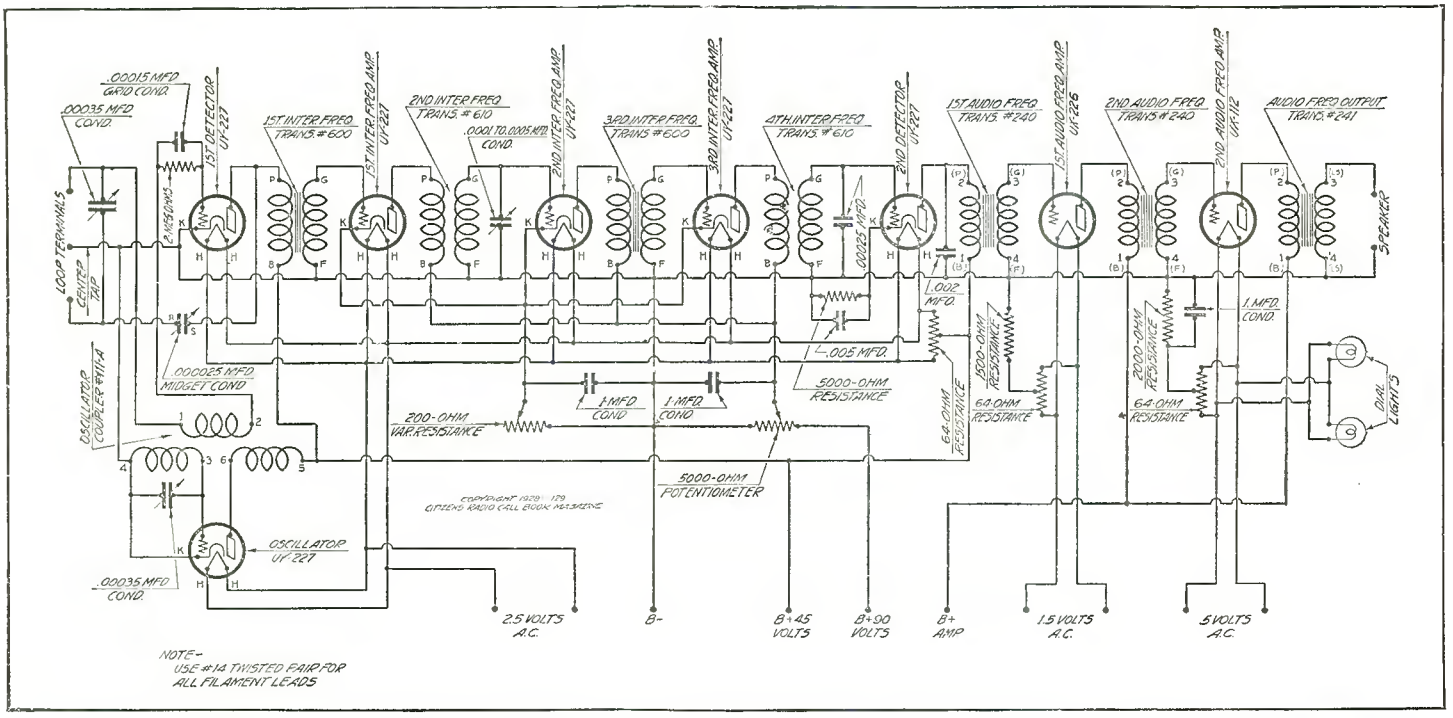


Figure 2. Schematic circuit showing all details of the receiver is given above and should be consulted by the experimenter who wishes to learn the electrical story of the set

right there is a possibility it will cause the amplifier to block.

Looking at Figure 1, one sees the rear view of the receiver. At the right front is the plug-in oscillator coil close by its respective tuning condenser attached to the Remler drum dial. In the center on the front panel is the 5000 ohm variable resistance, while the knob controlling the radio frequency amplifier C bias is shown

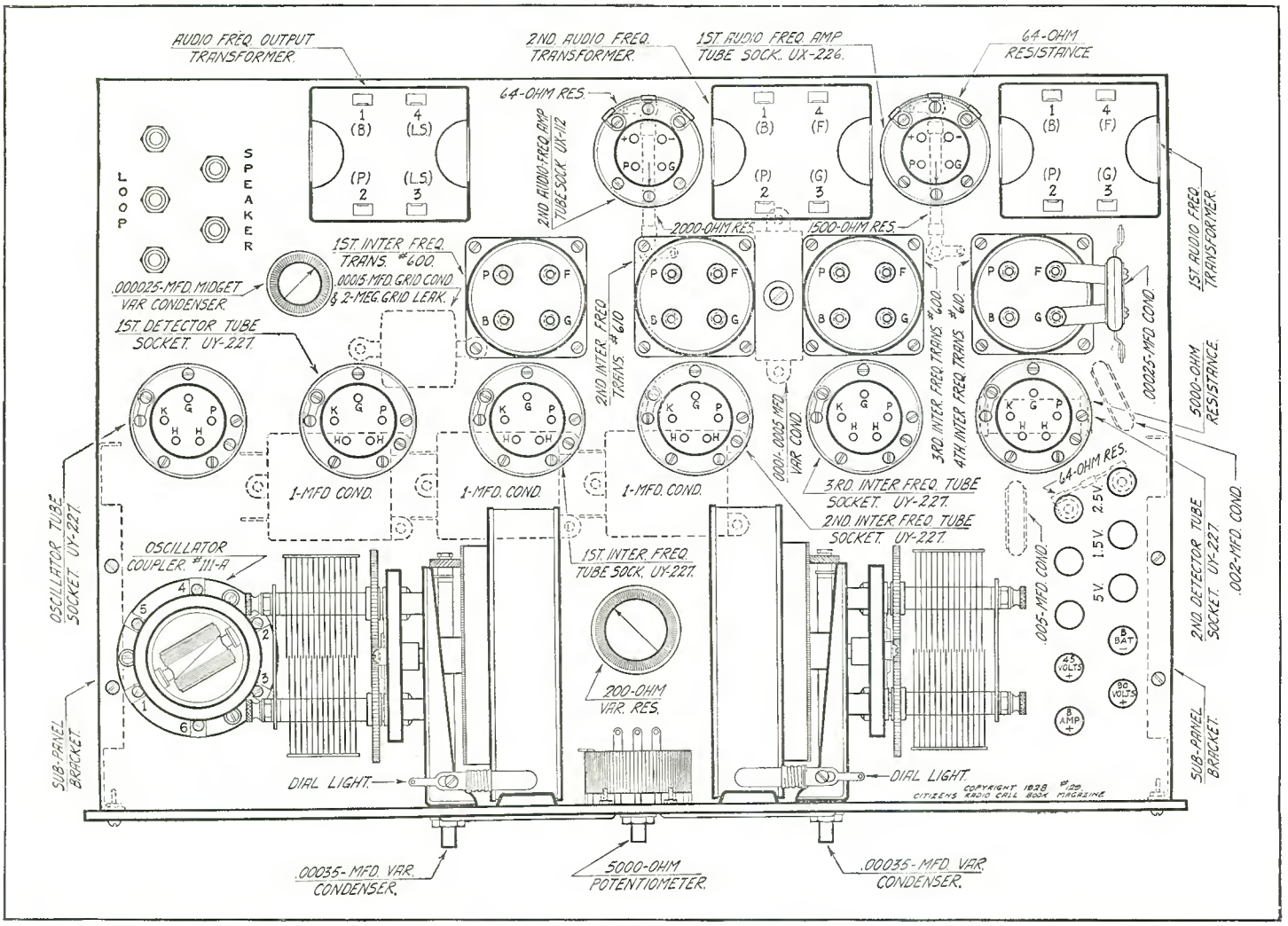


Figure 3. The above baseboard layout shows the actual position in which all units of this receiver must be placed in order to make it a compact one

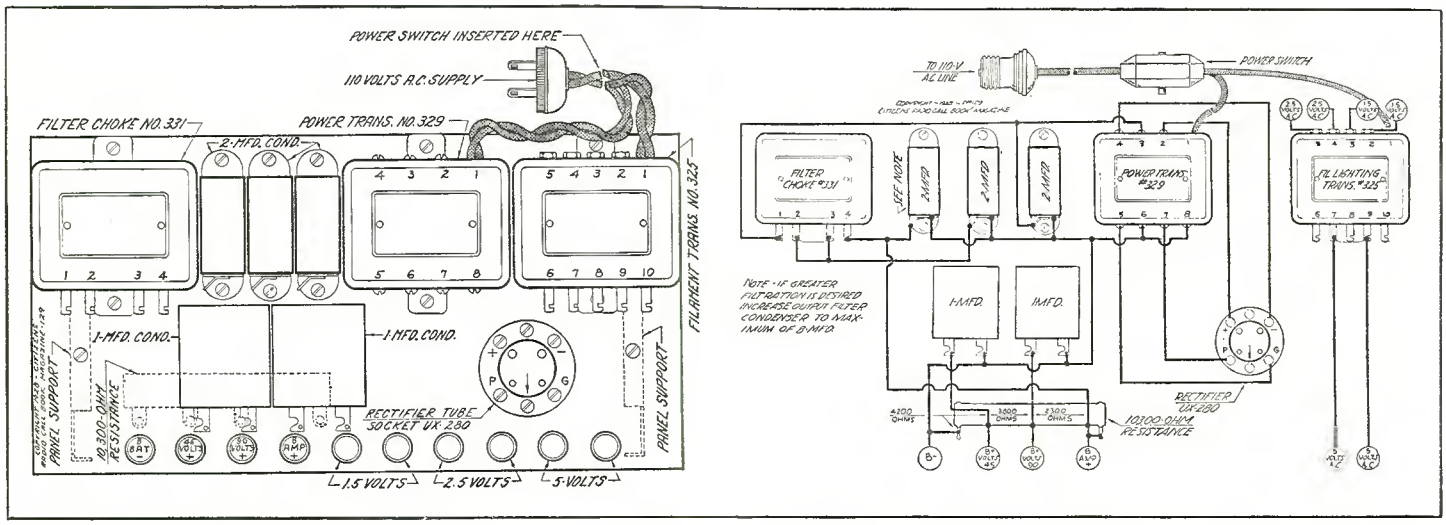


Figure 4. Parts for the power amplifier used with this receiver should be laid out in accordance with the panel layout shown above

Figure 5. The novice should wire up the power amplifier by means of the graphic illustration shown above

mounted on the sub-panel between the two drums. To the left of these controls is the drum and condenser for tuning the loop circuit. At the rear of the sub-panel are located the two Silver-Marshall audio transformers and a S-M output transformer. Speaker tip jacks are placed on the sub-panel at the right corner (Figure 1), while the loop tip jacks are placed in the same position. The midget condenser which controls the regeneration of the loop circuit may be seen close to the speaker tip jack. Suitable binding posts for the voltages are shown at the other extremity of the sub-panel and are laid out so as to match up with

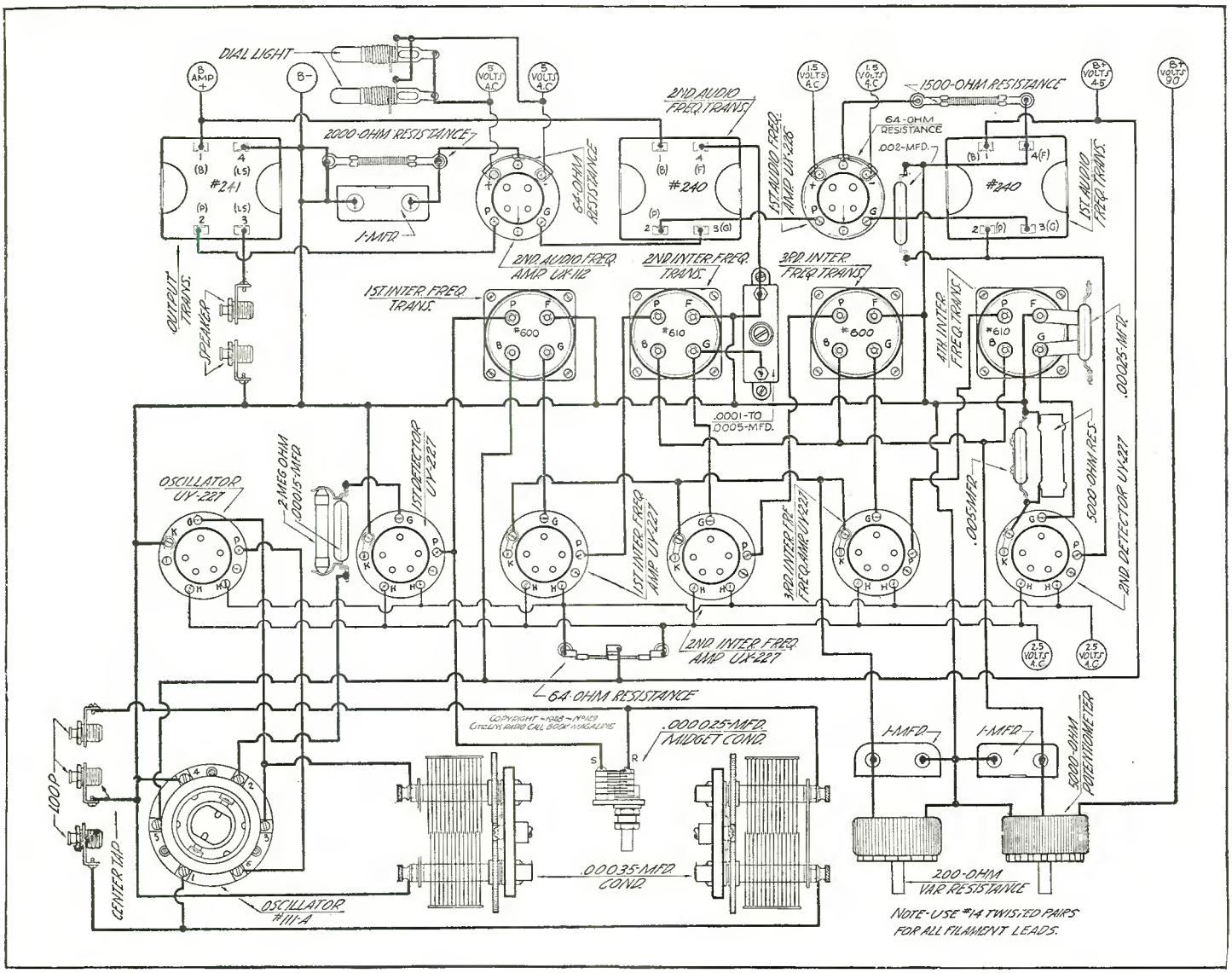


Figure 6. Those not able to use a schematic diagram in wiring their receiver should follow exactly the method of connection shown in the graphic diagram printed herewith

the proper binding posts on the power amplifier.

The power amplifier consists of a power transformer, condenser block, filament transformer and filter choke, with tube sockets and binding posts all located on a 7x12-inch chassis. The resistors for this amplifier are located below the chassis.

One of the reasons for the selection of the 45 kilocycle amplifier for use in this set was the fact of its simplicity, the availability of transformers, and the fact that thousands of sets using them and now in use could easily be converted to the newer circuit using many of the old parts. Selectivity of the set is quite good and allows of ten to fifteen kilocycle separation of powerful local and weak out-of-town stations.

To operate the set turn the midget condenser all out, connect the Bodine L-350 to the loop binding post and tune in a station with the two drums. Set the C bias potentiometer, located on the sub-panel, so that one-eighth or one-fourth of its total resistance is in the circuit, which will give about one-half to one volt negative bias on the r.f. amplifier grids. A good starting point would be KDKA tuned at 53 on the loop and 46 or 58 on the oscillator. If the volume knob is tuned all the way to the left, no signal will be heard. Advancing it to the right up to the oscillation point would increase the volume; if the volume knob is tuned too far to the right only squeals will be heard. If the midget condenser governing the loop circuit is turned in too far, squeals will be heard. This condenser should be adjusted on a station around 220 meters and then left alone. The oscillator coupler rotor should generally be set at about a 45 degree position. The rotor should be set on a weak 300 or 325 meter station to produce greatest volume and best selectivity on either the upper or lower oscillator dial setting. The X-L Variodenser located between the second and third intermediate transformers should be adjusted on a weak signal for the sharpest signals and sharpest tuning.

Parts for the receiver described above are as follows:

Receiver

2—110 Remler universal drum dials
2—600 Remler interstage transformers
2—610 Remler tuned stage transformers
2—638 Remler .00035 mfd variable condensers
2—240 S-M audio transformers
1—241 S-M output transformer
6—512 S-M five prong tube sockets
3—511 S-M tube sockets
1—515 S-M coil socket
1—111A S-M coil
2—540 S-M pairs mounting brackets
1—340 S-M midget condenser
1—Polymet .00015 mfd grid condenser with clips
1—Polymet .00025 mfd fixed condenser
1—Polymet .002 mfd fixed condenser
1—Polymet .005 mfd fixed condenser
1—Polymet 2 megohm grid leak
3—Tobe 1 mfd by-pass condensers
1—F1500 Frost 1500 ohm fixed resistor

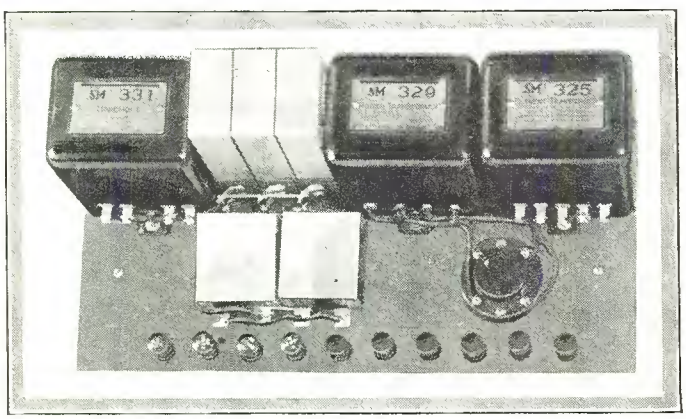


Figure 7. This photograph shows a top view of the Silver-Marshall power supply designed for use with the Remler A. C. Super

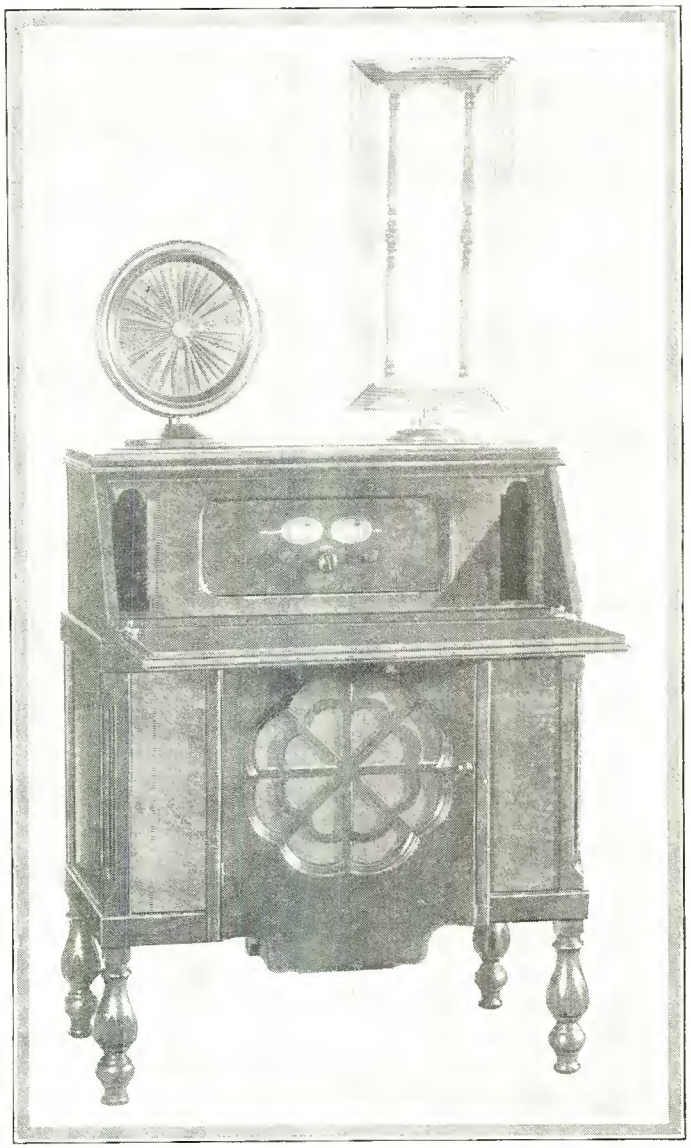


Figure 9. In the above photograph the Remler A. C. Super has been mounted in an Ehlert console and is operated from a Bodine loop and a Sonochorde speaker

1—F2000 Frost 2000 ohm fixed resistor
3—FT64 Frost 64 ohm center tap fixed resistance
5—253 Frost tip jacks
1—No. 1835 Frost 5000 ohm de luxe potentiometer
1—Polymet 5000 ohm fixed resistor
1—No. 1822 Frost 200 ohm de luxe potentiometer
1—G XL variodenser
10—Eby binding posts
1—Formica panel, 7x18x3/16 inches
1—Formica sub-panel, 12x17x3/16 inches
25—Feet Corwico Braidite wire
1—Package Kester radio solder
Miscellaneous—lugs, nuts, screws, etc.

Power Supply

1—329 S-M power transformer
1—331 S-M Unichoke
1—325 S-M filament transformer
1—511 S-M tube socket
1—540 S-M pair mounting brackets
1—659 Ward-Leonard resistor
1—Formica power unit base, 14x7x3/16 inches
3—Tobe 2 mfd 400 volt condensers
2—Tobe 1 mfd 300 volt condensers
10—Eby binding posts
10—Feet Corwico Braidite wire
1—Package Kester radio solder

The New H. F. L. 1928 Nine-in-Line May Be Run With Batteries or A. C.

Arcturus Tubes Allow Alternating Current Operation with Total Absence of Hum

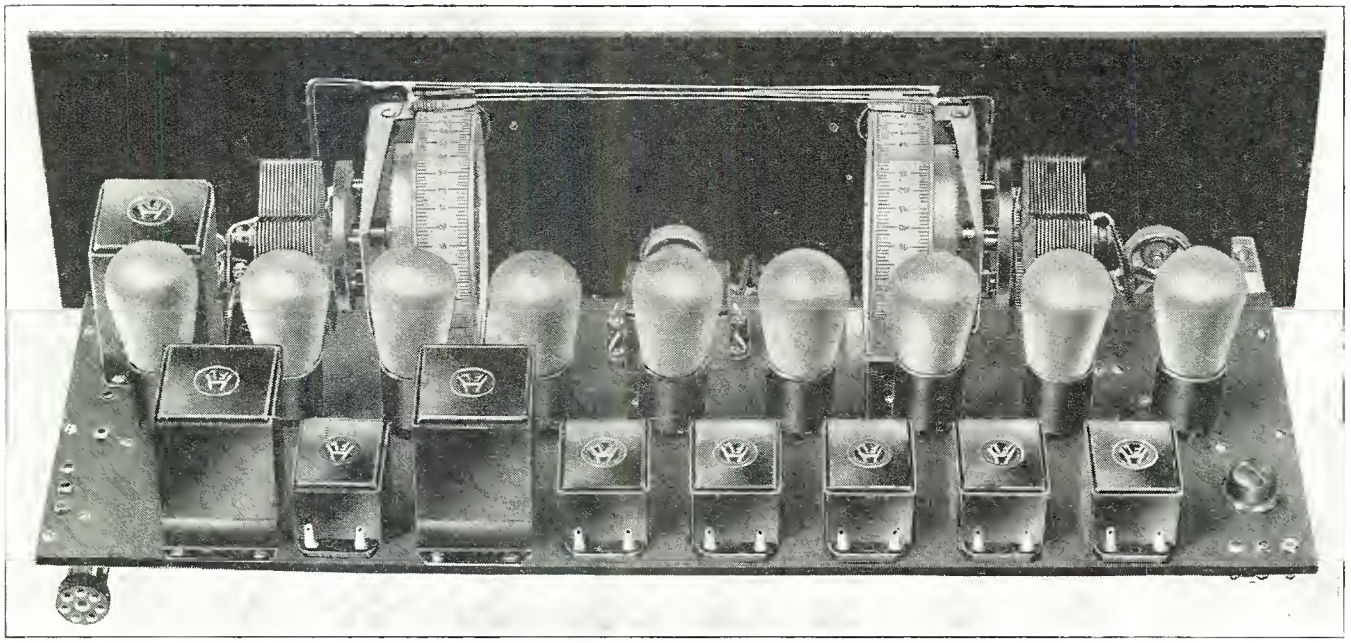


Figure 1. This photograph shows the rear view of the completed Nine-in-Line receiver, which may be operated from storage batteries or with a. c. tubes, very trifling changes being involved in the latter form of operation

EDITORIAL departments of this magazine for the past thirty days have been besieged with questions from readers as to the manner in which existing popular superheterodynes may be converted for alternating current operation. In the case of the receiver about to be described there are many Nine-in-Line supers which have been giving unvarying good performance to their owners, but these individuals are now desirous of securing full alternating current operation for their set without the intermediary of batteries or chargers. It is in response to these requests that we are presenting in this article the Nine-in-Line receiver which may be either operated as a direct current set from storage batteries, or with minor changes arranged so that it will operate with the Arcturus tubes from the alternating current mains.

Few Changes Needed

Those who have already built the previous model of this receiver will recognize by an inspection of the schematic circuit given in this article that very few changes are necessary for the use of alternating current tubes, especially if the type of tube used in this particular set is utilized. No matter what sort of circuit or system is used in a receiver, the inevitable question of performance comes up. To the average radio set owner performance means, first of all, the ability to bring in distant stations. Other considerations are, of course, tone quality, selectivity, volume and ease of operation. In general, however, sensitivity is the main requisite. The receiver under description has covered these five points, as those who have built it will state.

Uses Five I.F. Transformers

Some of the sensitivity of the Nine-in-Line is due to the intermediate amplifier, which consists of four stages. The input transformer has an iron core which allows a wide band of frequencies to be amplified and the presence of the iron tends to permit a greater amplification than otherwise. The next transformer is of the same iron core type, but the third one is a sharply tuned intermediate having no iron in its core. The fourth intermediate is the same as the first two, while the fifth is sharply tuned, which still further increases the selectivity of the amplifier as a whole. Thus it will be seen that the overall characteristic of the amplifier is one of good amplification and selectivity.

Minimizes Harmonics

Immediately preceding the intermediate amplifier is the usual detector and oscillator combination. These circuits are standard in all receivers of this type. The oscillator unit has been designed especially for the receiver and is very compact, operating with a minimum of harmonics and being practically fieldless because of its small physical dimensions. The radio frequency choke, which is used in conjunction with the oscillator, tends to stabilize the circuit as a whole and aids in isolating the oscillator from the balance of the receiver, doing away with interaction between this circuit and the balance of the set.

The usual regenerative detector is used and regeneration is accomplished by means of the .000045 mfd midget condenser shown in the schematic diagram in Figure 3, and in the graphic, Figure 5. This midget condenser is located on the extreme left

(This receiver tested and all illustrations made in our laboratory)

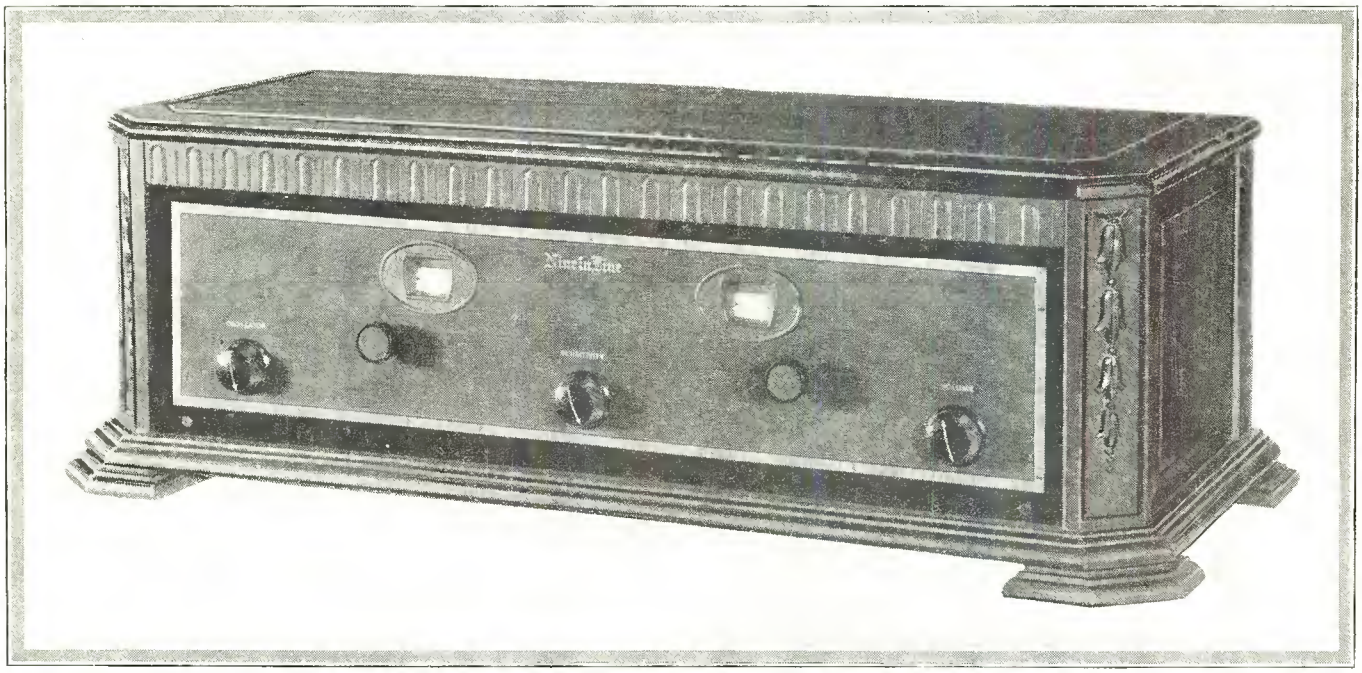


Figure 2. In the above photograph the receiver has been mounted in an attractive cabinet

rear of the sub-panel, as is shown in the layout in Figure 4. This adjustment need not be used ordinarily, as the receiver is quite sensitive without it. However, for distant stations it will be of value, inasmuch as it will sensitize the first detector and make it more susceptible to weak signals. It need be adjusted only once on a distant station and then left in that position. A Qualitone loop is used for furnishing the signal input to the grid of the first detector. Those who examine the schematic circuit of this receiver will notice that all of the tubes except the oscillator make use of a negative grid bias of three volts. This feature greatly decreases the plate current consumption in the intermediate stages and helps somewhat on the selectivity and tone quality of the receiver.

Handles Lower Notes

Two well designed audio transformers handle the lower notes creditably, while the output transformer serves to reduce the output impedance to a value which matches approximately standard speakers on the market. This transformer further serves to isolate the direct current plate potential and pass only pure alternating current for the speaker. This saves the speaker magnets from demagnetization and allows the reproducer to handle a greater load with much better tone.

The drawings which accompany this article explain fully the layout of parts and their proper wiring. Looking at the sub-panel layout in Figure 4, the reader will note that the tubes, reading from the left end of the sub-panel, are as follows: first detector, first intermediate, second intermediate, third intermediate, fourth intermediate, second detector, oscillator, first and second audio.

Uses Arcturus Tubes

Realizing there is a great demand for set builders for a set using alternating current tubes which may be run direct from the usual light cord, the designers of the Nine-in-Line have adapted their circuit to the use of alternating current tubes, those utilized in the present test having been made by Arcturus.

Study Diagram Carefully

An hour of study on the diagrams will save much time for the builder when the actual construction of the receiver is started. The reader has probably already noticed the drawings accompanying this receiver and will have observed that Arcturus tubes are specified. Under tests the receiver operated entirely satisfactorily, without any discernible hum. These tubes are of the heater type and the cathode is connected inside to what normally would be the positive filament prong. For this reason in wiring the receiver all grid returns must eventually go to the positive filament line through their respective C batteries. This includes all by-pass condensers which would normally connect to the negative

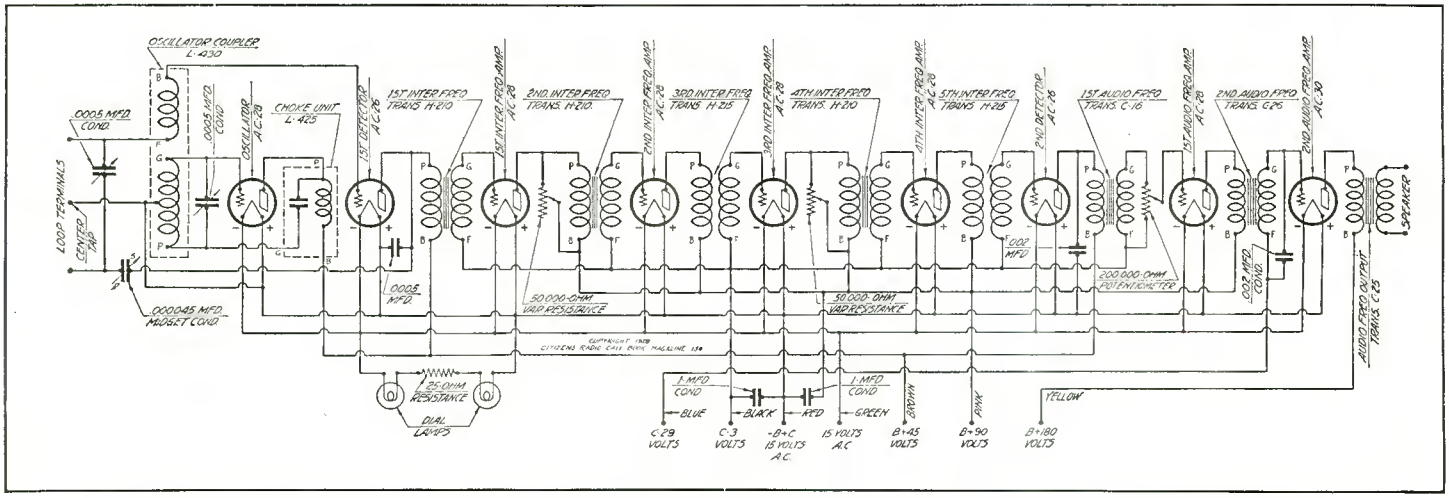


Figure 3. The electrical connections required in the Nine-in-Line receiver are shown in the schematic above

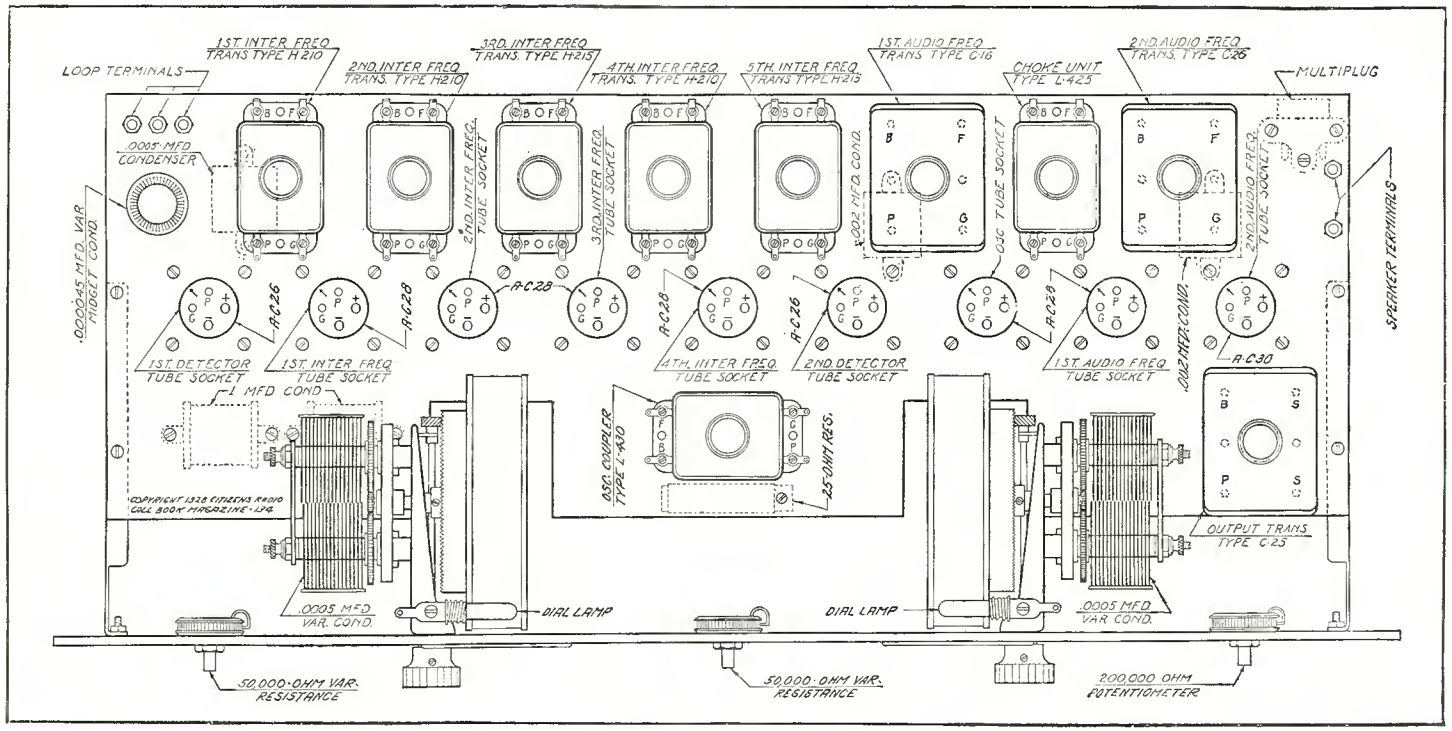


Figure 4. The builder is urged to lay out all parts strictly in accordance with the sub-panel layout shown in the above drawing

filament. The regular Jones cable plug is used for connecting power to the set and in the alternating current model which is described here the C battery connects to the cable instead of plugging in on the sub-panel. The sub-panel C battery jacks are not used in the alternating current model.

Bias on Intermediates

For alternating current operation three to four and one-half negative bias is used on the intermediate transformers, second detector and the first audio transformer, while 30 to 40 volts is used on the grid of the last audio tube. Those who have already built this receiver for the storage battery operation will observe that the three-quarter ampere Daven ballast and the two rheostats will not be needed in the construction of the alternating current receiver. In place of the 6 volt storage battery a 50 watt filament transformer furnishes the 15 volts required for the filaments of all tubes.

Stabilizing the I. F. Stages

Two Carter 50,000 ohm variable resistors are used to stabilize

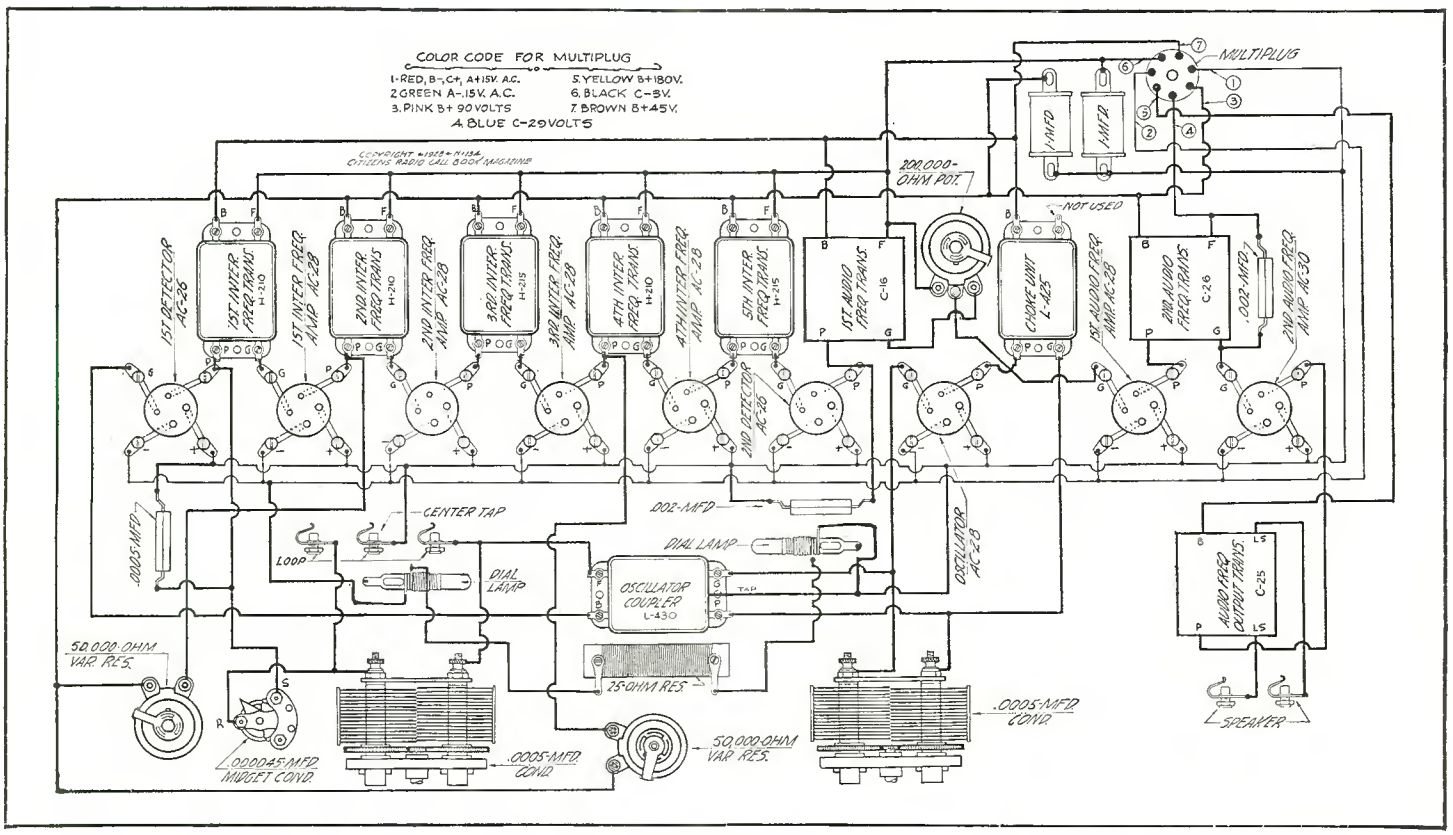


Figure 5. All wiring of this receiver should be accomplished in accordance with the graphic wiring diagram which is printed above

the r. f. amplifier. On the battery operated set this operation is accomplished through the rheostats. A Carter 25 ohm fixed resistance is used in series with the dial lights to furnish them with the proper voltage from the 15 volt alternating current source. The lights are wired in series so that if one should burn out, the other would not be damaged by the increased voltage that would be thrown across it. In wiring the set the important point to be remembered is that the red lead must connect to the positive side of all tube sockets. Externally the red lead connects to one side of the filament lighting transformer (the green lead going to the other side), and the red lead connects also to the B negative and C positive terminals.

Three Kinds of Tubes

Tubes used in this receiver are manufactured in three forms, amplifier, detector and power amplifier. It will be noticed that the two detectors are of the 26 type, the five amplifiers and the oscillator being of the 28 type, and the power amplifier of the 30 type. Under test the alternating current model Nine-in-Line handled exceedingly good volume and fine tone quality. Its operation was satisfactory in every way.

While on the subject of the heater type of tubes, it would be worthwhile to bring to the attention of the builder the fact that these tubes and all others using a heater require about a minute to build up enough heat to function properly. This is an important point to remember in testing and matching the tubes in the intermediate amplifier for their present position.

Drilled Sub-panel

Prospective builders of this receiver will be able to save considerable time in their assembly of the set by virtue of the fact that a drilled sub-panel is available and all that he needs to do is to place the parts on the sub-panel and mount them in their specified positions. In the event the builder does not secure a drilled panel, he may do the drilling in accordance with the general layout shown in Figure 4.

Loop Condenser at Left

In looking at the drawing just referred to, the builder will notice that the tuning condenser for the loop circuit is located at the left, where it is closest to the loop terminals, while the oscillator condenser is located at the right in close proximity to the oscillator coupler located at the center of the sub-panel. Two Remler drum dials are used for ease of tuning. At the left of the sub-panel layout diagram may be seen on the front panel one of the 50,000 ohm variable resistances which is used as a control across the primary of the second intermediate frequency transformer. The second 50,000 ohm variable resistance which is located at the center of the front panel is placed across the primary of the fourth intermediate frequency transformer. These two variable controls serve to increase or diminish the amount of energy in the intermediate amplifier circuit. The 200,000 ohm potentiometer shown at the right of the front panel in Figure 4 is placed across the grid and filament terminals of the first audio frequency transformer and serves as a control for the audio volume of the receiver.

Check Your Wiring

In operation, after all wiring has been carefully checked and tubes placed in their respective sockets, the left hand drum dial is turned to a given point on its scale and the right hand dial turned until a signal is heard. During this process it may be necessary to advance the first and second 50,000 ohm variable resistances to increase the sensitivity of the receiver if the tuning is being done on an out of town station. After a station has once been tuned in, the operator will readily be able to adjust the receiver for its maximum performance. The midget condenser which is shown on the left rear of the sub-panel should be balanced for a station about mid-point of the broadcast band and it may then be left untouched. If this midget condenser is turned in too far, this fact will be manifest by the squeal which is heard. The squeal may be stopped by turning the rotor of this condenser towards zero.

Figure 6. In this photograph the Nine-in-Line has been placed in a console and is operated with a Qualitone loop

List of Parts

Parts used in building the A. C. Nine-in-Line are:

3—H-210 H. F. L. transformers
2—H-215 H. F. L. transformers
1—C-16 H. F. L. audio transformer
1—C-25 H. F. L. output transformer
1—C-26 H. F. L. audio transformer
1—L-425 H. F. L. r. f. choke
1—L-430 H. F. L. r. f. transformer
1—AC-15 H. F. L. filament transformer
9—9044 Benjamin sub-panel sockets
2—8629 Benjamin sub-panel brackets
2—Remler 110 illuminated drum dials, 1 right, 1 left
2—163 Remler .0005 mfd variable condensers
2—Carter 1 mfd by-pass condensers
1—Carter .0005 mfd. fixed condenser
2—Carter .002 mfd fixed condensers
8—Carter tipjacks
2—Carter 50,000 ohm variable resistors
1—Carter 200,000 ohm variable resistor
1—Jones type BM multiplug
1—Celeron, Formica or Lignole 7x26x3/16 inch drilled and engraved front panel
1—Celeron or Formica 8x24x3/16 inch drilled sub-panel
30—ft. Acme Celatsite wire
1—pkg. Kester radio solder
1—Carter 25 ohm fixed resistance
Miscellaneous lugs, screws, nuts, etc.

Samson Supply Furnishes All Receiver and Amplifier Voltages

Sturdy Combination Using 281 Rectifier Tube and Regulator Has Push-Pull Audio Included

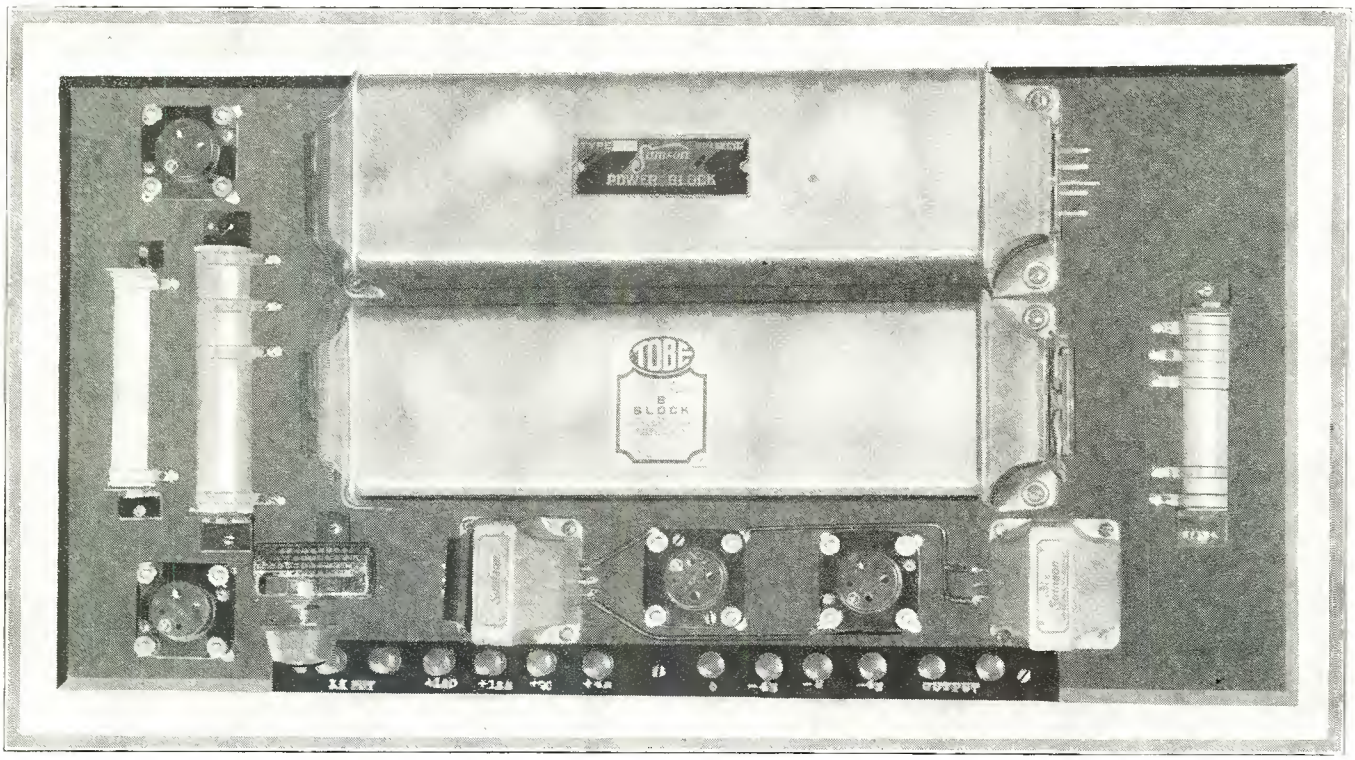


Figure 1. In the above photograph may be seen the compact Samson power supply described in the accompanying article

WITH the insistent demand for high quality reproduction it is only natural that public taste is rapidly centering itself on power amplifier systems that are sturdy enough to meet all requirements and whose cost is not excessive. Simplicity of control, sturdiness of the apparatus and unvarying values of voltage are some of the requirements which have been met in the Samson power amplifier system described in this article, which amplifier has been thoroughly tested in our laboratories.

As it is shown by the schematic diagram in Figure 2, the amplifier consists essentially of a power block containing a primary for the 110 volt alternating current, a high voltage winding for supplying the rectifier tube, a filament winding for the filament supply of the rectifier tube, another filament winding for the filaments of the two 210 tubes arranged in push-pull and a filter choke for ironing out the pulsations in the rectified output of the 281 tube. All of this material is located within a metal container shown in the photograph in Figure 1, and with suitable connections coming down through the baseboard or subpanel, as the case may be, so that the majority of wiring may be done underneath the baseboard or sub-panel. The Tobe filter block is likewise enclosed in a single metal container of the same general dimensions as the power units and may also be seen by referring to the photograph in Figure 1.

The four sockets, audio frequency input transformer, audio frequency output impedance and the necessary variable and fixed resistances are located on top of the baseboard, with the binding post strip conveniently placed so as to simplify as much as possible the carrying of wires from the resistance units to their respective positions on the binding post strip.

Referring again to the schematic in Figure 2, the reader will observe that the output of this radio set goes to the input binding posts on the audio frequency input transformer, whose secondary leads to the grids of two 210 tubes arranged in push-pull. The plates of these two power tubes are connected across the extremities of an audio frequency output impedance, whose center tap receives the high voltage tap from the power supply. The speaker leads are placed on binding posts across the two extremities of the audio frequency output impedance.

Has Safety Switch

In order to safeguard the operation of the set as much as possible by those who are not quite familiar with power amplifiers, the negative return line of the high voltage winding has been purposely broken and cut in through two of the terminals on the socket which holds the type 874 regular tube. Thus if the regulator tube is removed from its socket, the set becomes inoperative. When the 874 tube is placed in the socket, two of its connections complete the high voltage circuit and the set is ready for operation. This is done so that in the event the regulation tube is pulled out, the condenser used in the amplifier will not be subjected to a voltage strain which might occur without the stabilizing influence of the 874 regulator tube.

All of the apparatus required for the use of the constructor in

(This amplifier tested and all illustrations made in our laboratory)

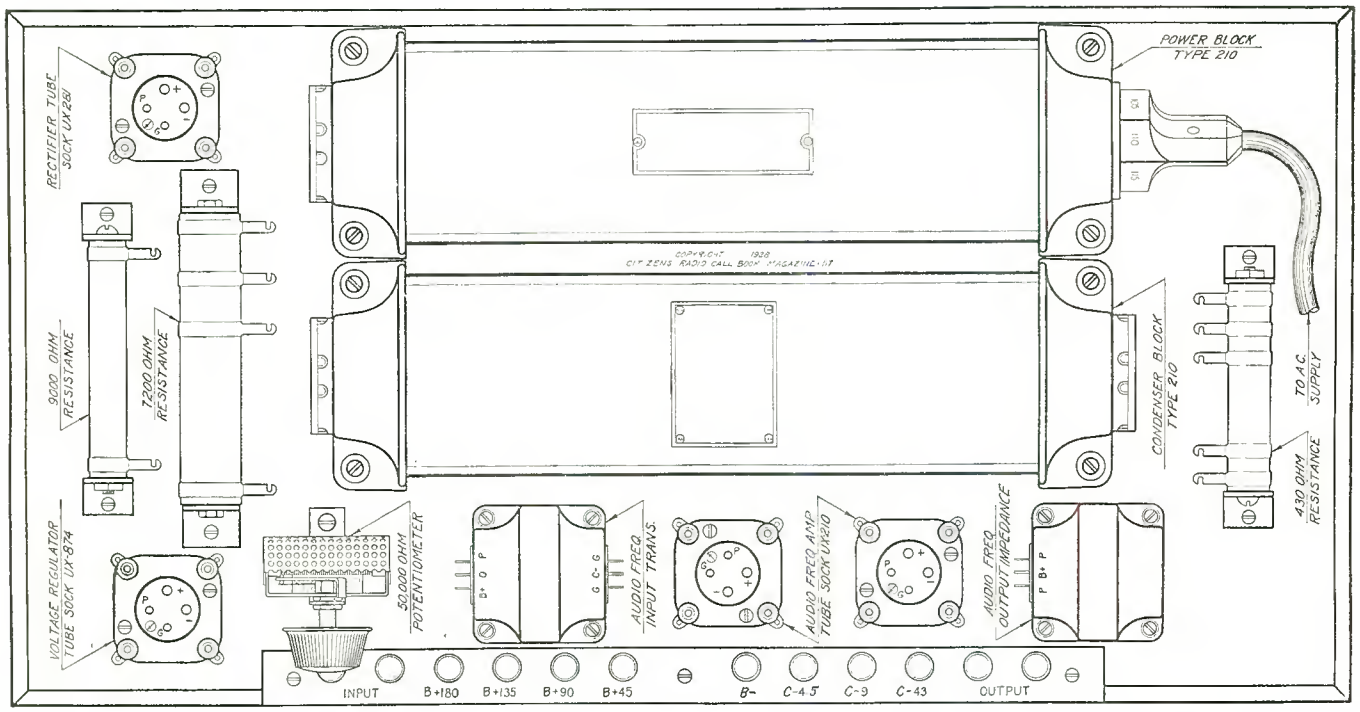


Figure 4. To simplify the work of the constructor, the baseboard layout is given above so that all parts may be placed in accordance with this illustration

building this power amplifier should be laid out in accordance with the photograph shown in Figure 1, and the layout in Figure 4, while the wiring of the power supply may be made either from the graphic illustration shown in Figure 3, or the schematic diagram shown in Figure 2.

All voltages supplied by the unit are of a fixed nature, with the exception of the plus 45 volt lead, which is controlled by means of a 50,000 ohm variable resistance located between the 90 volt terminal and the B 45. This enables the operator to supply the detector circuit with any voltage between zero and 45. The

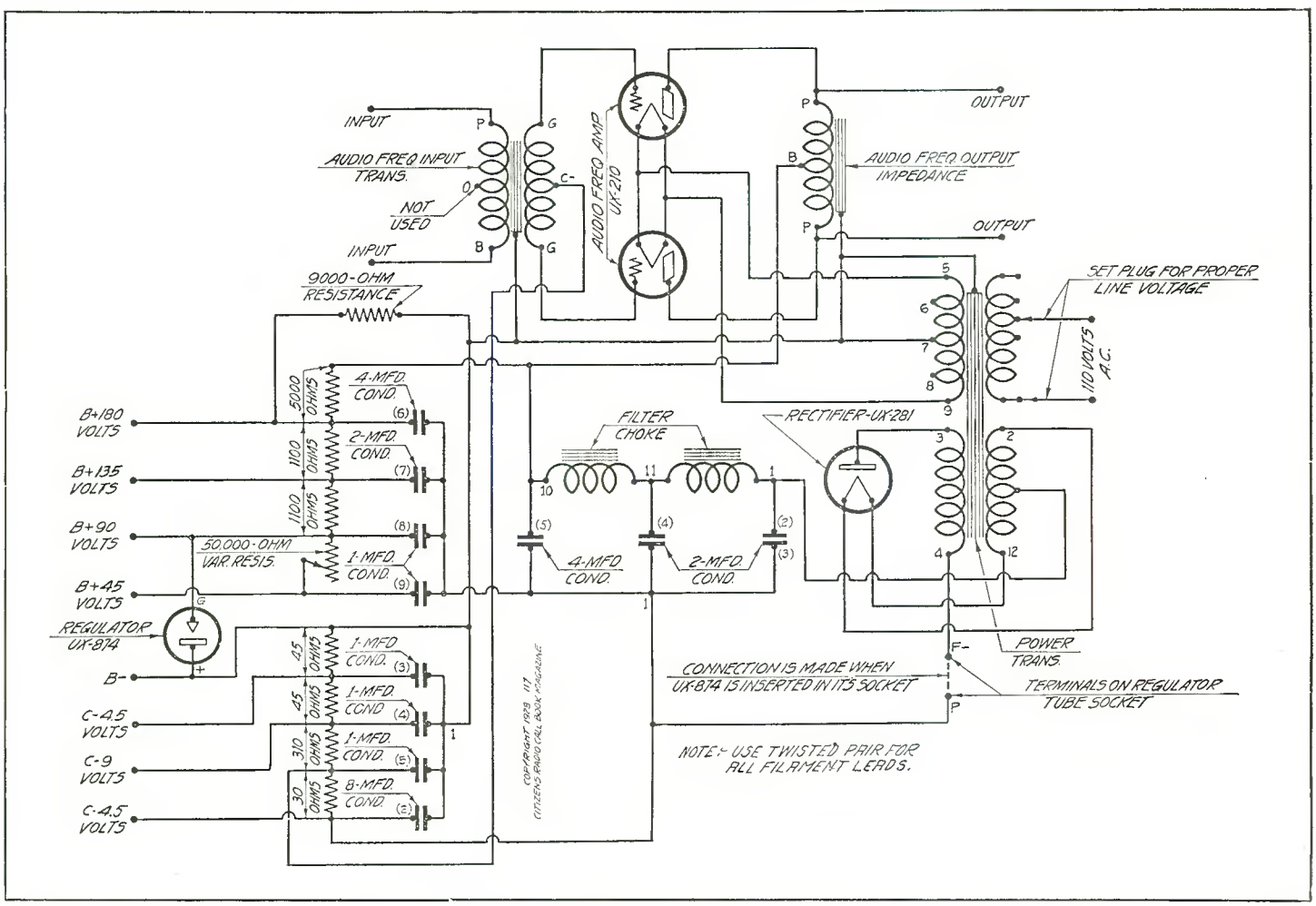


Figure 2. Schematic circuit of the Samson power supply is shown above and will serve for wiring by the experienced set builders

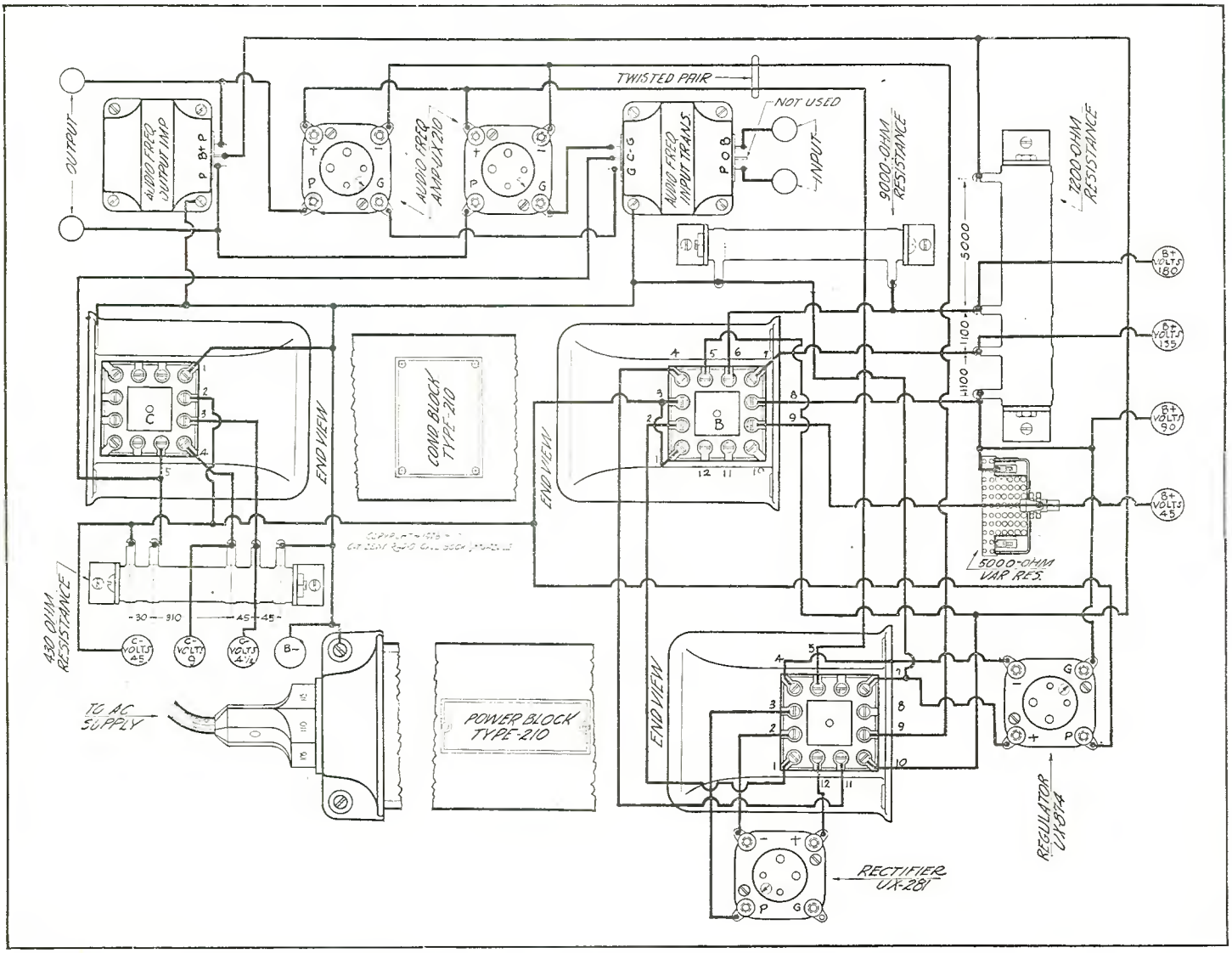


Figure 3. This illustration represents the graphic method of wiring up the amplifier and is much in demand by beginners in radio or others who are not certain of their ability to read a schematic diagram

voltage regulator tube is located across the negative B terminal and the 90 volt positive lead, so that its current drain acts as a stabilizing influence over the voltage available in that particular section of the resistance train. One tap is provided for a plate voltage of 135, another is provided for a voltage of 180, while the top end of the resistor gives the maximum voltage available, which is carried to the plates of the 210 tubes shown in push-pull arrangement.

Three bias voltages are supplied by the power unit, each through a separate bias resistor provided with its accompanying bypass capacity. The negative 4½ volt bias is supplied through the drop across a 45 ohm resistor located between B negative and the C negative 4½ volt terminal, this resistance being bypassed by a 1 mfd condenser. The negative 9 volt bias is supplied by the drop across a second 45 ohm resistance bypassed by a 1 mfd condenser. The bias for the grids of the 210 tubes is secured through a 300 ohm resistance in series with the previous two 45 ohm resistances, this last resistance also being bypassed by a 1 mfd condenser. A separate 45 volt bias, which is carried to a binding post, is provided across the 30 ohm section at the bottom of the bias resistance strip and is, of course suitably bypassed by an 8 mfd bypass condenser, this 45 volt bias tap being common with the return of the bypass condensers across the filter choke and with the bypass condensers across the high voltage section of the resistance train.

All of the metal cases containing the power block and the B block are grounded to negative B, as well as the iron core of the first audio frequency input transformer, the audio frequency output impedance and the core of the transformer contained within the power block housing.

List of Parts

The following is a list of parts used in the construction of the Samson power supply:

1—210 Sampson power block
1—Sampson push-pull input transformer
1—Sampson push-pull output impedance
1—210 Tobe-Sampson condenser block
1—Harfield 7,200 ohm resistor
1—Harfield 430 ohm resistor
1—Harfield 9,000 ohm "plug-in" 4-watt resistor
1—Electrad 50,000 ohm Tru-volt resistor
4—1040 Bejamin sockets
12—Eby engraved binding posts and bakelite strip for mounting
1—12"x20"x½" wood base-board
1—Sonatron type 281 tube
2—Sonatron type 210 tubes
20—Ft. Acme flexible Celatsite wire
1—Pkg. Kester radio solder
Miscellaneous—lugs, nuts, screws, etc.

Abox ABC Eliminator Built to Run Receivers From Power Mains

High Capacity Filter Used to Eliminate Hum in Filament Source Forms Basis of This Desirable Combination

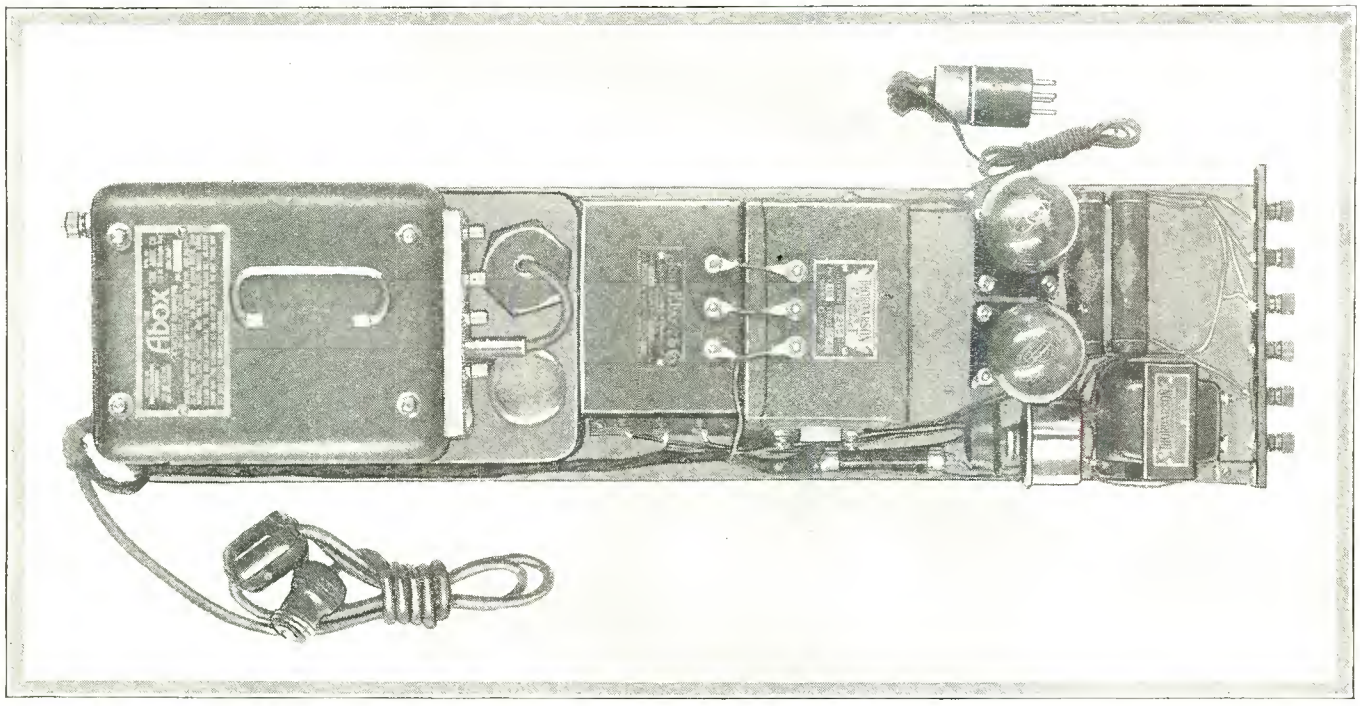


Figure 1. In the above photograph at the left is shown the Abox rectifier and filter, the condenser block, the high voltage Thordarson transformer and the necessary tubes and resistances

COMPLETE elimination of batteries, the convenience of attaching the radio set to the light socket, like any other electric appliance, is the most desirable feature to be found in any receiver. The trouble and expense of battery charging or frequent replacement of dry batteries is the one thing most people object to in the operation of a radio set and has been a great hindrance to the universal popularity of radio.

Aside from the economic saving which is effected, the convenience of full electric power at all times, with no attention other than turning the house light current "on" or "off" more than repays for the moderate additional cost necessary to convert any radio set into an a.c. house-current receiver.

Complete Eliminator

The A, B and C eliminator and super power amplifier described in this article, and which can be built by anyone at a moderate cost, is offered for those desiring a.c. operation. It embodies a perfect A eliminator, a power amplifier using the new power tubes of greatest amplification, and a B and C eliminator supplying as high as 300 volts. It represents, theoretically, mechanically and operatively, probably the finest thing in a complete battery eliminator and super power amplifier that may be constructed.

One of its salient features is its universal adaptability to any existing radio receiver of nine standard ¼ ampere tubes or less, with no changes in the wiring or tubes of the set. It does not affect the operation or tuning of the set, except making it equivalent in power output to any receiver made and operating it with great efficiency entirely from the alternating current line, with no batteries or battery substitutes of any kind.

The selection of parts was made with a number of things in mind. The laboratory model has been in the process of development over a period of nearly a year and every part has been carefully tested to meet all requirements.

First, efficiency, reliability, adaptability for the circuit, and simplicity. Second, ease of assembly, so as to simplify the construction of the complete unit; and, third, compactness, so that the completed eliminator and amplifier might be placed in any battery table or console.

The most critical instrument is the A supply. For this the Abox A battery eliminator is ideal. It is a true storage battery eliminator, suppressing the alternating current component to such a degree that it is inaudible even with the tremendous amplification of the power amplifier. The slightest variation in the filament circuit would be particularly noticeable in this unit, while under ordinary conditions it would not bother.

Large Capacity Filter

The efficiency of the Abox A eliminator is due mainly to the tremendous capacity of the electrolytic condensers used in the filter circuit which is embodied in the unit. These have a capacity of several hundred microfarads, obtained by virtue of the unusual arrangement of nickel and steel plates immersed in a non-acid caustic solution which sonstitutes the condenser. The plates form one side of the condenser, and the solution the other. When an electrical current is passed through the unit, films of hydrogen and oxygen form over the entire surface of the plates. This film is infinitesimally thin and forms the dielectric of the condensers. As a condenser increases in capacity as the thickness of the dielectric decreases, this film is no doubt responsible to a large

(This amplifier tested and all illustrations made in our laboratory)

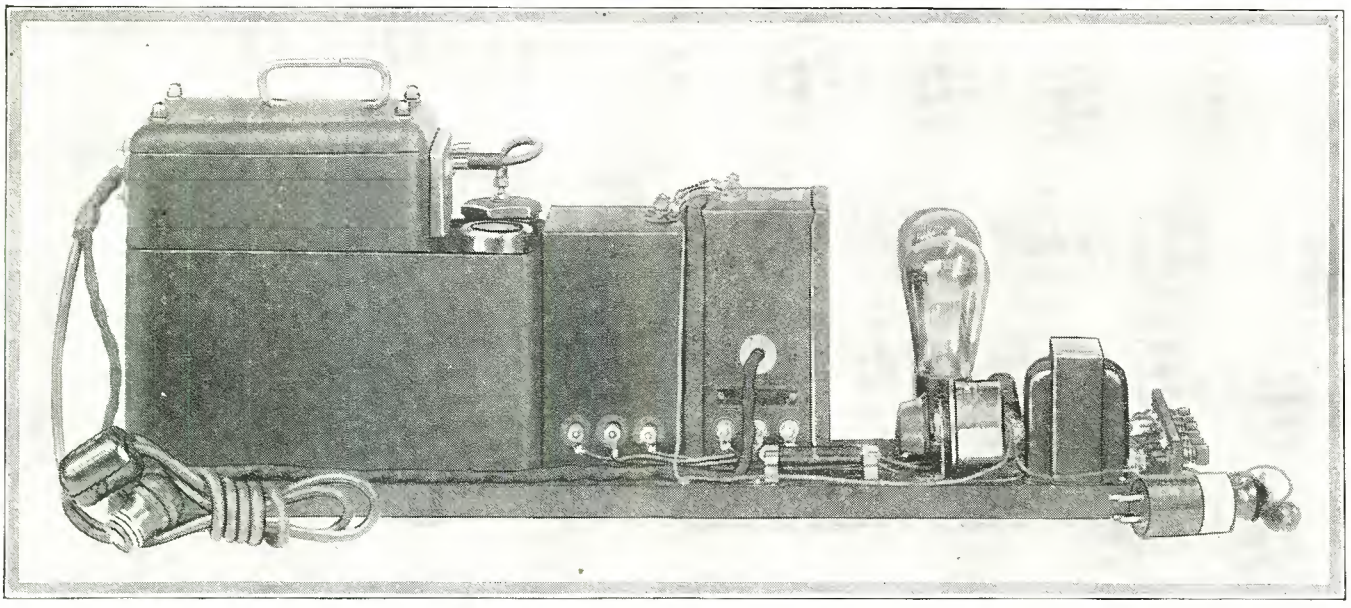


Figure 2. This photograph shows the side view of the apparatus used in the Abox ABC eliminator. The Abox and the Thordarson compact line cords are parallel, as shown at the left of the illustration and a snap switch placed in series so that this switch will start and stop the entire amplifier. The plug for plugging into the grid circuit of the last audio stage of any receiver is illustrated at the right

degree for the tremendous capacity obtained.

The Thordarson power compact is equipped with a lead to be run to the light socket. In this unit it is attached to the cord leading to the Abox so that both units may be connected to the light socket with the same wire and controlled with a single switch. Shorten the compact cord to the required length, bare the ends of the wire and splice them to the Abox cord, taping well when finished.

Toward the end of the Abox cord, a series "on" and "off" switch is inserted. This controls the entire unit and the set.

When the unit is completed and ready to attach to the set, the power amplifier is connected by means of a long, flexible lead attached to the grid prong of a tube base from which the bulb has been removed. This is then inserted in the socket of the last audio tube in the receiver.

Parts required for building the Abox ABC eliminator are:

1—Abox A battery eliminator
1—Thordarson 210 power compact
1—Fast 210 condenser block
1—Heavy duty Clarostat
1—R76 Thordarson output transformer
2—Benjamin base mounting sockets
2—Amsco 10,000 ohm ten watt resistors
1—Amsco 1,000 ohm five watt resistor
1—Amsco resistor mountings
1—Binding post strip, 1x6½x3/16, with six posts and mounting brackets
1—Series "On" and "Off" switch
1—UX type base with tube removed
8—Feet flexible wire or one cord of phone wire
1—Roll Belden rubber covered flexible hook-up wire
1—Baseboard, 6½x25x1-inch
1—Ceco R81 rectifying tube
1—Ceco L10 power amplifying tube

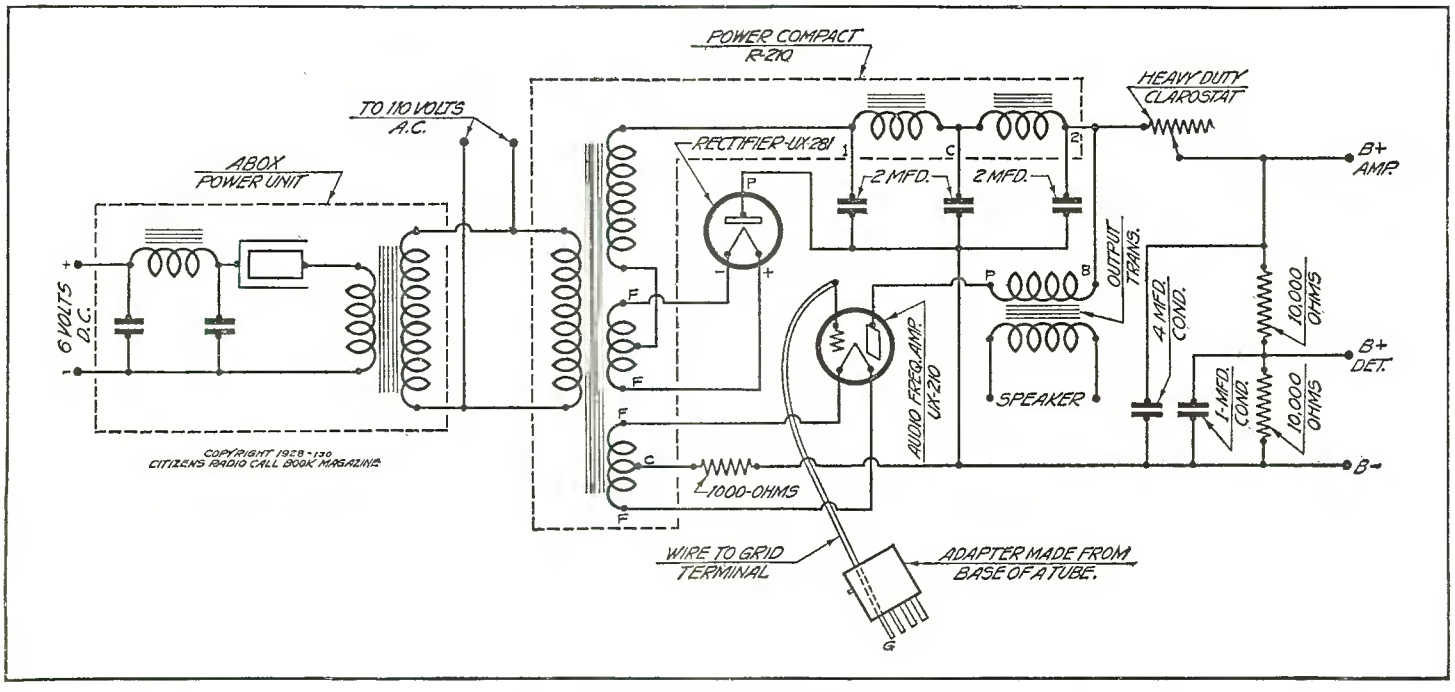
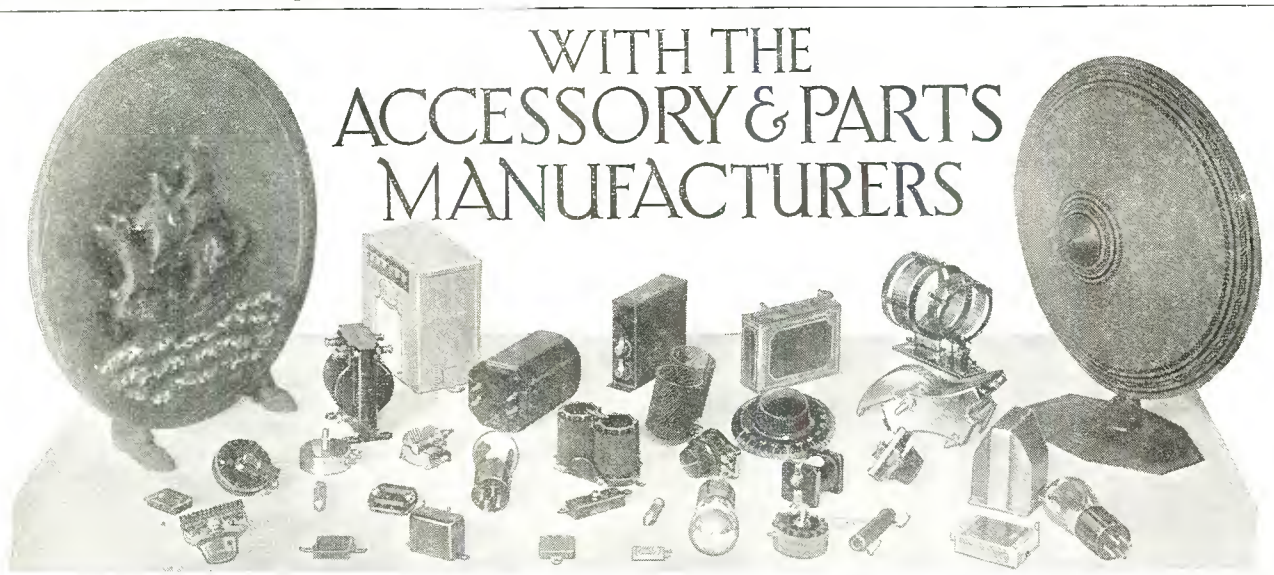


Figure 3. In the above schematic circuit the builder will find all the necessary electrical details for wiring up this power amplifier and filament supply device



Readers desiring any further information on products shown in these columns, may secure full data on writing to the Accessory and Parts Department, care of this magazine. Be sure to specify name of product on which information is desired

Popular Demand Is for Home Assembled Cone Speaker

Quality Reproduction Possible with Ensco Kit; Directions are Simple and Finished Product Well Worth the Builder's Time

ENGINEERS, musicians and acoustical experts are today fairly well agreed that for real quality of reproduction and fidelity of tone the large cone speaker, generally three feet in diameter, cannot be equalled. It is only necessary for the average listener to hear a good speaker to become convinced of this fact.

Many set builders have wished to take advantage of the fine reproducing qualities of a cone speaker and yet have not cared to make an outlay for the manufactured product. However, many are now finding that such a speaker may readily be assembled through the purchase of an Ensco kit of parts. With this kit and an hour's work in assembling the builder may thus obtain a three-foot cone, secure excellent reproduction and save considerably in the operation. In selling the speaker in kit form, the excessive cost of packing and shipping is eliminated, making it possible for anyone to own one of these big cone reproducers.

In the illustration shown in Figure 1 is a photograph of the Ensco pedestal type speaker, which is proving popular with many radio owners at the present and which may readily be assembled by following a few simple directions.

Figure 1. In the photograph above is shown the front of an Ensco pedestal speaker, this type being popular with many builders

The speaker may be constructed in the form shown in Figure 1 or in either the wall type or console type. It would appear, however, that most of the interest is centered around the pedestal type of speaker illustrated in this article, although there are many who would, on account of conditions within the home, prefer the wall type shown in Figure 2.

After securing the Ensco cone speaker kit, the builder should read carefully all of the instructions given for assembling it before doing any of the work. This is to familiarize himself with the general idea underlying the home assembly of a cone speaker and after he has fully understood the instructions he is ready to go ahead with this work. In order to save as much of the builder's time as possible, the Ensco designers have provided a sheet of Phonotex, which is already marked both front and rear, the front being the decorative border shown in Figure 1, while the rear shows the lines around which the sheet is to be cut. The Phonotex sheet is to be laid down flat and cut out along the circle stenciled on the outer line. A segment also indicated on the sheet is then cut out. The cutting of the segment is done so

that the two edges may be pulled together and the cone shaped, a flap being left for glueing the two edges together so that the cone will remain in that shape. When the cone is ready to paste, take a blunt instrument such as the back of a knife and score the line marked "bend on this line." This allows the edge to be turned back when the cone is completed.

Now pull down the two edges of the cut out section together so

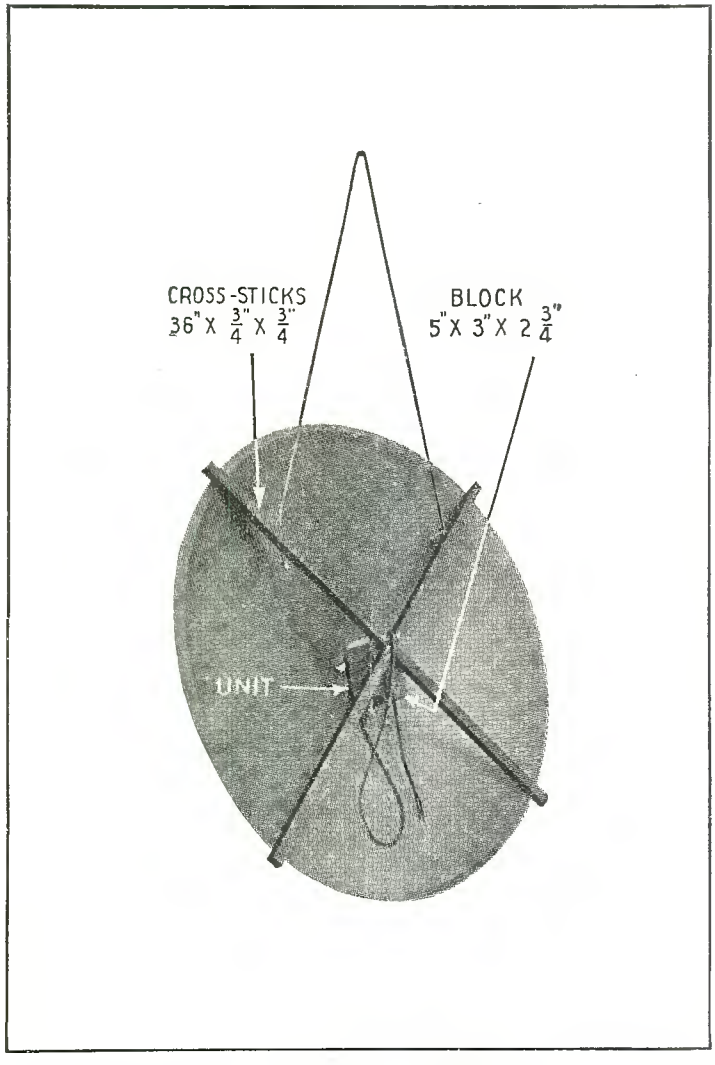


Figure 2. In the above photograph the reader may see the Ensco type speaker, the dimensions of the frame being given in the illustration

that one edge fits over space marked "glue here." On this space spread a thin coat of cement, a can of which is provided in the kit. Be sure to pull the cone into shape with due regard of the style of the speaker to be constructed. If the wall or pedestal type is to be made, the design should be on the outer or convex side of the cone. Turn the sheet with the design downward and proceed to paste by spreading glue along the space marked "for glue." Press the edges together by pressing gently at the seam, starting at the inner apex and working outward. Allow the cone to dry for a few minutes, or until the cement is hard and then paste in the small cone, which is cut from a corner of the sheet and which is also plainly stenciled thereon. This small cone goes on the inner apex when a pedestal or wall cone is built and on the outer apex when the console type is made. The small cone makes the large cone rigid. When the cone is completed, lay it face down and bend back the edge along the scored line.

In the illustration shown in Figure 2, the Ensco wall type speaker is shown. For mounting the wall type speaker a hub is furnished with four dowels matched to a block. These four dowels are inserted in the hub and glued in place so that each leg is of the same length. By inserting the opposite sticks first and sighting through the other two holes two dowels can be brought to the exact center and glued, and when the other two are placed in the hub they should match perfectly. The unit is then mounted and fastened by two screws through the mounting plate. For wall mounting a cord is attached to two dowels about one-half way to the center.

When mounting the unit be sure that the drive pin is in line with the center of the cross stick. Next attach the drive pin extension and the mounted cone. The cone is clamped to the drive pin extension with the two metal apexes and two nuts.

Some idea of this detail may be learned by referring to the upper portion of Figure 3 in this article. One metal apex is placed on each side of the main cone apex. The center should be mounted in such a way that the bent up flange rests lightly on the arms of the frame without putting any tension or strain on the pin. In the wall type the flange of the cone is now attached to the arms of the frame with four thumb tacks.

In Figure 3 is shown a detailed sketch of the Ensco unit, whose single magnet is made of high grade tungsten steel marked as NS in the sketch. The air gap G of the unit is located at the center of the coil C, this serving to reduce the magnetic leakage. The only adjustment which the builder may find necessary to make is to regulate the air gap. If the cone chatters, the gap is too small. A slight turn of the nut A in a clockwise direction facing the back of the speaker will open it. If the gap is too wide, the volume will be low. Nut A is then turned about one-eighth of a turn in the opposite direction. Naturally when turning nut A it will be necessary to make a like adjustment on B, so these two nuts will always be tightly clamped against the armature bar.

Should any trouble be encountered in operating the speaker, it is best to remove the cone and test the unit separately instead of trying to readjust the unit while in the speaker. To test, simply connect the unit to the set and hold it against the apexes of the finished cone. The unit should then work excellently in this fashion. If it does and if the assembled speaker does not work, it indicates that the cone is pushing in or out on the drive pin and changing the unit adjustment. This can be rectified in taking extreme care in assembling.

The speaker described in this article will operate on any radio set that will operate a speaker. It may be used on any voltage from 90

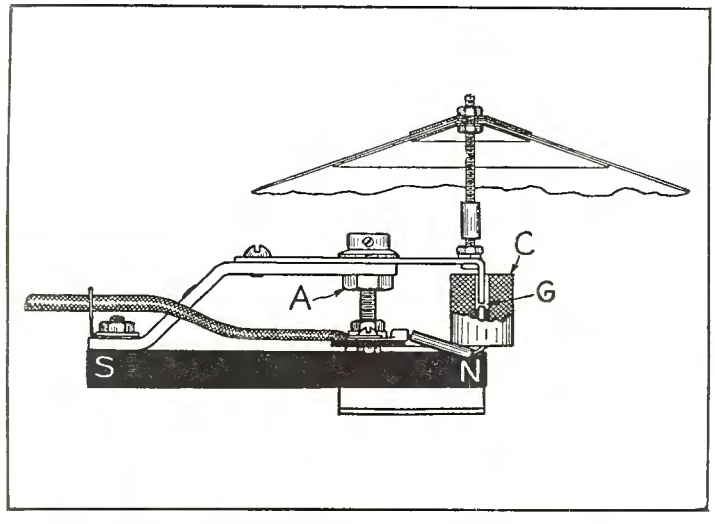


Figure 3. In this illustration the coil is shown in section, exposing the pole tips and air gap. Adjustment is made by nuts A and B

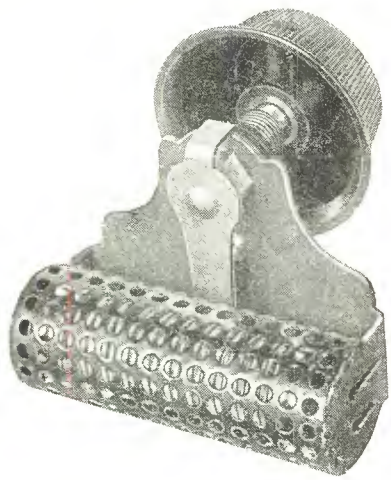
to 250 volts and works well with all of the modern tubes from the 201-A to the 210 types. The tonal frequency range is quite wide and excellent quality of reproduction may be secured. If the speaker is used with voltages over 250, it is suggested that an output filter and an output transformer be used in order to isolate the direct current plate potential from the windings of the unit.

Electrad Designs Resistance Kit

Truvolt resistors, both fixed and variable, are enjoying the distinction of being exclusively recommended for the Hammarlund-Roberts Hi-Q Six B power supply unit.

In order to meet the demand for Truvolts resulting from this recommendation, Electrad, Inc., 173 Varick St., New York, manufacturers of Truvolts, have designed a special resistance kit for use with Hi-Q.

A photograph of the variable Truvolt is shown below.



The kit is in attractive box form and contains four special resistors, designated respectively No. 1, 2, 3 and 4. It is the company's intention to carry these designations without values or type numbers in all literature on the Hi-Q power unit, because the resistors so designated are especially designed for use only with the Hi-Q.

In connection with this resistance kit, 25,000 Hi-Q booklets are being printed. These will carry full information on the Hi-Q Six B power supply unit, together with diagrams showing how the Truvolt resistors in the Electrad kit are to be incorporated. The kit containing these resistors lists at $10.85.

De Jur Air Cooled Power Rheostat

Designed and made specially for high current carrying capacities, the rheostat shown below has a large refractory base, 2¾ inches diameter, and is a single hole mount.

Resistance element is of the highest and best quality resistance wire obtainable (having the lowest rising temperature coefficient), wound on best grade India mica imbedded in grooves, and is covered with a high heat refractory cement, making the element permanent and everlasting, tightly fastened to the base.

The contact arm rides smoothly over the surface of the resistance. Soldering lugs are supplied for convenient connections. It is made in the following ohmages as standard: 2, 3, 5, 6, 10, 15, 20, 30, 50, 100 and 200 ohms. This rheostat can also be made up with an extra connection and used as a potentiometer in any of the above ohms.

Furnished complete with bakelite knob. List price, $2.50. Made by De Jur Products Company, 199 Lafayette St., New York.

Magnaformer Reports Records

Many of our readers who have followed the construction articles dealing with the Magnaformer 9-8 receiver published in our September and November issues have now had the opportunity to build their receivers and try them out in various ways. The results achieved in many instances read almost like a log book of the world's broadcasting stations. Such countries as China, Japan, Australia, New Zealand, Porto Rico, England, Cuba, Brazil, Mexico, Canada and other foreign ports have been received on the loud speaker from the United States. Enthusiastic fans have sent lists of stations received ranging all the way from a dozen stations to ninety-eight. In each instance the owner doesn't fail to state the tone quality of the reception was most clear and lifelike.

As our readers will recall, the outstanding characteristic of the Magnaformer 9-8 receiver is the intermediate transformers with which the combination 9- and 8-tube receiver is equipped. An unusual feature in these transformers is, that they are laboratory sealed and peaked at precisely 69.73 kilocycles, each coil being exactly matched with each and every other one. Each of the Magnaformer r.f. transformers supplies double amplification to each r.f. stage, thus supplying the greatest possible selectivity and great distance-getting sensitivity.

The designers state the first of the many reports on D-X reception was received from K. G. Ormiston and party of witnesses from Los Angeles. On the night of September 11, 1927, Mr. Ormiston's party logged Tokio, Japan and Sydney and Melbourne, Australia. This performance was subsequently repeated on several occasions.

After this the reports began coming in thick and fast. R. C. Anderson, a Long Beach jeweler, with a home-built Magnaformer, reported five 6,000- to 9,000-mile distant stations from the Eastern hemisphere, including 1YA of Auckland, New Zealand; 2BL from Sydney, Australia; 5CL from Adelaide, Australia; JOAK from Tokio, Japan, and sixty-one Western hemisphere stations from the Atlantic to the Pacific.

Southern Toy Table

This table is made of genuine mahogany or walnut. The top is five-ply. Finished with high grade lacquer, rubbed to a piano finish. It is a handsome addition to other household furniture, and is shown below.

Table No. 37—Top, 17x36 inches. Height, 28 inches. Battery compartments 8 inches wide, 10¼ inches high and 14 inches deep.

This radio table was brought out to meet an insistent demand from radio owners for a table of this character. It is made at a reasonable price according to our highest ideals of workmanship and finish.

The finish is the best that we know how to produce—and we make fine piano benches that require the highest grade finish.

The battery spaces are ample for storage battery, dry batteries, eliminators or rectifiers.

The height of table is just right—28 inches. The leg room is ample. The design in general is chaste and pleasing. It is securely packed and protected in a strong wooden crate. Made by Southern Toy Co., Inc., Hickory, N. C.

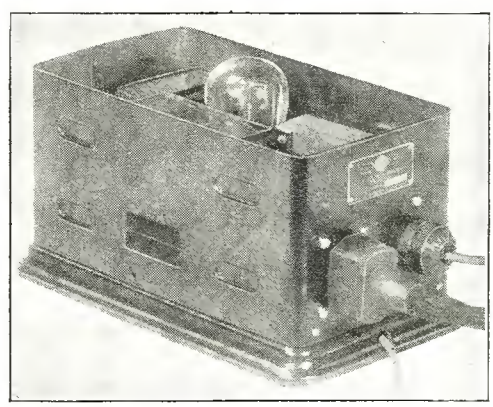
New Webster A.C. Power Unit

Dealers, jobbers, and radio set manufacturers throughout the radio industry are giving their greatest attention at the present time to determining the easiest and best method of building a.c. receivers or rebuilding batttery receivers into sets which employ the new a.c. tubes.

All wish to avoid as far as possible revolutionary rebuilding of sets and are striving to avoid rendering obsolete all the parts of the battery receivers in use or in hand, and the method of rebuilding receivers that is the most simple and produces the best results is going to be the most popular.

The new a.c. power unit recently evolved by the Webster Company, 860 Blackhawk Street, Chicago, the manufacturer of the well known Webster B and BC socket power units, makes it possible for distributors, set manufacturers or anyone familiar with battery receivers to easily convert battery sets into the latest improved a.c. tube receivers.

That dealers may avail themselves of the present wonderful opportunity to sell their customers a less expensive proposition than a new



set and meet the demand for a.c. receivers, the Webster unit has been developed using as a basis the well known Webster B unit, in which the B transformer is provided with special windings for the filament lighting on the radio and audio tubes as well as the detector tube and the 171 power tube in the last audio stage.

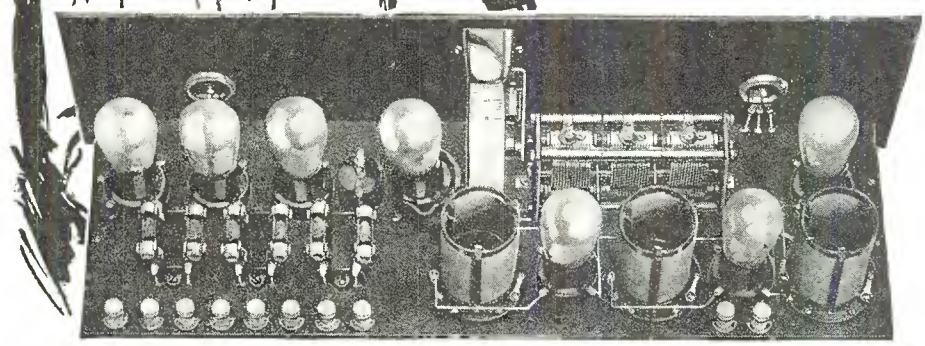
The accompanying illustration shows the Webster a.c. power unit for a receiver of commercial manufacture employing the 226 R. C. A. tubes for the radio and audio stages, 227 tube for the detector and the 171 power tube for the last stage. The power unit provides all the a.c. and d.c. voltages as well as the necessary grid bias for the power tube.

There are two separate windings for the 226 tubes; one for the radio frequency group and one for the audio. This is to prevent voltage variations in the audio filaments when adjusting the filament voltage of the radio frequency stages. It is, however, impossible to build the a.c. units for general distribution applicable to all the receivers or all the a.c. tubes on the market. These units are made in standard production for R. C. A. tubes as above mentioned and also for supplying the current for a.c. tubes requiring 15 volts on the filament such as the Arctures tubes, as well as those requiring 3 volts such as the Sovereign and Kellogg.

All circuit wiring is brought out through a mutiple connection as shown in the illustration. In this unit all voltages from the unit are brought out through a multiplug connection and a second receptacle is provided for a standard 2-prong plug attached to the cord running from the radio set control switch. In this way the unit may be completely controlled automatically from the receiver control switch.

AERO-SEVEN RECEIVER

10-Kilocycle Selectivity



Utilizing New 340 Tubes

Unique Features

The Aero-Seven Receiver is the biggest hit of the present radio season. Thousands of fans and set builders have built this popular circuit. It is a new tried and tested tuned R.F. circuit incorporating the most modern radio improvements at a popular price. It is a distinct innovation in a tuned R. F. receiver, utilizing three stages of R. F. and three stages of audio. Circuit is built around the famous improved Aero Universal Coils, with improved Amsco S. L. tuning 3-gang condenser, S-M single-control drum dial and the tried and tested parts of other famous manufacturers. Such names as Carter, X-L, Westinghouse, Aero, Amsco, and Silver-Marshall assure you of a circuit that is the final word in perfection.

Distinct features are: the new Hi-Mu tube at input and in R. F. stages, potentiometer control, higher amplification, 10-kilocycle selectivity and true single control.

It requires no shielding as with the small Aero coils, direct pick-up is negligible and coupling between coils is the very minimum. The coils are twice-matched at both high and low frequencies of the broadcast band, thus eliminating many difficulties in single dial control and overcoming one of the principle causes of disappointments.

The adjustable compensators on the Amsco condensers facilitate the equalization of circuits, solving the major problem of tandem tuning.

Here is one of many testimonials that speaks for itself:

DEPARTMENT OF POLICE, CITY OF ST. LOUIS

Gentlemen:

I recently constructed the Aero Seven, and I must state that it is without question the best receiver I have ever constructed, or heard. The selectivity is as perfect as can be expected, and the volume of the set is wonderful. Gives the most life-like reproduction that I have ever heard, and since constructing the receiver, three of my friends have done likewise. The principal secret of success in the Aero Seven is not only due to the fine parts used, but—the wonderful Aero Coils, to which I believe there is no equal.

Yours very truly,

C. MILTON DAVIS,
2341a South 11th St., St. Louis, Mo.

New and Unique Hookup
3 Stages of Radio Frequency
3 Stages of Audio Amplification

The Aero-Seven has a new and unique hook-up that incorporates three stages of R. F. and three stages of Audio. There are two stages of tuned radio frequency and a special coupling stage, the secondary function of which is to prevent antenna detuning, thereby giving single control which is both theoretically and practically perfect. This independent antenna circuit is of a new and efficient design and employs a resistance connected between the antenna and ground inputting to the first grid circuit. Five CX340 tubes are used—3 in the R. F. circuit, one detector and one in the audio.

In the three audio stages, one 171 power tube is used, one 201A tube and the one CX340 tube in the input.

The circuit, therefore, is different from the usual 7-tube R. F. circuits, which variations contribute to its optimum selectivity, perfect quality and thrilling volume.

The combination of all the various parts, the matching of the Aero Universal Coils, together with the Amsco compensating 3-gang condenser, with true single control and potentiometer control, greatly simplifies operation and tuning, while adding efficiency to the circuit.

First Use of New CX340 Tubes—
1-6/10 Times Better

Utilizing the new CX340 Cunningham tubes in place of the usual 201A, gives the Aero-Seven the distinction of being the first circuit using this superior method. CX340 tubes are 1-6/10 times more effective than 201A tubes, having a 5-volt filament and .25 amperes; plate, 180 volts maximum. In this receiver 90 volts is used constantly on the plate for the R. F. circuit, something seldom attempted but efficiently worked out here. It is a High Mu tube, having a high amplification factor (Mu-30) and is used both as a detector and as a radio and audio amplifier. The Aero-Seven is specially designed to operate with this new and better CX340 tube and the results secured will be a pleasing revelation to you. It is surprising what tone and volume is secured with a minimum use of current.

10 Kilocycle Selectivity
Now a Real Fact

Ten kilocycle selectivity is OPTIMUM Selectivity. It means a receiver that tunes sharply enough to eliminate interference and yet does not tune so sharply as to cause distortion. It is the ideal tuning characteristic "Optimum tuning," says the engineer, when he means a perfect set.

Why bother with anything but the best? Why put up with anything but 10-kilocycle selectivity, as represented in the Aero-Seven circuit?

Due to the low-loss construction of the coils and condensers in the Aero-Seven and the great selectivity introduced into the circuit itself, you get selectivity so sharp that you cannot get two stations at one time under present broadcast regulations, at the same time providing adequate frequency margin to prevent high "cut off"—distortion.

Imagine what this means in perfect radio reception. Selectivity, the ability to tune in clearly, sharply, without fear of disturbance in getting the station you want whenever you want it—that's something every radio fan has long desired. It is an actuality in the Aero-Seven—a feature that is necessary in an up-to-date circuit—a feature that you get in the Aero-Seven when you build it.

New, Modern, Proved Features
in Aero-Seven

10 Kilocycle selectivity.
Uses new CX340 tubes instead of 201A.
3 stages of R. F.
3 stages of audio amplification.
Extreme D-X reception.
Potentiometer control.
Silver-Marshall single drum dial.
True single control.
Aero Coils are twice matched at both high and low frequencies.
Amsco adjustable condensers.
Carter resistances.
Westinghouse Foundation Unit.
X-L Posts.
High quality parts throughout.
Range below 200 to above 550 meters (1,500-500 KC).
Low loss characteristics throughout.
Perfectly compensated—variation in antenna circuit doesn't affect it.
Wiring underneath sub-panel.
Simple construction.
Easy to build in quick time.
The most popular-priced 7-tube circuit.
For true tone, D-X, selectivity and volume, plus easy control, it represents a decided forward step in radio advancement.

An Opportunity for Set Builders

The set builder will find the Aero-Seven a most profitable receiver to build. It is an extremely simple circuit—efficient, high grade and having a record of exceptional performance. It could hardly be duplicated in a factory-built set at double the cost.

You can make big money building this set for your friends and get a real "kick" out of it yourself.

Complete parts, drilled and engraved panels and foundation units are being distributed through the jobbing trade and are available at leading radio stores everywhere. If your dealer cannot supply you, order direct, giving your dealer's name and we will see that you are supplied promptly. Mail coupon below for complete facts—NOW!

List of Aero-Seven Parts for Battery Operation

		List Price
1	Aero Seven Foundation Unit	$12.00
1	Aero TRF Kit, Code U-12 (3 coils)	12.00
1	Aero Choke No. 60	1.50
1	Silver-Marshall Drum Dial	3.00
1	Carter Battery Switch D	.65
1	Carter 200-ohm "IMP" Potentiometer	1.25
1	Carter 6-ohm "IMP" Rheostat	1.00
1	Carter H-1000 Resistor	.30
1	Carter H-1 Resistor	.25
1	Carter .00025 Mfd. Condenser with Clips	.50
1	Carter .001 Mfd. Condenser	.50
2	Carter ½ Mfd. Bypass Condensers	1.80
10	X-L Binding Posts, Lettered—Aerial, Ground A+, A—, 2C—, B90+, Amplifier, B+, Speaker+, Speaker—	1.50
1	Amsco Floating Socket	1.00
6	Amsco Plain Sockets @ $0.50	3.00
1	Amsco .0005 Mfd. Triple Condenser	11.25
1	Amsco Grid Gate Mounting	.30
1	Amsco 5 Meg. Grid Gate	.50
1	Kit AMSCO Aero-7 Resistance Coupled Audio	7.00
	Screw Assortment and Bus Bar	.25
	List	$59.55

Aero Products, Inc.
1768 Wilson Ave., Dept. 301, Chicago

Dear Sirs: Please send me construction data and all the facts in building the new Aero-Seven Receiver.

Name.....

Address.....

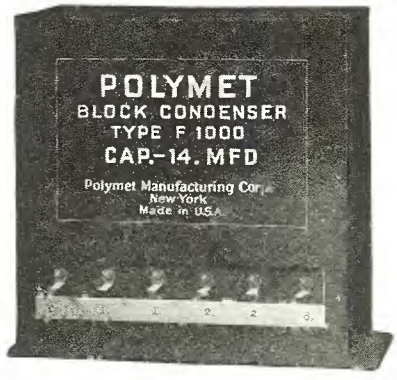
AERO PRODUCTS, INC., 1768 Wilson Ave., Dept. 301, Chicago, U. S. A.

Associated Manufacturers

Amsco, Aero, Carter, Westinghouse-Micarta, Silver-Marshall, X-L

Polymet Block Condensers

Working voltage under which these condensers are to operate has been carefully studied and only the proper condenser sections incorporated in these blocks. Polymet block condensers not only improve the appearance of the set, but also simplify the wiring and save time and space in assembling.



The type of condensers used in each section follows the voltage requirements of the circuit as prepared by the tube manufacturers. Polymet blocks have been recommended for Raytheon, Q. R. S., Amertran power pack, Thordarson power pack and other popular circuits.

Filter Condensers

Polymet filter condensers comprise a line of thoroughly efficient paper dielectric condensers for use in radio receivers, B eliminators and power packs.

Only the highest grade of foil and specially prepared linen paper are used in their manufacture.

Polymet condensers are non-inductive and the special process of impregnating insures a high working voltage, long durability and also prevents leakage.

Polymet filter condensers in all popular capacities, are made by Polymet Mfg. Corp., 599 Broadway, New York City.

Complete Kit of Parts for the New HARKNESS Counterfonic Six

—the set with *tuned audio* amplification

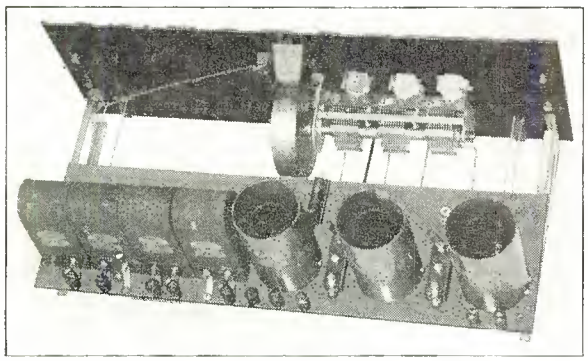
AN entirely new and patented method of audio amplification is used in the Harkness Counterfonic Six, the latest and greatest achievement of Kenneth Harkness, widely known radio inventor and authority.

With this new "tuned double impedance" audio amplifier, the Counterfonic reproduces music and the human voice with a more natural, life-like quality than has ever before been attained in radio. If you build the Counterfonic you will hear the finest reproduction which modern developments in audio amplification have made possible.

Many other new and exclusive features are embodied in the Counterfonic Six. A new method of shielding, effective and efficient. A new system of neutralization, easy to adjust and which permits high radio frequency gain per stage. The set is ultra-sensitive. Every point on the dial is alive. Distant stations come rolling in, night after night.

The selectivity is perfect—just enough to prevent interference, not too much to affect tone quality.

There is just one tuning knob and one volume control. Tuning is reduced to a single control without loss of efficiency. The r.f. transformers and tuning condensers are accurately matched.



You can build the Counterfonic Six in less than three hours with the complete kit of parts prepared for your convenience by Kenneth Harkness, the designer of the set. The kit contains everything needed to build the set. No experience is necessary. Even if you have never attempted to build a radio set before you will find you can build the Counterfonic without any difficulty. The assembly and wiring are fully and clearly explained in the instruction folder accompanying the kit.

By building the Counterfonic you save money. A factory-built set with the receiving range, volume and selectivity of the Counterfonic Six would cost two or three times as much.

If your local radio dealer does not carry the Harkness Counterfonic Kit in stock, mail your order directly to the manufacturer, at the address below, and the complete kit will be sent to you at once.

If you do not want to build the set yourself, write us and we will arrange to have it built for you.

Dealers and Set-Builders. **We allow liberal discounts. Mail the coupon for details of our agency proposition.**

Greatest Value in Radio Today!

Kit contains everything for building the Harkness Counterfonic Six. Front and sub-panels drilled and engraved. Assembly and wiring fully explained in step-by-step instructions accompanying kit.

LIST PRICE

$68.50

Contents of Kit

1	Bakelite front panel, 7 x 21", drilled and engraved	$5.00
1	Bakelite sub-panel, 5¾ x 20", drilled, with six tube sockets attached	4.50
1	Pair Harkness sub-panel brackets, 9½" long	1.00
3	Harkness R.F. transformers	6.00
3	Harkness coil shields	3.00
3	Harkness double impedance tuned audio couplers, 1st, 2nd and 3rd stage types	22.50
1	Harkness audio output filter unit	5.00
1	Harkness radio frequency choke	1.00
1	U S.L. 3-gang condenser, .00035 mfd	6.00
3	Hammarlund equalizer concondensers	1.50
1	Silver-Marshall drum dial	3.00
1	Carter 10 ohm midget rheostat, with knob	.55
2	Saturn toggle switches	1.30
1	Carter fixed resistance, 4/5 ohm	.25
3	Aerovox fixed condensers, .001, .00025 and .0001	1.10
1	Aerovox by-pass condenser, 1 mfd.	.90
1	Aerovox grid leak mounting	.25
1	2 megohm grid leak	.40
2	X-L or Wizard Variodensers, .0001 mfd.	3.00
12	Eby binding posts	1.80
	Lugs, screws, nuts, panel supports, etc.	.45
	Complete Parts	$68.50

Big Discounts to Dealers and Set-Builders

You can make lots of money building Harkness Counterfonic Receivers for your friends. As our authorized agent you can buy the complete kit of parts at a big discount and make a large profit on the sale of the finished set and accessories. Write today for our agency proposition, or check and mail the coupon below.

MAIL THIS COUPON NOW!

Kenneth Harkness, Inc.
74 Cortlandt Street
New York City

Without obligation, send me free literature on the Harkness Counterfonic Six and full details of your agency proposition.
I am a

☐ dealer ☐ set-builder

Print Name.....

Full Address.....

.....

KENNETH HARKNESS Inc.
74 Cortlandt Street **New York City**

Sales Representatives: Aaron Siedman & Co., 307 N. Michigan Ave., Chicago, Ill.

New Translucent Plate

Designed for set builders and fans who desire an illuminated dial, the Kurz-Kasch Co. of Dayton, Ohio, is now marketing a separate translucent plate, which when placed in the present type of Aristocrat port-vernier dial will make it possible for the user to place a dial light in the rear of the set so the plate may be illumined.

Above is a reproduction of the vernier dial with the translucent plate. One of the features of the dial lights is the fact that since it is made of bakelite no body caacity is experienced by the user when turning the dial. Thisf eature makes it highly desirable in circuits where there is a possibility of body capacity through conduction to the dial and where the builder desires to eliminate it.

assemble the Ensco

"THE WORLD'S FINEST LOUD SPEAKER"

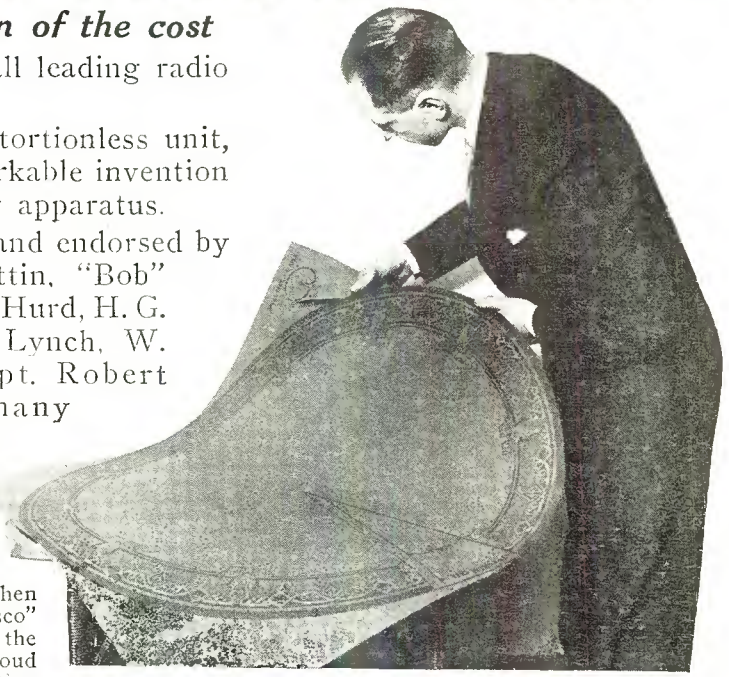
in less than an hour

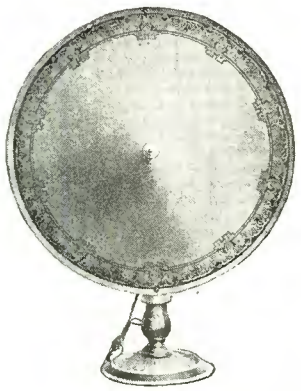
at a fraction of the cost

Approved by all leading radio magazines.

The Ensco distortionless unit, the most remarkable invention in reproducing apparatus.

Ensco is used and endorsed by Frank L. Brittin, "Bob" Casey, Volney Hurd, H. G. Cisin, Arthur Lynch, W. G. Many, Capt. Robert Wood, and many other experts.





The Two-Foot Pedestal

Equally as well made and as beautiful as the three-foot model, but smaller. Can be used on top of the set or on any other piece of furniture. Complete Kit, including pedestal. Polychrome finish.

Model F-135-24 ..... $13.50
In Canada 17.50

The Standard and Wall Models

Two or Three Foot

The wall model kits are furnished with a hard wood wall frame for easy mounting. Made in two and three foot sizes. The standard Kit is used for making console models and roll or book type speakers as described in instruction book—same as wall Kit, but without frame. You can make your own wall frame if desired.

Standard Model, 2 or 3 Feet

Either Size $10.00
In Canada 11.50

Wall Model 2 or 3 Feet

Either Size $11.00
In Canada 12.50

WHY pay a high price for a manufactured speaker when you can buy an "Ensco" Kit and assemble the "World's Finest Loud Speaker" at a fraction of the cost. No manufactured speaker, regardless of price, will give you any better reproduction.

The Simplest Cone to Assemble

The "Ensco" Single Cone is by far the simplest cone to assemble, no mechanical or radio knowledge is necessary. If you can use a pair of scissors, a screwdriver and a pair of pliers, you can build the "Ensco" as perfectly as an expert mechanic. Within an hour from the time you start work, you will be enjoying music the like of which you never thought possible.

Compare—Let Your Ear Be the Judge

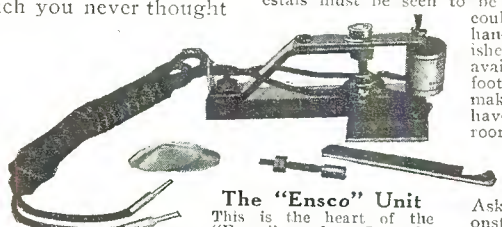
Don't take our word for it. Go to your dealer, or any of the offices listed below. Hear the "Enseo" in competition with any speaker, no matter what the price. Then, and only then, will you know the difference between ordinary and "Ensco" reproduction. The bass notes, the foundation of all music, come booming through in their true relation. The higher notes are equally free from choking or distortion. The tone is clear as a bell, without the slightest trace of mechanical noise.

Absolutely Guaranteed

The "Enseo" is backed by a guarantee that means something. All "Ensco" units are guaranteed to give satisfaction. After purchasing the "Ensco" Kit, you have ten days' trial in which you may test the speaker and return it if not satisfactory. Your money will be promptly refunded.

The Art Models

The first in the field, the "Enseo" is naturally the first to bring out Art Models. The beautiful pedestals must be seen to be appreciated, no picture could do justice to the handsome polychrome finishes. The "Ensco" is now available in two- and three-foot pedestals, which will make any woman glad to have them in her living room.



The "Ensco" Unit

This is the heart of the "Ensco" speaker. It is the only direct-drive unit, which satisfactorily operates a 3-foot cone. It has no transmission arms or levers to reduce the motion of the armature. **The "Ensco" Unit is fully patented. Can be used with up to 250 volts without protection and up to 500 with an output system.**

Go to Your Dealer

Ask your dealer for a demonstration, then let your ear decide for you. If your dealer has not been supplied, you can order direct from us by using the coupon. You are fully protected by our guarantee.

If your dealer has not been supplied—
Send this coupon

ENGINEERS' SERVICE COMPANY

RMA Radio Manufacturers' Association Member

25 Church St. NEW YORK
28 E. Jackson Blvd. CHICAGO
73 Cornhill BOSTON
331 Bay Street TORONTO, ONT.
144 2nd Street, San Francisco, Cal.

ENGINEERS' SERVICE CO.
Send to nearest office

	U.S. Prices	Canada Prices	I am enclosing
2-foot Standard Kit	$10.00	$11.50	Check
3-foot Standard Kit	10.00	11.50	Money Order
2-foot Wall Kit	11.00	12.50	Cash (registered letter)
3-foot Wall Kit	11.00	12.50	Send C.O.D.
2-foot Pedestal Kit	13.50	17.50	(All shipping charges paid on
3-foot Pedestal Kit	17.50	22.50	Standard and Wall Kits only)

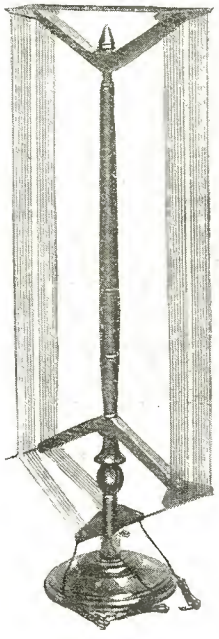
Name.....

Address.....

City..... State.....

Qualitone DeLuxe Loop

Woodwork used in the Qualitone loops, the DeLuxe type of which is illustrated below, is selected solid walnut, hand rubbed, natural finish. The DeLuxe woodwork is turned wood of pleasing period design and harmonizes with surroundings to suit the most exacting taste. The wire spacers are made of best insulated material, reducing losses to a minimum. Well insulated, flexible stranded wire covered with brown silk braiding is used on all Qualitone loops.



Three long leads for readily connecting loop to receiver are furnished. All Qualitone loops are provided with a removable center tap, and either two or three leads may be used as desired. The DeLuxe model turns within a radius of 5½ inches, while the Qualitone model turns within a radius of 7½ inches. All Qualitone loops are designed for use with .0005 mfd condensers and are specified in the popular circuits of the year.

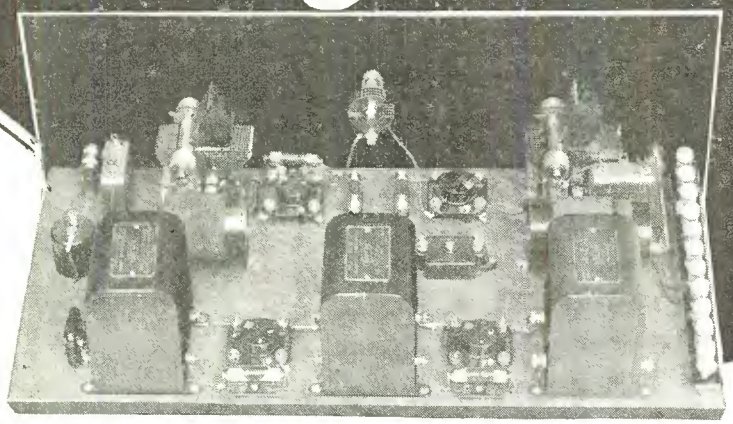
Dimensions on the DeLuxe are: Erected 29 inches x 11 inches x ¾ inches, packed 5 inches x 8 inches x 19 inches. Shipping weight, 4 lbs. Priced at $12.50. Manufactured by Duro Metal Products Co., 2649 N. Kildare Avenue, Chicago, Illinois.

New Baldwin "99" Speaker

One of the most popular speakers of this season is the Baldwin "99," which is illustrated in this article. The merits of this speaker may be classified under the three following headings:

(Continued on page 166)

Step A Year Ahead with the "Everyman 4"



Build the World's 4 Premier Tube Set

For all Amateur or Professional Set Builders who want wonderful long distance, remarkable selectivity and faultless natural tone quality *without* the trouble making complications of multiple tubes—the Everyman 4 shows the way to satisfaction. In this magnificent set Radio Engineers and practical set builders have combined to give you a four tube set which out-performs nearly all six tube sets—and yet is *simple* to *build*, easy to operate, and dependable in performance. Simplicity of assembly and operation are outstanding characteristics of the Everyman 4 which appeal to every set builder and every user.

Big New York Sensation!

IN New York, where the Everyman 4 was first introduced, its simplicity and dependability resulted in the greatest popularity ever attained by a four tube circuit. The unusual selectivity of this set under New York's "crowded air" conditions proved a surprise to many experts. Volume even on D.X. stations is surprisingly good. Tone quality throughout the entire audio range is a delight to all those using the set.

The satisfaction of thousands of fans who have already built the Everyman 4 is illustrated by the following letter from Sidney Greenstein, of 828 Dawson St., New York City: "I have built hundreds of receivers, of all types. That is, from a 1-tuber to an 8-tuber, and never yet have I been so pleased as with the results obtained with Everyman 4. It is simple to tune, voluminous and a bear for distance. The quality is just flawless. Really it seems too good to be true. Why, it is as simple to tune in KOA, the General Electric station at Denver, as a local. It happened to be my hard luck, that when I installed this set, someone had cut down my antenna. It was necessary for me to use a makeshift indoor antenna. I expected just moderate results. But, what a surprise I received! WGY rolled in like a local. Well, why go on. The set is just a peach, and that's all there is to it."

The opinion of qualified radio experts is shown by the fact that the technical editors of two of the largest newspapers in the two largest American cities both tried out the Everyman 4 and found it to out-perform most six tube sets.

Feats of Reception

Reported by Builders in New York City

A builder of the Everyman 4 in Newark has no trouble in getting WPG, Atlantic City, at 3 P. M., with WAAM and WAAT on the air. Not a trace of interference.

A radio fan on University Ave., listens to WBBM, Chicago, and WTAM, Cleveland, while WRNY is on full power.

WNYC was separated from WEAF without any trace of interference at a distance of 500 feet from WNYC transmitting aerial. (Impossible with other sets having more tubes and costing twice as much to build.)

WOC—at Davenport—at all times just like a local station.

40 stations in one hour.

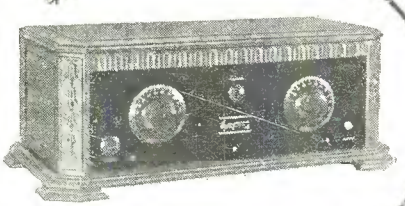
Partial list of stations received: WOC, Davenport; WLS, Chicago; WBBM, Chicago; WEAS, Virginia Beach, Virginia; WTAM, Cleveland; KDKA, East Pittsburgh; WGY, Schenectady

Western stations on loud speaker during early evening hours while locals are on. And what volume!

Complete List of Quality Parts, Only $53.85

2—Hammarlund .0005 mfd. variable condensers	$11.00
1—Hammarlund .00005 mfd. midget Condenser	1.75
1—7x21x3/16 in. drilled and engraved Micarta panel	3.75
2—Twin-coupler "Every Man" Coils	5.00
4—9040 Benjamin sockets	3.00
11—XL Binding posts	1.65
1—10x20½ base board	1.80
1—3300 Muter audio transformer	7.00
1—3320 Muter audio transformer	7.00
1—2700 Muter clarifier	5.00
1—3730 Muter 3 megohm grid leak	.50
1—1600 Muter filament switch	.35
1—800 Muter grid leak mounting	$ 0.15
1—305 Muter .00025 mfd. grid condenser	.40
1—301 Muter .0001 mfd. fixed condenser	.75
2—507 Muter .5 mfd. by-pass condensers	1.50
1—2750 Muter radio frequency choke	1.50
3—1700 Muter tubestats	1.50
1—1730 Muter tubestat	.50
1—1900 Muter variall balancing condenser	.75
	$53.85

Specified Parts Insure Best Results



Professional Set Builders!

will find in the Everyman-4 a Real Producer. Write us for full information.

This is the Set for YOU TO BUILD

Can Be Built in One Hour!

See your Dealer for Everyman-4 parts and full directions for assembly. You may also write Everyman 4, Dept. 502-A, 76th and Greenwood Ave., Chicago, for folder giving full information on this world's greatest 4 tube set.

Associated Manufacturers

Leslie F. Muter Co. Chicago, Ill.
Twin Coupler Co. Poughkeepsie, N. Y.
Hammarlund Mfg. Co. New York, N. Y.
Benjamin Elec. Mfg. Co. Chicago, Ill.
X-L Radio Laboratories Chicago, Ill.

EVERYMAN 4
Dept. 502-A
76th and Greenwood
Chicago, Ill.

Gentlemen: Kindly rush folder giving full information regarding the Everyman 4.

Name.....

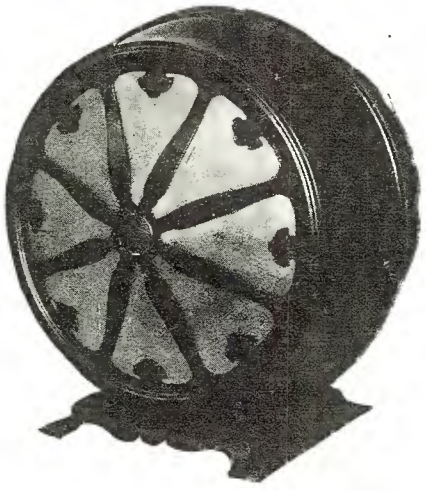
Address.....

City.....

State.....

(Continued from page 164)

First, those excellences which come to it by virtue of the use of the Baldwin balanced armature unit; second, those advantages peculiar to the particular type of tone chamber employed, and third, the advantages fo appearance in its artistic design.



The Baldwin armature in the unit is balanced between four points on two pole pieces. These four points operate on both the push and pull phases of the electrical impulses which flow from the set. The tone chamber employed in the "99" speaker is quite ingenious. It is made of a material recently developed composed largely of wood, which when formed assumes two hard outer surfaces, which give it mechanical strength, but retains a soft and pithy inner core. This soft core will not respond to the vibrations of the unit itself and, therefore, the walls of the tone chamber are entirely silent.

The unit is furnished in bronze with a lighter shade of silk shielded by an artistic grill. It is furnished in two models, a table model 14 inches in height and a pedestal model 49 inches in height. The table model is illustrated above. Manufactured by Nathaniel Baldwin, Ins., and distributed by J. W. & W. L. Woolf, 227 Fulton Street, New York City.

Hagel Bakelite Power Plugs

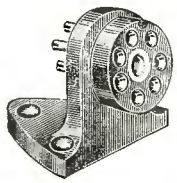
Constructed entirely of genuine bakelite throughout the Hagel power plug and cable, several forms of which are illustrated in this column, should be of interest to professional set builders.

In the illustration below is shown the bracket socket type, the pins being firmly imbedded in bakelite so they will not loosen while the receiver is being soldered. This form of bracket socket

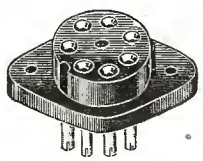
(Continued on page 168)

(Continued from page 166)

may be used either on baseboard models or above or below the sub-panel.



With the demand for sub-panel construction, the sub-panel type of plug which is shown below is designed by Hagel to simplify receiver wiring. As in the previous model noted, the plug is made entirely of bakelite and the color code marking is stamped directly on the bakelite so that the builder does not have to worry about losing a color.



In the illustration below is shown the Hagel cable head, the housing of which is also made of bakelite, while the pin separator is made of the same material.

On account of the bakelite construction, the units will not be affected by heat or moisture, will not deteriorate with age, will not corrode the contacts and will not burn when exposed to heat.

These items are manufactured by Eugene A. Hagel, 1035 East 76th Street, Chicago, Illinois.

Karas Set Conversion Method

Converting present battery operated receivers to true alternating current operation is now possible by the simple expedient of using the new Karas AC Former and the new Carter adaptor cable harness, the former being illustrated below.

All that is necessary to do is to take out the present battery operated tubes, insert the adaptors, attach the other end of the cable harness to the Karas AC Former and put in the alternating current tubes.

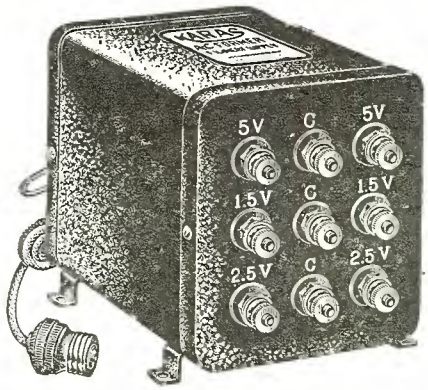
Different harness arrangements are available for various receivers.

The Karas AC Former represents the results of careful engineering and painstaking workmanship. Correct voltages for the operation of the standard 1½, 2½, 5 and 7½ volt tubes are

(Continued on page 170)

(Continued from page 168)

assured. The AC Former is made by the Karas Electric Co., 4026 N. Rockwell Street, Chicago, while the harness for the conversion of battery receivers to alternating current receivers is



manufactured by the Carter Radio Co., 300 South Racine Avenue, Chicago.

Placing Speaker to Best Advantage

Programs now available have become so great that they deserve the finest speaker radio science can construct.

In choosing a speaker suitable for the best reproduction, care and thought are required. But after all, the speaker alone is not all that is required. The location of the speaker within the home requires additional attention.

It is a well known fact that a speaker located directly above or on the radio set itself is not desirable. A simple test of this is to place the speaker first on the left of the set and then on the right; it will be noticed that distortion will occur when the speaker coils come within the radio frequency field of the r.f. tuning units.

As most speakers are equipped with a short cord, it is impossible to locate the speaker very much further away from the set than a few feet.

This, however, can be easily overcome; merely connect the speaker cord tips to a Birnbach extension cord connector and with the aid of a Birnbach extension cord of 10, 20, 30, 40, 50 or 100 feet, place the speaker in any part of the room which is not only appealing to the eye but also produces the ideal acoustic values.

The cord may be hung on small cup hooks on the wood work and will not be unsightly or cause anyone to trip over it.

Sterling 6 Volt Socket Power

In the perfected R-93 "Dri-A" 6 volt unit, Sterling engineers have satisfied the demand for a socket power having capacity, reliability, convenience, and popular price.

The heart of this unit is a dry electro-static type condenser,

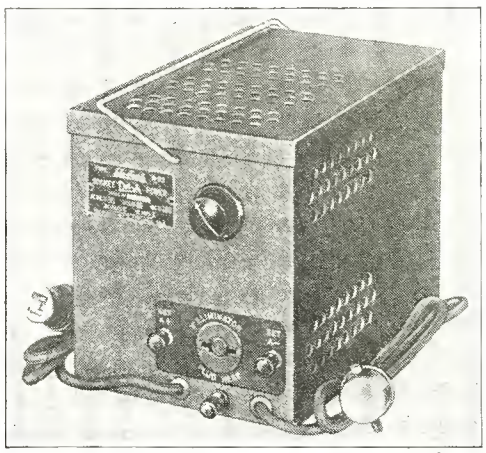
(Continued on page 172)

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine

(Continued from page 170)

similar in action to that in the approved "B" power units. This compact condenser—the creation of Sterling's own laboratories—is made from foil and specially processed paper. Combined with chokes in the unit, it possesses remarkably high capacity. It delivers three amperes, at normal rate.

The Sterling "Dri-A" unit is designed to use the new full



wave Tungar bulb, which delivers the smoothest possible filament supply, and produces the least possible hum. Long experience has proved the great reliability of this type rectifier.

Months of continuous service of the R-93 "Dri-A" on the larger sets have proved its ability to deliver continuous current without any attention whatever.

Sterling engineers have answered the question of voltage control by the use of a reliable voltage-limiting cutout. The exact amount of voltage for any number or combination of tubes consuming up to 3 amperes of current is adjusted by rheostat. This rheostat adjustment not only insures full six volts at the tube filaments, but in localities where the house lighting supply drops below normal voltage a slight turn of the rheostat will fully compensate low a. c. line voltage.

The R-93 operates from 115 volts, 60 cycle, A. C. 6 volts, 3.0 amperes. Size—7x11x8 inches high. Net weight, 23½ lbs. Lots of six, shipping weight, 165 lbs. List price Sterling R-93 "Dri-A" including 3-ampere ful wave bulb, $39.50.

Sterling "B-C" Power Supply

This universal model Sterling "B-C" unit will operate any radio set using up to 100 milliamperes—without hum. Maximum voltage is 180 volts. "C" voltage 40 volts. Independent and variable voltage regulation is provided for both detector and r. f.

ACCURATE TO 1-5 of 1%

THE rated inductance of some of our coils are really accurate to 1/5th of 1%. All of them are accurate to 1%. That is why Precision *Diamond Cut* Coils are better. That is why you can use them in gang condenser work. Wherever accuracy is desired you will more and more see Precision *Diamond Cut* Coils specified. The diamond cut bakelite form assures a rigid coil and accurate spacing. Rigidity of the form is particularly necessary in gang condenser work.

The Citizens Shielded Five Uses A Precision *Diamond Cut* Coil

Type 3B $3.75

The engineers wanted only the best material in the set which was to bear the name of this magazine. Therefore they picked a Precision *Diamond Cut* Coil. You will see our coils specified in many other circuits. When you have Precision Coils in your set you **know** the coil is right.

Send for our new catalogue

PRECISION COIL CO., Inc.
207 Centre Street **New York, N. Y.**

When you need Resistance

WHETHER for power unit or set, just think of Clarostat. It's reliable—just as reliable as any wire-wound resistance, when used within its rated current—carrying capacity. It provides exact resistance required—not a few ohms above or below, but the exact value to the ohm. And it stays put, although always ready to correct for changes in the radio circuit.

VOLUME CONTROL CLAROSTAT

A little fellow but a giant for work in the radio set. Compact, neat, convenient, with 0-500,000 ohm range in several turns of knob. Micrometric adjustment. One-hole mounting. Convenient screw terminals. Many applications in present-day sets. Price, $1.50.

Standard Clarostat

The "old reliable" in B-power units and receivers. Compact, neat, 0-5,000,000 ohm range in several turns of knob. Micrometric adjustment. One-hole mounting. Convenient clip and screw bracket terminals. Supplied with mounting bracket for baseboard mounting. Ideal for voltage control in B-power units. 20-watt rating. Price, $2.25.

Power Clarostat

The big brother of Clarostat family. Husky enough for real work in A-B-C power units, A.C. tube control, line-voltage control, power amplifiers, and in electrified sets in general. Available in three ranges — 0-10, 25-500, and 200-100,000 ohms. Range covered in several turns of knob. Micrometric adjustment. Screw terminals. One-hole mounting. 40-watt rating. Price, $3.50.

Be sure you get GENUINE Clarostats—in the green box and stamped with the name Clarostat on the shell. Don't be fooled by imitations, which do not extend beyond general appearance.

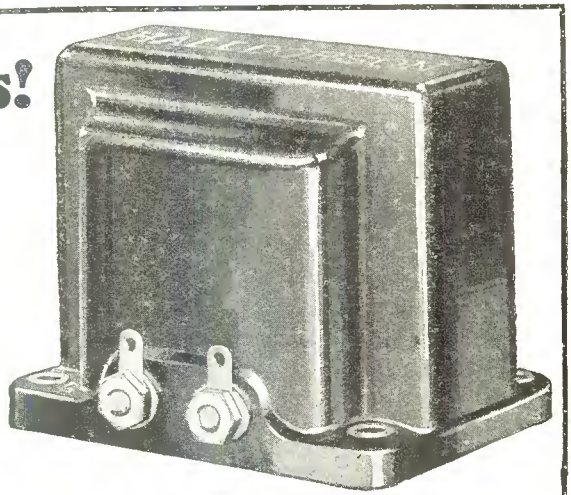
Ask your dealer to show you the three types of Clarostats and to give you literature. Or write us direct.

AMERICAN MECHANICAL LABORATORIES, Inc.
Specialists in Variable Resistors
285 N. Sixth St. : : Brooklyn, N. Y.

RMA RADIO MANUFACTURERS ASSOCIATION MEMBER

Set Builders—Dealers!

We want ONE live-wire in every town to become a Thompson Super Seven—official service station—are you the man? We have an interesting proposition to those selected. Wire or write air mail today—Attention salesmanager



The Thompson Super Seven

is startling setbuilders all over the country with its phenomenal ability to get distance through locals. Too much power is the verdict of every builder, with tonal quality that's a revelation.

10 K.C. Selectivity

Selectivity that's positive, not on one station but on all. Stations snap in one after another. The heart of the receiver—Halldorson long wave transformers are designed to give high amplification over a narrow band of only ten K.C. The selectivity is such that interference from local stations while receiving distance is impossible. Thirty to forty out-of-town stations through Chicago locals is easy, small stations you've never heard before.

Greater Distance

You'll get greater distance than you ever dreamed possible with any receiver. Think what it means to have stations from coast to coast pound in just like locals. The Thompson Super Seven will get them for you. Read about Halldorson Transformers and judge for yourself why.

Easy to Sell

You know how easy it is to sell your pet receiver—the one you use yourself. That's how easy it is to sell every Thompson Super Seven, especially when you consider that it's the lowest priced quality kit on the market. Get your parts today, a few hours' work, and you have the finest performing receiver money can buy.

Audio and Output Transformers

Halldorson transformers are built different than other transformers. A new method of construction, a silicon steel core built up of one-piece laminations not only enables us to build them of moderate size but delivers that one essential requirement of perfect reproduction — amplification of overtones.

Overtone Amplification

Overtone amplification is the ability of the transformers to amplify the weak overtones of both music and speech with true fidelity. In Halldorson Overtone transformers there is no over-accentuation of any frequencies, but perfect amplification over the entire audio range.

Will Improve Any Set

If your receiver does not give the tonal quality you would like, or if you want the finest tone quality with terrific power, use Halldorson Overtone audio and output transformers in every receiver you build. Halldorson transformers are being used by the largest set manufacturers in the country. What better proof of their merit?

Halldorson Long Wave Transformers

Precision methods make possible a transformer with a tremendously high gain per stage. Peaked between 41 and 45 K.C. they may be used in any receiver using long wave transformers. They will increase the amplification of the intermediate amplifiers several hundred times.

THE HALLDORSON COMPANY

Factory: 4745 N. Western Ave. **Chicago, Ill.—Office, 607 Brooks Bldg.**

Halldorson Overtone *Audio Transformer*

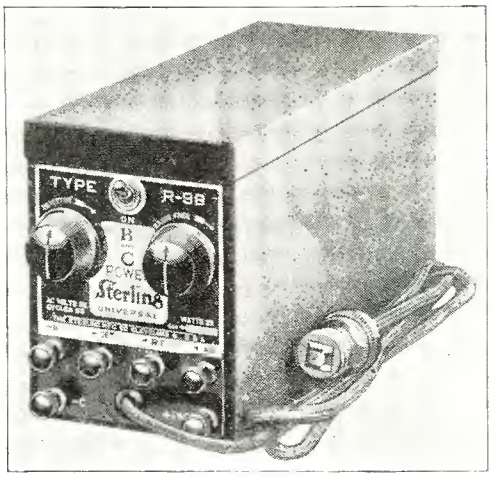
Get the facts today on all Halldorson precision products —mail the coupon.

Enclosed find two cents in stamps for complete data on the Thompson Super Seven and Halldorson Overtone Transformers.

Name.....

Address.....

.....



Price without tube, $33.50. B H Raytheon Tube, $4.50. Made by the Sterling Manufacturing Company, 2831-53 Prospect Avenue, Cleveland, Ohio.

Acme Single Free-Edge Cone

The Acme Apparatus Co., 37 Osborn Street, Cambridge, Massachusetts, have recently developed in their research laboratories a smaller speaker than their standard, having a single free-edge cone of 11 inches in diameter. All the faithfulness of reproduction inherent in their double free-edge cone is maintained in this unit, which is illustrated below.

The actuating unit is of different design, but of the same rugged construction. As with the other models, plate currents up to 25 milliamperes may be safely used, the manufacturers stating that the DC component of the current is an aid to the operation of the speaker.

PARVOLT

WOUND CONDENSERS

IT is not "horse sense" to jeopardize the success of a circuit or the investment made in the parts by the use of inefficient by-pass or filter condensers.

Parvolt Wound Condensers are made in three service voltage ratings and in a wide variety of capacities and styles. Use them wherever the circuit calls for capacity. Their use is assurance of

Continued accuracy within 10 per cent of rating.

Continuous duty at full rated voltage.

Available in capacity and voltage ratings suitable for all radio and audio frequency by-pass and filter work.

Series A 400 Volt Duty	Mfds.	Series B 800 Volt Duty
$0.85	0.1	$1.25
.95	0.25	1.50
1.00	0.5	2.00
1.25	1.0	2.50
2.25	2.0	3.50
4.00	4.0	6.00

Series C—1,000 Volt Duty

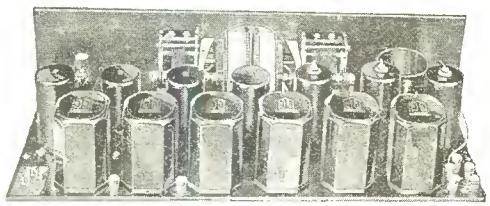
1 Mfd.—$5.00; 2 Mfds.—$7.00; 4 Mfds.—$12.00. Buffer Condensers 0.1 Zero—0.1 Mfd.—$1.75.

CONDENSER GROUPS	List
For R171	$12.00
For R210	15.00
Raytheon ABC	17.50
Q. R. S. (400 mil. tube)	19.00
Special 4-4-2-2-1-1	13.00

THE ACME WIRE COMPANY
New Haven, Connecticut

Tyrman "70"

Shielded Grid Amplimax



THE Tyrman "70" Amplimax Receiver, using the newly developed shielded grid tube in a remarkably efficient impedance-coupled super-heterodyne circuit, is unquestionably the finest receiver ever developed and made available to the general public. Its combined sensitivity, selectivity, volume and marvelous tone-quality surpasses that of any other receiver of today. Actual demonstrations have proven 3000 mile loud-speaker reception on a 6 foot indoor antenna. The receiver is absolutely **free from harmonics** and covers the entire broadcast band with **full volume** on all stations. It has a positive 10 Kilocycle separation and will **"cut through"** powerful local stations in congested metropolitan districts such as Chicago and New York. The Tyrman "70" is surprisingly **inexpensive in operation** and actually uses only a fraction of the power required on other supers.

This receiver can be truly considered to be the superlative receiver which everyone has been waiting for. In fact it will completely satisfy the most critical in their expectations. All instruments are scientifically matched, subjected to the most rigid tests and fully guaranteed.

List of Parts Required to Build the Tyrman "70" Receiver

3—Tyrman Type 9-90 R.F. Impedance	$12.50	$37.50
1—Tyrman Type 9-80 Antenna Inductance	3.00	3.00
2—Tyrman Type 3-30 Audio Transformers	8.00	16.00
1—Tyrman Type 3-51 Power Output Trans.	10.00	10.00
7—Tyrman Shielded Sockets	1.25	8.75
1—Tyrman Double Vernier Drum Dial	10.00	10.00
1—Camfield .0005 Condenser, Single	6.00	6.00
1—Camfield .00025 Condenser, Single	5.50	5.50
1—Camfield Type 622 Oscillator Coupler	3.50	3.50
1—Yaxley 15 ohm Switching Rheostat 915K	1.75	1.75
1—Yaxley 4L Resistance	.15	.15
1—Yaxley 15 ohm Resistance	.15	.15
1—Yaxley No. 669 Cahle	3.25	3.25
1—Yaxley 25 ohm Rheostat	1.35	1.35
1—Yaxley Pup Jack	.15	.15
1—Hammarlund 50 mmf. Midget Condenser	1.75	1.75
4—Carter 1 mfd. Condensers	1.25	5.00
1—Carter .001 Mica Condenser	.50	.50
5—XL Binding Posts	.15	.75
1—7x24 in. Front Panel Drilled	6.00	6.00
1—8x23 in. Sub Panel Drilled	5.50	5.50
1—Pr. Benjamin Brackets	.70	.70
TOTAL		$127.25

Special arrangements have been made with a prominent manufacturer of dry power units to supply a combination "A," "B," and "C" power device of superior design, for use with this receiver, if light socket operation is desired.

FURTHER DETAILS AND COMPLETE LITERATURE WILL BE IMMEDIATELY FURNISHED UPON RECEIPT OF 10c IN STAMPS.

We Specialize in Super-Heterodyne Parts

Distributors for

SCOTT'S WORLD'S RECORD TEN
TYRMAN TEN
TYRMAN "70"
VICTOREEN
AERO AC SEVEN
MAGNAFORMER
MELO HEALD ELEVEN
MELO HEALD HOT-SPOT FOURTEEN
HAMMARLUND-ROBERTS HI Q SIX
KARAS EQUAMATIC

We Are Wholesale Distributors of All Standard Radio Merchandise

DEALERS WANTED EVERYWHERE

Write for Catalogue and Discounts

Nelson Electric Company
Telephone Wabash 8719
508 South Dearborn Street Chicago, Illinois

Liberal Discounts—Immediate Deliveries

Arcturus A. C. Tubes

Alternating current tubes fall into two general categories, the filament emitter, or "raw a. c." tube, and the filament heater type.

The Arcturus a. c. tubes fall in this last group. The filament heater operates from a potential of fifteen volts and consumes a current of .35 amperes. Aside from the electrical advantages of this design the volt ampere characteristics of the filament are of paritcular convenience to the enthusiast or service man altering receivers for a. c. operation. Also, it is quite practical to operate all heaters in parellel without the use of extra heavy leads, making it possible, in many instances, to utilize the original filament wiring of a receiver.

One side of the cathode is connected to the heater, adapting

the tube to the standard four prong UX base, again limiting the number of changes which must be made for a. c. operation.

The Arcturus tubes are made in four types, detector, amplifier, high Mu and power tubes, all of which are of the heater design. Potentiometers are thereby eliminated from the circuits, and consistent grid and filament wiring may be used throughout the circuit.

The filament heater of the Arcturus tube is of carbon, operating at a temperature considerably lower than that of the usual carbon incandescent light, thereby insuring exceptionally long life to the tube. While the tubes on life test as yet show no indication of approaching the end of their usefulness, comparison of the Arcturus filament consuming 4.5 watts to the candle power with a filament of the usual carbon lamp consuming 3.5 watts per candle power would indicate a theoretical life well in excess of 1,000 hours.

Regeneration and Impedance Coupling

(Continued from Page 133)

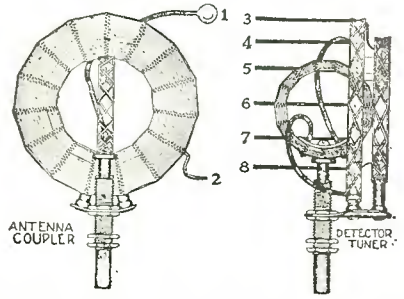
is recommended that the builder refer to the literature accompanying his particular 171 tube, so that the proper bias voltage may be determined for use with other voltages than 180 volts on the plate.

Operation of the receiver in congested metropolitan sections may make it necessary to keep the primary coupling of the first radio frequency transformer removed as far as possible from the secondary of this circuit to cut down interference. However, the same effect may be secured after a fashion by reducing the length of the antenna when the set is to be operated in a congested district. The manipulation of this coupling control which extends to the front panel of the receiver may also be used when it is desired to reduce the amount of volume secured from a given station, the reduction in volume being secured when the primary is farthest away from the secondary and conversely the greatest volume being secured when the two coils are closely coupled.

List of Parts

Parts used in the construction ot fhis receiver are shown in the accompanying list:—

2—Hammarlund .0005 mfd variable condensers
1—Hammarlund .00005 mfd midget condenser
2—"Every Man" twin-coupler coils
4—9040 Benjamin sockets
11—XL binding posts
1—3300 Muter audio transformer
1—3320 Muter audio transformer
1—2700 Muter output
1—1600 filament switch
1—3730 Muter 3 megohm grid leak
1— 800 Muter grid leak mounting
1— 305 Muter .00025 mfd grid condenser
1— 301 Muter .0001 mfd fixed condenser
2— 507 Muter .5 mfd by-pass condensers
1—2750 Muter radio frequency choke
3—1700 Muter Tubestats
1—1730 Muter Tubestat
1—1900 Muter Variall balancing condenser
1—Micarta 7"x21"x3/16" drilled and engraved panel
3—Sonatron type 201-A tubes
1—Sonatron type 171 tube
25—Ft. Belden flexible hook-up wire
1—Pkg. Kester radio solder
1—Ekko ground clamp
Miscellaneous—lugs, Nuts, Screws, etc.



THE "LYNCH 5" model was built around SICKLES COILS. You can expect to duplicate the exceptional results only with the same SICKLES COILS. These are the same standard high quality accurately calibrated coils which have had no superior during the past five years. Specially designed for the "LYNCH 5."

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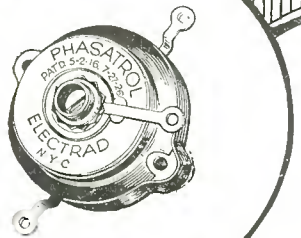
24	Browning-Drake	7.50 set	28	Lynch 5	4.50 set
18A	Roberts	8.00 set	19	Acme Reflex	4.50 set
			20	Craig	4.50 set



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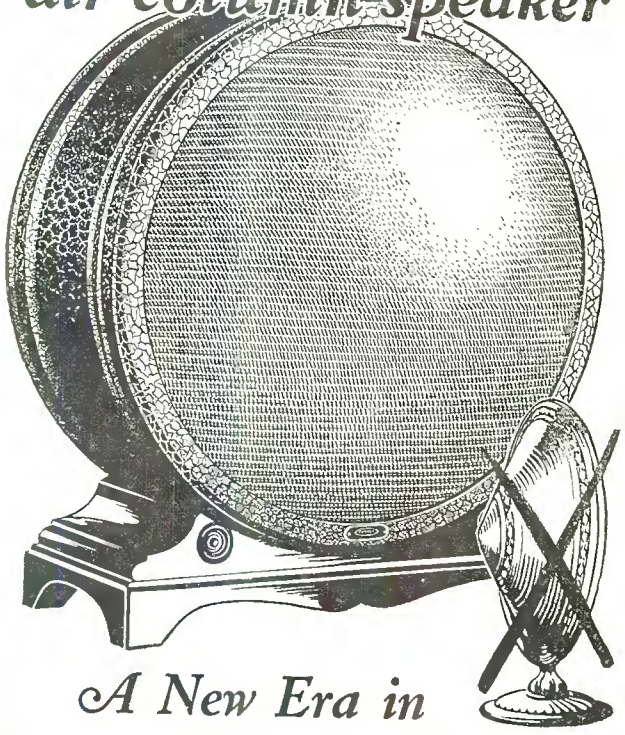

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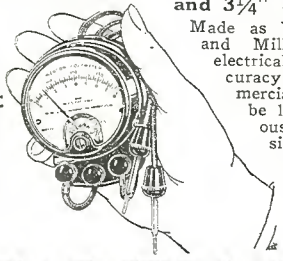
Thermo Instruments for Radio Transmitters

The Thermo-Couple type of ammeter, originated and developed by Weston, is one of the most noteworthy of all contributions to the art of electrical measurement.

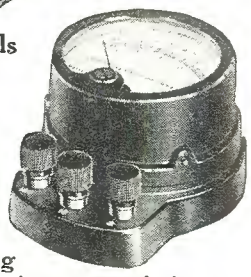
These instruments are now made in 2″ and 3¼″ sizes for the measurement of high frequency antennae currents. All the objections to the "hot wire expansion" type of instruments —such as sluggish indications, zero shift with consequent errors and lack of compensation against changes in surrounding temperature, or in the temperature of the instrument itself, —are fully overcome in the Weston Thermo-Couple type.

These instruments will also accurately measure alternating currents of low frequency as well as give correct indications on direct current service.



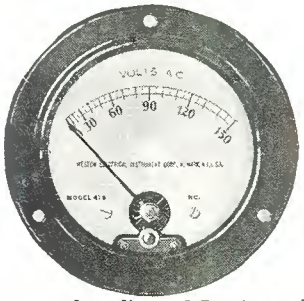
D. C. Model 489 1000 ohms per volt

A remarkably fine instrument with high internal resistance for giving true voltage measurement of the output of B-Eliminators, as well as for D. C. voltage testing.



Models 489 and 528 for D.C. and A.C. Testing

Portable instruments of the same size as shown held in the hand below. Black bakelite case for D. C. and mottled red and black bakelite for A. C. Handy and accurate models for testing battery operated sets and the new A. C. tube receivers.



A complete line of D. C. and A. C. Panel Instruments—2″ and 3¼″ diam.

Made as Voltmeters, Ammeters and Milliammeters. Unusual electrical characteristics. Accuracy of 2% on any commercial frequency and may be left in circuit continuously. High internal resistance and excellent damping. Exquisite design and workmanship, yet moderately priced.

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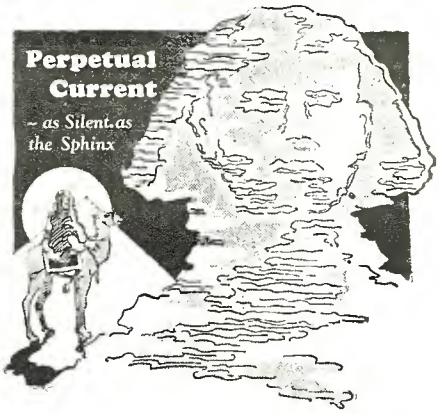

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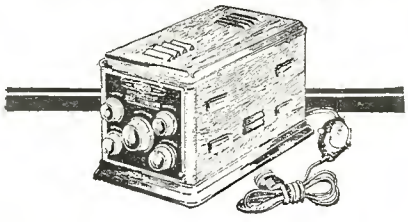

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All power from light socket automatically controlled from "A" unit "on" and "off" switch. Webster B and BC units give minute regulation up to 180 volts (plus) for quality reception.

Price $23.00 to $38.00
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For any set requiring up to 2½ Amp. Equipped with control switch and line voltage control.

With the Webster A-10 Elkon equipped and B or BC units Raytheon equipped, you can completely electrify any battery receiver without "revolutionary" rewiring of set.

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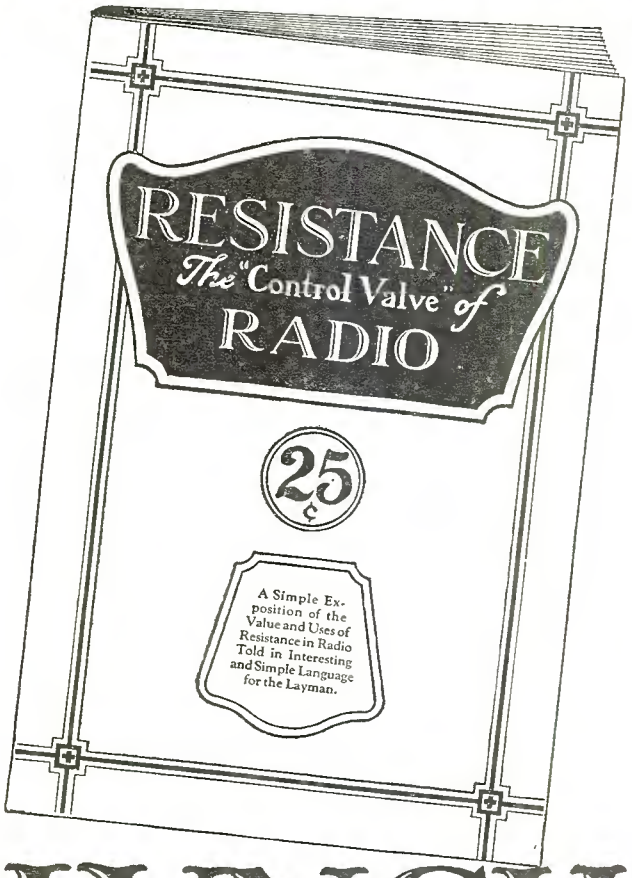

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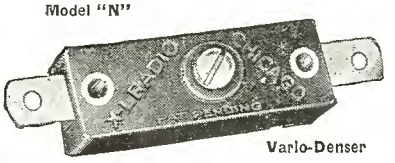

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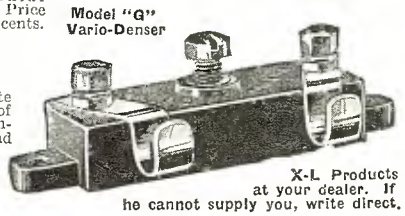

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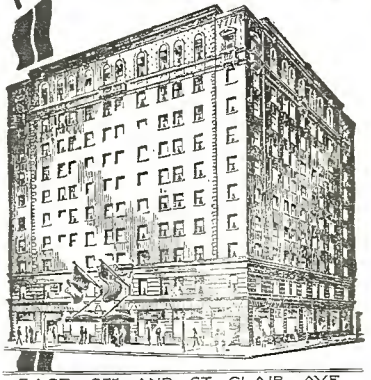

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Sincerely yours,
GEORGE J. PAUL
Managing Director

The Citizens Radio Call Book

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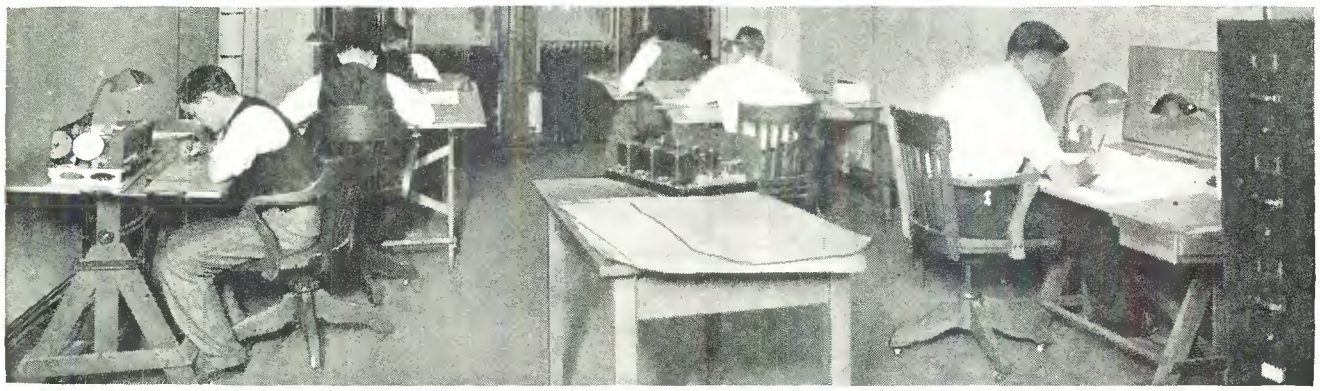

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Full Size Graphic Wiring Diagrams

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*Circuits described in present issue.

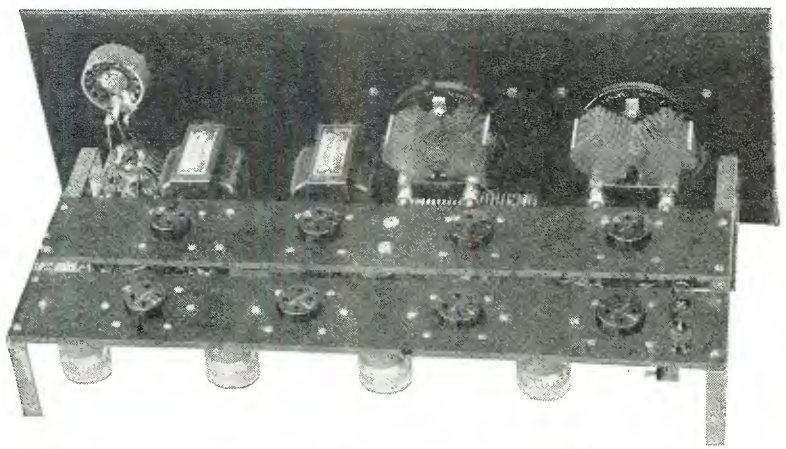
Any of the above blue prints will be sent postpaid by return mail upon receipt of the proper amount or they can be obtained from any of the Radio jobbers advertising in this publication

CITIZENS RADIO SERVICE BUREAU

508 So. Dearborn Street 7th Floor Chicago, Illinois

St. James Twin '4'

Latest Design



Using "U" Circuit

Radio's Lowest-Priced Super Circuit

HERE is good news for the home set builder—a high-quality receiver made up of standard high grade parts throughout—at a price far below anything on the market.

The St. James Twin "4" is a remarkable circuit from the standpoint of tone quality, long-distance reception and selectivity. It is even more remarkable when you consider its low cost and extreme simplicity of construction. Anyone can build this circuit quickly, economically and perfectly.

Look at the list of parts and you will readily understand why this is a dependable circuit. Look at the "twin" arrangement of two sub-panel strips, each with four built-in sockets, and you will see why the "Twin 4" is so easy and economical to build.

10 Feet of Wiring

Then look at the perfectly simple wiring arrangement. Ten feet of wiring make all the necessary connections. Nothing can go wrong. No short circuiting is possible. Every connection is made direct, with no winding around endlessly. There's nothing else quite like the St. James, because no other circuit can be built so economically and easily.

New D-X Records Established

St. James Laboratories,
Chicago, Ill.

Gentlemen:

The following results, which I had confirmed by the station, speak for themselves and it is such results that made me and have kept me a staunch believer in St. James products.

With my St. James "Super" I have never been forced to the popular delusion that DX is hopeless during the summer months. as I can pick up distant stations at any time with satisfactory results except when severe electrical storms interfere.

When it is considered that W.Q.J., W.E.B.H., W.I.B.O. and W.B.B.M. are all located within one-half to two miles from me and in different directions it shows extraordinary selectivity.

Of further importance is the fact that weather conditions have no effect on the efficiency or match of the St. James transformers.

At 11:45 P. M. (C.S.T.) on Saturday evening, July 31, a rainy night and with the local stations going full blast. I tuned in K.F.I. of Los Angeles and listened to them without an interruption until 12:30.

To prove that this was not due to some peculiar condition at the time I again tuned in K.F.I. at 11:00 P. M. (C.S.T.) Sunday evening, August 1, another rainy night with local stations going. and listened to them without interruption until they signed off at 12:30.

Both receptions were on the loud speaker with more volume than I cared to use and with good quality.

Believing that exceptional efficiency in a product is deserving of acknowledgment is my reason for writing this.

Very truly yours,
FRED B. GLENNON.

Naval Hospital, San Diego, Calif.
9 Oct., 1927.

Dear Mr. St. James:

Last nite, 8 Oct., was my best reception this season—fifty-six stations played on St. James Super-Loud Speaker, one audio stage. Most distant stations among them being KDKA (Pittsburgh), PWX (Cuba), WSM (Nashville), KWKH (Shreveport, La.), WMAK (Buffalo), 4YA (New Zealand), 2BL (Sidney, Australia), JOAK (Japan). Not too bad for the season, eh? When old winter comes we'll have some real reception.

Best wishes,
Lt. C. H. Forth, U.S.N.

Dec. 5, 1927.

I applied your suggestions to my St. James. It sure knocked the bugs out of it. It works better than some $500 sets I have listened to. It has volume galore with quality to spare. For distance it's right there and cuts through like lightning.

S. D. Mourning, Jerseyville, Ill.

Utica, N. Y., Dec. 27, 1927

I have consistently for the past two weeks had KFI with its Rock-a-Bye-Bay signing off, practically every night. The longest distance received is Buenos Ayres (South America), and I hope for Japan on the new hook-up.

E. J. Malley, Secy., Auto Club.

The Famous 'U' Circu t

What is the 'U' Circuit?

Did it ever occur to you that a radio receiver functions much like a camera?

Radio waves and light waves have much in common, as both are subject to reflection, refraction, defraction and absorption.

It is easy to note the effects when light is handled, and enables us to appreciate what happens to our radio wave. A camera which leaked light at the bellows or plate holder could not reproduce the image clearly, nor will a radio receiver reproduce properly if energy is allowed to impress itself any old place in the wiring system.

The receiver must be immune to signals excepting through the proper channels, the loop or coil collector. Shielding accomplishes but little and the St. James Laboratories have developed a new and effective method in the use of a U circuit.

If we consider the wiring in a set and exposed devices as being capable of picking up a portion of all energy and disturbances which set up a field, it becomes evident that it is a detriment to the receiver.

A column of water in a pipe has a certain pressure existing throughout its height, but we can balance out this pressure by bending the pipe in the form of a U. The water in the pipe is now at a state of rest, and may be affected by external pressures.

Our receiver is likewise constructed, the wiring forming a U by turning back one-half of the system to oppose the other, thus balancing out such energy as might be impressed upon the wiring.

It is much more sensitive to energy coming through the proper inlet and amplifies to more perfect reproduction, than if parasitic disturbances were allowed to flow at will. It is necessary, too, that the inductances, and other devices be as small as possible so that their exposure to fields will be likewise small, and the St. James intermediate transformers, and other devices are ideal for this purpose, as no coil is over one inch in diameter. But ten feet of wire is required to make the connections, and five inches wires the oscillator circuit.

The advantages of the system are self-evident, and with the high degree of accuracy in the St. James parts, the use of the best parts available from responsible manufacturers assure the builder a radio receiver at small cost, capable of being constructed by anyone, which will compare with the highest price set, in tone power and selectivity.

The U circuit may be constructed in two models, the Upright Eight and the Twin Four, complete plans and instructions which are now ready.

Parts by Leading Manufacturers

4 St. James Transformers @ $7.50	$30.00
1 St. James Oscillector	5.00
1 St. James Choke Coil	1.50
2 Celoron Strips with built-in Benjamin redtop sockets @ $2.80	5.60
Lignole two-tone Panel (7x21)	5.00
No. 1824 Frost Potentiometer	1.25
No. 51802 Frost Rheostat and Switch	1.35
2 Frost Tip Jacks @ $0.10	.20
No. 638—Remler Tuning Condenser, .00035	5.00
No. 639—Remler Tuning Condenser, .0005	5.00
Yaxley Cable Plug	2.50
2 No. R200 Thordarson Audio Transformers @ $8.00	16.00
Sangamo Bypass condenser, 1 mf.	1.25
Acme Parvolt condenser .006	.70
Acme Parvolt condenser .002	.50
2 St. James Brackets	.75
1 Clarostat	1.50
Celatsite Wire	.30
Total list price	$83.40

Optional Parts

2 Remler Dials @ $1.00	$ 2.00

Accessories Recommended

Quam Speaker	$17.50
Bodine Loop	12.50
Ehlert Radio Cabinet, as desired.	

Electrical operation is the talk of today. The St. James Twin "4" can be made a complete electrically operated set. And the beauty of it is that you can operate it either way, with batteries or socket power, just as you wish, without making any changes in the circuit. No need to buy expensive A-C tubes—no worrying about tubes blowing out—just smooth, care-free, dependable service that can't be beat.

Back of the St. James Twin "4" stands the best brains of the radio industry—the leading, reliable manufacturers whose reputation means complete satisfaction to the user.

Those who have built other St. James circuits will tell you that they can't be beat. In the Twin "4" you have one that is up to date and 'way ahead of anything else. Builders of the "Upright 8" can easily convert their sets to the Twin "4," likewise the latter can be easily changed over for semi-portable or full portable operation for summer use.

YES—We Have Full-Size Plans

One of the outstanding features of the St. James Twin "4" is its very simple construction. Our complete, full-size blue prints, diagrams and the easy instruction sheet makes it possible to build this exceptional receiver in very little time. You will wonder at the ease with which you can do it. You will say, as many other have said, "The easiest wiring and building job there is."

Your Guarantee of Satisfaction

The following leading manufacturers whose parts are used to build this new St. James Wonder Circuit, assure you of getting real service and value. These parts are for sale by leading jobbers and dealers everywhere:

St. James Intermediate Transformers
Remler Condensers and Dials
Celoron Panels
Benjamin Sockets
Frost Rheostats and Parts
Clarostat
Thordarson Audio Transformers
Yaxley Cable Plug
Sangamo Condensers
Acme Wire and Condensers
Bodine Loop
Quam Speaker
Ehlert Cabinet

Get the facts on this remarkable new circuit NOW. Save money by building it. Its high quality and low price speaks for itself. *Mail the coupon and get the facts.*

ST. JAMES LABORATORIES
123 N. Sangamon St., • Dept. 11 • Chicago

MAIL THIS COUPON NOW

ST. JAMES LABORATORIES,
123 N. Sangamon St., Dept. 11,
Chicago, Ill.

Dear Sirs:

☐ Please send me complete facts regarding the St. James Twin "U" the circuit that is making D-X records and which is entirely different and easier to build.

☐ I enclose $1.25 for complete life-size blue prints and diagrams.

☐ I enclose $36.50 for St. James Parts, including 4 transformers, oscillector and choke, to be sent postpaid, to build this receiver, which I am unable to buy locally.

Your Name.....

Address.....

City.....

State.....

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine

SM

New! All-Wave Tuners and Unipacs

LOOK at it—the prettiest little tuner you ever laid eyes on, to go with any two stage power amplifier or Unipac, all light-socket operated, and costing only $31.50 for the complete kit. The S-M 642-AC Universal All-Wave Tuner is a two tube A.C. receiver, using interchangeable coils to cover all waves from 18 to 3,000 meters at will, and is equipped with illuminated drum dials, beautifully decorated metal panel, and all modern refinements. The circuit is the popular and efficient one stage of RF amplification and regenerative detector, and its DX range 500 to 1,500 miles or more. A 642-AC Universal All-Wave Tuner and one of the new 682-210 two stage push-pull 210 Unipac power amplifier and ABC power plant is the finest medium range receiver money can buy, with tone absolutely unequalled. The 642-AC kit, complete to the last screw and lug, is priced at $31.50, for use with any two-stage audio amplifier at all.

The Universal All-Wave Tuners are a series of the neatest, snappiest sets you can build, low in cost but great in dependable performance and real value. Model 642 is a two tube battery operated tuner at $29.50; Model 644 the same tuner plus two audio stages, making a "wow" of a four tube set with 1,500 mile loud speaker range at $42.50, complete. Model 644-AC is a four tube socket powered all wave tuner priced at $54.00, deriving all power from the 684 ABC power unit kit at $32.50—just $86.50 for a complete four tube all wave set with ABC power unit included that will give sweeter results than any of the popular six tube, one dial sets.

Or if you want, you can build the three tube model Universal Tuner to precede all standard high quality one stage power amplifiers—or you can build the new screen grid tube into any of these tuners.

Complete blueprints and instructions for all models. 25c.

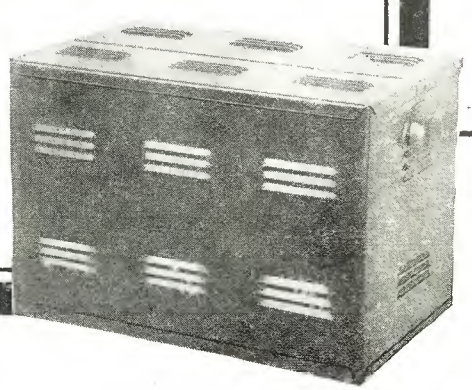
S-M Unipacs
Socket Powered Amplifiers

New Unipac amplifiers are just being released—power amplifiers for every need, giving the finest quality of reproduction you can possibly demand. Each model contains the famous push-pull 210 amplifier stage first introduced by Silver-Marshall, as well as its own complete ABC power plant operating from any 110 volt, 60 cycle lamp socket.

Model 681-210 is a single stage push-pull amplifier using two UX-210 tubes with an undistoreed power output of over 5,000 milliwatts—up to several hundred times clearer than that of ordinary receivers. It can be used with any set equipped with at least one stage of AF amplification to boost volume, eliminate B batteries and give finer quality than you can get from any other power amplifier or receiver on the market. Type 681-210 has a self-contained power supply using one or two UX-281 rectifier tubes at will and a UX-874 voltage regulator tube to hold receiver B voltages, supplied by the Unipac, absolutely constant.

The new Unipac case is 17¼" long, 10¼" high, and 9¾" wide—large enough to accommodate the Unipac and an extra audio stage if desired, as well as an A power transformer to enable the 681-210 to supply receiver ABC power when A.C. tubes are used. Price, 681-210 KIT, ready to assemble, $83.25; or 681-210 WIRED Unipac, ready to use, $93.25.

Model 682-210 is a complete two stage amplifier for phonograph or radio containing the 210 push-pull output amplifier stage of the 681-210 plus a first audio stage using a UX-226 tube and a S-M 220 transformer. Type 682-210 will furnish A, B and C power to an A.C.-tube-equipped receiver as well as complete audio amplification of the finest imaginable quality. Price, in same case as 681-210. $97.75 for 682-210 KIT, or $107.75 for 682-210 WIRED Unipac, ready to use.

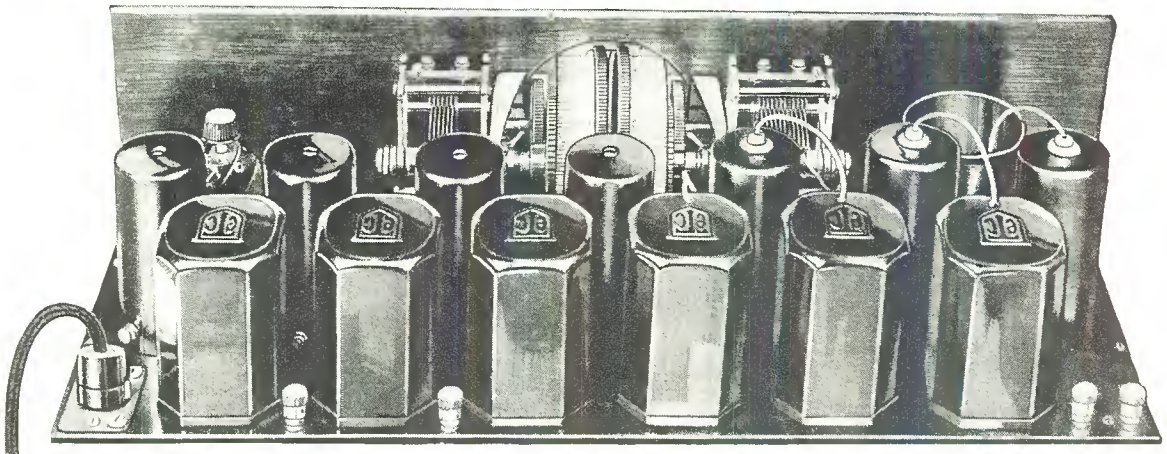


Tyrman "70"

Shielded Grid Amplimax

Using Type SP122 Tubes

for A-C or Battery Operation

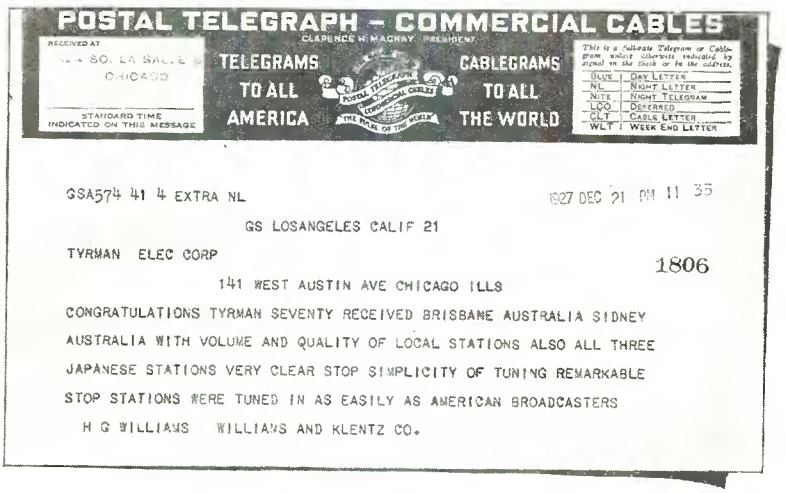


WEBSTER "70"

A Real Companion for the Tyrman "70"

Webster "10" ("A" Power Unit). Operates any set from 4 to 10 tubes.

Brings in JAPAN-AUSTRAL A with VOLUME and QUALITY



POSTAL TELEGRAPH – COMMERCIAL CABLES

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NITE	NIGHT TELEGRAM
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CLT	CABLE LETTER
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TYRMAN ELEC CORP 1806

141 WEST AUSTIN AVE CHICAGO ILLS

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H G WILLIAMS WILLIAMS AND KLENTZ CO.

Until now all claims for distance, selectivity, volume and tone quality have been based upon number of tubes employed.

Now greater results are obtained through Tyrman Laboratories by the development of the Tyrman "70" without distortion or oscillation.

Build this new receiver and be the first to benefit by this revolutionary improvement.

Tyrman Electric Corp.

141 West Austin Avenue, Chicago, Ill.

Mail Coupon Today!

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Dept. CB, 141 W. Austin Ave.
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Gentlemen:

Kindly send me, gratis, special literature describing the Tyrman "70" Shielded Grid Amplimax in detail.

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Address.....

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Six Super Features Make This New

CUSTOM-BUILT Hi-Q SIX

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This CUSTOM-BUILT instrument is not only the greatest radio advance of recent years but is equally remarkable both in its low cost and in the profits it is making for those who are building and selling it.

First, its circuit is the final expression of three solid years of research and scientific development.

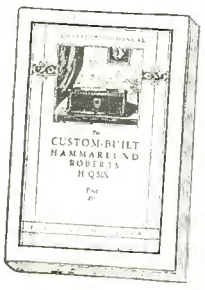
Second, it employs only the very finest parts available, all having been selected for perfect synchronization.

Third, its Automatic Variable Coupling effects even and maximum amplification over the entire tuning range.

Fourth, each of its four tuned stages is completely isolated by means of chokes, by-pass condensers and heavy aluminum shields. Each stage operates independently without interstage coupling.

Fifth, symphonic audio amplification, plus a power tube, produces natural tone quality which is nothing short of a revelation.

Sixth, the Hi-Q Six can be built at a cost of only $95.80 for all parts. The finished CUSTOM-BUILT instrument is unequalled by ready-made sets at least $100 higher in price.



If you want to save at least $100 on America's finest receiver or if you want to make big, easy profits CUSTOM-BUILDING the Hi-Q Six, send 25c now for this fully illustrated 48-page Construction Manual.

The Best In Radio Must Be CUSTOM-BUILT!

TO meet the exacting requirements of individual reception areas—to meet the personal preferences of individual tastes—and to meet the desires of those intelligent persons who appreciate the advantages of truly fine handicraft—*the best in radio* MUST BE CUSTOM-BUILT!

The new Hi-Q SIX is exclusively a CUSTOM-BUILT Receiver—an instrument created and perfected by the engineering brains of ten of America's leading radio manufacturers. In this remarkable instrument every modern constructional feature has been incorporated; each part is the very finest known to radio science, and the entire group has been purposely selected for perfect synchronization.

The result is a receiver that establishes totally new standards in every department in which radio engineers have sought improvements—increased sensitivity, greater power output, keener selectivity and tonal qualities that are nothing short of a revelation.

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GUARANTEE

We guarantee the successful operation of every receiver built from parts purchased of us. If you can't make it work, we will. Send for catalog of parts and kits.

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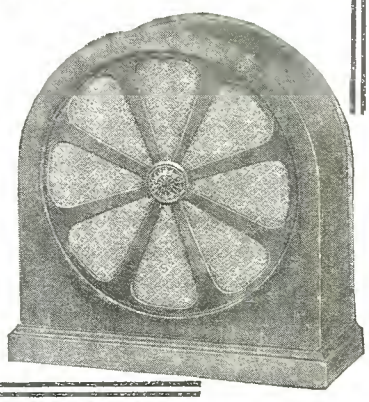

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Sub-Panels (2).....Per set of 2.....$6.00
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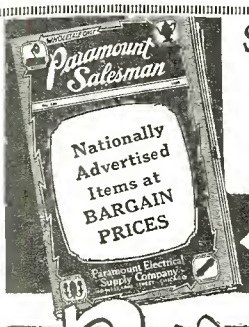

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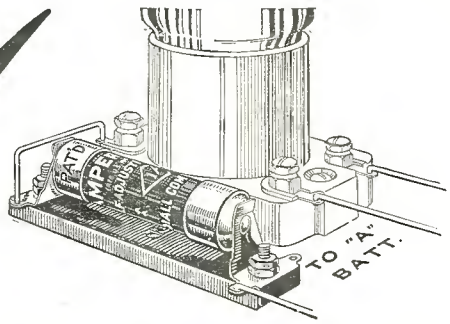
GREAT-EASTERN-RADIO-CO 523 MARKET ST. PHILA. PA.

OK for Every Circuit



TUBE performance can be perfect—and tube life prolonged—only by keeping the tube filament voltage, or temperature, constant, despite variations in "A" battery voltage. AMPERITE alone does this—and it does it automatically. That is why AMPERITE is specified by every radio engineer—and is indispensable in every radio circuit. Takes the "guess", inconvenience and unsightliness out of panel rheostats. Simplifies wiring, panel design and tuning. Proved for 6 years. Entirely different from—and must not be confused with—fixed filament resistors. Particularly necessary with battery eliminators. Order AMPERITE by name. Accept nothing else. Price $1.10 with mounting (in U.S.A.). For sale by all dealers.

FREE

Write for "Amperite Book" of season's best circuits and latest construction data. Address Dept. CCB1.

Radiall Company
50 FRANKLIN ST., NEW YORK

AMPERITE
REG. PAT. OFF.

The "SELF-ADJUSTING" *Rheostat*

Sensational! Prices Reduced

Continental Standard Meter Test
RADIO TUBES

Formerly $1.75
Now Only **$1.00**

The greatest and most sensational price reduction ever offered in high quality, standard, meter test guaranteed radio tubes. Genuine "firsts" of our very best grade. Increased production and large volume business enables us to offer tubes at the standard price of only $1.00.

Never before has a standard quality radio tube been offered to the public at this low price. Take advantage of this opportunity now to get your radio tubes at a real saving.

X200A	$2.50	X281	$6.00
X112	2.50	X210	7.50
X171	2.50	C226	3.00
X280	4.00	C227	6.00

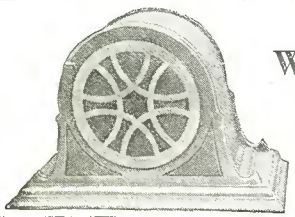
For sale by progressive dealers. If your dealer cannot supply, order direct, giving his name.

Dealers and Jobbers: Write for special offer
CONTINENTAL CORPORATION
179 W. Washington St., Dept. CB3, Chicago, U. S. A.

Professional Set Builders . . .

DO you wish us to send you some of the inquiries we receive from those in your locality who wish to have receivers built to order for them? If so, send your name and address at once to

F. A. RYDER
Radiart Laboratories Co.
19 S. La Salle St., Chicago, Ill.



Pep up your set with a
WorkRite Cone Speaker

Greater volume—wider tone range—greater distance with this double magnet cone speaker, combine to give you greater pleasure from your radio set.

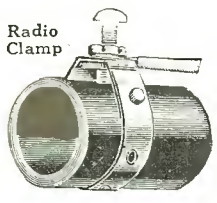
U. S. Electric Corporation
WorkRite Division
CLEVELAND - - - OHIO

Complete Parts for the Every Man 4 Circuit Supplied by

THE HARRY ALTER CO.

18th and Michigan Chicago, Ill.

Wholesale Only



Blackburn Ground Clamps

Telephone companies using MILLIONS. Adjustable—fits any size pipe. Requires no pipe cleaning—screw bores through rust and scale. Send 12 cents for sample and postage.

BLACKBURN SPECIALTY CO.
1968 E. 66th St. Cleveland, Ohio

Official Distributor for the Everyman-4

We have complete parts in stock for this new low priced receiver. Send us your order. PROMPT TWENTY-FOUR HOUR SERVICE ASSURED.

WRITE TODAY FOR COMPLETE CATALOG
in Case You Do Not Have It

W. C. BRAUN COMPANY, *Pioneers in Radio*
595 West Randolph Street Chicago, Illinois

Raytheon
LONG LIFE RECTIFYING TUBE

TYPE BH—Standard for "B" Power Units, 125 m.a., 300 volts, $4.50.

TYPE BA—For complete A-B-C Power, 350 m.a., $7.50.

Raytheon Manufacturing Company Cambridge, Mass.

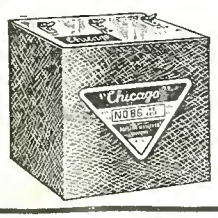
$5.50 buys this famous cabinet

The Iveyline

Sizes range from 7x18x10 to 7x30x12. Mahogany finish, $5.50 to $8.75. Solid Walnut, $6.50 to $10.50, f.o.b. Hickory. 12-hour service. Write for catalogue.

BUY direct from us and save money. Your choice in either gleaming mahogany finish or solid walnut. All orders shipped within 12 hours of receipt. You can't beat this Iveyline cabinet. Order today or write for catalogue.

SOUTHERN TOY CO., Manufacturers, HICKORY, N. C.

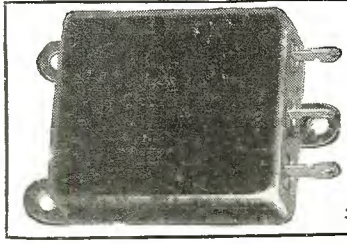


"CHICAGO" HEAVY DUTY "B"

is the only battery on the market carrying a six months' unconditional guarantee.

Dealers, Agents: Write today for discounts and details of our exclusive selling franchise. We make a complete line of Dry Cell Batteries for every radio requirement.

AUSTIN ACCESSORIES MFG. CO.
12 S. Clinton St. Chicago, Ill.



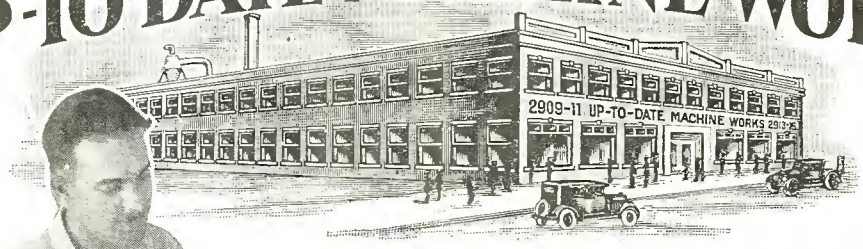
Radio fans: Buy **Fast** condensers from your dealer and get reliable service and long life because of higher insulation resistance and non-inductivity.

Manufacturers, send us your specifications for your set condensers, A-C eliminator blocks, etc. Jobbers, dealers: Write for price list and catalog.

JOHN E. FAST & CO.
3982 Barry Av., Dept. CB4, Chicago

ESTABLISHED 1913 CHICAGO, ILLINOIS

UP-TO-DATE MACHINE WORKS



SENT ON TRIAL

THE FIRM BACK OF THE UP-TO-DATE HOME CRAFTSMAN SHOP

15 years a standard in mechanical perfection. The basis of our fifteen years of success in mechanical production is the guarantee placed on every one of our over 1000 commodities. **"We place an absolute guarantee on all of our products. If satisfaction is not yours on the receipt of your order, without question or delay, every cent of your purchase is refunded."**

Such is the organization back of the Up-to-Date Home Craftsman Shop, which is manufactured, distributed and guaranteed by the Up-to-Date Machine Works.

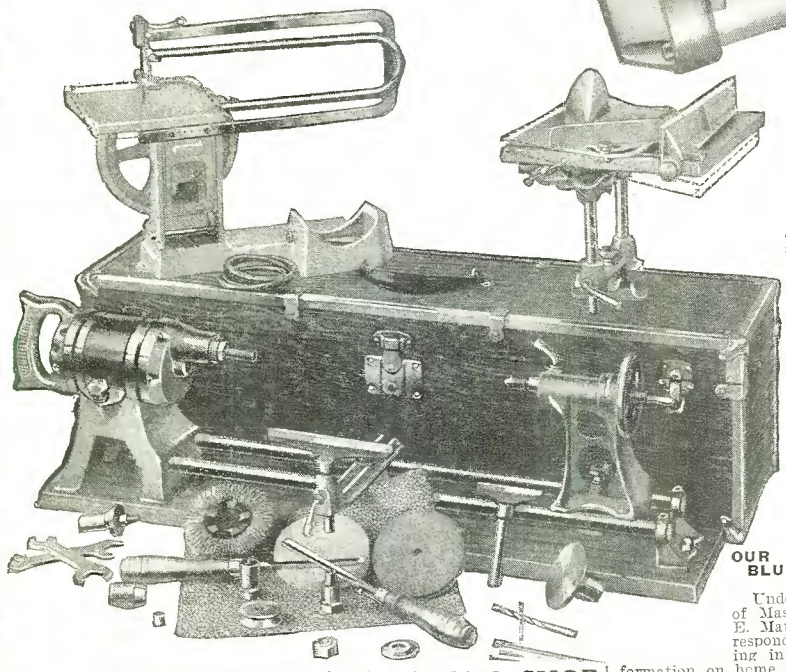
We place this article here because we feel safer when purchasing from a reliable firm of many years' standing and we know that you bear the same attitude.

ONLY $10 DOWN

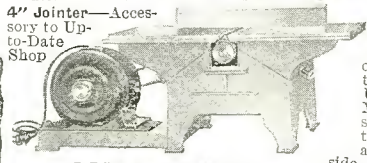
THE SUPER-POWER MOTOR

The heart of the Home Craftsman Shop equipment. A ½ Horse Power Motor operating on 110, 32, or 220 volts, either A.C. or D.C. Current. This motor is positively the latest development in Electric motor equipments. The motor will operate to perfect satisfaction a 4" jointer, a 12" or 16" band saw, a (10"x34") lathe, a 12" jig saw, and a 6" circular saw. Never before the **Up-to-Date Motor** has such power been realized in a drill motor, which we guarantee not to stall, burn out or wear out in the ordinary usage of shop or factory. Power and endurance are the two main qualities installed in our motor.

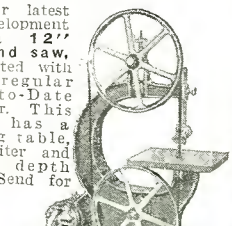
Notice the design, a convenient, easy grip, a sturdy Aluminum housing, the spindle in dead line center with the grip so as to assure perfect alignment when drilling. For further details on this remarkable motor and the perfected craftsman shop it operates, **Mail the coupon below, today.**



4" Jointer—Accessory to Up-to-Date Shop



Our latest development—a **12" band saw,** operated with the regular Up-to-Date Motor. This saw has a tilting table, a miter and side and depth gauge. Send for details.

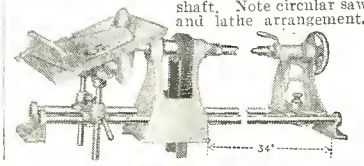


GUARANTEE

After receipt of the Up-to-Date Home-Craftsman's Shop, if you are not satisfied, without question or delay every cent refunded and return express charges paid. **YOUR** own terms on purchase. **$10.00** down—balance arranged to your convenience. Liberal discount for cash.

OUR EDUCATIONAL AND BLUE PRINT DEPARTMENTS

Under personal supervision of Master Craftsman Eugene E. Maurey, offers special correspondence crafts course, giving in simple detail full information on home handicraft. Blue print service giving plans and details for making hundreds of pieces of wood handicraft included in this course FREE to our users. Individual headstock furnished where no electricity is available or to operate from an individual motor, gasoline engine, or line shaft. Note circular saw and lathe arrangement.



Use our shop for 10 days at our expense. If not satisfied—return—express charges collect.

UP-TO-DATE HOME CRAFTSMAN SHOP

An Advanced Development in Home Craftsman Shop Equipment

The Up-to-Date Electrical Home Craftsman Shop can be used in any home lighting fixture, thus making of your old-fashioned work bench a complete machine shop, made of a Super-power Motor, an accurate Lathe (10"x34"), a 6" circular saw, which features the bevel, miter, side and depth gauges, a Tilting Table, Jig saw, and all accessories for buffing, grinding cleaning and all portable or stationary drilling and sawing. This collection of electrically driven tools, complete in every detail, will make you an advanced craftsman. Master mechanics have designed and skilled engineers have constructed this equipment which, after inspection, you will agree is the best of its kind. For those who build, invent, create and construct at home, it is unexcelled. **Our literature gives all details.**

10 DAY FREE TRIAL

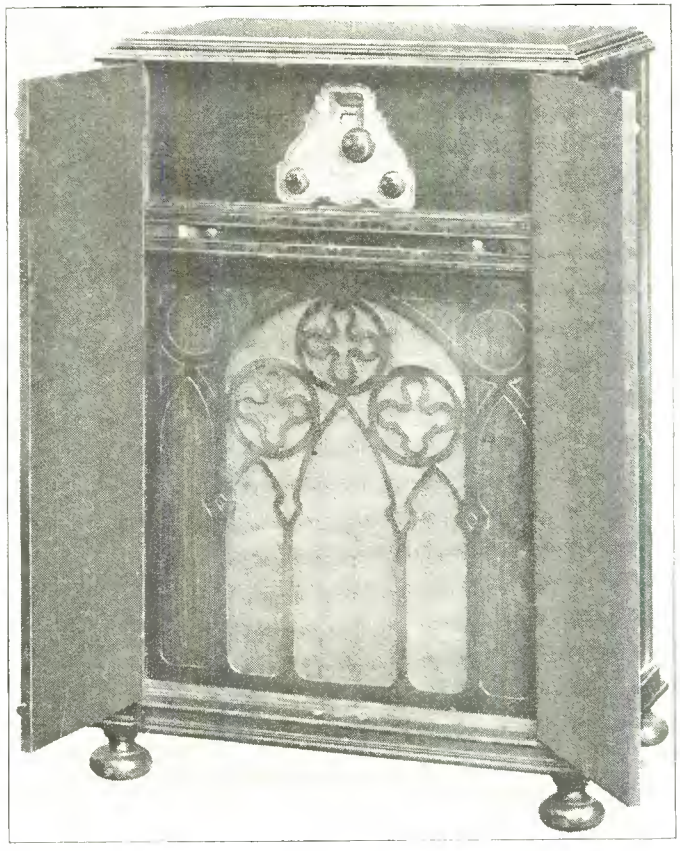
Mail This for Full Particulars to

UP-TO-DATE MACHINE WORKS
2915 S. Wabash Ave., Chicago, Ill.

MANAGER, Dept. V:—Wtihout any obligation, please send me all particulars about your shop, 10-day free trial, free blue prints, free crafts course. Also $10.00 down payment offer.

NAME.....

ADDRESS.....



The Newest—the Classic Console

The exquisite beauty of the Chillicothe Radio Console is creating a sensation among radio owners. Every set owner desires the enhancing artistry, so accurately expressed in this most attractive and convenient cabinet. "The Classic" Console is faultlessly constructed of genuine black walnut, "that master of woods."

A long air column Newcombe-Hawley horn with Baldwin unit,—standard equipment.

Sufficient space in lower compartment for all types of battery and electrical equipment.

A walnut panel which will accommodate all sets up to 26½"x9".

The above are additional advantages of this Chillicothe Console.

Here—in this new creation by the Chillicothe Furniture Company, you will find authentic, distinctive design, simplicity and unsurpassed convenience, — truly a pleasant combination.

Interesting booklets on Chillicothe radio cabinets will be cheerfully mailed upon request. A letter to Department C, Chillicothe Furniture Company, Inc., Chillicothe, Missouri, will demonstrate how these cabinets will improve your set.

CONSTRUCTION

The same ideals which the Chillicothe Furniture Company has at all times expressed in the construction of their genuine Walnut Dining Room Suites, have been carried into this new field of radio cabinets, and built in "the Walnut center of America," by this reliable firm, you are assured of a radio cabinet superb.

RADIO MANUFACTURERS RMA ASSOCIATION MEMBER

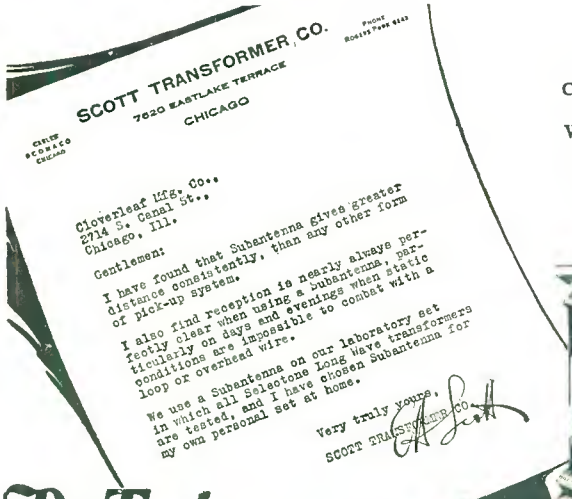
"Built in the Walnut Center of America"

CHILLICOTHE
RADIO CABINETS

CHILLICOTHE FURNITURE COMPANY
INCORPORATED
CHILLICOTHE, MISSOURI

Tell 'Em You Saw It in the Citizens Radio Call Book Magazine

Index to Advertisers



SCOTT TRANSFORMER CO.
7620 EASTLAKE TERRACE
CHICAGO

Cloverleaf Mfg. Co.,
2714 S. Canal St.,
Chicago, Ill.

Gentlemen:

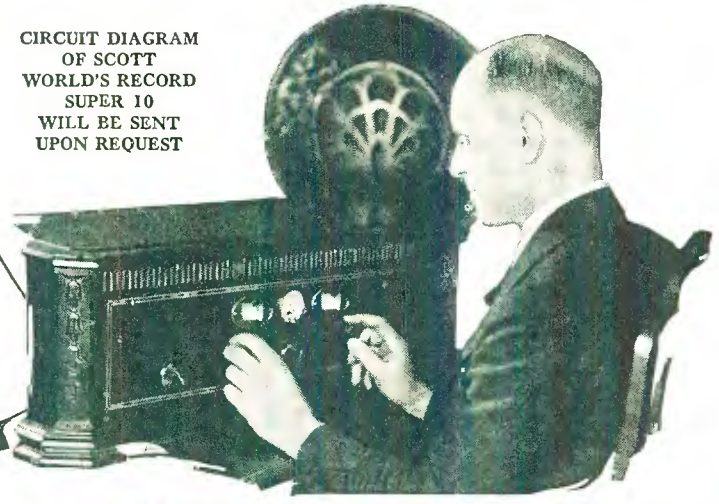
I have found that Subantenna gives greater distance consistently, than any other form of pick-up system.

I also find reception is nearly always perfectly clear when using a Subantenna, particularly on days and evenings when static conditions are impossible to combat with a loop or overhead wire.

We use a Subantenna on our laboratory set in which all Selectone Long Wave transformers are tested, and I have chosen Subantenna for my own personal set at home.

Very truly yours,
SCOTT TRANSFORMER CO.

CIRCUIT DIAGRAM OF SCOTT WORLD'S RECORD SUPER 10 WILL BE SENT UPON REQUEST



By Test

SUBANTENNA

proved best for DX by designer of the 9400 MILE SCOTT WORLD'S RECORD Super 10

The fact that Mr. E. H. Scott, whose fondness for far distant reception led him and his World's Record Super 10 into the spotlight of world-wide fame, endorses and uses a Subantenna in his laboratory work and at home is conclusive proof of the merit of this device.

Read the letter reproduced above. It contains the official answer to the question foremost in the mind of the inveterate DX listener. *"DOES Subantenna increase distance?"* E. H. Scott, the inventor of the WORLD'S RECORD SUPER 10—the receiver holding more distance records than any other, says Subantenna DOES. He says it not only increases distance but that it gives absolute clarity on far-away stations when a loop or up-in-the-air aerial brings mostly static and noise. Thousands of fans, hundreds of whom have so written, confirm Mr. Scott's finding. For instance, J. White of Brooklyn, N.Y., picked up Sydney, Australia—10,144 miles away—with a Subantenna. Reception was *clear*, but the instant he switched to a 200 ft. up-in-the-air aerial, the reception became a jumble. From all parts of the world come letters describing truly amazing distance tests in which Subantenna asserts its superiority.

Listen in on Static-Free Ground Waves Enjoy Louder, Clearer, Better "Distance"

The picture at the right explains why Subantenna brings in far distant stations when other types of "pick-up" fail. Subantenna, as the picture shows, intercepts only the ground component of the wave. This wave is always practically pure and static free. Hence, the radio signal dominates and comes in clearly regardless of the condition in the air. Result—loud, clear DX, irrespective of the weather or the season.

Authorities and Thousands of Users Prove Amazing Merit of SUBANTENNA

AUSTRALIA

John White of Brooklyn, New York, has verifications from station 2FC, Sydney, Australia, and 3AR, Melbourne, Australia, of reception made possible by a SUBANTENNA.

CUBA and SOUTH AMERICA

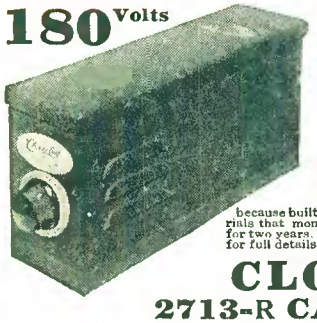
"To show you that I received a program from Station PWX in Havana, Cuba, I enclose herewith a verification card from that station. On January 28th, I received a program on my set broadcasted from Buenos Aires, South America, at 10:15 in the evening. Many other long-distance stations have been heard on my set after installing the Subantenna. I never could receive such distance on my outside antenna."—W. C. F., Chicago, Ill.

"MORE STATIONS—NO STATIC"

"I get plenty of stations with my Subantenna, on the loud speaker, that I have never been able to reach with my outside aerial. It absolutely cuts down interference to the minimum, cuts static out too—*not just partly out—but all out.*"—H. S. M., North Carolina.

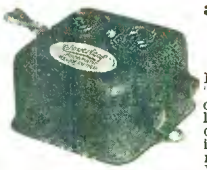
CLOVERLEAF Lifetime "B" Eliminator

180 Volts



85 Mil. Tube

A new, better, advanced type "B" at a new, lower price than any other unit of equal capability. Supplies fixed voltages of 22-45-90-135 and 180 volts for power tube from permanent, non-adjustable taps. No "motorboating." Will run any standard set. The true "lifetime" eliminator, because built of the finest quality materials that money can buy. Guaranteed for two years. Test it FREE. Mail coupon for full details of FREE TRIAL OFFER.



and Cloverleaf AUTOMATIC A and B CONTROL

Localizes control of "A" battery trickle charger and "B" Eliminator in the switch on your set. Installed in a minute. Never needs attention. When you turn your set "off," the Cloverleaf Control automatically turns the tubes *off*, the "B" Eliminator *off*, and the trickle charger *on*. When the set switch is turned "on," the opposite takes place. Try at our risk. Check coupon for full details.

FREE TRIAL

Make this Convincing Test at Our Risk

Install Subantenna. Leave your old aerial up. Select a bad night when DX is almost impossible with the ordinary aerial. Make a comparison station for station, connecting first your aerial, then Subantenna. If, from stations that are just a mess of jumbled noise with the old aerial, you don't get reception that rivals local in sweetness and clarity the instant you switch to Subantenna, this test is Free. Obtain a Subantenna from your dealer or send coupon at once for scientific explanation of Subantenna and for particulars of GUARANTEE and FREE TRIAL OFFER. SEND COUPON NOW!

CLIP and MAIL AT ONCE

CLOVERLEAF MFG. CO.
2713-R Canal St., Chicago, Illinois

Tell me all about SUBANTENNA; your unqualified unconditional guarantee and your FREE TRIAL OFFER. Also send me particulars of

- ☐ Cloverleaf LIFETIME "B" Eliminator
- ☐ Cloverleaf Automatic A and B Control
- ☐ Send FREE Circuit Diagram of Scott World's Record Super 10

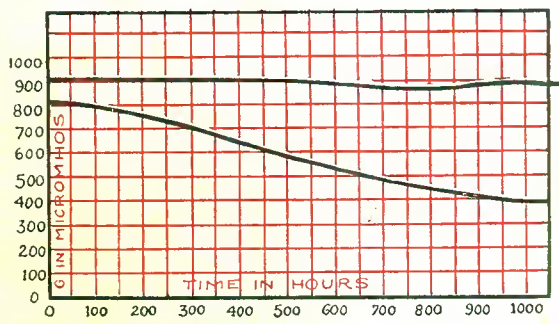
Name.....

Street.....

Town.....State.....

CLOVERLEAF MFG CO.
2713-R CANAL ST. CHICAGO. ILL.

No Falling Off



CeCo Tubes
Avg. of 27 Other Makes

THE above chart graphically illustrates the longer life and steadier performance of CeCo Tubes as shown by an unbiased test of CeCo Tubes in comparison with twenty-seven other makes.

The test was conducted by a nationally known set manufacturer (name on request).

CeCo Tubes prove to be as efficient after 1,000 hours of use as when new. In fact, hundreds of instances have been called to our attention by users where CeCo Tubes have performed for over 2,000 hours without apparent deterioration.

Experiences like these, together with a noticeable improvement of tone, clarity and volume resulting from the use of CeCo Tubes, have secured the recommendations of well-known radio authorities such as

ARTHUR H. LYNCH	GERALD M. BEST	HERMAN BERNARD
GLENN H. BROWNING	KENNETH HARKNESS	KEITH HENNEY
LAWRENCE M. COCKADAY	VOLNEY HURD	JAMES MILLEN

There's a CeCo Tube for Every Radio Need

GENERAL PURPOSE TUBES
SPECIAL PURPOSE TUBES
POWER TUBES
RECTIFIERS
A. C. TUBES

Ask your dealer to help you select the types best suited to your set

C. E. MFG. CO., Inc., Providence, R. I.

Largest plant in the world devoted exclusively to making of Radio Tubes