Winter Edition

Fifty Cents

Radio Listeners' Guide and Call Book

Edited by S. Gernsback

A Quarterly Magazine

30 DAYS FREE TRIAL

Battery or
All-Electric
OPERATION

HERE is the great value offer of the day. Test and try this powerful seven-tube RANDOLPH RADIO for thirty days. After it **brings in stations from coast to coast** with amazing clearness—**with easy one-dial tuning**—after it **easily equals any other radio** regardless of cost—after you are more than satisfied then you can buy it **direct at factory prices. Every RANDOLPH must make good before it is sold.**

The RANDOLPH SEVEN-TUBE CONSOLE illustrated here can be had for use with batteries or **connected direct to the electric light socket—absolutely batteryless—no batteries, chargers or acids—just plug in and tune in.** 100% efficient either way. Its construction and performance have been tested and approved by leading radio engineers and authorities—by leading radio publications and laboratories.

7 Tubes—Single Control
Illuminated Drum

One drum dial operated by one simple vernier control tunes in all stations with easy selectivity to tremendous volume. No overlapping of stations. Illuminated drum permits operation in the dark. Volume control for finer volume modulation. This is a seven-tube tuned radio frequency receiver with power transformers and power amplification. Space wound solenoid coils. Full and completely shielded. A real receiver of the highest quality. Tremendous distance, wonderful tone quality, simple to operate.

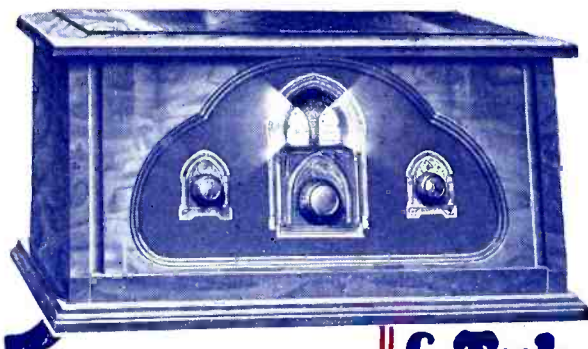
Beautiful Walnut Console
Built-in Cone Speaker

The Randolph Seven-tube Ampliphonic Console illustrated above is housed in a genuine burl-walnut cabinet with two-tone hand rubbed finish giving it unsurpassed beauty. The same expert cabinet work has gone into the making of these consoles as in the finest furniture. Has **built-in cone loud speaker that compares with any on the market.** Accurately reproduces complete range of musical notes from the highest to the lowest pitch.

What Users Say

I have logged more than 50 stations from coast to coast.—Lloyd Davenport, Littlefield, Texas. I have logged 52 stations from Cuba to Seattle, the set is a world beater.—J. Tampkinson, Detroit, Mich. Your set is a revelation, has all others tied to the post for distance and selectivity.—Waldo Powers, Vergennes, Vermont. On strength of its performance sold two more sets this week.—T. Scanlow, Orlando, Florida.

The Randolph 7-Tube Console Single Control RETAIL PRICE Completely Assembled **$99**



The Senior Six

Now you can have a new, modern, single-control, six-tube radio. Do not compare this set with old style 2-dial 6-tube sets selling for about the same price. The Randolph 1928 Senior Six has also been tested and approved by the leading radio engineers.

Comes in a beautiful solid walnut cabinet of hand-rubbed finish. Single control. Illuminated Drum with space for logging. Absolutely dependable and very selective. **Sent for 30 Days' Free Trial. You test it before you buy.**

6-Tube $55 Retail Price Single Control

MAIL COUPON NOW!

The Randolph Radio Corporation are pioneers in the manufacture of radios. All of its vast and unlimited resources have been used in making and perfecting of the Randolph Receivers. Because of our long and successful experience in the radio business, we are perfectly confident in sending out a Randolph Radio on trial. We know what it will do. Mail us the coupon now for the greatest radio offer ever made.

Sensationally Big Discounts to Agents

Work either full or part time and make big money. Tremendous advertising campaign helps you sell. Regardless of whether you have ever sold before, be sure to get our proposition. The Randolph sells on first demonstration. Men and women both can make money this easy way. Get your demonstration set for thirty day's FREE TRIAL.

Use This Coupon NOW!

Randolph Radio Corporation,
711 West Lake Street, Dept. 235
Chicago, Illinois.

Send me full particulars about the RANDOLPH Six and Seven-Tube All-Electric and Battery Table and Console Sets with details of your **30 Day FREE Trial Offer.**

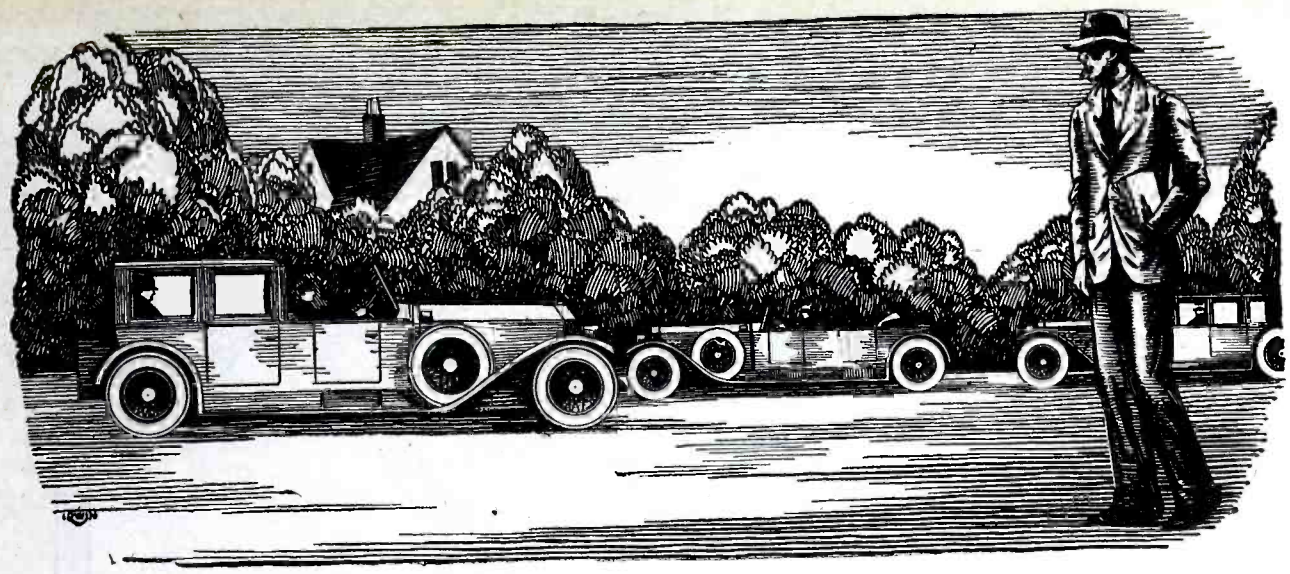
Name.....

Address.....

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

Mark here ☐ if interested in Agent's proposition.

RANDOLPH RADIO CORPORATION
711 West Lake Street Dept. 235 Chicago, Illinois



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 me 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 back-bone 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 had a chance?" *Did Mary secretly think that too?* And after all, wasn't it *true* that I had a "wish-bone" where my back-bone 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. PC-5, Washington, D. C.

J. E. SMITH, President,
National Radio Institute,
Dept. PC-5, 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.....

Radio Listeners' Guide and Call Book

A Quarterly Magazine

Volume II — **Number 3**

DECEMBER, 1927

Contents *of* This Issue

RADIO LISTENERS' GUIDE AND CALL BOOK

VOL. II, No. 3 — **DECEMBER, 1927**

Published quarterly by The Consrad Co., Inc., 230 Fifth Ave., New York, N. Y., telephone number Ashland 9344; H. Gernsback, President; S. Gernsback, Vice-President and Treasurer. Price 50c a copy; subscriptions $1.75 a year in the United States of America, Canada and all countries within the domestic postal zone; elsewhere $2.00 a year, payable in advance. Subscriptions only acceptable in U. S. currency or stamps. No foreign currency or stamps. Checks and money orders should be drawn to the order of THE CONSRAD CO., Inc.

When subscribing to RADIO LISTENERS' GUIDE AND CALL BOOK send your name and remittance to The Consrad Company, Inc., 230 Fifth Ave., New York, N. Y. Mention that you desire to subscribe to RADIO LISTENERS' GUIDE AND CALL BOOK. We also publish and distribute CONSRAD PATTERNS, E. I. COMPANY BOOKS, etc. Write clearly.

Entered as second class matter, March 10, 1925, at the Post Office at New York, N. Y. under the Act of March 3, 1879.

Printed in U. S. A.

Published by the Same Management:

RADIO NEWS — SCIENCE AND INVENTION — AMAZING STORIES

FRENCH HUMOR — SPARE-TIME MONEY MAKING

INDEX TO ADVERTISERS

Wins World's Championship & Cup

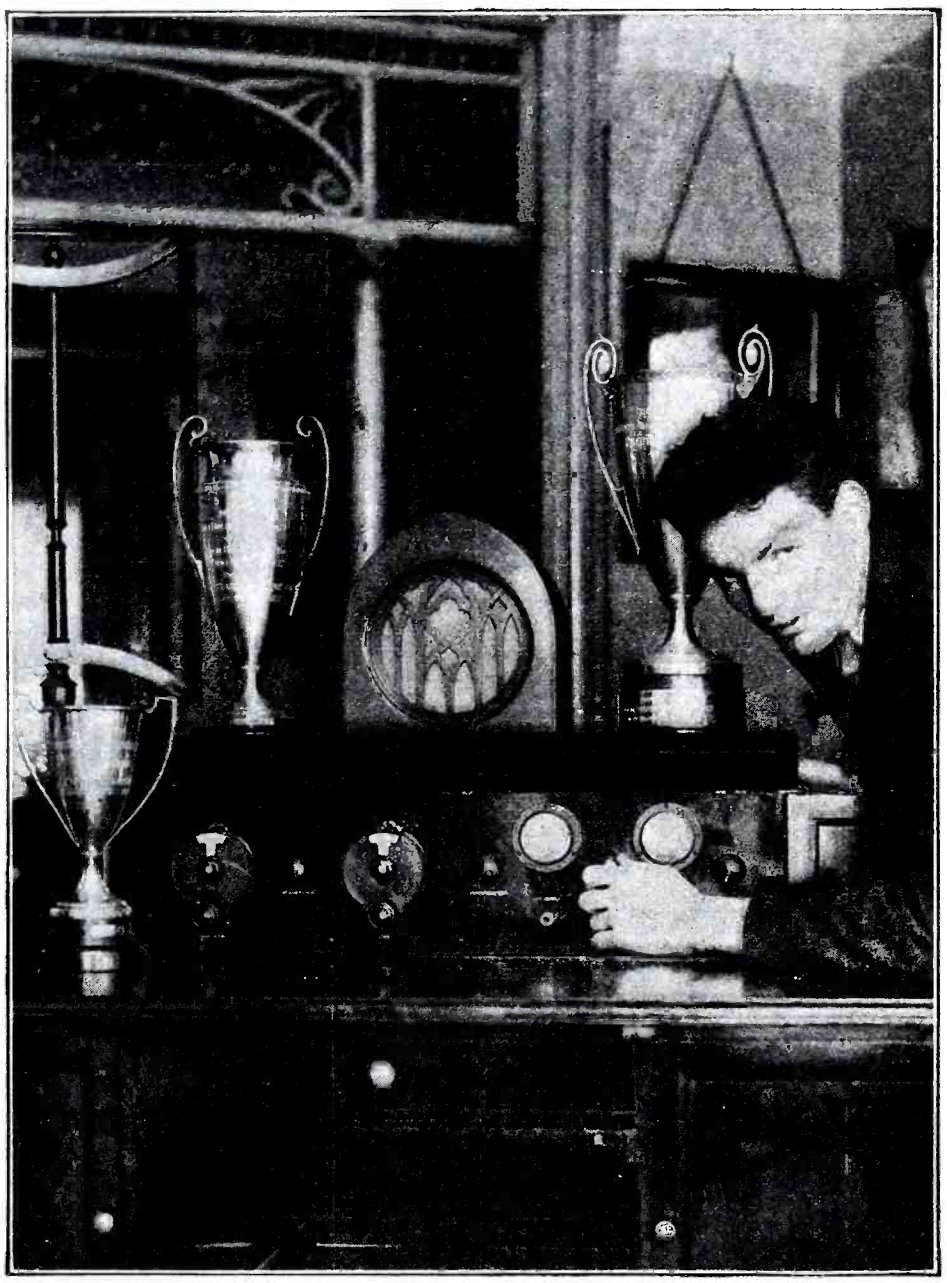
with the famous Robertson-Davis

HOT SPOT Fourteen Receiver

John H. Hartley, of Brooklyn, N. Y., retains World's International Championship for Set Building at the Radio World's Fair in New York, using the famous

Roberston-Davis HOT SPOT 14 Receiver

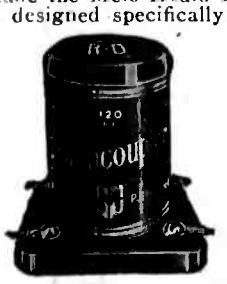
to defend his 1926 Championship Cup



NO RECEIVER HARMONICS

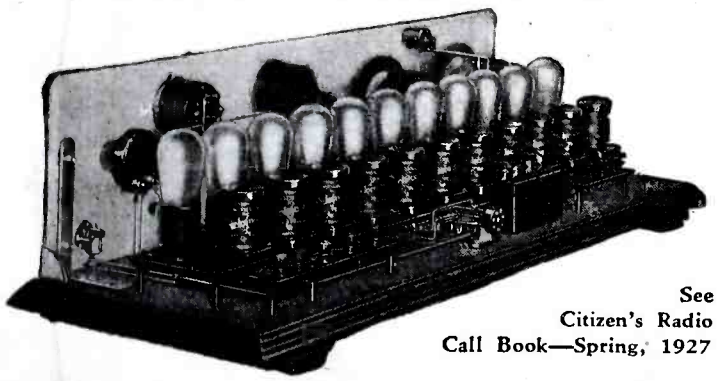
ACTUAL SINGLE POINT RECEPTION—NO REPEATS

The same mixing system is used in the HOT SPOT Fourteen that made the Melo-Heald Eleven famous. Each intermediate transformer is designed specifically for its position. Only one oscillator setting is necessary for each station — real single point reception. 14 Tubes—No Oscillator Repeats. 8 Stages of Intermediates — 3 Stages of Audio. 2 Tuning Controls — Easily Tuned as Single Stage. Quick and Simple to Build — Beautiful Panel and Chassis. "A" BAT., 2 Amps.—"B" BAT., 35 Milliamperes. Loop Regeneration—Potentiometer—Volume Control. These are the features that enabled John H. Hartley to win the cup and Radio's Highest Honors.



The famous Robertson-Davis

Melo-Heald Eleven Receiver



See Citizen's Radio Call Book—Spring, 1927

PHOTO FROM: WIDE WORLD PHOTOS.

NEW YORK WIRE: September 24, 1927.

By Telegraphic Dispatch from N. Y. comes news of the HOT SPOT'S wonderful efficiency by enabling John H. Hartley to retain Title and Cup for another year.

The illustration above shows Hartley with his Championship HOT SPOT Fourteen Receiver that enabled him to out-class all contenders in the keen competition for the Set Building honors at the Radio World's Fair in New York City.

Further details of the HOT SPOT Fourteen are printed in the editorials of Radio Listeners' Guide and Call Book. The famous Melo-Heald Eleven is explained in the Spring, 1927, issue of Citizen's Radio Call Book and other leading publications.

RADIO'S TWO PHENOMENAL RECEIVERS—The famous Robertson-Davis HOT SPOT Fourteen and Melo-Heald Eleven are illustrated above with the Meloformer (Audio Frequency) and the Melocoupler (Radio Frequency), the Certified transformers that are the secret of such great success in radio reception. Details of these exceptional receivers and transformers sent FREE on request.

Fill in and Mail Coupon for FREE Plans and Data

ROBERTSON-DAVIS COMPANY, Inc.

(Engineers and Manufacturers of Electrical Windings)

DEPT. RL-12

412-20 ORLEANS ST. CHICAGO, U. S. A.

FILL IN, TEAR OUT AND MAIL TODAY FOR FREE PLANS & DATA

Gentlemen: Without charge or obligation, please send me Plans and Specifications for construction of receiver designed by Merwyn Heald and described in the Listeners' Guide and Call Book. Also, send further particulars regarding Certified Meloformers and Melocouplers manufactured by you and used in designing Mr. Heald's sets.

I am interested in The Famous HOT SPOT Fourteen ☐

I am interested in The Famous Melo-Heald Eleven ☐

(Check receiver you are interested in.)

Name..... (WRITE OR PRINT CLEARLY)

Address.....

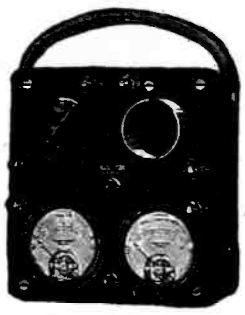
City.....

ROBERTSON-DAVIS COMPANY, Inc., 412 Orleans St., CHICAGO

RL-12

When Radio Instruments are Mentioned You Think of "JEWELL" —BECAUSE—

No. 135—The choice of the set builder. It is specified in most popular radio circuits. It has a D'Arsonval moving coil type movement and is a high quality instrument. 0-8 volt scale.



No. 115—A small compact tube checker with provision for testing power tubes. Genuine bakelite case with carrying handle. Tubes can be rapidly tested with this instrument.

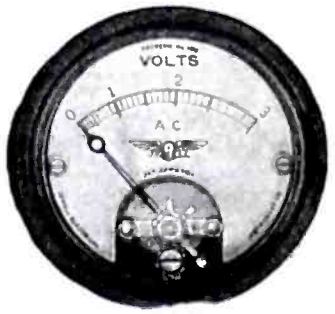
No. 139—A small high resistance voltmeter of the D'Arsonval type suitable for use by the individual in checking and adjusting B-eliminator voltages. 0-300 volt scale.

—every place you go you see Jewell instruments in use. Your friend has Jewell instruments mounted on the panel of his set for regulating the A and B battery voltage or else has Jewell portable instruments for checking the A and B batteries or for testing his set. Your local battery man has Jewell instruments on his charging panel. Your amateur acquaintance governs his transmitting power with the famous Jewell trio of transmitting instruments. The radio service man who services your set carries a Jewell radio service set or a Jewell radio set analyzer on all his service calls. Your radio dealer uses Jewell tube testers and testing equipment for checking his product before you take it home. Your radio set was tested with Jewell instruments at the factory by the manufacturer before its release for sale.

And so it is—everywhere—everyone using Jewell instruments. There is a reason. All of these people use Jewell equipment because there is a special Jewell instrument for every radio use and they have found them to be sturdy and reliable.

You—too, will want Jewell instruments so write for your copy of our 15-C radio instrument catalog.

No. 64—Radio frequency ammeter. One of the famous Jewell Transmitting Trio. Thermo couple type in 3-inch case. Instrument loss is less than ½ of the minimum required by the Navy.



No. 190—A.C. Filament Control voltmeter. Case is 2 inches in diameter and matches No. 135. It is accurate and neat in appearance and is designed for continuous service with small energy consumption.

No. 133—Radio Set Analyzer. Enables a service man to quickly locate the source of trouble in a radio set. The case is of genuine black Morocco leather 4½ x 6⅛ x 8⅜ inches.

"27 Years Making Good Instruments"

Jewell Electrical Instrument Co.

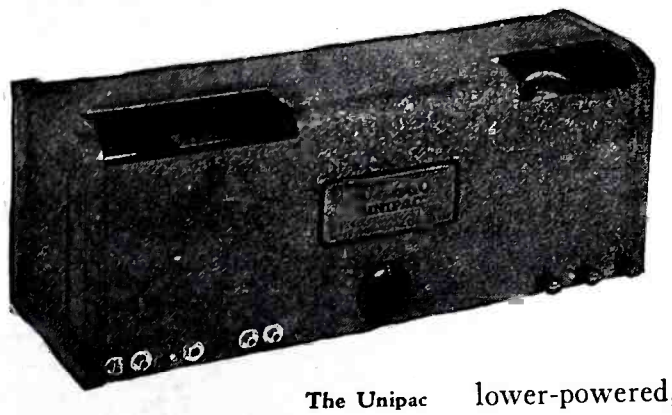
1650 Walnut Street - Chicago

SM

Power Amplification with Tone

DO you know that no matter what kind of a set you have, by adding an S-M Unipac you can eliminate all B batteries and add power amplification that will give you tone quality obtainable by no other method—not even with the most expensive of the new sets?

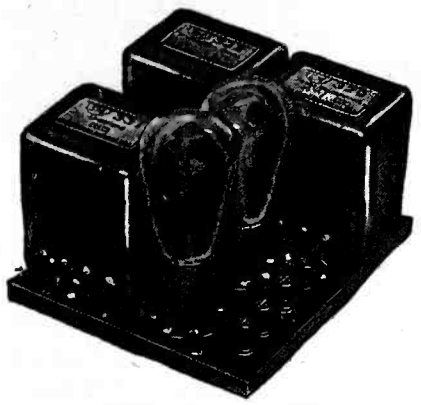
The 660-210 push-pull Unipac is a light socket push-pull 210 power amplifier stage (and receiver B supply) far superior to any other power pack you can buy. It will give from five to fifteen or more times the power you can get from any other 210 power pack—in fact, it is the finest amplifier ever offered. It is priced at $83.25 for the kit.



The Unipac

Then there's the new 660-171A Unipac, a similar model for 112 or 171 tubes that will far out-perform ordinary 210 packs, and it also supplies ABC power for any receiver at all using A.C. tubes. It is priced at $66.00, or for the same kit, slightly lower-powered, with receiver B supply as well, $64.00.

The 660-240 Unipac, a two stage amplifier and B supply for any set at all is the choice of L. M. Cockaday for his LC-28 set, and of Glen Browning for the new two tube Browning Drake. It is priced at $81.25 for the kit, and uses one 210 amplifier, one 226 A.C. amplifier, two 216B or 281 rectifiers and one 874 ballast tube.



652A "Reservoir B"

LIGHT SOCKET ABC POWER

S-M power supplies are available in two types, 652A is an ABC power plant delivering up to 180 volts B, 40 volts for C, for any receiver, and 1.5, 2.5 and 5 volts for A power for A.C. tube sets. It is $36.50, ready to assemble. Type 652 unit, a B supply only of 180 volts output is $34.50. Both use the ballast or glow tube voltage regulator tube insuring no "motor-boating," "putting" or "humming."

S-M PLUG-IN COILS

No matter what circuit you build, there's a standard S-M plug-in coil for your needs. S-M coils are low loss, accurate to ¼ or one percent, and rugged and efficient. Different sizes tune from 30 to 3000 meters; for short wave tuners, one tube sets, tuned R.F. circuits, supers, or what have you? Broadcast and short wave coils are $2.50 each, and the interchangeable plug-in socket, type 515, $1.00.

Plug-In Inductances

THE NEW TRANSFORMERS

Three new S-M transformers are ready. One is the new super-power 328 unit, with two 550 volt secondaries, two 7.5 volt secondaries and one 1.5 volt winding, in addition to a 105-120 volt, 60 cycle primary. For single or full-wave power supplies, it costs but $18.00 (331 Unichoke at $8.00 is a single unit selective brute-force filter choke for all powers up to 125 M.A. and for use with 328 transformer). The new small type audios (selected by Hugo Gernsback for the Peridyne, by L. M. Cockaday for the LC-28 amplifier and approved by Glen Browning for the two tube Browning Drake amplifier) contain more steel and copper than any other transformers you can buy except S-M 220, and performs on a par with the 220 from 100 to 5000 cycles. The new compact 240 audio is but $6.00—241 output $5.00—the best values ever offered by any manufacturer.

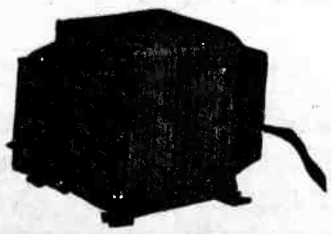
440 JEWELERS' TIME AMPLIFIER

The 440 Time Signal Amplifier is tremendously popular already. The Waltham Watch Company uses one for controlling their master clock, as do many jewelers and observers. Thousands have been sold, for its the best long wave amplifier ever develoned. Three stages and a detector, shielded and tuned exactly to 112 K.C., provide tremendous sensitivity and selectivity. Price, laboratory calibrated, sealed in a copper and brass catacomb, $35.00.

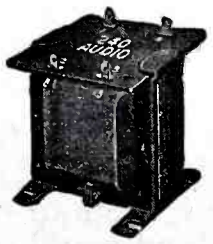
We can't tell you here about all the new S-M developments, but if you'll send us 10c postage we'll send you more information on complete light socket operation, super audio amplification and other pertinent subjects than you can read in a week.

SILVER-MARSHALL, INC.

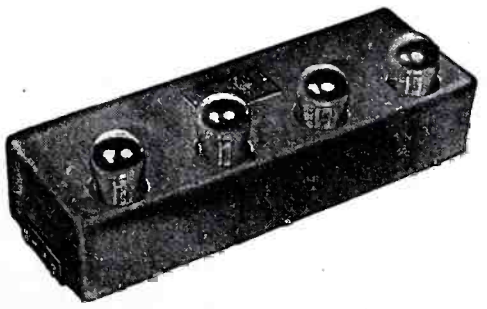
866 WEST JACKSON BLVD. CHICAGO, U. S. A.



328 Super Power Transformer



The New 240 Audio and 241 Output Transformer



440 Jewelers' Time Amplifier

SILVER-MARSHALL, Inc.,
866 W. Jackson Blvd., Chicago.

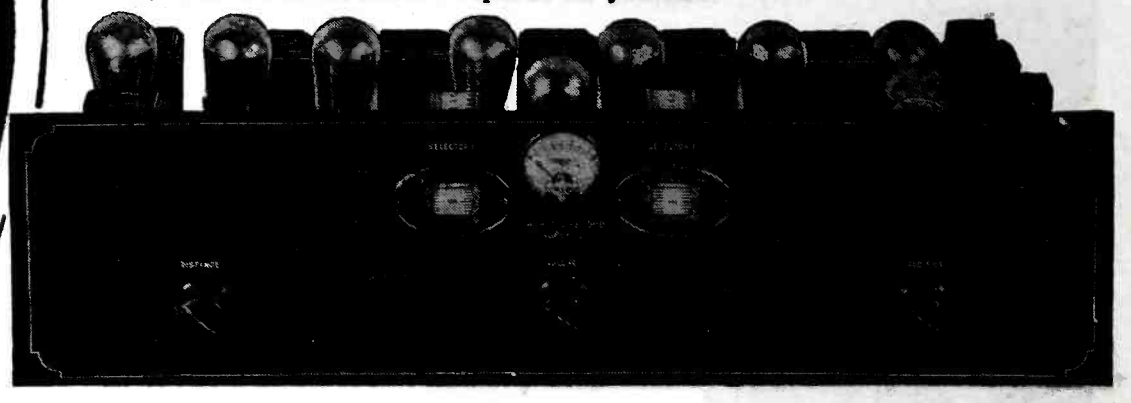
Please send me full information on the new S-M developments for which I enclose 10c.

Name .....

Address .....

Build Radio's New

Mr. E. H. Scott, himself, will tell you how he designed the original DX receiver, with which he made the four World's Records described on the opposite page—how that set has been duplicated hundreds of times, each one performing as well as the original—how later developments and refinements have enabled him to improve on the original in the New World's Record Super 10—and how you can, even without any previous experience, build a World's Record Super 10 for yourself.



DISTANCE—Here is the receiver for the man who wants the most powerful and sensitive set it is possible to build. Many claim to have received far distant stations once or twice, but Mr. Scott with his World's Record Super proved his claims to record honors by bringing in consistently, night after night, stations distant six thousand miles or more. The new World's Record Super 10, in actual comparative tests with the original receiver on which the records were made, has proved that it is even more powerful and brings in the far distant stations with almost unbelievable volume.

No other receiver has approached the marvelous DX records that the World's Record Super has established, and it is safe to say none will for years to come.

REMARKABLE SELECTIVITY—Here is a receiver for today's conditions. In Chicago, where there are about forty broadcasting stations, the New World's Record Super 10 cuts through with the greatest of ease. It brings in distant stations only a few meters apart with such volume that you think you have a local station until you hear the call letters and find you are listening to a station hundreds of miles away.

NATURAL TONE QUALITY—A receiver may have great DX ability and wonderful selectivity, but what good is it if the tone is raspy or distorted? When you hear the New World's Record Super 10, you will realize that here at last is a receiver that it is a pleasure to listen to.

EASY TO BUILD—With the parts here listed, any one can build an exact duplicate of the New World's Record Super 10. The only tools required are a screw driver, pliers, and soldering iron. The building instructions and full size blue prints show exactly where to place each part and how to run every connection, and are so simple and easy to follow that any one, even without previous experience in building a radio receiver, can duplicate this marvelous receiver and own the finest radio set available today.

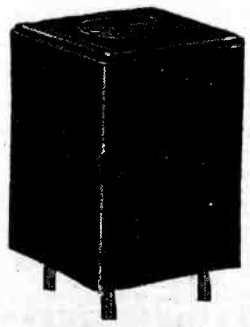
— LIST OF PARTS —

1	Formica panel drilled and engraved 26x7x3/16	$ 6.70	
1	Formica sub panel drilled 25x10x3/16	7.00	
1	Remler 3-in-line condenser No. 633 00035	15.00	
1	Remler condenser No. 638 00035	5.00	
2	Remler drum dials No. 110	9.00	
2	Remler R. F. choke coils No. 35	1.80	
2	Thordarson audio transformers R200	16.00	
1	Thordarson output transformer No. 76	6.00	
2	Selectone L. W. transformers No. B500	12.00	
2	Selectone L. W. transformers No. B510	12.00	
2	Selectone R. F. transformers No. 520	10.00	
1	Selectone Antenna coupler No. 530	5.00	
1	Selectone Oscillator coupler No. 540	5.00	
10	Benjamin sockets No. 9044	5.00	
1	pr. Benjamin brackets No. 8629	.75	
1	Carter Imp. rheostat 1R-15S ohms	1.50	
1	S. M. balancing condenser No. 340	1.50	
1	Carter power rheostat MW-1 ohm	.75	
1	Carter Imp. pot. 1R-400 ohms	1.25	
1	Carter fixed condenser 00025 with grid clips	.50	
1	Carter fixed condenser 002	.50	
1	pr. No. 10 Carter pin jacks	.20	
1	Jewel Voltmeter 0.8v Pat. 135	7.00	
4	Tobe Bypass condensers 1 Mfd	3.60	
1	Tobe grid leak	.50	
1	Jones 10 contact multi-plug and 4 ft. cable type BM	3.50	
40	Kellog soldering lugs	.25	
30	ft. rubber covered hook-up wire	.50	

Here's your chance to build a radio set that will give you all that radio has to give—distance, selectivity, clear and natural tone. Experience is not required, for full instructions will be sent you by Mr. Scott himself. Don't hesitate—don't delay. Send *now* for full details. Then you can't forget it, and you'll never regret it.

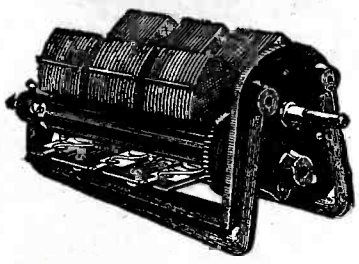
Greatest "DX" Receiver

World's Record Super 10

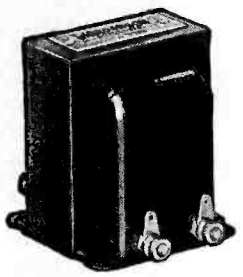


Selectone Transformers cut through the local stations with ease, and their tremendous amplification brings in the distant stations with great volume.

They are supplied in perfectly matched sets, insuring maximum amplification and the finest tone quality.

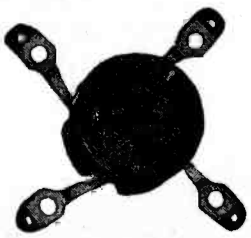


The new Remler Three-in-Line Condenser with the Remler Drum Dial represents the last word in gang condenser construction. Balancing condensers are integral with the main unit, and are easily and quickly adjusted. A special staggered connection of plates makes it self-shielding, preventing interstage coupling. All insulation is of genuine Bakelite.



Thordarson Amplifying Transformers were used in the original World's Record Super, designed by Mr. Scott. Because of the unusual tone quality obtained Thordarson apparatus is again selected. Two Thordarson R-200 Amplifying Transformers and one R-76 Output Transformer are used in this receiver.

If you enjoy good music, insist on Thordarson amplification.



The famous Benjamin Spring Cushioned Shock Absorbing Socket was the choice of Mr. E. H. Scott in his original World's Record Super.

Mr. Scott has paid the very highest tribute to the efficiency of Benjamin Shock Absorbing Sockets by again selecting them for this newest and greatest of radio receivers.

Tobe Condensers. Only the highest grade parts were selected by Mr. Scott for the World's Record Super 10, and the fact that Tobe parts are specified is one more proof of their claim for leadership in the condenser field.

Here Are the Verified Records

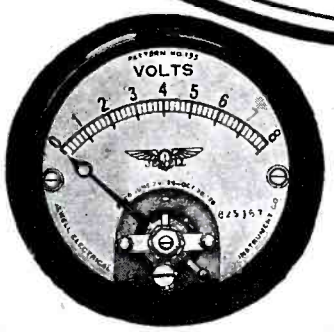
The authenticity of the startling achievements of the World's Record Super (as listed below) is based upon hundreds of verifications by leading Broadcasting Stations and Publications from Coast to Coast.

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

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

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

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



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. A special mounting arrangement makes it easy to mount in a radio panel. It is the ideal instrument for filament control.

Jones Ten Contact Multiplug and 4 ft. Cable enable all batteries to be placed out of sight and simplify wiring. Now used on over one million receivers; endorsed by leading radio engineers.

Half Size

Carter Rheostats are so designed that they are self-cooling and contact arm shaped so that it provides smooth contact with constant pressure at all times, making control of filaments noiseless.

Send Coupon for Full Details

MR. E. H. SCOTT,
7620 Eastlake Terrace,
Chicago, Ill.

Without obligation, please send me details of the World's Records you made with your Super 9, and full instructions for building your NEW World's Record Super 10.

Name.....

Address.....

.....

ENSEMBLE OF ARTISTS
OF THE MOSKOW
THEATRE OF
DECLAMATION
O.V. KOVALEVA
VOCALIST

HARRIET BENNET
OF THE
ROSE MARIE COMPANY
BROADCASTING FROM
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VICTORIA B.C. CANADA

BROADCAST STATION
3LO
EILEEN HARPER
SYD BECK
MELBOURNE

BROADCAST STATION AYRE
STUDIO BUILDING
CARACAS VENEZUELA

VIEW OF BROADCAST STATION
4QG
BRISBANE, AUSTRALIA

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.

The cabinet work is of true Excello quality. Doors of 5-ply butt walnut in 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.

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 bass 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-32

Style R-23

Style R-29

Style R-28

Style R-31 opened 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

EXCELLO PRODUCTS CORPORATION

4821-29 West 16th Street, Cicero, Illinois
(Suburb of Chicago)

BROADCAST STATION WABQ
ROSE CHADWIN
SOPRANO
PHILADELPHIA

BROADCAST STATION WBAL
FITZ SISTERS
BALTIMORE, MARYLAND

BROADCAST STATION WJZ
HORACE PARKER SAMPSON
ANNOUNCER - NEW YORK

BROADCAST STATION WRVA
PAUL SAUNIER - ST. JAMES EPISCOPAL
CHURCH - RICHMOND, VA.

BROADCASTING STATION WTIC
HANFORD S. BILLINGS, MANAGER
HARTFORD, CONN.

BROADCAST STATION WMBB
EDNA CUNNINGHAM, SOPRANO
CHICAGO

BROADCAST STATION WBZA
MAIN STUDIO
BOSTON

Radio Cabinet and Bench

$1.00 down

Only $1.00 with coupon below brings this handsome, massive, pure Period design consolette radio cabinet, with bench to match, to your home on 30 days

FREE Catalog of home furnishings sent with or without order. See coupon.

Free Trial!

Just the thing you need to give your radio the appearance of a costly set and to beautify the room with a touch of elegance. Ample space inside of cabinet for all batteries, chargers and eliminators. Keep all unsightly accessories out of sight in this splendid piece of furniture. Made of well seasoned, selected hardwood in **Handsome Walnut Finish.** Two large, French style swinging doors at front with ornamental brass knobs. Front panels of doors in carved panel effects and legs of both cabinet and bench are neatly turned. Edge of top neatly bevelled. Cabinet has lower cross brace to insure rigidity. Top s 33¾ x 18 inches, height inside 11½ inches. Full height 33 inches. Bench is 18 inches high.

$1.50 a Month

After 30 days trial if not satisfied, send Cabinet and bench back at our expense and we'll refund your $1.00 plus all transportation charges you paid. Or keep them and pay only $1.50 a month till you've paid our smashed cut price for this sale—only **$14.95.** Our credit price beats cash prices anywhere. **Order by No. B182A.** Shpg. wgt. about 70 lbs.

Send Coupon NOW!

Straus & Schram Dept. R3569 Chicago

Straus & Schram, Dept. R3569 Chicago

Enclosed find $1. Ship Walnut Finish Radio Cabinet and Bench. I am to have 30 days free trial. If I keep the cabinet and bench I will pay you $1.50 monthly. If not satisfied, I am to return them at your expense and you are to **refund my money** and any freight or express charges I paid.

Radio Cabinet and Bench No. B182A, $14.95

*Name*_____

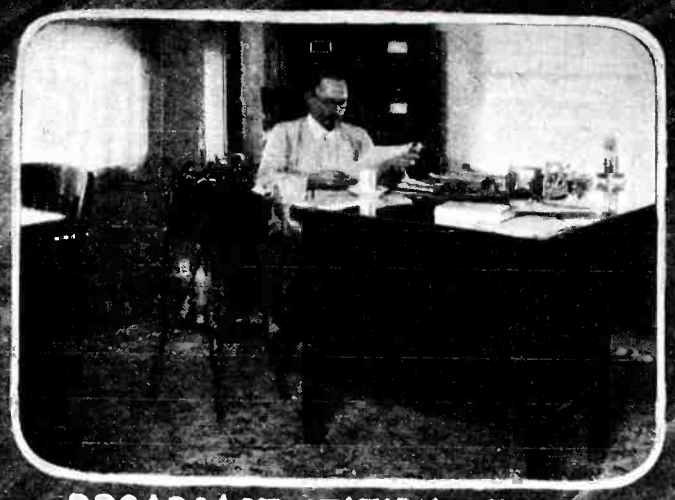
*Street, R.F.D. or Box No.*_____

*Shipping Point*_____

*Post Office*_____ *State*_____

*Married or Single*_____ *Nationality or Color*_____

If you want only our free catalog of home furnishings, mark X here ☐



BROADCAST STATION KFKB
DR. J. R. BRINKLEY-MILFORD, KANS.

BROADCAST STATION KYW
LUCILLE LONG, CONTRALTO
CHICAGO

BROADCAST STATION KYW
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BROADCAST STATION WFIW
MRS. FRED JACKSON - DIRECTOR
HOPKINSVILLE, KY.

BROADCAST STATION KMOX - ST. LOUIS, MO.
OPERATING STAFF AT WORK ON GENERATORS

BROADCAST STATION WOK - CHICAGO
GEO. W. ALLEN, ANNOUNCER-DIRECTOR

Balkite has pioneered—
but not at public expense

Licensed under Andrews-Hammond patent

Balkite "A" *Contains no battery.* The same as Balkite "AB" but for the "A" circuit only. Not a battery and charger but a perfected light socket "A" power supply. One of the most remarkable developments in the entire radio field. Price $35.00.

Balkite "B" *One of the longest lived devices in radio.* The accepted tried and proved light socket "B" power supply. The first Balkite "B," after 5 years, is still rendering satisfactory service. Over 300,000 in use. Three models: "B"-W, 67-90 volts, $22.50; "B"-135*, 135 volts, $35.00; "B"-180, 180 volts, $42.50. Balkite now costs no more than the ordinary "B" eliminator.

Balkite Chargers

Standard for "A" batteries. Noiseless. Can be used during reception. Prices drastically reduced. Model "J,"* rates 2.5 and .5 amperes, for both rapid and trickle charging, $17.50. Model "N"* Trickle Charger, rate .5 and .8 amperes, $9.50. Model "K" Trickle Charger, $7.50.

**Special models for 25-40 cycles at slightly higher prices*

Prices are higher West of the Rockies and in Canada

The great improvements in radio power have been made by Balkite First noiseless battery charging. Then successful light socket "B" power. Then trickle charging. And today, most important of all, Balkite "AB," a complete unit containing no battery in any form, supplying both "A" and "B" power directly from the light socket, operating only while the set is in use.

This pioneering has been important. Yet alone it would never have made Balkite one of the best known names in radio. Balkite is today the established leader because of Balkite performance at the hands of its owners.

Because with 2,000,000 units in the field Balkite has a record of long life and freedom from trouble seldom equalled in any industry.

Because of the first 16 light socket "B" power supplies put on the market, Balkite "B" alone remains in its original form; all others have either been radically revised in principle or completely withdrawn.

Because the first Balkite "B," purchased 5 years ago, is still in use and will be for years to come.

Because to your radio dealer Balkite is a synonym for quality.

Because the electrolytic rectification developed and used by Balkite is so reliable that today it is standard on the signal systems of most American as well as European and Oriental railroads.

Because Balkite is permanent equipment. Balkite has pioneered—but not at the expense of the public.

Today, whatever type of set you own, whatever type of power equipment you want (with batteries or without), whatever you want to pay for it, Balkite has it. And production is so enormous that prices are astonishingly low.

Your dealer will recommend the Balkite equipment you need for your set.

Balkite "AB" *Contains no battery.* A complete unit, replacing both "A" and "B" batteries and supplying radio current directly from the light socket. Contains no battery in any form. Operates only while the set is in use. Two models: "AB" 6-135,* 135 volts "B" current, $64.50; "AB" 6-180, 180 volts, $74.50.

FANSTEEL PRODUCTS COMPANY, INC., NORTH CHICAGO, ILLINOIS

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FANSTEEL

Balkite
Radio Power Units

30 Days FREE TRIAL

5-6-7 Tube Sets $47.00 to $72.00 RETAIL PRICES

The Last Word in Guaranteed Radio Sets and the Biggest Values Ever Offered

Westgale Radio Sets

NOW!—you can get the finest quality Radio, DIRECT FROM FACTORY on 30 Days Trial and save almost half. Now you can put any of the new 1928 WESTGALE models in your home and use them to your heart's content for 30 Days at our risk. Listen to the music, concerts, news, sports, market reports from all over the country. Test the Westgale Radio for distance, selectivity and REAL Tone value. Compare it for quality and price with any other Radio. Then if not convinced that Westgale gives you the biggest value for the money—YOU DON'T HAVE TO KEEP IT.

Why Not Be Our Agent?

Buy at cost. We want Agents and Dealers in every locality to demonstrate and take orders for these amazing new 1928 Westgale Models. This is your chance to get a Westgale Radio at a big discount and make it pay you big money. Millions of radios will be sold this season. Get a Westgale set on 30 Days Trial—demonstrate to your neighbors and friends and get your share of these big radio profits.

Your Own RADIO Free

Our new Catalog also explains a plan whereby you can put a Westgale Radio in your home on 30 Days Trial—demonstrate it to your neighbors and friends in your spare time and get your own set without cost before the trial period is up.

6 Tubes—1 Dial
Only
$87.00
Retail Price Including Speaker

Special Discounts to Agents

To quickly introduce these wonderful new 1928 models we are offering for a limited time a big reduction, 'way below retail prices, on the FIRST Westgale set placed in each community. So get busy now! Be first in your locality to mail the coupon for our FREE catalog and get full particulars of this special discount offer.

Westgale Electric Company
Dept. 3312
1751 Belmont Ave., CHICAGO, Ill.

Westgale Sets Are Licensed Under R.C.A. and Associated Companies Patents

For the 4th consecutive year Westgale offers you the newest and latest in Radio at lowest prices. Our 1928 models are licensed under the basic patents of the Radio Corporation of America and Associated Companies. That assures you dependable service. Beware of an un-licensed Radio. Why not have the best? Why pay high prices? Why take chances when you can test out any Westgale model in your own home on 30 Days Trial. Our retail prices are low factory prices. Our Agent's prices are lower. Send for our new 1928 catalog and see for yourself.

24 Models to Choose from Table Styles—Consoles—De Luxe Cabinets

This season Westgale offers you 5 tube—6 tube—and 7 tube models in your choice of a beautiful array of table styles, consoles and period type walnut cabinets. Don't buy any radio until you send the coupon for our new catalog which pictures and describes our complete line in almost any size or style you could wish for. Don't wait,—a special introductory discount from retail prices for those who write quick. Mail the coupon today—get posted before you buy.

Mail Today - Don't Delay

WESTGALE ELECTRIC CO.,
Dept. 3312 1751 Belmont Ave.,
CHICAGO, ILL.

Please send me your FREE catalog on the new 1928 Westgale Radio Sets. Also full particulars of your Special Discount Offer on the first outfit placed in each community.

Name.....

Address.....

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WALTER JOHNSON
CHIEF ANNOUNCER
HARTFORD, CONN.

BROADCAST STATION KMOX
GRACE McGAWAN-OFFICE MANAGER
ST. LOUIS, MO.

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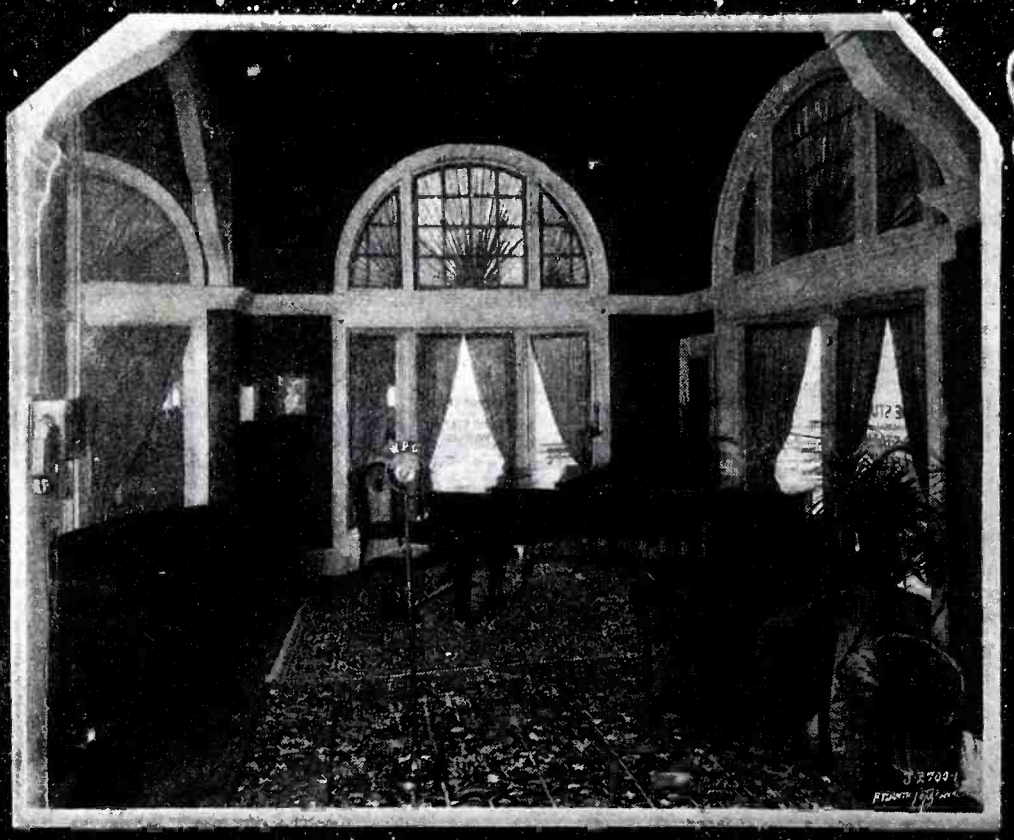
"THE SOLEMN OLD JUDGE"
NASHVILLE, TENN.

BROADCAST STATION WJAX
JACKSONVILLE LITTLE SYMPHONY ORCHESTRA
JACKSONVILLE, FLA.



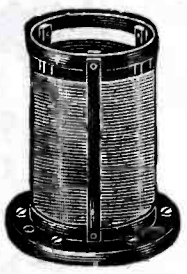
WPG BROADCAST STATION'S SUMMER HEADQUARTERS
ATLANTIC CITY, N.J.

BROADCAST STATION-WRNY-N.Y.
MELBA ALTER "DREAM GIRL"

You Need These New and Improved

AERO COIL

SUPER-SENSITIVE
INDUCTANCE UNITS



The Improved AERO Universal Coil

At last—a true universal coil. This improved coil is suitable for any straight tuned radio frequency circuit, both bridge and loss balance. It is easily and ideally adaptable to 3, 4, 5, 6 or 7 tube sets and can be used with all types of tubes—201-A, 199, 112, and the new 240 tubes and A.C. tubes.

Sharp selectivity, true tone quality, distance and volume, to a heretofore unknown degree, are assured where these coils are used. For that reason the improved Aero 6, Aero 7, Aero 4, and other circuits built around these coils will be more popular than ever during the coming season.

New AERO Kits Employing the Improved AERO Universal Coil

The AERO Universal Tuned Radio Frequency Kit

Kit of 4 Coils (For Improved Aero-Dyne 6)

Code No. U-16

Kit consists of 4 twice matched units—adaptable to all standard 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)

Code No. U-12

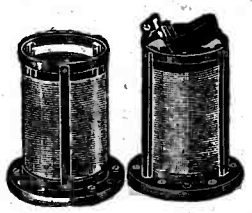
Consists of 3 twice matched units. Coils are wound on Bakelite skeleton forms, assuring a 95% air di-electric. Range from below 200 to above 550 meters. Each kit carefully matched at both ends of the broadcast range.

For .0005 Condenser, Code No. U-12.....Price $12.00
For .00035 Condenser, Code No. U-123.....Price $12.00

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. Use 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 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 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 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, Aero Transmitter, 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. 111
1772 Wilson Avenue Chicago, Ill.

FACTORY PRICES~SAVE 50%
Choice of beautiful cabinets offered

3 Year Guarantee

TRY IT 30 DAYS FREE
BEFORE YOU BUY

ALL METAL SHIELDED CHASSIS

Only $69.75
Retail List Completely Assembled

8 tube ~ one dial MIRACO

TRADE MARK REGISTERED

MAGNIFICENT TONE~SUPER SELECTIVE~POWERFUL DISTANCE GETTER

All Electric or Battery Set!

America's big, old, reliable Radio Corporation* (8th successful year) **guarantees** in its big, powerful, latest 6, 7 and 8 tube Miraco sets "the finest, most enjoyable performance obtainable in **high grade** radios." Unless 30 days' use in your home fully satisfies you a Miraco is unbeatable at any price for beautiful, clear cathedral tone, razor-edge selectivity, powerful distance reception, easy operation, etc.—**don't buy it! Your verdict final.** Save or make lots of money on sets and equipment—write for testimony of nearby users and **Amazing Special Factory Offer.**

Miraco's work equally fine on "AC" electric house current or with batteries. Take your choice. Many thousands of Miraco users—who bought after thorough comparisons—enjoy programs Coast to Coast, Canada to Mexico, loud and clear—with the magnificent cathedral tone quality of costliest sets. Don't confuse Miraco's with cheap, "squawky" radios. Miraco's have finest parts, latest approved shielding, metal chassis, etc.—as used in many $200 sets.

Deal Direct with Big Factory

Your Miraco reaches you completely assembled, rigidly tested, fully guaranteed. Easy to connect and operate. **30 days' trial free.** 3 year guarantee if you buy. You take no risk, you insure satisfaction, you enjoy **rock-bottom money-saving prices** by dealing direct with one of radio's oldest, most successful builders of fine sets. 8th successful year in the radio manufacturing business.

MIRACO Users Say:

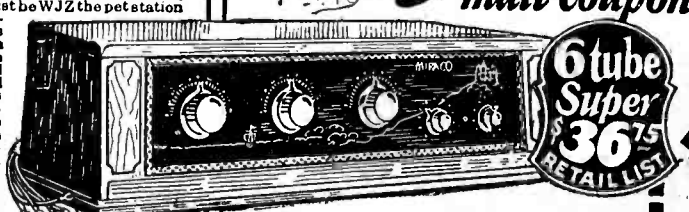
Reports from users everywhere leave little for us to add. These are only a few of the many in our files and which we receive daily. Send coupon for plenty of additional proof and testimony of nearby users.

CLEARER THAN A $450.00 SET
Before I bought your set I tried out and heard quite a number of different makes sets and I believe I can truthfully say that I never yet have heard a set with such wonderful tone and clearness as the Miraco. I never thought that a set could be as clear and reproduce tones and voices as the Miraco. Saturday I listened to a $450.00 set and it can't even come near your set for clearness and volume. I have logged some very distant stations on the Unitune and although people won't hardly believe me, the first week I had KFI Los Angeles on two nights in succession on a 30-ft. temporary inside aerial.—FRANK A. OLDENBURG, Milwaukee, Wis.

SHARPLY SEPARATES STATIONS
The Unitune brings in stations very clearly and with a selectivity that is amazing when you take in consideration the mass of stations on the air at the same time. I have heard three and four stations that were on almost same wavelengths at the same time and was able to tune out one after the other without the least interference.—W. L. BROBACK, San Francisco, Calif.

EXPERIENCED FAN PRAISES SET
Miraco is the most wonderful radio I have ever seen. I have had experience with many popular makes of radios, also have built a number of them myself but in tone quality it is far superior to all. For sensitiveness I can say it is more like a superhetrodyne.—R. D. WHITE, Proctor, W. Va.

HAS POWER TO SPARE
"Well Pleased" with Miraco would be putting it mildly. Haven't heard anything to equal it regardless of price. With temporary aerial tuned in WEAF then WIOD Florida felt sure this must be WJZ the pet station of this locality. Stations all coming in clear with wonderful tone and tremendous volume. Seldom have more than half of volume turned on. A local agent insisted he could prove his set superior but to his surprise and astonishment my family and neighbors and the agent himself admitted his $165 set had to step out of the way for Miraco—H. W. HOEPFL, Perkiomensville, Pa.



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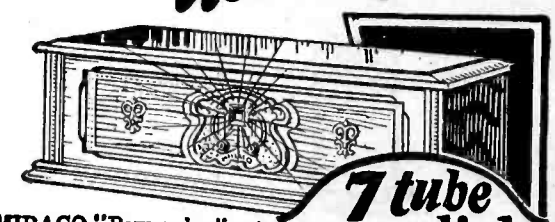

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RADIO LISTENERS' GUIDE and CALL BOOK

A Quarterly Magazine

Sidney Gernsback, Editor — *W. G. Many, Managing Editor*

RADIO BROADCAST STATIONS OF THE UNITED STATES

Indexed Alphabetically by Call Letters

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KD	**KDKA—East Pittsburgh, Pa.**—Westinghouse Elec. & Mfg. Co.	50000	315.6	950	Eastern
	KDLR—Devils Lake, N. D.—Radio Elec. Co.	15	230.6	1300	Central
	KDYL—Salt Lake City, Utah—Intermountain Broadcasting Corp., 1009 Ezra Thompson Bldg.	100	258.5	1160	Mountain
KE	**KELW—Burbank, Calif.**—E. L. White, 3702 Magnolia Ave. (Divides time with KPPC) (1000 watts Daytime)	500	228.9	1310	Pacific
	KEX—Portland, Ore.—Western Broadcasting Co.	2500	239.9	1250	Pacific
KF	**KFAB—Lincoln, Nebr.**—Nebraska Buick Auto Co. (5000 watts before 7 P. M.)	2000	309.1	970	Central
	KFAD—Phoenix, Ariz.—Electrical Equipment Co.	500	272.6	1100	Mountain
	KFAU—Boise, Idaho—Independent School, District of Boise (4000 watts Daytime)	2000	285.5	1050	Mountain
	KFBB—Havre, Mont.—F. A. Buttrey Co.	50	275.1	1090	Mountain
	KFBC—San Diego, Calif.—W. K. Azbill and Dr. A. W. Yale, 5038 Cliff Place	100	247.8	1210	Pacific
	KFBK—Sacramento, Calif.—Kimball Upson Co., 610 California St.	100	535.4	560	Pacific
	KFBL—Everett, Wash.—Leese Bros., 2814 Rucker Ave.	100	223.7	1340	Pacific
	KFBU—Laramie, Wyo.—St. Mathews Cathedral, Bishop N. S. Thomas	500	428.3	700	Mountain
	KFCB—Phoenix, Ariz.—Nielsen Radio & Sporting Goods Co., Central Ave. at Pierce	125	243.8	1230	Mountain
	KFCR—Santa Barbara, Calif.—Santa Barbara Broadcasting Co., 1200 Anacapa St.	50	211.1	1420	Pacific
	KFDM—Beaumont, Tex.—Magnolia Petroleum Co.	500	483.6	620	Central
	KFDX—Shreveport, La.—First Baptist Church	250	236.1	1270	Central
	KFDY—Brookings, S. D.—South Dakota State College (Divides time with KMA)	500	394.5	760	Central
	KFDZ—Minneapolis, Minn.—H. O. Iverson, 2510 Thomas Ave., So.	10	215.7	1390	Central
	KFEC—Portland, Ore.—Meier & Frank Co. (Divides time with KFIF)	50	214.2	1400	Pacific
	KFEL—Denver, Colo.—Eugene P. O'Fallon, Argonaut Hotel	250	247.8	1210	Mountain
	KFEQ—St. Joseph, Mo.—Scroggin & Co. Bank, Hotel Robidoux (2000 watts Daytime)	1000	230.6	1300	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KF	**KFEY—Kellogg, Idaho**—Bunker Hill & Sullivan Mining & Concentrating Co., 834 McKinley Ave.	10	232.4	1290	Pacific
	KFGQ—Boone, Iowa—Boone Biblical College, 924 W. Second St.	10	209.7	1430	Central
	KFH—Wichita, Kans.—Rigby-Gray Hotel Co., Hotel Lassen, First and Market Sts.	500	245.8	1220	Central
	KFHA—Gunnison, Colo.—Western State College of Colorado.	50	254.1	1180	Mountain
	KFHL—Oskaloosa, Iowa—Penn College.	10	212.6	1410	Central
	KFI—Los Angeles, Calif.—Earle C. Anthony, Inc., 1000 So. Hope St.	5000	468.5	640	Pacific
	KFIF—Portland, Ore.—Benson Polytechnic School (Divides time with KFEC)	50	214.2	1400	Pacific
	KFIO—Spokane, Wash.—North Central High School (Divides time with KFPY)	100	245.8	1220	Pacific
	KFIZ—Fond du Lac, Wis.—Fond du Lac Commonwealth Reporter, 22 Forest Avenue	100	267.7	1120	Central
	KFJB—Marshalltown, Iowa—Marshalltown Elec. Co., 1603 W. Main St.	100	247.8	1210	Central
	KFJF—Oklahoma City, Okla.—National Radio Mfg. Co., Security Bldg. (1000 watts Daytime)	750	272.6	1100	Central
	KFJI—Astoria, Ore.—Liberty Theatre (E. E. Marsh), (Divides time with KMED)	15	249.9	1200	Pacific
	KFJM—Grand Forks, N. Dak.—University of N. D.	100	333.1	900	Central
	KFJR—Portland, Ore.—Ashley C. Dixon & Son, Fifth and Stark, Lumbermen's Building	100	282.8	1060	Pacific
	KFJY—Fort Dodge, Iowa—Tunwall Radio Co., 1004 Central (Divides time with KFMR) (Proposed change by Radio Commission to 1290 k.c.)	100	440.9	680	Central
	KFJZ—Fort Worth, Tex.—W. E. Branch, 3rd and Main Sts.	50	249.9	1200	Central
	KFKA—Greeley, Colo.—Colorado State Teachers College (Proposed change by Radio Commission to 550 k.c.)	200	399.8	750	Mountain
	KFKB—Milford, Kans.—J. R. Brinkley, M. D. (2500 watts Daytime)	1500	241.8	1240	Central
	KFKU—Lawrence, Kans.—University of Kansas (Divides time with WREN)	500	254.1	1180	Central
	KFKX—Chicago, Ill.—Westinghouse Elec. & Mfg. Co. (Divides time with KYW)	2500	526	570	Central
	KFKZ—Kirksville, Mo.—State Teachers College.	15	225.4	1330	Central
	KFLV—Rockford, Ill.—Swedish Evangelical Mission Church	100	267.7	1120	Central
	KFLX—Galveston, Tex.—Geo. R. Clough, 3327 Ave. P.	100	270.1	1110	Central
	KFMR—Sioux City, Iowa—Morningside College (Divides time with KFJY)	100	440.9	680	Central
	KFMX—Northfield, Minn.—Carleton College (Divides time with WCAL)	500	236.1	1270	Central
	KFNF—Shenandoah, Iowa.—Henry Field Seed & Nursery Co.	2000	461.3	650	Central
	KFOA—Seattle, Wash.—Rhodes Dept. Store	1000	447.5	670	Pacific
	KFON—Long Beach, Calif.—Nichols & Warinner, Inc., Jergins Trust Bldg.	500	241.8	1240	Pacific
	KFOR—Lincoln, Nebr.—Howard A. Shuman.	100	217.3	1380	Central
	KFOX—Omaha, Nebr.—Board of Education, Technical High School (Divides time with KOCH, WNAL)	100	258.5	1160	Central

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KF	**KFOY—St. Paul, Minn.**—Beacon Radio Service, 376 Robert St.	250	285.5	1050	Central
	KFPL—Dublin, Tex.—C. C. Baxter, 205 Grafton St.	15	275.1	1090	Central
	KFPM—Greenville, Tex.—The New Furniture Co.	15	230.6	1300	Central
	KFPR—Los Angeles, Calif.—Los Angeles County Forestry Dept. (Divides time with KFQZ)	250	232.4	1290	Pacific
	KFPW—Carterville, Mo.—St. Johns M. E. Church, 120 W. Main St.	50	263	1140	Central
	KFPY—Spokane, Wash.—Symons Investment Co. (Divides time with KFIO)	250	245.8	1220	Pacific
	KFQA—St. Louis, Mo.—The Principia, 5539 Page Ave. (Divides time with WMAY)	50	247.9	1210	Central
	KFQB—Fort Worth, Tex.—Lone Star Broadcast Co., 205 Worth Bldg. (Proposed change by Radio Commission to 900 k.c.)	1000	325.9	920	Central
	KFQU—Alma (Holy City), Cal.—W. E. Riker	100	249.9	1200	Pacific
	KFQW—Seattle, Wash.—KFQW, Inc., Continental Hotel	100	217.3	1380	Pacific
	KFQZ—Hollywood, Calif.—Taft Radio & Broadcasting Co., Inc., 1641 N. Argyle (Divides time with KFPR)	100	232.4	1290	Pacific
	KFRC—San Francisco, Calif.—Don Lee, Inc.	1000	454.3	660	Pacific
	KFRU—Columbia, Mo.—Stephens College, Administration Bldg.	500	249.9	1200	Central
	KFSD—San Diego, Calif.—Airfan Radio Corp., U. S. Grant Hotel	500	440.9	680	Pacific
	KFSG—Los Angeles, Calif.—Echo Park Evangelistic Association, Angelus Temple	500	275.1	1090	Pacific
	KFUL—Galveston Tex.—Thos. Groggan and Bros. Music Co., 2126 Market St.	500	258.5	1160	Central
	KFUM—Colorado Springs, Colo.—Corley Mountain Highway, Mining Exchange Bldg. (Proposed change by Radio Commission to 1060 k.c.—1000 watts)	100	236.1	1270	Mountain
	KFUO—St. Louis, Mo.—Lutheran Church of the Missouri Synod, Concordia Theological Seminary (Divides time with KFVE)	1500	234.2	1280	Central
	KFUP—Denver, Colo.—Fitzsimons General Hospital, Red Cross Bldg., Educational & Recreational Dept., U. S. Army	100	227.1	1320	Mountain
	KFUR—Ogden, Utah—Peery Building Co., 420—25 St.	50	225.4	1330	Pacific
	KFUS—Oakland, Calif.—Louis L. Sherman, 529—28 St. (Divides time with KRE)	50	256.3	1170	Pacific
	KFUT—Salt Lake City, Utah—University of Utah	50	499.7	600	Mountain
	KFVD—Venice, Calif.—McWhinnie Elec. Co, 1825 So. Pacific Ave. (Divides time with KGFJ)	250	208.2	1440	Pacific
	KFVE—St. Louis, Mo.—Greater St. Louis Broadcasting Corp., Hotel Chase (2000 watts Daytime) (Divides time with KFUO)	1000	234.2	1280	Central
	KFVG—Independence, Kans.—First Methodist Episcopal Church	50	225.4	1330	Central
	KFVI—Houston, Tex.—Headquarters Troop 56th Cavalry	50	238	1260	Central
	KFVN—Fairmont, Minn.—Carl E. Bagley	100	228.9	1310	Central
	KFVS—Cape Girardeau, Mo.—Hirsch Battery & Radio Co., 312 S. Frederick St.	50	223.7	1340	Central
	KFWB—Los Angeles, Calif.—Warner Bros. Pictures, Inc., 5842 Sunset Blvd	500	361.2	830	Pacific
	KFWC—San Bernardino, Calif.—L. E. Wall	100	222.1	1350	Pacific
	KFWF—St. Louis, Mo.—St. Louis Truth Center, 4030 Lindell Blvd.	250	214.2	1400	Central
	KFWH—Eureka, Calif.—F. Wellington Morse, Jr., Hotel Vance	100	254.1	1180	Pacific

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KF	**KFWI—San Francisco, Calif.** (Transmitter in So. San Francisco)—Radio Entertainments, Inc., 1400 Van Ness Ave.	500	267.7	1120	Pacific
	KFWM—Oakland, Calif.—Oakland Educational Society, 1520—8 Ave., (1000 watts Daytime)	500	236.1	1270	Pacific
	KFWO—Avalon, Catalina Island, Calif.—Major Lawrence Mott, Signal Corps, U. S. Army	250	299.8	1000	Pacific
	KFXD—Jerome, Idaho—The Service Radio Co., Main St.	15	204	1470	Mountain
	KFXF—Denver, Colo.—Pikes Peak Broadcasting Co., Brown Palace Hotel	500	282.8	1060	Mountain
	KFXJ—Edgewater, Colo.—R. G. Howell	15	215.7	1390	Mountain
	KFXR—Oklahoma City, Okla.—Exchange Ave. Baptist Church	50	223.7	1340	Central
	KFXY—Flagstaff, Ariz.—Mary M. Costigan, Orpheum Theatre	25	205.4	1460	Mountain
	KFYO—Breckenridge, Tex.—Kirpsey Bros. Battery & Elec. Co.	15	211.1	1420	Central
	KFYR—Bismarck, N. D.—Hoskins Meyer, Inc., 200 4th St. (500 watts Daytime)	250	249.9	1200	Central
KG	**KGA—Spokane, Wash.**—Northwest Radio Service Co., 325 E. Rowan Ave.	2000	260.7	1150	Pacific
	KGAR—Tucson, Ariz.—Tucson Citizen, 80 So. Stone Ave.	100	234.2	1280	Mountain
	KGBS—Seattle, Wash.—A. C. Dailey, 844 E. 58 St.	100	202.6	1480	Pacific
	KGBX—St. Joseph, Mo.—Foster-Hall Tire Co., 1221 Fred Ave.	100	288.3	1040	Central
	KGBY—Shelby, Nebr.—(Transmitter in Columbus)—Dunning & Taddiken	50	202.6	1480	Central
	KGBZ—York, Nebr.—Federal Live Stock Remedy Co., 303 West 5th St.	100	212.6	1410	Central
	KGCA—Decorah, Iowa—Chas. W. Greenley (Divides time with KWLC)	10	247.8	1210	Central
	KGCB—Oklahoma City, Okla.—Wallace Radio Inst., 105 W. 13 St. (Divides time with KGFG)	50	215.7	1390	Central
	KGCH—Wayne, Nebr.—Wayne Hospital	250	293.9	1020	Central
	KGCI—San Antonio, Tex.—Liberto Radio Sales, 409 So. Flores St. (Divides time with KGRC)	15	220.4	1360	Central
	KGCL—Seattle, Wash.—Louis Wasmer and Archie Taft, 1107—2nd Ave. (Divides time with KPCB)	50	230.6	1300	Pacific
	KGCN—Concordia, Kans.—Concordia Broadcasting Co., 1117 So. Hill St.	50	208.2	1440	Central
	KGCR—Brookings, S. D.—Cutler's Radio Broadcasting Service, Inc., 415 Main St.	15	208.2	1440	Central
	KGCU—Mandan, N. D.—Mandan Radio Assoc., 320 Main St.	100	239.9	1250	Mountain
	KGCX—Vida, Mont.—First State Bank of Vida	10	243.8	1230	Mountain
	KGDA—Dell Rapids, S. D.—Home Auto Co. (Daytime only)	15	254.1	1180	Central
	KGDE—Barrett, Minn.—Jaren Drug Co	50	205.4	1460	Central
	KGDJ—Cresco, Iowa—R. Rathert, 316—5th Ave.	10	202.6	1480	Central
	KGDM—Stockton, Calif.—Victor G. Koping and E. F. Peffer, 42 S. California St.	10	217.3	1380	Pacific
	KGDR—San Antonio, Tex.—Joe B. McShane	15	202.6	1480	Central
	KGDW—Humboldt, Nebr.—Frank J. Rist	100	206.8	1450	Central
	KGDX—Shreveport, La.—Wm. Erwin Anthony (Divides time with KGGH)	250	212.6	1410	Central
	KGDY—Oldham, S. D.—J. Albert Loesch	15	206.8	1450	Central
	KGEF—Los Angeles, Calif.—Trinity Methodist Church, 1201 So. Flower St.	500	263	1140	Pacific

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KG	**KGEH—Eugene, Ore.**—Eugene Broadcasting Station, 432 W. E. Miner Bldg.	50	201.2	1490	Pacific
	KGEK—Yuma, Colo.—Beehler Elec. Equipment Co., 109 W. Second Ave.	10	263	1140	Mountain
	KGEN—El Centro, Calif.—E. R. Irey and F. M. Bowles, Chamber of Commerce Bldg.	15	225.4	1330	Pacific
	KGEO—Grand Island, Nebr.—Raymond D. Chamberlain, 116 N. Locust St.	100	205.4	1460	Central
	KGEQ—Minneapolis, Minn.—Fred W. Herrmann, 920 Fifth Ave, N.	50	202.6	1480	Central
	KGER—Long Beach, Calif.—C. Merwin Dobyns, 435 Pine Ave. (Divides time with KRLO)	100	215.7	1390	Pacific
	KGES—Central City, Nebr.—Central Radio Elec. Co.	10	204	1470	Central
	KGEU—Lower Lake, Calif.—L. W. Clement	50	227.1	1320	Pacific
	KGEW—Fort Morgan, Colo.—City of Fort Morgan, City Hall Bldg.	10	218.8	1370	Mountain
	KGEY—Denver, Colo.—J. W. Dietz, 1631 California St.	15	201.2	1490	Mountain
	KGEZ—Kalispell, Mont.—Flathead Broadcasting Assoc.	100	205.4	1460	Mountain
	KGFB—Iowa City, Iowa—A. C. Dunckle	10	223.7	1340	Central
	KGFF—Alva, Okla.—Earl E. Hampshire, 718—5th St.	25	205.4	1460	Central
	KGFG—Oklahoma City, Okla.—Full Gospel Church (Divides time with KGCB)	50	215.7	1390	Central
	KGFH—La Crescenta, Calif.—Frederick Robinson, Box 163 (Divides time with KMIC)	250	223.7	1340	Pacific
	KGFI—San Angelo, Tex.—Ragsdale Auto Co., 20 W. Concho Ave.	15	220.4	1360	Central
	KGFJ—Los Angeles, Calif.—Ben S. McGlashan, 2333 W. 21st St. (Divides time with KFVD)	100	208.2	1440	Pacific
	KGFK—Hallock, Minn.—Kittson County Enterprise	50	223.7	1340	Central
	KGFL—Trinidad, Colo. (Transmitter in Paton, N. M.) —Trinidad Broadcasting Co., 219 W. Main St.	50	222.1	1350	Mountain
	KGFM—Yuba City, Calif.—Geo. W. Johnson, 336 Plumas St.	15	211.1	1420	Pacific
	KGFN—Aneta, N. D.—Haraldson & Thingstad.	15	199.9	1500	Central
	KGFO—Terre Haute, Ind.—Brandt Radio Power Co.	100	204	1470	Central
	KGFP—Mitchell, S. D.—Mitchell Broadcast Co., 113 W. 4th Ave.	10	212.6	1410	Central
	KGFW—Ravenna, Nebr.—Otto F. Sothman, 318 Grand Ave. (Proposed change by Radio Commission to 1010 k.c.)	10	299.8	1000	Central
	KGFX—Pierre, S. D.—Dana McNeil, 510 Summit Ave.	200	254.1	1180	Central
	KGGF—Picher, Okla.—Dr. D. L. Connell	100	206.8	1450	Central
	KGGH—Cedar Grove, La.—Bates Radio & Elec. Co.	50	212.6	1410	Central
	KGGM—Inglewood, Calif. (Portable)—Jay Peters	100	204	1470	
	KGO—Oakland, Calif.—General Elec. Co.	5000	384.4	780	Pacific
	KGRC—San Antonio, Tex.—G. Roth & Co., 103 San Pedro Ave. (Divides time with KGCI)	50	220.4	1360	Central
	KGRS—Amarillo, Tex.—Gish Radio Service, 108 E. 8 St.	150	243.8	1230	Central
	KGTT—San Francisco, Calif.—Glad Tidings Temple and Bible Inst.	50	206.8	1450	Pacific
	KGW—Portland, Ore.—The Oregonian Pub. Co., 806 Oregonian Bldg.	1000	491.5	610	Pacific
	KGY—Lacey, Wash.—St. Martins College	50	243.8	1230	Pacific
KH	**KHJ—Los Angeles, Calif.**—The Times Mirror Co. (Proposed change by Radio Commission to 720 k.c.)	500	405.2	740	Pacific
	KHMC—San Benito, Tex.—Harlingen Music Co.	15	236.1	1270	Central
	KHQ—Spokane, Wash.—Louis Wasmer, Davenport Hotel	1000	370.2	810	Pacific

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KI	**KICK—Atlantic, Iowa**—Atlantic Automobile Co. (Proposed change by Radio Commission to 930 k.c.)	100	475.9	630	Central
KJ	**KJBS—San Francisco, Calif.**—Julius Brunton & Sons Co., 1380 Bush St.	50	220.4	1360	Pacific
	KJR—Seattle, Wash.—Northwest Radio Service Co., 614 Terminal Sales Bldg.	2500	348.6	860	Pacific
KK	**KKP—Seattle, Wash.**—City of Seattle, Harbor Dept.	15	265.3	1130	Pacific
KL	**KLCN—Blytheville, Ark.**—Daily Courier News	50	285	1050	Central
	KLDS—Independence, Mo.—Reorganized Church of Jesus Christ of Latter Day Saints	1500	270.1	1110	Central
	KLIT—Portland, Ore.—Lewis I. Thompson, 475—21 St.	10	206.8	1450	Pacific
	KLS—Oakland, Calif.—Warner Bros. Radio Supplies Co., 2201 Telegraph Ave. (Divides time with KZM)	250	245.8	1220	Pacific
	KLX—Oakland, Calif.—The Oakland Tribune	500	508.2	590	Pacific
	KLZ—Denver, Colo.—Reynolds Radio Co., Shirley-Savoy Hotel (Proposed change by Radio Commission to 750 k.c.)	250	267.7	1120	Mountain
KM	**KMA—Shenandoah, Iowa**—May Seed & Nursery Co. (Divides time with KWKH and KFOY)	1000	394.5	760	Central
	KMBC—Kansas City, Mo.—Midland Broadcasting Co.	1500	270.1	1110	Central
	KMED—Medford, Ore.—W. J. Virgin (Divides time with KFJI)	50	249.9	1200	Pacific
	KMIC—Inglewood, Calif.—J. R. Fouch, 219 No. Market St. (Divides time with KGFH)	250	223.7	1340	Pacific
	KMJ—Fresno, Calif.—Fresno Bee	50	365.6	820	Pacific
	KMMJ—Clay Center, Nebr.—M. M. Johnson Co. (Divides time with WCAJ) (Proposed change by Radio Commission to 1050 k.c.)	500	379.5	790	Central
	KMO—Tacoma, Wash.—KMO, Inc., Hotel Winthrop	250	254.1	1180	Pacific
	KMOX—St. Louis, Mo. (Transmitter in Kirkwood)—The Voice of St. Louis, Inc., Mayfair Hotel	5000	299.8	1000	Central
	KMTR—Hollywood, Calif.—KMTR Radio Corp., 1025 N. Highland Ave.	500	526	570	Pacific
KN	**KNRC—Santa Monica, Calif.**—C. B. Juneau	500	374.8	800	Pacific
	KNX—Los Angeles, Calif.—Los Angeles Evening Express, 6116 Hollywood Blvd.	500	336.9	890	Pacific
KO	**KOA—Denver, Colo.**—General Elec. Co., 1370 Krameria St. (10000 watts until 7 P. M.)	5000	325.9	920	Mountain
	KOAC—Corvallis, Ore.—Oregon Agricultural College	500	270.1	1110	Pacific
	KOB—State College, N. Mex.—New Mexico College of Agriculture and Mechanic Arts (Divides time with KWSC and KTW) (7500 watts Daytime)	5000	394.5	760	Mountain
	KOCH—Omaha, Nebr.—Omaha Central High School, 22nd and Dodge (Divides time with WNAL and KFOX)	250	258.5	1160	Central
	KOCW—Chickasha, Okla.—Oklahoma College for Women	250	252	1190	Central
	KOIL—Council Bluffs, Iowa—Mona Motor Oil Co. (4000 watts Daytime)	2000	277.6	1080	Central
	KOIN—Portland, Ore.—(Transmitter in Sylvan)—KOIN, Inc.	1000	319	940	Pacific
	KOLO—Durango, Colo.—Gerald K. Hunter	5	199.9	1500	Mountain
	KOMO—Seattle, Wash.—Fisher s Blend Station, Inc., Metropolitan Center	1000	305.9	980	Pacific
	KOW—Denver, Colo.—Associated Industries, Inc., 1429 Champa St. (Proposed change by Radio Commission to 1210 k.c.)	250	475.9	630	Mountain
	KOWW—Walla Walla, Wash.—Blue Mountain Radios Assoc	500	299.8	1000	Pacific

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KP	KPCB—Seattle, Wash.—Pacific Coast Biscuit Co., Central Bldg. (Divides time with KGCL)	50	230.6	1300	Pacific
	KPJM—Prescott, Ariz.—Frank Wilburn	15	214.2	1400	Mountain
	KPLA—Los Angeles, Calif.—Pacific Development Radio Co.	500	252	1190	Pacific
	KPNP—Muscatine, Iowa—Central Radio Co., East Second St.	100	211.1	1420	Central
	KPO—San Francisco, Calif.—Hale Bros. and the San Francisco Chronicle	1000	422.3	710	Pacific
	KPPC—Pasadena, Calif.—Pasadena Presbyterian Church (Divides time with KELW)	50	228.9	1310	Pacific
	KPRC—Houston, Tex.—Houston Post Dispatch	500	293.9	1020	Central
	KPSN—Pasadena, Calif.—The Star-News	1000	315.6	950	Pacific
KQ	KQV—Pittsburgh, Pa.—Doubleday-Hill Elec. Co., 719 Liberty Ave. (Divides time with WJAS)	500	270.1	1110	Eastern
	KQW—San Jose, Calif.—Fred J. Hart, Sherman Clay & Co. Bldg.	500	296.9	1010	Pacific
KR	KRAC—Shreveport, La.—Caddo Radio Club, Fair Grounds	50	220.4	1360	Central
	KRE—Berkeley, Calif.—First Congregational Church of Berkeley (Divides time with KFUS)	100	256.3	1170	Pacific
	KRLD—Dallas, Tex.—Dallas Radio Labs., 208 N. St. Paul St.	500	461.3	650	Central
	KRLO—Los Angeles, Calif.—Freeman Lang and A. B. Scott, 218 N. Larchmont Blvd. (Divides time with KGER)	250	215.7	1390	Pacific
	KRSC—Seattle, Wash.—Radio Sales Corp., 1202 Fifth Ave.	50	211.1	1420	Pacific
KS	KSAC—Manhattan, Kans.—Kansas State Agricultural College	500	333.1	900	Central
	KSBA—Shreveport, La.—Shreveport Broadcasting Corp.	1000	267.7	1120	Central
	KSCJ—Sioux City, Iowa—Perkins Bros. Co. (Divides time with KWUC) (1000 watts Daytime)	500	243.8	1230	Central
	KSD—St. Louis, Mo.—Pulitzer Pub. Co., 12th and Olive St.	500	545.1	550	Central
	KSEI—Pocatello, Idaho—KSEI Broadcasting Assoc	250	333.1	900	Mountain
	KSL—Salt Lake City, Utah—Radio Service Corp. of Utah, Vermont Bldg.	1000	302.8	990	Mountain
	KSMR—Santa Maria, Calif.—Santa Maria Valley R. R. Co.	100	272.6	1100	Pacific
	KSO—Clairnda, Iowa—Berry Seed Co.	500	227.1	1320	Central
	KSOO—Sioux Falls, S. D.—Sioux Falls Broadcast Assoc., 609 Minnehaha Bldg.	250	209.7	1430	Central
KT	KTAB—Oakland, Calif.—The Associated Broadcasters, 1410 Tenth Ave.	500	280.2	1070	Pacific
	KTAP—San Antonio, Tex.—Robert B. Bridge, Alamo Broadcasting Co., 822 W. Mulberry St.	20	228.9	1310	Central
	KTBI—Los Angeles, Calif.—Bible Institute of Los Angeles, 536 So. Hope St.	500	288.3	1040	Pacific
	KTBR—Portland, Ore.—M. E. Brown, Commodore Hotel (Divides time with KFJR)	50	282.8	1060	Pacific
	KTHS—Hot Springs Nat'l. Park, Ark.—New Arlington Hotel Co.	1000	384.4	780	Central
	KTNT—Muscatine, Iowa—Norman Baker (5000 watts Daytime)	3500	256.3	1170	Central
	KTSA—San Antonio, Tex.—Alamo Broadcasting Co.	2000	265.3	1130	Central
	KTUE—Houston, Tex.—Uhalt Electric Co., 614 Fannin St.	5	212.6	1410	Central
	KTW—Seattle, Wash.—The First Presbyterian Church of Seattle	1000	394.5	760	Pacific

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KU	**KUJ—Seattle, Wash.**—The Puget Sound Radio Broadcasting Co., Inc., 5811—5 Ave., N. E.	10	199.9	1500	Pacific
	KUOA—Fayetteville, Ark.—University of Arkansas.	500	296.9	1010	Central
	KUOM—Missoula, Mont.—State University of Montana (Proposed change by Radio Commission to 650 k.c.)	500	374.8	800	Mountain
	KUSD—Vermillion, S. D.—University of S. Dak.	250	483.6	620	Central
	KUT—Austin, Tex.—University of Texas.	500	232.4	1290	Central
KV	**KVI—Tacoma, Wash.**—Puget Sound Radio Broadcasting Co., Inc., 15 No. Tacoma Ave.	50	234.2	1280	Pacific
	KVOO—Tulsa, Okla.—Southwestern Sales Corp.	1000	348.6	860	Central
	KVOS—Seattle, Wash.—L. L. Jackson and L. Kessler, 1208 Tenth Ave.	50	209.7	1430	Pacific
KW	**KWBS—Portland, Ore.**—Schaeffer Mfg. Co., 226 E. 41 St.	15	199.9	1500	Pacific
	KWCR—Cedar Rapids, Ia.—H. F. Paar, Cedar Rapids Broadcasting Corp., 1444—2nd Ave., E. (Divides time with WJAM) (Proposed change by Radio Commission to 1250 k.c.)	250	352.7	850	Central
	KWG—Stockton, Calif.—Portable Wireless Telephone Co., Commercial & Savings Bank Bldg.	50	344.6	870	Pacific
	KWJJ—Portland, Ore.—Wilbur Jerman, 385 E. 58 St., So.	50	228.9	1310	Pacific
	KWKC—Kansas City, Mo.—Wilson Duncan Broadcasting Studios, Werby Bldg.	100	222.1	1350	Central
	KWKH—Shreveport, La.—W. K. Henderson.	1000	394.5	760	Central
	KWLC—Decorah, Iowa—Luther College.	50	247.8	1210	Central
	KWSC—Pullman, Wash.—State College of Washington, Mechanic Arts Bldg. (Divides time with KTW and KOB)	500	394.5	760	Pacific
	KWTC—Santa Ana, Calif.—Dr. John W. Hancock, 1101 North Ross St.	5	352.7	850	Pacific
	KWUC—Le Mars, Iowa—Western Union College (Divides time with KSCJ)	1500	243.8	1230	Central
	KWWG—Brownsville, Tex.—Chamber of Commerce.	500	277.6	1080	Central
KX	**KXA—Seattle, Wash.**—American Radio Tel. Co.	500	277.6	1080	Pacific
	KXL—Portland, Ore.—KXL Broadcasters, 501 Pantage Bldg.	50	220.4	1360	Pacific
	KXRO—Seattle, Wash.—KXRO, Inc., Heron and So. H Sts.	50	227.1	1320	Pacific
KY	**KYA—San Francisco, Calif.**—Pacific Broadcasting Co.	500	309.1	970	Pacific
	KYW—Chicago, Ill.—Westinghouse Elec. & Mfg. Co., 508 S. Michigan Ave. (Divides time with KFKX) (500 watts after 10 P. M.)	2500	526	570	Central
KZ	**KZM—Oakland, Calif.**—Preston D. Allen, 13th and Harrison Sts. (Divides time with KLS)	100	245.8	1220	Pacific
WA	**WAAD—Cincinnati, Ohio**—Ohio Mechanics Institute.	25	267.7	1120	Central
	WAAF—Chicago, Ill.—Chicago Daily Drovers Journal (Divides time with WBBM and WJBT)	500	389.4	770	Central
	WAAM—Newark, N. J.—I. R. Nelson, 1 Bond St., Studio at 626 Central Ave., East Orange (Divides time with WGBS)	500	348.6	860	Eastern
	WAAT—Jersey City, N. J.—Bremer Broadcasting Corp., 210 Jackson Ave. (Divides time with WGBB and WSOM)	500	245.8	1220	Eastern
	WAAW—Omaha, Nebr.—Omaha Grain Exchange (Before 7 P. M. only) (Proposed change by Radio Commission to 600 k.c.)	300	348.6	860	Central
	WABC—New York, N. Y.—Atlantic Broadcasting Corp., 113 W. 57 St. (Divides time with WBOQ)	2500	325.9	920	Eastern
	WABF—Pringleboro, Pa.—Markle Broadcasting Corp., 294 Wyoming Ave.	250	205.4	1460	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WA	**WABI—Bangor, Me.**—First Universalist Church, Park St.	100	389.4	770	Eastern
	WABO—Rochester, N. Y.—Hickson Elec. Co. (Consolidated with station WHEC)	500	254.1	1180	Eastern
	WABQ—Philadelphia, Pa.—Keystone Broadcasting Co., Hotel Lorraine, 1923 Chestnut St. (Proposed change by Radio Commission to 1340 k.c.)	500	260.7	1150	Eastern
	WABW—Wooster, Ohio—College of Wooster	50	247.8	1210	Eastern
	WABY—Philadelphia, Pa.—John Magaldi, Jr.	50	247.8	1210	Eastern
	WABZ—New Orleans, La.—Colis Place Baptist Church, 1376 Camp St	50	247.8	1210	Central
	WADC—Akron, Ohio—Allen T. Simmons, Towell-Cadillac Bldg	500	296.9	1010	Eastern
	WAFD—Detroit, Mich.—Albert B. Parfet Co., Charlotte St. and Woodward Ave	100	230.6	1300	Eastern
	WAGM—Royal Oak, Mich.—Robert L. Miller, 309 So. Main St	50	225.4	1330	Eastern
	WAIT—Taunton, Mass.—A. H. Waite & Co., 32 Weir St.	10	214.2	1400	Eastern
	WAIU—Columbus, Ohio—American Insurance Union, Deshler-Walleck Hotel (Divides time with WEAO)	5000	282.8	1060	Eastern
	WALK—Willow Grove, Pa.—Albert A. Walker	50	201.2	1490	Eastern
	WAMD—Minneapolis, Minn.—Radisson Radio Corp.	500	225.4	1330	Central
	WAPI—Auburn, Ala.—Alabama Polytechnic Inst. (Proposed change by Radio Commission to 920 k.c.)	1000	319	940	Central
	WARS—Brooklyn, N. Y.—Amateur Radio Specialty Co., 77 Cortlandt St., N. Y., Studios at Shelburne Hotel, Brighton Beach (Divides time with WSDA and WBBC)	500	227.1	1320	Eastern
	WASH—Grand Rapids, Mich.—Baxter Laundries, Inc.	250	256.3	1170	Central
	WATT—Boston, Mass. (Portable)—Edison Elec. Illuminating Co	100	201.2	1490	
WB	**WBAA—West Lafayette, Ind.**—Purdue University (Divides time with WRM)	500	272.6	1100	Central
	WBAK—Harrisburg, Pa.—Pennsylvania State Police (Divides time with WPSC)	500	299.8	1000	Eastern
	WBAL—Baltimore, Md.—Transmitter in Glen Morris—Consolidated Gas, Elec. Light & Power Co.	5000	285.5	1050	Eastern
	WBAO—Decatur, Ill.—James Millikin University	100	267.7	1120	Central
	WBAP—Fort Worth, Tex.—Carter Publishing Co. (Divides time with WFAA)	1500	499.7	600	Central
	WBAW—Nashville, Tenn.—Waldrum Drug Co.	100	247.8	1210	Central
	WBAX—Wilkes-Barre, Pa.—John H. Stenger, Jr., 66 Gildersleeve St. (Divides time with WBRE)	100	249.9	1200	Eastern
	WBBC—Brooklyn, N. Y.—Brooklyn Broadcasting Corp., 16 Court St. (Divides time with WARS and WSDA)	500	227.1	1320	Eastern
	WBBL—Richmond, Va.—Grace-Covenant Presbyterian Church, 1627 Monument Ave.	100	247.8	1210	Eastern
	WBBM—Chicago, Ill.—Transmitter in Glenview—Atlass Investment Co., 728 Kimball Bldg. (Divides time with WJBT and WAAF)	5000	389.4	770	Central
	WBBP—Petoskey, Mich.—Petoskey High School	100	239.9	1250	Central
	WBBR—Rossville, N. Y.—People's Pulpit Assoc., 117 Adams St., Brooklyn (Divides time one-half with WLTH—WEBJ)	1000	256.3	1170	Eastern
	WBBW—Norfolk, Va.—Ruffner Junior High School	50	236.1	1270	Eastern
	WBBY—Charleston, S. C.—Washington Light Infantry	75	499.7	600	Eastern
	WBBZ—Chicago, Ill. (Portable)—C. L. Carrell, 1506 No. American Bldg.	100	204	1470	
	WBCN—Chicago, Ill.—Great Lakes Broadcasting Co., Straus Bldg. (Divides time with WENR)	250	288.3	1040	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WB	**WBES—Tacoma Park, Md.**—Bliss Electrical School (Proposed change by Radio Commission to 1130 k.c.)	100	296.9	1010	Eastern
	WBET—Boston, Mass.—Boston Transcript (Proposed change by Radio Commission to 1130 k.c.)	500	288.3	1040	Eastern
	WBIS—Boston, Mass.—The Shepard Stores	100	302.8	990	Eastern
	WBKN—Brooklyn, N. Y.—Arthur Faske, 1515 Eastern Parkway (Divides time with WWRL, WIBI and WBMS)	100	267.7	1120	Eastern
	WBMH—Detroit, Mich.—Braun's Music House, 13214 E. Jefferson Ave.	100	211.1	1420	Central
	WBMS—Union City, N. J.—George J. Schowerer, 837—34 St. (Divides time with WBKN, WWRO and WIBI)	100	267.7	1120	Eastern
	WBNY—New York, N. Y.—Baruchrome Corp., 400 E. 139 St. (Divides time with WHAP—WMSG)	500	236.1	1270	Eastern
	WBOQ—New York, N. Y.—Transmitter in Richmond Hill—Atlantic Broadcasting Corp., 113 W. 57 St. (Divides time with WABC)	500	325.9	920	Eastern
	WBRC—Birmingham, Ala.—Birmingham Broadcasting Corp., Loew's Temple Theatre	250	243.8	1230	Central
	WBRE—Wilkes-Barre, Pa.—L. G. Baltimore, 16 N. Main St. (Divides time with WBAX)	100	249.9	1200	Eastern
	WBRL—Tilton, N. H.—Booth Radio Labs., 23 Summer St. (Proposed change by Radio Commission to 1290 k.c.)	500	461.3	650	Eastern
	WBRS—Brooklyn, N. Y.—North American Broadcasting Corp. (Divides time with WCDA, WCGU and WRST)	100	211.1	1420	Eastern
	WBSO—Wellesley Hills, Mass.—Babson Statistical Organization (Divides time with WDWF)	100	384.4	780	Eastern
	WBT—Charlotte, N. C.—C. C. Coddington, 500 West Trade St. (Uses 1000 watts Daytime)	500	258.5	1160	Eastern
	WBZ—Springfield, Mass.—Transmitter is in East Springfield—Westinghouse Elec. & Mfg. Co., Hotel Kimball	15000	333.1	900	Eastern
	WBZA—Boston, Mass.—Westinghouse Elec. & Mfg. Co., Hotel Statler	500	333.1	900	Eastern
WC	**WCAC—Mansfield, Conn.**—Connecticut Agricultural College (Divides time with WTIC)	500	535.4	560	Eastern
	WCAD—Canton, N. Y.—St. Lawrence University (1000 watts Daytime)	500	365.6	820	Eastern
	WCAE—Pittsburgh, Pa.—Kaufmann & Baer Co., Sixth and Smithfield Sts.	500	516.9	580	Eastern
	WCAH—Columbus, Ohio—Entrekin Elec. Co., Studio at Fort Hayes Hotel (Proposed change by Radio Commission to 1280 k.c.)	250	535.4	560	Eastern
	WCAJ—Lincoln, Nebr.—Nebraska Wesleyan University (Divides time with KMMJ)	500	379.5	790	Central
	WCAL—Northfield, Minn.—St. Olaf College (Divides time with KFMX)	500	236.1	1270	Central
	WCAM—Camden, N. J.—City of Camden, Civic Centre	500	223.7	1340	Eastern
	WCAO—Baltimore, Md.—Monumental Radio, Inc., 848 N. Howard St. (Divides time with WCBM)	250	384.4	780	Eastern
	WCAT—Rapid City, S. D.—South Dakota State School of Mines	100	247.8	1210	Mountain
	WCAU—Philadelphia, Pa.—Universal Broadcasting Co., (Proposed change by Radio Commission to 1150 k.c.)	500	336.9	890	Eastern
	WCAX—Burlington, Vt.—University of Vermont	100	254.1	1180	Eastern
	WCAZ—Carthage, Ill.—Carthage College	50	340.7	880	Central
	WCBA—Allentown, Pa.—Chas. W. Heimbach, 1015 Allen St. (Divides time with WSAN)	100	222.1	1350	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WC	**WCBD—Zion, Ill.**—Wilbur G. Voliva (Divides time with WLS)	5000	344.6	870	Central
	WCBE—New Orleans, La.—Uhalt Bros., Hotel De Soto	5	227.1	1320	Central
	WCBM—Baltimore, Md.—Hotel Chateau, Charles St. and North Ave. (Divides time with WCAO)	100	384.4	780	Eastern
	WCBR—Providence, R. I. (Portable)—Chas. H. Messter, 42 Doyle Ave	100	201.2	1490	
	WCBS—Springfield, Ill.—Harold L. Dewing and Chas. H. Messter, St. Nicholas Hotel	250	209.7	1430	Central
	WCCO—Minneapolis-St. Paul, Minn.—Transmitter at Anoka—Washburn-Crosby Co. (7500 watts Daytime)	5000	405.2	740	Central
	WCDA—Cliffside, N. J.—Italian Educational Foundation Corp. (Divides time with WRST, WBRS and WCGU)	250	211.1	1420	Eastern
	WCFL—Chicago, Ill.—Chicago Federation of Labor, 623 S. Wabash Ave. (Divides time with WLTS)	1500	483.6	620	Central
	WCGU—New York, N. Y.—Chas. G. Unger, 1587 Broadway (Divides time with WKBO and WKBQ)	500	218.8	1370	Eastern
	WCLO—Camp Lake, Wis.—C. E. Whitmore	100	227.1	1320	Central
	WCLS—Joliet, Ill.—M. A. Felman Co., 301 E. Jefferson St. (Divides time with WKBB)	150	215.7	1390	Central
	WCMA—Culver, Ind.—Culver Military Academy	250	258.5	1160	Central
	WCOA—Pensacola, Fla.—City of Pensacola, City Hall	500	249.9	1200	Central
	WCOC—Columbus, Miss.—Crystal Oil Co.	250	230.6	1300	Central
	WCOM—Manchester, N. H.—172nd Field Artillery, N. H. N. G.	100	238	1260	Eastern
	WCOT—Olneyville, R. I.—Jacob Conn, 1849 Westminster St.	100	225.4	1330	Eastern
	WCRW—Chicago, Ill.—Clinton R. White, Embassy Hotel, 2756 Pine Grove Ave. (Divides time with WPPC)	500	223.7	1340	Central
	WCSH—Portland, Me.—Henry P. Rines, Congress Square Hotel Co.	500	428.3	700	Eastern
	WCSO—Springfield, Ohio—Wittenberg College	1000	256.3	1170	Central
	WCWK—Fort Wayne, Ind.—Chester W. Keen, 1729 Lafayette St.	250	214.2	1400	Central
	WCWS—Danbury, Conn.—Connecticut Portable Broadcasting Corp.	100	214.2	1400	Eastern
	WCX—Detroit, Mich.—(Transmitter in Pontiac)—Detroit Free Press	5000	440.9	680	Eastern
WD	**WDAD—Nashville, Tenn.**—Dad's Auto Accessory and Radio Store, 171 Eighth Ave., North	1000	225.4	1330	Central
	WDAE—Tampa, Fla.—Tampa Daily Times	500	267.7	1120	Eastern
	WDAF—Kansas City, Mo.—The Kansas City Star, 18th and Grand Ave.	1000	370.2	810	Central
	WDAG—Amarillo, Tex.—J. Laurance Martin, 605 E. 4th St.	250	263	1140	Central
	WDAH—El Paso, Tex.—Trinity Methodist Church, Cor. Blod and Misa Ave.	100	234.2	1280	Mountain
	WDAY—Fargo, N. D.—Radio Equipment Corp., 119 Broadway	250	361.2	830	Central
	WDBJ—Roanoke, Va.—Richardson-Wayland Electric Corp., 106 Church Ave., S. W.	250	230.6	1300	Eastern
	WDBK—Cleveland, Ohio—(Transmitter in Akron)—W. F. Jones (Divides time with WJAY)	250	227.1	1320	Eastern
	WDBO—Orlando, Fla.—Orlando Broadcasting Co., Inc., Fort Gatlin Hotel (1000 watts Daytime)	500	288.3	1040	Eastern
	WDBZ—Kingston, N. Y.—Under Management of Kingston Chamber of Commerce Boy Scouts of America (Divides time with WOKO)	50	215.7	1390	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WD	**WDEL—Wilmington, Del.**—Wilmington Elec. Specialty Co., 405 Delaware Ave. (Proposed change by Radio Commission to 1010 k.c.)	100	265.3	1130	Eastern
	WDGY—Minneapolis, Minn.—Geo. W. Young, Superior Boulevard and Falvey Cross Road, Studio at 217 Loeb Arcade	500	263	1140	Central
	WDOD—Chattanooga, Tenn.—Chattanooga Radio Co., 615 Market St.	500	245.8	1220	Central
	WDRC—New Haven, Conn.—Doolittle Radio Corp., 70 College St.	500	282.8	1060	Eastern
	WDWF—Cranston, R. I.—Dutee W. Flint and Lincoln Studios, Inc., 335 Westminster St., Providence (Divides time with WBSO) (Proposed change by Radio Commission to 1150 k.c.)	500	374.8	800	Eastern
	WDWM—Asbury Park, N. J.—Radio Industries Broadcast Co., 525 Bangs Ave. (Proposed change by Radio Commission to 1140 k.c.)	500	361.2	830	Eastern
	WDZ—Tuscola, Ill.—Jas. L. Bush (Daytime only)	100	277.6	1080	Central
WE	**WEAF—New York, N. Y.**—(Transmitter at Bellmore, L. I.)—National Broadcasting Co., Inc., 195 Broadway	50000	491.5	610	Eastern
	WEAI—Ithaca, N. Y.—Cornell University	250	483.6	620	Eastern
	WEAM—North Plainfield, N. J.—Borough of North Plainfield (Divides time with WOAX)	250	239.9	1250	Eastern
	WEAN—Providence, R. I.—The Shepard Co., 122 Mathewson St. (Divides time with WNAC) (Proposed change by Radio Commission to 1040 k.c.)	500	319	940	Eastern
	WEAO—Columbus, Ohio—The Ohio State University (Divides time with WAIU)	750	282.8	1060	Eastern
	WEAR—Cleveland, Ohio—Willard Storage Battery Co., 1100 Chester Ave. (Divides time with WTAM)	1000	399.8	750	Eastern
	WEBC—Superior, Wis.—W. C. Bridges	250	241.8	1240	Central
	WEBE—Cambridge, Ohio—R. W. Waller, 319 Wall Ave.	10	247.8	1210	Eastern
	WEBH—Chicago, Ill.—Edgewater Beach Hotel Co., 5300 Sheridan Rd. (Divides time with WJJD)	2000	365.6	820	Central
	WEBJ—New York, N. Y.—Third Ave. Railway Co., 2396 Third Ave. (Divides time [one quarter] with WJBI—WBBR)	500	256.3	1170	Eastern
	WEBQ—Harrisburg, Ill.—Tate Radic Co., 1 N. Main St.	15	223.7	1340	Central
	WEBR—Buffalo, N. Y.—Howell Broadcasting Co., 54 Niagara St.	200	241.8	1240	Eastern
	WEBW—Beloit, Wis.—Beloit College	500	258.5	1160	Central
	WEDC—Chicago, Ill.—Emil Denemark Broadcasting Station, 3860 Ogden Ave. (Divides time with WGES)	500	241.8	1240	Central
	WEEI—Boston, Mass.—The Edison Elec. Illuminating Co. (Proposed change by Radio Commission to 650 k.c.)	500	447.5	670	Eastern
	WEHS—Evanston, Ill.—A. T. Becker, 1318 Elmwood Ave.	100	215.7	1390	Central
	WEMC—Berrien Springs, Mich.—Emmanuel Missionary College, (Divides time with WCFL and WLTS)	1000	483.6	620	Central
	WENR—Chicago, Ill.—Great Lakes Radio Broadcasting Co., 310 So. Michigan Ave. (Divides time with WBCN)	500	288.3	1040	Central
	WEPS—Gloucester, Mass.—Matheson Radio Co., 209 Main St.	100	296.9	1010	Eastern
	WEVD—New York, N. Y.—Union Course Labs., Debs Memorial Radio Fund (Divides time with WGBB and WAAT)	500	245.8	1220	Eastern
	WEW—St. Louis, Mo.—St. Louis University	1000	352.7	850	Central

Radio Call Letters	Location and Owner	Kilocycles	Power in Watts	Hours Operation	Time Zone
WF					
WFAA	Dallas, Tex.—Dallas News and Texas Broadcasting Co., Baker Hotel (Divides time with WBAP)	800	500	650	Central
WFAM	St. Cloud, Minn.—Times Publishing Co., 10 4th Ave., No.	940	250	1190	Central
WFBC	Knoxville, Tenn.—First Baptist Church	900	250	1200	Central
WFBE	Cincinnati, Ohio—Lunkfield Piano Hotel Co. (Divides time with WKRC)	700	500	1220	Central
WFBG	Altoona, Pa.—The William F. Gable Co.	1000	250	1070	Eastern
WFBJ	Collegeville, Minn.—St. John's University	1000	500	1100	Central
WFBL	Syracuse, N. Y.—The Onondaga Co.	760	250	1160	Eastern
WFBM	Indianapolis, Ind.—Merchants Heat & Light Co.	240	500	1060	Central
WFBR	Baltimore, Md.—Fifth Infantry, Maryland National Guard, Fifth Regiment Armory (500 watts Daytime)	240	500	1220	Eastern
WFBZ	Galesburg, Ill.—Knox College (Divides time with WRAM)	900	500	1200	Central
WFCI	Pawtucket, R. I.—Frank Conch Inc., 901 Exchange St.	1400	500	1260	Eastern
WFDF	Flint, Mich.—Frank D. Fallain, Fisher Bldg. (Proposed change by Radio Commission to 1100 k.c.)	1300	500	950	Eastern
WFI	Philadelphia, Pa.—Strawbridge & Clothier (Divides time with WLIT)	1500	500	760	Eastern
WFIW	Hopkinsville, Ky.—Avery Mills, Inc. (1000 watts Daytime)	1500	500	1070	Central
WFKB	Chicago, Ill.—Francis K. Bridgman, 4536 Woodlawn Ave. (Divides time with WCRW)	1500	500	1160	Central
WFLD	Philadelphia, Pa.—Fessenden Radio Engineering Co.	900	500	1210	Eastern
WFLA	Clearwater, Fla.—(Transmitter in City Park at Causeway)—Chamber of Commerce (Proposed change by Radio Commission to 1060 k.c.)	1500	500	820	Eastern
WG					
WGAL	Lancaster, Pa.—Lancaster Elec. Supply and Construction Co., 33 E. Orange St.	1500	500	1190	Eastern
WGBB	Freeport, N. Y.—Harry H. Carman, 217 Buffalo Av. (Divides time with WAAT and WPAM)	1400	500	1220	Eastern
WGBC	Memphis, Tenn.—First Baptist Church, Linden and Lauderdale Sts.	1500	500	1080	Central
WGBF	Evansville, Ind.—Fisher Furniture Co., 309 So. Seventh St.	1500	500	1270	Central
WGBI	Scranton, Pa.—Scranton Broadcasters, Inc., 600 Linden St. (Divides time with WQAN)	1500	500	1300	Eastern
WGBO	New York, N. Y.—(Transmitter in Astoria, L. I.)—(Central Term., 43rd and Broadway) (Divides time with WAAM)	1500	500	940	Eastern
WGCP	Newark, N. J.—Paramount Broadcasting & Artists' Service, Inc., 591 Broad St. (Divides time with WNJ)	1500	500	1070	Eastern
WGES	Chicago, Ill.—(Transmitter in Oak Park)—Oakleaves Broadcasting Corp., Coyne Electric School, 128 N. Crawford Ave. (Divides time with WEDC)	1500	500	1260	Central
WGHP	Mount Clemens, Mich.—Geo. H. Phelps, 110 Robertus St.	750	500	940	Central
WGL	New York, N. Y.—(Transmitter in Secaucus, N. J.)—International Broadcast Corp., 485 5th Ave.	1500	500	1020	Eastern
WGM	Jeannette, Pa.—Verne & Elton Spencer, 301 Cowen Ave.	1500	500	1400	Eastern
WGMS	Minneapolis, Minn.—University of Minnesota	1500	500	1250	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WG	**WGMU—New York, N. Y. (Portable)**—Atlantic Broadcasting Corp. (Divides time with WRMU)	100	201.2	1490	
	WGN—Chicago, Ill.—The Chicago Tribune, Drake Hotel (Divides time with WLIB)	15000	305.9	980	Central
	WGR—Buffalo, N. Y.—Federal Radio Corp., Hotel Statler	750	302.8	990	Eastern
	WGST—Atlanta, Ga.—Georgia School of Technology (Divides time with WMAZ)	500	270.1	1110	Central
	WGWB—Milwaukee, Wis.—Radiocast Corp. of Wisconsin, 144 Broadway	500	218.8	1370	Central
	WGY—So. Schenectady, N. Y.—General Electric Co. (Divides time with WHAZ)	50000	379.5	790	Eastern
WH	**WHA—Madison, Wis.**—University of Wisconsin (Divides time with WLBL) (Proposed change by Radio Commission to 990 k.c.)	750	319	940	Central
	WHAD—Milwaukee, Wis.—Marquette University (Divides time with WSOE)	500	270.1	1110	Central
	WHAM—Rochester, N. Y.—(Transmitter in Victor Township) — Stromberg-Carlson Telephone Mfg. Co.	5000	277.6	1080	Eastern
	WHAP—New York, N. Y. (Transmitter in Carlstadt, N. J.)—Defenders of Truth Society, Inc., 9 W. 96th St. (Divides time with WBNY and WMSG)	1000	236.1	1270	Eastern
	WHAR—Atlantic City, N. J.—F. B. Cook's Sons, Inc., Seaside Hotel (Divides time with WPG)	750	272.6	1100	Eastern
	WHAS—Louisville, Ky.—Courier-Journal and Louisville Times, 3rd and Liberty Sts.	500	461.3	650	Central
	WHAZ—Troy, N. Y.—Rensselaer Polytechnic Inst. (Divides time with WGY) (Proposed change by Radio Commission to 550 k.c.)	500	379.5	790	Eastern
	WHB—Kansas City, Mo.—Sweeney Automotive and Elec. School. Sweeney Bldg. (Divides time with WOQ)	500	336.9	890	Central
	WHBA—Oil City, Pa.—Shaffer Music House	10	260.7	1150	Eastern
	WHBC—Canton, Ohio—St. John's Catholic Church, 627 McKinley Ave., N. W.	10	236.1	1270	Eastern
	WHBD—Bellefontaine, Ohio—Chamber of Commerce	100	222.1	1350	Central
	WHBF—Rock Island, Ill.—Beardsley Specialty Co., 217 Eighteenth St.	100	222.1	1350	Central
	WHBL—Chicago, Ill. (Portable)—C. L. Carrell	100	204	1470	
	WHBM—Chicago, Ill. (Portable)—C. L. Carrell, 1506 No. American Bldg.	100	201.2	1490	
	WHBN—St. Petersburg, Fla.—(Transmitter in Gainesville)—University of Florida	10	296.9	1010	Eastern
	WHBP—Johnstown, Pa.—Johnstown Automobile Co., 101 Main St. (500 watts Daytime)	250	228.9	1310	Eastern
	WHBQ—Memphis, Tenn.—WHBQ, Inc., Dermon Bldg.	100	232.4	1290	Central
	WHBU—Anderson, Ind.—Citizens Bank, 1002 Meridian St.	15	220.4	1360	Central
	WHBW—Philadelphia, Pa.—D. R. Kienzle, 4916 Chestnut St.	100	220.4	1360	Eastern
	WHBY—West De Pere, Wis.—St. Norbert's College	50	249.9	1200	Central
	WHDI—Minneapolis, Minn.—Wm. Hood Dunwoody Industrial Inst., 818 Superior Blvd. (Divides time with WLB)	500	245.8	1220	Central
	WHEC—Rochester, N. Y.—Hickson Elec. Co., 36 South Ave., (Consolidated with WABO, Lake Avenue Baptist Church)	500	254.1	1180	Eastern
	WHFC—Chicago, Ill.—Goodson & Wilson, Inc., Hotel Flanders, 4145 Broadway	200	215.7	1390	Central
	WHK—Cleveland, Ohio—Radio Air Service Corp., 1116 Carnegie Hall (1000 watts Daytime)	500	265.3	1130	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WH	**WHN—New York, N. Y.**—George Schubel, 1540 Broadway (Divides time with WQAO and WPAP)..	500	394.5	760	Eastern
	WHO—Des Moines, Ia.—Bankers Life Co., 1110 Liberty Bldg.....	5000	535.4	560	Central
	WHPP—New York, N. Y.—Bronx Broadcasting Co., 150 Delancey St.....	10	206.8	1450	Eastern
	WHT—Chicago, Ill. (Transmitter in Deerfield)—Radiophone Broadcasting Corp., 410 N. Michigan Blvd. (Divides time with WIBO).....	5000	416.4	720	Central
WI	**WIAD—Philadelphia, Pa.**—Howard R. Miller, Hotel Vendig (Divides time with WNAT).....	100	288.3	1040	Eastern
	WIAS—Ottumwa, Iowa—Poling Elec. Co., 107 E. 2nd St. (Proposed change by Radio Commission to 930 k.c.).....	100	475.9	630	Central
	WIBA—Madison, Wis.—Capital Times Studio, and Strand Theatre Corp., 14 E. Mifflin St.....	100	239.9	1250	Central
	WIBG—Elkins Park, Pa.—St. Paul's Protestant Episcopal Church (Sunday's 11 A. M. and 4 P. M.)..	50	440.9	680	Eastern
	WIBI—Flushing, N. Y.—Frederick B. Zittell, Jr., 369 Amity St. (Divides time with WBKN, WWRL and WBMS).....	100	267.7	1120	Eastern
	WIBJ—Chicago, Ill. (Portable)—C. L. Carrell, 1506 No. American Bldg.....	100	201.2	1490	
	WIBM—Chicago, Ill. (Portable)—C. L. Carrell, 1506 No. American Bldg.....	100	201.2	1490	
	WIBO—Chicago, Ill.—WIBO Broadcasters, Inc., 6312 Broadway (Divides time with WHT).....	5000	416.4	720	Central
	WIBR—Steubenville, Ohio—Thurman A. Owings.....	50	249.9	1200	Eastern
	WIBS—Elizabeth, N. J.—Lieut. Thos. F. Hunter (Divides time with WTRC and WLBX).....	150	204	1470	Eastern
	WIBU—Poynette, Wis.—Wisconsin State Journal.....	20	217.3	1380	Central
	WIBW—Topeka, Kans.—C. L. Carrell, 910 Reserve Life Bldg.....	100	204	1470	Central
	WIBX—Utica, N. Y.—WIBX, Inc., Hotel Utica.....	150	238	1260	Eastern
	WIBZ—Montgomery, Ala.—A. D. Trum, 217 Catonia St.....	15	230.6	1300	Central
	WICC—Bridgeport, Conn.—Bridgeport Broadcasting Co., Inc.....	500	214.2	1400	Eastern
	WIL—St. Louis, Mo.—Benson Radio Broadcasting Co. (Divides time with WSBF).....	250	258.5	1160	Central
	WIOD—Miami Beach, Fla.—Carl G. Fisher Co.....	1000	247.8	1210	Eastern
	WIP—Philadelphia, Pa.—Gimbel Bros., Market St. Bldg., (Divides time with WOO).....	500	508.2	590	Eastern
WJ	**WJAD—Waco, Tex.**—Frank P. Jackson, 801 Austin Ave. (Proposed change by Radio Commission to 900 k.c.).....	500	447.5	670	Central
	WJAG—Norfolk, Nebr.—Norfolk Daily News, Hotel Norfolk.....	250	285.5	1050	Central
	WJAK—Kokomo, Ind.—J. A. Kautz, Y. M. C. A. Bldg.	50	234.2	1280	Central
	WJAM—Cedar Rapids, Ia.—D. M. Perham, 322 Third Ave., W. (Divides time with KWCR) (Proposed change by Radio Commission to 1250 k.c.).....	250	352.7	850	Central
	WJAR—Providence, R. I.—The Outlet Co. (Proposed change by Radio Commission to 800 k.c.).....	500	483.6	620	Eastern
	WJAS—Pittsburgh, Pa.—Pittsburgh Radio Supply House, 10th and Penn Ave. (Divides time with KQV).....	500	270.1	1110	Eastern
	WJAX—Jacksonville, Fla.—City of Jacksonville, Waterworks Park, 1st and Main Sts.....	1000	336.9	890	Eastern
	WJAY—Cleveland, Ohio—Cleveland Radio Broadcasting Corp., Hotel Hollenden.....	500	227.1	1320	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WJ	**WJAZ—Chicago, Ill.** (Transmitter in Mount Prospect)—Zenith Radio Corp., 3620 Iron St. (Divides time with WMBI)	5000	263	1140	Central
	WJBA—Joliet, Ill.—D. H. Lentz, Jr., 301 Whitley Ave.	50	322.4	930	Central
	WJBB—St. Petersburg, Fla.—(Transmitter in Tampa)—Financial Journal, 126—13th St., N.	250	344.6	870	Eastern
	WJBC—LaSalle, Ill.—Hummer Furniture Co., 2nd & Joliet Sts.	100	227.1	1320	Central
	WJBI—Red Bank, N. J.—Robt. S. Johnson, 63 Broad St.	150	263	1140	Eastern
	WJBK—Ypsilanti, Mich.—Ernest F. Goodwin, 803 Congress St.	15	220.4	1360	Eastern
	WJBL—Decatur, Ill.—Wm. Gushard Dry Goods Co., 301 N. Water St.	250	212.6	1410	Central
	WJBO—New Orleans, La.—Valdemar Jensen, 119 S. St. Patrick St.	100	263	1140	Central
	WJBR—Omro, Wis.—(Transmitter in Appleton)—Irving Zuelke Music Studio	100	227.1	1320	Central
	WJBT—Chicago, Ill.—John S. Boyd, Kimball Bldg. (Divides time with WBBM and WAAF)	500	389.4	770	Central
	WJBU—Lewisburg, Pa.—Bucknell University, Engineering Bldg.	100	214.2	1400	Eastern
	WJBW—New Orleans, La.—C. Carlson, Jr., 2743 Dumaine St.	30	238	1260	Central
	WJBY—Gadsden, Ala.—Electric Const. Co., 517 Broad St.	50	234.2	1280	Central
	WJBZ—Chicago Heights, Ill.—Roland G. Palmer and A. Coppotelli, 144 E. 16 St.	100	208.2	1440	Central
	WJJD—Mooseheart, Ill.—Supreme Lodge, Loyal Order of Moose (Divides time with WEBH)	1000	365.6	820	Central
	WJKS—Gary, Ind.—Johnson Kennedy Radio Corp., 540 Lake St.	500	232.4	1290	Central
	WJPW—Ashtabula, Ohio—J. P. Wilson, 192 Prospect St.	50	208.2	1440	Eastern
	WJR—Detroit, Mich.—(Transmitter in Pontiac)—Good Will Station WJR, Inc. & Detroit Free Press, General Motors Bldg. & Book Cadillac Hotel.	5000	440.9	680	Eastern
	WJZ—New York, N. Y.—(Transmitter in Bound Brook, N. J.)—National Broadcasting Co., 195 Broadway, Studios at 711 Fifth Ave.	30000	454.3	660	Eastern
WK	**WKAR—East Lansing, Mich.**—Michigan State College (1000 watts Daytime)	500	285.5	1050	Central
	WKAV—Laconia, N. H.—Laconia Radio Club, 533 Main St.	50	223.7	1340	Eastern
	WKBB—Joliet, Ill.—Sanders Bros., 607 Jefferson St. (Divides time with WCLS)	150	215.7	1390	Central
	WKBC—Birmingham, Ala.—H. L. Ansley, 1428 N. 12th Ave.	10	218.8	1370	Central
	WKBE—Webster, Mass.—K & B Electric Co., 59 Emerald St.	100	228.9	1310	Eastern
	WKBF—Indianapolis, Ind.—Noble B. Watson, Hoosier Athletic Club	500	252	1190	Central
	WKBG—Chicago, Ill. (Portable)—C. L. Carrell, 36 S. State St.	100	201.2	1490	
	WKBH—La Crosse, Wis.—Callaway Music Co., 221 Main St.	500	220.4	1360	Central
	WKBI—Chicago, Ill.—Fred L. Schoenwolf, 1917 Warner Ave.	50	322.4	930	Central
	WKBL—Monroe, Mich.—Monrona Radio Mfg. Co., 16 S. Monroe St.	15	205.4	1460	Eastern
	WKBM—Newburgh, N. Y.—WKBM Radio Broadcasting Co., 130 Broadway	100	208.2	1440	Eastern
	WKBN—Youngstown, Ohio—Radio Electric Service, Y. M. C. A. (Divides time with WMBW)	50	214.2	1400	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WKBO	**Jersey City, N. J.**—Camith Corporation, 2866 Boulevard (Divides time with WKBQ and WCGU	500	218.8	1370	Eastern
WKBP	**Battle Creek, Mich.**—Battle Creek Enquirer and News	50	212.6	1410	Eastern
WKBQ	**New York, N. Y.**—Standard Cahill Co., Inc., 1100 E. 177 St. (Divides time with WKBO and WCGU)	500	218.8	1370	Eastern
WKBS	**Galesburg, Ill.**—P. N. Nelson 227 Duffield, Ave. (Divides time with WLBO)	100	217.3	1380	Central
WKBT	**New Orleans, La.**—First Baptist Church	50	252	1190	Central
WKBU	**New Castle, Pa. (Portable)**—Harry K. Armstrong	50	204	1470	
WKBV	**Brookville, Ind.**—Knox Battery & Elec. Co., 1058 Main St.	100	217.3	1380	Central
WKBW	**Buffalo, N. Y.**—Churchill Evangelistic Assoc., 1420-1428 Main St. (750 watts Daytime)	500	217.3	1380	Eastern
WKBZ	**Ludington, Mich.**—Karl L. Ashbacker, First National Bank Bldg.	15	199.9	1500	Eastern
WKDR	**Kenosha, Wis.**—Edward A. Dato, 936 N. Michigan Ave., Chicago, Ill.	15	322.4	930	Central
WKEN	**Buffalo, N. Y.**—(Transmitter in Kenmore)—H. L. Turner, 121 Norwood Ave. (Divides time with WSVS)	250	204	1470	Eastern
WKJC	**Lancaster, Pa.**—Kirk Johnson Co., 16 W. King St. (Divides time with WGAL)	50	252	1190	Eastern
WKRC	**Cincinnati, Ohio**—Kodel Radio Corp., 507 E. Pearl St.	250	245.8	1220	Central
WKY	**Oklahoma City, Okla.**—WKY Radiophone Co., Huckins Hotel	150	288.3	1040	Central
WLAC	**Nashville, Tenn.**—Dad's Auto Accessory & Radio Store	1000	225.4	1330	Central
WLAP	**Louisville, Ky.**—Virginia Ave. Baptist Church, 2600 Virginia Ave. (100 watts Daytime)	30	267.7	1120	Central
WLB	**Minneapolis, Minn.**—University of Minnesota (Divides time with WHDI)	500	245.8	1220	Central
WLBC	**Muncie, Ind.**—D. A. Burton, 2224 So. Jefferson St.	50	209.7	1430	Central
WLBF	**Kansas City, Mo.**—Everett L. Dillard, 32nd and Main Sts.	50	209.7	1430	Central
WLBG	**Petersburg, Va.**—R. A. Gamble	100	214.2	1400	Eastern
WLBH	**Farmingdale, N. Y.**—Joseph J. Lombardi	30	232.4	1290	Eastern
WLBI	**East Wenona, Ill.**—Wenona Legion Broadcasters, Inc.	250	238	1260	Central
WLBL	**Stevens Point, Wis.**—Wisconsin Dept. of Markets (Divides time with WHA) (Proposed change by Radio Commission to 990 k.c.)	1000	319	940	Central
WLBM	**Boston, Mass.**—Browning-Drake Corp., 353 Washington St.	50	230.6	1300	Eastern
WLBN	**Chicago, Ill. (Portable)**—Wm. E. Hiler, 339 S. Homan Ave.	50	204	1470	
WLBO	**Galesburg, Ill.**—Frederick Trebbe, Jr. (Divides time with WKBS)	100	217.3	1380	Central
WLBP	**Ashland, Ohio**—Robert A. Fox	15	202.6	1480	Eastern
WLBQ	**Atwood, Ill.**—E. Dale Trout	25	202.6	1480	Central
WLBR	**Belvidere, Ill.**—Alford Radio Co.	15	322.4	930	Central
WLBT	**Crown Point, Ind.**—Harold Wendell	50	322.4	930	Central
WLBV	**Mansfield, Ohio**—Mansfield Broadcasting Assoc., Chamber of Commerce Bldg.	50	206.8	1450	Eastern
WLBW	**Oil City, Pa.**—Petroleum Telephone Co.	500	293.9	1020	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WL	**WLBX—Long Island City, N. Y.**—John N. Brahy, 283 Crescent St. (Divides time with WIBS, WMBQ and WTRC)	250	204	1470	Eastern
	WLBY—Iron Mountain, Mich.—Aimone Electric	50	209.7	1430	Central
	WLBZ—Dover-Foxcroft, Me.—Thompson L. Guernsey.	250	208.2	1440	Eastern
	WLCI—Ithaca, N. Y.—Lutheran Assoc. of Ithaca	50	247.8	1210	Eastern
	WLEX—Springfield, Mass.—Transmitter in Lexington—Willow Garages, Inc., 131 Willow Ave	5	215.7	1390	Eastern
	WLIB—Chicago, Ill.—Liberty Weekly (Divides time with WGN)	500	305.9	980	Central
	WLIT—Philadelphia, Pa.—Lit Bros., 8th and Market Sts. (Divides time with WFI)	500	405.2	740	Eastern
	WLS—Chicago, Ill.—(Transmitter in Crete, Ill.)—Sears Roebuck & Co. (Divides time with WCBD)	5000	344.6	870	Central
	WLSI—Cranston, R. I.—Dutee W. Flint and Lincoln Studios, Inc., 335 Westminster St., Providence (Divides time with WBSO) (Proposed change by Radio Commission to 1150 k.c.)	500	384.4	780	Eastern
	WLTH—Brooklyn, N. Y.—Flatbush Radio Labs., 1421 E. 10 St. (Divides time with WKDQ and WKBO)	250	256.3	1170	Eastern
	WLTS—Chicago, Ill.—Lane Technical High School (Divides time with WCFL)	100	483.6	620	Central
	WLW—Cincinnati, Ohio—(Transmitter in Harrison)—Crosley Radio Corp.	5000	428.3	700	Central
	WLWL—New York, N. Y.—Paulist Fathers, 415 W. 59 St. (Divides time with WMCA)	5000	370.2	810	Eastern
WM	**WMAC—Cazenovia, N. Y.**—Clive B. Meredith (Divides time with WSYR)	500	225.4	1330	Eastern
	WMAF—South Dartmouth, Mass.—Round Hills Radio Corp	500	428.3	700	Eastern
	WMAK—Lockport, N. Y.—WMAK Studios, Inc., Studios at Buffalo	750	545.1	550	Eastern
	WMAL—Washington, D. C.—M. A. Leese Radio Co., 720 Eleventh St., N. W. (Proposed change by Radio Commission to 1240 k.c.)	250	302.8	990	Eastern
	WMAN—Columbus, Ohio—Heskett Radio Station, 507 N. High St.	50	234.2	1280	Eastern
	WMAQ—Chicago, Ill.—Chicago Daily News, 15 N. Wells St. (Divides time with WQJ)	1000	447.5	670	Central
	WMAY—St. Louis, Mo.—Kings Highway Presbyterian Church (Divides time with KFQA)	100	247.8	1210	Central
	WMAZ—Macon, Ga.—Mercer University (Divides time with WGST)	500	270.1	1110	Eastern
	WMBA—Newport, R. I. (Portable)—LeRoy Joseph Beebe	100	204	1470	
	WMBB—Chicago, Ill.—(Transmitter in Homewood)—American Bond & Mortgage Co., 6201 Cottage Grove Ave. (Divides time with WOK)	5000	252	1190	Central
	WMBC—Detroit, Mich.—Michigan Broadcasting Co., Savoy Hotel	100	243.8	1230	Eastern
	WMBD—Peoria Heights, Ill.—Peoria Heights Radio Laboratory, 107 E. Glen Ave.	250	205.4	1460	Central
	WMBE—St. Paul, Minn.—(Transmitter in White Bear)—Dr. C. S. Stevens, 2018 Grand Ave.	10	208.2	1440	Central
	WMBF—Miami Beach, Fla.—Fleetwood Hotel Corp.	500	384.4	780	Eastern
	WMBG—Richmond, Va.—Havens & Martin, 914 West Broad St.	15	220.4	1360	Eastern
	WMBH—Chicago, Ill. (Portable)—Edwin Dudley Aber, 1526 E. 53 St.	100	204	1470	
	WMBI—Chicago, Ill.—(Transmitter in Addison)—Moody Bible Inst. of Chicago, 153 Institute Place (Divides time with WJAZ)	5000	263	1140	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WM	**WMBJ—Monessen, Pa.**—Wm. Roy McShaffrey	50	232.4	1290	Eastern
	WMBL—Lakeland, Fla.—Benford Radio Studios, 14 Marble Arcade Bldg	50	228.9	1310	Eastern
	WMBM—Memphis, Tenn.—Seventh Day Adventist Church	10	209.7	1430	Central
	WMBO—Auburn, N. Y.—Radio Service Labs., 17 South St	100	220.4	1360	Eastern
	WMBQ—Brooklyn, N. Y.—Paul J. Gollhofer, 95 Leonard St. (Divides time with WIBS and WLBX)	100	204	1470	Eastern
	WMBR—Tampa, Fla.—F. J. Reynolds	100	252	1190	Eastern
	WMBS—Harrisburg, Pa. (Transmitter in Lemoyne)—Mack Battery Co.	250	234.2	1280	Eastern
	WMBW—Youngstown, Ohio—Youngstown Broadcasting Co., 647 Market St. (Divides time with WKBN)	50	214.2	1400	Eastern
	WMC—Memphis, Tenn.—Memphis Commercial Appeal, Inc., Commercial Appeal Bldg	500	516.9	580	Central
	WMCA—New York, N. Y.—(Transmitter in Hoboken, N. J.)—Associated Broadcasters, Inc., Hotel McAlpin (Divides time with WLWL)	500	370.2	810	Eastern
	WMCO—Detroit, Mich.—(Transmitter in Saginaw)—W. T. Thomas Radio Co., Whittier Hotel (Divides time with WAFD)	250	218.8	1370	Eastern
	WMES—Boston, Mass.—Educational Society, Barristers Hall	100	211.1	1420	Eastern
	WMPC—Lapeer, Mich.—First Methodist Protestant Church	30	234.2	1280	Eastern
	WMRJ—Jamaica, N. Y.—Peter J. Prinz, 10 New York Blvd. (Divides time with WTRL and WHPP)	10	206.8	1450	Eastern
	WMSG—New York, N. Y.—Madison Square Garden Broadcasting Corp., 319 W. 49 St. (Divides time with WBNY and WHAP)	500	236.1	1270	Eastern
WN	**WNAC—Boston, Mass.**—The Shepard Stores (Proposed change by Radio Commission to 1040 k.c.)	500	352.7	850	Eastern
	WNAD—Norman, Okla.—University of Oklahoma	500	239.9	1250	Central
	WNAL—Omaha, Nebr.—R. J. Rockwell, 5019 Capital Ave. (Divides time with KOCH and KFOX)	250	258.5	1160	Central
	WNAT—Philadelphia, Pa.—Lennig Bros. Co., Spring Garden and 9 Sts. (Divides time with WIAD)	100	288.3	1040	Eastern
	WNAX—Yankton, S. D.—Gurney Seed & Nursery Co., (500 watts Daytime)	250	302.8	990	Central
	WNBA—Forest Park, Ill.—M. T. Rafferty, 810 Desplaines Ave.	200	208.2	1440	Central
	WNBF—Endicott, N. Y.—Howitt-Wood Radio Co., Inc., 117 W. Main St., Hotel Frederick	50	206.8	1450	Eastern
	WNBH—New Bedford, Mass.—New Bedford Broadcasting Co., New Bedford Hotel	250	260.7	1150	Eastern
	WNBJ—Knoxville, Tenn.—Lonsdale Baptist Church, 122 W. Conn Ave.	50	206.8	1450	Central
	WNBL—Bloomington, Ill.—Harvey R. Storm, 107 E. Front St. (Divides time with WMBY)	15	199.9	1500	Central
	WNBO—Washington, Pa.—John B. Spriggs, So. Main St.	15	211.1	1420	Eastern
	WNBQ—Rochester, N. Y.—Gordon P. Brown, 192 S. Goodman St.	15	202.6	1480	Eastern
	WNBR—Memphis, Tenn.—Popular Radio Shop, 883 Poplar Ave.	20	228.9	1310	Central
	WNBW—Carbondale, Pa.—Home Cut Glass & China Co., 21 Salem Ave.	5	258.5	1160	Eastern
	WNBX—Springfield, Vt.—First Congregational Church	10	241.8	1240	Eastern
	WNJ—Newark, N. J.—Herman Lubinsky, 89 Lehigh Ave. (Divides time with WGCP)	500	280.2	1070	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WN	**WNOX—Knoxville, Tenn.**—People's Telephone and Telegraph Co., 313 Commerce Ave.	1000	265.3	1130	Central
	WNRC—Greensboro, N. C.—Wayne M. Nelson	250	223.7	1340	Eastern
	WNYC—New York, N. Y.—Dept. of Plants and Structures, Municipal Bldg.	500	526	570	Eastern
WO	**WOAI—San Antonio, Tex.**—Southern Equipment Co., 1031 Navarro St. (Proposed change by Radio Commission to 940 k.c.)	5000	302.8	990	Central
	WOAN—Lawrenceburg, Tenn.—Jas. D. Vaughn	250	285.5	1050	Central
	WOAX—Trenton, N. J.—Franklyn J. Wolff, The Monument Pottery Co. (Divides time with WEAM)	500	239.9	1250	Eastern
	WOBR—Shelby, Ohio—Harl Smith	10	204	1470	Eastern
	WOBT—Union City, Tenn.—Tittsworth's Radio & Music Shop, 114 So. First St.	15	205.4	1460	Central
	WOBU—Charleston, W. Va.—Charleston Radio Broadcasting Co., 1023 Quarier St.	50	267.7	1120	Eastern
	WOC—Davenport, Iowa—The Palmer School of Chiropractic, 1002 Brady St.	5000	374.8	800	Central
	WOCL—Jamestown, N. Y.—A. E. Newton	25	223.7	1340	Eastern
	WODA—Paterson, N. J.—James K. O'Dea, Inc., 115 Ellison St. (Divides time with WGL)	1000	293.9	1020	Eastern
	WOI—Ames, Iowa—Iowa State College (5000 watts daytime 6 to 6)	2500	265.3	1130	Central
	WOK—Chicago, Ill.—(Transmitter in Homewood)—Trianon, Inc. (Divides time with WMBB)	5000	252	1190	Central
	WOKO—Peekskill, N. Y.—Harold E. Smith	250	215.7	1390	Eastern
	WOKT—Rochester, N. Y.—Titus-Ets. Corp.	500	209.7	1430	Eastern
	WOMT—Manitowoc, Wis.—Mikadow Theatre	50	222.1	1350	Central
	WOO—Philadelphia, Pa.—John Wanamaker (Divides time with WIP)	500	508.2	590	Eastern
	WOOD—Grand Rapids, Mich.—(Transmitter in Furnwood)—Walter B. Stiles, Inc., Hotel Rowe	500	260.7	1150	Central
	WOQ—Kansas City, Mo.—Unity School of Christianity, (500 watts Daytime) (Divides time with WHB)	250	336.9	890	Central
	WOR—Newark, N. J.—(Transmitter in Kearny)—L. Bamberger & Co.	5000	422.3	710	Eastern
	WORD—Chicago, Ill.—(Transmitter in Batavia)—Peoples Pulpit Assoc., 124 Columbia Heights, Brooklyn, N. Y. (Divides time with WHT and WIBO)	5000	416.4	720	Central
	WOS—Jefferson City, Mo.—Missouri State Marketing Bureau (Proposed change by Radio Commission to 710 k.c.)	500	468.5	640	Central
	WOW—Omaha, Nebr.—Woodmen of the World Life Insurance Assoc	1000	508.2	590	Central
	WOWO—Fort Wayne, Ind.—The Main Auto Supply Co., 213 W. Main St. (5000 watts Daytime)	2500	228.9	1310	Central
WP	**WPAP—Cliffside, N. J.**—Palisades Amusement Park (Divides time with WHN)	500	394.5	760	Eastern
	WPCC—Chicago, Ill.—North Shore Congregational Church	500	223.7	1340	Central
	WPCH—New York, N. Y.—(Transmitter at Hoboken, N. J.)—Concourse Radio Corp., Park Central Hotel, 56th St. and 7th Ave. (Divides time with WRNY)	500	309.1	970	Eastern
	WPEP—Waukegan, Ill.—Maurice Mayer, 140 Hazel Court	250	215.7	1390	Central
	WPG—Atlantic City, N. J.—Municipality of Atlantic City (Divides time with WHAR)	5000	272.6	1100	Eastern
	WPRC—Harrisburg, Pa.—Wilson Printing & Radio Co., Fifth and Kelker Sts	100	209.7	1430	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WP	**WPSC—State College, Pa.**—Pennsylvania State College (Divides time with WBAK)	500	299.8	1000	Eastern
	WPSW—Philadelphia, Pa.—Philadelphia School of Wireless Telegraphy	50	202.6	1480	Eastern
	WPTF—Raleigh, N. C.—Durham Life Ins. Co., 226½ Fayetteville St.	500	416.4	720	Eastern
WQ	**WQAA—Parkesburg, Pa.**—Horace A. Beale, Jr.	500	215.7	1390	Eastern
	WQAE—Springfield, Vt.—Moore Radio News Station	50	249.9	1200	Eastern
	WQAM—Miami, Fla.—Electrical Equipment Co., 42 Northwest Fourth St.	750	322.4	930	Eastern
	WQAN—Scranton, Pa.—Scranton Times, Penn Ave. and Spruce St. (Divides time with WGBI)	250	230.6	1300	Eastern
	WQAO—Cliffside, N. J.—Calvary Baptist Church (Divides time with WHN)	500	394.5	760	Eastern
	WQJ—Chicago, Ill.—Calumet Rainbo Broadcasting Co. (Divides time with WMAQ)	500	447.5	670	Central
WR	**WRAF—Laporte, Ind.**—The Radio Club, Inc., 719 Michigan Ave.	100	208.2	1440	Central
	WRAH—Providence, R. I.—Stanley N. Read, 191 Alabama Ave	250	199.9	1500	Eastern
	WRAK—Escanaba, Mich.—Economy Light Co., 1105 Ludington St.	50	282.8	1060	Central
	WRAM—Galesburg, Ill.—Lombard College (Divides time with WFBZ)	50	247.8	1210	Central
	WRAV—Yellow Springs, Ohio—Antioch College (Proposed change by Radio Commission to 1010 k.c.)	100	340.7	880	Central
	WRAW—Reading, Pa.—Avenue Radio & Elec. Shop, 460 Schuylkill Ave.	100	238	1260	Eastern
	WRAX—Philadelphia, Pa.—Berachah Church, Inc., 1608 Allegheny Ave. (Divides time with WNAT)	250	212.6	1410	Eastern
	WRBC—Valparaiso, Ind.—Immanuel Lutheran Church	250	238	1260	Central
	WRC—Washington, D. C.—Radio Corp. of America	500	468.5	640	Eastern
	WRCV—Norfolk, Va.—Radio Corp. of Virginia	100	209.7	1430	Eastern
	WREC—Memphis, Tenn.—WREC, Inc.	50	254.1	1180	Central
	WREN—Lawrence, Kans.—Jenny Wren, Inc. (Divides time with KFKU)	750	254.1	1180	Central
	WRES—Quincy, Mass.—Harry L. Sawyer, 335A Newport Ave.	50	217.3	1380	Eastern
	WRHF—Washington, D. C.—Washington Radio Hospital Fund, 525 11 St., N. W. (Daytime only)	150	322.4	930	Eastern
	WRHM—Minneapolis, Minn.—Rosedale Hospital Co., Andrews Hotel (Divides time with WDGY)	1000	260.7	1150	Central
	WRK—Hamilton, Ohio—Doron Bros. Elec. Co., 3 Railroad St.	100	205.4	1460	Central
	WRM—Urbana, Ill.—University of Illinois (1000 watts before 6 P. M.) (Divides time with WBAA)	500	272.6	1100	Central
	WRMU—New York, N. Y. (Portable)—Atlantic Broadcasting Corp., 113 W. 57th St.	100	201.2	1490	
	WRNY—New York, N. Y.—(Transmitter in Coytesville, N. J.)—Experimenter Pub. Co., 230—5th Ave. (Divides time with WPCH)	500	309.1	970	Eastern
	WRPI—Terre Haute, Ind.—Rose Polytechnic Inst.	100	208.2	1440	Central
	WRR—Dallas, Tex.—City of Dallas, Police and Fire Signal Dept. (Proposed change by Radio Commission to 650 k.c.)	500	352.7	850	Central
	WRRS—Racine, Wis.—Racine Broadcasting Corp., Hotel Racine	50	322.4	930	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WR	**WRSC—Chelsea, Mass.**—Wm. S. Pote, 56 Washington Ave.	100	211.1	1420	Eastern
	WRST—Bay Shore, N. Y.—Radiotel Mfg. Co., Carleton Hall (Divides time with WCDA and WBRS).	250	211.1	1420	Eastern
	WRVA—Richmond, Va.—Larus & Brother Co., 22nd and Cary Sts.	1000	254.1	1180	Eastern
WS	**WSAI—Cincinnati, Ohio** (Transmitter in Mason)—United States Playing Card Co.	5000	361.2	830	Eastern
	WSAJ—Grove City, Pa.—Grove City College.	250	223.7	1340	Eastern
	WSAN—Allentown, Pa.—Allentown Call Pub. Co. (Divides time with WCBA).	100	222.1	1350	Eastern
	WSAR—Portsmouth, R. I.—Doughty & Welch Elec. Co., 46 N. Main St.	100	252	1190	Eastern
	WSAX—Chicago, Ill. (Portable)—Zenith Radio Corp., 332 So. Michigan Ave.	100	204	1470	
	WSAZ—Huntington, W. Va.—McKellar Elec. Co., 1143—4th Ave.	100	241.8	1240	Eastern
	WSB—Atlanta, Ga.—The Atlanta Journal	1000	475.9	630	Central
	WSBC—Chicago, Ill.—World Battery Co., 1219 South Wabash Ave. (Divides time with WWAE)	500	232.4	1290	Central
	WSBF—St. Louis, Mo.—Mississippi Valley Broadcasting Co., 6th and Washington Sts. (Divides time with WIL)	250	258.5	1160	Central
	WSBT—South Bend, Ind.—South Bend Tribune, 225 W. Colfax Ave.	500	238	1260	Central
	WSDA—Brooklyn, N. Y.—Amateur Radio Specialty Co. (Divides time with WARS and WBBC)	500	227.1	1320	Eastern
	WSEA—Virginia Beach, Va.—Virginia Beach Broadcasting Co., Cavalier Hotel, Main Studio at Norfolk	500	263	1140	Eastern
	WSIX—Springfield, Tenn.—638 Tire & Vulc. Co.	150	212.6	1410	Central
	WSKC—Bay City, Mich.—World's Star Knitting Co. (Proposed change by Radio Commission to 1100 k.c.)	500	374.8	800	Eastern
	WSM—Nashville, Tenn.—The National Life & Accident Ins. Co., National Bldg.	5000	340.7	880	Central
	WSMB—New Orleans, La.—Saenger Amusement Co. & Maison Blanche Co.	500	322.4	930	Central
	WSMK—Dayton, Ohio—S. M. K. Radio Corp., 39 E. 3rd St.	200	296.9	1010	Eastern
	WSOE—Milwaukee, Wis.—School of Engineering, 415 Marshall St.	250	270.1	1110	Central
	WSRO—Middletown, Ohio—H. W. Fahrlander, Central and Canal Sts.	100	384.4	780	Central
	WSSH—Boston, Mass.—Tremont Temple Baptist Church (Proposed change by Radio Commission to 1130 k.c.)	1000	288.3	1040	Eastern
	WSUI—Iowa City, Iowa—State University of Iowa (Proposed change by Radio Commission to 630 k.c.)	500	422.3	710	Central
	WSVS—Buffalo, N. Y.—Seneca Vocational School. 666 E. Delavan Ave. (Divides time with WKEN)	50	205.4	1460	Eastern
	WSYR—Syracuse, N. Y.—Clive B. Meredith, Hotel Syracuse (Divides time with WMAC)	500	225.4	1330	Eastern
WT	**WTAD—Quincy, Ill.**—Illinois Stock Medicine Broadcasting Corp. (500 watts Daytime)	250	236.1	1270	Central
	WTAG—Worcester, Mass.—Worcester Telegram Pub. Co., 18 Franklin St.	500	516.9	580	Eastern
	WTAL—Toledo, Ohio—Toledo Broadcasting Co., Recreation Bldg., 217 Superior St. (Divides time with WABR)	100	280.2	1070	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WT	**WTAM—Cleveland, Ohio**—Willard Storage Battery Co., 1100 Chester Ave. (Divides time with WEAR) (5000 watts Daytime)	3500	399.8	750	Eastern
	WTAQ—Eau Claire, Wis.—Gillette Rubber Co.	500	254.1	1180	Central
	WTAR—Norfolk, Va.—Reliance Elec. Co., 519 W. 21 St.	500	263	1140	Eastern
	WTAS—Batavia, Ill.—Illinois Broadcasting Corp.	3500	275.1	1090	Central
	WTAW—College Station, Tex.—Agricultural & Mechanical College of Texas (Proposed change by Radio Commission to 620 k.c.)	500	309.1	970	Central
	WTAX—Streater, Ill.—Williams Hardware Co., 115 So. Vermillion St.	50	322.4	930	Central
	WTAZ—Lambertville, N. J.—Thos. J. McGuire	15	220.4	1360	Eastern
	WTFF—Mount Vernon Hills, Va.—Independent Publishing Co.	50	204	1470	Eastern
	WTFI—Toccoa Falls, Ga.—Toccoa Falls Inst.	250	209.7	1430	Central
	WTHS—Atlanta, Ga.—Atlanta Technical High School	200	270.1	1110	Central
	WTIC—Hartford, Conn.—Travelers Ins. Co	500	535.4	560	Eastern
	WTMJ—Milwaukee, Wis.—(Transmitter in Brookfield) —Milwaukee Journal	1000	293.9	1020	Central
	WTRL—Midland Park, N. J.—Technical Radio Labs. (Divides time with WMRJ and WHPP)	15	206.8	1450	Eastern
WW	**WWAE—Chicago, Ill.**—Dr. Geo. F. Courrier, 2024 So. Wabash Ave. (Divides time with WCLO and WJBC)	500	227.1	1320	Central
	WWJ—Detroit, Mich.—Evening News Assoc.	1000	352.7	850	Eastern
	WWL—New Orleans, La.—Loyola University	100	275.1	1090	Central
	WWNC—Asheville, N. C.—Asheville Chamber of Commerce, 101 Patton Ave.	1000	296.9	1010	Central
	WWRL—Woodside, N. Y.—W. H. Reuman (Divides time with WBKN, WIBI and WBMS)	100	267.7	1120	Eastern
	WWVA—Wheeling, W. Va.—John C. Stroebel, Jr., 1229 Main St. (Proposed change by Radio Commission to 890 k.c.)	250	389.4	770	Eastern

This list has been corrected up to and including November 1st, 1927

RADIO BROADCAST STATION KYW
EDDIE AND FANNIE CAVANAUGH
THE GAELIC TWINS
CHICAGO, ILL.

BROADCAST STATION KDKA
T.J. VASTINE, DIRECTOR
WESTINGHOUSE BAND
EAST PITTSBURGH, PA.

BROADCAST STATION KGO-OAKLAND, CAL.
JOSEPHINE HOLUB, VIOLINIST

BROADCAST STATION KFI-LOS ANGELES
ALMA FRANCIS GORDON, CONTRALTO

BROADCAST STATION KFI-LOS ANGELES
LOUISE KLOS, HARPIST

RADIO BROADCAST STATION KYW
THE EDISON STRING TRIO
CHICAGO, ILL.

RADIO BROADCAST STATION KFSD
EAST END OF RECEPTION ROOM
SAN DIEGO, CAL.

RADIO BROADCAST STATIONS OF THE UNITED STATES

By Wavelengths and Frequencies

Meters	Kilocycles	Power	Call Letters	Location
199.9	1500	15	KGFN	Aneta, N. Dak.
199.9	1500	5	KOLO	Durango, Colo.
199.9	1500	10	KUJ	Seattle, Wash.
199.9	1500	15	KWBS	Portland, Ore.
199.9	1500	15	WKBZ	Ludington, Mich.
199.9	1500	15	WNBL	Bloomington, Ill.
199.9	1500	250	WRAH	Providence, R. I.
201.2	1490	50	KGEH	Eugene, Ore.
201.2	1490	15	KGEY	Denver, Colo.
201.2	1490	50	WALK	Willow Grove, Pa.
201.2	1490	100	WATT	Boston, Mass.
201.2	1490	100	WCBR	Providence, R. I.
201.2	1490	100	WGMU	New York, N. Y.
201.2	1490	100	WHBM	Chicago, Ill.
201.2	1490	100	WIBJ	Chicago, Ill.
201.2	1490	100	WIBM	Chicago, Ill.
201.2	1490	100	WKBG	Chicago, Ill.
201.2	1490	100	WRMU	New York, N. Y.
202.6	1480	100	KGBS	Seattle, Wash.
202.6	1480	50	KGBY	Shelby, Nebr.
202.6	1480	10	KGDJ	Cresco, Iowa
202.6	1480	15	KGDR	San Antonio, Tex.
202.6	1480	50	KGEQ	Minneapolis, Minn.
202.6	1480	15	WLBP	Ashland, Ohio
202.6	1480	25	WLBQ	Atwood, Ill.
202.6	1480	15	WNBQ	Rochester, N. Y.
202.6	1480	50	WPSW	Philadelphia, Pa.
204	1470	15	KFXD	Jerome, Idaho
204	1470	10	KGES	Central City, Nebr.
204	1470	100	KGFO	Terre Haute, Ind.
204	1470	100	KGGM	Inglewood, Calif.
204	1470	100	WBBZ	Chicago, Ill.
204	1470	100	WHBL	Chicago, Ill.
204	1470	150	WIBS	Elizabeth, N. J.
204	1470	100	WIBW	Topeka, Kans.
204	1470	50	WKBU	New Castle, Pa.
204	1470	250	WKEN	Buffalo, N. Y.
204	1470	50	WLBN	Chicago, Ill.
204	1470	250	WLBX	Long Island City, N. Y.
204	1470	100	WMBA	Newport, R. I.
204	1470	100	WMBH	Chicago, Ill.
204	1470	100	WMBQ	Brooklyn, N. Y.
204	1470	10	WOBR	Shelby, Ohio
204	1470	100	WSAX	Chicago, Ill.
204	1470	50	WTFF	Mt. Vernon Hills, Va.
205.4	1460	25	KFXY	Flagstaff, Ariz.
205.4	1460	50	KGDE	Barrett, Minn.
205.4	1460	100	KGEO	Grand Island, Nebr.
205.4	1460	100	KGEZ	Kalispell, Mont.
205.4	1460	25	KGFF	Alva, Okla.
205.4	1460	250	WABF	Pringleboro, Pa,
205.4	1460	15	WKBL	Monroe, Mich.
205.4	1460	250	WMBD	Peoria Heights, Ill.
205.4	1460	15	WOBT	Union City, Tenn.
205.4	1460	100	WRK	Hamilton, O.
205.4	1460	50	WSVS	Buffalo, N. Y.
206.8	1450	100	KGDW	Humboldt, Nebr.
206.8	1450	15	KGDY	Oldham, S. Dak.
206.8	1450	100	KGGF	Picher, Okla.
206.8	1450	50	KGTT	San Francisco, Cal.
206.8	1450	10	KLIT	Portland, Ore.
206.8	1450	10	WHPP	New York, N. Y.
206.8	1450	50	WLBV	Mansfield, Ohio
206.8	1450	10	WMRJ	Jamaica, N. Y.
206.8	1450	50	WNBF	Endicott, N. Y.
206.8	1450	50	WNBJ	Knoxville, Tenn.
206.8	1450	15	WTRL	Midland Park, N. J.
208.2	1440	250	KFVD	Venice, Calif.
208.2	1440	50	KGCN	Concordia, Kans.
208.2	1440	15	KGCR	Brookings, S. Dak.
208.2	1440	100	KGFJ	Los Angeles, Calif.
208.2	1440	50	WGM	Jeannette, Pa.
208.2	1440	100	WJBZ	Chicago Heights, Ill.
208.2	1440	50	WJPW	Ashtabula, Ohio
208.2	1440	100	WKBM	Newburgh, N. Y.
208.2	1440	250	WLBZ	Dover-Foxcroft, Me.
208.2	1440	10	WMBE	St. Paul, Minn.
208.2	1440	200	WNBA	Forest Park, Ill.
208.2	1440	100	WRAF	Laporte, Ind.
208.2	1440	100	WRPI	Terre Haute, Ind.
209.7	1430	10	KFGQ	Boone, Iowa
209.7	1430	250	KSOO	Sioux Falls, S. D.
209.7	1430	50	KVOS	Seattle, Wash.
209.7	1430	250	WCBS	Springfield, Ill.
209.7	1430	50	WLBC	Muncie, Ind.
209.7	1430	50	WLBF	Kansas City, Mo.
209.7	1430	50	WLBY	Iron Mountain, Mich.
209.7	1430	10	WMBM	Memphis, Tenn.
209.7	1430	500	WOKT	Rochester, N. Y.
209.7	1430	100	WPRC	Harrisburg, Pa.
209.7	1430	100	WRCV	Norfolk, Va.
209.7	1430	250	WTFI	Toccoa Falls, Ga.
211.1	1420	50	KFCR	Santa Barbara, Cal.
211.1	1420	15	KFYO	Breckenridge, Tex.
211.1	1420	15	KGFM	Yuba City, Calif.
211.1	1420	100	KPNP	Muscatine, Iowa
211.1	1420	50	KRSC	Seattle, Wash.
211.1	1420	100	WBMH	Detroit, Mich.
211.1	1420	100	WBRS	Brooklyn, N. Y.
211.1	1420	250	WCDA	Cliffside, N. J.
211.1	1420	100	WMES	Boston, Mass.
211.1	1420	15	WNBO	Washington, Pa.
211.1	1420	100	WRSC	Chelsea, Mass.
211.1	1420	250	WRST	Bay Shore, N. Y.

Meters	Kilocycles	Power	Call Letters	Location
212.6	1410	10	KFHL	Oskaloosa, Iowa
212.6	1410	100	KGBZ	York, Nebr.
212.6	1410	250	KGDX	Shreveport, La.
212.6	1410	10	KGFP	Mitchell, S. Dak.
212.6	1410	50	KGGH	Cedar Grove, La.
212.6	1410	5	KTUE	Houston, Tex.
212.6	1410	250	WJBL	Decatur, Ill.
212.6	1410	50	WKBP	Battle Creek, Mich.
212.6	1410	250	WRAX	Philadelphia, Pa.
212.6	1410	150	WSIX	Springfield, Tenn.
214.2	1400	50	KFEC	Portland, Ore.
214.2	1400	50	KFIF	Portland, Ore.
214.2	1400	250	KFWF	St. Louis, Mo.
214.2	1400	15	KPJM	Prescott, Ariz.
214.2	1400	10	WAIT	Taunton, Mass.
214.2	1400	250	WCWK	Fort Wayne, Ind.
214.2	1400	100	WCWS	Danbury, Conn.
214.2	1400	500	WICC	Bridgeport, Conn.
214.2	1400	100	WJBU	Lewisburg, Pa.
214.2	1400	50	WKBN	Youngstown, Ohio
214.2	1400	100	WLBG	Petersburg, Va.
214.2	1400	50	WMBW	Youngstown, Ohio
215.7	1390	10	KFDZ	Minneapolis, Minn.
215.7	1390	15	KFXJ	Edgewater, Colo.
215.7	1390	50	KGCB	Oklahoma City, Okla.
215.7	1390	100	KGER	Long Beach, Calif.
215.7	1390	50	KGFG	Oklahoma City, Okla.
215.7	1390	250	KRLO	Los Angeles, Calif.
215.7	1390	150	WCLS	Joliet, Ill.
215.7	1390	50	WDBZ	Kingston, N. Y.
215.7	1390	100	WEHS	Evanston, Ill.
215.7	1390	200	WHFC	Chicago, Ill.
215.7	1390	150	WKBB	Joliet, Ill.
215.7	1390	5	WLEX	Springfield, Mass.
215.7	1390	250	WOKO	Peekskill, N. Y.
215.7	1390	250	WPEP	Waukegan, Ill.
215.7	1390	500	WQAA	Parkesburg, Pa.
217.3	1380	100	KFOR	Lincoln, Nebr.
217.3	1380	100	KFQW	Seattle, Wash.
217.3	1380	10	KGDM	Stockton, Calif.
217.3	1380	20	WIBU	Poynette, Wis.
217.3	1380	100	WKBS	Galesburg, Ill.
217.3	1380	100	WKBV	Brookville, Ind.
217.3	1380	500	WKBW	Buffalo, N. Y.
217.3	1380	100	WLBO	Galesburg, Ill.
217.3	1380	50	WRES	Quincy, Mass.
218.8	1370	10	KGEW	Fort Morgan, Colo.
218.8	1370	500	WCGU	New York N. Y.
218.8	1370	500	WGWB	Milwaukee, Wis.
218.8	1370	10	WKBC	Birmingham, Ala.
218.8	1370	500	WKBO	Jersey City, N. J.
218.8	1370	500	WKBQ	New York, N. Y.
218.8	1370	250	WMCO	Detroit, Mich.
220.4	1360	15	KGCI	San Antonio, Tex.
220.4	1360	15	KGFI	San Angelo, Tex.
220.4	1360	50	KGRC	San Antonio, Tex.
220.4	1360	50	KJBS	San Francisco, Cal.
220.4	1360	50	KRAC	Shreveport, La.
220.4	1360	50	KXL	Portland, Ore.
220.4	1360	15	WHBU	Anderson, Ind.
220.4	1360	100	WHBW	Philadelphia, Pa.
220.4	1360	15	WJBK	Ypsilanti, Mich.
220.4	1360	500	WKBH	LaCrosse, Wis.
220.4	1360	15	WMBG	Richmond, Va.
220.4	1360	100	WMBO	Auburn, N. Y.
220.4	1360	15	WTAZ	Lambertville, N. J.
222.1	1350	100	KFWC	San Bernardino, Cal.
222.1	1350	50	KGFL	Trinidad, Colo.
222.1	1350	100	KWKC	Kansas City, Mo.
222.1	1350	100	WCBA	Allentown, Pa.
222.1	1350	100	WHBD	Bellefontaine, O.
222.1	1350	100	WHBF	Rock Island, Ill.
222.1	1350	50	WOMT	Manitowoc, Wis.
222.1	1350	100	WSAN	Allentown, Pa.
223.7	1340	100	KFBL	Everett, Wash.
223.7	1340	50	KFVS	Cape Girardeau, Mo.
223.7	1340	50	KFXR	Oklahoma City, Okla.
223.7	1340	10	KGFB	Iowa City, Iowa
223.7	1340	250	KGFH	La Crescenta, Calif.
223.7	1340	50	KGFK	Hallock, Minn.
223.7	1340	250	KMIC	Inglewood, Calif.
223.7	1340	500	WCAM	Camden, N. J.
223.7	1340	500	WCRW	Chicago, Ill.
223.7	1340	15	WEBQ	Harrisburg, Ill.
223.7	1340	500	WFKB	Chicago, Ill.
223.7	1340	50	WKAV	Laconia, N. H.
223.7	1340	250	WNRC	Greensboro, N. C.
223.7	1340	25	WOCL	Jamestown, N. Y.
223.7	1340	500	WPCC	Chicago, Ill.
223.7	1340	250	WSAJ	Grove City, Pa.
225.4	1330	15	KFKZ	Kirksville, Mo.
225.4	1330	50	KFUR	Ogden, Utah
225.4	1330	50	KFVG	Independence, Kans.
225.4	1330	15	KGEN	El Centro, Calif.
225.4	1330	50	WAGM	Royal Oak, Mich.
225.4	1330	500	WAMD	Minneapolis, Minn.
225.4	1330	100	WCOT	Olneyville, R. I.
225.4	1330	1000	WDAD	Nashville, Tenn.
225.4	1330	1000	WLAC	Nashville, Tenn.
225.4	1330	500	WMAC	Cazenovia, N. Y.
225.4	1330	500	WSYR	Syracuse, N. Y.
227.1	1320	100	KFUP	Denver, Colo.
227.1	1320	50	KGEU	Lower Lake, Calif.
227.1	1320	500	KSO	Clarinda, Iowa
227.1	1320	50	KXRO	Seattle, Wash.
227.1	1320	500	WARS	Brooklyn, N. Y.
227.1	1320	500	WBBC	Brooklyn, N. Y.
227.1	1320	5	WCBE	New Orleans, La.
227.1	1320	100	WCLO	Camp Lake, Wis.
227.1	1320	250	WDBK	Cleveland, O.
227.1	1320	500	WJAY	Cleveland, Ohio
227.1	1320	100	WJBC	LaSalle, Ill.
227.1	1320	100	WJBR	Omro, Wis.
227.1	1320	500	WSDA	Brooklyn, N. Y.
227.1	1320	500	WWAE	Chicago, Ill.
228.9	1310	500	KELW	Burbank, Calif.
228.9	1310	100	KFVN	Fairmont, Minn.
228.9	1310	50	KPPC	Pasadena, Calif.

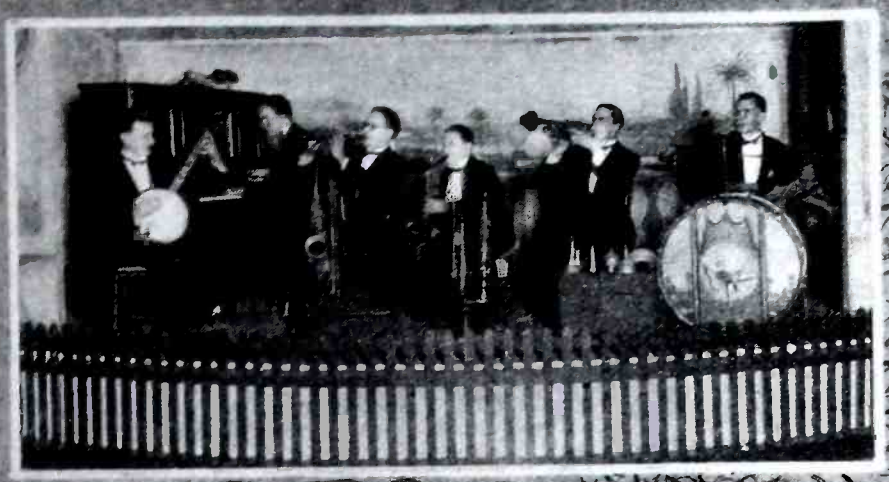
Meters	Kilocycles	Power	Call Letters	Location
228.9	1310	20	KTAP	San Antonio, Tex.
228.9	1310	50	KWJJ	Portland, Ore.
228.9	1310	250	WHBP	Johnstown, Pa.
228.9	1310	100	WKBE	Webster, Mass.
228.9	1310	50	WMBL	Lakeland, Fla.
228.9	1310	20	WNBR	Memphis, Tenn.
228.9	1310	2500	WOWO	Ft. Wayne, Ind.
230.6	1300	1000	KFEQ	St. Joseph, Mo.
230.6	1300	15	KFPM	Greenville, Tex.
230.6	1300	50	KGCL	Seattle, Wash.
230.6	1300	50	KPCB	Seattle, Wash.
230.6	1300	100	WAFD	Detroit, Mich.
230.6	1300	250	WCOC	Columbus, Miss.
230.6	1300	250	WDBJ	Roanoke, Va.
230.6	1300	250	WGBI	Scranton, Pa.
230.6	1300	15	WIBZ	Montgomery, Ala.
230.6	1300	50	WLBM	Boston, Mass.
230.6	1300	250	WQAN	Scranton, Pa.
232.4	1290	10	KFEY	Kellogg, Idaho
232.4	1290	250	KFPR	Los Angeles, Cal.
232.4	1290	100	KFQZ	Hollywood, Cal.
232.4	1290	500	KUT	Austin, Tex.
232.4	1290	100	WHBQ	Memphis, Tenn.
232.4	1290	100	WHEC	Rochester, N. Y.
232.4	1290	500	WJKS	Gary, Ind.
232.4	1290	30	WLBH	Farmingdale, N. Y.
232.4	1290	50	WMBJ	Monessen, Pa.
232.4	1290	500	WSBC	Chicago, Ill.
234.2	1280	1500	KFUO	St. Louis, Mo.
234.2	1280	1000	KFVE	St. Louis, Mo.
234.2	1280	100	KGAR	Tucson, Ariz.
234.2	1280	50	KVI	Tacoma, Wash.
234.2	1280	100	WDAH	El Paso, Tex.
234.2	1280	50	WFBC	Knoxville, Tenn.
234.2	1280	50	WJAK	Kokomo, Ind.
234.2	1280	50	WJBY	Gadsden, Ala.
234.2	1280	50	WMAN	Columbus, O.
234.2	1280	250	WMBS	Harrisburg, Pa.
234.2	1280	30	WMPC	Lapeer, Mich.
236.1	1270	250	KFDX	Shreveport, La.
236.1	1270	500	KFMX	Northfield, Minn.
236.1	1270	100	KFUM	Colorado Springs, Colo.
236.1	1270	500	KFWM	Oakland, Calif.
236.1	1270	15	KHMC	San Benito, Tex.
236.1	1270	50	WBBW	Norfolk, Va.
236.1	1270	500	WBNY	New York, N. Y.
236.1	1270	500	WCAL	Northfield, Minn.
236.1	1270	250	WGBF	Evansville, Ind.
236.1	1270	1000	WHAP	New York, N. Y.
236.1	1270	10	WHBC	Canton, Ohio
236.1	1270	500	WMSG	New York, N. Y.
236.1	1270	250	WTAD	Quincy, Ill.
238	1260	50	KFVI	Houston, Tex.
238	1260	100	WCOM	Manchester, N. H.
238	1260	150	WIBX	Utica, N. Y.
238	1260	30	WJBW	New Orleans, La.
238	1260	250	WLBI	East Wenona, Ill.
238	1260	100	WRAW	Reading, Pa.
238	1260	250	WRBC	Valparaiso, Ind.
238	1260	500	WSBT	South Bend, Ind.
239.9	1250	2500	KEX	Portland, Ore.
239.9	1250	100	KGCU	Mandan, N. Dak.
239.9	1250	100	WBBP	Petoskey, Mich.
239.9	1250	250	WEAM	No. Plainfield, N. J.
239.9	1250	100	WIBA	Madison, Wis.
239.9	1250	500	WNAD	Norman, Okla.
239.9	1250	500	WOAX	Trenton, N. J.
241.8	1240	1500	KFKB	Milford, Kans.
241.8	1240	500	KFON	Long Beach, Calif.
241.8	1240	100	KFXH	El Paso, Tex.
241.8	1240	250	WEBC	Superior, Wis.
241.8	1240	200	WEBR	Buffalo, N. Y.
241.8	1240	500	WEDC	Chicago, Ill.
241.8	1240	100	WFCI	Pawtucket, R. I.
241.8	1240	500	WGES	Chicago, Ill.
241.8	1240	10	WNBX	Springfield, Vt.
241.8	1240	100	WSAZ	Huntington, W. Va.
243.8	1230	125	KFCB	Phoenix, Ariz.
243.8	1230	10	KGCX	Vida, Mont.
243.8	1230	150	KGRS	Amarillo, Tex.
243.8	1230	50	KGY	Lacey, Wash.
243.8	1230	500	KSCJ	Sioux City, Iowa
243.8	1230	1500	KWUC	Le Mars, Iowa
243.8	1230	250	WBRC	Birmingham, Ala.
243.8	1230	250	WFBR	Baltimore, Md.
243.8	1230	100	WMBC	Detroit, Mich.
245.8	1220	500	KFH	Wichita, Kans.
245.8	1220	100	KFIO	Spokane, Wash.
245.8	1220	250	KFPY	Spokane, Wash.
245.8	1220	250	KLS	Oakland, Calif.
245.8	1220	100	KZM	Oakland, Calif.
245.8	1220	500	WAAT	Jersey City, N. J.
245.8	1220	500	WDOD	Chattanooga, Tenn.
245.8	1220	500	WEVD	New York, N. Y.
245.8	1220	250	WFBE	Cincinnati, Ohio
245.8	1220	400	WGBB	Freeport, N. Y.
245.8	1220	500	WGMS	Minneapolis, Minn.
245.8	1220	500	WHDI	Minneapolis, Minn.
245.8	1220	250	WKRC	Cincinnati, Ohio
245.8	1220	500	WLB	Minneapolis, Minn.
247.8	1210	100	KFBC	San Diego, Cal.
247.8	1210	250	KFEL	Denver, Colo.
247.8	1210	100	KFJB	Marshalltown, Ia.
247.8	1210	10	KGCA	Decorah, Iowa
247.8	1210	50	KWLC	Decorah, Iowa
247.8	1210	50	WABW	Wooster, Ohio
247.8	1210	50	WABY	Philadelphia, Pa.
247.8	1210	50	WABZ	New Orleans, La.
247.8	1210	100	WBAW	Nashville, Tenn.
247.8	1210	100	WBBL	Richmond, Va.
247.8	1210	100	WCAT	Rapid City, S. D.
247.8	1210	10	WEBE	Cambridge, Ohio
247.8	1210	50	WFBZ	Galesburg, Ill.
247.8	1210	50	WFKD	Philadelphia, Pa.
247.8	1210	1000	WIOD	Miami Beach, Fla.
247.8	1210	50	WLCI	Ithaca, N. Y.
247.8	1210	100	WMAY	St. Louis, Mo.
247.8	1210	50	WRAM	Galesburg, Ill.

Meters	Kilocycles	Power	Call Letters	Location
247.8	1210	50	KFQA	St. Louis, Mo.
249.9	1200	15	KFJI	Astoria, Ore.
249.9	1200	50	KFJZ	Fort Worth, Tex.
249.9	1200	100	KFQU	Alma (Holy City), Calif.
249.9	1200	500	KFRU	Columbia, Mo.
249.9	1200	250	KFYR	Bismarck, N. D.
249.9	1200	50	KMED	Medford, Ore.
249.9	1200	100	WBAX	Wilkes-Barre, Pa.
249.9	1200	100	WBRE	Wilkes-Barre, Pa.
249.9	1200	500	WCOA	Pensacola, Fla.
249.9	1200	50	WHBY	West De Pere, Wis.
249.9	1200	50	WIBR	Steubenville, Ohio
249.9	1200	50	WQAE	Springfield, Vt.
252	1190	250	KOCW	Chickasha, Okla.
252	1190	500	KPLA	Los Angeles, Calif.
252	1190	10	WFAM	St. Cloud, Minn.
252	1190	15	WGAL	Lancaster, Pa.
252	1190	500	WKBF	Indianapolis, Ind.
252	1190	50	WKBT	New Orleans, La.
252	1190	50	WKJC	Lancaster, Pa.
252	1190	5000	WMBB	Chicago, Ill.
252	1190	100	WMBR	Tampa, Fla.
252	1190	5000	WOK	Chicago, Ill.
252	1190	100	WSAR	Portsmouth, R. I.
254.1	1180	50	KFHA	Gunnison, Colo.
254.1	1180	500	KFKU	Lawrence, Kans.
254.1	1180	100	KFWH	Eureka, Calif.
254.1	1180	200	KGFX	Pierre, S. Dak.
254.1	1180	15	KGDA	Dell Rapids, S. Dak.
254.1	1180	250	KMO	Tacoma, Wash.
254.1	1180	500	WABO	Rochester, N. Y.
254.1	1180	100	WCAX	Burlington, Vt.
254.1	1180	50	WREC	Memphis, Tenn.
254.1	1180	750	WREN	Lawrence, Kans.
254.1	1180	1000	WRVA	Richmond, Va.
254.1	1180	500	WTAQ	Eau Claire, Wis.
256.3	1170	50	KFUS	Oakland, Cal.
256.3	1170	100	KRE	Berkeley, Cal.
256.3	1170	3500	KTNT	Muscatine, Iowa
256.3	1170	250	WASH	Grand Rapids, Mich.
256.3	1170	1000	WBBR	Rossville, N. Y.
256.3	1170	1000	WCSO	Springfield, Ohio
256.3	1170	500	WEBJ	New York, N. Y.
256.3	1170	250	WLTH	Brooklyn, N. Y.
258.5	1160	100	KDYL	Salt Lake City, Utah
258.5	1160	100	KFOX	Omaha, Neb.
258.5	1160	500	KFUL	Galveston, Tex.
258.5	1160	250	KOCH	Omaha, Neb.
258.5	1160	500	WBT	Charlotte, N. C.
258.5	1160	250	WCMA	Culver, Ind.
258.5	1160	500	WEBW	Beloit, Wis.
258.5	1160	750	WFBL	Syracuse, N. Y.
258.5	1160	250	WIL	St. Louis, Mo.
258.5	1160	250	WNAL	Omaha, Neb.
258.5	1160	5	WNBW	Carbondale, Pa.
258.5	1160	250	WSBF	St. Louis, Mo.
260.7	1150	2000	KGA	Spokane, Wash.
260.7	1150	500	WABQ	Philadelphia, Pa.
260.7	1150	10	WHBA	Oil City, Pa.
260.7	1150	250	WNBH	New Bedford, Mass.
260.7	1150	500	WOOD	Grand Rapids, Mich.
260.7	1150	1000	WRHM	Minneapolis, Minn.
263	1140	50	KFPW	Carterville, Mo.
263	1140	500	KGEF	Los Angeles, Calif.
263	1140	10	KGEK	Yuma, Colo.
263	1140	250	WDAG	Amarillo, Tex.
263	1140	500	WDGY	Minneapolis, Minn.
263	1140	5000	WJAZ	Chicago, Ill.
263	1140	150	WJBI	Red Bank, N. J.
263	1140	100	WJBO	New Orleans, La.
263	1140	5000	WMBI	Chicago, Ill.
263	1140	500	WSEA	Virginia Beach, Va.
263	1140	500	WTAR	Norfolk, Va.
265.3	1130	15	KKP	Seattle, Wash.
265.3	1130	2000	KTSA	San Antonio, Tex.
265.3	1130	100	WDEL	Wilmington, Del.
265.3	1130	500	WHK	Cleveland, Ohio
265.3	1130	1000	WNOX	Knoxville, Tenn.
265.3	1130	2500	WOI	Ames, Iowa
267.7	1120	100	KFIZ	Fond du Lac, Wis.
267.7	1120	100	KFLV	Rockford, Ill.
267.7	1120	500	KFWI	San Francisco, Calif.
267.7	1120	250	KLZ	Denver, Colo.
267.7	1120	1000	KSBA	Shreveport, La.
267.7	1120	25	WAAD	Cincinnati, Ohio
267.7	1120	100	WBAO	Decatur, Ill.
267.7	1120	100	WBKN	Brooklyn, N. Y.
267.7	1120	100	WBMS	Union City, N. J.
267.7	1120	500	WDAE	Tampa, Fla.
267.7	1120	100	WIBI	Flushing, N. Y.
267.7	1120	30	WLAP	Louisville, Ky.
267.7	1120	150	WOBU	Charleston, W. Va.
267.7	1120	100	WWRL	Woodside, N. Y.
270.1	1110	100	KFLX	Galveston, Tex.
270.1	1110	1500	KLDS	Independence, Mo.
270.1	1110	500	KOAC	Corvallis, Ore.
270.1	1110	500	KQV	Pittsburgh, Pa.
270.1	1110	500	WGST	Atlanta, Ga.
270.1	1110	500	WHAD	Milwaukee, Wis.
270.1	1110	500	WJAS	Pittsburgh, Pa.
270.1	1110	500	WMAZ	Macon, Ga.
270.1	1110	250	WSOE	Milwaukee, Wis.
270.1	1110	200	WTHS	Atlanta, Ga.
272.6	1100	750	KFJF	Oklahoma City, Okla.
272.6	1100	100	KSMR	Santa Maria, Cal.
272.6	1100	500	WBAA	West Lafayette, Ind.
272.6	1100	100	WFBJ	Collegeville, Minn.
272.6	1100	750	WHAR	Atlantic City, N. J.
272.6	1100	5000	WPG	Atlantic City, N. J.
272.6	1100	500	WRM	Urbana, Ill.
275.1	1090	50	KFBB	Havre, Mont.
275.1	1090	250	WFBM	Indianapolis, Ind.
275.1	1090	15	KFPL	Dublin, Tex.
275.1	1090	500	KFSG	Los Angeles, Calif.
275.1	1090	3500	WTAS	Batavia, Ill.
275.1	1090	100	WWL	New Orleans, La.
277.6	1080	2000	KOIL	Council Bluffs, Iowa
277.6	1080	500	KWWG	Brownsville, Tex.

Meters	Kilocycles	Power	Call Letters	Location
277.6	1080	500	KXA	Seattle, Wash.
277.6	1080	100	WDZ	Tuscola, Ill.
277.6	1080	10	WGBC	Memphis, Tenn.
277.6	1080	5000	WHAM	Rochester, N. Y.
280.2	1070	500	KTAB	Oakland, Calif.
280.2	1070	100	WFBG	Altoona, Pa.
280.2	1070	500	WFIW	Hopkinsville, Ky.
280.2	1070	500	WGCP	Newark, N. J.
280.2	1070	500	WNJ	Newark, N. J.
280.2	1070	100	WTAL	Toledo, Ohio
282 8	1060	100	KFJR	Portland, Ore.
282 8	1060	500	KFXF	Denver, Colo.
282 8	1060	50	KTBR	Portland, Ore.
282.8	1060	5000	WAIU	Columbus, Ohio
282.8	1060	750	WEAO	Columbus, Ohio
282.8	1060	500	WDRC	New Haven, Conn.
282.8	1060	50	WRAK	Escanaba, Mich.
285.5	1050	2000	KFAU	Boise, Idaho
285.5	1050	250	KFOY	St. Paul, Minn.
285.5	1050	50	KLCN	Blytheville, Ark.
285.5	1050	5000	WBAL	Baltimore, Md.
285.5	1050	250	WJAG	Norfolk, Nebr.
285.5	1050	500	WKAR	East Lansing, Mich.
285.5	1050	250	WOAN	Lawrenceburg, Tenn.
288.3	1040	100	KGBX	St. Joseph, Mo.
288.3	1040	500	KTBI	Los Angeles, Cal.
288.3	1040	250	WBCN	Chicago, Ill.
288.3	1040	500	WBET	Boston, Mass.
288.3	1040	500	WDBO	Orlando, Fla.
288.3	1040	500	WENR	Chicago, Ill.
288.3	1040	100	WIAD	Philadelphia, Pa.
288.3	1040	150	WKY	Oklahoma City, Okla.
288.3	1040	100	WNAT	Philadelphia, Pa.
288.3	1040	1000	WSSH	Boston, Mass.
293.9	1020	250	KGCH	Wayne, Nebr.
293.9	1020	500	KPRC	Houston, Tex.
293.9	1020	500	WGL	New York, N. Y.
293.9	1020	500	WLBW	Oil City, Pa.
293.9	1020	1000	WODA	Paterson, N. J.
293.9	1020	1000	WTMJ	Milwaukee, Wis.
296.9	1010	500	KQW	San Jose, Cal.
296.9	1010	500	KUOA	Fayetteville, Ark.
296.9	1010	500	WADC	Akron, Ohio
296.9	1010	100	WBES	Takoma Park, Md.
296.9	1010	100	WEPS	Gloucester, Mass.
296.9	1010	10	WHBN	St. Petersburg, Fla.
296.9	1010	200	WSMK	Dayton, Ohio
296.9	1010	1000	WWNC	Asheville, N. C.
299.8	1000	250	KFWO	Avalon, Catalina Is., Cal.
299.8	1000	10	KGFW	Ravenna, Nebr.
299.8	1000	5000	KMOX	St. Louis, Mo.
299.8	1000	500	KOWW	Walla Walla, Wash.
299.8	1000	500	WBAK	Harrisburg, Pa.
299.8	1000	500	WPSC	State College, Pa.
302.8	990	1000	KSL	Salt Lake City, Utah
302.8	990	100	WBIS	Boston, Mass.
302.8	990	750	WGR	Buffalo, N. Y.
302.8	990	250	WMAL	Washington, D. C.
302.8	990	250	WNAX	Yankton, S. D.
302.8	990	5000	WOAI	San Antonio, Tex.
305.9	980	1000	KOMO	Seattle, Wash.
305.9	980	15000	WGN	Chicago, Ill.
305.9	980	500	WLIB	Chicago, Ill.
309.1	970	2000	KFAB	Lincoln, Nebr.
309.1	970	500	KYA	San Francisco, Cal.
309.1	970	500	WPCH	New York, N. Y.
309.1	970	500	WRNY	New York, N. Y.
309.1	970	500	WTAW	College Station, Tex.
315.6	950	50000	KDKA	East Pittsburgh, Pa.
315.6	950	1000	KPSN	Pasadena, Cal.
319	940	1000	KOIN	Portland, Ore.
319	940	1000	WAPI	Auburn, Ala.
319	940	500	WEAN	Providence, R. I.
319	940	750	WGHP	Mt. Clemens, Mich.
319	940	750	WHA	Madison, Wis.
319	940	1000	WLBL	Madison, Wis.
322.4	930	50	WJBA	Joliet, Ill.
322.4	930	50	WKBI	Chicago, Ill.
322.4	930	15	WKDR	Kenosha, Wis.
322.4	930	15	WLBR	Belvidere, Ill.
322.4	930	50	WLBT	Crown Point, Ind.
322.4	930	750	WQAM	Miami, Fla.
322.4	930	150	WRHF	Washington, D. C.
322.4	930	50	WRRS	Racine, Wis.
322.4	930	500	WSMB	New Orleans, La.
322.4	930	50	WTAX	Streator, Ill.
325.9	920	1000	KFQB	Fort Worth, Tex.
325.9	920	5000	KOA	Denver, Colo.
325.9	920	2500	WABC	New York, N. Y.
325.9	920	500	WBOQ	New York, N. Y.
333.1	900	100	KFJM	Grand Forks, N. D.
333.1	900	500	KSAC	Manhattan, Kans.
333.1	900	250	KSEI	Pocatello, Idaho
333.1	900	15000	WBZ	Springfield, Mass.
333.1	900	500	WBZA	Boston, Mass.
336.9	890	500	KNX	Los Angeles, Calif.
336.9	890	500	WCAU	Philadelphia, Pa.
336.9	890	500	WHB	Kansas City, Mo.
336.9	890	1000	WJAX	Jacksonville, Fla.
336.9	890	250	WOQ	Kansas City, Mo.
340.7	880	50	WCAZ	Carthage, Ill.
340.7	880	100	WRAV	Yellow Springs, Ohio
340.7	880	5000	WSM	Nashville, Tenn.
344.6	870	50	KWG	Stockton, Calif.
344.6	870	5000	WCBD	Zion, Ill.
344.6	870	250	WJBB	St. Petersburg, Fla.
344.6	870	5000	WLS	Chicago, Ill.
348.6	860	2500	KJR	Seattle, Wash.
348.6	860	1000	KVOO	Tulsa, Okla.
348.6	860	500	WAAM	Newark, N. J.
348.6	860	300	WAAW	Omaha, Neb.
348.6	860	500	WGBS	New York, N. Y.
352.7	850	250	KWCR	Cedar Rapids, Iowa
352.7	850	5	KWTC	Santa Ana, Calif.
352.7	850	1000	WEW	St. Louis, Mo.
352.7	850	250	WJAM	Cedar Rapids, Iowa
352.7	850	500	WNAC	Boston, Mass.

Meters	Kilocycles	Power	Call Letters	Location
352.7	850	500	WRR	Dallas, Tex.
352.7	850	1000	WWJ	Detroit, Mich.
361.2	830	500	KFWB	Los Angeles, Calif.
361.2	830	250	WDAY	Fargo, N. D.
361.2	830	500	WDWM	Asbury Park, N. J.
361.2	830	5000	WSAI	Cincinnati, Ohio
365.6	820	50	KMJ	Fresno, Calif.
365.6	820	500	WCAD	Canton, N. Y.
365.6	820	2000	WEBH	Chicago, Ill.
365.6	820	500	WFLA	Clearwater, Fla.
365.6	820	1000	WJJD	Mooseheart, Ill.
370.2	810	1000	KHQ	Spokane, Wash.
370.2	810	1000	WDAF	Kansas City, Mo.
370.2	810	5000	WLWL	New York, N. Y.
370.2	810	500	WMCA	New York, N. Y.
374.8	800	500	KNRC	Santa Monica, Calif.
374.8	800	500	KUOM	Missoula, Mont.
374.8	800	5000	WOC	Davenport, Iowa
374.8	800	500	WDWF	Cranston, R. I.
374.8	800	100	WFDF	Flint, Mich.
374.8	800	500	WSKC	Bay City, Mich.
379.5	790	500	KMMJ	Clay Center, Nebr.
379.5	790	500	WCAJ	Lincoln, Nebr.
379.5	790	50000	WGY	So. Schenectady, N. Y.
379.5	790	500	WHAZ	Troy, N. Y.
384.4	780	5000	KGO	Oakland, Calif.
384.4	780	1000	KTHS	Hot Spgs. Natl. Pk., Ark.
384.4	780	100	WBSO	Wellesley Hills, Mass.
384.4	780	250	WCAO	Baltimore, Md.
384.4	780	100	WCBM	Baltimore, Md.
384.4	780	500	WLSI	Cranston, R. I.
384.4	780	500	WMBF	Miami Beach, Fla.
384.4	780	100	WSRO	Middletown, Ohio
389.4	770	500	WAAF	Chicago, Ill.
389.4	770	100	WABI	Bangor, Me.
389.4	770	5000	WBBM	Chicago, Ill.
389.4	770	500	WJBT	Chicago, Ill.
389.4	770	250	WWVA	Wheeling, W. Va.
394.5	760	500	KFDY	Brookings, S. D.
394.5	760	1000	KMA	Shenandoah, Iowa
394.5	760	5000	KOB	State College, N. Mex.
394.5	760	1000	KTW	Seattle, Wash.
394.5	760	1000	KWKH	Shreveport, La.
394.5	760	500	KWSC	Pullman, Wash.
394.5	760	500	WHN	New York, N. Y.
394.5	760	500	WPAP	Cliffside, N. J.
394.5	760	500	WQAO	Cliffside, N. J.
399.8	750	200	KFKA	Greeley, Colo.
399.8	750	1000	WEAR	Cleveland, Ohio
399.8	750	3500	WTAM	Cleveland, Ohio
405.2	740	500	KHJ	Los Angeles, Calif.
405.2	740	5000	WCCO	St. Paul-Minneap., Minn.
405.2	740	500	WFI	Philadelphia, Pa.
405.2	740	500	WLIT	Philadelphia, Pa.
416.4	720	5000	WHT	Chicago, Ill.
416.4	720	5000	WIBO	Chicago, Ill.
416.4	720	5000	WORD	Chicago, Ill.
416.4	720	500	WPTF	Raleigh, N. C.
422.3	710	1000	KPO	San Francisco, Calif.
422.3	710	5000	WOR	Newark, N. J.
422.3	710	500	WSUI	Iowa City, Iowa
428.3	700	500	KFBU	Laramie, Wyo.
428.3	700	500	WCSH	Portland, Me.
428.3	700	5000	WLW	Cincinnati, Ohio
428.3	700	500	WMAF	South Dartmouth, Mass.
440.9	680	100	KFJY	Fort Dodge, Ia.
440.9	680	100	KFMR	Sioux City, Iowa
440.9	680	500	KFSD	San Diego, Calif.
440.9	680	5000	WCX	Pontiac, Mich.
440.9	680	50	WIBG	Elkins Park, Pa.
440.9	680	5000	WJR	Detroit, Mich.
447.5	670	1000	KFOA	Seattle, Wash.
447.5	670	500	WEEI	Boston, Mass.
447.5	670	500	WJAD	Waco, Tex.
447.5	670	1000	WMAQ	Chicago, Ill.
447.5	670	500	WQJ	Chicago, Ill.
454.3	660	1000	KFRC	San Francisco, Calif.
454.3	660	30000	WJZ	New York, N. Y.
461.3	650	2000	KFNF	Shenandoah, Iowa
461.3	650	500	KRLD	Dallas, Tex.
461.3	650	500	WBRL	Tilton, N. H.
461.3	650	500	WHAS	Louisville, Ky.
468.5	640	5000	KFI	Los Angeles, Calif.
468.5	640	500	WOS	Jefferson City, Mo.
468.5	640	500	WRC	Washington, D. C.
475.9	630	100	KICK	Atlantic, Iowa
475.9	630	250	KOW	Denver, Colo.
475.9	630	100	WIAS	Burlington, Iowa
475.9	630	1000	WSB	Atlanta, Ga.
483.6	620	500	KFDM	Beaumont, Tex.
483.6	620	250	KUSD	Vermillion, S. D.
483.6	620	1500	WCFL	Chicago, Ill.
483.6	620	250	WEAI	Ithaca, N. Y.
483.6	620	1000	WEMC	Berrien Springs, Mich.
483.6	620	500	WJAR	Providence, R. I.
483.6	620	100	WLTS	Chicago, Ill.
491.5	610	1000	KGW	Portland, Ore.
491.5	610	50000	WEAF	New York, N. Y.
499.7	600	50	KFUT	Salt Lake City, Utah
499.7	600	1500	WBAP	Fort Worth, Tex.
499.7	600	75	WBBY	Charleston, S. C.
499.7	600	500	WFAA	Dallas, Tex.
508.2	590	500	KLX	Oakland, Calif.
508.2	590	500	WIP	Philadelphia, Pa.
508.2	590	500	WOO	Philadelphia, Pa.
508.2	590	1000	WOW	Omaha, Nebr.
516.9	580	500	WCAE	Pittsburgh, Pa.
516.9	580	500	WMC	Memphis, Tenn.
516.9	580	500	WTAG	Worcester, Mass.
526	570	500	KMTR	Hollywood, Calif.
526	570	2500	KYW	Chicago, Ill.
526	570	500	WNYC	New York, N. Y.
535.4	560	100	KFBK	Sacramento, Calif.
535.4	560	500	WCAC	Mansfield, Conn.
535.4	560	250	WCAH	Columbus, Ohio
535.4	560	5000	WHO	Des Moines, Iowa
535.4	560	500	WTIC	Hartford, Conn.
545.1	550	500	KSD	St. Louis, Mo.
545.1	550	750	WMAK	Lockport, N. Y.

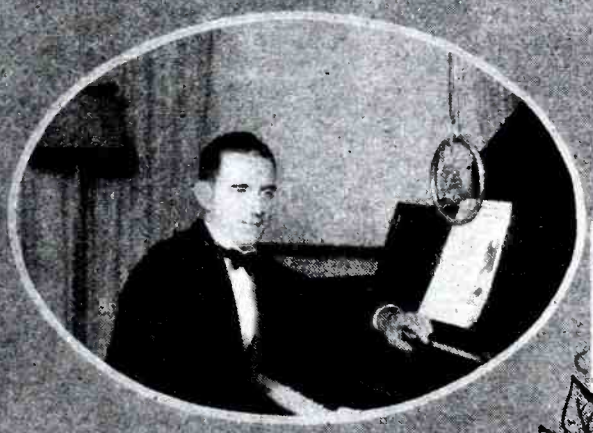
This list has been corrected up to and including November 1st, 1927



"THE ARIONS"
WRVA
RICHMOND, VA.

"BILL" RAY
ASS'T MANAGER
KFWB
HOLLYWOOD, CAL.

MILDRED
HUNT
WHN
NEW YORK, N.Y.

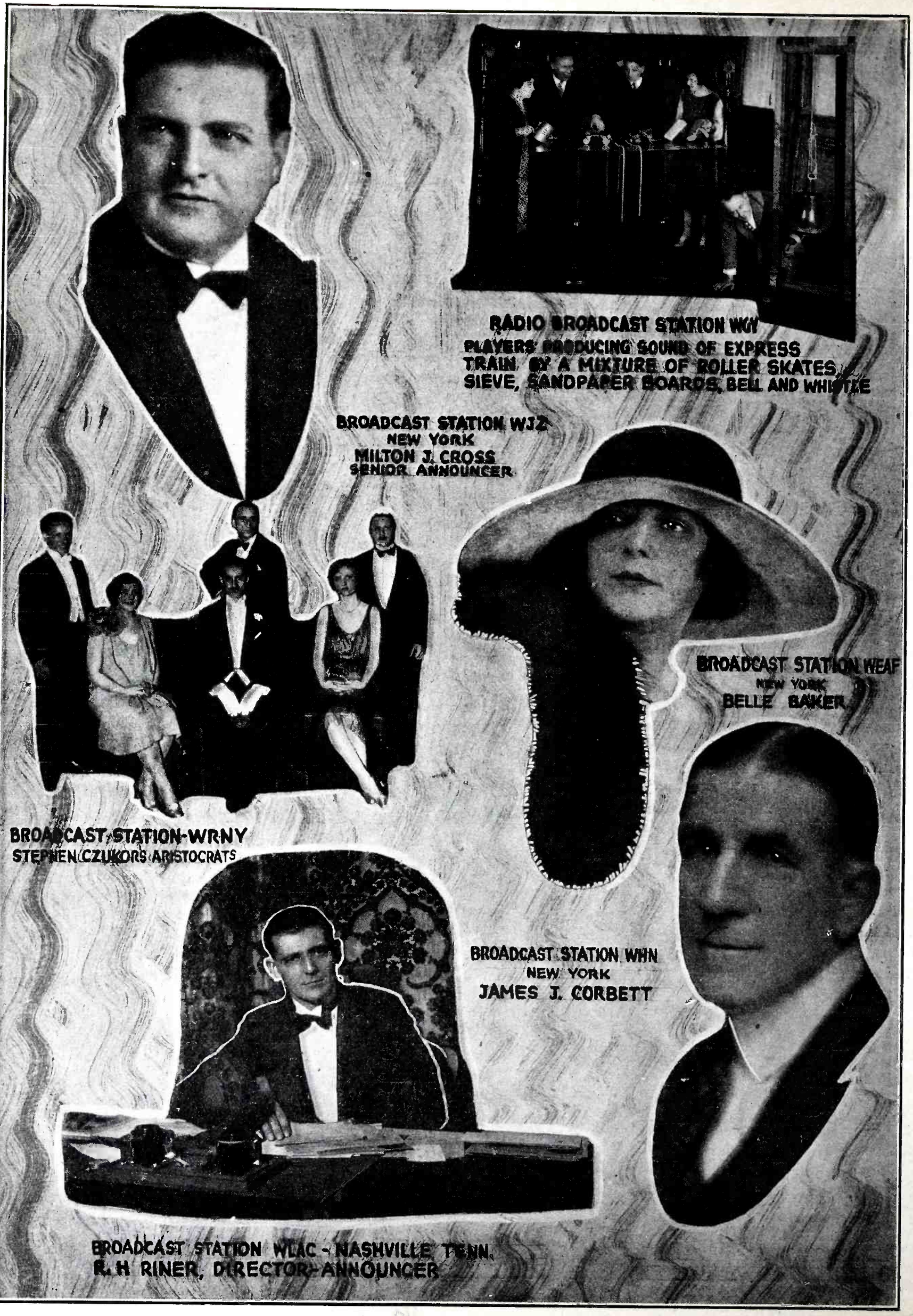


AUDITION HOUR
KMOX
ST. LOUIS, MO.

E. JONES
PIANIST
WTAM
CLEVE, OHIO.

MEL DIX
ASST. ANNOUCER
KMOX
ST. LOUIS, MO

HENRY FIELD
KFNF
SHENANDOAH
IOWA



RADIO BROADCAST STATIONS OF THE UNITED STATES

By States and Cities

State and City	Call Letters	Wave Length	Power
ALABAMA			
Auburn	WAPI	319	1000
Birmingham	WBRC	243.8	250
Birmingham	WKBC	218.8	10
Gadsden	WJBY	234.2	50
Montgomery	WIBZ	230.6	15
ARIZONA			
Flagstaff	KFXY	205.4	25
Phoenix	KFAD	272.6	500
Phoenix	KFCB	243.8	125
Prescott	KPJM	214.2	15
Tucson	KGAR	234.2	100
ARKANSAS			
Blytheville	KLCN	285	50
Fayetteville	KUOA	296.9	500
Hot Springs National Park	KTHS	384.4	1000
CALIFORNIA			
Alma (Holy City)	KFQU	249.9	100
Avalon, Catalina Island	KFWO	299.8	250
Berkeley	KRE	256.3	100
Burbank	KELW	228.9	500
El Centro	KGEN	225.4	15
Eureka	KFWH	254.1	100
Fresno	KMJ	365.6	50
Hollywood	KFQZ	232.4	100
Hollywood	KMTR	526	500
Inglewood	KGGM	204	100
Inglewood	KMIC	223.7	250
La Crescenta	KGFH	223.7	250
Long Beach	KFON	241.8	500
Long Beach	KGER	215.7	100
Los Angeles	KFI	468.5	5000
Los Angeles	KFPR	232.4	250
Los Angeles	KFSG	275.1	500
Los Angeles	KFWB	361.2	500
Los Angeles	KGEF	263	500
Los Angeles	KGFJ	208.2	100
Los Angeles	KHJ	405.2	500
Los Angeles	KNX	336.9	500
Los Angeles	KPLA	252	500
Los Angeles	KRLO	215.7	250
Los Angeles	KTBI	288.3	500
Lower Lake	KFEU	227.1	50
Oakland	KFUS	256.3	50
Oakland	KFWM	236.1	500
Oakland	KGO	384.4	5000
Oakland	KLS	245.8	250
Oakland	KLX	508.2	500
Oakland	KTAB	280.2	500
Oakland	KZM	245.8	100
Pasadena	KPPC	228.9	50
Pasadena	KPSN	315.6	1000
Sacramento	KFBK	535.4	100
San Bernardino	KFWC	222.1	100
San Diego	KFBC	247.8	1210
San Diego	KFSD	440.9	500
San Francisco	KFRC	454.3	1000
San Francisco	KFWI	267.7	500
San Francisco	KGTT	206.8	50
San Francisco	KJBS	220.4	50
San Francisco	KPO	422.3	1000
San Francisco	KYA	309.1	5000
San Jose	KQW	296.9	500
Santa Ana	KWTC	352.7	5
Santa Barbara	KFCR	211.1	50
Santa Maria	KSMR	272.6	100
Santa Monica	KNRC	374.8	500
Stockton	KGDM	217.3	10
Stockton	KWG	344.6	50
Venice	KFVD	208.2	250
Yuba City	KGFM	211.1	15
COLORADO			
Colorado Springs	KFUM	236.1	100
Denver	KFEL	247.8	250
Denver	KFUP	227.1	100
Denver	KFXF	282.8	500
Denver	KGEY	201.2	15
Denver	KLZ	267.7	250
Denver	KOA	325.9	5000
Denver	KOW	475.9	250
Durango	KOLO	199.9	5
Edgewater	KFXJ	215.7	15
Fort Morgan	KGEW	218.8	10
Greeley	KFKA	399.8	200
Gunnison	KFHA	254.1	50
Trinidad	KGFL	222.1	50
Yuma	KGEK	263	10
CONNECTICUT			
Bridgeport	WICC	214.2	500
Danbury	WCWS	214.2	100
Hartford	WTIC	535.4	500
Mansfield	WCAC	535.4	500
New Haven	WDRC	282.8	500
DELAWARE			
Wilmington	WDEL	265.3	100
DISTRICT OF COLUMBIA			
Washington	WMAL	302.8	250
Washington	WRC	468.5	500
Washington	WRHF	322.4	150

State and City	Call Letters	Wave Length	Power
FLORIDA			
Clearwater	WFLA	365.6	500
Jacksonville	WJAX	336.9	1000
Lakeland	WMBL	228.9	50
Miami Beach	WIOD	247.8	1000
Miami Beach	WMBF	384.4	500
Miami	WQAM	322.4	750
Orlando	WDBO	288.3	500
Pensacola	WCOA	249.9	500
St. Petersburg	WHBN	296.9	10
St. Petersburg	WJBB	344.6	250
Tampa	WDAE	267.7	500
Tampa	WMBR	252	100
GEORGIA			
Atlanta	WGST	270.1	500
Atlanta	WSB	475.9	1000
Atlanta	WTHS	270.1	200
Macon	WMAZ	270.1	500
Toccoa	WTFI	209.7	250
IDAHO			
Boise	KFAU	285.5	2000
Jerome	KFXD	204	15
Kellogg	KFEY	232.4	10
Pocatello	KSEI	333.1	250
ILLINOIS			
Atwood	WLBQ	202.6	25
Batavia	WTAS	275.1	3500
Belvidere	WLBR	322.4	15
Bloomington	WNBL	199.9	15
Carthage	WCAZ	340.7	50
Chicago	KYW	526	2500
Chicago	WAAF	389.4	500
Chicago	WBBM	389.4	5000
Chicago	WBBZ	204	100
Chicago	WBCN	288.3	250
Chicago	WCFL	483.6	1500
Chicago	WCRW	223.7	500
Chicago	WEBH	365.6	2000
Chicago	WEDC	241.8	500
Chicago	WENR	288.3	500
Chicago	WFKB	223.7	500
Chicago	WGES	241.8	500
Chicago	WGN	305.9	15000
Chicago	WHBL	204	100
Chicago	WHBM	201.2	100
Chicago	WHFC	215.7	200
Chicago	WHT	416.4	5000
Chicago	WIBJ	201.2	100
Chicago	WIBM	201.2	100
Chicago	WIBO	416.4	5000
Chicago	WJAZ	263	5000
Chicago	WJBT	389.4	500
Chicago	WKBG	201.2	100
Chicago	WKBI	322.4	50
Chicago	WLBN	204	50
Chicago	WLIB	305.9	500
Chicago	WLS	344.6	5000
Chicago	WLTS	483.6	100
Chicago	WMAQ	447.5	1000
Chicago	WMBB	252	5000
Chicago	WMBH	204	100
Chicago	WMBI	266	5000
Chicago	WOK	252	5000
Chicago	WORD	416.4	5000
Chicago	WPCC	223.7	500
Chicago	WQJ	447.5	500
Chicago	WSAX	204	100
Chicago	WSBC	232.4	500
Chicago	WWAE	227.1	500
Chicago Heights	WJBZ	208.2	100
Decatur	WBAO	267.7	100
Decatur	WJBL	212.6	250
East Wenona	WLBI	238	250
Evanston	WEHS	215.7	100
Forest Park	WNBA	208.2	200
Galesburg	WFBZ	247.8	50
Galesburg	WKBS	217.3	100
Galesburg	WLBO	217.3	100
Galesburg	WRAM	247.8	50
Harrisburg	WEBQ	223.7	15
Joliet	WCLS	215.7	150
Joliet	WJBA	322.4	50
Joliet	WKBB	215.7	150
LaSalle	WJBC	227.1	100
Mooseheart	WJJD	365.6	1000
Peoria Heights	WMBD	205.4	250
Quincy	WTAD	236.1	250
Rockford	KFLV	267.7	100
Rock Island	WHBF	222.1	100
Springfield	WCBS	209.7	250
Streator	WTAX	322.4	50
Tuscola	WDZ	277.6	100
Urbana	WRM	272.6	500
Waukegan	WPEP	215.7	250
Zion	WCBD	344.6	5000
INDIANA			
Anderson	WHBU	220.4	15
Brookville	WKBV	217.3	100
Culver	WCMA	258.5	250
Crown Point	WLBT	322.4	50
Evansville	WGBF	236.1	250
Fort Wayne	WCWK	214.2	250
Fort Wayne	WOWO	228.9	2500
Gary	WJKS	232.4	500
Indianapolis	WFBM	275.1	250
Indianapolis	WKBF	252	500
Kokomo	WJAK	234.2	50
Lafayette	WBAA	272.6	500
Laporte	WRAF	208.2	100
Muncie	WLBC	209.7	50
South Bend	WSBT	238	500
Terre Haute	KGFO	204	100
Terre Haute	WRPI	208.2	100
Valparaiso	WRBC	238	250
IOWA			
Ames	WOI	265.3	2500
Atlantic	KICK	475.9	100
Boone	KFGQ	209.7	10

State and City	Call Letters	Wave Length	Power
IOWA—Con.			
Burlington	WIAS	475.9	100
Cedar Rapids	KWCR	352.7	250
Cedar Rapids	WJAM	352.7	250
Clarinda	KSO	227.1	500
Council Bluffs	KOIL	277.6	2000
Cresco	KGDJ	202.6	10
Davenport	WOC	374.8	5000
Decorah	KGCA	247.8	10
Decorah	KWLC	247.8	50
Des Moines	WHO	535.4	5000
Fort Dodge	KFJY	440.9	100
Iowa City	KGFB	223.7	10
Iowa City	WSUI	422.3	500
Le Mars	KWUC	243.8	1500
Marshalltown	KFJB	247.8	100
Muscatine	KPNP	211.1	100
Muscatine	KTNT	256.5	3500
Oskaloosa	KFHL	212.6	10
Shenandoah	KFNF	461.3	2000
Shenandoah	KMA	394.5	1000
Sioux City	KFMR	440.9	100
Sioux City	KSCJ	243.8	500
KANSAS			
Concordia	KGCN	208.2	50
Independence	KFVG	225.4	50
Lawrence	KFKU	254.1	500
Lawrence	WREN	254.1	750
Manhattan	KSAC	333.1	500
Milford	KFKB	241.8	1500
Topeka	WIBW	204	100
Wichita	KFH	245.8	500
KENTUCKY			
Hopkinsville	WFIW	280.2	500
Louisville	WHAS	461.3	500
Louisville	WLAP	267.7	30
LOUISIANA			
Cedar Grove	KGGH	212.6	50
New Orleans	WABZ	247.8	50
New Orleans	WCBE	227.1	5
New Orleans	WJBO	263	100
New Orleans	WJBW	238	30
New Orleans	WKBT	252	50
New Orleans	WSMB	322.4	500
New Orleans	WWL	275.1	100
Shreveport	KFDX	236.1	250
Shreveport	KGDX	212.6	250
Shreveport	KWKH	394.5	1000
Shreveport	KRAC	220.4	50
Shreveport	KSBA	267.7	1000
MAINE			
Bangor	WABI	389.4	100
Dover-Foxcroft	WLBZ	208.2	250
Portland	WCSH	428.3	500
MARYLAND			
Baltimore	WBAL	285.5	5000
Baltimore	WCAO	384.4	250
Baltimore	WCBM	384.4	100
Baltimore	WFBR	253.8	250
Tokoma Park	WBES	296.9	100
MASSACHUSETTS			
Boston	WATT	201.2	100
Boston	WBET	288.3	500
Boston	WBIS	302.8	100
Boston	WBZA	333.1	500
Boston	WEEI	447.5	500
Boston	WLBM	230.6	50
Boston	WMES	211.1	100
Boston	WNAC	352.7	500
Boston	WSSH	288.3	1000
Chelsea	WRSC	211.1	100
Gloucester	WEPS	296.9	100
New Bedford	WNBH	260.7	250
South Dartmouth	WMAF	428.3	500
Springfield	WBZ	333.1	15000
Springfield	WLEX	215.7	5
Taunton	WAIT	214.2	10
Webster	WKBE	228.9	100
Wellesley Hills	WBSO	384.4	100
Wollaston	WRES	217.3	50
Worcester	WTAG	516.9	500
MICHIGAN			
Battle Creek	WKBP	212.6	50
Bay City	WSKC	374.8	500
Berrien Springs	WEMC	483.6	1000
Detroit	WAFD	230.6	100
Detroit	WBMH	211.1	100
Detroit	WJR	440.9	5000
Detroit	WMBC	243.8	100
Detroit	WMCO	218.8	250
Detroit	WWJ	352.7	1000
Escanaba	WRAK	282.8	50
Flint	WFDF	374.8	100
Grand Rapids	WASH	256.3	250
Grand Rapids	WOOD	260.7	500
Iron Mountain	WLBY	209.7	50
East Lansing	WKAR	285.5	500
Lapeer	WMPC	234.2	30
Ludington	WKBZ	199.9	15
Monroe	WKBL	205.4	15
Mt. Clemens	WGHP	319	750
Petoskey	WBBP	239.9	100
Pontiac	WCX	440.9	5000
Royal Oak	WAGM	225.4	50
Ypsilanti	WJBK	220.4	15
MINNESOTA			
Barrett	KGDE	205.4	50
Collegeville	WFBJ	272.6	100
Fairmont	KFVN	228.9	100
Hallock	KGFK	223.7	50
Minneapolis	KFDZ	215.7	10
Minneapolis	KGEQ	202.6	50
Minneapolis	WAMD	225.4	500
Minneapolis	WDGY	263	500
Minneapolis	WGMS	245.8	500
Minneapolis	WHDI	245.8	500

State and City	Call Letters	Wave Length	Power
MINNESOTA—Con.			
Minneapolis	WLB	245.8	500
Minneapolis	WRHM	260.7	1000
Northfield	KFMX	236.1	500
Northfield	WCAL	236.1	500
St. Cloud	WFAM	252	10
St. Paul	KFOY	285.5	250
St. Paul	WMBE	208.2	10
St. Paul-Minneapolis	WCCO	405.2	5000
MISSISSIPPI			
Columbus	WCOC	230.6	250
MISSOURI			
Cape Girardeau	KFVS	223.7	50
Carterville	KFPW	263	50
Columbia	KFRU	249.9	500
Independence	KLDS	270.1	1500
Jefferson City	WOS	468.5	500
Kansas City	KMBC	270.1	1500
Kansas City	KWKC	222.1	100
Kansas City	WDAF	370.2	1000
Kansas City	WHB	336.9	500
Kansas City	WLBF	209.7	50
Kansas City	WOQ	336.9	250
Kirksville	KFKZ	225.4	15
St. Joseph	KFEQ	230.6	1000
St. Joseph	KGBX	288.3	100
St. Louis	KFQA	247.9	50
St. Louis	KFUO	234.2	1500
St. Louis	KFVE	234.2	1000
St. Louis	KFWF	214.2	250
St. Louis	KMOX	299.8	5000
St. Louis	KSD	545.1	500
St. Louis	WEW	352.7	1000
St. Louis	WIL	258.5	250
St. Louis	WMAY	247.8	100
St. Louis	WSBF	258.5	250
MONTANA			
Havre	KFBB	275.1	50
Kalispell	KGEZ	205.4	100
Missoula	KUOM	374.8	500
Vida	KGCX	243.8	10
NEBRASKA			
Central City	KGES	204	10
Clay Center	KMMJ	379.5	500
Grand Island	KGEO	205.4	160
Humboldt	KGDW	206.8	100
Lincoln	KFAB	309.1	2000
Lincoln	KFOR	217.3	100
Norfolk	WJAG	285.5	250
Omaha	KFOX	258.5	100
Omaha	KOCH	258.5	250
Omaha	WAAW	348.6	300
Omaha	WNAL	258.5	250
Omaha	WOW	508.2	1000
Ravenna	KGFW	299.8	10
Shelby	KGBY	202.6	50
University Place	WCAJ	379.5	500
Wayne	KGCH	293.9	250
York	KGBZ	212.6	100
NEW HAMPSHIRE			
Laconia	WKAV	223.7	50
Manchester	WCOM	238	100
Tilton	WBRL	461.3	500
NEW JERSEY			
Asbury Park	WDWM	361.2	500
Atlantic City	WHAR	272.6	750
Atlantic City	WPG	272.6	5000
Camden	WCAM	223.7	500
Cliffside	WCDA	211.1	250
Cliffside	WPAP	394.5	500
Cliffside	WQAO	394.5	500
Elizabeth	WIBS	204	150
Jersey City	WAAT	245.8	500
Jersey City	WKBO	218.8	500
Lambertville	WTAZ	220.4	15
Midland Park	WTRL	206.8	15
Newark	WAAM	348.6	500
Newark	WGCP	280.2	500
Newark	WNJ	280.2	500
Newark	WOR	422.3	5000
North Plainfield	WEAM	239.9	250
Paterson	WODA	293.9	1000
Red Bank	WJBI	263	150
Trenton	WOAX	239.9	500
Union City	WBMS	267.7	100
NEW MEXICO			
State College	KOB	394.5	5000
NEW YORK			
Auburn	WMBO	220.4	100
Bay Shore	WRST	211.1	250
Brooklyn	WARS	227.1	500
Brooklyn	WBBC	227.1	500
Brooklyn	WBKN	267.7	100
Brooklyn	WBRS	211.1	100
Brooklyn	WLTH	256.3	250
Brooklyn	WMBQ	204	100
Brooklyn	WSDA	227.1	500
Buffalo	WEBR	241.8	200
Buffalo	WGR	302.8	750
Buffalo	WKBW	217.3	500
Buffalo	WKEN	204	250
Buffalo	WSVS	205.4	50
Canton	WCAD	365.6	500
Cazenovia	WMAC	225.4	500
Endicott	WNBF	206.8	50
Farmingdale	WLBH	232.4	30
Flushing	WIBI	267.7	100
Freeport	WGBB	245 8	400
Ithaca	WEAI	483.6	250
Ithaca	WLCI	247.8	50
Jamaica	WMRJ	206.8	10
Jamestown	WOCL	223.7	25
Kingston	WDBZ	215.7	50
Lockport	WMAK	545.1	750
Long Island City	WLBX	204	250
Newburgh	WKBM	208.2	100

State and City	Call Letters	Wave Length	Power
EW YORK—Con.			
New York	WABC	325.9	2500
New York	WBNY	236.1	500
New York	WBOQ	325.9	500
New York	WCGU	218.8	500
New York	WEAF	491.5	50000
New York	WEBJ	256.3	500
New York	WEVD	245.8	500
New York	WGBS	348.6	500
New York	WGL	293.9	500
New York	WGMU	201.2	100
New York	WHAP	236.1	1000
New York	WHN	394.5	500
New York	WHPP	206.8	10
New York	WJZ	454.3	30000
New York	WKBQ	218.8	500
New York	WLWL	370.2	5000
New York	WMCA	370.2	500
New York	WMSG	236.1	500
New York	WNYC	526	500
New York	WPCH	309.1	500
New York	WRMU	201.2	100
New York	WRNY	309.1	500
Peekskill	WOKO	215.7	250
Rochester	WABO	254.1	500
Rochester	WHAM	277.6	5000
Rochester	WHEC	232.4	100
Rochester	WNBQ	202.6	15
Rochester	WOKT	209.7	500
Rossville	WBBR	256.3	1000
So. Schenectady	WGY	379.5	50000
Syracuse	WFBL	258.5	750
Syracuse	WSYR	225.4	500
Troy	WHAZ	379.5	500
Utica	WIBX	238	150
Woodside	WWRL	267.7	100
ORTH CAROLINA			
Asheville	WWNC	296.9	1000
Charlotte	WBT	258.5	500
Greensboro	WNRC	223.7	250
Raleigh	WPTF	416.4	500
ORTH DAKOTA			
Aneta	KGFN	199.9	15
Bismarck	KFYR	249.9	250
Devils Lake	KDLR	230.6	15
Fargo	WDAY	361.2	250
Grand Forks	KFJM	333.1	100
Mandan	KGCU	239.9	100
HIO			
Akron	WADC	296.9	500
Ashland	WLBP	202.6	15
Ashtabula	WJPW	208.2	50
Bellefontaine	WHBD	222.1	100
Cambridge	WEBE	247.8	10
Canton	WHBC	236.1	10
Cincinnati	WAAD	267.7	25
Cincinnati	WFBE	245.8	250
Cincinnati	WKRC	245.8	250
Cincinnati	WLW	428.3	5000
Cincinnati	WSAI	361.2	5000
Cleveland	WDBK	227.1	250
Cleveland	WEAR	399.8	1000
Cleveland	WHK	265.3	500
Cleveland	WJAY	227.1	500
Columbus	WAIU	282.8	5000
Columbus	WCAH	535.4	250
Columbus	WEAO	282.8	750
Columbus	WMAN	234.2	50
Dayton	WSMK	296.9	200
Hamilton	WRK	205.4	100
Mansfield	WLBV	206.8	50
Middletown	WSRO	384.4	100
Shelby	WOBR	204	10
Springfield	WCSO	256.3	1000
Steubenville	WIBR	249.9	50
Toledo	WTAL	280.2	100
Wooster	WABW	247.8	50
Yellow Springs	WRAV	340.7	100
Youngstown	WKBN	214.2	50
Youngstown	WMBW	214.2	50
OKLAHOMA			
Alva	KGFF	205.4	25
Chickasha	KOCW	252	250
Norman	WNAD	239.9	500
Oklahoma City	KFJF	272.6	750
Oklahoma City	KFXR	223.7	50
Oklahoma City	KGCB	215.7	50
Oklahoma City	KGFG	215.7	50
Oklahoma City	WKY	288.3	150
Picher	KGGF	206.8	100
Tulsa	KVOO	348.6	1000
OREGON			
Astoria	KFJI	249.9	15
Corvallis	KOAC	270.1	500
Eugene	KGEH	201.2	50
Medford	KMED	249.9	50
Portland	KEX	239.9	2500
Portland	KFEC	214.2	50
Portland	KFIF	214.2	50
Portland	KFJR	282.8	100
Portland	KGW	491.5	1000
Portland	KLIT	206.8	10
Portland	KOIN	319	1000
Portland	KTBR	282.8	50
Portland	KWBS	199.9	15
Portland	KWJJ	228.9	50
Portland	KXL	220.4	50
PENNSYLVANIA			
Allentown	WCBA	222.1	100
Allentown	WSAN	222.1	100
Altoona	WFBG	280.2	100
Bethayres	WALK	201.2	50
Carbondale	WNBW	258.5	5
E. Pittsburgh	KDKA	315.6	50000
Elkins Park	WIBG	440.9	50

State and City	Call Letters	Wave Length	Power
PENNSYLVANIA—Con.			
Grove City	WSAJ	223.7	250
Harrisburg	WBAK	299.8	500
Harrisburg	WMBS	234.2	250
Harrisburg	WPRC	209.7	100
Jeannette	WGM	208.2	50
Johnstown	WHBP	228.9	250
Lancaster	WGAL	252	15
Lancaster	WKJC	252	50
Lewisburg	WJBU	214.2	100
Monessen	WMBJ	232.4	50
New Castle	WKBU	204	50
Oil City	WHBA	260.7	10
Oil City	WLBW	293.9	500
Parkesburg	WQAA	215.7	500
Philadelphia	WABQ	260.7	500
Philadelphia	WABY	247.8	50
Philadelphia	WCAU	336.9	500
Philadelphia	WFI	405.2	500
Philadelphia	WFKD	247.8	50
Philadelphia	WHBW	220.4	100
Philadelphia	WIAD	288.3	100
Philadelphia	WIP	508.2	500
Philadelphia	WLIT	405.2	500
Philadelphia	WNAT	288.3	100
Philadelphia	WOO	508.2	500
Philadelphia	WPSW	202.6	50
Philadelphia	WRAX	212.6	250
Pittsburgh	KQV	270.1	500
Pittsburgh	WCAE	516.9	500
Pittsburgh	WJAS	270.1	500
Pringleboro	WABF	205.4	250
Reading	WRAW	238	100
Scranton	WGBI	230.6	250
Scranton	WQAN	230.6	250
State College	WPSC	299.8	500
Washington	WNBO	211.1	15
Wilkes-Barre	WBAX	249.9	100
Wilkes-Barre	WBRE	249.9	100
RHODE ISLAND			
Cranston	WDWF	374.8	500
Cranston	WLSI	384.4	500
Newport	WMBA	204	100
Olneyville	WCOT	225.4	100
Pawtucket	WFCI	241.8	100
Portsmouth	WSAR	252	100
Providence	WCBR	201.2	100
Providence	WEAN	319	500
Providence	WJAR	483.6	500
Providence	WRAH	199.9	250
SOUTH CAROLINA			
Charleston	WBBY	499.7	75
SOUTH DAKOTA			
Brookings	KFDY	394.5	500
Brookings	KGCR	208.2	15
Dell Rapids	KGDA	254.1	15
Mitchell	KGFP	212.6	10
Oldham	KGDY	206.8	15
Pierre	KGFX	254.1	200
Rapid City	WCAT	247.8	100
Sioux Falls	KSOO	209.7	250
Vermillion	KUSD	483.6	250
Yankton	WNAX	302.8	250
TENNESSEE			
Chattanooga	WDOD	245.8	500
Knoxville	WFBC	234.2	50
Knoxville	WNBJ	206.8	50
Knoxville	WNOX	265.3	1000
Lawrenceburg	WOAN	285.5	250
Memphis	WGBC	277.6	10
Memphis	WHBQ	232.4	100
Memphis	WMBM	209.7	10
Memphis	WMC	516.9	500
Memphis	WNBR	228.9	20
Memphis	WREC	254.1	50
Nashville	WBAW	247.8	100
Nashville	WDAD	225.4	1000
Nashville	WLAC	225.4	1000
Nashville	WSM	340.7	5000
Springfield	WSIX	212.6	150
Union City	WOBT	205.4	15
TEXAS			
Amarillo	KGRS	243.8	150
Amarillo	WDAG	263	250
Austin	KUT	232.4	500
Beaumont	KFDM	483.6	500
Breckenridge	KFYO	211.1	15
Brownsville	KWWG	277.6	500
College Station	WTAW	309.1	500
Dallas	KRLD	461.3	500
Dallas	WFAA	499.7	500
Dallas	WRR	352.7	500
Dublin	KFPL	275.1	15
El Paso	KFXH	241.8	100
El Paso	WDAH	234.2	100
Fort Worth	KFJZ	249.9	50
Fort Worth	KFQB	325.9	1000
Fort Worth	WBAP	499.7	1500
Galveston	KFLX	270.1	100
Galveston	KFUL	258.5	500
Greenville	KFPM	230.6	15
Houston	KFVI	238	50
Houston	KPRC	293.9	500
Houston	KTUE	212.6	5
San Angelo	KGFI	220.4	15
San Benito	KHMC	236.1	15
San Antonio	KGCI	220.4	15
San Antonio	KGDR	202.6	15
San Antonio	KGRC	220.4	50
San Antonio	KTAP	228.9	20
San Antonio	KTSA	265.3	2000
San Antonio	WOAI	302.8	5000
Waco	WJAD	447.5	500
UTAH			
Ogden	KFUR	225.4	50
Salt Lake City	KDYL	258.5	100

State and City	Call Letters	Wave Length	Power
UTAH—Con.			
Salt Lake City	KFUT	499.7	50
Salt Lake City	KSL	302.8	1000
VERMONT			
Burlington	WCAX	254.1	100
Springfield	WNBX	241.8	10
Springfield	WQAE	249.9	50
VIRGINIA			
Mt. Vernon Hills	WTFF	204	50
Norfolk	WBBW	236.1	50
Norfolk	WRCV	209.7	100
Norfolk	WTAR	263	500
Petersburg	WLBG	214.2	100
Richmond	WBBL	247.8	100
Richmond	WMBG	220.4	15
Richmond	WRVA	254.1	1000
Roanoke	WDBJ	230.6	250
Virginia Beach	WSEA	263	250
WASHINGTON			
Everett	KFBL	223.7	100
Lacey	KGY	243.8	50
Pullman	KWSC	394.5	500
Seattle	KFOA	447.5	1000
Seattle	KFQW	217.3	100
Seattle	KGBS	202.6	100
Seattle	KGCL	230.6	50
Seattle	KJR	348.6	2500
Seattle	KKP	265.3	15
Seattle	KOMO	305.9	1000
Seattle	KPCB	230.6	50
Seattle	KRSC	211.1	50
Seattle	KTW	394.5	1000
Seattle	KUJ	199.9	10
Seattle	KVOS	209.7	50
Seattle	KXA	277.6	500
Seattle	KXRO	227.1	50
Spokane	KFIO	245.8	100
Spokane	KFPY	245.8	250
Spokane	KGA	260.7	2000
Spokane	KHQ	370.2	1000
Tacoma	KMO	254.1	250
Tacoma	KVI	234.2	50
Walla Walla	KOWW	299.8	500
WEST VIRGINIA			
Charleston	WOBU	267.7	50
Huntington	WSAZ	241.8	100
Wheeling	WWVA	389.4	250
WISCONSIN			
Beloit	WEBW	258.5	500
Camp Lake	WCLO	227.1	100
Eau Claire	WTAQ	254.1	500
Fond du Lac	KFIZ	267.7	100
Kenosha	WKDR	322.4	15
La Crosse	WKBH	220.4	500
Madison	WHA	319	750
Madison	WIBA	239.9	100
Manitowoc	WOMT	222.1	50
Milwaukee	WGWB	218.8	500
Milwaukee	WHAD	270.1	500
Milwaukee	WSOE	270.1	250
Milwaukee	WTMJ	293.9	1000
Omro	WJBR	227.1	100
Poynette	WIBU	217.3	20
Racine	WRRS	322.4	50
Stevens Point	WLBL	319	1000
Superior	WEBC	241.8	250
West De Pere	WHBY	249.9	50
WYOMING			
Laramie	KFBU	428.3	500

This list has been corrected up to and including November 1st, 1927

Canadian Radio Broadcast Stations

Indexed Alphabetically by Call Letters

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
CF	**CFAC—Calgary, Alberta**—The Calgary Herald, Herald Bldg	500	434.5	690	Mountain
	CFCA—Toronto, Ont.—Star Publishing & Printing Co., S. W. Cor. Yonge St. and St. Clair Ave	500	356.9	840	Eastern
	CFCF—Montreal, Que.—Canadian Marconi Co., Mount Royal Hotel	1650	410.7	730	Eastern
	CFCH—Iroquois Falls, Ont.—Abitibi Power & Paper Co., Ltd	250	499.7	600	Eastern
	CFCN—Calgary, Alberta—W. W. Grant (Ltd.), 708 Crescent Rd., N. W	1800	434.5	690	Mountain
	CFCQ—Vancouver, B. C.—Sprott-Shaw Radio Co., Bekin Bldg	10	410.7	730	Pacific
	CFCT—Victoria, B. C.—G. W. Deaville, 1405 Douglas St	500	329.5	910	Pacific
	CFCY—Charlottetown, P. E. Island—Island Radio Co., 176 Kent St	100	312.3	960	Atlantic
	CFGC—Brantford, Ont.—The Brant Radio Supply Co., 90 Colborne St	50	296.9	1010	Eastern
	CFJC—Kamloops, B. C.—N. S. Dalgleish & Sons, and Weller & Weller, 186 Victoria St	15	267.7	1120	Pacific
	CFLC—Prescott, Ont.—Radio Assoc. of Prescott, Victoria Hall	50	296.9	1010	Eastern
	CFMC—Kingston, Ont.—Monarch Battery Co., Montreal St	20	267.7	1120	Eastern
	CFNB—Fredericton, N. B.—James S. Neill & Sons, Ltd., 212 Waterloo Row	25	247.8	1210	Atlantic
	CFQC—Saskatoon, Sask.—The Electric Shop, Ltd., 1322 Osler St	500	329.5	910	Mountain
	CFRB—York Co., Ont.—Standard Radio Mfg. Corp., Ltd., Township of King	1000	291.1	1030	Eastern
	CFRC—Kingston, Ont.—Queen's University, Dept. of Electrical Engineering, Fleming Hall, Queen's University	500	267.7	1120	Eastern
	CFYC—Burnaby, B. C.—International Bible Students Assoc., 2243 Royal Oak Ave	500	410.7	730	Pacific
CH	**CHCS—Hamilton, Ont.**—The Hamilton Spectator, Spectator Bldg	10	340.7	880	Eastern
	CHCY—Edmonton, Alberta—Int'l Bible Students Assoc., King Edward Park	250	516.9	580	Mountain
	CHGS—Summerside, P. E. I.—R. T. Holman, Ltd., Holman Bldg	25	267.7	1120	Atlantic
	CHIC—Toronto, Ontario—Northern Electric Co., Ltd., Hillcrest Park. (Uses Station CKNC, Canadian Nat'l Carbon Co., Toronto, Ontario)	500	356.9	840	Eastern
	CHMA—Edmonton, Alberta—Christian & Missionary Alliance, 9618—106A Ave	250	516.9	580	Mountain
	CHML—Mt. Hamilton, Ont.—Maple Leaf Radio Co., Ltd., Yale Avenue	50	340.7	880	Eastern
	CHNC—Toronto, Ont.—Toronto Radio Research Soc., Hillcrest Park. (Uses Station CKNC, Canadian Nat'l Carbon Co., Toronto, Ont)	500	356.9	840	Eastern
	CHNS—Halifax, N. S.—Northern Elec. Co., Carleton Hotel, Cor. Prince and Argyle Sts	100	322.4	930	Atlantic

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
CH	**CHPC—Vancouver, B. C.**—Central Presbyterian Church (Uses Station CKCD)	1000	410.7	730	Pacific
	CHRC—Quebec, Que.—E. Fontaine, 120 Dolbeau St.	5	340.7	880	Eastern
	CHSC—Unity, Sask.—H. N. Stovin & Radio Sales, Main St	50	267.7	1120	Mountain
	CHUC—Saskatoon, Sask.—The International Bible Students Assoc., Cor. Ave. D and 26th St	500	329.5	910	Mountain
	CHWC—Regina, Sask.—R. H. Williams & Sons, Ltd., Cor. Hamilton St. and 11th Ave	15	312.3	960	Mountain
	CHWK—Chilliwack, B. C.—Chilliwack Broadcasting Co., Ltd., Wellington Ave.	5	247.8	1210	Pacific
	CHYC—Montreal, Que.—Northern Electric Co., Ltd., 121 Shearer St	750	410.7	730	Eastern
CJ	**CJBC—Toronto, Ont.**—Jarvis St. Baptist Church. (Uses one of the stations in Toronto City or District.)	500	291.1 356.9	1030 840	Eastern
	CJBR—Regina, Sask.—Saskatchewan Co-operative Wheat Producers, Ltd.	500	312.3	960	Mountain
	CJCA—Edmonton, Alberta—The Edmonton Journal, Ltd., Journal Bldg	500	516.9	580	Mountain
	CJCJ—Calgary, Alberta—Radio Service & Repair Shop, 18th Ave. & 7th St. E	250	434.5	690	Mountain
	CJGC—London, Ont.—London Free Press Printing Co., Ltd. 430 Richmond St.	500	329.5	910	Eastern
	CJGX—Yorkton, Sask.—The Winnipeg Grain Exchange	500	475.9	630	Mountain
	CJOR—Sea Island, B. C.—Geo. C. Chandler	50	291.1	1030	Pacific
	CJRM—Moose Jaw, Sask.—Jas. Richardson & Sons, Ltd., 337 Coteau St. W.	500	296.9	1010	Mountain
	CJSC—Toronto, Ont.—The Evening Telegram. (Uses station CKCL, the Dominion Battery Co., 20 Trinity St., Toronto, Ont.)	500	356.9	840	Eastern
	CJWC—Saskatoon, Sask.—The Wheaton Electric Co., 33d St. and Ave. "C" N.	250	329.5	910	Mountain
	CJYC—Scarboro Station, Ont.—Universal Radio of Canada, Ltd.	500	291.1	1030	Eastern
CK	**CKAC—Montreal, Que.**—La Presse Publishing Co., Ltd., Cor. St. James St. & St. Lawrence Blvd	1200	410.7	730	Eastern
	CKCD—Vancouver, B. C.—Vancouver Daily Province, 142 Hastings St. W.	1000	410.7	730	Pacific
	CKCI—Qubec, Que.—Le "Soleil," Ltd., 120 Dolbeau St.	22½	340.7	880	Eastern
	CKCK—Regina, Sask.—Leader Publishing Co., Ltd	500	312.3	960	Mountain
	CKCL—Toronto, Ont.—Dominion Battery Co., Ltd., 20 Trinity Street	500	356.9	840	Eastern
	CKCO—Ottawa, Ont.—Dr. G. M. Geldert (for Ottawa Radio Assn.), 282 Somerset St. W.	100	434.5	690	Eastern
	CKCR—St. George, Ont.—John Patterson, Main St.	25	257.7	1120	Eastern
	CKCV—Quebec, Que.—G. A. Vandry, 66 St. Joseph St.	50	340.7	880	Eastern
	CKCW—Bowmanville, Ont.—Gooderham & Worts	5000	312.3	960	Eastern
	CKCX—Scarboro Station, Ont.—International Bible Students Assoc. (Uses station CJYC, Universal Radio Co. of Canada, Ltd., Scarboro Station, Ont.)	500	291.1	1030	Eastern
	CKFC—Vancouver, B. C.—United Church of Canada, Cor. Thurlow and Pendrell Sts.	50	410.7	730	Pacific
	CKLC—Red Deer, Alberta—The Alberta Pacific Grain Co., Ltd	1000	356.9	840	Mountain
	CKMC—Cobalt, Ont.—R. L. Mac Adam	5	247.8	1210	Eastern
	CKNC—Toronto, Ont.—Canadian National Carbon Co., Ltd., Hillcrest Park	500	356.9	840	Eastern
	CKOC—Hamilton, Ont.—Wentworth Radio Supply Co., Ltd., Royal Connaught Hotel	100	340.7	880	Eastern
	CKPC—Preston, Ont.—Wallace Russ, 40 Russ Ave.	7½	247.8	1210	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power Watts	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
CK	**CKPR—Midland, Ont.**—E. O. Swan	50	267.7	1120	Eastern
	CKSH—St. Hyacinthe, Que.—City of St. Hyacinthe, Que., Mondor and Cascades Sts	50	312.3	960	Eastern
	CKSM—Toronto, Ont.—St. Michael's Cathedral (Uses station CFRB, Standard Radio Mfg. Corp. Ltd.)	1000	291.1	1030	Eastern
	CKUA—Edmonton, Alberta—University of Alberta	500	516.9	580	Mountain
	CKWX—Vancouver, B. C.—A. Holstead & Wm. Hanlon, 1220 Seymour St	50	410.7	730	Pacific
	CKY—Winnipeg, Manitoba—Manitoba Telephone System, Sherbrooke St	500	384.4	780	Central
CN	**CNRA—Moncton, N. B.**—Canadian National Railways.	500	322.4	930	Atlantic
	CNRC—Calgary, Alberta—Canadian National Railways (Uses station CFAC, Calgary Herald, Calgary, or station CFCN, W. W. Grant, Ltd., Calgary).	500	434.5	690	Mountain
	CNRE—Edmonton, Alberta—Canadian National Railways. (Uses station CJCA, Edmonton Journal Ltd., Edmonton, Alberta)	500	516.9	580	Mountain
	CNRM—Montreal, Que.—Canadian National Railways. (Uses station CHYC, Northern Elec. Co., Ltd., Montreal; CKAC, LaPresse Pub. Co., Ltd., Montreal; CFCF, Canadian Marconi Co., Montreal, P. Q.)	1000-1650	410.7	730	Eastern
	CNRO—Ottawa, Ont.—Canadian National Railways	500	434.5	690	Eastern
	CNRQ—Quebec, Que.—Canadian National Railways (Uses Station CKCV)	50	340.7	880	Eastern
	CNRR—Regina, Sask.—Canadian National Railways. (Uses station CKCK, Leader Pub. Co., Ltd., Regina, Sask	500	312.3	960	Mountain
	CNRS—Saskatoon, Sask.—Canadian National Railways. (Uses station CFQC, Elec. Shop, Ltd., Saskatoon, Sask.)	500	329.5	910	Mountain
	CNRT—Toronto, Ont.—Canadian National Railways. (Uses station CFCA, Star Printing & Pub. Co., Toronto, Ont.)	500	356.9	840	Eastern
	CNRV—Vancouver, B. C.—Canadian National Railways, (Transmitter is on Lulu Island, B. C.)	500	291.1	1030	Pacific
	CNRW—Winnipeg, Manitoba—Canadian National Railways. (Uses station CKY, Manitoba Tel. System, Winnipeg, Manitoba.)	500	384.4	780	Central

Canadian Radio Broadcast Stations

By Provinces and Cities

Provinces	Cities	Call Letters	Wave Length (Meters)	Power (Watts)
ALBERTA	Calgary	CFAC	434.5	500
"	Calgary	CFCN	434.5	1800
"	Calgary	CJCJ	434.5	250
"	Calgary	CNRC	434.5	500
"	Edmonton	CHMA	516.9	250
"	Edmonton	CJCA	516.9	500
"	Edmonton	CKUA	516.9	500
"	Edmonton	CNRE	516 9	500
"	Red Deer	CKLC	356.9	1000
BRITISH COLUMBIA	Burnaby	CFYC	410.7	500
"	Chilliwick	CHWK	247.8	5
"	Kamloops	CFJC	267.7	15
"	Sea Island	CJOR	291.1	50
"	Vancouver	CFCQ	410.7	10
"	Vancouver	CHPC	410.7	1000
"	Vancouver	CKCD	410.7	1000
"	Vancouver	CKFC	410.7	50
"	Vancouver	CKWX	410.7	50
"	Vancouver	CNRV	291.1	500
"	Victoria	CFCT	329.5	500
MANITOBA	Winnipeg	CKY	384.4	500
"	Winnipeg	CNRW	384.4	500
NEW BRUNSWICK	Fredericton	CFNB	247.8	25
"	Moncton	CNRA	322.4	500
NOVA SCOTIA	Halifax	CHNS	322.4	100
ONTARIO	Bowmanville	CKCW	312.3	5000
"	Brantford	CFGC	296.9	50
"	Cobalt	CKMC	247.8	5
"	Hamilton	CHCS	340.7	10
"	Hamilton	CKOC	340.7	100
"	Iroquois Falls	CFCH	499.7	250
"	Kingston	CFMC	267.7	20
"	Kingston	CFRC	267.7	500
"	London	CJGC	329.5	500
"	Midland	CKPR	267.7	50
"	Mt. Hamilton	CHML	340.7	50
"	Ottawa	CKCO	434.5	100
"	Ottawa	CNRO	434.5	500
"	Prescott	CFLC	296.9	50
"	Preston	CKPC	247.8	7½
"	St. George	CKCR	257.7	25
"	Scarboro Station	CJYC	291.1	500
"	Scarboro Station	CKCX	291.1	500
"	Toronto	CFCA	356.9	500
"	Toronto	CHIC	356.9	500
"	Toronto	CHNC	356.9	500
"	Toronto	CJBC	291.1–356.9	500
"	Toronto	CJSC	356.9	500
"	Toronto	CKCL	356.9	500
"	Toronto	CKNC	356.9	500
"	Toronto	CKSM	291.1	1000
"	Toronto	CNRT	356.9	500
"	York Co.	CFRB	291.1	1000

Provinces	Cities	Call Letters	Wave Length (Meters)	Power (Watts)
P. E. ISLAND	Charlottetown	CFCY	312.3	100
"	Summerside	CHGS	267.7	25
QUEBEC	Montreal	CFCF	410.7	1650
"	Montreal	CHYC	410.7	750
"	Montreal	CKAC	410.7	1200
"	Montreal	CNRM	410.7	1000-1650
"	Quebec	CHRC	340.7	5
"	Quebec	CKCI	340.7	22½
"	Quebec	CKCV	340.7	50
"	Quebec	CNRQ	340.7	50
"	St. Hyacinthe	CKSH	312.3	50
SASKATCHEWAN	Moose Jaw	CJRM	296.9	500
"	Regina	CHWC	312.3	15
"	Regina	CJBR	312.3	500
"	Regina	CKCK	312.3	500
"	Regina	CNRR	312.3	500
"	Saskatoon	CFQC	329.5	500
"	Saskatoon	CHUC	329.5	500
"	Saskatoon	CJWC	329.5	250
"	Saskatoon	CNRS	329.5	500
"	Unity	CHSC	267.7	50
"	Yorkton	CJGX	475.9	500

Licenses Required for Both Transmitters and Receivers in Canada

All radio stations, whether used for transmitting or receiving purposes are required to be licensed in Canada. The penalty on summary conviction for operating an unlicensed radio station is a fine not exceeding $50.00, and on conviction or indictment a fine not exceeding $500.00, with imprisonment for a term not exceeding 12 months. in addition to forfeiture of all unlicensed apparatus. The different classes of stations for which licenses are issued and their license fees vary from $1.00 for a private receiving set to $50.00 for a public commercial station.

The issue of licenses for transmitting stations is limited to British subjects or to companies incorporated under the laws of the Dominion of Canada or its provinces. Licenses for private receiving sets are issued to any person irrespective of nationality. Licenses for receiving sets are obtained from the Postmaster of the larger towns and cities in the Dominion, radio dealers, Royal Canadian Mounted Police, Department of Radio Inspectors, Departmental Agencies or from the Department of Marine and Fisheries. Licenses for all other classes of stations are obtained from the Department of Marine and Fisheries at Ottawa.

Foreign Radio Broadcast Stations

Including U. S. Possessions

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
ALASKA				
Anchorage	Anchorage Radio Club		227.1	100
Juneau	Alaska Elec. Light & Power Co.	KFIU	226	10
Ketchikan	Alaska Radio & Service Co.	KGBU	229	500
ALGERIA				
Algiers	Colin & Fils	8DB	310	100
ARGENTINE				
Buenos Aires	Enrique Caride	LOK	280.5	500
" "	Radio America	LOL	236	500
" "	Telegrafo de la Provincia	LOM	450	1000
" "	Radio Fenix	LON	210	2000
" "	Radio Prieto	LOO	252	1000
" "	Radio Buenos Aires	LOQ	261	500
" "	Sociedad Radio Argentine	LOR	330	1000
" "	Municipality of Buenos Aires	LOS	291.2	5000
" "	Francisco J. Brusa	LOV	361.5	2000
" "	Grand Splendid	LOW	303	2000
" "	Radio Cultura	LOX	380	500
" "	Sociedad Radio Nacional	LOY	315.8	1000
" "	"La Nacion"	LOZ	330	1000
" "	Gino Bocci y Hno.	B2	215	100
" "	Gino Bocci Hnos.	A11		
" "	Radio Club Argentine	A1		
" "	Francisco J. Brusa	B1		1000
" "	Facultad de Ciencias Medicas	C1	229.2	100
" "	Departmento Nacional de Higiene	C2		
Cordoba	Antonio Vanelli	H4	275	20
"	Sociedad Radio Comercial de Cordoba		381	100
"	Jorge Coen	HA8	255	50
"	Diario "Los Principios"	H6	250	20
Hurlingham, FCP.	Felix Gunther	DA-1		
La Plata, FCS.	Universidad Nacional	LOP	425	1000
Mendoza	Ministerio de Obras Publicas	LOU	380	500
"	Pedro B. Baldasarre	M6	348	100
Monte Grande, FCS.	Argentine Broadcasting Assn.			
Olivos, FCCA.	Radio Broadcasting	LOT	400	1000
Rio Cuarto	Arturo Rodriguez	H5	275	100
Rosario	Manuel Fugardo	F4	260	100
San Fernando, FCCA.	Americo Liberti	D3	235.3	100
San Luis	Santoalla	Q4	205.1	60
Santa Fe	Jose Roca Soler	F1	285.8	100
" "	Sociedad Rural de Cerealistas	F2	275	100
Tucunian	Radio Club	K4	311.8	250
AUSTRALIA				
Adelaide	Central Broadcasters Ltd.	5CL	395	5000
"	5 DN Pty. Ltd.	5DN	313	500
" "	Sports Radio Broadcasting Station	5KA	250	1000
"	Millswood Auto & Radio Co.	5MA		
"	Marshall & Co.	5MC	273	500
Bathurst	Mockler Bros.	2MK	275	250
Brighton		3PB		
Brisbane	Dr. V. McDowell	4CM	278	250
"	Radio Manufacturers Ltd.	4MB	337	250

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
AUSTRALIA				
Brisbane	Queensland Radio Service	**4QG**	385	5000
Hobart	Tasmanian Broadcasting Pty.	**7ZL**	516	3000
Melbourne	Associated Radio Co.	**3AR**	484	1600
"	Druleigh Business & Technical College	**3DB**	225	500
"	Broadcasting Co. of Australia	**3LO**	371	5000
"	O. J. Nilson & Co.	**3UZ**	319	100
"	L. J. Hellier	**3WR**	303	100
Mildura	R. J. Egge	**3EO**	286	100
Newcastle	H. A. Douglas	**2HD**	288	100
Northbridge	Otto Sandel	**2UW**	263	500
Perth	Westralian Farmers, Ltd.	**6WF**	1250	3000
Rockhampton	Queensland Government	**4RN**	323	500
Sydney	The Electrical Utilities Supply Co.	**2UE**	293	250
"	Burgin Electric Co.	**2BE**	316	100
"	Theosophical Broadcasting Service	**2GB**	316	3000
"	Trades Hall Broadcasting Station	**2KY**	280	1500
"	Farmer & Co., Ltd.	**2FC**	442	5000
"		**2WA**	462	100
"	Broadcasters Sydney, Ltd.	**2BL**	353	5000
"	Otto Sandel	**2UW**	267	500
Toowoomba	Gold Radio Elec. Service	**4GR**	294	100
Wagga	Otto Sandel	**2UX**	300	500
AUSTRIA				
Graz	Oesterreichische Radio-verkehrs Gesellschaft		404	500
Vienna	Oesterreichische Radio-verkehrs Gesellschaft	**ORV**	577	1500
BELGIUM				
Brussels	Radio Belgique Co.	**BAV**	508.5	1500
"	Radio Belgique Co	**SBR**	481	1500
BOLIVIA				
La Paz			175—300	50
Oruro	Radio Club Boliviano	**CPM**	50—200	50
BRAZIL				
Bahia	Radio Sociedade de Bahia	**SQID**	425	50
Bello Horizonte	Radio Sociedade de Mina Geraes		400	500
Ceare	Radio Club Cearense			50
Curytiba	Livio Moreira			
Fortaleza	Radio Club			300
Goyanna	Benedicto Ravello			
Matto Grosso	Radio Club de Campo Grande			
Minas Geraes	Juiz de Fora			100
Para	Radio Club de Para			100
Parana			370	300
Parahyba	Radio Sociedade de Parahyba			
Pelotas	Radio Sociedade Pelotense			
Penedo	A. G. Oliveira			
Pernambuco	Radio Club de Pernambuco		310	1000
"	Cia Radiotelegrafica Brasileira		250—380	500
"	Radio Sociedade de Jader de Andrada			
"	Radio Sociedade de Garanhuns			
Petropolis	Radio Club de Petropolis			
Porto Alegre	Radio Sociedade Riograndense	**RSR**	381	80
Praia Vermelha	Radio Club do Brasil	**SQIB**	320	500
Rio de Janeiro	Radio Sociedade de Rio de Janeiro	**SQIA**	400	2000
" " "	Radio Club do Brasil	**SPE**	312	500
" " "	National Telegraph Service		450	500
Sao Paulo	Sociedade Radio Educadora		310	1000
" "	Sociedade Radio Educadora Paulista	**SQIG**	360	1000

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
BRAZIL				
Sao Paulo	Radio Club de Sao Paulo		350	100
" "	Radio Bandeirantes		370	50
" "	Dias Carneiro & Cia.		380—420	100
CANARY ISLANDS				
La Laguna	Servando Ortoll Delmotte	**EAJ5**	280	50
Las Palmas	Canary Islands Radio Club		300	6
Teneriffe	Cervanado Ortoll Delmotte	**EAR5**	280	50
CEYLON				
Colombo			800	1500
CHILE				
Antofagasta	Sr. J. Pedreny	**CHAO**		40
"	Oficina Jose Santos Ossa	**CLAC**		50
"	Oficina Jose Francisco Vergara	**CLAD**		50
Iquique	Gildemeister & Cia.	**CLAE**		100
"	Oficina San Pedro	**CLAF**		100
"	Oficina Pena Chica	**CLAG**		100
San Eugenio	Rene Doneaud		230	25
Santiago	Radio Corporation of Chile	**CBC**	400—600	250
"	Chilean Radiophone Club	**CMAH**	300	100
"	Ferrocarril Transandino Chileno	**CLAA**		200
"	Carlos Buin Walsen	**CMAA**	240	20
"	International Machinery Co.	**CMAB**	480	1500
"	Castagneto Felli	**CMAD**	320	100
"	Ministerio de Higiene	**CMAF**	400	1350
"	Sociedad Broadcasting de Chile	**CRC**	385	350
"	"El Mercurio"	**CMAC**	360	1000
"	Radio Commercial	**CMAE**	280	100
"	Pedro Arroyo	**CMAG**	250	250
"	Cia Radio Transandino	**CMAI**	260	100
"	Universidad de Chile	**CMAU**	440	100
"		**ORC**	430	
"		**RC**	350	50
"	Harvey Diamond	**CNAA**		
"	Jose Bellalta	**CNAC**		
"	Fratelli Castagneto		320	100
"	Commercial Radio Co.		350	50
Tacna	Ministerio de Relaciones Exteriores	**CMAT**	365	1000
"	Chilean Government	**CRCT**	550	200
Valparaiso	Cia Radio Transandina	**CNAD**	265	500
"	Cia de Salitres de Antofagasta	**CLAB**		50
Vilna del Mar	Antonio Cornish Besa	**ACB**	400	50
" " "	Antonio Cornish Besa	**CNAB**		
CHINA				
Kharbin	Eastern Manchurian Broadcasting Station	**XOH**	340	50
Shanghai	Kellogg Switchboard & Supply Co.	**KRC**	335	150
"	The Shanghai Shimbun Ltd.	**KSMS**	277	50
"	Shinsho Co.	**NKS**	318	50
"	Radio Supply Co. of Nanking Road	**RSC**	235	10
Tientsin	Gisho Electrc Co.	**GEC**	288	50
"	Tientsin Broadcasting Station	**XOL**	480	500
Victoria (Hongkong)	Hongkong Radio Society	**5HK**	475	150
COSTA RICA				
San Jose	Government			
CUBA				
Caibarien	Maria J. Alvarez	**6EV**	250	50
Camaguey	Pedro Nogueras	**7AZ**	225	10
Camajuani	Diego Ibarra	**6YR**	200	20

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
CUBA				
Central Elia	Salvador Rionda	**7SR**	350	500
Central Tuinicu	Frank H. Jones	**6KW**	340	100
" "	Frank H. Jones	**6JK**	272	100
Ciego de Avila	Eduardo V. Figueroa	**7BY**	235	20
Cienfuegos	Jose Ganduxe	**6VY**	260	200
"	Antonio T. Figueroa	**6CX**	170	20
"	Eduardo Terry	**6DW**	225	10
"	Luis Del Castillo	**6GR**	253	10
Cienfuegos	Juan Pablo Ros	**6GF**	190	50
"	Eligio Cobelo Ramirez	**6JQ**	275	10
"	Valentin Ullivarri	**16AZ**	200	20
Havana	Credito y Construcciones Cia.	**2HP**	295	100
"	Julio Power	**2JP**	185	20
"	Frederick W. Borton	**2CX**	320	10
"	Alberto S. Bustamante	**2AB**	220	10
"	Cuban Telephone Co.	**PWX**	400	500
"	Jose Leiro	**2JL**	275	5
"	Alvara Daza	**2K**	200	20
"	E. Sanchez de Fuentes	**2KD**	350	50
"	"El Pais"	**2EP**	355	400
"	F. W. Borton	**2CG**	350	15
"	Bernardo Barrie	**2BB**	250	15
"	Frederick W. Borton	**2BY**	260	100
"	Julio Power	**2HS**	180	50
"	Jose Lara	**2LR**	32	50
"	Manuel y Guillermo Salas	**2MG**	284	20
"	R. B. Waters	**2MK**	85	20
"	Maria Garcia Velez	**2OK**	360	100
"	Oscar Collado	**2OL**	225	100
"	Roberto E. Ramirez	**2TW**	270	20
"	Benito Veita Ferro	**2UF**	265	10
"	Raul Karman	**2RK**	315	20
"	Raul Karman	**2RY**	170	5
"	Homero Sanchez	**2SZ**	418	10
"	Amadeo Saenz	**2WW**	210	20
"	Antonio A. Ginard	**2XX**	150	5
"	Raul Perez Falcon	**2JD**	105	20
"	Heraldo de Cuba	**2HC**	275	500
Matanzas	Leopoldo T. Figueroa	**5EV**	360	5
Nueva Gerona	Isle of Pines Telephone Co.	**8JQ**	130	20
Puerto del Rio	Antonio Zarazola	**1AZ**	275	5
Sagua la Grande	Guillermo Polanco	**6HS**	200	10
Santiago	Alfredo Vinnet	**8FU**	225	15
"	Pedro C. Anduz	**8DW**	275	50
"	Alfredo Brooks	**8AZ**	240	20
"	Ceferino Ramos	**8IR**	190	20
"	Alberto Ravelo	**8BY**	250	100
"	Guillermo Polanco	**8HS**	200	20
Tuinicu	Frank H. Jones	**6KW**	340	100
"	Frank H. Jones	**6XJ**	30½	100
CZECHOSLOVAKIA				
Bratislava		**OKR**	300	500
Brunn	Radio Journal	**OKB**	441.2	2500
Koszice (Kassa)			1870	
Prague	Radio Journal	**OKP**	1110	1000
DANZIG				
Danzig			272.7	

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
DENMARK				
Copenhagen	Copenhagen Radio Broadcasting Station		337	2000
Ryvang			1150	1500
Soro	Ministry of War		1153.8	1500
EGYPT				
Cairo		**SRE**	255	
EQUADOR				
Guayaquil	J. Puig Verdaguer			
ESTONIv				
Tallinn			285.7	2250
FINLAND				
Bjorneborg	Nuoren Voiman Liiton Radiohydistys		311	200
Hango	Nuoren Voiman Liiton Radiohydistys		260	250
Helsingfors	Civil Guards of Finland		375	2000
Jacobstad			275.2	
Jyvaskyla	Nuoren Voiman Liiton Radiohydistys		297	250
Lahtis			318	
Mikkeli	Nuoren Voiman Liiton Radiohydistys		566	250
Pori	Nuoren Voiman Liiton Radiohydistys		255.3	100
Skatudden	Military Station Radio Div.		318	750
St. Michel	Nuoren Voiman Liiton Radioyhdistys		566	250
Tammerfors	Nuoren Voiman Liiton Radiohydistys	**3NB**	393	250
Tampere			373	250
Uleaborg			250	250
Viborg			214.3	750
FRANCE				
Agen	Dept. of Lot et Garonne	**2BD**	297	250
Angers	Radio Anjou		275.2	500
Bordeuax			419.5	2000
Dijon			207.5	1000
Grenoble	Ministry of P. T. T.		588.2	1500
Issy-les-Moulineaux	Ministry of War	**QGA**	1800	500
Juan-les-Pins			230	500
Lille			287	500
Lyon	Ministry of P. T. T.	**YN**	478.1	1000
"	Radio Lyon		291.3	1500
Marseilles	Ministry of P. T. T.		309	500
Mont-de-Marsen	Radio Club Landrais		400	500
Montpelier	Societe Languedocienne de T. S. F.		252.1	1000
Paris	Ecole Superieure de P. T. T.	**FPTT**	464	500
"	Eiffel Tower, Army	**FL**	2650	5000
"	Societe Francaise Radioelectrique	**8AJ**	1780	100
"	Lucien Levy		350	250
"	Petit Parisien	**5NG**	340.9	500
"	Cie. Francaise de Radiophone		1750	6000
"	Radio Paris	**CFR**	1750	3000
"	Radio Vitus		308	1000
Pic du Midi			350	
Reims			204.1	500
Reziers			178	500
St. Etienne	Radio Club Forezien		220	50
Strasbourg	Military Station Radio Club	**8GF**	222.2	250
Toulouse	Aerodrome	**MRD**	315	2000
"	La Radio		389.6	3000
GERMANY				
Berlin	Koenigswusterhausen Deutsche Welle A. G.	**AFP**	4000–2900	18000
"	Koenigswusterhausen Station	**AFT**	1250	8000
"	Vox Haus Funkstunde	**AB**	566–483.9	2000-4000

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
GERMANY				
Berlin	Witzleben Funkstunde A. G.		483.9	4000
"	Wolff's Bureau		2525	5000
Bremen	Nordischer Rundfunk	**BMN**	400	1500
Breslau	Schlessische Funkstunde		315.8	5000
Dortmund	Westdeutsche Funkstunde		283	750
Dresden	Mitteldeutscher Rundfunk		294.1	750
Elberfeld	Westdeutsche Funkstunde		259	
Frankfort-on-the-Main	Sudwestdeutscher Rundfunkdienst	**LP**	428.6	4000
Freiburg im Breisgau	Suddeutscher Rundfunk		577	9500
Gleiwitz	Schlesische Funkstunde		250	750
Hamburg	Nordischer Rundfunk	**EG**	394.7	10000
"		**HA**	394.7	4000
Hanover	Nordischer Rundfunk		297	750
Kassel	Sudwestdeutscher Rundfunk		272	750
Kiel	Nordicher Rundfunk		254.2	750
Koenigsberg	Ostmarken Rundfunk		329.7	4000
Langenberg		**LA**	468.8	25000
Leipzig	Mitteldeutscher Rundfunk	**MR**	365.8	4000
Munich	Deutsche Stunde in Bayern	**WM**	535.7	1500
Munster	Westdeutsche Funkstunde	**MS**	241.9	1500
Norddeich		**KAV**	1800	
Nuremberg	Deutsche Stunde in Bayern		303	750
Stettin	Funkstunde A. G.		252.1	500
Stuttgart	Suddeutscher Rundfunk	**OKP**	379.7	4000
HAITI				
Port-au-Prince	Haitien Government	**HHK**	361.2	1000
HAWAII				
Honolulu	Honolulu Advertiser	**KGU**	270	500
HUNGARY				
Budapest	Hungarian States' Post and Telegraph	**MTI**	546	1000
"	Magyar Tavirati Iroda		1050	2000
"	Hungarian Telephone & Radio Co.		555.6	3000
ICELAND				
Reykjavik			333.3	500
INDIA				
Bangalore	Indian Broadcasting Co.			
Bombay	Walter Rogers & Co.	**2AX**	226	
"	Bombay Residency Radio Club	**2FV**	375	220
Calcutta	Radio Club of Bengal	**2BZ**	800	500
"	Indian States & Eastern Agency	**5AF**	425	1500
Karachi	Karachi Radio Club		425	40
Madras	Crampton Elec. Co.		220	120
"	Madras Presidency Club	**2GR**	400	200
Rangoon	Radio Club of Burmah	**2HZ**	350	40
IRISH FREE STATE				
Cork		**6CK**	400	1500
Dublin	Government	**2RN**	319.1	1500
ITALY				
Milan	Unione Radiofonica Italiana	**IMI**	322.6	1500
Naples	Unione Radiofonica Italiana	**INA**	333.3	1500
Nice			362	1000
Rome	Unione Radiofonica Italiana	**IRO**	449	3000
JAPAN				
Keijo	Keijo Broadcasting Co.	**JODK**	345	1000
Nagoya	Nagoya Radio Broadcasting Co.	**JOCK**	360	1000
Osaka	Osaka Central Broadcasting Co.	**JOBK**	385	1000
Tokyo	Tokyo Central Broadcasting Co.	**JOAK**	375	1000

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
JAVA				
Batavia	Bataviasche Radio Vereeninging	**JFC**	220	40
KWANTUNG				
Dairen	Government Bureau of Communications	**JQAK**	395	500
LATVIA				
Riga			526.5	2000
LITHUANIA				
Kovno			2000	2000
LUXEMBURG				
Luxemburg		**LOAA**	217.4	250
MEXICO				
Chihuahua	Federal Government	**CZF**	310	250
"	Telefonos Del Gobierno del Estado de Chihuahua	**ZCF**	310	250
"	Compania Telefonica	**XICE**	500	500
Guadelajara	Radio Club—Degollado Theatre		280	10
"	Federal Military Command	**FAM**	490	1000
Mazatlan	Castulo Llamas	**CYR**	475	250
Merida	Partido Socialista del Surestan	**CYY**	549	100
Mexico City	Efran R. Gomez	**CYA**	300	500
" "	Jose J. Reynosa (El Buen Tono)	**CYB**	275	500
" "	Miguel S. Castro (La High Life)	**CYH**	375	100
" "	General Electric Co.	**CYJ**	410	1000
" "	"El Universal"	**CYL**	400	500
" "	Martinez y Zetina	**CYO**	425	100
" "	Excelsior Compania Editorial	**CYX**	260	750
" "	La Liga del Radio	**CYZ**	400	100
" "	Departmento de Educacion	**CZE**	357	1000
" "	Secretaria de Industria, Comercio y Trabajo	**CZI**	450–505	750
" "	Fabrica Nacional de Vestuario	**IJ**		500
" "	F. C. Stephenex	**IR**	250	100
Monterrey	Roberto Reyes	**CYM**	275	100
"	D. Constantino de Tarnava, Jr.	**CYH**		
"	Constantino de Tarnava	**CYS**	311	250
Oaxaca	Federico Zonilla	**CYF**	265	100
Puebla	Augustin del P. Saenz	**CYU**	312	100
Saltillo	Colegio Ateneo Fuente		450	135
Tampico		**CYE**	360	100
Vera Cruz	Ministerio de Communicaciones	**CYC**	300	500
" "		**CYD**	250	500
MOROCCO				
Casablanca	Radio Club de Moroc	**CNO**	250	500
NETHERLANDS				
Amsterdam		**PCFF**	2125	
Bloemendaal			566	
De Bilt		**PCFF**	1100	1250
Eindhoven	Phillips Lamp Works	**PCJJ**	30.2	
Hilversum	Nederlandische Seintoellen Fabriek	**PFBI**	1000	10,000
"		**HDO**	1060	5000
Scheveningen			1950	2500
NETHERLANDS EAST INDIES				
Soe abaya	Radiotelegraph Club		90	
NEW ZEALAND				
Auckland	Newcomb (Ltd.)	**1YL**	260	500
"	The Radio Broadcasting Co. of New Zealand	**1YA**	333	500
"	La Gloria Gramophone Co.	**1YB**	275	50
"	L. R. Keith	**IZO**	330	50
Christchurch	Radio Broadcasting Co., of New Zealand	**3AC**	240	10
"	Radio Broadcasting Co. of New Zealand	**3YA**	306	500

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
NEW ZEALAND				
Dunedin	Otago University	**4XO**	140	
"	Radio Broadcasting Co. of New Zealand	**4YA**	463	750
"	Radio Supply Co.	**4YO**	370	500
"	Radio Broadcasting Co.	**VLDN**	380	750
Gisborne	Gisborne Radio Co.	**2YM**	260	500
Napier	B. C. Spackman	**2YL**	190	100
Wellington	Broadcastings Ltd.	**2YB**	275	15
"	Radio Broadcasting Co. of New Zealand	**2YA**	420	3000
Whangarei	N. C. Shepherd	**1YC**	250	15
NORWAY				
Bergen	Bergen Broadcasters		370.4	1500
Fredrikstad	Broadcasting Co. A. S.		384.8	750
Hamar	Broadcasting Co. A. S.		566	750
Natodden	Broadcasting Co. A. S.		447.8	
Oslo	Broadcasting Co. A. S.	**OSLO**	461.5	1500
Porsgrund	Broadcasting Co. A. S.		504	750
Rjuken	Broadcasting Co. A. S.		443	250
Stavanger			277.8	250
Tromso	Tromso Broadcasters		500	
Trondhjem			243.9	
PERU				
Arequipa	Augusto Gilardi	**3OA**	240	10
Lima	Peruvian Broadcasting Co.	**OAX**	380	1500
"	German Gallo	**5OA**	250	20
"	Enrique Perez	**4OA**	250	20
PHILIPPINE ISLANDS				
Baguio		**KZUY**	359.9	500
Iloilo		**KPM**	400	500
Manila	Radio Corp. of the Philippines	**KZIB**	260	500
"	Radio Corp. of the Philippines	**KZKZ**	270	500
"	Radio Corp. of the Philippines	**KZRM**	413	1000
"	Radio Corp. of the Philippines	**KZRQ**	400	1000
POLAND				
Cracow			422	1500
Posen			270	1500
Warsaw	Government	**PTR**	380	700
"		**AXO**	1111	10000
PORTO RICO				
San Juan	Radio Corp. of Porto Rico	**WKAQ**	340.7	500
PORTUGAL				
Lisbon	Grandes Armazens do Chiado	**PIAA**	310	150
Montesanto	Government Wireless Station	**CTV**	2450	1500
SAN SALVADOR				
San Salvador	Government of el Salvador	**AQM**	452	500
SENEGAL				
St. Louis	Senegal Radio Club		300	100
SPAIN				
Barcelona	Radio Barcelona (Hotel Colon)	**EAJ1**	344.8	1500
"	Radio Catalana	**EAJ13**	462	1000
Bilbao	Radio Club Vizcaina	**EAJ9**	436	1000
"	Radio Vizcaya	**EAJ11**	418	2000
"	Armando de Otera		383	200
Cadiz	Radio Cadiz	**EAJ3**	400	500
"	Radio Lehera	**EAJ10**	297	1000
Cartagena	Enrique de Orbe	**EAJ16**	279	1000
"		**EBX**	1200	1000
Madrid	Radio Espana	**EAJ2**	393	3000

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
SPAIN				
Madrid	Escuela Superior	**PTT**	458	1000
"	Antonio Castilla	**EAJ4**	375	6000
"	Radio Iberica	**EAJ6**	392	1000
"	Union Radio	**EAJ7**	373	3000
"		**EAJ12**	306	2000
	Radio Espanola	**EAJ15**	490	1000
"		**EGC**	1650–2200	2000
Malaga	Spanish Telecommunication Co.	**EAJ25**	325	1000
"	Alfonso Villota		325	200
Oviedo (Cima)	Arturo Cima Fernandez	**EAJ19**	340	1000
Salamanca		**EAJ22**	402.5	500
San Sebastian	Sabino Ucelayeta	**EAJ8**	346	2000
Sevilla	Manuel Garcia Ballesta	**EAJ17**	400	1000
"	Jorge la Riva	**EAJ21**	300	1000
"	Radio Club Sevillano	**EAJ5**	344.8	1000
Valencia		**EAJ24**	360	1000
"	Jose Lopes Azcar	**EAJ14**	500	500
Zaragoza		**EAJ23**	325	1500
STRAIGHTS SETTLEMENTS				
Singapore	Malaya Amateur Wireless Society		330	150
SWEDEN				
Boden	Radiotjanst	**SASE**	1200	1500
Boras		**SMBY**	230.8	250
Eskilstume	Radio Club	**SMUC**	250	250
Falun	Radiotjanst	**SMZK**	400	1500
Gaevle	Radio Club	**SMXF**	204.1	250
Goteborg	Radiotjanst	**SASB**	416.7	1000
Halmstad		**SMSB**	215.8	250
Helsingborg		**SMYE**	229	250
Jonkopings	Jonkopings Rundradiostation	**SMZD**	201.3	500
Kalmar		**SMSN**	252.1	250
Karlsborg	Radiotjanst	**SASF**	1350	50
"		**SAJ**	1365	5000
Karlskrona		**SMSM**	196	2000
Karlstadt	Radio Club of Karlstad	**SMXG**	221	150
Karlstadt		**SMXZ**	221	250
Kristinehamm		**SMTY**	202.7	250
Linkoeping	Radio Club	**SMUV**	467	25
"		**SMUW**	497.5	250
Malmo	Radiotjanst	**SASC**	260.9	500
Motola			1305	30000
Norrkoeping	Radio Club	**SMVV**	275.2	250
Orebro		**SMTI**	218	250
Ostersund			720	1000
Saffle		**SMTS**	252.1	500
Stockholm	The Swedish Broadcasting Co.	**SASA**	454.5	1500
Sundsvall	Radiotjanst	**SASD**	545.6	500
Trodhattan	Trodhattans Rundradiostation	**SMXQ**	277.8	250
Uddevalla		**SMZP**	294.1	250
Umea		**SMSN**	229	250
Varborg		**SMSO**	297	250
SWITZERLAND				
Basle		**HB3**	1100	250
Berne	Radio—Genossenschaft	**HBA**	411	5000
Geneva	Radio Broadcasting Soc. of Geneva	**HBI**	760	1500
Lausanne	Lausanne Radio Society	**HB2**	318	500
Zurich	Zurich University	**RGZ**	515–650	500

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power (Watts)
SWITZERLAND				
Zurich	Zurich Radio Genossenschaft	HBZ	496	1000
TUNISIA				
Tunis	French Army	OCTU—TUA	1450—45	500
UNION OF SO. AFRICA				
Cape Town	African Broadcasting Assn.	WAMG	375	1500
UNION OF SO. AFRICA				
Durban	Town Council		400	1500
Johannesburg	African Broadcasting Co.	JB	450	500
UNION OF SOVIET SOCIALIST	REPUBLICS (formerly Russia)			
Astrakhan		RA26	700	1000
Baku		RA45	760	1250
Bogorodsk		RA8	750	
Ekaterinburg		RA15	750	250
Homel		RA39	925	1250
Irkutsk			1300	
Ivanovo Voznesensk		RA7	800	1000
Kharkov		RA43	640	4000
"		RA24	475	4000
Kiev		RA5	775	1000
Kniepropetrovsk			560	1000
Krasnodar		RA38	513	1000
Leningrad		RA6	940	2000
"		RA42	1000	10000
Minsk		RA18	950	1250
Moscow	Sokolniki		1010	2000
"	Trade Union	KAZ	450	2000
"	Lubovitch		365	
"		MSK	650	2000
"	Union of Soviet Workers	RA4	675	500
"	Kominern	RDW	1450	40000
"	Radio-Peredatcha	RAI	420	2000
Niji-Novgorod		RA13	1400	1500
Novosibirsk		RA33	700	4000
Odessa		RA40	1000	1250
Rostov-on-Don		RA14	820	1250
Saratoff			700	1000
Sevastopol		RA9	800	1000
Stavropol		RA20	655	1250
Tashkent		RA27	800	4000
Tiflis			870	4000
Tver		RA44	965	1250
Ust-Syssolsk		REG	1000	1250
Veliky Ustjuk		RA16	1010	1250
Vladivostok		RA17	456	1250
"	Union of Soviet Worker s Radio Club	RL20	480	1500
Voronesh		RA12	950	1250
UNITED KINGDOM				
Aberdeen	British Broadcasting Co.	2BD	500	1500
Belfast	British Broadcasting Co.	2BE	306.1	1500
Birmingham	British Broadcasting Co.	5IT	326.1	1500
Bournemouth	British Broadcasting Co.	6BM	491.8	1500
Cardiff	British Broadcasting Co.	5WA	353	1500
Chelmsford	British Broadcasting Co.	2BR		
Daventry	British Broadcasting Co.	5XX	1604.3	5000-10000
Dundee	British Broadcasting Co.	2DE	288.5	200
Edinburgh	British Broadcasting Co.	2EH	294.1	200
Glasgow	British Broadcasting Co.	5SC	405.4	1500

Countries and Cities	Owner	Call Letters	Wave Length (Meters)	Power Watts)
UNITED KINGDOM				
Hull	British Broadcasting Co.	**6KH**	288.5	200
Leeds-Bradford	British Broadcasting Co.	**2LS**	277.8—254.2	200
Liverpool	British Broadcasting Co.	**6LV**	297	2000
London	British Broadcasting Co.	**2LO**	361.4	3000
Manchester	British Broadcasting Co.	**2ZY**	384.6	1500
Newcastle	British Broadcasting Co.	**5NO**	312.5	1500
Nottingham	British Broadcasting Co.	**5NG**	275.2	200
Plymouth	British Broadcasting Co.	**5PY**	400	200
Poldhu	British Broadcasting Co.	**2YT**		
Sheffield	British Broadcasting Co.	**6FL**	272.7	200
Stoke-on-Trent	British Broadcasting Co.	**6ST**	288.5	200
Swansea	British Broadcasting Co.	**5SX**	288.5	200
URUGUAY				
Montevideo	Radio Sudamericano	**CWOZ**	320	500
"		**CWOA**		1000
"	Diario "El Dia"	**CWOR**	350	500
"	Danree & Cia	**CWOF**	300	100
"	Templo Metodista	**CWOG**	280	10
"	Instituto Metereologico	**CWOB**	250	50
"	General Electric Co. of Uruguay	**CWOS**	380	500
VENEZUELA				
Caracas	Empresa Venezolana de Radiotelefonia	**AYRE**	375	1000
YUGOSLAVIA				2000
Agram (Zagreb)			310	1000
Belgrade	Cie. Generalle De T. S. F.	**HFF**	225.6	1000

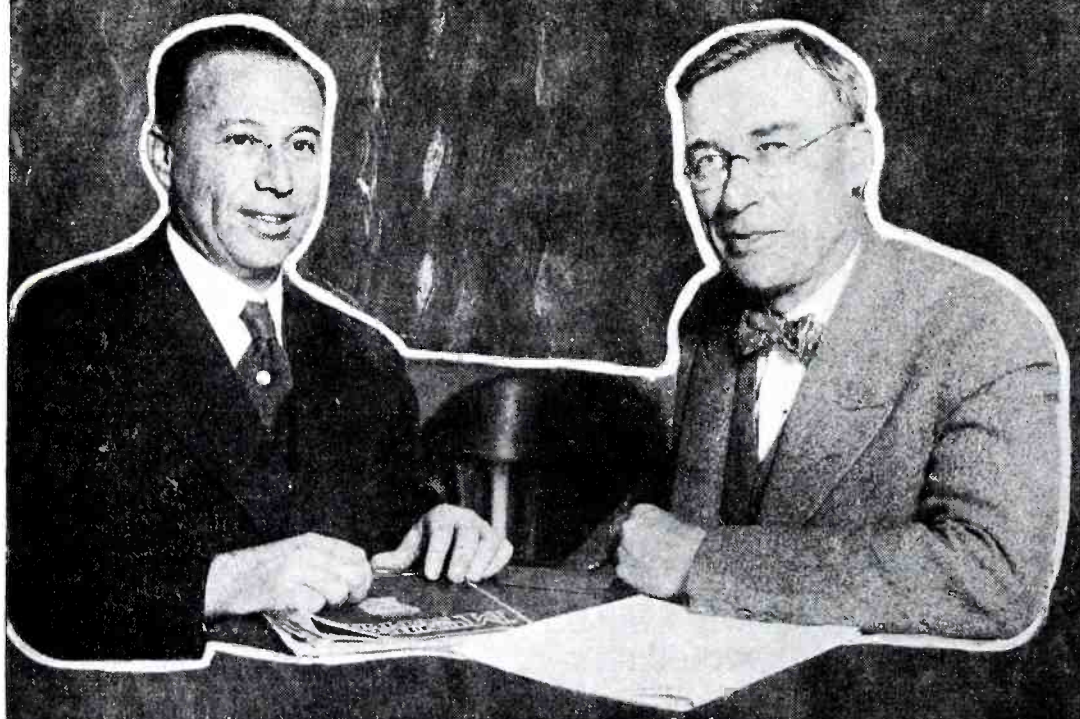
Artists performing at Radio Broadcast Station JOAK, Tokyo, Japan

BROADCAST STATION WHAD-MILWAUKEE
THEIR ROYAL MAJESTIES

BROADCAST STATION KDKA
LOUIS L. KAUFMAN-ANNOUNCER
EAST PITTSBURGH, PA.

BROADCAST STATION
KSO
PAUL D. MAXWELL
DIRECTING ENGINEER

BROADCAST STATION KDKA-PITTSBURGH
LITTLE SYMPHONY ORCHESTRA



KNX BROADCAST STATION-LOS ANGELES
JOSEPH DISKAY AND MAYOR CRYER

STEPHEN CZUKOR
GEN'L MG'R WRNY NEW YORK N.Y.

The Knickerbocker Four

by Joseph Calcaterra

IN these days one would almost believe that no receiver can be any good at all unless it makes use of at least a half dozen tubes, and preferably a dozen. A great majority of the receivers featured in the construction sections of the radio publications call for the use of eight or nine tubes. It will therefore come as a relief to many fans to get the "low-down" on a first class receiver that makes use of only four tubes.

The Knickerbocker Four receiver is such a receiver. It does not resort to reflexing or any other tricks but nevertheless is capable of delivering results equal to those obtained from many of the receivers that use more tubes. This statement is not an unusual one, but its truth in this case is borne out by the working of the receiver and will be self-evident to readers from the theoretical description which is to follow.

Many of us whose experience in radio dates back beyond the present multi-tube era, remember the astonishing results obtainable with the old one or two tube regenerative receivers. The old "single-circuit" receivers, although they left much to be desired, certainly were able to step out and bring in the distant stations.

These old receivers would not be suitable for use today mainly because they were not selective enough to cope with the present day congestion of the air. Then, too, they had the disadvantage of poor parts, unstable values of resistance and capacity, audio transformers with poor amplification curves, etc. If the regenerative principle is incorporated in a receiver which also includes the other developments of the past few years, the results obtained should be well worth while.

This was the idea behind the Knickerbocker Four receiver. The result is a receiver which employs one stage of highly efficient, tuned radio-frequency amplification; a detector which employs automatically regulated regeneration; and two stages of high-grade, transformer coupled audio amplification. The circuit idea in itself is not a new one. In fact such a four tube arrangement is generally recognized as a highly efficient combination and during the past year has been one of the most popular with home radio constructors.

Heretofore there have been two outstanding objections to the employment of a regenerative detector following a stage of tuned, radio-frequency amplification. The first has been that in order to make the R.F. stage stable it has been necessary to cut its efficiency to a point where it did little except serve as a coupling tube to couple the antenna to the detector. It served the purpose in most cases of preventing radiation of the oscillations of the detector but that is about all.

The second objection has been the necessity for an extra control knob to regulate the amount of regeneration. thus making a one tube amplifier a three control job.

In the Knickerbocker Four receiver both of these faults have been eliminated. The outstanding factor in so doing has been the use of the Equamatic type coupling coils, which provide automatic variable coupling for both the R.F. and the detector stages. In the first case the coil unit which couples the antenna circuit to the R.F. tube consists of a secondary and a primary coil, each of which is wound on an individual form and has its individual means for mounting. The secondary coil is mounted on the base-

PARTS REQUIRED

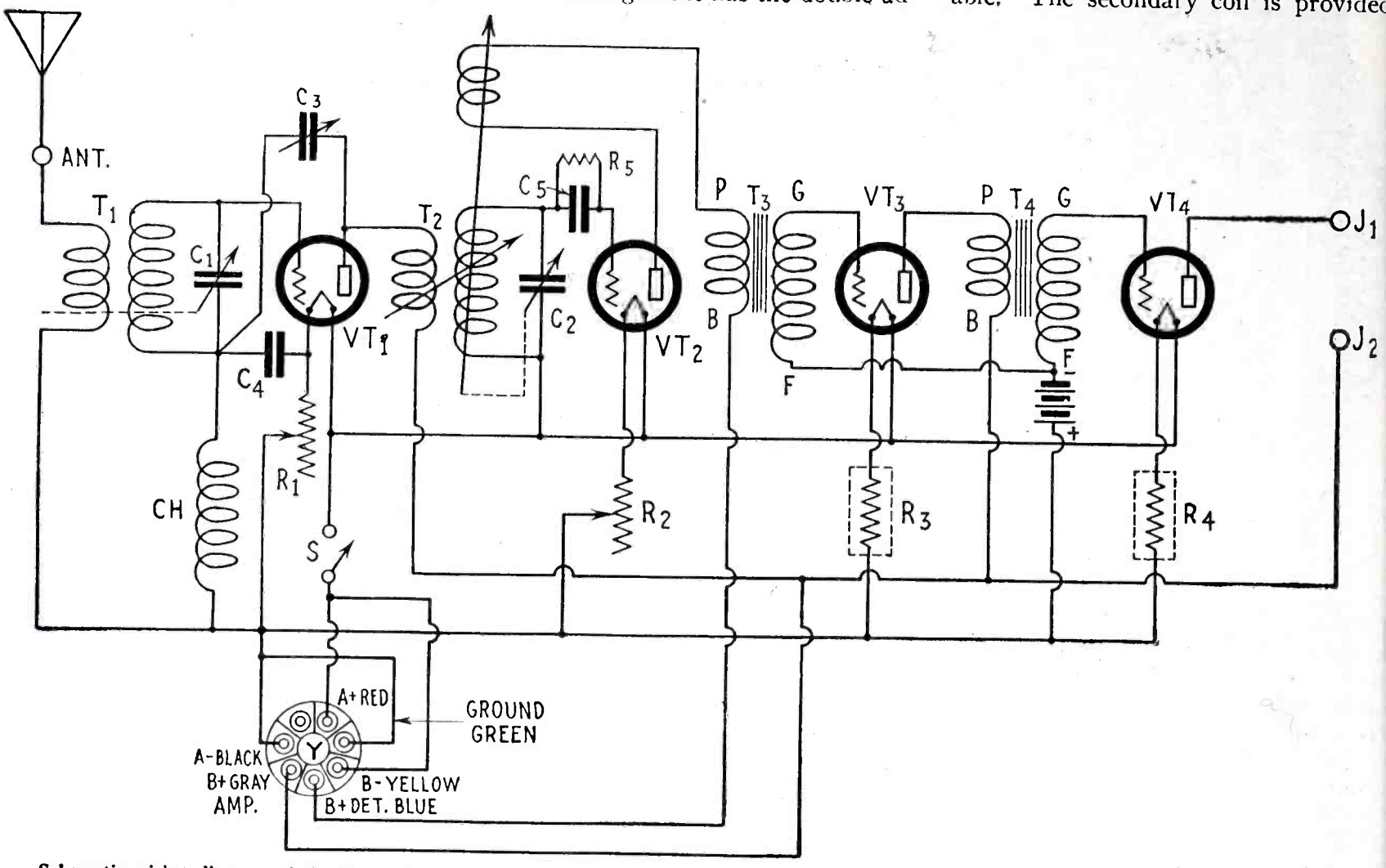
- 1 7" x 18" x 3/16" Formica panel
- 1 8" x 17" x 3/16" Formica sub-panel
- 2 Karas sub-panel mounting brackets
- 2 Karas Orthometric, .00037 mfd. variable condensers (C1, C2)
- 1 Samson Neutralizing condenser (C3)
- 1 Carter .0001 mfd. Molded mica condenser (C4)
- 1 Carter .00025 mfd. Molded mica condenser with clips for grid leak mounting (C5)
- 1 Samson No. 85, R.F. choke coil (CH)
- 2 Carter No. 10 tip jacks (J1, J2)
- 2 Yaxley 20 ohm air cooled rheostats (R1, R2)
- 2 Amperites No. 1A (R3, R4)
- 1 Lynch or Durham 2 megohm Metalized grid leak resistor (R5)
- 1 Karas Equamatic inductance coil (T1)
- 1 Karas 3-Circuit inductance (T2)
- 2 Karas Harmonik audio-frequency transformers (T3, T4)
- 4 Benjamin Type 9040, Cle-Ra-Tone sockets (VT1, VT2, VT3, VT4)
- 2 Karas Micrometric vernier dials
- 1 Yaxley Cable Connector Plug
- 1 Yaxley No. 10, Midget battery switch (S)
- 1 package Cornish Braidite or Flexibus hook-up wire
- 1 X-L binding post (antenna)
- 1 "C" battery and clip (CB)
- 1 package Kester radio solder

board or sub-panel while the primary coil is mounted on the rear end of the shaft of the tuning condenser, by means of an extension mounting arm and collar that is provided with the coil. The secondary coil is mounted directly behind the variable condenser in such a position that the mounted primary coil can turn within the secondary. Then, by placing the secondary coil at the proper angle, the coupling between the coils will vary as the condenser rotor is turned, during the tuning process. Thus, when a high wave station is tuned in, the primary coil will be parallel with the secondary and the coupling will be close. When the condenser knob is turned to tune in low wave stations, the primary coil turns with it and the coupling is loosened accordingly.

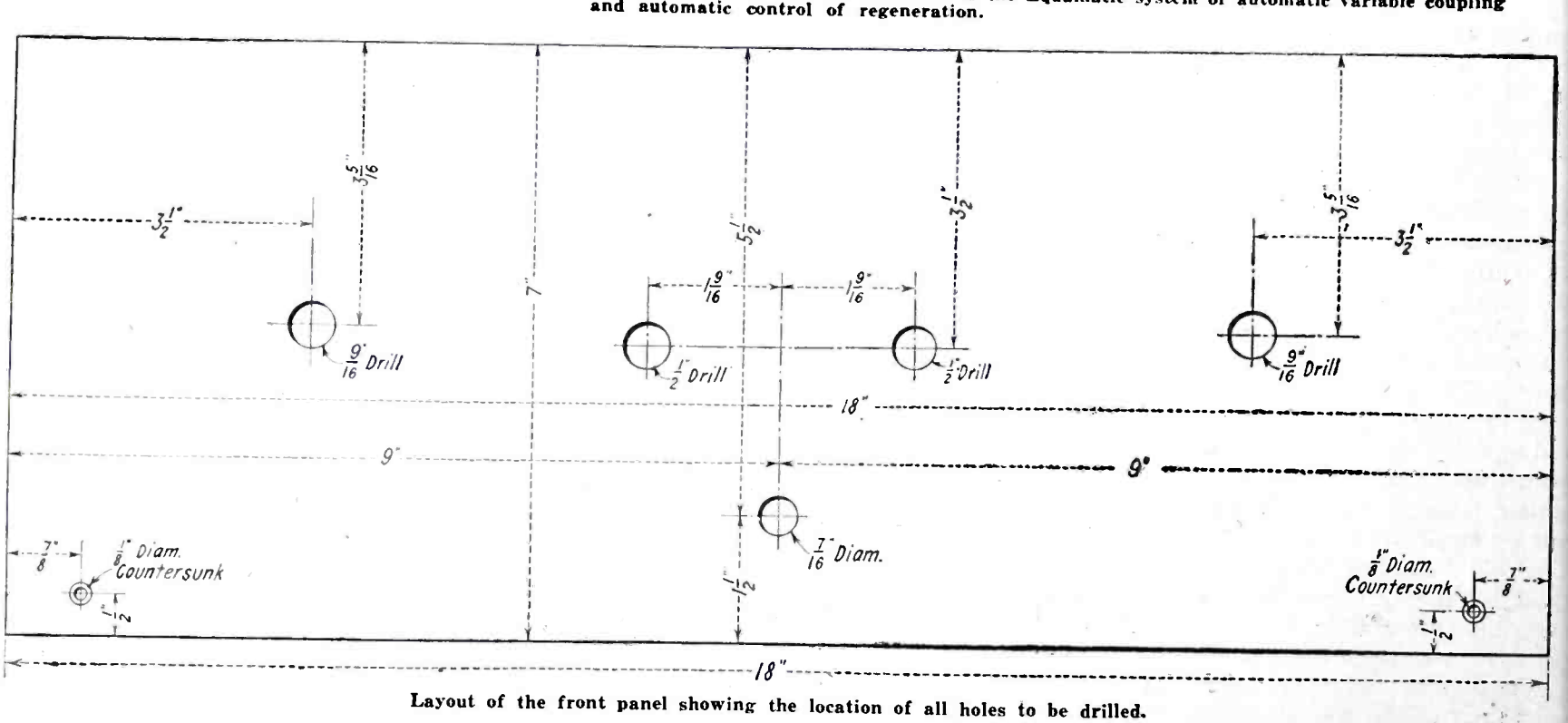
This arrangement has the double advantage that it provides the close coupling required for adequate energy transfer at the high waves, and the comparatively loose coupling needed at the lower waves to avoid excessive tendency toward oscillation. This automatic coupling scheme is adjustable so that it may be made to automatically cover any range or degree of coupling.

In the case of the coil unit which provides the coupling between the R.F. tube and the detector, there are three coils. The primary-secondary coupling is variable, while the secondary-tickler coupling is automatically variable. The secondary coil is provided with a bracket for mounting on the baseboard or sub-panel and the primary coil is hinged directly onto the secondary. The coupling between these two coils is adjusted once and thereafter requires no further attention.

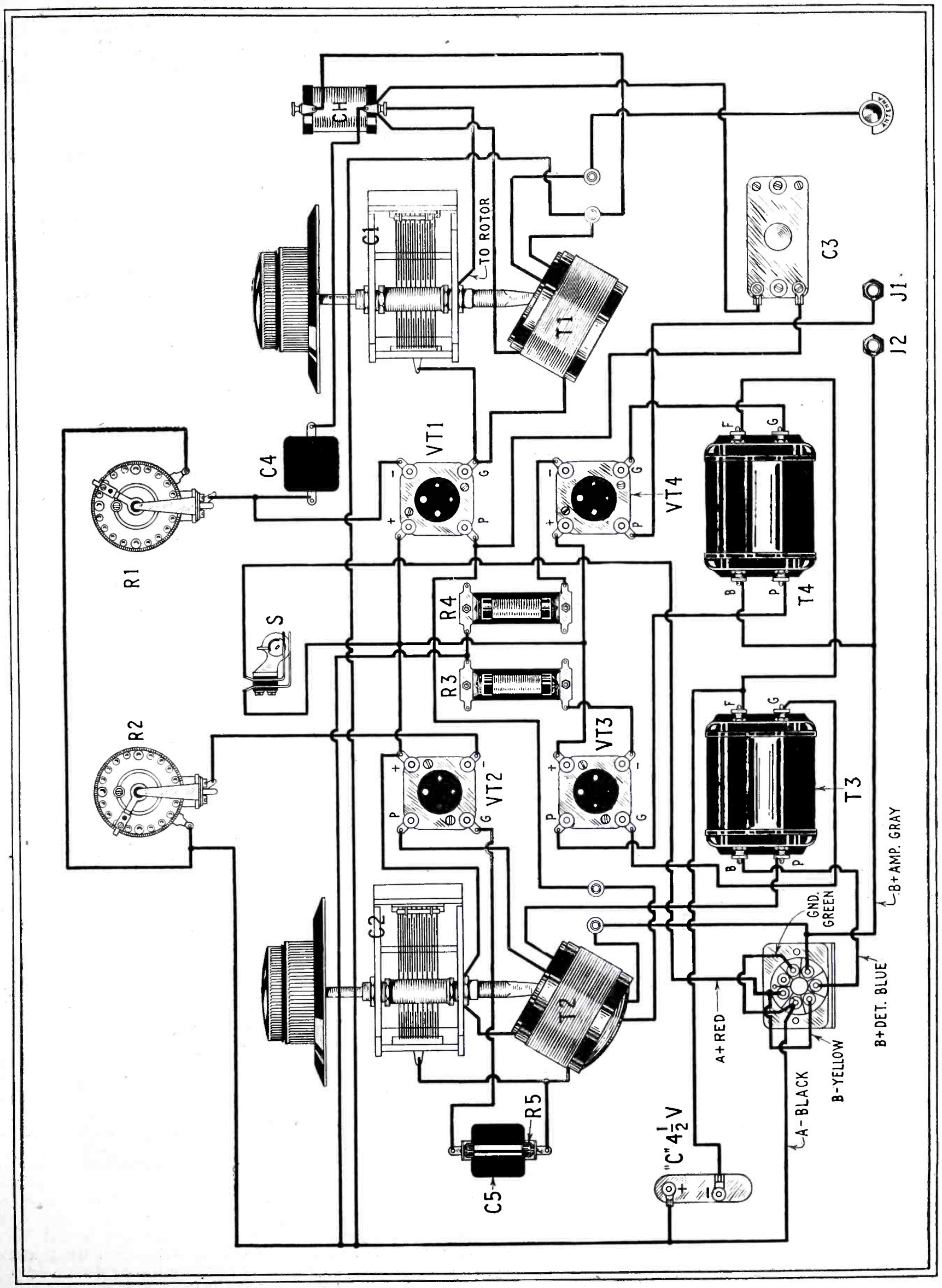
The tickler coil is attached to the rear end of the condenser extension shaft and therefore turns with the ro-



Schematic wiring diagram of the Knickerbocker Four. The special feature of this circuit is the Equamatic system of automatic variable coupling and automatic control of regeneration.

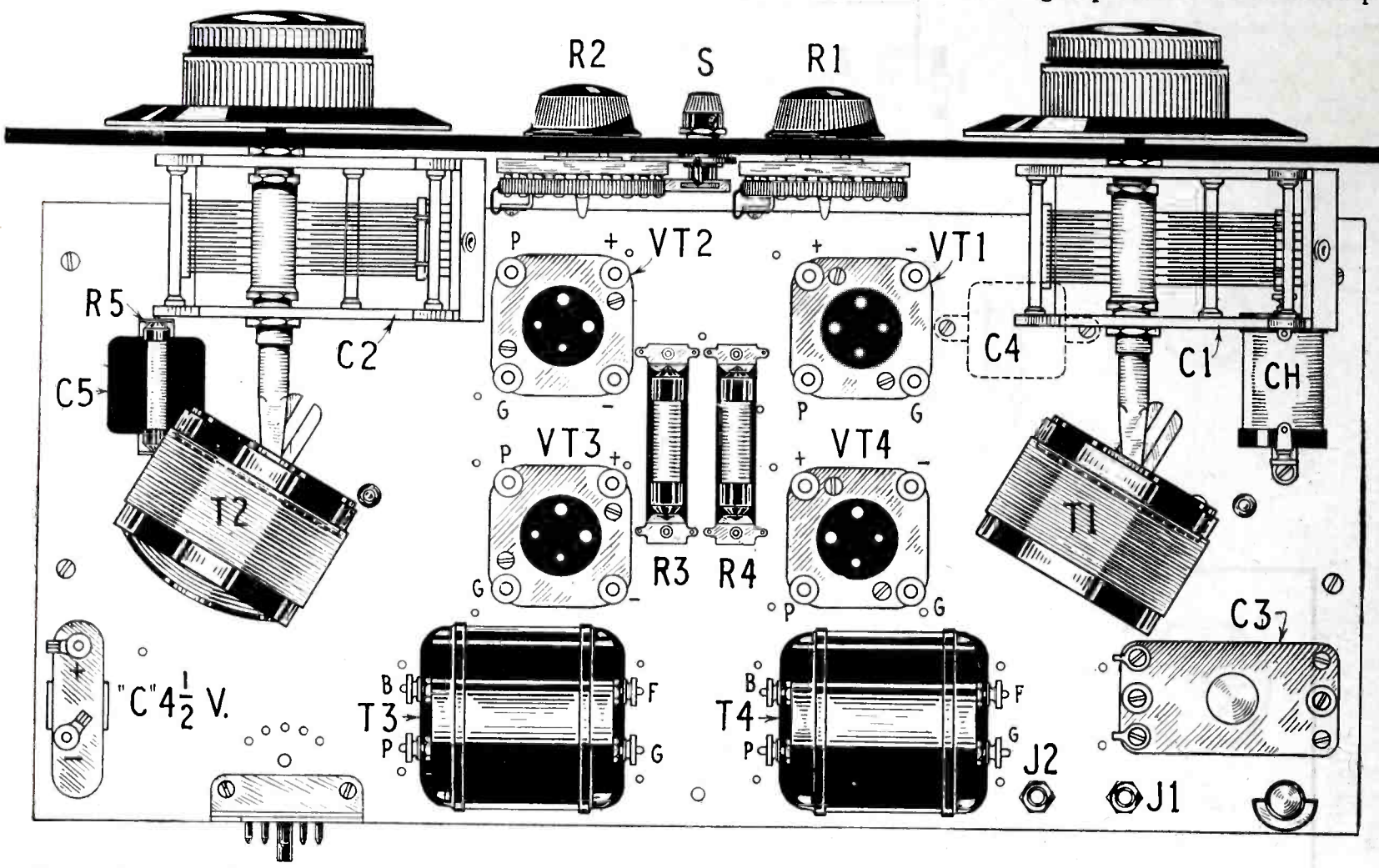


Layout of the front panel showing the location of all holes to be drilled.



tor plates of the condenser, when the receiver is tuned. In so turning, it varies the coupling between the secondary and tickler coils and thereby regulates the amount of energy that is fed back from the plate circuit to the grid. By properly adjusting the angle of the secondary coil the coupling range may be regulated so that throughout the entire broadcast band the detector will be kept just under the point of oscillation, and therefore in its most sensitive condition.

Inasmuch as the tickler adjustment is usually quite critical it seems at first glance to be somewhat surprising that automatic control can be used in its regulation. A little study of the equamatic coil system makes the matter entirely clear, however. With the secondary coil set in a position where its winding is parallel with the front panel, the coupling between it and the tickler will not vary when the tickler coil is rotated by the condenser drive shaft because the tickler will remain at the same angle in its relation to the



Layout of parts on the front and sub-panel. The single binding post shown in the lower right hand corner of the above illustration is the aerial terminal.

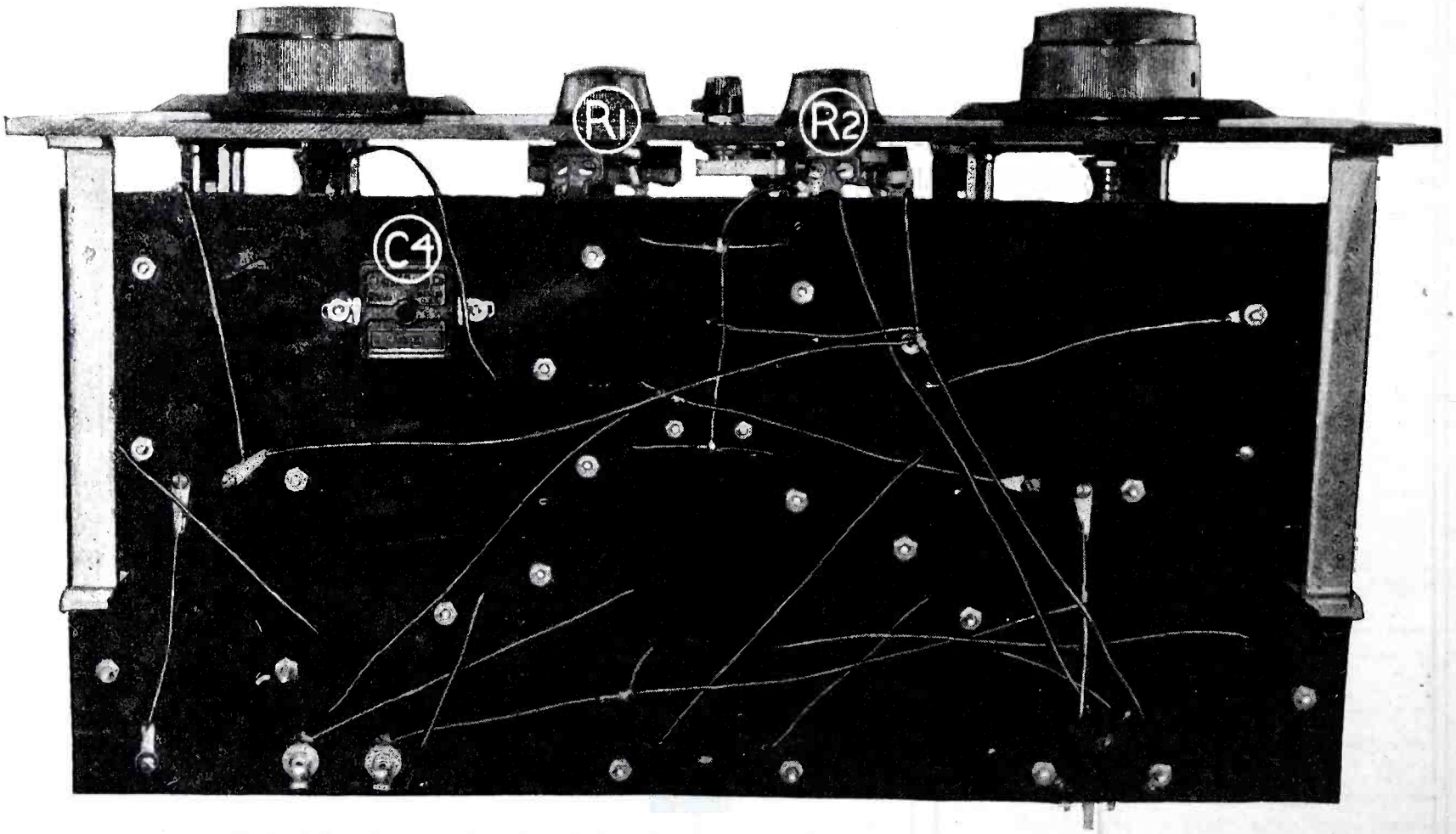
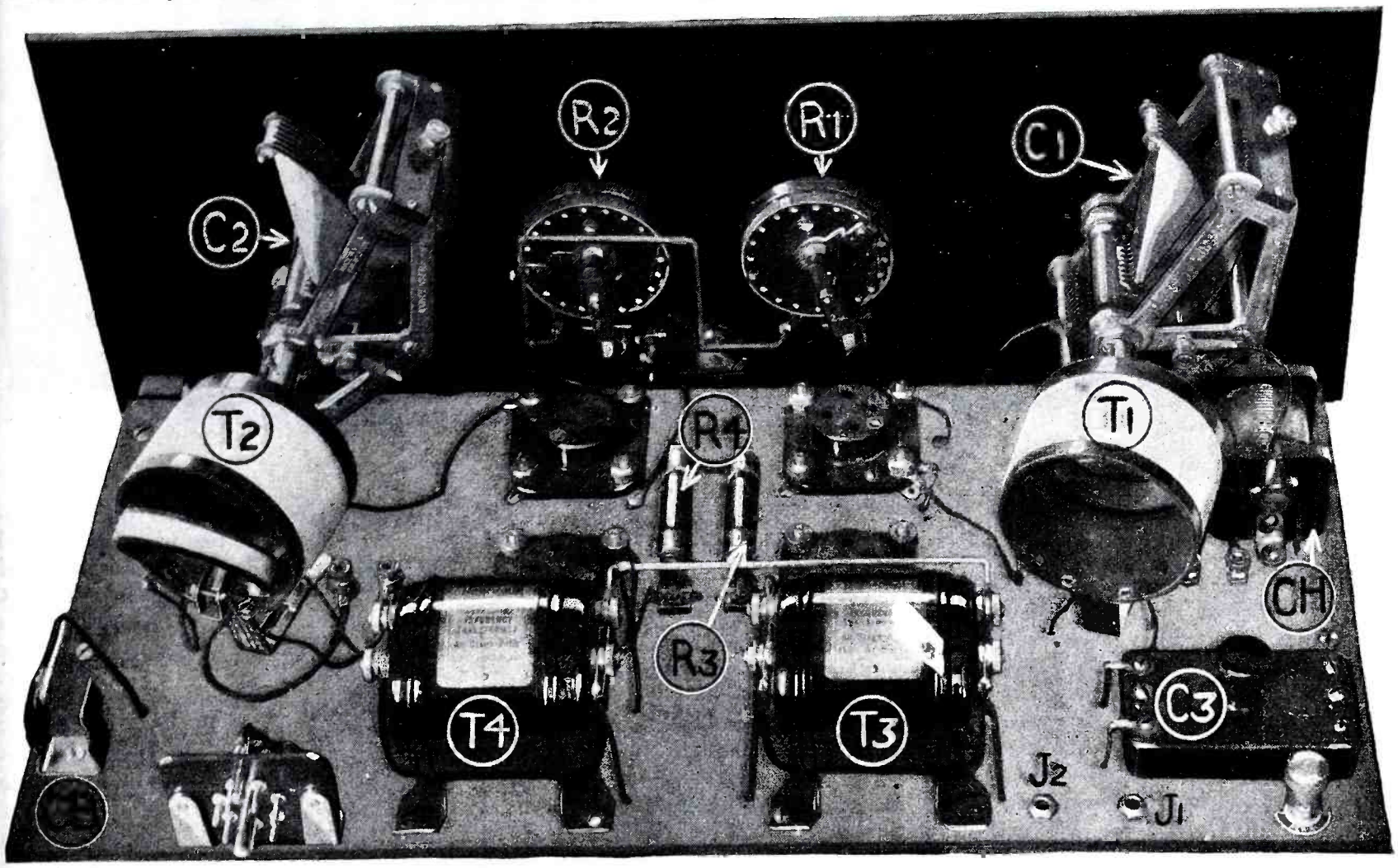


Photo of the set as seen from beneath the sub-panel. Note all wiring is made with flexible hook-up wire.

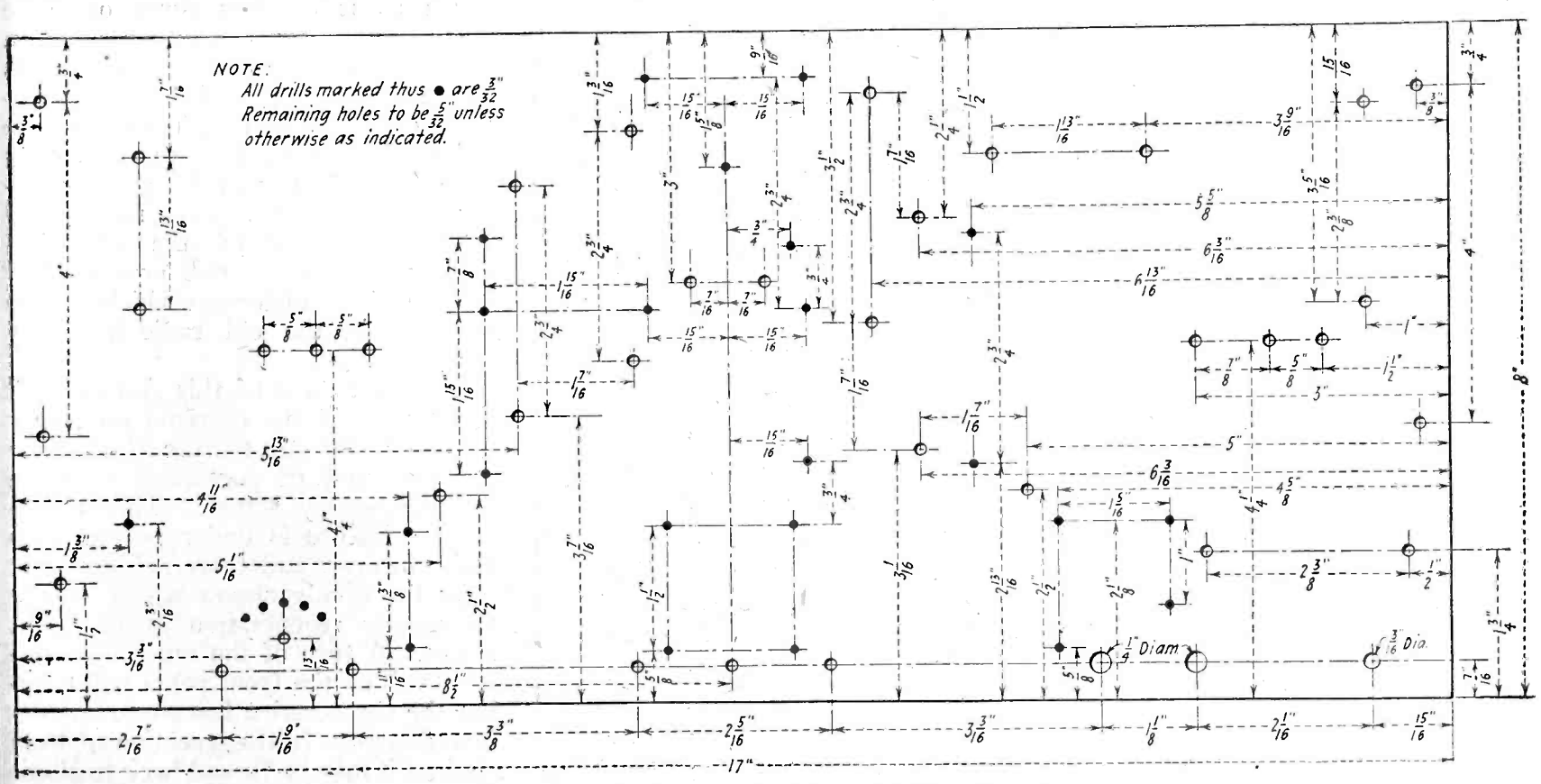
secondary. If the secondary coil is swung around to a 45 degree angle from the front panel, however, and the tickler is so adjusted that its winding is parallel with that of the secondary when the tuning condenser is set with its plates all in, then when the condenser is turned with its plates all out, the primary will have changed to an angle of 90 degrees from the secondary. It is therefore evident that the range of coupling obtainable with this automatic arrangement can be limited to any desired extremes. With the secondary set at a 45 degree angle the coupling will vary between zero and maximum when the condenser dial is turned throughout its range. If the secondary coil is turned to an angle of 30 degrees from the front panel the coupling will be limited to a smaller range and instead of decreasing to zero when the condenser plates are all out, it will only decrease about 60% from maximum.

The feed-back coupling can therefore be set to any desired range limitations. After the receiver is in operation a tentative preliminary adjustment of the coil angles can be made and then altered if necessary until the angle is found where the detector will

(*Continued on page* 136)

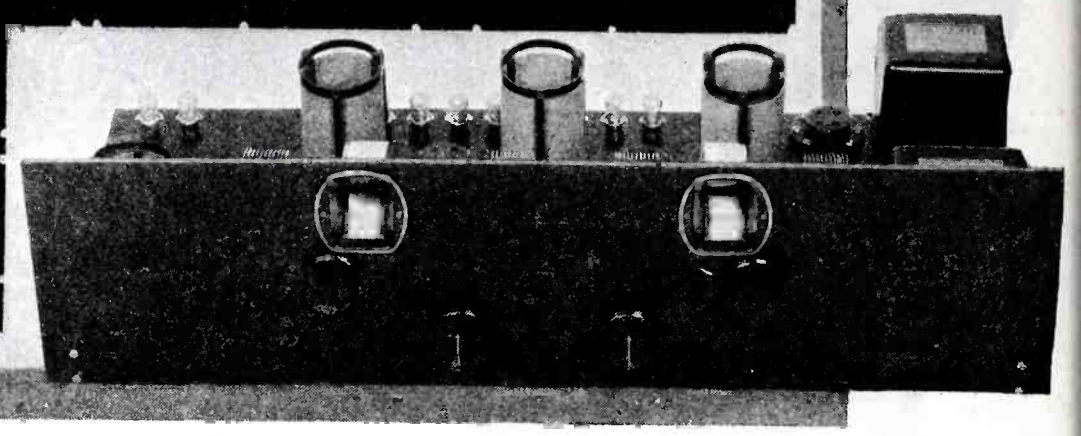


A rear view of the Knickerbocker Four receiver. A 4½-volt "C" battery is held in the clip at CB.



The above is the layout of the sub-panel drilling dimensions.

HOW TO BUILD THE AERO-DYNE-SIX



THERE are those of us who are always inclined to think, and to tell the world at large, that the older things are best. The good old days at the old "swimmin' hole," or the pies that mother used to make, may be better than these things are today. Mostly our memories and recollections are tinted by the rose colored haze of the passing years—a haze which for some reason magnifies the best of the past and obscures the less pleasant part.

But once in a while we do stumble across something that proves the value of the old order. In radio, for instance, resistance coupled amplification has taken its place during the last two seasons as one of the most popular forms of audio coupling, after having practically dropped out of existence for a span of several years. Experimenters started off at all sorts of tangents after the World War to find improvements over resistance coupling, mainly for economical reasons. There was a complete migration to transformer coupling eventually and the average fan came to believe that transformer coupling was the one and only practical coupling method. Then came the reduction in the cost of tubes and practical sources of high plate voltage supply, and with them came the resurrection of resistance coupling. Since that time transformers have been improved to a point where transformer coupling is equal to resistance coupling so far as quality of reproduction is concerned, and both methods are now in popular use.

A somewhat similar reversion to the old order is now noticeable in the radio-frequency end of some of our present day receivers. One or more stages of untuned. transformer coupling are to be found in many of the new receivers, particularly for use in coupling the antenna to the first R.F. tube. There is also a growing tendency to include resistances in the plate or grid circuits of the R.F. tubes to prevent oscillation. All of these schemes were popular a few years back but then became strictly taboo. There were reasons for the one time popularity of these features—and there were reasons for discarding them. Then later developments brought them back into logical usage. And so it goes.

PARTS REQUIRED FOR AERO-DYNE-SIX

1 Aero Kit No. U-16, consisting of four Aero coils, T1, T2, T3, T4.
1 Aero Foundation Unit, consisting of drilled front panel and sub-panel, sub-panel mounting brackets and full size blue-prints.
4 Hammarlund Type ML-23, .0005 mfd. Midline variable condensers.
2 Silver-Marshall drum dials.
2 Silver-Marshall No. 220 audio-frequency transformers, T5, T6.
5 Silver-Marshall No. 511 tube sockets, VT1, VT2, VT3, VT5, VT6.
1 Benjamin No. 9040, Cle-Ra-Tone tube socket, VT4.
1 Carter .00025 mfd. Molded Mica condenser, C5.
1 Carter .001 mfd. Molded Mica condenser, C6.
2 Tobe 1 mfd. by-pass condensers, C7, C8.
1 Tobe Tipon 2 megohm grid leak, R4. (GL)
1 Yaxley combination 6 ohm rheostat and battery switch R1(S).
1 Yaxley 1 ohm fixed filament resistance, R2.
1 Yaxley 200 ohm potentiometer, R3.
1 Polymet E-Z grid-leak mounting.
11 X-L binding posts with marker tags as follows: Aerial, Ground, A Battery+, A Battery—, C Battery— (2), B Battery 45+, B Battery 90+, B+ Amplifier, Speaker Positive, Speaker Negative.
1 package Kester radio solder.
1 package Cornish Braidite or Flexibus hook-up wire.

In the Aero-Dyne-Six receiver the old method is employed, of controlling sensitivity and stability in the R.F. amplifier through the use of variable grid potential. In the R.F. amplifiers of past years this method was generally used but the drawback then was in its use in conjunction with untuned stages and the resulting lack of selectivity. Where the individual stages were tuned this method did not offer adequate or satisfactory control over stability. Today, however, we have made tremendous advances in the design of radio-frequency coils and condensers with the result that stability is an easier thing to attain than heretofore and the old grid potential variation scheme can be used to good advantage in circuits designed for this purpose.

All of the R.F. stages in the Aero-Dyne-Six receiver are tuned and inasmuch as it employs three of these stages, plus a tuned detector stage—a total of four tuned circuits—there is ample selectivity. Thus the replacement of the single tuned circuit of the old receivers with four tuned circuits has eliminated one of the greatest objections to the old. Also the greater inherent stability of the radio-frequency amplifier in this new receiver eliminates the distortion which was so common in the old radio-frequency amplifiers.

The advantage of this Aero circuit lies largely in the extreme sensitivity obtainable through the use of a certain small amount of regeneration in the radio-frequency stages. This regenerative feature is under perfect control, however, and therefore does not offer the disadvantages which usually accompany regeneration in the R.F stages. A turn of the sensitivity control knob on the front panel will regulate the regenerative feature to any degree desired. In the reception of local stations it may be turned back to eliminate regeneration entirely and this resulting decrease in sensitivity largely eliminates reception of undesirable static and other external noises to permit the pure, sweet reception of the

broadcast programs, unadulterated by extraneous noise or interference.

But when the reception of signals from distant stations is desired the sensitivity required for such reception is easily obtained by turning up the sensitivity knob to the degree necessary to provide the proper sensitivity. Incidentally, in increasing the sensitivity in this way the selectivity is also increased from normal to an unusually high degree. The advantage of this double barrelled action will be appreciated when it is realized that ultra-selectivity is essential when it is desired to tune in weak distant signals through a barrage of powerful local stations.

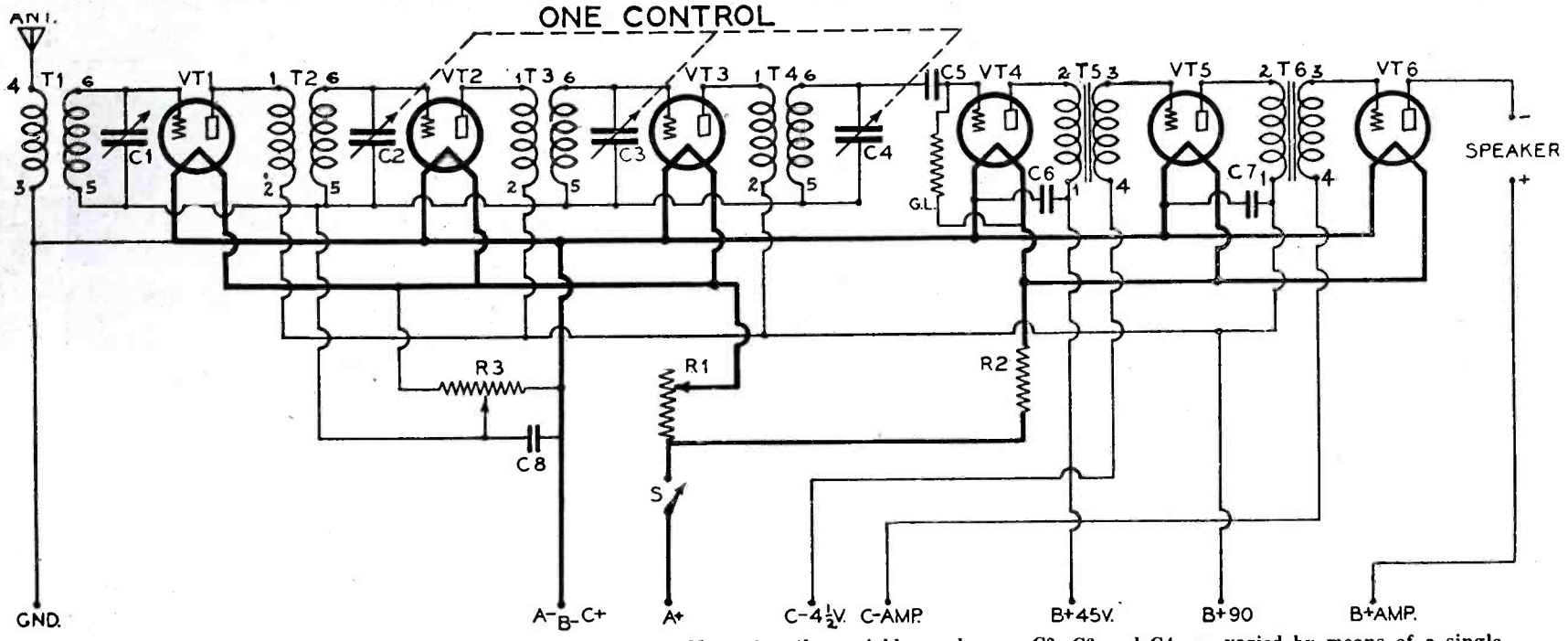
Construction of this receiver is so simple that it can safely be undertaken even by a beginner. There is no complicated shielding of any kind to interfere with the wiring and to generally complicate the construction, nor are there any constructional or wiring difficulties imposed by neutralizing or balancing systems. One circuit follows another in natural sequence, from the antenna to the output. In addition to the full size blue prints which are supplied with the foundation unit (see list of parts) the front panel and the sub-panel are furnished completely drilled. Thus the most tedious and painstaking jobs are taken care of in advance, and the chance of costly mistakes in drilling and layout is eliminated entirely.

Most of the wiring of the receiver is completed under the sub-panel. The plate and grid wiring to each tube is done above the sub-panel, however, to allow these connections to be as short as possible. A great deal of the wiring can be completed before the sub-panel is mounted on the front panel.

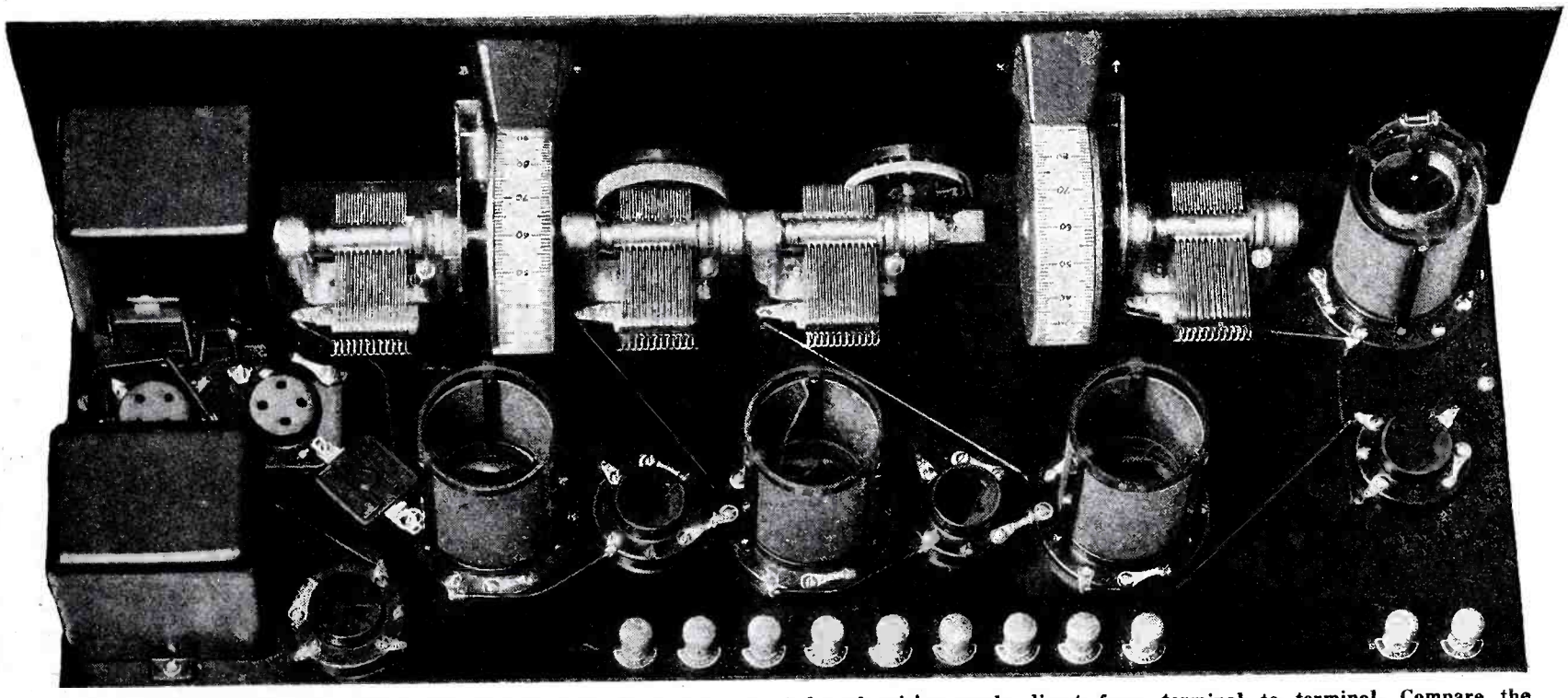
Simplicity of operation is an important consideration in a receiver, particularly if it is to be operated by inexperienced members of the family.

Tuning of the Aero-Dyne-Six is therefore limited to two knobs which operate the drum dials and the four tuning condensers. The left hand knob, which is located just below the left hand dial window, controls the condenser, C1, which tunes the input circuit of the first R. F. tube. This circuit is individually tuned to permit exact tuning regardless of the size and characteristics of the antenna used with the receiver.

The right hand tuning control operates the three condensers C2, C3 and C4, which are grouped on a single shaft for simultaneous control. This



Schematic wiring diagram of the improved Aero-Dyne-Six. Note that the variable condensers C2, C3 and C4 are varied by means of a single control. Rheostat R1 controls the R.F. stages, while the fixed resistor R2 is used for the detector and A.F. tubes.



A back panel view of the receiver showing how the parts are mounted and wiring made direct from terminal to terminal. Compare the above photo with the instrument layout on a following page.

This radio-frequency amplifier is unusual in that it requires no preliminary adjustments of any kind. There are no neutralizing condensers to be adjusted, critical fixed resistance values to be determined, nor balancing adjustments of any kind.

"ganging" is permissible in this receiver because the coils and variable condensers used are built to such a high degree of accuracy as to tune exactly alike. Tuning them all with a single control is therefore the natural and logical arrangement.

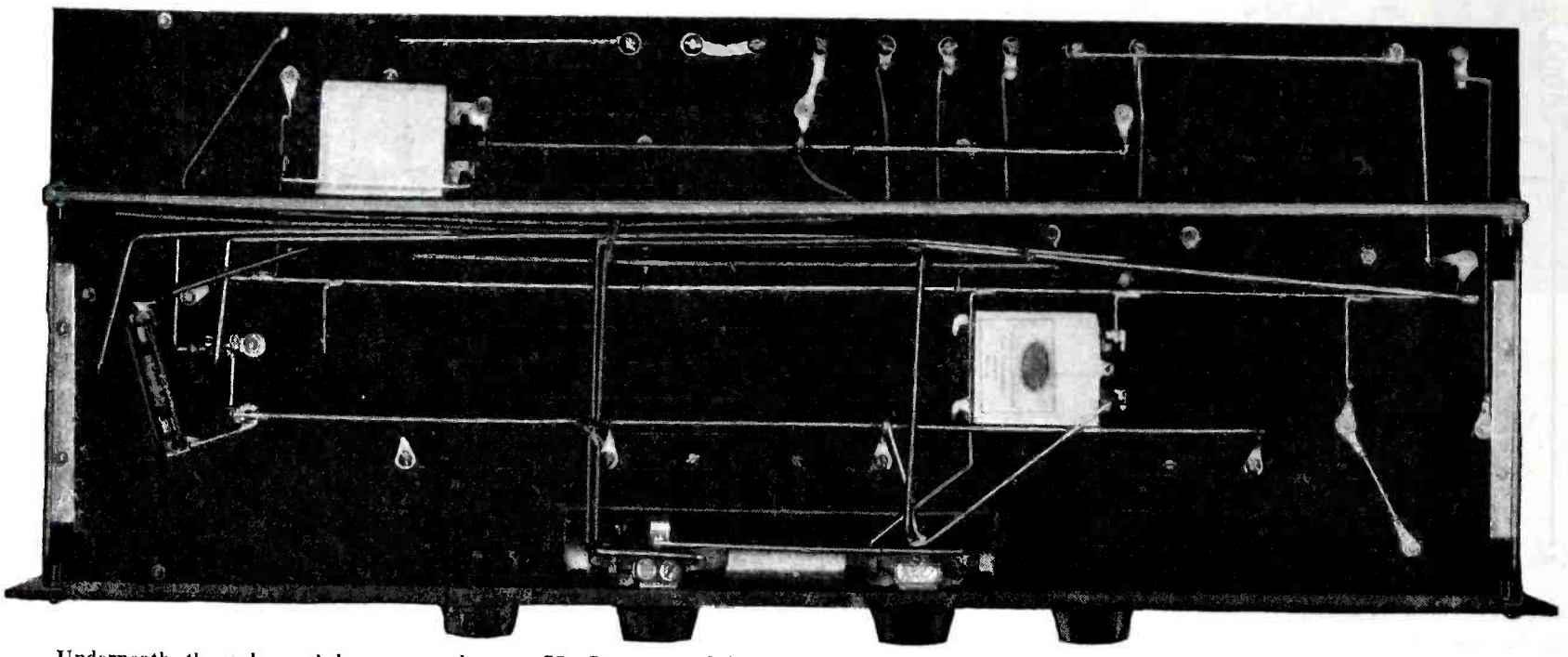
In addition to the two tuning knobs there are two other knobs conveniently placed on the front panel to provide means for controlling the sensitivity and volume of the receiver. To many fans these two terms may seem to mean about the same thing. Actually, however, there is an important difference. In increasing sensitivity the ability of the receiver to respond to weak electrical impulses is tremendously increased. This brings in distant stations—but it also brings in much undesirable noise due to static, electrical disturbances of one kind and another, from far and near. On the other hand, if the sensitivity is low but volume is high, the local stations will come in with plenty of "kick" and without any disturbing noises. By the inclusion of both sensitivity and volume controls in this receiver it is possible to bring in distant stations when desired, or when local reception is desired it may be had without accompanying noise.

The volume control is included in the filament circuit of the radio-frequency amplifier and is therefore capable of regulating volume without in any way affecting the quality of reproduction. The quality, by the way, is excellent, as will be recognized from the fact that transformers of the new type with a fine amplification curve are used. Amplification, in effect, is practically constant at all tone frequencies and the reproduction is therefore life-like and natural. The deep bass notes roll out of the loudspeaker with most stirring realism, and the higher frequencies are brought out in their full brilliance.

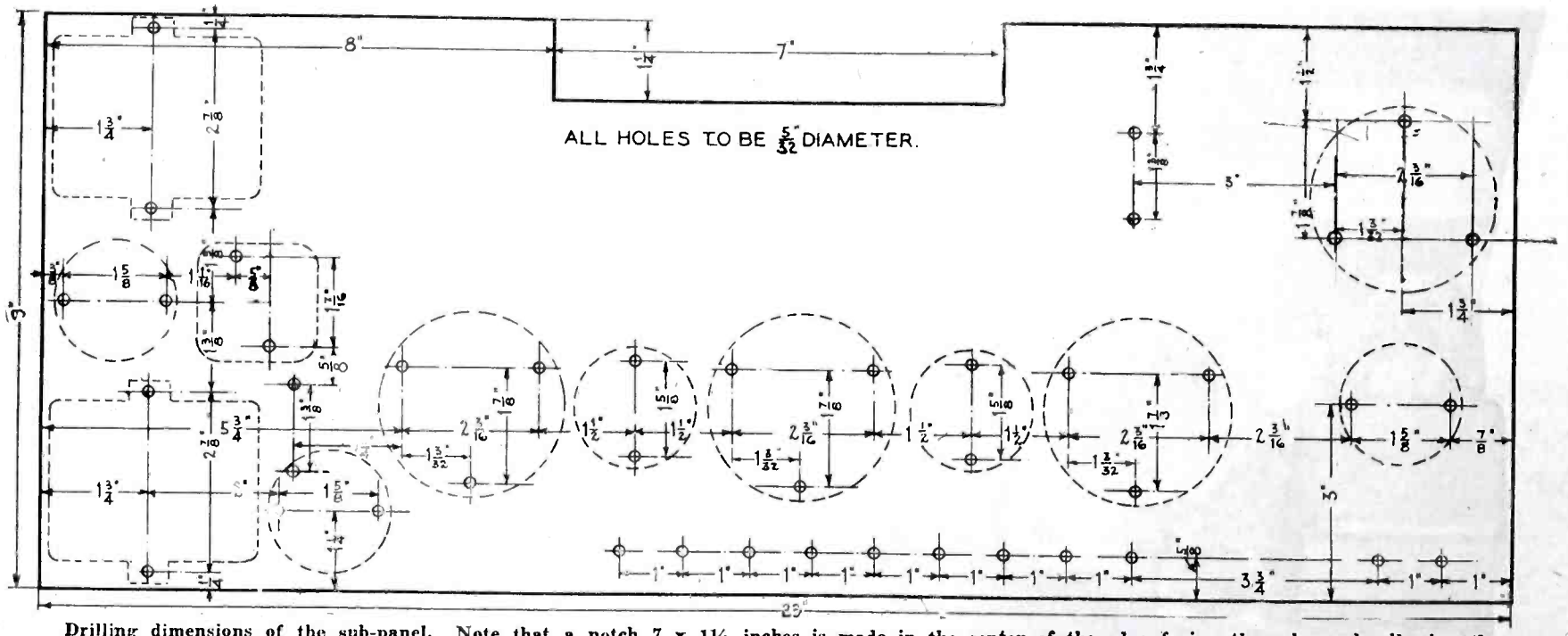
The audio transformers used are not alone enough to insure perfection in tone quality, of course. The tubes play an equally important part. For this reason a CX 371 valve is used in the last audio stage. In addition, the filaments of both the first and second audio tubes are controlled automatically by a fixed resistor unit which always keeps the filaments at their proper operating voltage, and thus insures normal functioning.

The actual construction of the receiver is so fully shown in the illustrations that no detailed verbal instructions are necessary. It is only necessary to attach the various instruments on the panels, in the positions shown in the photographs. The holes for the mounting screws are already drilled so the exact location of every instrument is automatically fixed.

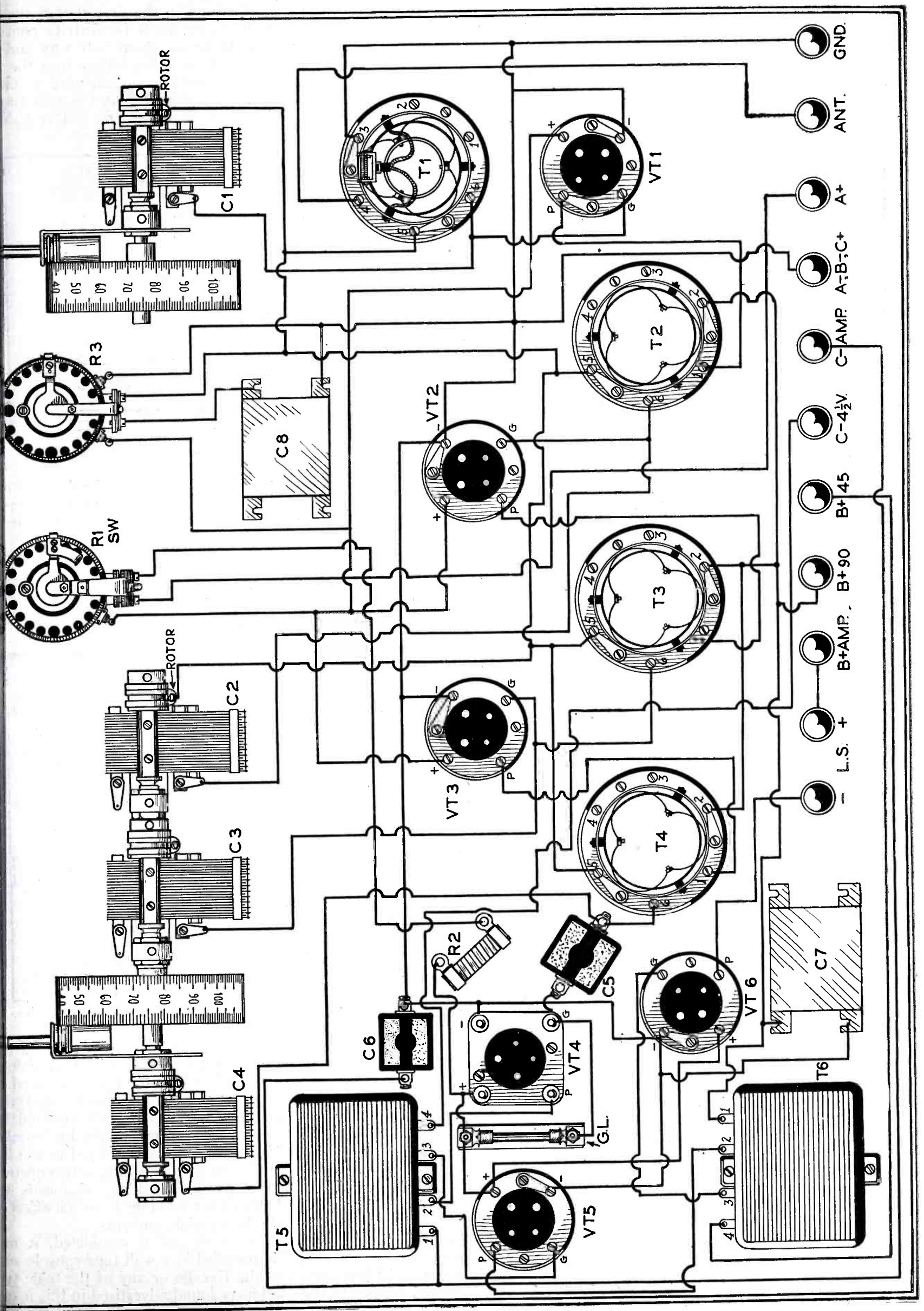
In wiring the receiver the free use of soldering lugs is recommended. Many of the connections can be made by means of two lugs, without any wire



Underneath the sub-panel by-pass condensers C7, C8 and grid leak are mounted. The strip of bakelite completely across the bottom is fastened to the ends of the two sub-panel brackets to give additional rigidity to construction.



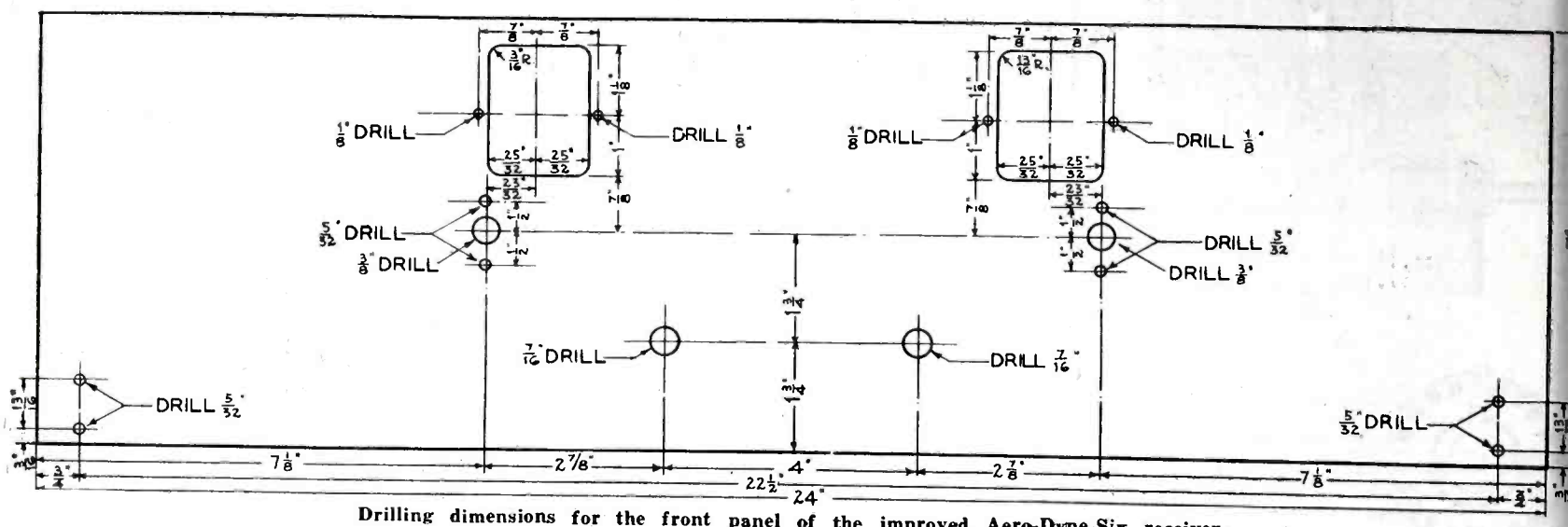
Drilling dimensions of the sub-panel. Note that a notch 7 x 1¼ inches is made in the center of the edge facing the sub-panel, allowing the rheostat and potentiometer to be mounted on the front panel.



at all. But in any event the use of lugs insures a tight connection under screw heads, and permits a good solid job of soldering to be done. Lugs about ¾" long are a convenient size to use and they are easier to work with than the smaller sizes.

single one, then if there should be anything wrong with the battery circuits it will be noted at once, without any chance of burning out more than one tube. This one tube should be inserted in the first socket at the left (looking at the receiver from the

To tune in the first station the p tentiometer knob (sensitivity contro should be set about half way and t rheostat the same. Then turn the tu tuning knobs in unison until a stati is heard, then adjust the two tuni controls to resonance. The volur



Drilling dimensions for the front panel of the improved Aero-Dyne-Six receiver.

A careful study of the photographs will show that in many instances the mounting screws which extend through the sub-panel from the sockets and coils are used for carrying connections through the sub-panel. Thus, by means of a lug, one of the coil terminals is connected to the top of one of the mounting screws, then the extension of the connection under the panel is made from the bottom end of the mounting screw.

Upon completion of the wiring a careful recheck of the entire circuit should be made to be sure that all is as it should be. Then, with the rheostat turned all the way off, the batteries, antenna, ground and loudspeaker may be connected up.

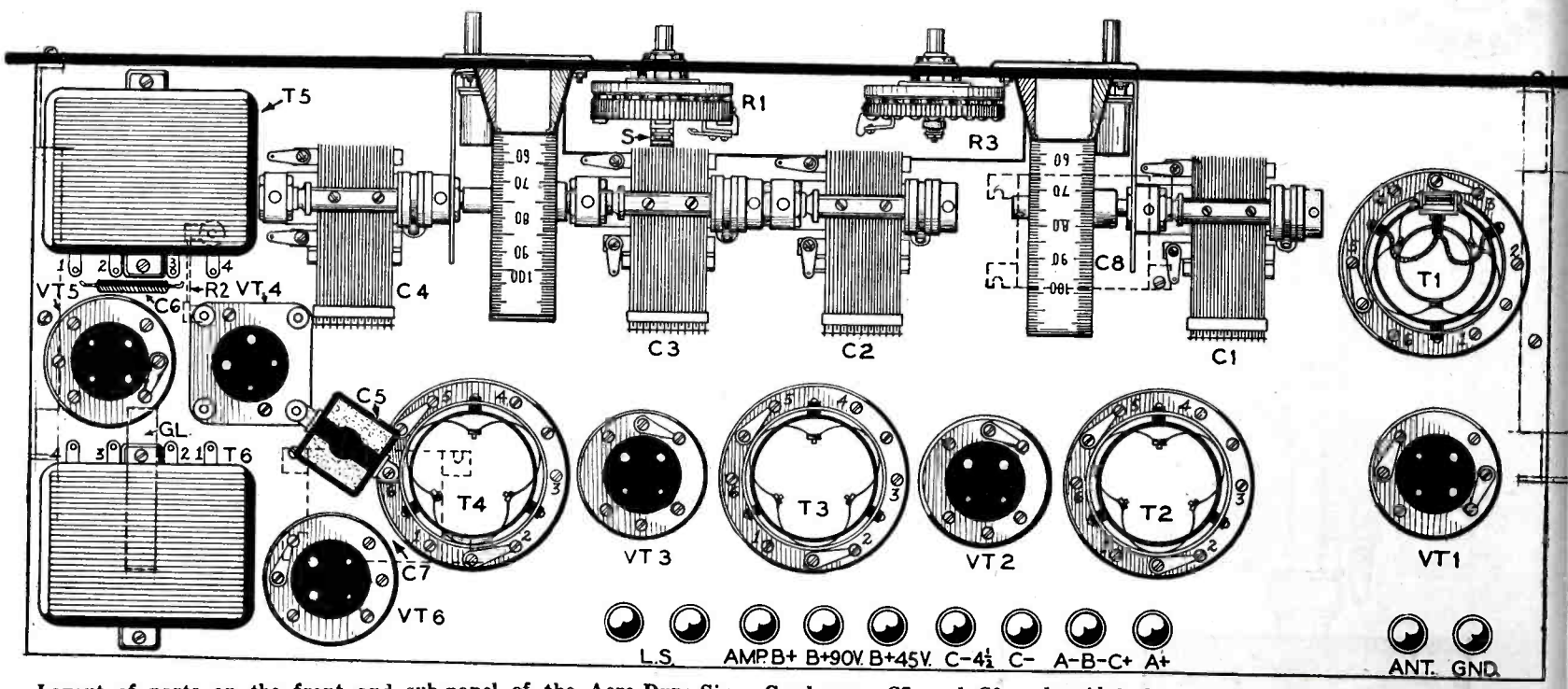
Before placing all the tubes in their sockets it is advisable to start with a

front) and the rheostat should be turned on only enough to make contact between its slider and resistance winding. If everything is O K to this point, the rheostat should be turned off again and the balance of the tubes placed in their sockets. Tubes of the 301-A type are placed in all sockets but the one at the rear edge of the sub-panel. In this socket is placed a 371 type power tube. This is the socket for the last audio stage. The others are from left to right: 1st. R. F., 2nd. R. F., 3rd. R. F., detector, 1st audio.

With the tubes in position, the detector and the two audio tubes should light to normal brilliance as soon as the rheostat knob is slightly turned to the right. The three R. F. tubes will light dimly at this position of the rheostat but will increase in brilliancy as the rheostat is turned further to the right.

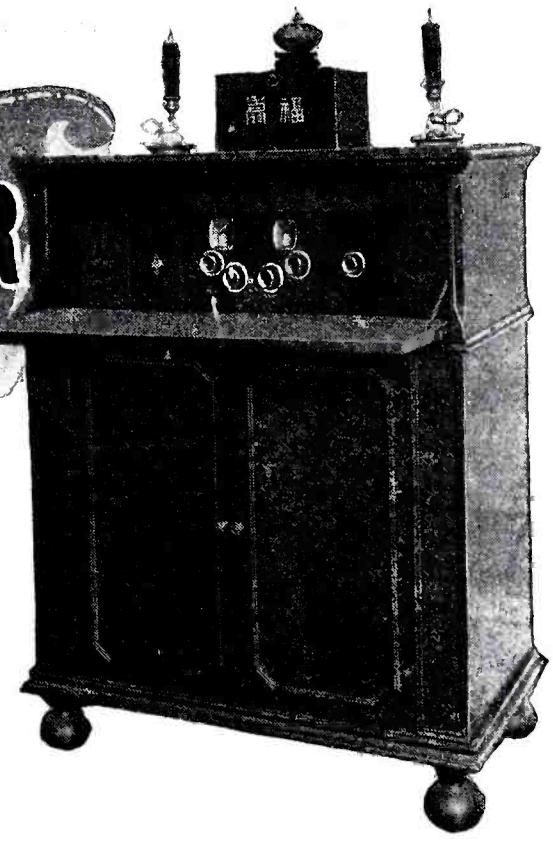
control and sensitivity knobs may nc be adjusted and a little experimentir will show the adjustment of both f maximum effectiveness.

If unusually great volume of repr duction is desired it can be obtain by the use of 180 volts for the pla



Layout of parts on the front and sub-panel of the Aero-Dyne-Six. Condensers C7, and C8 and grid leak are mounted beneath the sub-panel.

THE PERFAM A-C FOUR



FOR a long time it has been the dream of engineers to operate a radio receiving set direct from the light socket. Today this is easily possible. A.C. tubes have not sprung up over night. In fact they have been in operation in various laboratories for a number of years. There are two kinds of A.C. tubes; those that have a heavy filament which operates direct from the light socket through a step down transformer and those which have a heater which operates from A.C. and which, in turn, heats a cathode which supplies the electron emission which the radio set actually makes use of. Both kinds of tubes are perfectly satisfactory and when used in a set properly no hum will be heard.

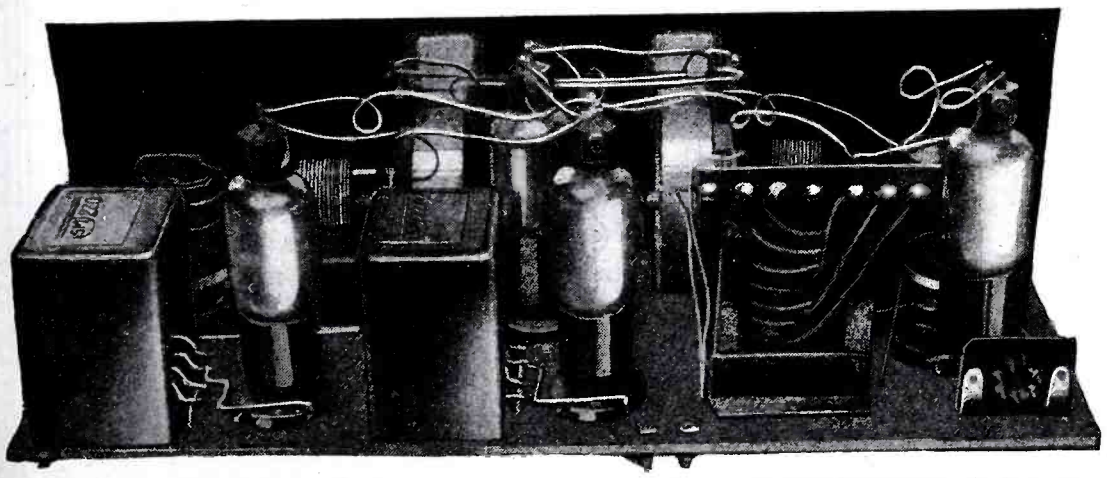
For the radio set builders who like to try out the new wrinkles in radio, the Perfam Four is offered for their approval. This receiver is low in price and many of the other improvements in radio apparatus are used.

The circuit is nothing new but does include a high quality audio. This is the most important part of any receiving set and is so overlooked by manufacturers of high grade sets which sell for a great deal more money.

Of the different A.C. tubes available, the Sovereign tubes are used in this receiver. They are of the heater type. The alternating current from the house supply, normally 110 volts, 60 cycles, is applied to a step down which reduces this voltage to approximately 3 volts.

LIST OF PARTS

1 Birnbach No. 60 tuner, L2
1 Birnbach No. 60 radio frequency coil, L1
4 Sovereign AC tubes
1 Sovereign special heater transformer, T3
1 Sovereign power switch, PS
2 Tobe No. 301, 1 mfd. condensers, C5, C6
1 Tobe 2 meg. leak, R1
1 Tobe .00025 mfd. grid condenser, C3
1 Tobe .0005 mfd. condenser, C4
4 Silver-Marshall No. 511 tube sockets
1 Pair Silver-Marshall No. 540 mounting brackets
2 Silver-Marshall No. 805 vernier drum dials
1 Silver-Marshall No. 275 radio frequency choke coil, CH
2 Silver-Marshall No. 220 audio transformers, T1, T2
2 Amsco No. 526 variable condensers, C1, C2
1 Jewell No. 190 A.C. voltmeter 0-5 volts (optional)
1 Clarostat (power type), R3
1 Clarostat (universal range), R2
1 Yaxley cable plug
1 Electrad Phasatrol, PH
50 Feet Acme Celatsite hook-up wire
1 Excello console or Iveyline table type cabinet
1 Formica panel 7x21x$\frac{3}{16}$"
1 Formica sub-panel 9x20x$\frac{3}{16}$"
1 Package Kester radio solder
Assortment of machine screws, nuts, etc.



A rear panel view of the Perfam A. C. Four as it appears when completed with all tubes in the set.

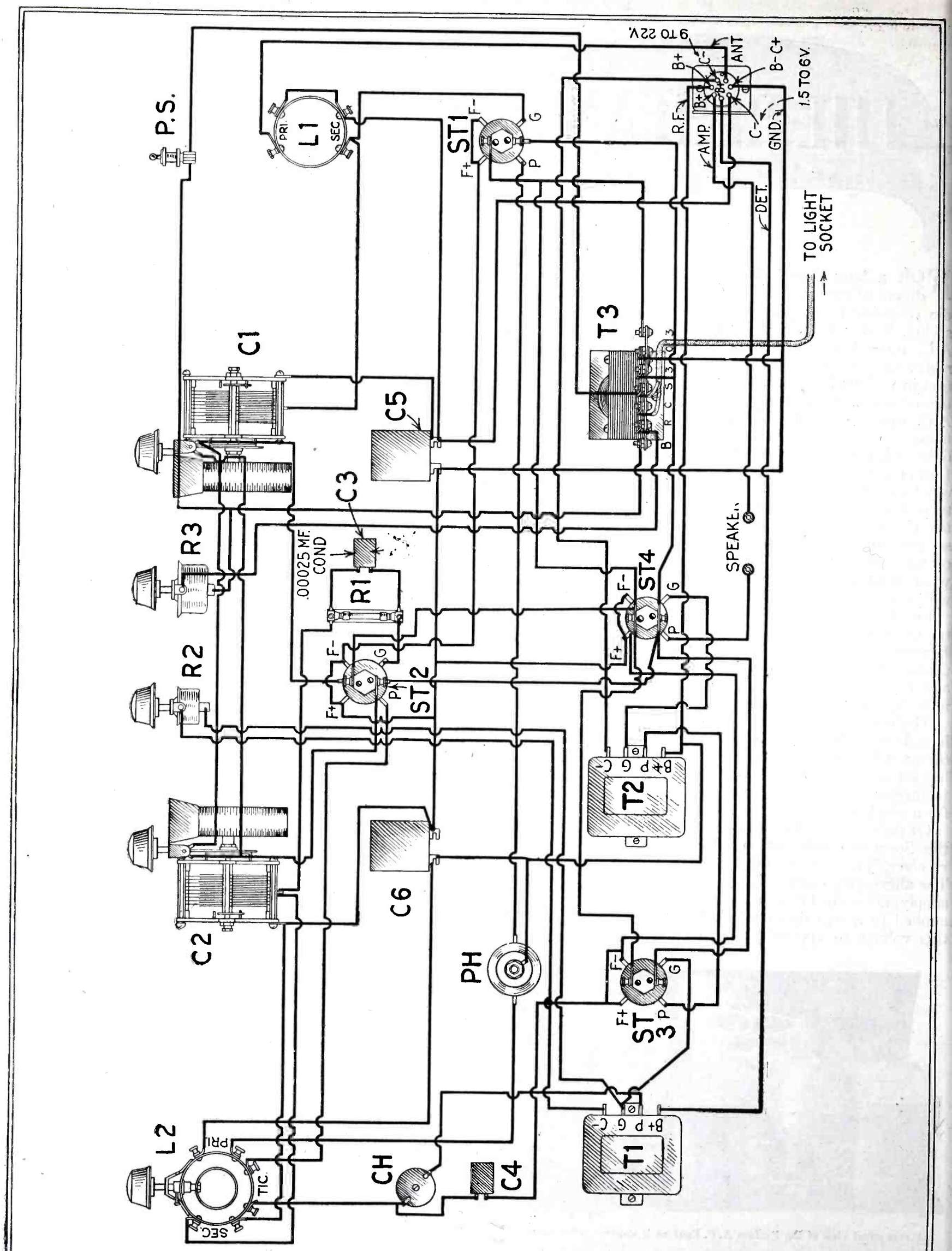
The tube heater units are then connected across the 3 volts in multiple as shown in sketch of transformer and tubes.

When this alternating current flows through the heater of a tube, it becomes hot and heats up a special cathode which, when hot, emits electrons and acts similarly to an ordinary filament in a 201A type tube. A low resistance power rheostat is connected in series with the stepdown transformer to regulate the A.C. voltage. The Sovereign tube, according to the manufacturers, has a normal life of 1500 hours and is operated at a comparatively low temperature. Thus the electron emission is practically constant for the life of the tube.

The selection of circuit for the Perfam Four was not difficult as it has been found that a stage of one tuned R.F. and a tuned detector followed by two stages of audio amplification is generally an easy circuit to construct with the suitable radio apparatus available, and its simplicity allows the average radio home builder no trouble.

When the radio frequency circuit is properly neutralized it is more stable, and for that reason a Phasatrol is used for this purpose. The Phasatrol is very easy to adjust and only requires a long wooden screw driver, which can be made from any piece of wood in a few moments with a sharp knife, and when properly adjusted, as will be explained later, will eliminate tendency to radio frequency oscillation or distortion.

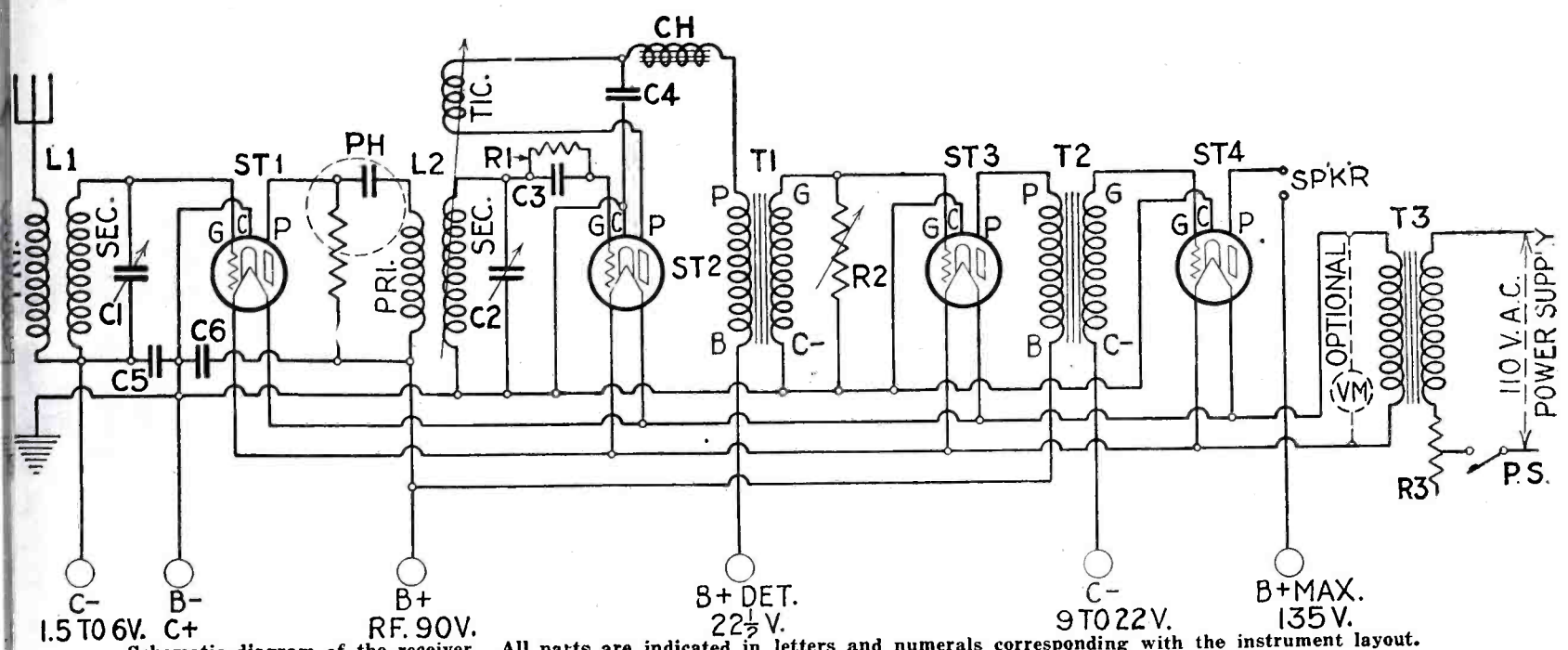
As it is desired to keep the cost to minimum and yet use good merchandise, the tuning coils selected are the Birnbach R.F. No. 60 and Birnbach No. 60 tuner. These coils when tuned with Amsco .0005 mfd condensers will cover a wave length range of 200 to 550 meters, sufficient to cover the broadcast range. An outside or inside antenna may be used and no shielding is necessary although the stepdown transformer is mounted on the subpanel directly in back of the R.F. tuning unit. Another new feature, but no additional expense, is the use of S-M drum dials. They present a neat appearance, are easy to tune, and allow



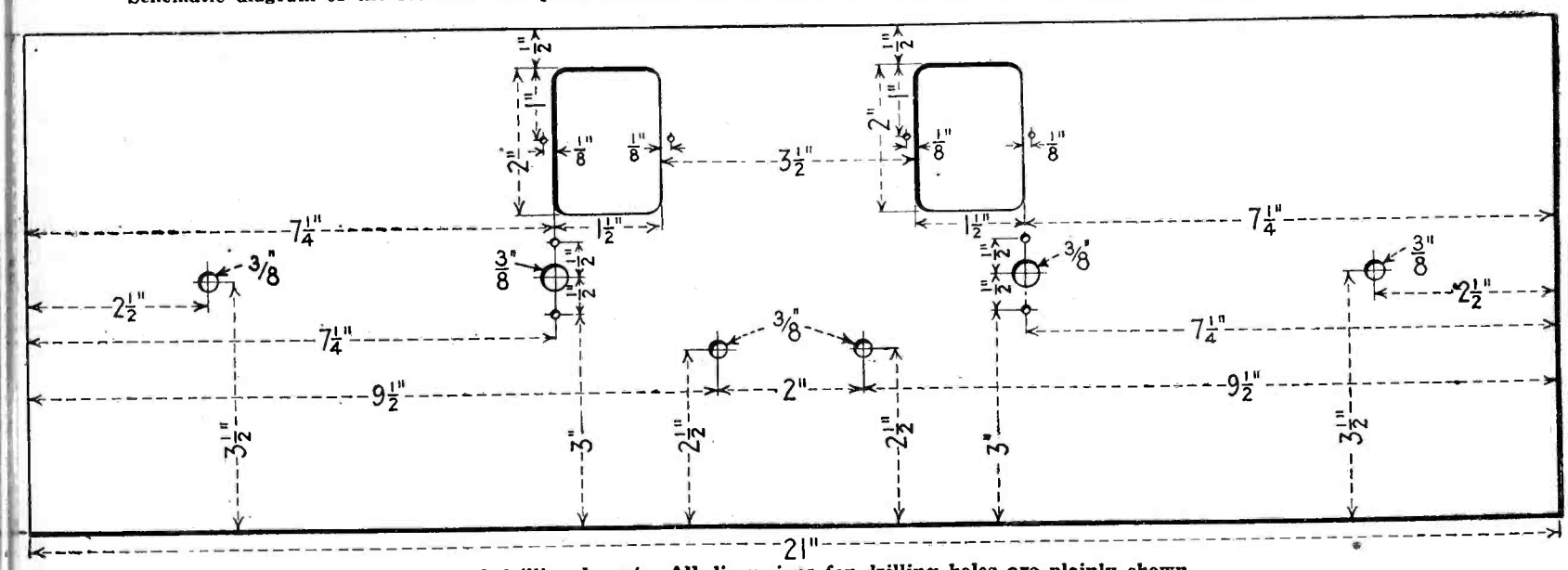
re room behind the front panel as condensers are mounted on a horizontal plane. The dials may be illumin-

it is doubtful if you can purchase a three volt lamp; but this is not a drawback as enough light will show when

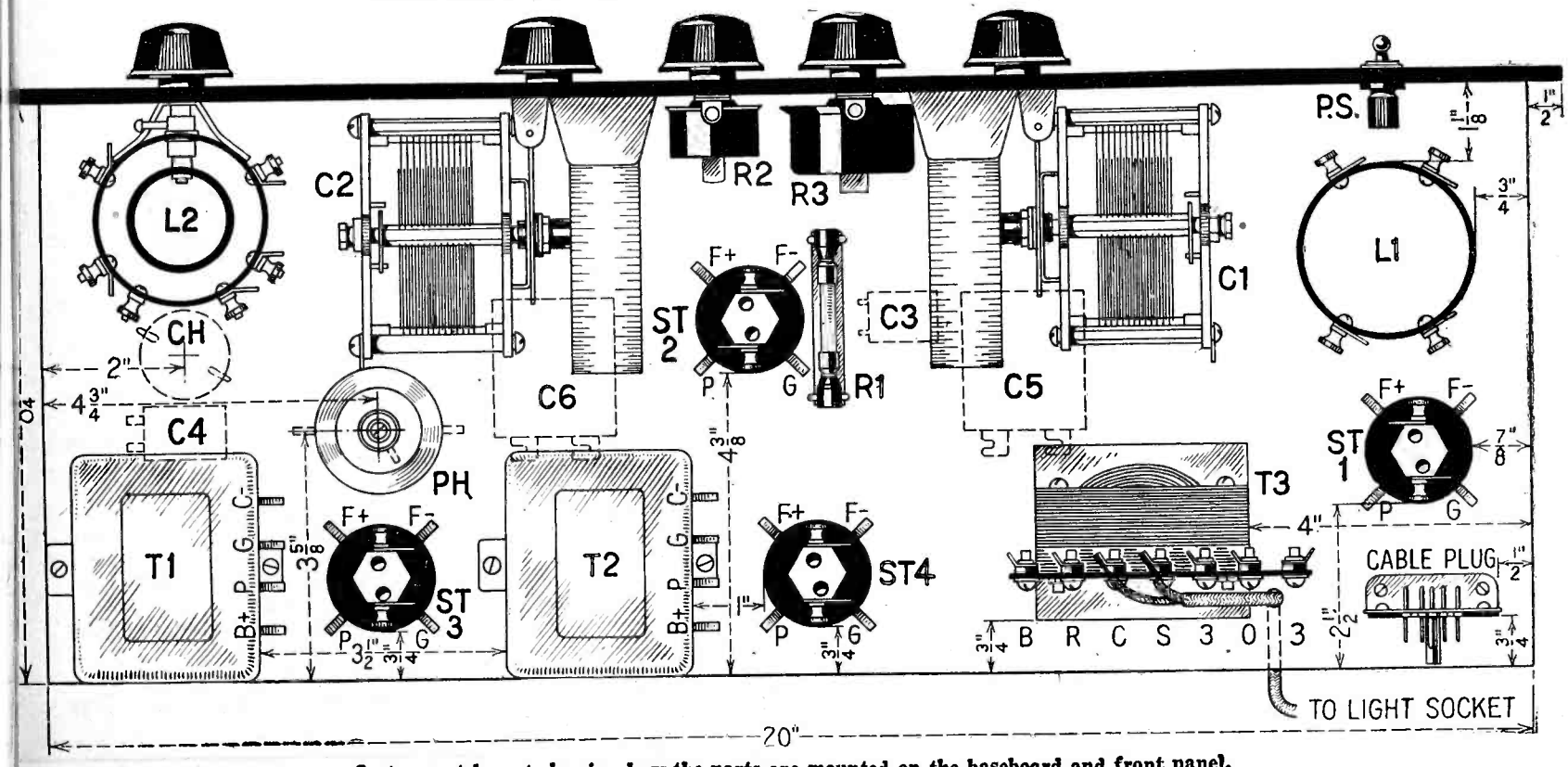
controlling the volume be employed, as the usual method of turning down the filaments in a receiver will not suffice



Schematic diagram of the receiver. All parts are indicated in letters and numerals corresponding with the instrument layout.



Front panel drilling layout. All dimensions for drilling holes are plainly shown.



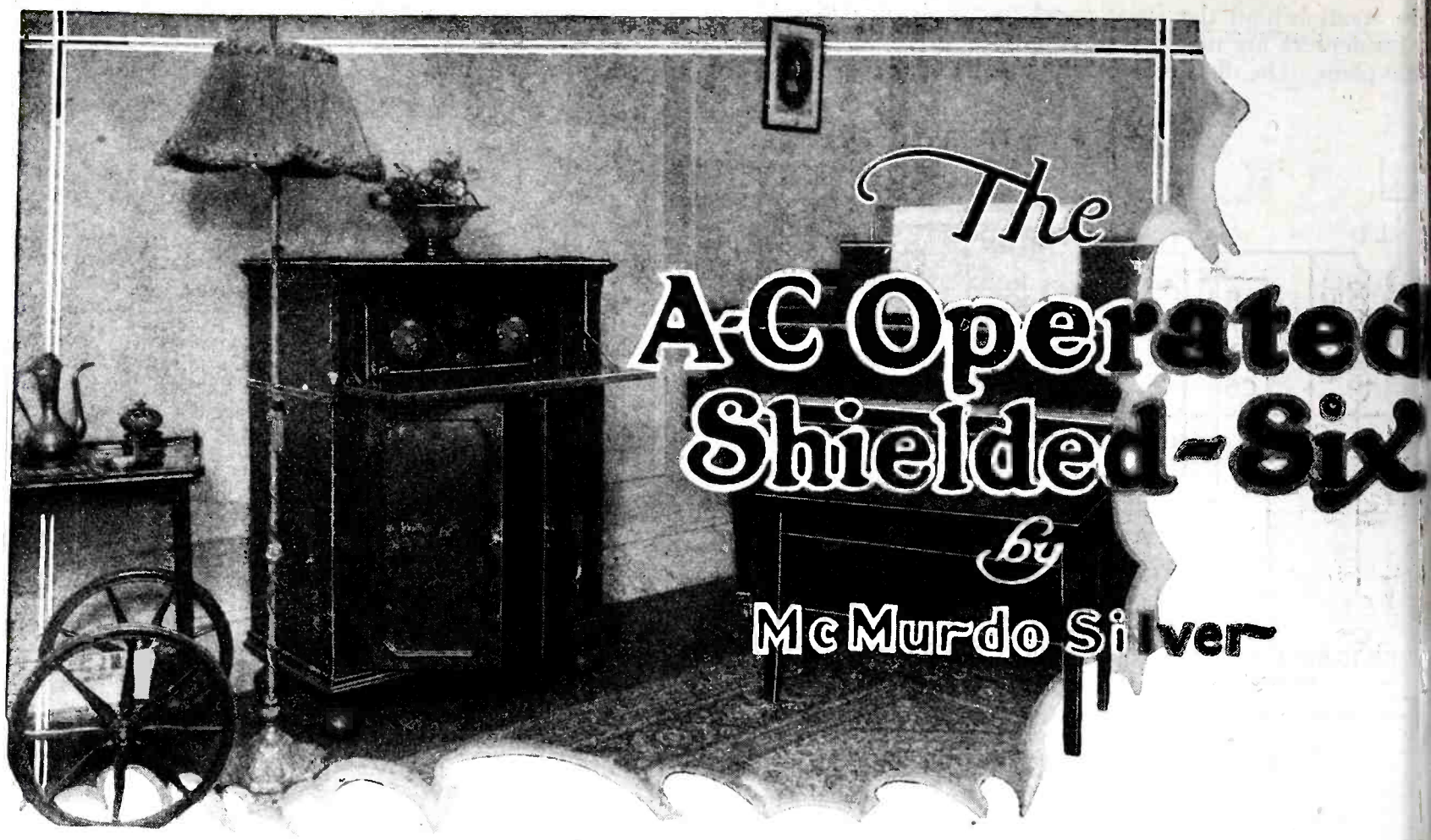
Instrument layout showing how the parts are mounted on the baseboard and front panel.

ted by connecting the dial light socket to the A.C. line for the tubes. The lights used are six volts and at present

six-volt lamps are used. In a receiver operated from A.C. current it is always necessary that some method of

for this type of tube. A universal range Clarostat is connected across the grid

(*Continued on page* 132)



The A-C Operated Shielded-Six

by McMurdo Silver

IT has been said that complete light-socket operation of broadcast receivers will be to radio exactly what the self-starter was to automobile development. The self-starter lifted the automobile out of the technical-hobby class and made it a public utility; and today it is a necessity. It is easy to understand this when it is realized that the self-starter has adapted automobiles to use by women, under varying climatic conditions, and in urban surroundings; this would have been utterly impossible if each and every car had to be cranked every time it was started.

And, as one looks at the illustration at the top of page 95, showing a six-tube, tuned-R.F. receiver whose entire "A-B-C" power plant is a small unit less than seven inches square, absolutely dependable in operation and entirely free of servicing troubles—light-socket operation looks absurdly simple. But let it be remembered that this final simplicity has been achieved only after years of laboratory work and that, at this writing, the receiver to be described is the only light-socket-operated set, using the new A.C. tubes, which is available to the home builder. The milestone it represents along the road of progress is an important one indeed, for it marks the end of servicing trouble, acid-laden storage batteries, liquid chargers, dying "B" batteries and the necessity for the knowledge involved in the care and operation of such paraphernalia.

The new Improved A.C. Shielded Six is in itself an unusual and excellent receiver, for it incorporates one of the few designs of sufficient merit to have enjoyed public popularity for over two years, though each year it has been improved and developed. This past popularity assures the builder that it is a thoroughly dependable receiver from which all "bugs" have been thoroughly eliminated. The Improved Shielded Six consists of three stages of tuned-radio-frequency amplification, a dete tor and two stages of audio amplific tion with a push-pull power outp stage. The entire assembly is mad upon a pressed-steel chassis, to th front of which is attached a beauti fully-decorated bronze panel carryin

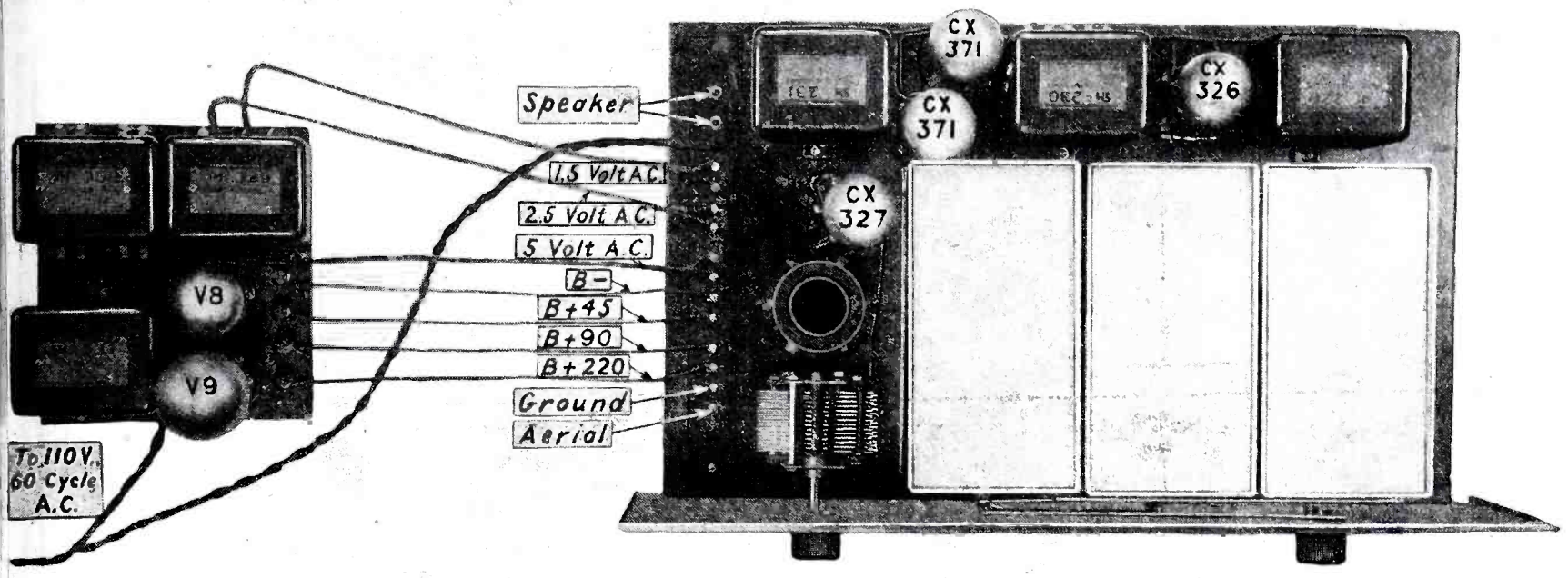
PARTS REQUIRED FOR A. C. OPERATED SHIELDED-SIX

- 3 Silver-Marshall stage shields
- 2 Silver-Marshall type 316A variable condensers (C2-C3)
- 2 Silver-Marshall type 316B variable condensers (C1-C4)
- 1 Silver-Marshall type 116A tuning coil (L1)
- 3 Silver-Marshall type 118A (matched) tuning coils (L2-3-4)
- 4 Silver-Marshall coil sockets to accommodate plug-in coils (L1-4)
- 4 Silver-Marshall tube sockets for five-prong tubes (V1-4)
- 3 Silver-Marshall tube sockets for standard four-prong tubes (V5-7)
- 1 Silver-Marshall A.F. transformer (T1)
- 1 Silver-Marshall A.F. transformer, push-pull type, input model (T2)
- 1 Silver-Marshall A.F. transformer, push-pull type, output model (T3)
- 1 Silver-Marshall triple link motion, (connects condensers C2, C3 and C4)
- 1 Carter .002 mfd. fixed condenser (C5)
- 3 Carter .5 mfd. each, No. 105 fixed condensers (C6-7-8)
- 1 Carter 6000 ohm Potentiometer, model HW6000 (R1)
- 2 Carter tip jacks (LS)
- 1 Carter 600 ohm fixed resistor, model H600 (R2)
- 2 Carter 1000 ohm fixed resistors, model H1000 (R3-R4)
- 2 Frost tapped resistors, model FT64 (R5-R6)
- 1 Kroblak or Ward-Leonard 5000 ohm fixed resistor (R7)
- 2 Marco vernier dials
- 1 Silver-Marshall terminal strip with terminals No. 636 AC
- 1 Silver-Marshall front panel, brass, drilled and engraved, 7 x 21"
- 1 Silver-Marshall steel chassis, 12 x 19¼ x 1¼"
- 1 Excello console or Fritts cabinet.
- 1 Carter single pole, double throw type antenna switch (S1)
- 1 Carter on-off switch (S2)
- 1 Polymet 250,000 ohm fixed resistor and mounting (R8)
- 1 Silver-Marshall type 329-A power transformer (PT)
- 1 Silver-Marshall type 331 choke coil unit (CH)
- 1 Silver-Marshall type 511 filter condenser (CD)
- 2 Silver-Marshall tube sockets, standard four-prong type
- 1 Silver-Marshall type 659 tapped resistor (R9)
- 1 Silver-Marshall steel base, 7 x 7", type No. 654
- 4 Cunningham A.C. heated cathode vacuum tubes, type No. 327 (V1-4)
- 1 Cunningham Raw A.C. vacuum tube, type No. 326 (V5)
- 2 Cunningham vacuum tubes, type No. 371 (V6-7)
- 1 Q.R.S. full-wave filamentless type rectifier tube (V8)
- 1 Cunningham voltage regulator tube (V9)
- 1 Pkg. Kester rosin core solder
- Miscellaneous screws, nuts, lugs and wire.

he two vernier tuning controls, the volume-adjustment knob, an antenna-adjustment switch, and the small control switch which serves to turn on and off all power.

is truly sharp. The Shielded Six will not only separate local stations in such cities as New York and Chicago, but if at all favorably located, it will bring in distant out-of-town stations while local stations are on, and with an aerial only twenty to fifty feet in length. Ordinarily, it will deliver more volume than is necessary on practically all stations heard.

ration, this low hum is less than that ordinarily heard with average "B" socket-power units, and is never loud enough to interfere with reception, even with volume turned well down.

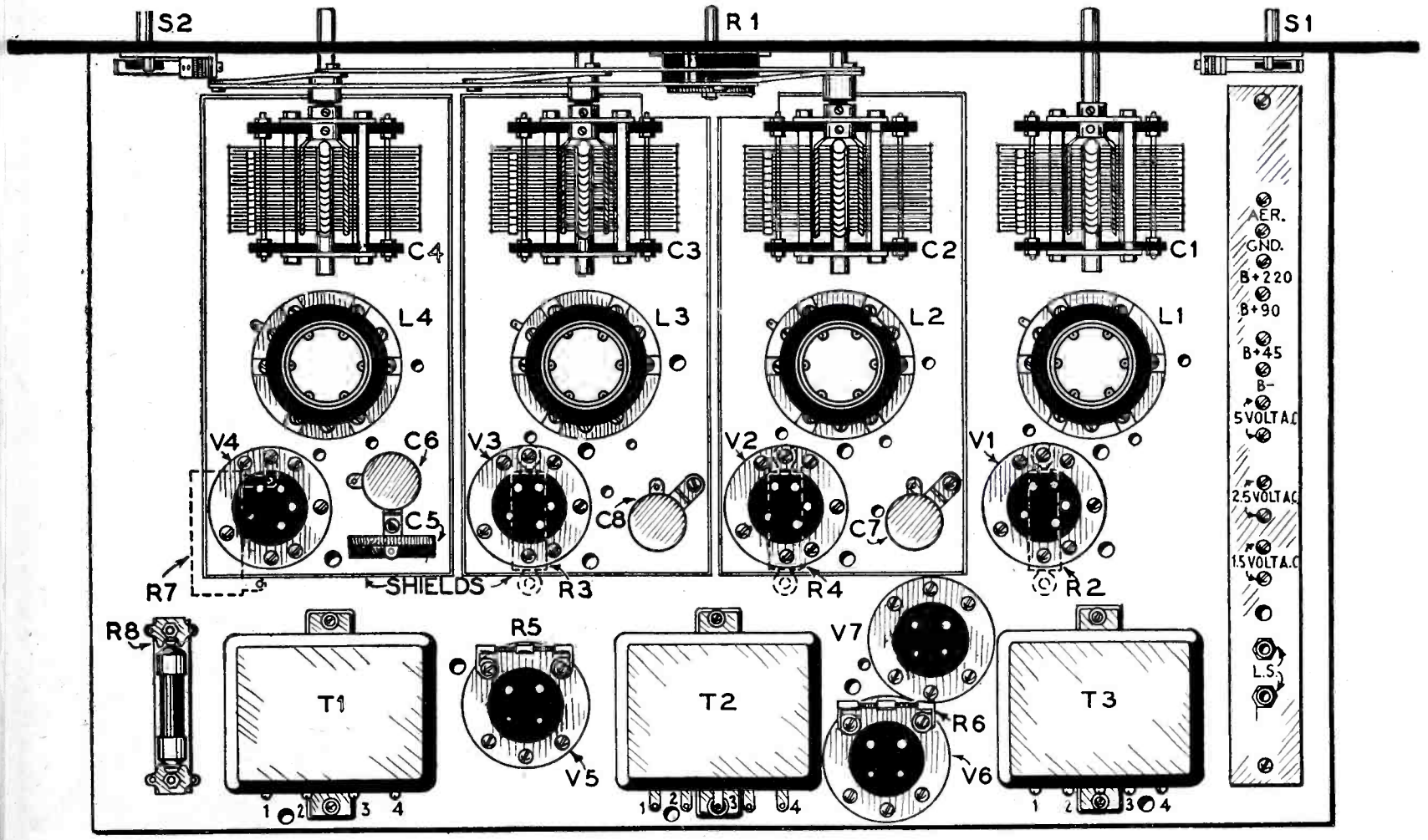


A photographic illustration showing how the power unit is connected to the A. C. Operated Shielded-Six.

Quality of Output

The performance of the receiver is a revelation in tone quality, for the Shielded Six provides a fidelity of reproduction which has pleased thousands

One of the features of the whole design is that the "A-B-C" power unit may be placed in the same cabinet with the set, only a foot or so away from the left end of the receiver.



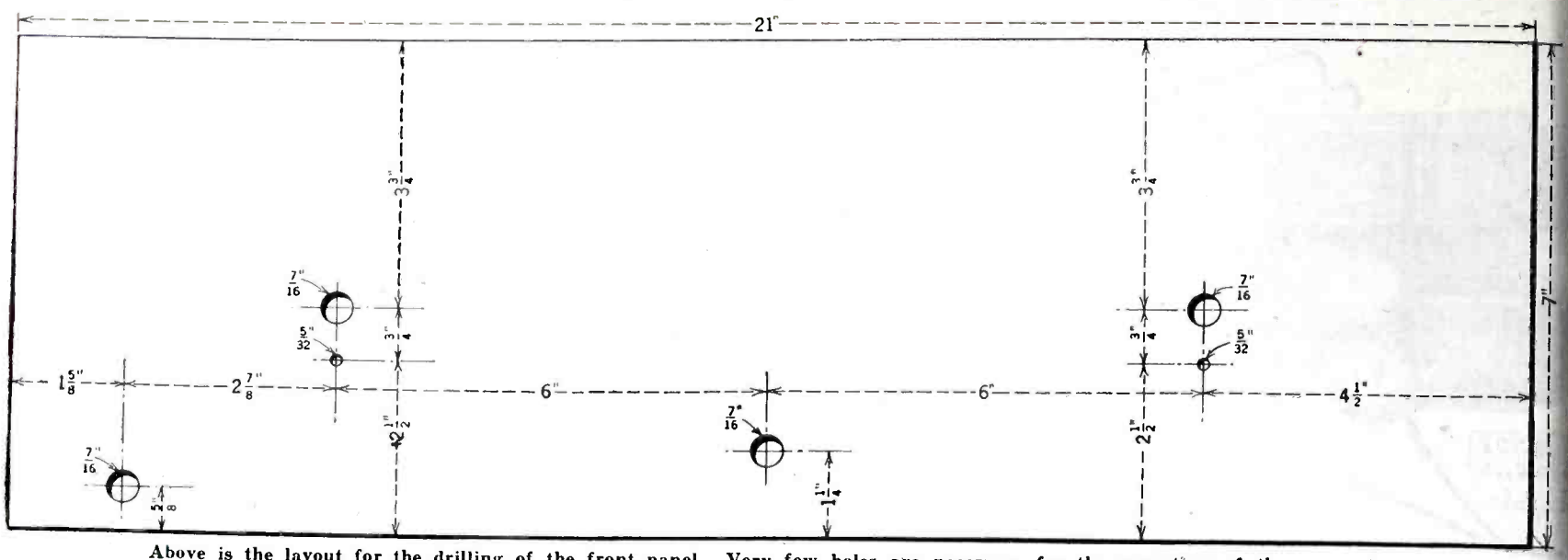
Instrument layout of the receiver showing the location of all parts. Resistances R2, R3, R4 and R7 are mounted beneath the sub-panel as indicated in dotted lines. The two switches, S1 and S2, are also mounted on the front panel underneath the sub-panel, though they are not shown in dotted lines in the above illustration.

of builders with its reality and life-likeness. Its operation is simplicity itself, for there are only two tuning controls to adjust, with a small auxiliary knob to regulate volume and sensitivity. The tuning is not critical, but

The use of the new A.C. tubes has been so carefully worked out that only a very low whisper of A.C. hum is heard in the loud speaker—so low that the head must be placed very close to the speaker to detect it at all. In ope-

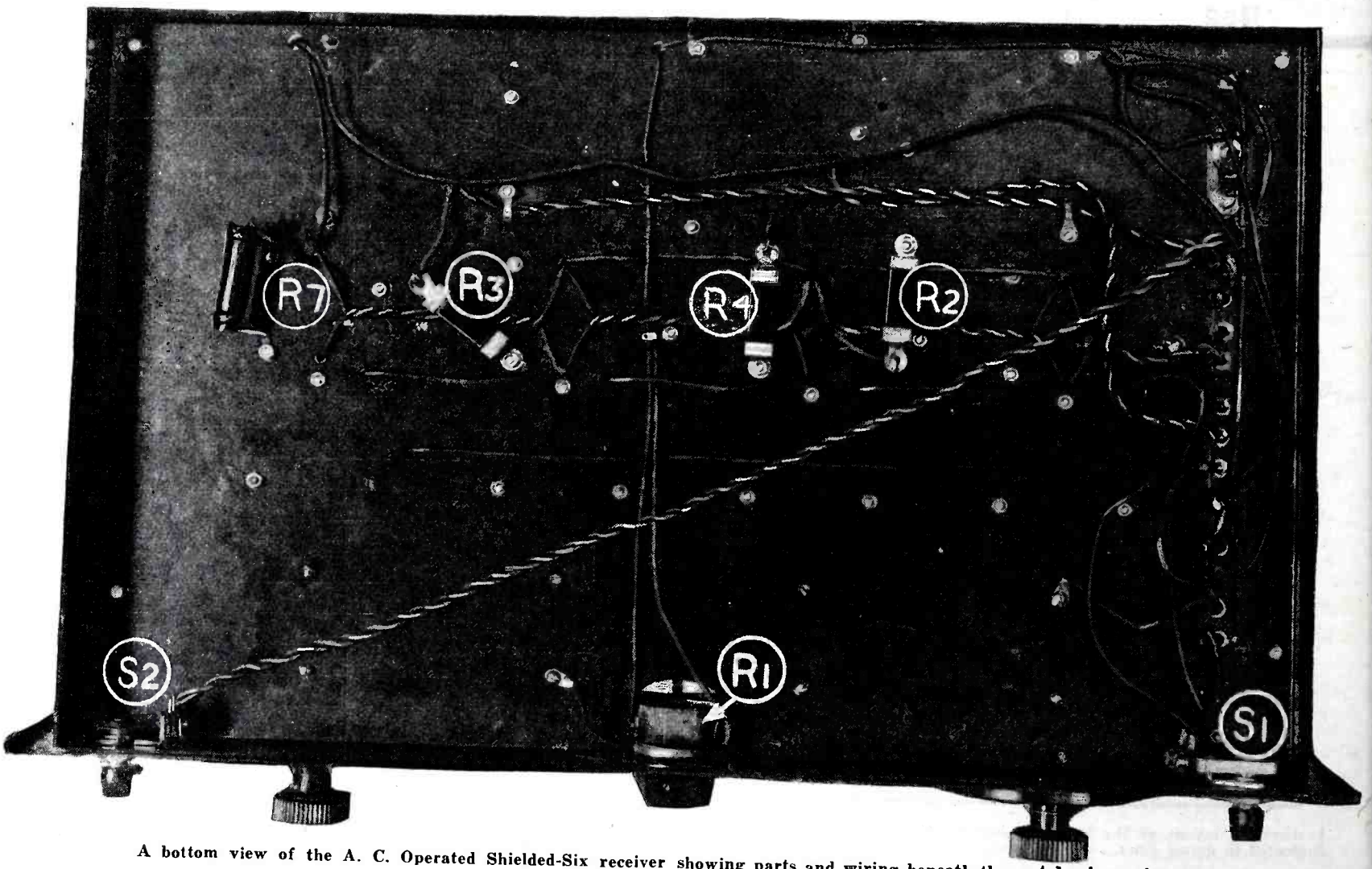
This simplicity attained through complete light-socket operation is the direct result of the development of the new A.C. tubes recently announced by tube manufacturers. However, the A.C. tubes in themselves are not suffi-

cient to replace batteries, chargers, and the accessory equipment forming an essential part of every radio installation up to now. In order to use these new A.C. tubes circuit designs must be very carefully evolved and worked up around them; for they cannot be put into any receiver without modification and expected to operate satisfactorily. It is probable that many fans will endeavor to do exactly this, and to convert their older receivers to complete light-socket operation, by employing A.C. tubes of special types and power units, which are certain to be advertised in tremendous quantities in the first few months by the get-rich-quick fraternity. With the full realization that such a course is certain to lead to trouble and grief, the entire design of the Improved Shielded Six receiver has been developed around the new A.C. tubes; so that, between the two models available (one for battery or socket-power unit operation and standard tubes, and one for light-socket operation) there are marked differences in circuit design. The points of difference have to do only with the different operating powers required for the new tubes; and, in actual performance, a Shielded Six, whether built for battery operation or for light-socket operation with A.C. tubes, will operate in exactly the same fashion so far as actual results are concerned.

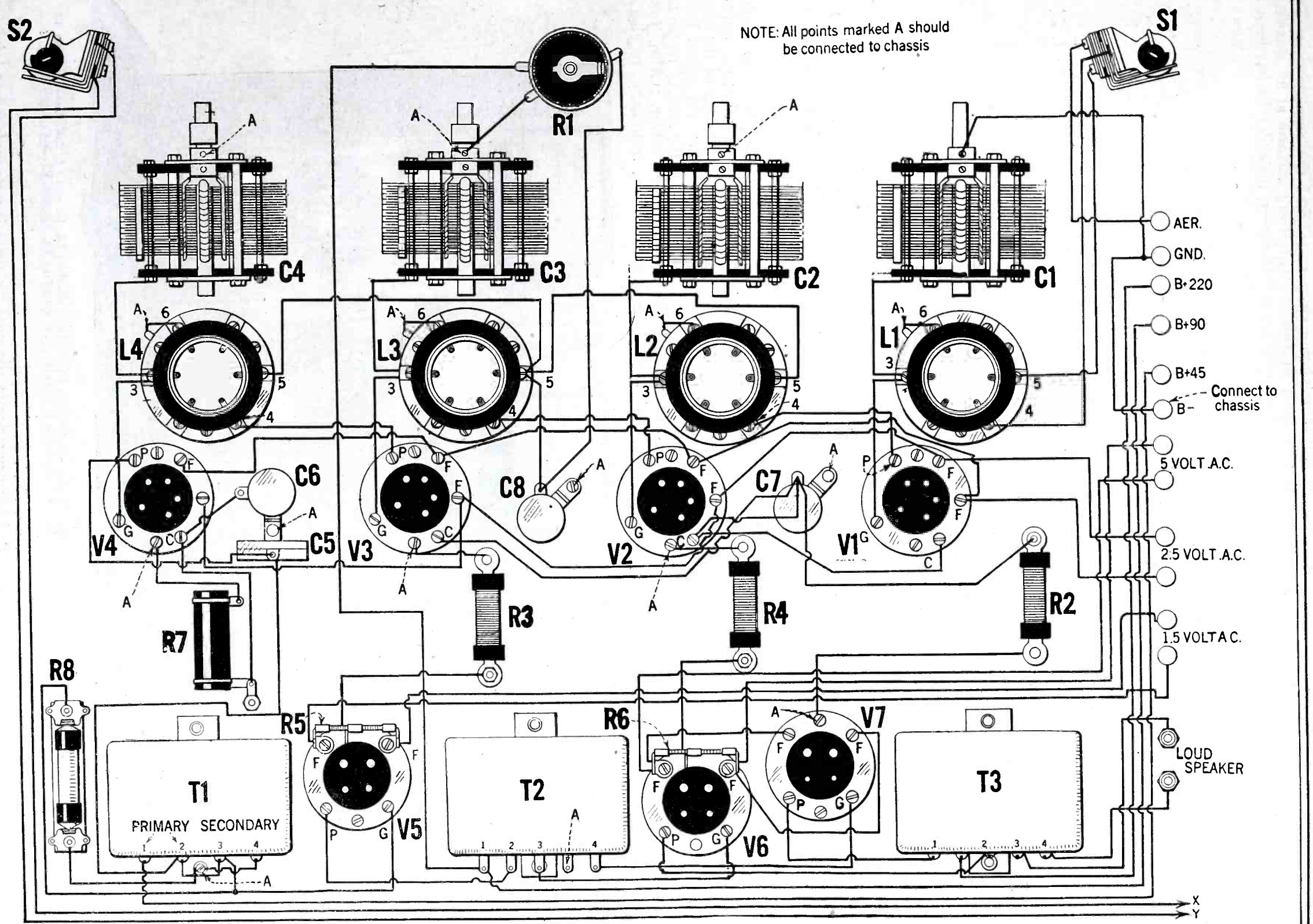


Above is the layout for the drilling of the front panel. Very few holes are necessary for the mounting of the apparatus.

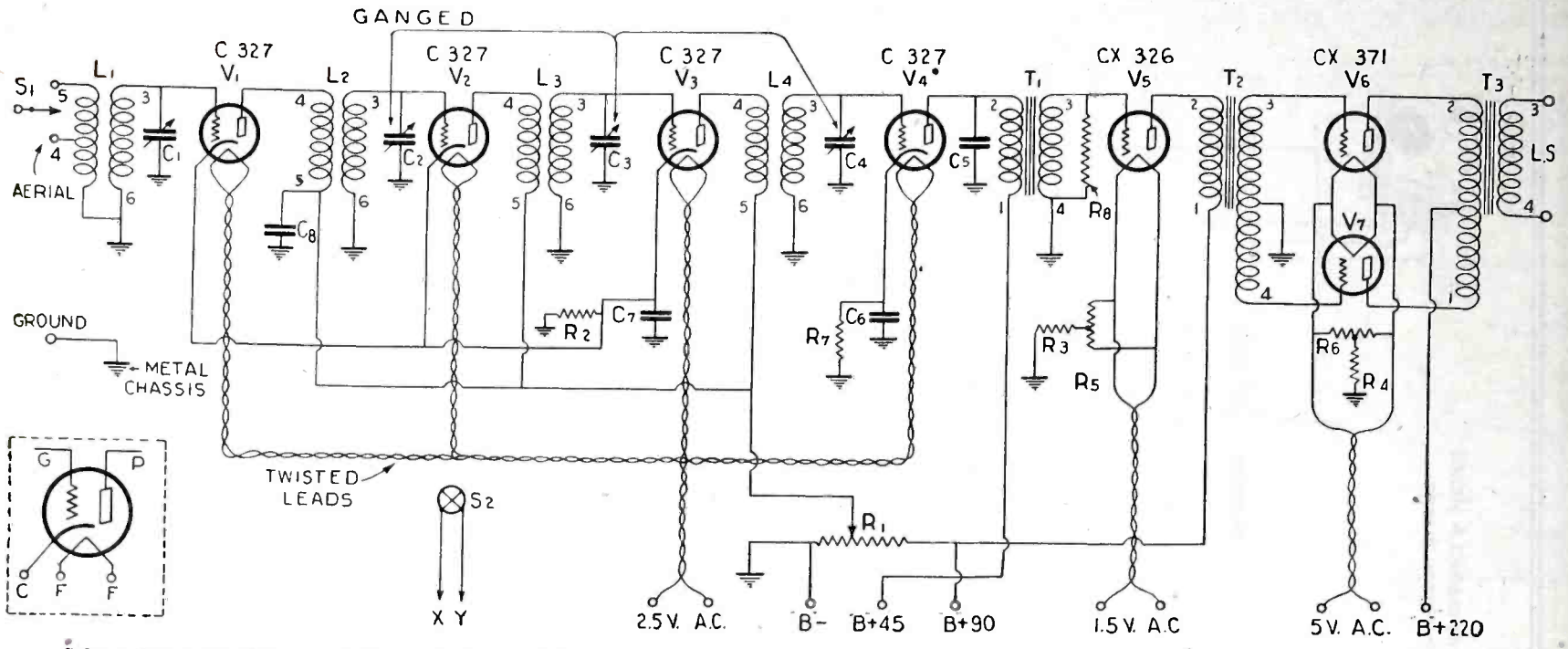
Electrically, the A. C. - operated Shielded Six comprises three low-resistance, low-loss tuned-R.F. amplifier stages and a detector; each containing a space-wound radio-frequency transformer, the primary and secondary windings of which are held on a molded bakelite form in such fashion that they are practically air-supported. The grid circuits of all four transformers are identical, as are the characteristics of the four modified-S.L.F. tuning condensers employed with them. As a result, the tuning adjustments of the second, third, and detector stages being identical, all are operated by a single-control dial simultaneously adjusting the three condensers through the agency of a mechanical link which is free from back-lash. Since antenna characteristics cannot be definitely pre-



A bottom view of the A. C. Operated Shielded-Six receiver showing parts and wiring beneath the metal sub-panel chassis.



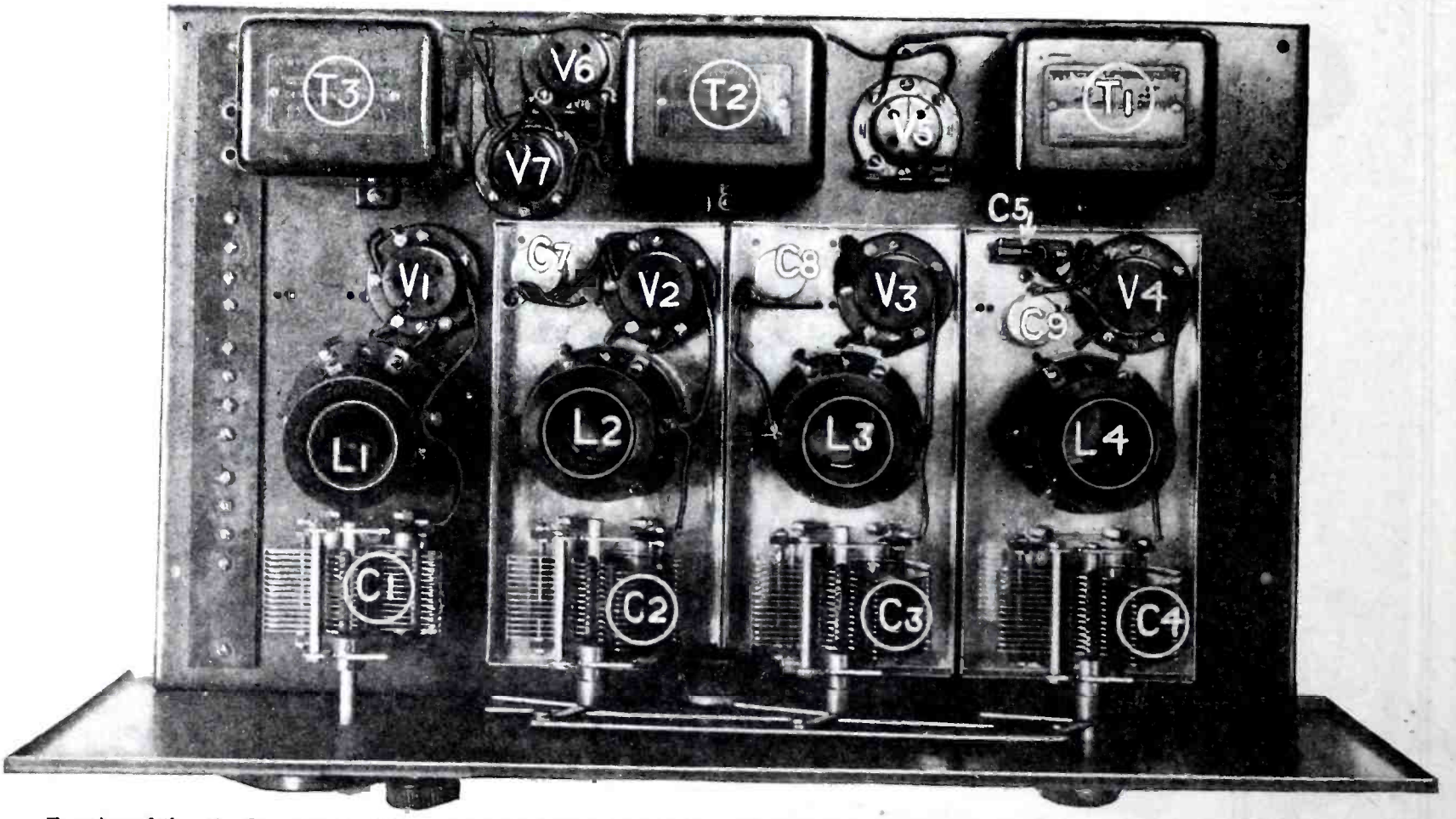
determined and will vary with every installation, the antenna stage of the Six is tuned by a separate control; and primary spacing is that maximum energy-transfer results from maximum coupling, and maximum coupling for a stage, and the amplification is comparatively uniform at all wavelengths. However, no endeavor has been made



Schematic wiring diagram of the A. C. Operated Shielded Six Receiver. The diagram of the socket-power unit is on page 100. In the left corner the cathode or electron emitter is marked C.

in order to accommodate varying lengths of aerials, a tap-switch is provided, allowing the use of part or whole of the antenna transformer's primary coil.

The design of the three R.F. transformers is very interesting, in that the primaries are spaced out under a large portion of the secondary windings instead of being bunched in a small slot at the filament end of the secondary, as recently advocated. The reason for given value of primary inductance is obtained through spacing the primary beneath the secondary. Were the primary bunched to obtain the same value of R.F. amplification, many more primary turns would have to be used and the oscillation tendency, due to the tuning effect of the primaries in the tube plate circuits of the receiver, would be greatly increased. The R.F. amplification factor of the receiver is quite high, averaging better than 10 to 12 per to obtain absolutely uniform amplification at all wavelengths; as, were this done, the high efficiency of the receiver at certain wavelengths would have to be cut down to the level of its performance at other waves. Also, for the same reason, automatic regeneration control is not employed and, instead, a small manual sensitivity adjustment allows the receiver to be operated at optimum efficiency at every wavelength.



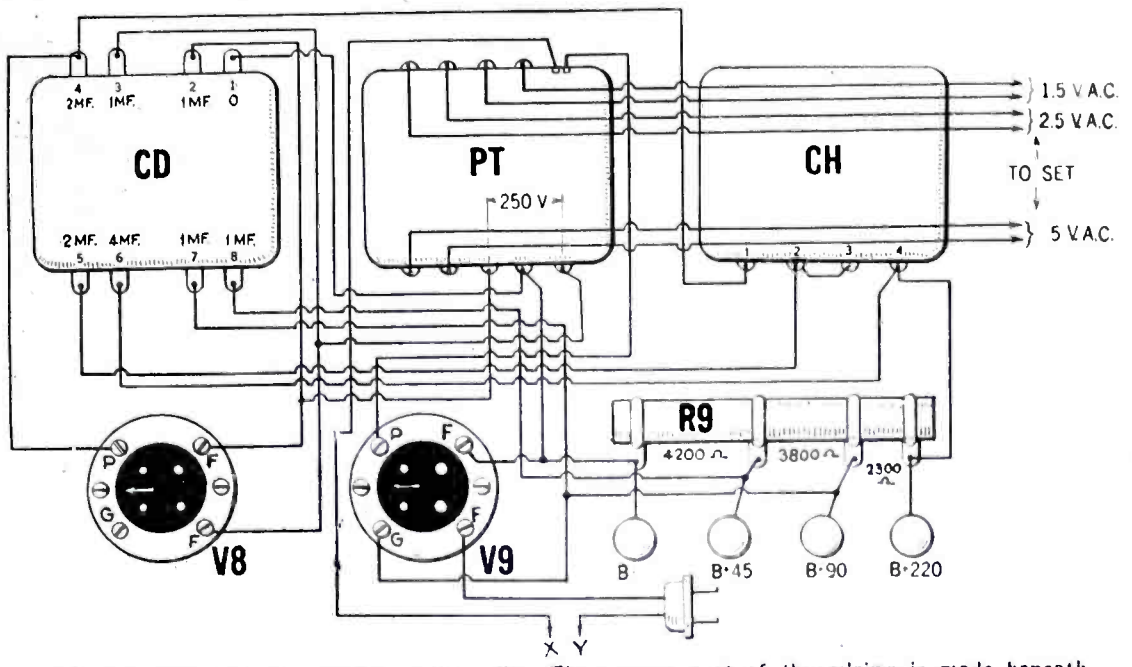
Top view of the set. C1, antenna condenser; C2, C3 and C4, R.F. tuning condensers; L1, antenna coupler; L2, L3 and L4, R.F. transformers; T1 and T2, A.F. transformers; T3, output transformer; V1, V2 and V3, R.F. tubes; V4, detector; V5, V6 and V7, A.F. amplifiers.

The first R.F. stage is unshielded;

there being little point in shielding it to prevent a coil-socket pick-up which would be far lower than the degree of energy intentionally fed to this first coil from the antenna. The problem with the three other tuned circuits is entirely different; and each is individually shielded in an aluminum housing, to prevent interaction between stages and pick-up of external interference, which has not passed through the filtering process imposed by the preceding stages. The wavelength range of the receiver with a set of standard coils is 200 to 550 meters; while by means of two additional sets, of four coils each, it may be extended up to 3,000 meters, thus rendering it adaptable to all classes of broadcast reception throughout the world.

Audio Amplification

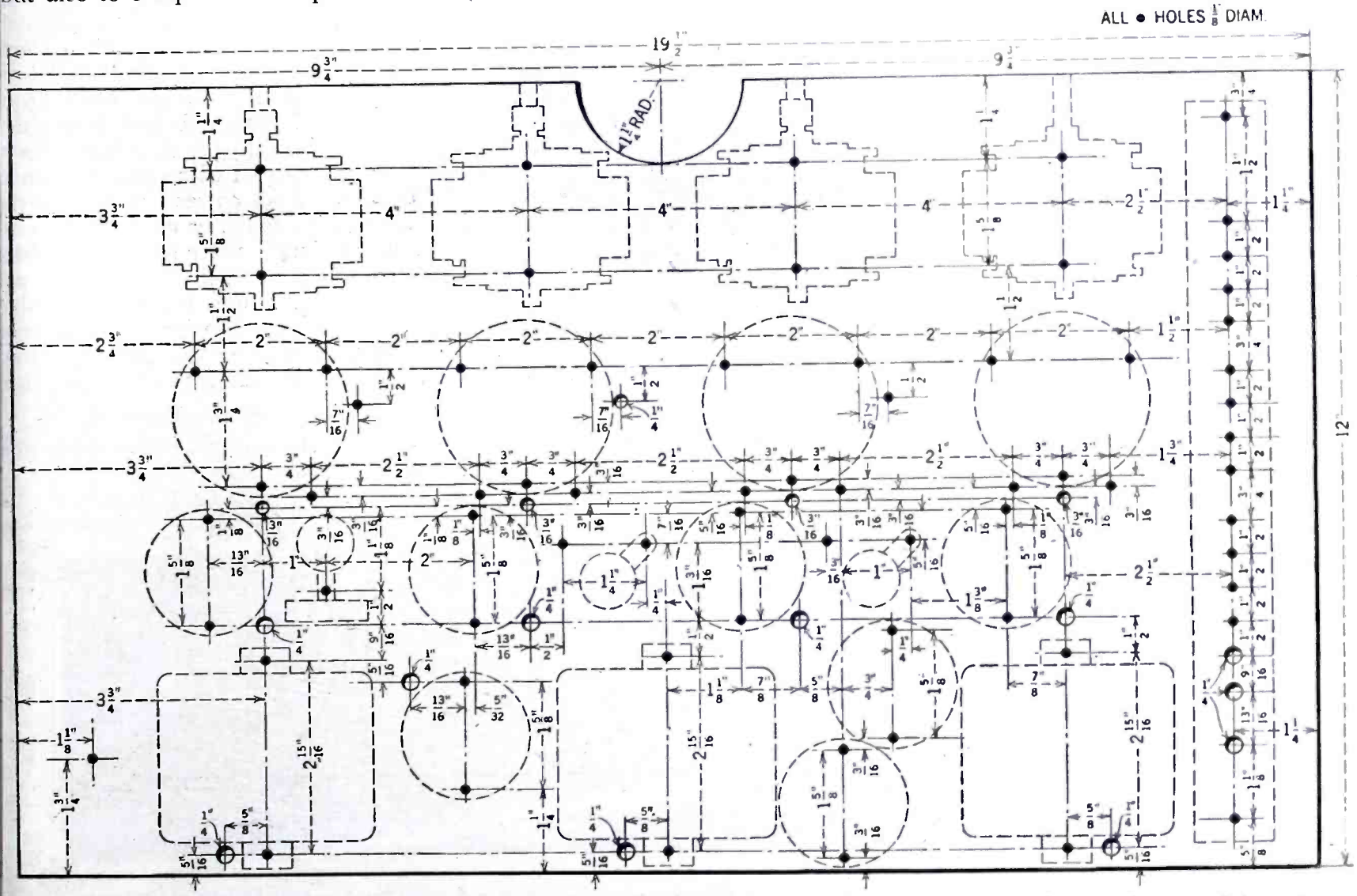
The audio-frequency amplifier consists of two stages employing large, heavy transformers which provide excellent low-note reproduction with a 5,000-cycle cut-off; resulting in the elimination to a great extent of background noise, heterodyne squeals, and interference. An output transformer is employed, not only to protect the loud-speaker windings from the high plate current of the last power tube, but also to compensate for poor loudspeaker performance at low frequencies. It is a well-known fact that the average loud speaker is far less efficient at very low frequencies than it is through the middle register. It is just this deficiency that the special output transformer compensates.



Picture wiring diagram of the power unit. The greater part of the wiring is made beneath the metal sub-panel. Resistance R9 is mounted on the underside of the sub-panel.

The A.C. Tubes

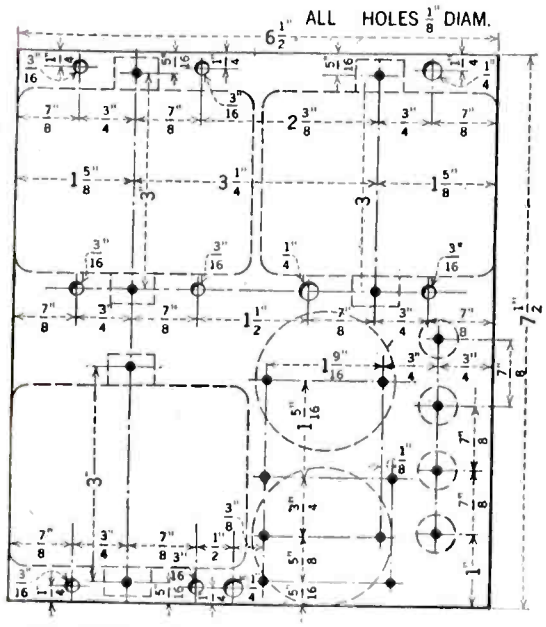
Four CY-327 (heater-type) tubes are employed in the three R.F. stages and as a detector. These tubes are used because the standard CX-326 (raw-A.C.) amplifying tubes are unsuited for use in an extremely sensitive radio-frequency amplifier; though the latter are well adapted to many of the comparatively insensitive "loss-controlled" T.R.F. sets, which are sold in large quantities at prices of from forty to sixty or seventy dollars. However, in an extremely sensitive amplifier with a manual sensitivity control capable of obtaining maximum performance from the R.F. amplifier, the raw-A.C. tubes introduce too high a value of hum; and therefore they do not lend themselves to such amplifiers. On the other hand, the five-prong CY-327 "heater" tubes, with isolated filaments heating an electron-emitter (cathode), are admirably



The drilling layout for the sub-panel. The different instruments are shown in dotted outline. All dimensions for mounting screw-holes and wire-holes are included.

suited to ultra-sensitive R.F. amplifiers and hence are employed in the Shielded Six.

The first audio amplifier is a CX-326 raw A.C. tube, which is entirely



The drilling layout for the sub-panel of the socket-power unit.

suited for first-stage audio work. The second audio stage consists of two CX-371 power tubes in a push-pull amplifier circuit capable of delivering considerably more undistorted power output than will the average 310 power pack employing only one amplifier tube. The CX-371s are not strictly A.C.-type tubes, but are entirely suited for last-stage audio work with direct A.C. excitation of the filaments. The push-pull feature is optional, and the receiver as available in kit form is provided with a straight 371 power output stage, which delivers ample volume for the majority of homes. The set illustrated herewith uses the push-pull arrangement.

Socket-Power Unit

Power for the receiver is obtained through a power-supply device, which is essentially a very carefully designed "B" socket-power unit incorporating automatic voltage regulation by a glow tube and a special selective filter circuit for extreme freedom from hum, required in such a set as the Shielded Six. This power unit consists of a step-up transformer carrying two 250-volt windings, and an 85-milliampere full-wave gaseous rectifying tube. The output of this tube is filtered through a single double-section choke coil and a special combination of condensers providing a selective circuit resonant at 120 cycles—the fundamental ripple of the rectified output. The filter delivers to the voltage dividing resistor a total of 220 volts at approximately 82 milliamperes. Of this, a portion is drawn by the glow tube, to be given up to the receiver under the instantaneous demand imposed by strong signals; the remainder goes directly to the plates of the power output tube.

Filament excitation is obtained from three separate filament-lighting windings carried by the power transformer. One winding of 2.5 volts lights the four CX-327 heater tubes; another winding of 1.5 volts lights the CX-326 first audio-stage amplifier; and the third winding of 5 volts lights the CX-371 power output tubes. "C" potential

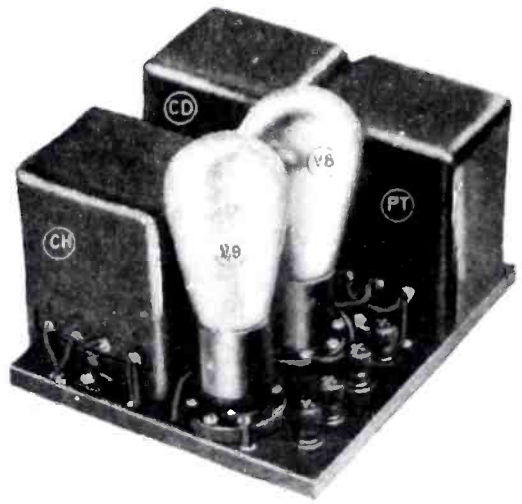
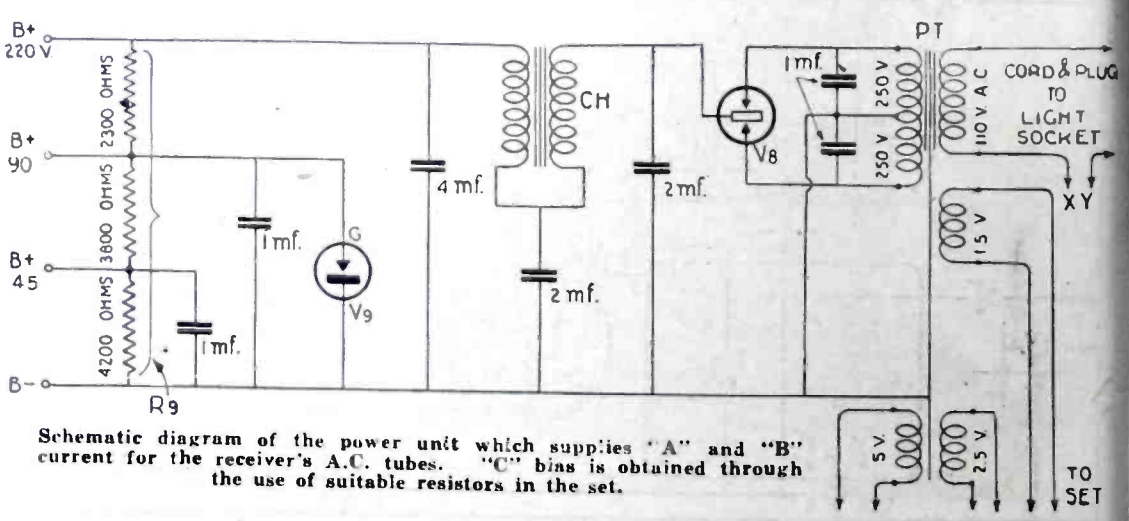


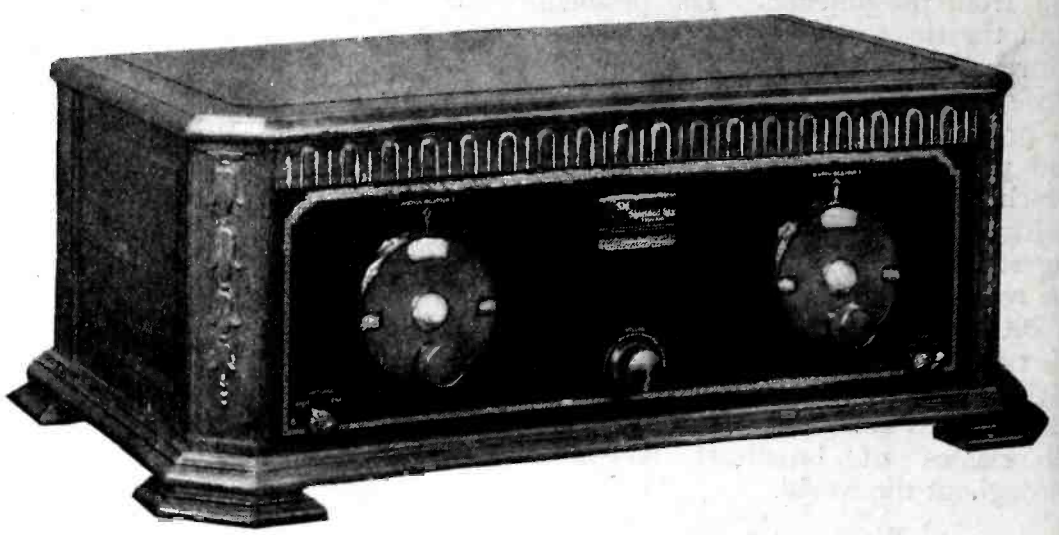
Photo of the power unit completely assembled and wired with tubes in place.

for the various circuits is obtained by means of four resistors inserted in the common grid and plate returns; the voltage drop developed in operation



Schematic diagram of the power unit which supplies "A" and "B" current for the receiver's A.C. tubes. "C" bias is obtained through the use of suitable resistors in the set.

serves to bias the various tube grids to the proper value. The by-passing of these resistors and other portions of the circuits has been very carefully considered and worked out; and, in constructing the receiver, it is vitally important that specifications be adhered to exactly, in order that the maximum results from the circuit design be realized.



The A.C. Operated Shielded Six receiver, mounted in a table-type cabinet. The left dial controls the variable condenser which tunes the antenna circuit. The right-hand dial operates the link motion that turns the three remaining condensers simultaneously. The switch S1 is at the left and S2 at the right is the "Off-On" switch.

In operation, the power unit is connected to the receiver terminal strip by means of three twisted pairs of wires for the three A.C. filament circuits, and four high-voltage connecting leads. Thus a total of ten wires to the power unit and receiver are all that are necessary, plus a short length of twisted lamp cord, which is run from the "on-off" switch to one side of the 110-volt cord of the power-supply unit. These leads may be cabled and the power unit placed either a few inches away from the left end of the receiver, with short leads, or beneath the set on the floor, or on the bottom of a console cabinet. The leads from power unit to receiver should, preferably, be not over three to four feet long. Since there are no batteries to wear out, the receiver is practically free from servicing trouble other than the occasional replacement of a tube, at intervals varying from three to four months to a year or more.

Building the Receiver

The parts used in constructing the A.C.-operated Shielded Six are listed elsewhere in this article. The principal components listed and specified should be used with no thought of substitution; for unlike that of a battery-ope-

(*Continued on page* 174)

THE "HOT SPOT" FOURTEEN

By

A. M. Powers

IN many multi-tube receivers the use of more than the normal 5 or 6 tubes is not justified by the results obtained. After all, there is little to be gained by using eight, nine or ten tubes in a receiver if the results obtained from them are not superior to results obtained with receivers that use fewer tubes.

On the other hand, if the use of a few extra tubes does result in superior reception, then their use is fully justified, if one is aiming at maximum results.

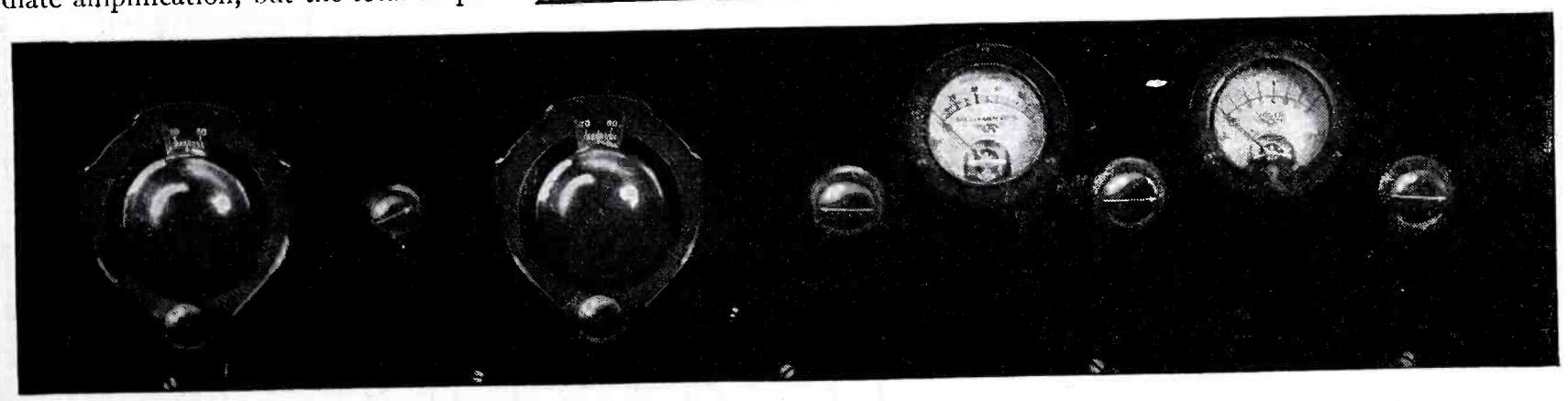
In the case of the "Hot Spot" Fourteen receiver an unusually large number of tubes is used. But it is believed that this is justified by the results obtained because the receiver combines extreme selectivity with unusual sensitivity, good tone quality and easy operation.

The most unusual feature of the receiver lies in the intermediate-frequency amplifier. This amplifier employs eight stages each of which is sharply tuned to a comparatively high frequency—much higher than the ordinary super-heterodyne intermediate frequency. Each one of these stages provides somewhat less amplification than does a stage of ordinary intermediate amplification, but the total amplification obtained with the eight stages is far greater than other receivers provide with their fewer stages, albeit higher amplification per stage.

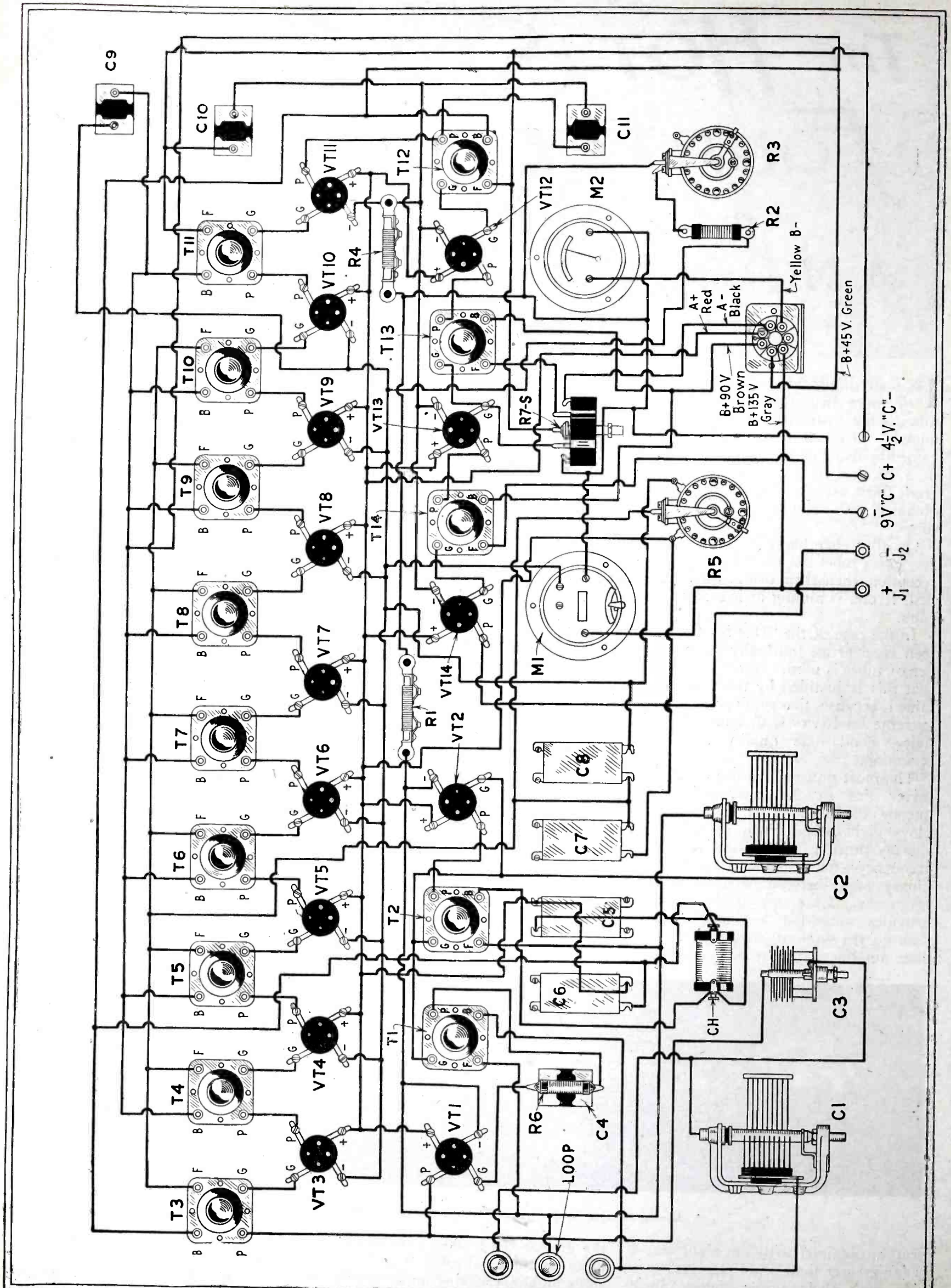
The higher the amplification per stage in a super-heterodyne receiver the greater the tendency toward instability, as a general rule. That is, a two stage amplifier having an amplification of let us say 10 per stage is liable to be more critical and unstable than a three stage amplifier with an amplification of 6 per stage. Yet this three stage amplifier would provide over twice the amplification of the two stage, high amplification unit. Thus a receiver

LIST OF PARTS REQUIRED FOR THE "HOT SPOT" FOURTEEN

1 Robertson Davis Certified Melocoupler No. 420, T1.
1 Robertson Davis Certified Melocoupler No. 460, T2.
1 Robertson Davis Certified Melocoupler No. 461, T3.
1 Robertson Davis Certified Melocoupler No. 462, T4.
1 Robertson Davis Certified Melocoupler No. 463, T5.
1 Robertson Davis Certified Melocoupler No. 464, T6.
1 Robertson Davis Certified Melocoupler No. 465, T7.
1 Robertson Davis Certified Melocoupler No. 466, T8.
1 Robertson Davis Certified Melocoupler No. 467, T9.
1 Robertson Davis Certified Melocoupler No. 468, T10.
1 Robertson Davis Certified Melocoupler No. 469, T11.
1 Robertson Davis Melo-Choke, CH.
3 Robertson Davis Multistage Meloformers, T12, T13, T14.
14 Benjamin No. 9040, Cle-Ra-Tone tube sockets, VT1 to VT14.
1 Yaxley cable plug.
2 Hammarlund Type ML-23, .0005 mfd. Midline variable condensers, C1, C2.
1 Hammarlund Type MC-9, .000032 mfd. midget variable condenser, C3.
1 Sangamo .00025 mfd. fixed condenser with grid leak clips, C4.
5 Sangamo 1 mfd. by-pass condensers, C5, C6. C7, C8, C9.
2 Sangamo .006 mfd. fixed condensers, C10, C11.
1 Yaxley 6 ohm semi-fixed, double arm, base mounting resistance, R1.
1 Yaxley 4 ohm fixed resistance, R2.
1 Yaxley 3 ohm rheostat, R3.
1 Yaxley 3 ohm semi-fixed, double arm, base mounting resistance, R4.
1 Yaxley 400 ohm potentiometer, R5.
1 Lynch 4 megohm Metallized grid resistor, R6.
1 Frost 200,000 ohm potentiometer with filament switch, R7 (S).
1 Jewell double range 7½-150 volt voltmeter (M_1).
1 Jewell 0-100 milliammeter (M_2).
2 Kurz-Kasch vernier dials.
1 Formica front panel, 7" x 30" x $\frac{3}{16}$".
1 Formica sub-panel, 7" x 29" x $\frac{3}{16}$".
1 wood baseboard, 10" x 29" x ½".
6 X-L binding posts with marker tags as follows: Loop (3), C Battery+, C Battery — (2).
2 Yaxley Tip Jacks, J1, J2.
1 package Kester radio solder.
30 feet Acme Celatsite hook-up wire.
1 Bodine DeLuxe Loop.
1 Excello console cabinet
Miscellaneous screws, nuts, etc.



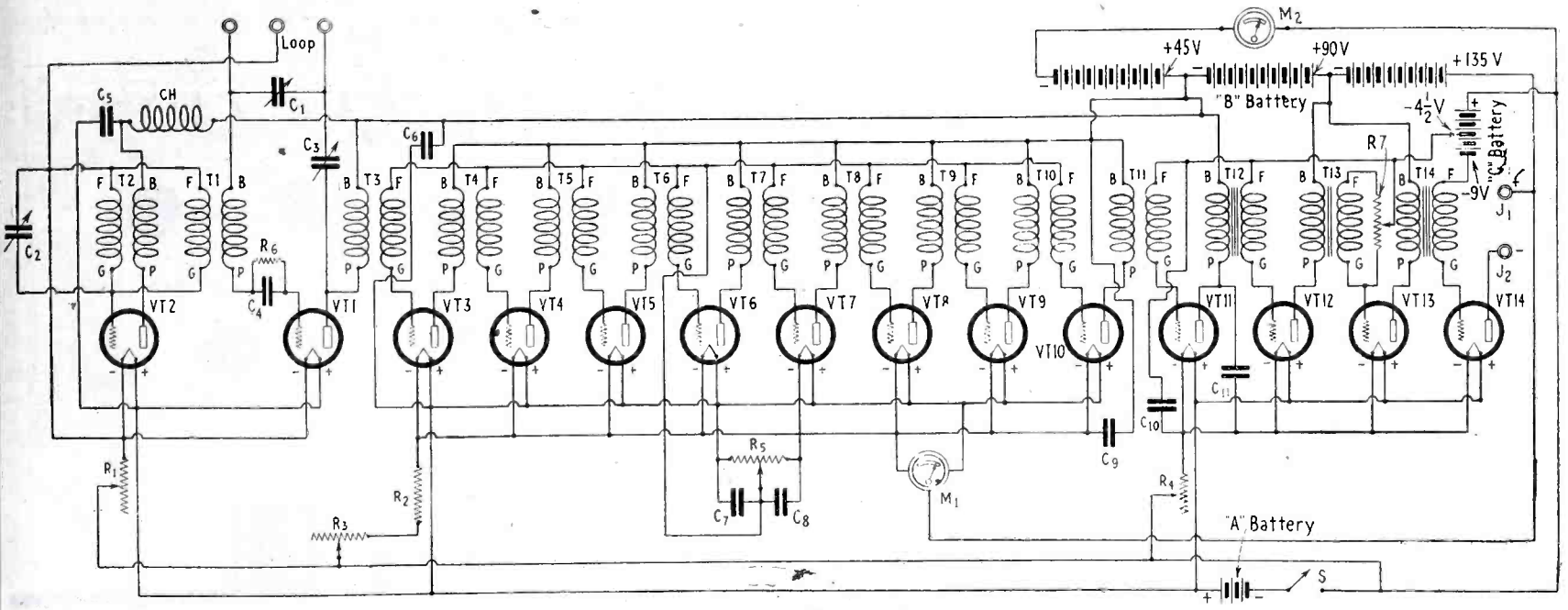
A close-up photo of the front panel showing the arrangement of dials, meters, etc.



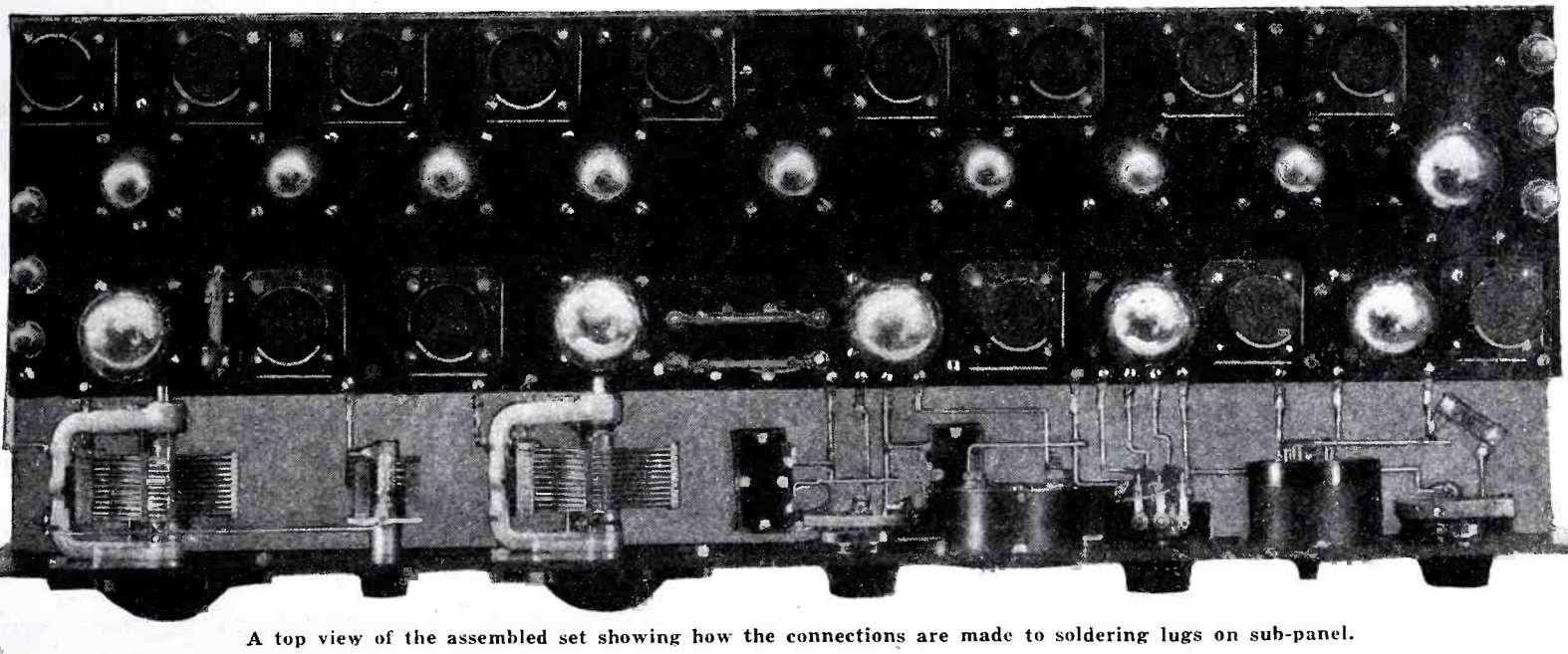
with an eight stage intermediate amplifier such as the "Hot Spot" Fourteen receiver, would produce much greater overall amplification, even if its amplification per stage were say four, than would a receiver in which is included a four stage amplifier with an average amplification of 10 per stage. The actual overall amplification of the former would be 65,536 as compared with 10,000 for the latter.

Following the above reasoning it is easy to understand why this receiver is unusually sensitive to weak signals from extremely distant stations. This multiplicity of intermediate-frequency stages also accounts for the extremely high selectivity. We know, for instance, that a two stage radio-frequency amplifier which is very broad in tuning can be sharpened tremendously by adding another stage of R.F. It follows that where several stages are used, each individual stage need not be sharp because the cumulative sifting out effect of one stage after another results in a high degree of overall selectivity.

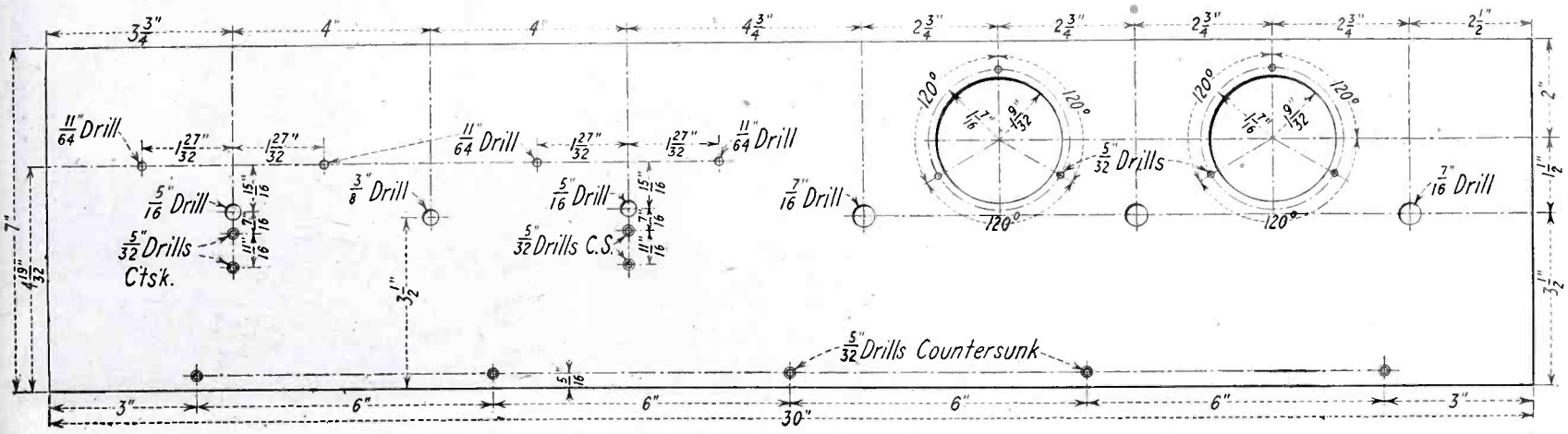
Just the assurance of ample selectivity is not the only consideration. How the selectivity is obtained is of equally great importance, because if there is any cutting of side bands there will be distortion and therefore poor quality of reproduction. This calls for careful design in the interstage coupling units in the case of a super-heterodyne receiver, which will result in just the proper frequency cut-off to include the necessary side-bands and no more. This has been accomplished in the "Hot Spot" receiver.



Schematic wiring diagram of the "Hot Spot" Fourteen receiver.



A top view of the assembled set showing how the connections are made to soldering lugs on sub-panel.



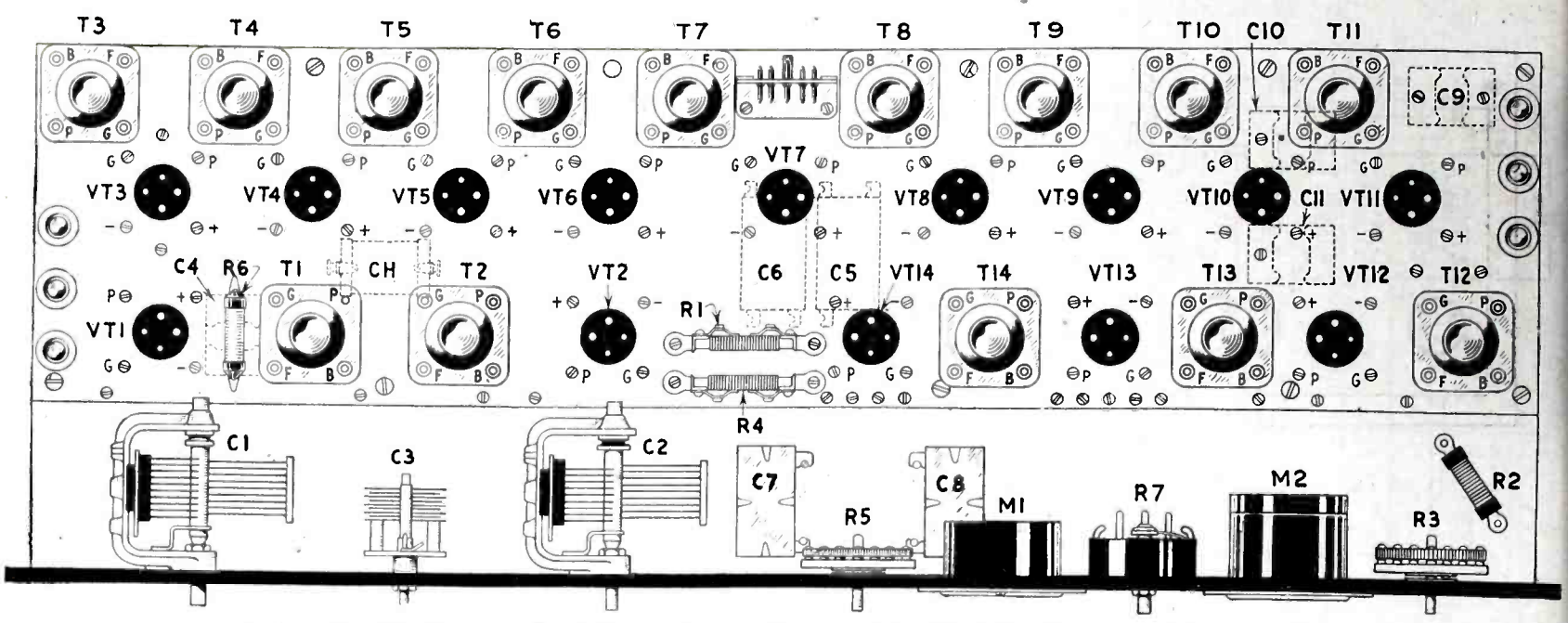
Front panel drilling layout giving dimensions of all holes.

Stability in the intermediate amplifier is obtained, in this receiver, through careful and proper design of the intermediate-frequency transformers, and the desired end has been attained to such a surprising degree that this receiver is as stable in operation as many receivers that employ only two or three stages of intermediate amplification; in fact it is more stable than many of the present day tuned R.F. receivers.

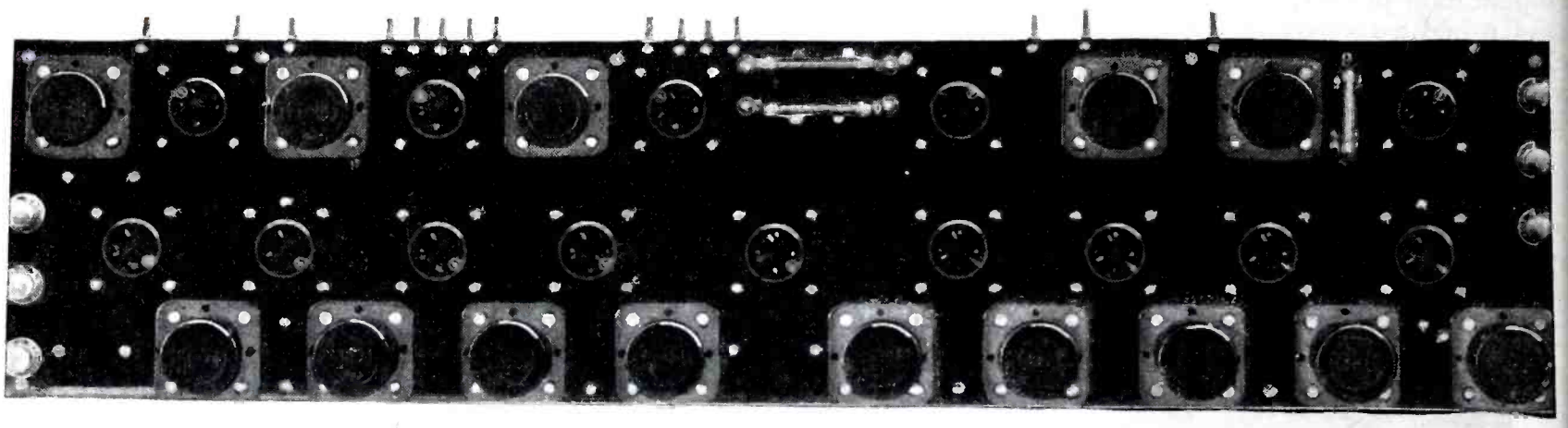
One reason for this stability lies in the fact that the peculiarities and requirements of each individual stage have been studied and the transformers are designed to meet these requirements. That is why it is imperative that the intermediate transformers be connected in the order given. The transformer for each stage has been given an individual type number, the last unit of which corresponds with the number of the stage in which the transformer is to be used. For instance, Melocoupler Type No. 461 is for use in the first stage, No. 463 is for use in the third stage, etc.

Of course, in any amplifier of this type, the use of a potentiometer to provide positive bias will prevent oscillation in the amplifier but the bias required to prevent oscillation in an unstable amplifier is just the opposite to the bias required for good amplification, therefore when oscillation is stopped with the potentiometer, the sensitivity of the receiver is shot to pieces. In the case of the "Hot Spot" receiver the stability is of such an order that the grids can be swung over to negative and still the amplifier will not oscillate and it is in this negative position that maximum sensitivity and maximum selectivity are both to be found.

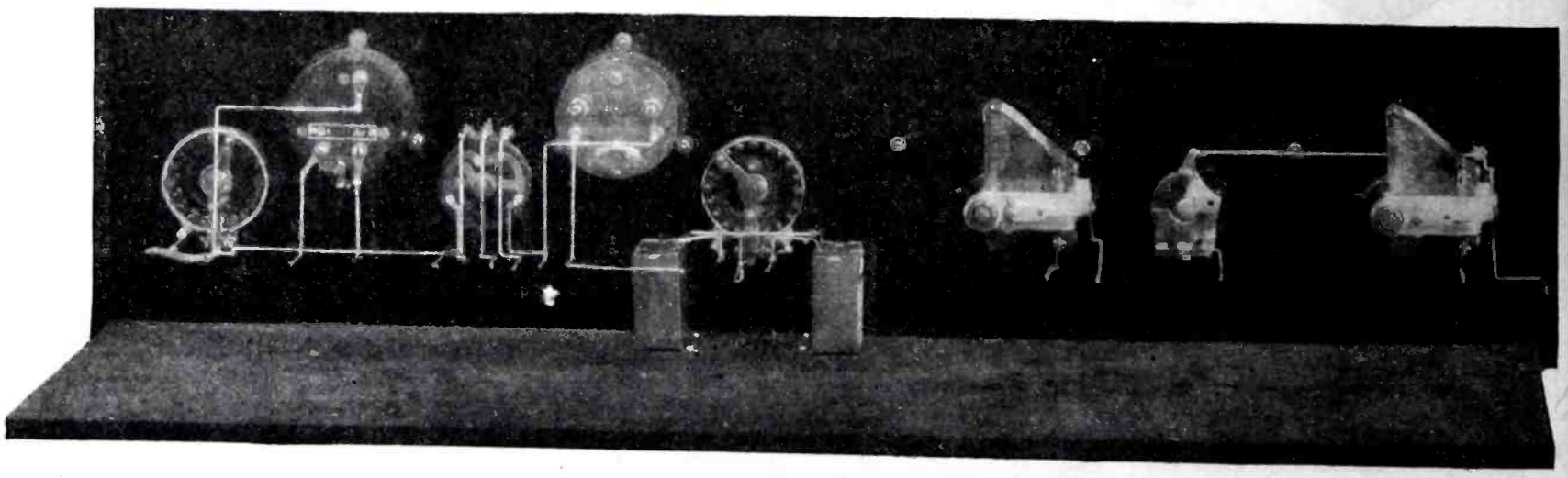
A novel oscillator coupling scheme has been employed to isolate the plate



Instrument assembly on panels. Letters and numerals correspond with wiring diagrams and list of parts.



A top view of the sub-panel showing the layout of parts. Note the connection lugs on the top edge of panel.



A rear view of the front panel and parts with the sub-panel assembly removed.

coil of the oscillator from the pick-up coil and other parts of the circuit. This is accomplished through the agency of a link coupling. An R.F. choke is also included in the "B" battery supply lead to the oscillator for the purpose of more complete isolation.

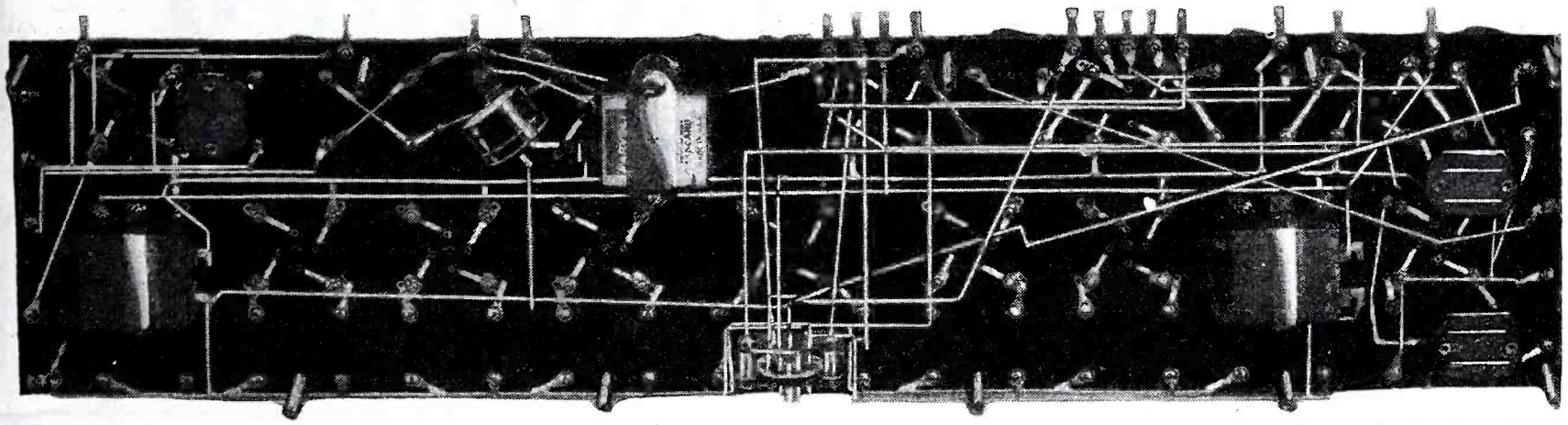
Probably one of the greatest bugbears of super-heterodyne owners is the double repeat point found in the tuning of almost every super. That is, when a station is tuned in on the loop, it may be heard at two distinct points on the oscillator dial. Or, if the loop is broad in tuning, low and high wave stations may come in side by side on the oscillator dial.

There are two ways of avoiding this difficulty. One of them is by fixing the frequency of the intermediate amplifier at a point sufficiently high that repeating on the oscillator dial is impossible. The other means is not a complete remedy but is helpful, and that is to provide sharp tuning in the loop circuit. The first of these two methods is employed in the "Hot Spot" receiver. By employing a higher frequency than usual for the intermediate amplifier the possibility for repeating is entirely eliminated.

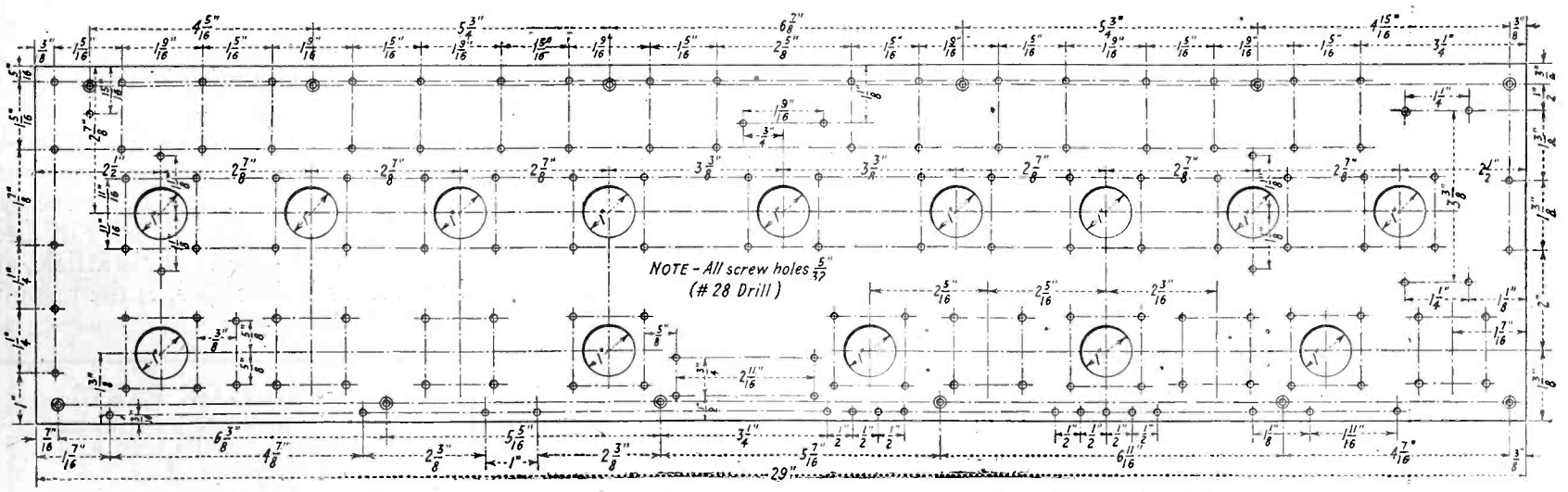
So much for the intermediate amplifier and the oscillator circuits. The first detector employs grid detection for the sake of the greater sensitivity of this method. In the case of the second detector, however, the plate method is employed because of the lessened possibility of distortion, particularly where there is so much previous amplification. Moreover, high sensitivity in the second detector is not an important consideration.

The audio frequency amplifier employed consists of three stages, coupled

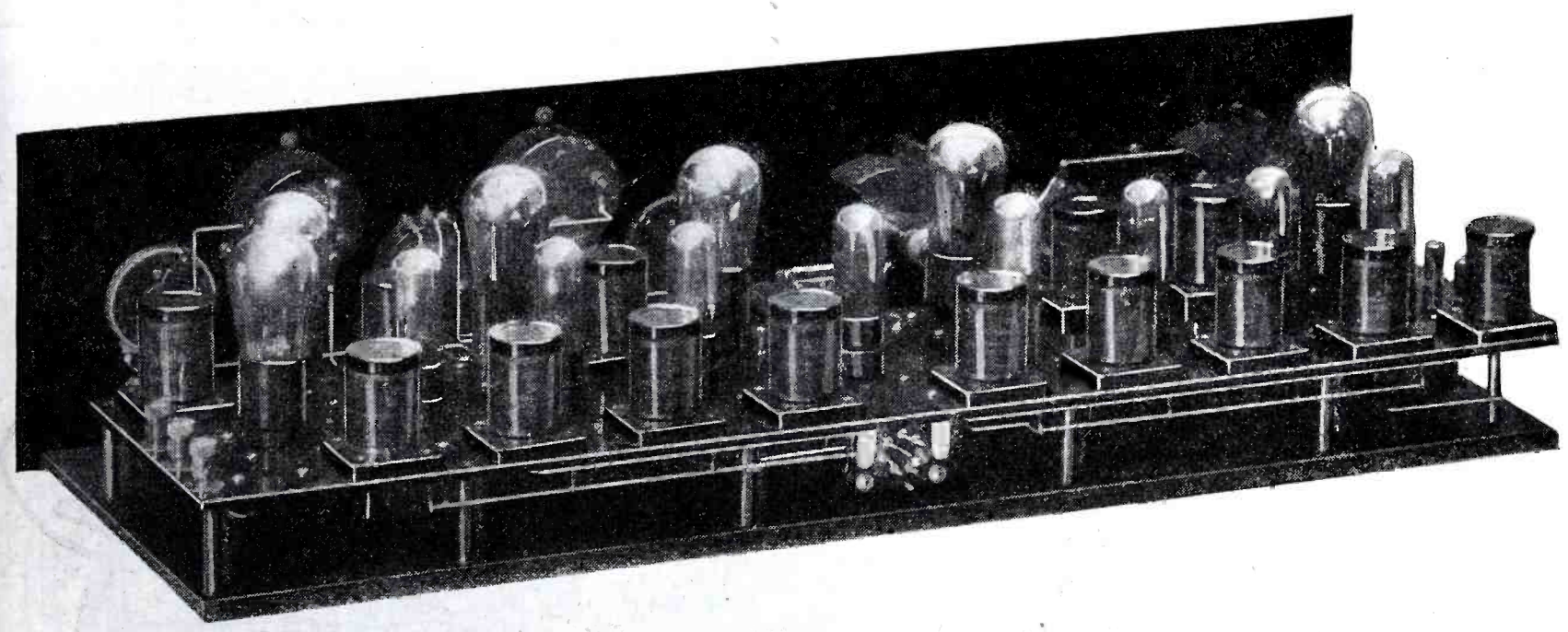
(*Continued on page* 146)



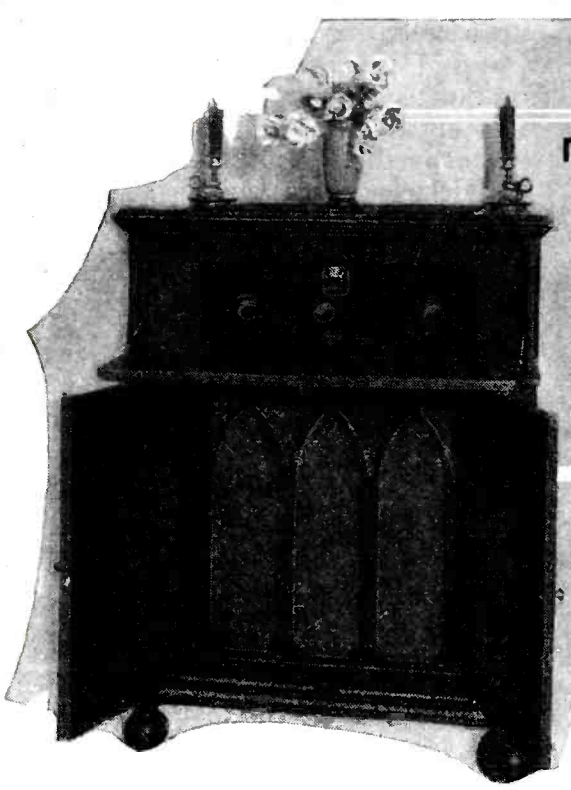
A bottom view of the sub-panel exhibiting parts and wiring. Observe the location of connection lugs which join the wiring to that on the front panel.



Drilling layout of sub-panel for the "Hot Spot" Fourteen giving the location of all holes.



The completed receiver as seen from the rear. Note the method of mounting the sub-panel on baseboard by means of brass pillars.

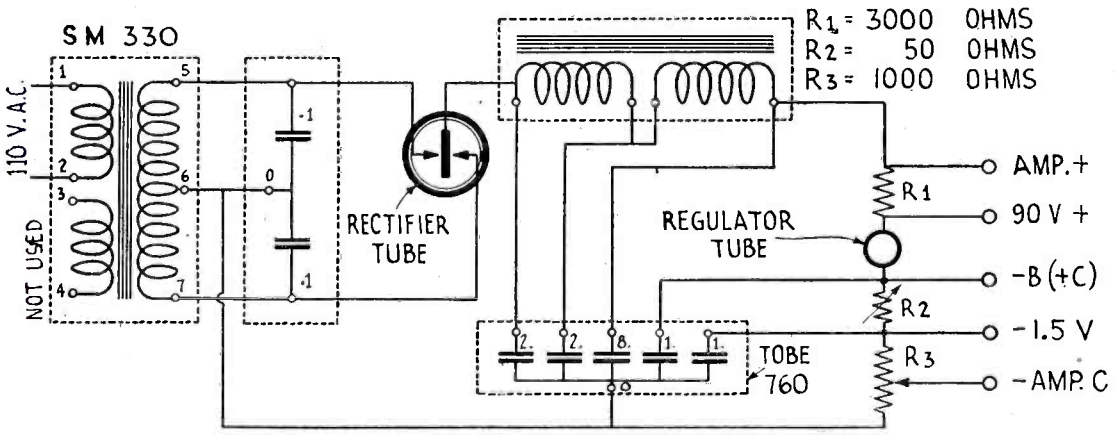


The Electrified Aero-Seven

by Zeh Bouck

IN the fall issue of RADIO LISTENERS' GUIDE & CALL BOOK the writer described the Aero-Seven receiver, one of the season's predominant achievements. It is hardly our custom to become unduly enthusiastic over any receiver, and we qualify our description of the Aero-Seven as a "predominant receiver" by an expression of its consistently good design. The Aero-Seven may be briefly described as combining the excellent points of many receivers while avoiding the majority of unfavorable points.

Since describing the original model, the author has received numerous requests for an A.C. design, in recognition of the general availability of alternating current tubes. This article, and the receiver it describes, is the response to a logical demand.



Wiring diagram of the eliminator employed with the set.

ELIMINATOR PARTS

1 Silver-Marshall 330 Transformer
1 Silver-Marshall 331 Choke Coil
2 Amsco Universal sockets
1 Raytheon BH tube
1 Raytheon type R regulator tube
1 Amsco 1000 ohm Monostat
1 Amsco 50 TT Rheostat
1 Tobe type 311, buffer block
1 Tobe type 760, filter block
1 Amsco type 125, 3000 ohm Resistor

LIST OF PARTS FOR THE SET

1 Aero-Seven Foundation Unit, drilled and engraved front panel, 7x24x1/8; drilled subpanel, 7x23x 3/16; two subpanel brackets
1 Aero Choke Coil No. 60 (CH)
1 Aero kit of coils No. U-12 (L1, L2, L3)
1 Silver-Marshall Drum Dial
1 Carter H-1000 Resistor, R1
1 Carter .00025 mfd. Condenser, C4
1 Carter .001 mfd. Condenser, C6
1 Carter Bypass ½ mfd. Condenser, C5
10 X-L Binding-posts
1 Amsco Floating Socket
6 Amsco Universal Sockets
1 Amsco Triplet Condenser .0005 mfd., C1, C2, C3
1 Amsco Grid Gate Mounting
1 Amsco 5 meg. Grid Gate, R2
3 Amsco Resistor Couplers No. RC1, RC2, RC3
1 Amsco .25 meg. Resistor
2 Amsco .1 meg. Resistor
1 Amsco .05 meg. Resistor
1 Amsco .5 meg. Resistor
1 Amsco 1. meg. Resistor
1 Clarostat Variable Resistor. R3
1 Centralab to 200,000 ohms Variable Resistor R4

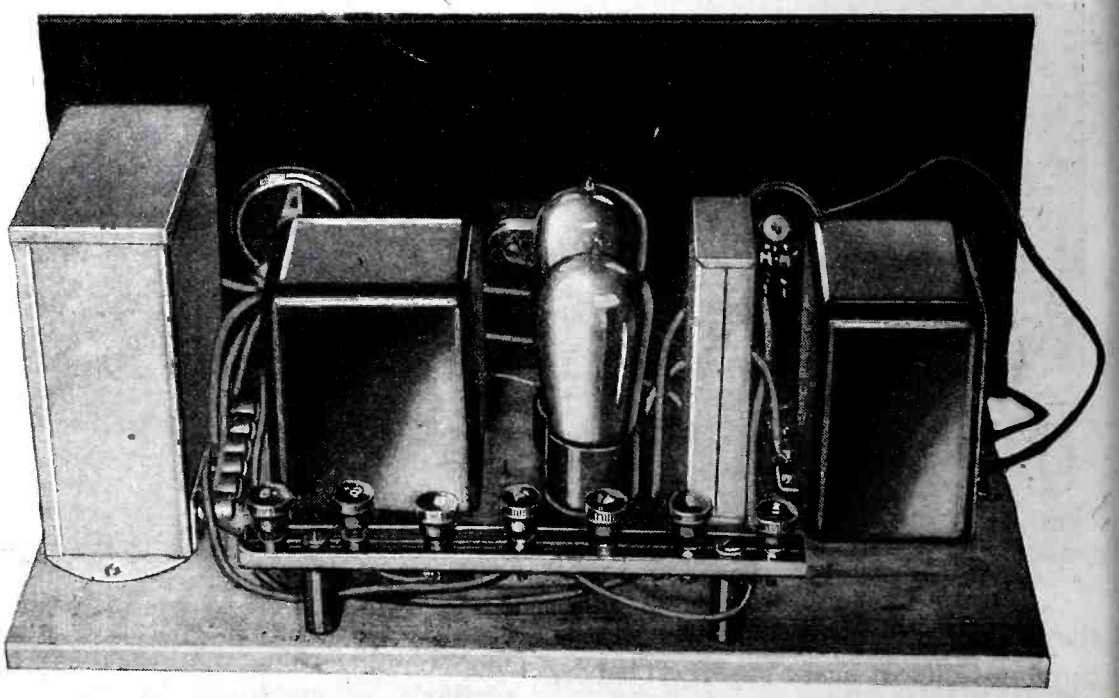


Photo showing the eliminator parts mounted on baseboard and panel.

The actual construction of the receiver itself is practically identical with that of the original battery model. The same panel, subpanel and foundation

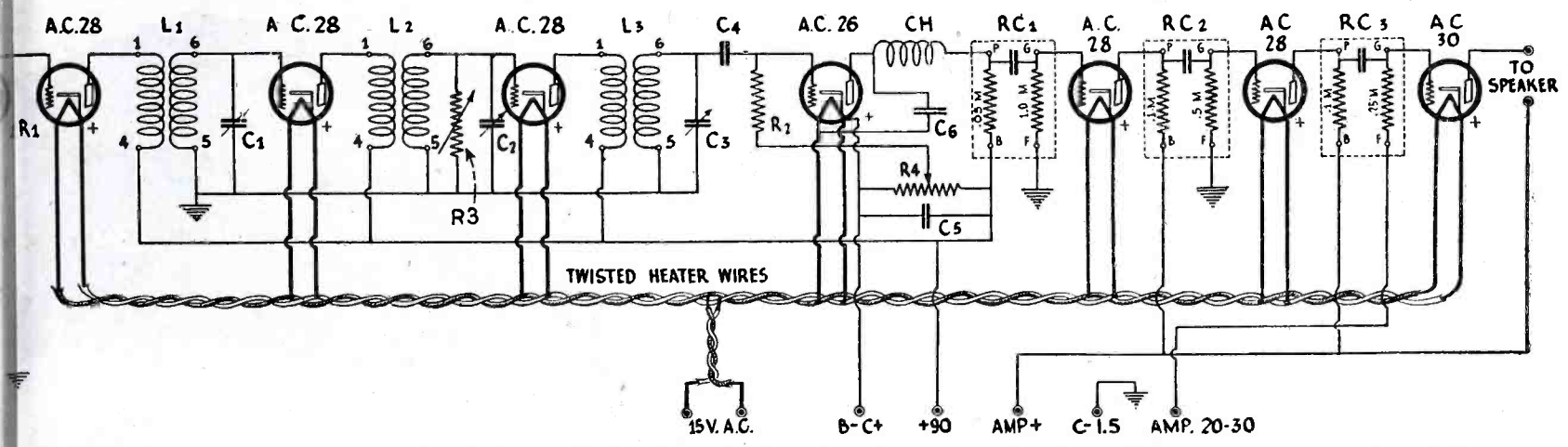
nit are used as shown in the accom-
nnying illustrations, and the reader is
ferred to the preceding issue of this
ublication for details of layout and

The following changes are made in the wiring of the Aero-Seven for Arcturus A.C. tubes:

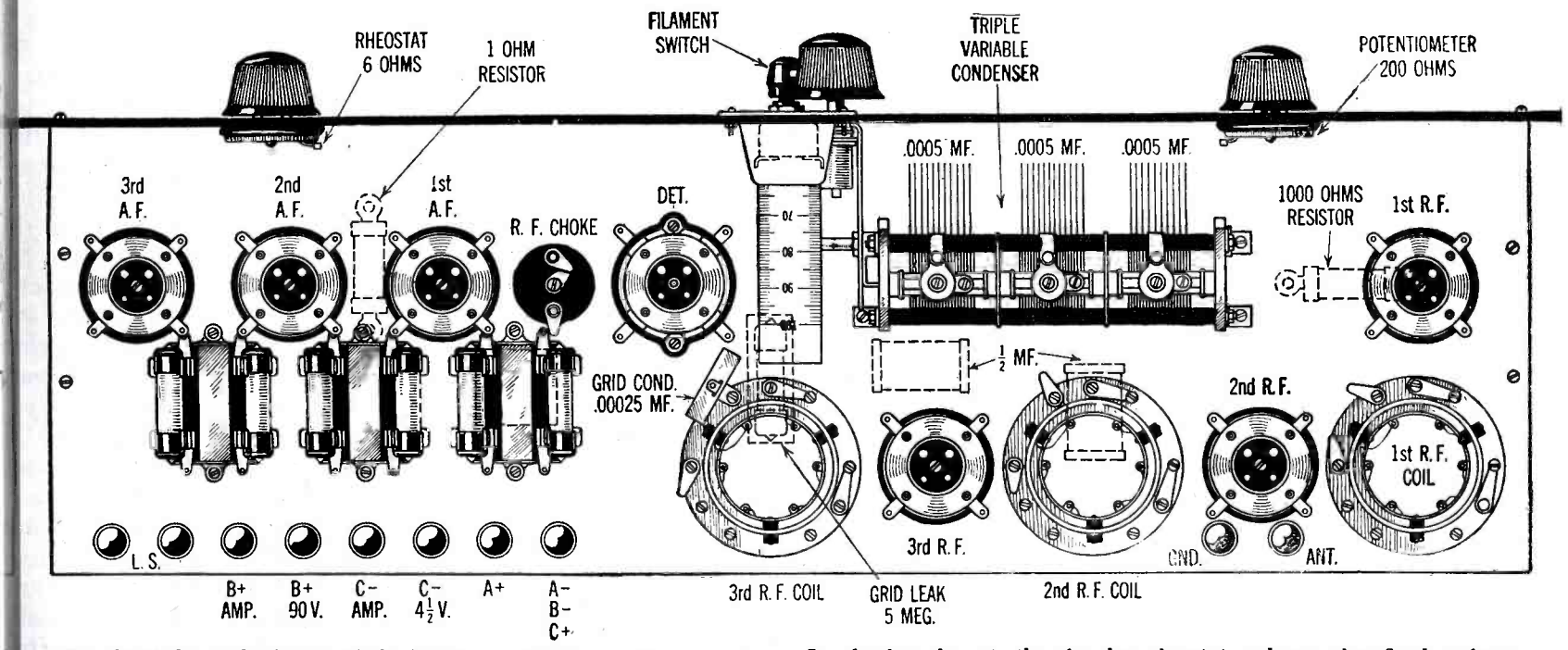
The rheostat and fixed resistor are

companying schematic wiring diagram.

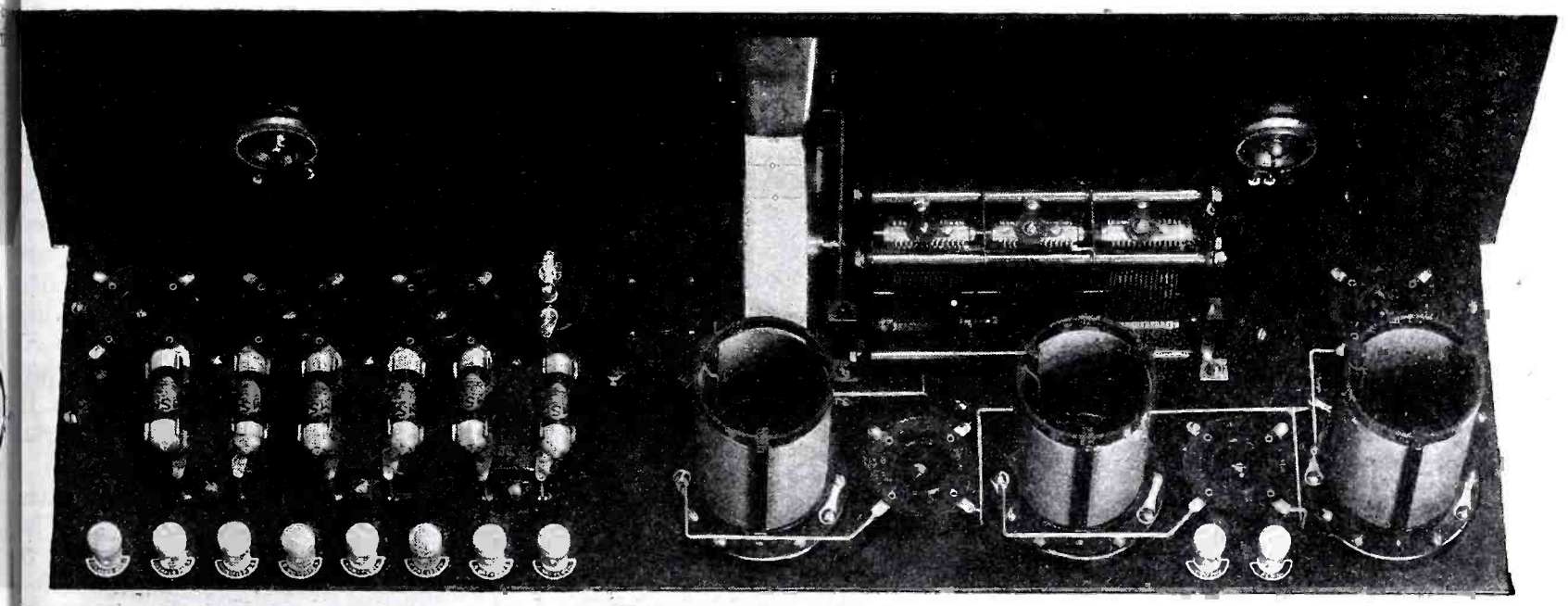
The potentiometer employed as a volume control in the battery model (the left hand knob) is eliminated and a uni-



Schematic wiring diagram of the electrified Aero-Seven. The twisted heater wires connect all tubes. Variable condensers C_1, C_2, and C_3 are ganged as one condenser. See layout directly below.



The above shows the layout of the battery operated Aero-Seven receiver. In altering the set, the six ohm rheostat and one ohm fixed resistor are removed, and the filament circuit is changed into a heater circuit with flexible cord (see diagram). A 200,000 ohm potentiometer is mounted in the hole of the panel formerly occupied by the rheostat



A photographic view of the battery operated Aero-Seven. The 200 ohm potentiometer is replaced with a Clarostat variable resistor which is used as a volume control. The location of most parts remain the same in the A. C. set.

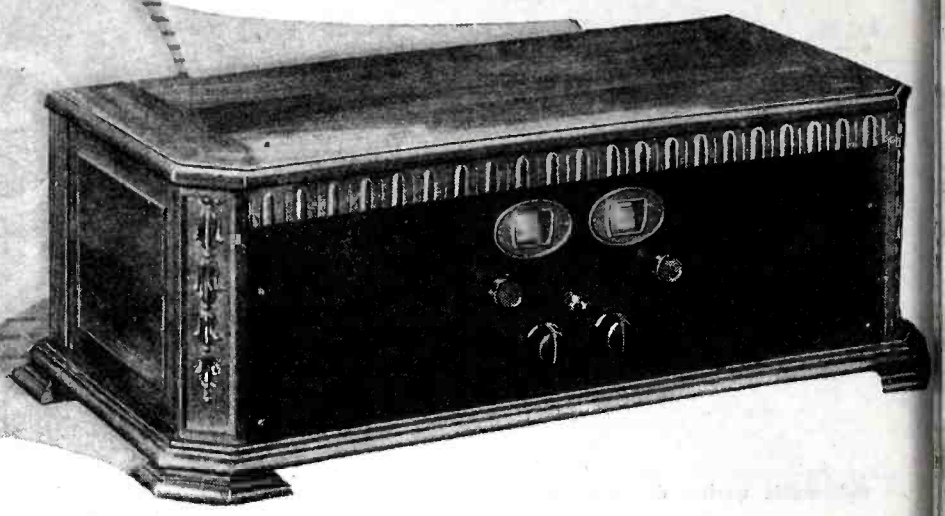
ring, other than the general photo-
aphs and schematic diagrams accom-
nying this article. The receiver is
signed for use with Arcturus A.C.
bes.

eliminated from the filament lighting circuit. The filament circuit now becomes a heater circuit. The heater circuit should be wired with flexible twisted cord as indicated in the ac-

versal range Clarostat variable resistor is mounted in its place. This is connected across the second R.F. secondary and functions as a volume control.

(*Continued on page* 179)

The La Peer AR-9



THE La Peer AR-9 Super is a receiver that depends upon careful design of the intermediate-frequency transformers for its extreme selectivity and high amplification rather than upon the use of an abnormally high number of tubes. For the fan who desires maximum efficiency with minimum cost of construction and upkeep, this receiver presents a logical selection.

If we go back over the history of super-heterodyne receivers we find that resistance coupling was first used for the intermediate amplifier but this method never attained any considerable degree of popularity because the amplification per stage was very low and also the resistance values were inclined to be too critical in adjustment, particularly as we did not have the variety of variable high resistances that we know today.

After resistances came the use of honeycomb coils for the intermediate inter-stage coupling. In this method each intermediate stage was tuned by means of a variable condenser which was connected across the grid coil, and in some cases both the plate and grid circuits of each stage were tuned. With this plan a high degree of efficiency was obtained but, on the other hand there were drawbacks, not the least of which was the large number of tuning controls involved and the more or less critical adjustment of the coupling between stages.

Then came the transformer coupled intermediate amplifiers with their untuned iron-core transformers. These transformers were a decided step forward. They reduced the number of tuning controls to a fairly reasonable figure and provided good amplification per stage. They offered practically no selectivity but this was taken care of by the use of one sharply tuned stage which usually consisted of a pair of honeycomb coils, one of which was shunted by a standard variable condenser by means of which the circuit was tuned. Later the honeycomb coil-variable condenser combination was replaced with a transformer which was tuned by means of a fixed condenser. This stage had been reached about four or five years ago.

LIST OF PARTS

2 Remler No. 649, .0005 mfd. variable condensers, C1, C2.
1 Muter No. 1900 Variall condenser, C3.
1 Muter No. 306, .00025 mfd. mica condenser, C4.
1 Muter No. 325, .002 mfd. mica condenser, C5.
2 Muter No. 507, ½ mfd. by-pass condensers, C6, C7.
5 Carter No. 10 tip jacks, J1, J2, J3, J4, J5.
1 La Peer "D" Oscillator coil unit, L1.
4 La Peer "D," Radio-frequency coils, L2, L3, L4, L5.
1 La Peer "AC" coil (for use with outside antenna).
1 Carter Type IR3, 3 ohm Imp rheostat, R1.
1 Carter Type IR200, 200 ohm Imp potentiometer, R2.
2 Muter No. 1700, ¼ ampere Tubestats, R3, R5.
2 Muter No. 1702, ½ ampere Tubestats, R4, R6.
1 Muter No. 781, 1/20 megohm grid leak, R7.
1 Carter Imp battery switch, SW.
2 Silver-Marshall No. 220 audio transformers, T1, T2.
1 Silver-Marshall No. 241 output transformer, T3.
9 Benjamin No. 9042, Cle-Ra-Tone tube sockets, VT1, VT2, VT3, VT4, VT5, VT6, VT7, VT8, VT9.
1 Formica panel, drilled and engraved.
1 Formica sub-panel, drilled.
2 La Peer sub-panel mounting brackets.
2 Remler No. 110 drum dials.
9 X-L binding posts with marker tags as follows: A+B—, A battery—, C battery +, C battery — (3), B battery 45 +, B battery 90+, B+ Amplifier.
1 package Acme Celatsite, flexible hook-up wire.
1 package Kester radio solder.

Receivers such as the one just described were responsible for many thrills to the hardy pioneers who undertook to build them. Tuned radio-frequency amplification at the broadcasting wavelengths was practically unknown at the time and one had to depend upon regenerative detectors for sensitivity. The regenerative detector was capable of bringing in distant stations but usually stations more than about 400 miles distant came in very faintly. The new super-heterodyne receiver, however, had the ability to bring in many of the more distant stations with almost as much volume as the local stations. It therefore became possible to receive distant stations with comfortable volume on the loudspeaker, something which was usually not possible with the average three-tube receiver of the time.

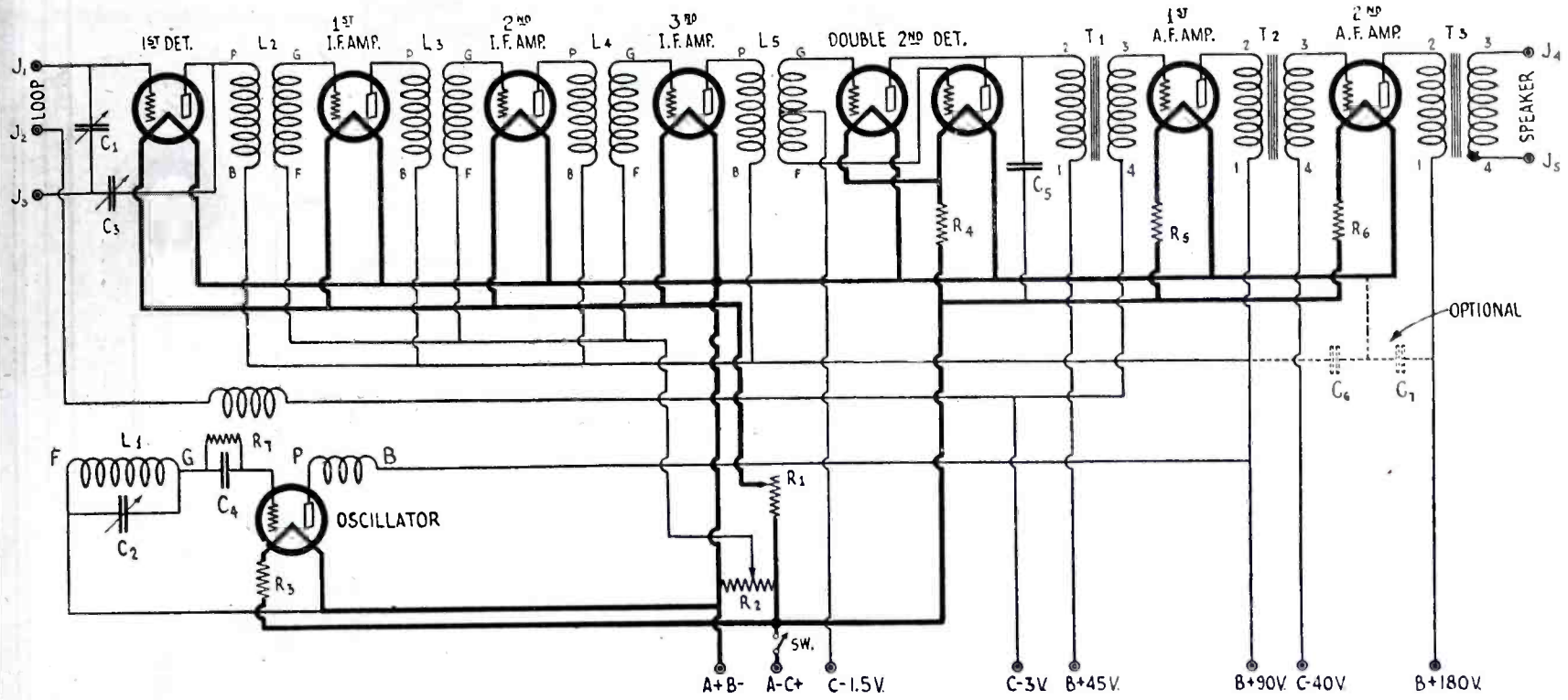
But to "do their stuff" these supers required three or four stages of intermediate amplification and, when the present broadcast band went into use and the number of broadcasting stations began to increase the selectivity of these receivers proved inadequate.

The next progress was made along the lines of broadly peaked intermediate transformers. That is, each transformer had a definite, although rather broad resonance peak, usually somewhere around 5000 meters. Then with a sharply tuned input (or output) transformer to serve as a filter the over-all selectivity of the receiver was considerably improved.

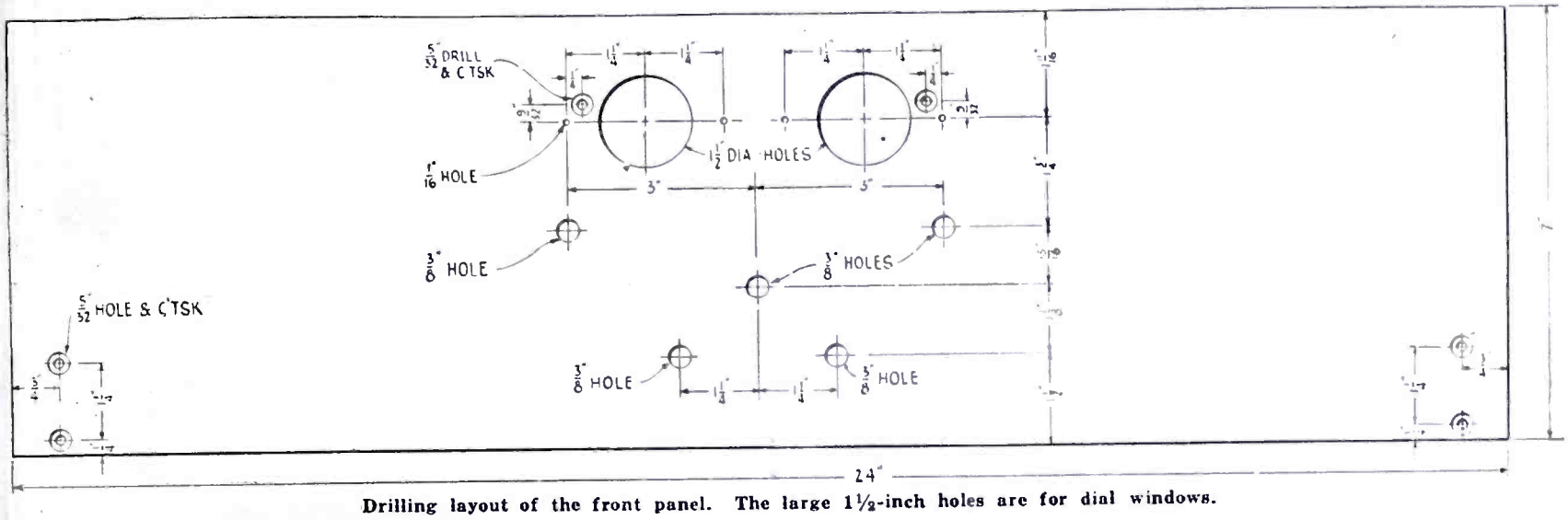
Further improvement was made along this line by using less and less iron in the transformer cores until the resonance peaks of the transformers became so pronounced that it became necessary to match transformers which were to go into a receiver. In other words, if the intermediate-frequency amplifier was to amplify at say 3000 meters each of the untuned transformers would have to be peaked close to this wavelength and the filter trans-

former would have to be shunted by a fixed condenser which would make it peak to correspond with the untuned stages. Much grief was encountered .001 mfd. for instance, and a fixed condenser of this size were purchased it might be found to be actually anywhere from five to a hundred percent

About two years ago some manufacturers had reduced the amount of iron in their transformers to such a degree that each transformer was quite



Schematic wiring diagram of the La Peer AR-9. Letters and numerals correspond with picture diagram and list of parts.



Drilling layout of the front panel. The large 1½-inch holes are for dial windows.

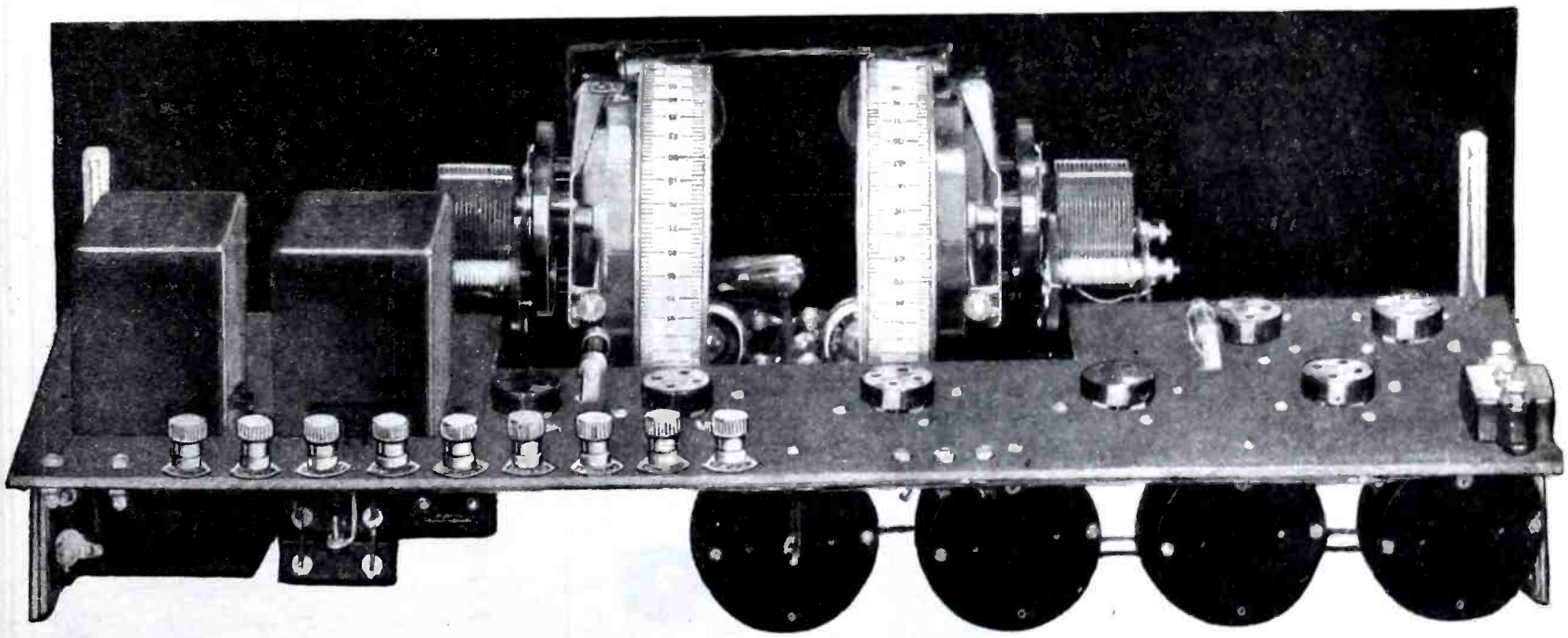
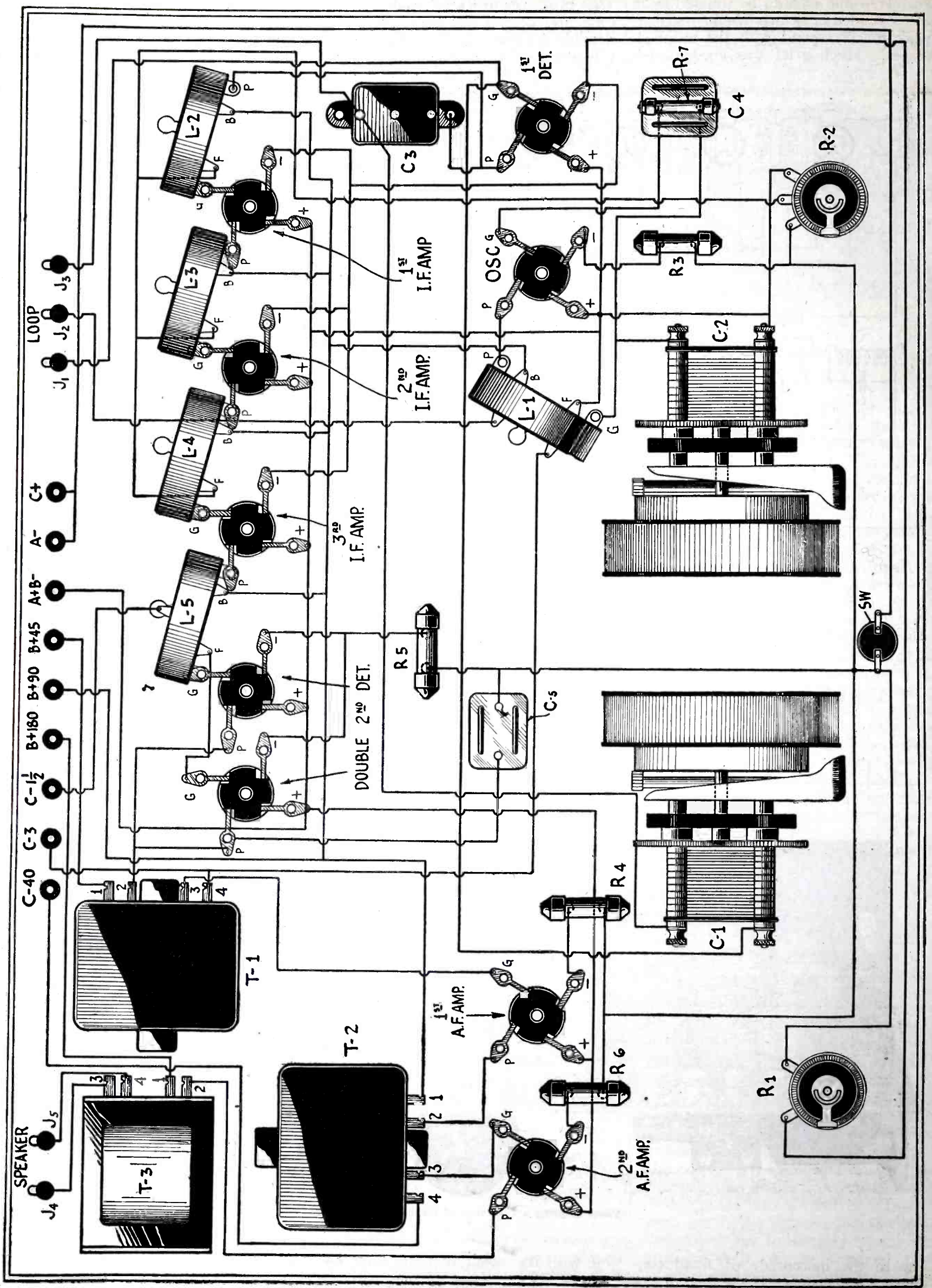


Photo showing a rear view of the completed receiver.

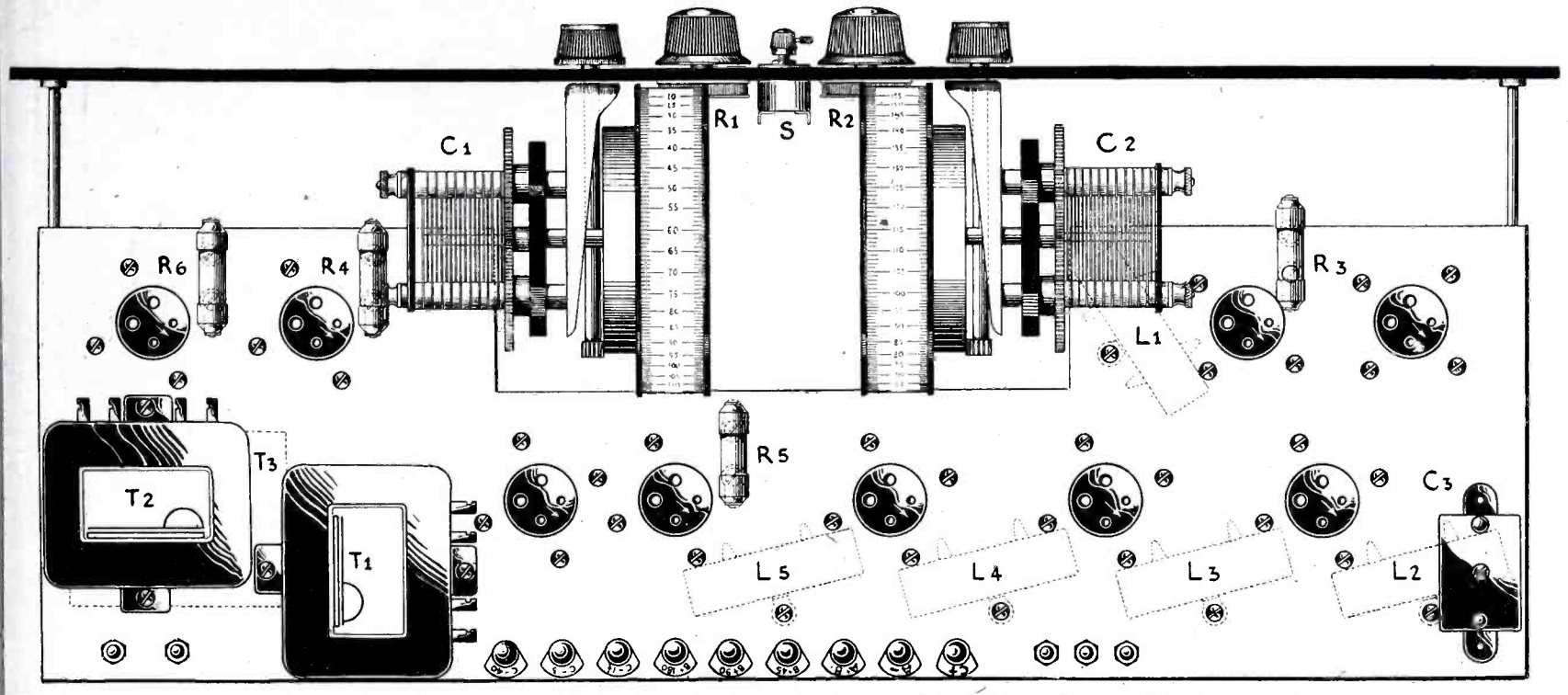
due to the inaccuracy of fixed condensers at the time. If the filter transformer called for a shunt capacity of

off with the result that the filter circuit would be all out of tune with the rest of the amplifier.

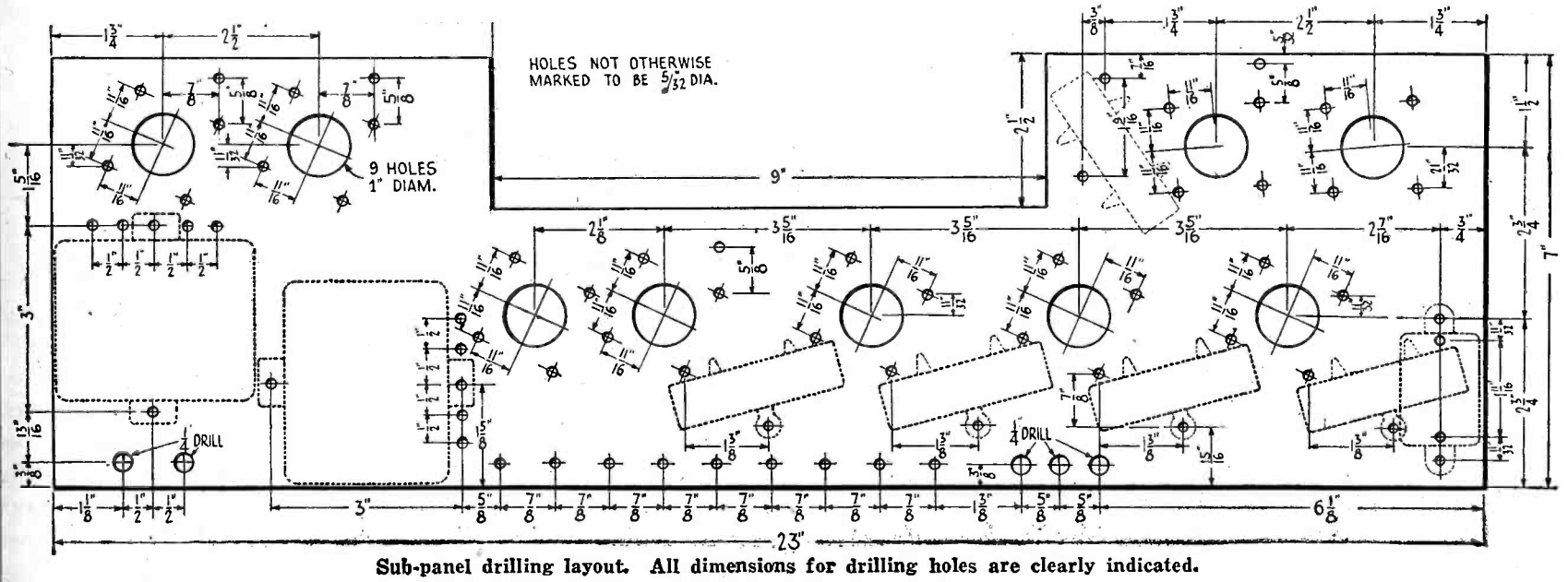
sharply tuned and the efficiency per stage of an amplifier that used these transformers was increased to such a



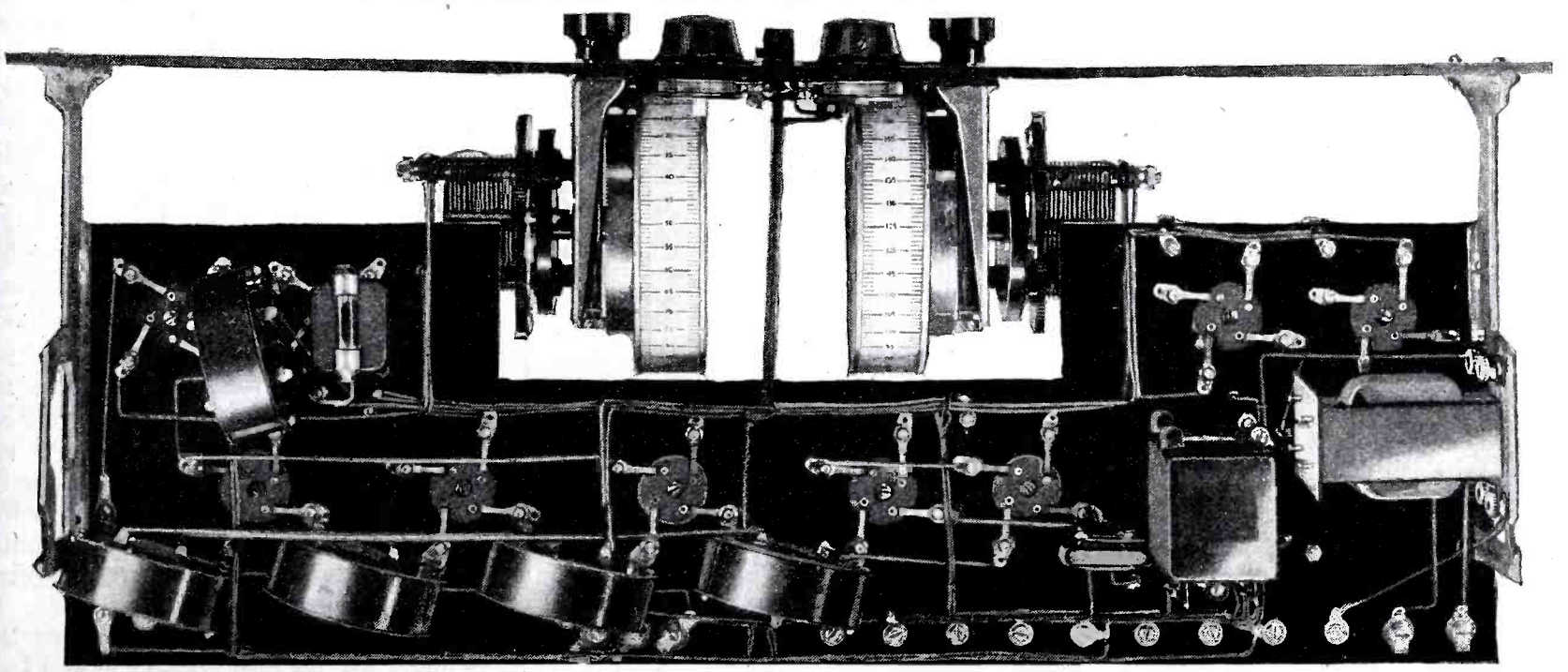
degree that two stages of intermediate-frequency amplification became ample. This required extremely careful matching of the transformers which were to be employed in a receiver and in many cases the manufacturers furnished the fixed condensers of exactly the right capacity to properly tune the filter transformer. In this way it was fairly certain that when a receiver was constructed the intermediate amplifier would be properly tuned and highly efficient.



Layout of parts on the front and sub-panel. Parts are indicated to correspond with wiring diagrams.



Sub-panel drilling layout. All dimensions for drilling holes are clearly indicated.



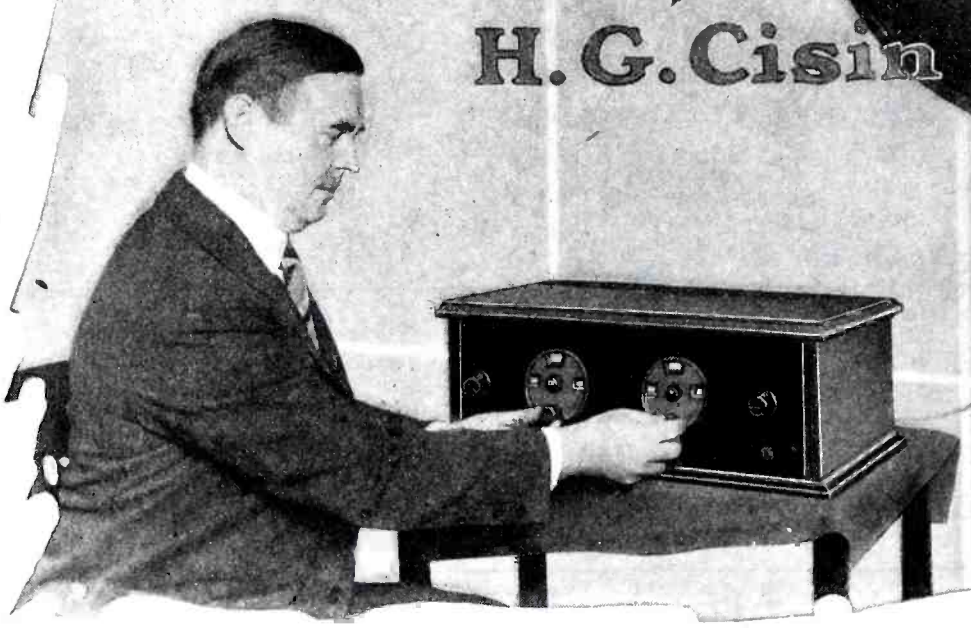
A bottom view of the set showing the simple method of mounting and wiring parts. Note particularly the method of mounting the intermediate transformers on the tube socket terminals.

If three or four stages of intermedi-

(*Continued on page* 160)

How to Build the Intertrol Five

by H. G. Cisin



THE regenerative principle is still the object of considerable experimentation and research on the part of those interested in the development of radio. The Intertrol Five features a regenerative detector in which regeneration is automatically controlled. In this circuit, operation is distortionless. There are no whistles, squeals or howls, such as are present in the usual regenerative receiver.

The intertrol circuit consists of one stage of tuned radio frequency, a regenerative detector, one stage of transformer coupled audio frequency amplification, and two stages of step-up impedance coupled audio frequency amplification. Auto-couple coils are used both for the antenna coupler and for the inter-stage radio frequency transformer. As the tuning condensers are rotated, the coupling between the primaries and the secondaries of the auto-couple coils is automatically varied, being made less close at short wave lengths, where the energy transfer would be greater and the selectivity would be consequently lessened. Changing the coupling in this way provides a constant transfer of energy, and results in uniform selectivity over the entire wave length range. Shielding is provided for the radio frequency stage and also for the detector stage. This eliminates any interaction between circuits, prevents direct pick-up, and adds to the stability and efficiency of the receiver.

The special arrangement of the regenerative detector should be noted, because of the greatly improved results which are attained. The plate of the detector tube, in addition to being connected to the primary of the audio transformer, is connected back through the small variable condenser C_2 to point "P", this being one end of the primary of the auto-couple coil (L_1). This causes the portion of the primary, B-P, to act as a tickler coil. As the coupling between the primary and secondary of the coil is varied with the rotation of the variable tuning con-

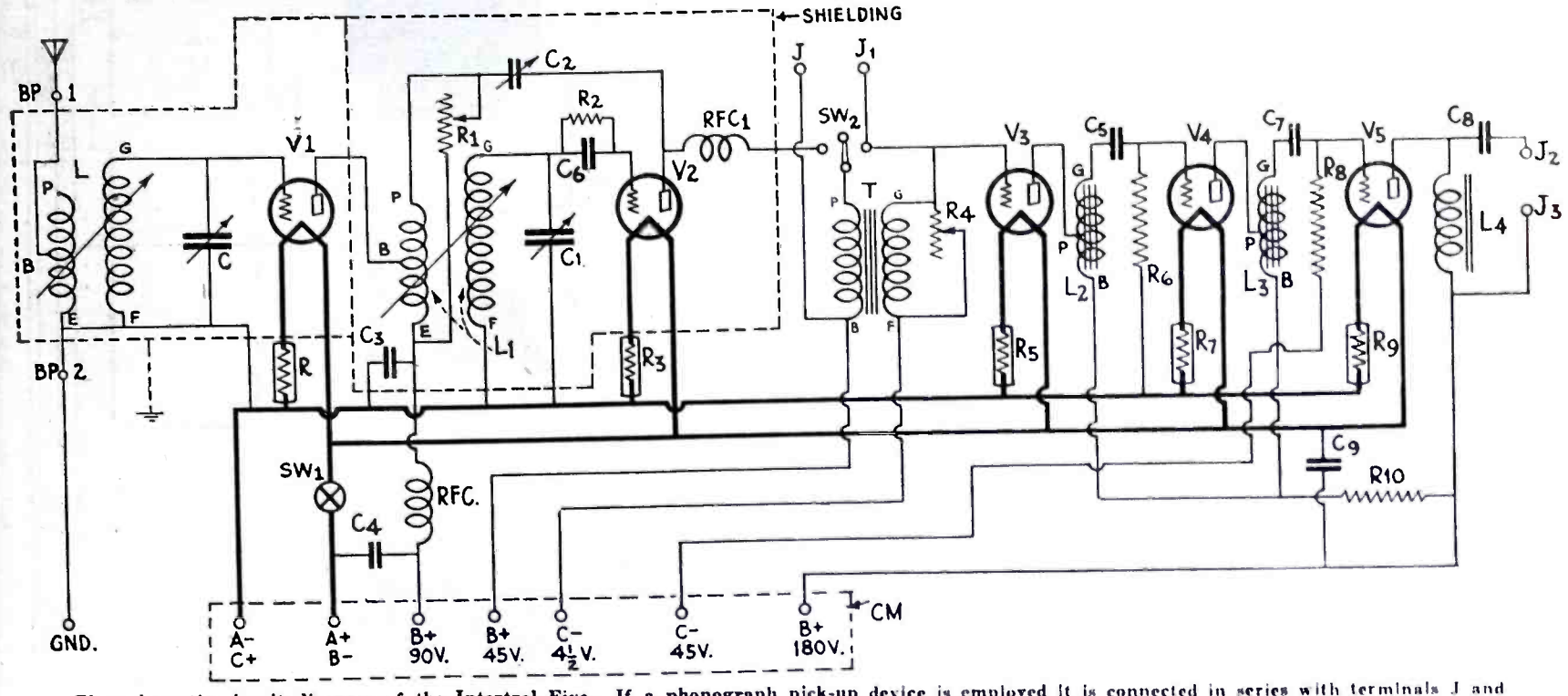
LIST OF PARTS REQUIRED FOR THE INTERTROL FIVE

- 2 Marco vernier dials, type 192.
- 2 Hammarlund .00035 mfd. midline variable condensers (C, C_1)
- 2 Hammarlund auto-couple coils (L, L_1)
- 2 Hammarlund aluminum shields, 6"x 7"x6"
- 4 Amperites, No. 1-A, with mountings (R, R_3, R_5, R_7)
- 1 Amperite, No. 112, with mounting (R_9)
- 5 Eby sockets
- 2 Hammarlund R. F. chokes, 85 m. h. (RFC, RFC_1)
- 1 Thordarson transformer, type R-200 (T)
- 2 Thordarson Autoformers (L_2, L_3)
- 1 Thordarson 30 henry choke, R-196 (L_4)
- 1 Electrad Royalty variable resistance, type "G" (R_1)
- 1 Electrad Tonatrol (R_4)
- 1 Muter .00025 mfd. grid condenser with clips (C_6)
- 1 Lynch 3 meg. metallized resistor grid leak (R_2)
- 1 Muter .001 mfd. by-pass condenser (C_3)
- 3 Acme "Parvolt" ½ mfd. series "A" condensers (C_5, C_7, C_9)
- 1 Acme "Parvolt" 1 mfd. series "A" condenser (C_4)
- 1 Acme "Parvolt" 2 mfd. series "A" condenser (C_8)
- 1 X-L Variodenser, type G-10 (C_2)
- 2 X-L push-posts (BP_1, BP_2)
- 1 Carter "Imp" Filament Switch (SW_1)
- 1 Carter, single-pole double-throw switch (SW_2)
- 1 Lynch 0.5 meg. resistor (R_6)
- 1 Lynch 0 25 meg. resistor (R_8)
- 1 Lynch 0.1 meg. resistor (R_{10})
- 3 Lynch single resistor mountings
- 4 Yaxley "pup" jacks (J, J_1, J_2, J_3)
- 1 Yaxley cable plug (CM)
- 1 roll Acme Celatsite wire
- 1 package Kester radio solder
- 1 Formica panel, 7"x21"x$\frac{3}{16}$"
- 1 Formica sub-panel, 7"x20½"x$\frac{3}{16}$"
- 1 Southern Toy Co "Iveyline" cabinet, 7"x21"x10"
- 1 B. M. S. "Via-Rad" electric phonograph reproducer
- 1 Ensco 3 ft. loud speaker kit

denser C_1, the oscillation control is practically automatic. It follows that regeneration is attained at a point of maximum efficiency and without distortion, squeals or howls. In order to get still finer adjustment of regeneration, the primary of the auto-couple coil is shunted by the variable resistance (R_1).

The design of the audio circuit presents an ideal combination of a transformer with two additional stages of step-up impedance coupling. Volume control is provided by a variable resistance connected in parallel with the secondary of the audio transformer. This gives extremely smooth variation of volume, with regulation to just the degree required. An output filter is provided, consisting of a choke and a 2 mfd. filter condenser.

The system of audio amplification used in the Intertrol Five leaves nothing to be desired insofar as tone quality is concerned and since the audio chokes are step-up impedances, there is no diminution of volume, such as would be noticed in resistance coupling.



The schematic circuit diagram of the Intertrol Five. If a phonograph pick-up device is employed it is connected in series with terminals J and J1. SW2 acts to switch from radio to phonograph pick-up or vice versa.

In line with modern standard practice, Amperites are used to furnish automatic filament control. Vernier dials of the type specified are recommended, since they are non-microphonic and entirely free from backlash. The sockets used are especially adapted to sub-panel wiring, although they are mounted on top of the sub-panel. A radio frequency choke is used for keeping R.F. current from the audio circuits and an R.F. choke is also placed in the B plus 90 lead, thus obstructing this path for R.F. currents which are consequently by-passed through the .001 mfd. fixed condenser.

The layout of the panel is an index to the simplicity of design of the entire set. At the left the filament switch is located. At the right, a switch is provided for changing from radio to electric phonograph pick-up. Both loud speaker and pick-up devices are connected to the receiver by means of phone-tip jacks located on the sub-panel. The matter of connecting the batteries to the set has been simplified by the use of a Yaxley cable plug mounting (CM) placed under the center of the sub-panel. X-L push-posts are provided for connecting both aerial and ground.

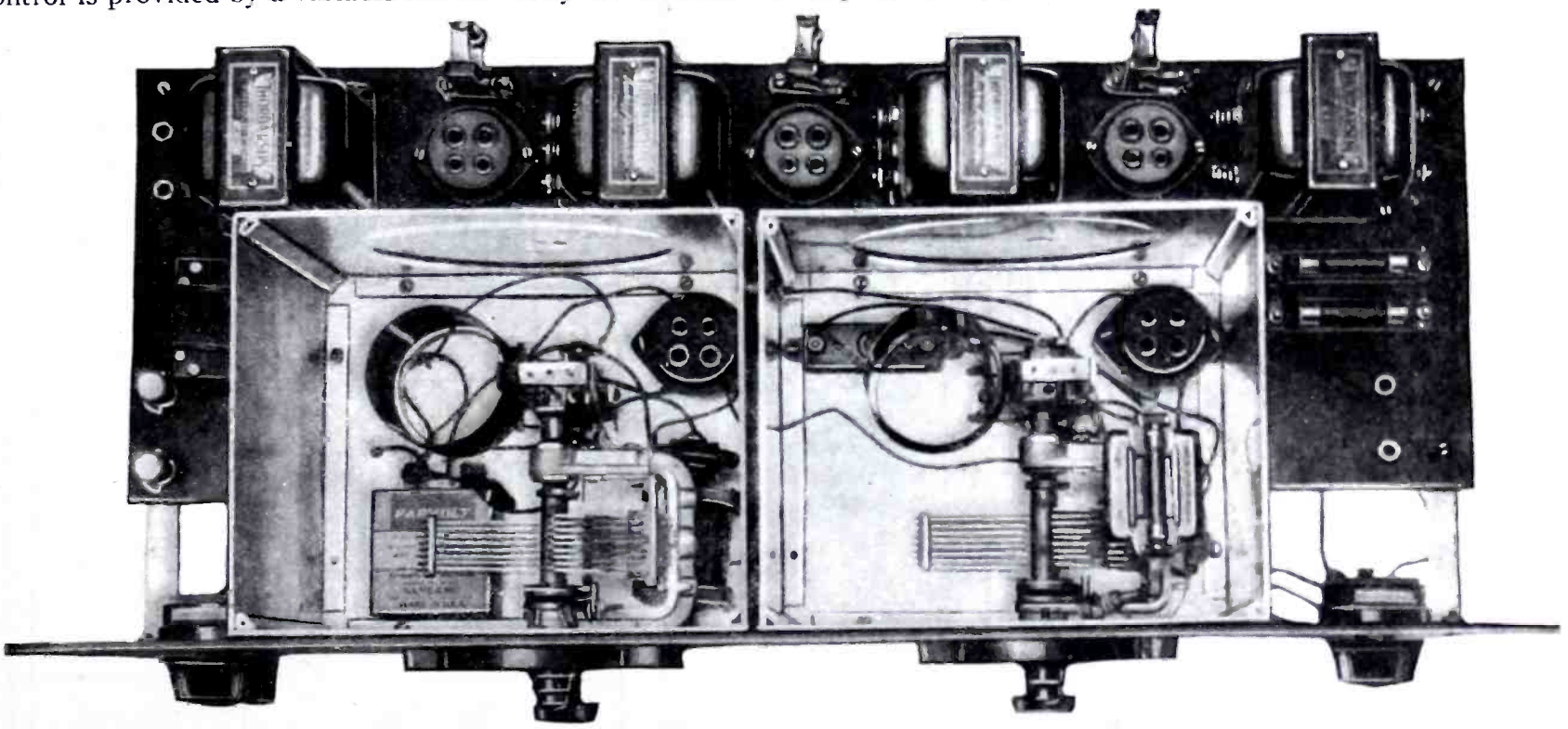
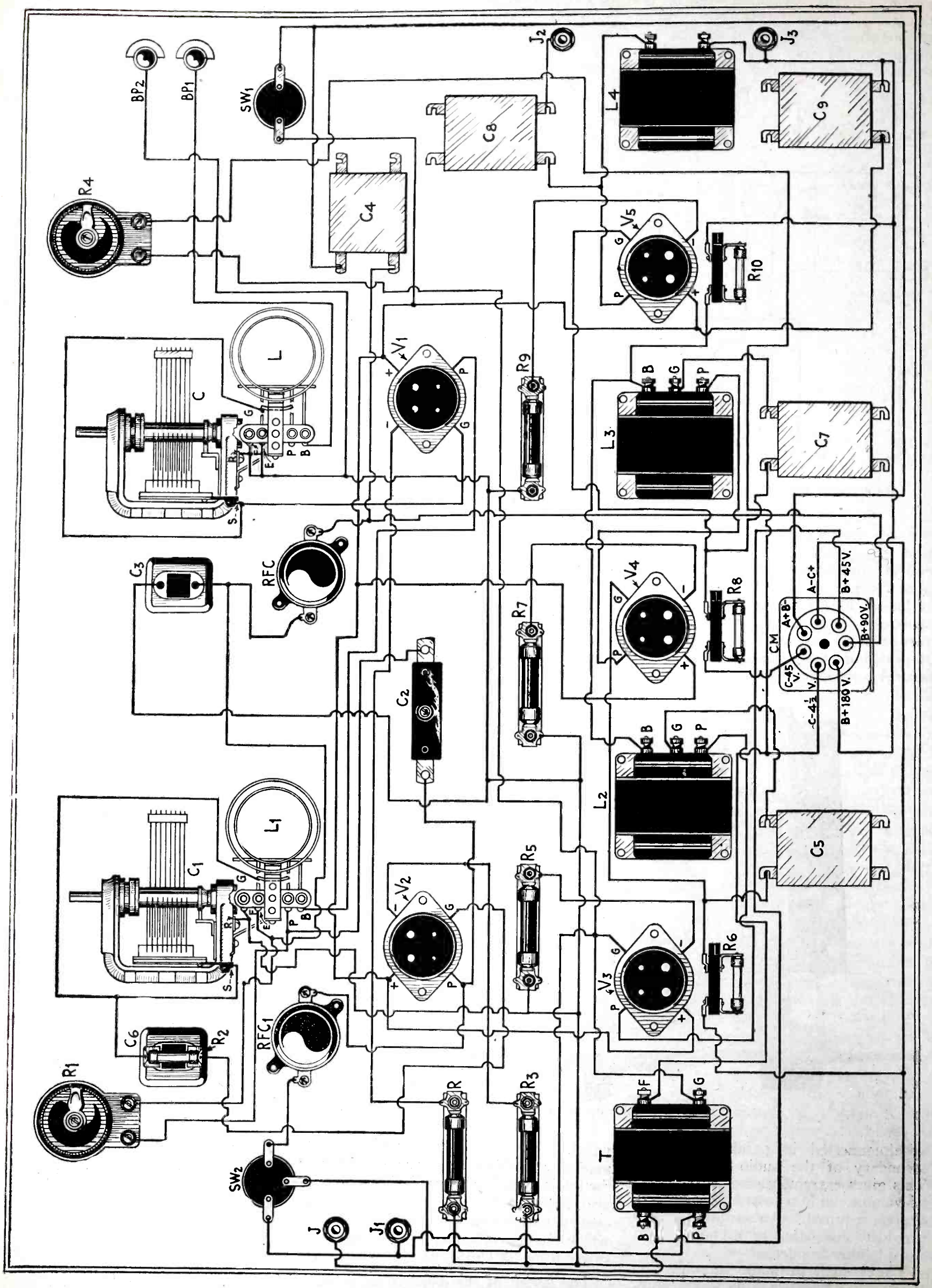
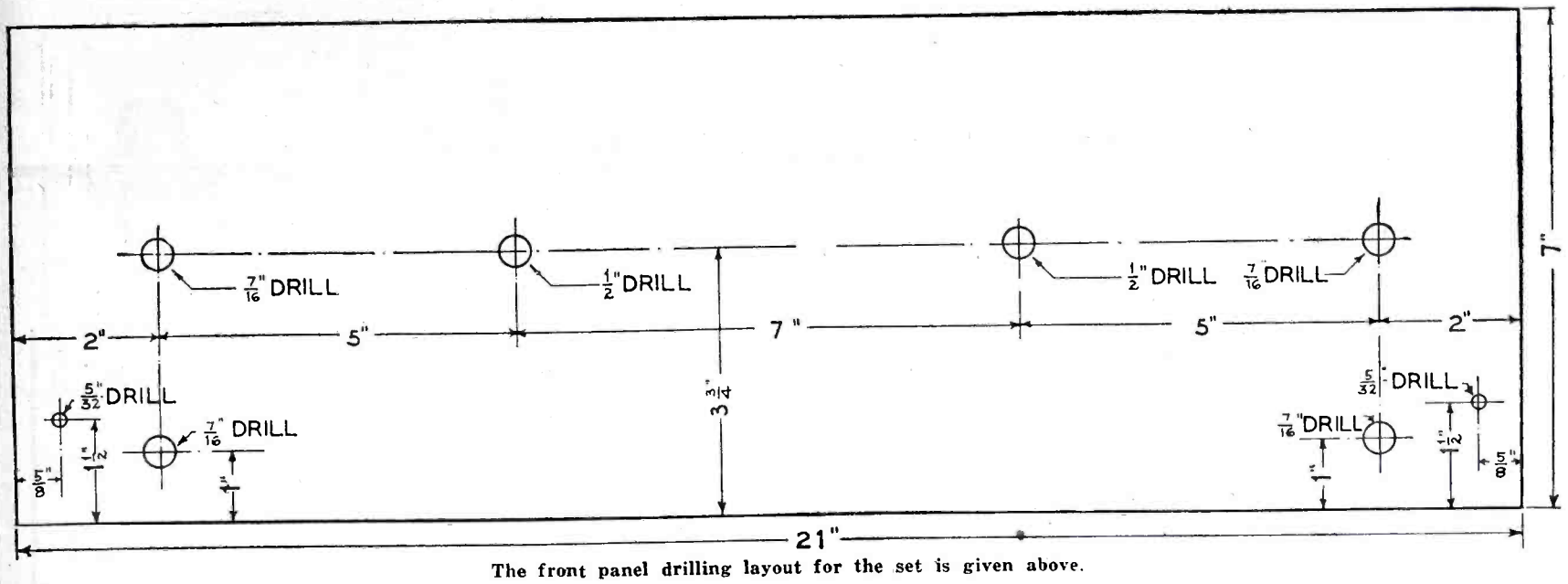


Photo showing a top view of the set with shielding covers removed.

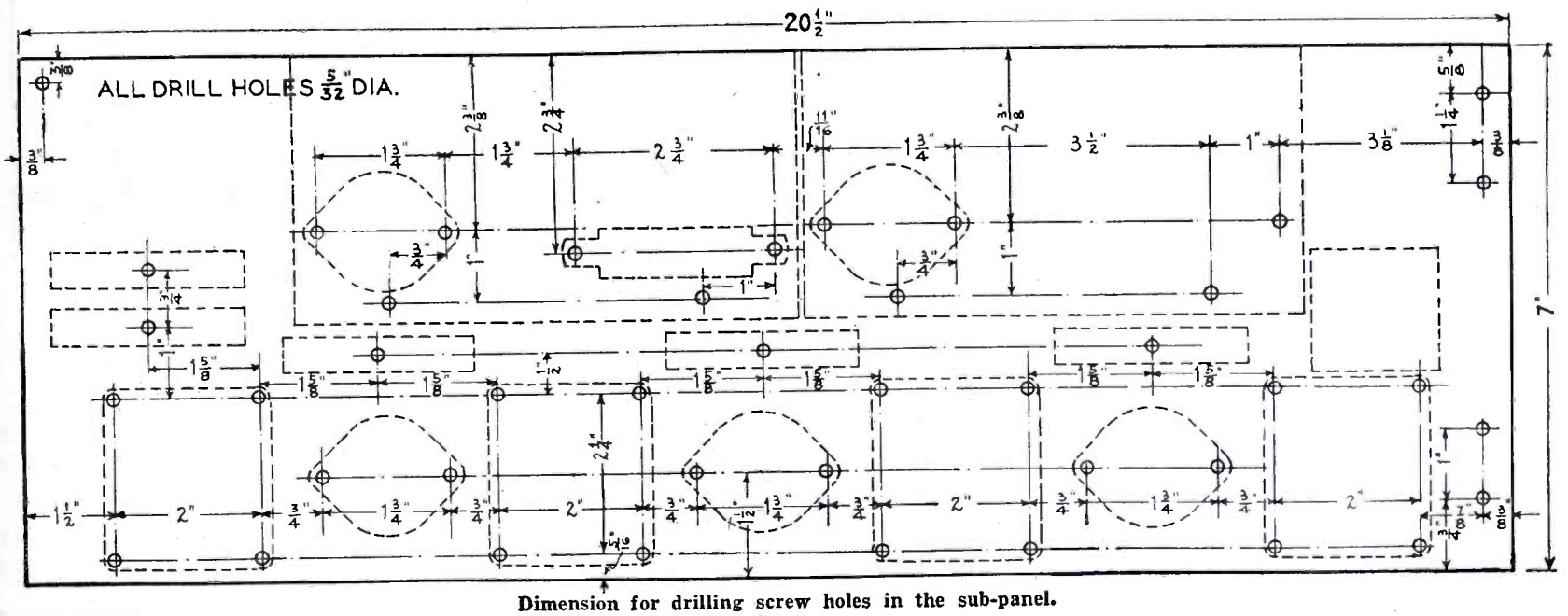
Very often the matter of using the proper tube in a receiver will make a vast difference in the results obtainable. "CeCo" tubes are recommended for use with the "Intertrol Five" as these will give highly satisfactory performance. The detector tube should



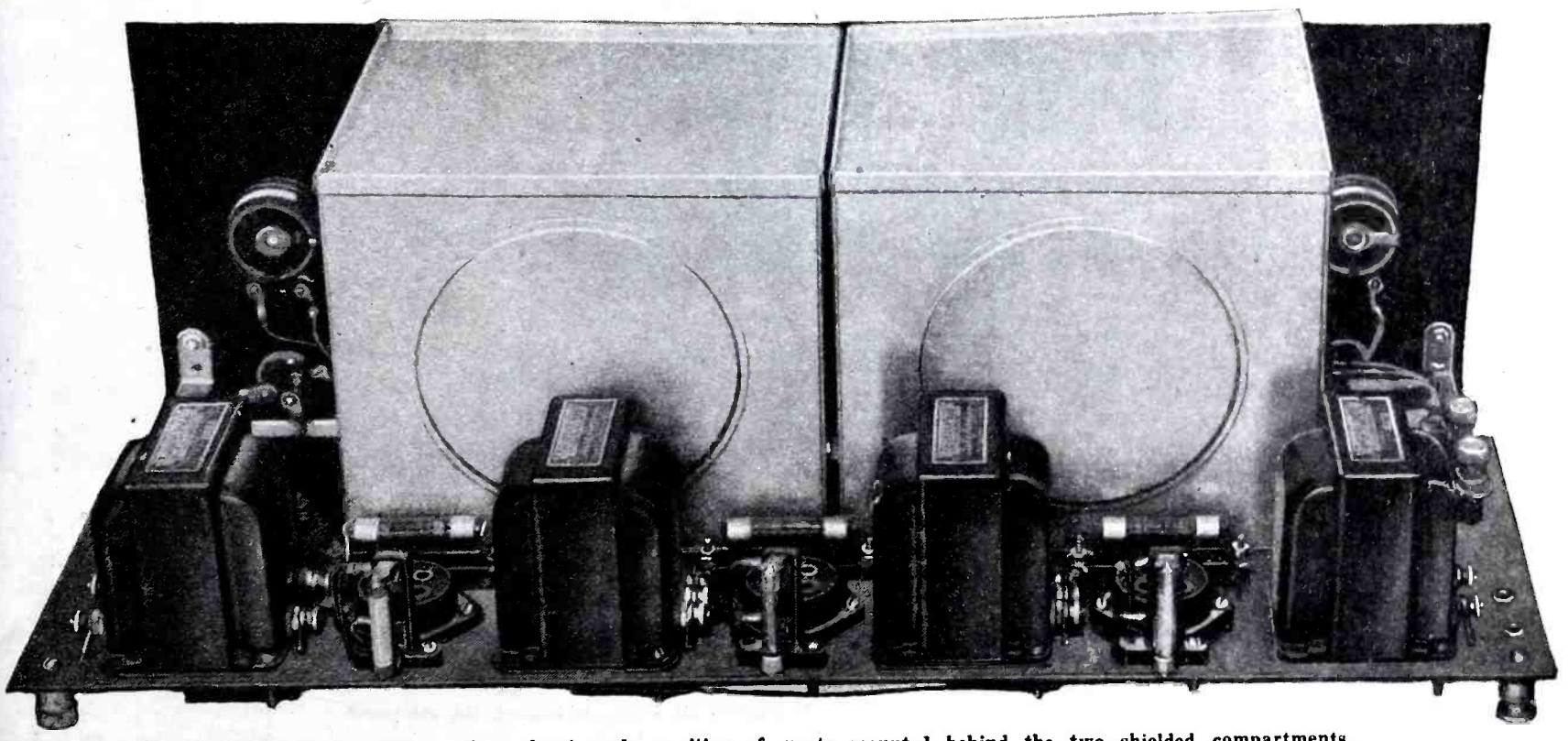
be a type "H" special detector. The "J-71" "CeCo" output tube is required for the last audio stage. The other tubes may be "CeCo" type "A" tubes, although a type "G" is preferable in the stage preceding the last. The com-



The front panel drilling layout for the set is given above.



Dimension for drilling screw holes in the sub-panel.



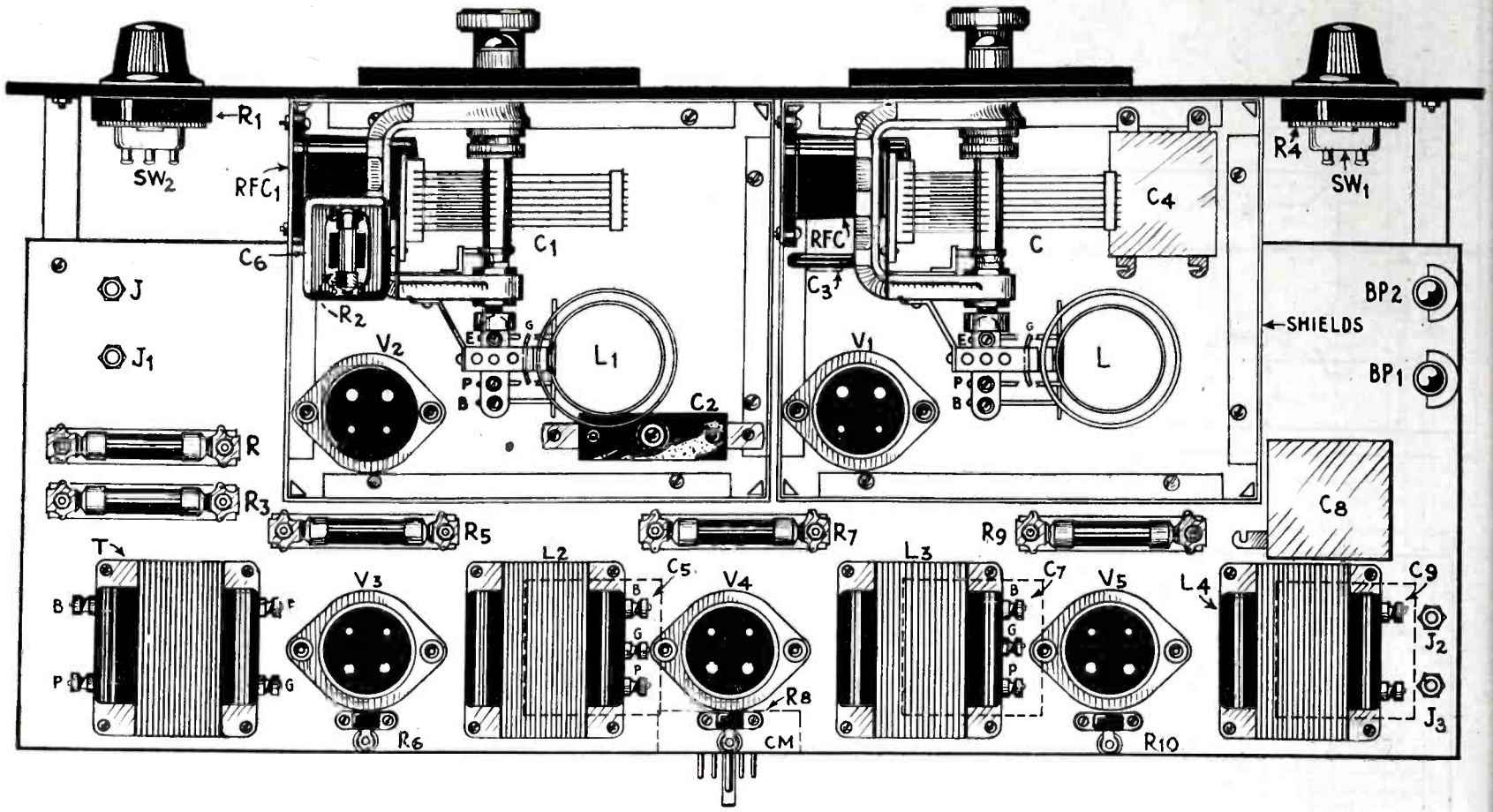
A rear view of the receiver showing the position of parts mounted behind the two shielded compartments.

for use on a radio table. However, the set may also be placed in a console such as the Excello style R-29.

The Ensco 3-ft. cone speaker is one ideally suited to the "Intertrol" circuit. This speaker is obtainable in kit form, and is very easy to assemble. It is capable of handling great volume without a suggestion of distortion and its

tone quality will be a revelation to those who have never heard it.

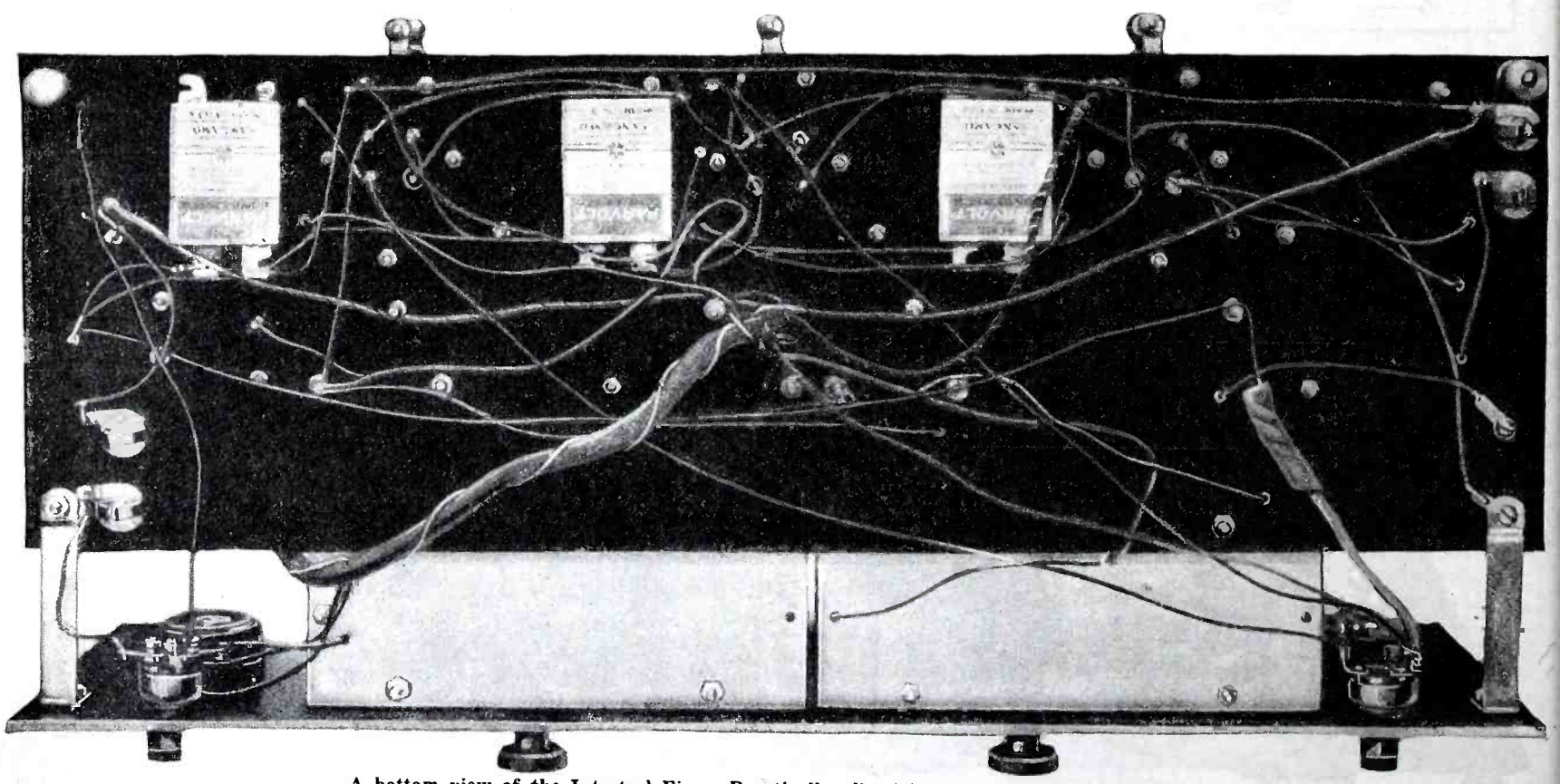
A number of interesting entertainments are available to the owner of an Intertrol Five, through the use of the switch (SW_2) provided for attaching the electric phonograph pick-up. If an earpiece is connected to a long extension cord and this in turn is plugged into the pick-up jacks (J, J_1) the earpiece may be used as a microphone and the voice of anyone talking into the earpiece will be greatly amplified and will be heard coming from the loud speaker, just as if the person were talking from the broadcasting studio. Reversing this process, the loudspeaker should be plugged into the pick-up jacks and the extension cord should be connected to the jacks provided for the loudspeaker. In this case, the voices of persons talking in the same room with the loudspeaker, will be clearly audible in the earpiece or headset, located at any remote point. This device will be found superior to most expensive commercial detective outfits.



Instrument layout of the receiver showing the location of all parts.

The first step in constructing the receiver is to attach the bottom and front shields to the sub-panel. The height of the front shield is 6½" and this determines the distance from the top of the sub-panel to the top edge of the panel. The shielding overlaps the front of the sub-panel by 2¼". In other words, the sub-panel sets back 2¼" from the panel. The next step is to locate the holes for the two variable condensers. In order to do this, measure off two parallel lines 7" from

(*Continued on page* 152)



A bottom view of the Intertrol Five. Practically all wiring is beneath the sub-panel.

The Light-Socket Operated World's Record Super Ten

IN the last isssue of RADIO LISTENERS' GUIDE AND CALL BOOK was described the latest development of Mr. E. H. Scott, designer of the World's Record Super Ten. This receiver was a distinct improvement over the original eight tube set with which Mr. Scott journeyed to Australia for the purpose of making long distance receiving tests. The establishment of four world's records for consistent distance reception was made as well as a resulting log of over seventy closely written pages covering the reception of American and foreign stations in Australia. The log that was later verified stands today as a proof of the truly remarkable performance of the World's Record Super receiver.

The New Improved World's Record Super Ten described in RADIO LISTENERS' GUIDE AND CALL BOOK was practically Mr. Scott's original eight tube set with two stages of preceding short wave tuned radio frequency amplification added, with the result that the sensitivity of the receiver was tremendously increased and its performance rendered truly marvelous. Many hundreds of these sets have been built since the publication of the last issue of this magazine, and some truly phenomenal reception reports have been received from builders. At the same time, with the rapid development of A.C. tubes which have taken place in the last few months, many of these same builders have inquired concerning the possibilities of complete light socket operation of the World's Record Super Ten, and it is in answer to these requests that this article is presented describing the completely light-socket operated model of the New World's Record Super Ten.

In order to obtain the most satisfactory and efficient power supply equipment and A.C. tubes for his receiver, Mr. Scott consulted with the engineering departments of two well known manufacturers, with the result that the Light-Socket Operated World's Record Super, employing A.C. tubes with all ABC power furnished by a specially designed unit, will give performance exactly on a par, if not slightly superior, to that obtainable from the regular battery operated model of the set, and with practically no trace of hum, or any other objections which might be raised against AC tubes as a result of lack of experience with these truly epoch making developments.

The Light-Socket Operated World's Record Super is substantially the same receiver as the battery operated model, and, in fact, any of the battery operated models may be easily converted to complete light socket operation by slight wiring changes with the addition of A.C. tubes of the type used and the World's Record Super Ten Power Pack described herewith. No detailed description of the World's Record receiver will be given as it can easily be obtained by a reference to page 91 of the Fall Edition of the RADIO LISTENERS' GUIDE AND CALL BOOK. Instead, this article will be confined to a description of those changes from the original circuit necessary to convert it to complete light socket operation.

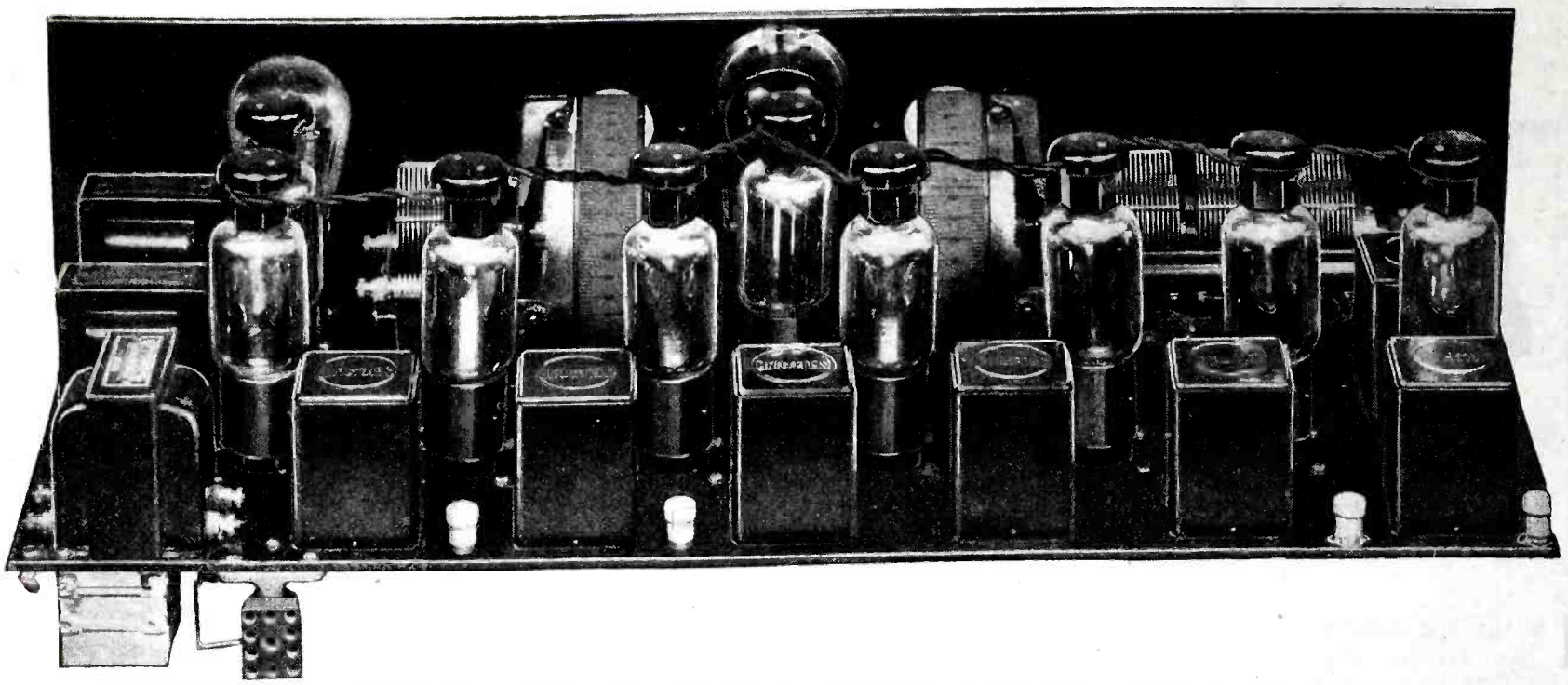
A reference to the schematic diagram will indicate that it has actually been somewhat simplified, compared to that of the battery operated model. The grid and plate leads from transformers to tube sockets of the receiver remain the same as in the original set, the only changes being in the filament wiring and the grid and plate returns, or low potential wiring. The Sovereign A.C. tubes are actually four-element tubes comprising a heater coil connected to two leads at the top of each tube, this heater being inside the

PARTS REQUIRED FOR SET

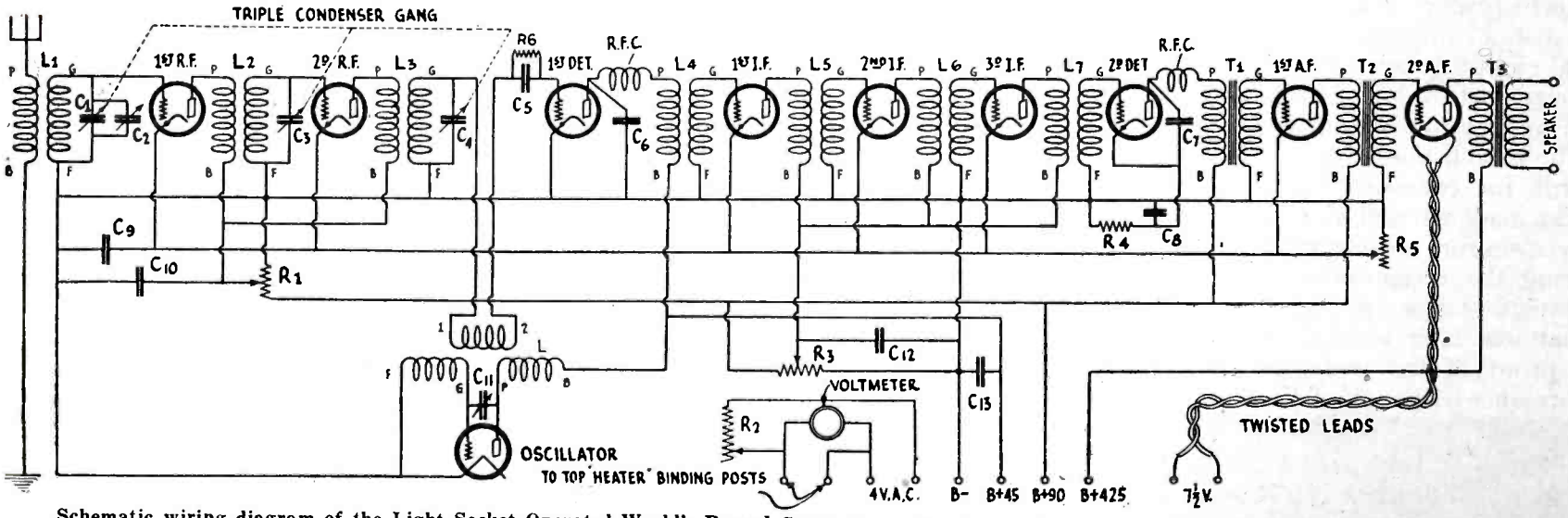
1 Formica panel, 26 x 7 x 3/16"
1 Formica sub-panel, 25 x 10 x 3/16"
1 Remler 3 in line condenser No. 633 .00035 mfd. (C_1, C_3, C_4)
1 Remler condenser No. 638 .00035 mfd. (C_{11})
2 Remler drum dials No. 110 (1 each 110 & 110-R)
2 Remler R.F. Choke Coils No. 35 (R.F.C.)
2 Thordarson audio transformers R200 (T_1, T_2)
1 Thordarson output transformer No. 76 (T_3)
2 Selectone L.W. transformers No. B500 (L_4, L_6)
2 Selectone L.W. transformers No. B510 (L_5, L_7)
2 Selectone R.F. transformers No. 520 (L_2, L_3)
1 Selectone antenna coupler No. 530 (L_1)
1 Selectone oscillator coupler No. 540 (L)
1 Silver-Marshall 340 midget condenser (C_2)
1 Ward-Leonard 5000 ohm resistor (R_4)
10 Benjamin sockets (without bases)
1 Pair Benjamin brackets No. 8629
1 Carter rheostat, M.W. 1/5 (R_2)
1 Carter potentiometer (400 ohms (R_5)
2 Carter potentiometers, H.W. 5000 (R_1, R_3)
1 Carter fixed condenser .00025 mfd. with grid clips (C_5)
1 Carter fixed condenser, .0001 mfd. (C_8)
2 Carter fixed condensers, .002 mfd. (C_6, C_7)
1 Pair No. 10 Carter pin jacks
2 X-L binding posts
1 Jewell A.C. voltmeter 0-8 volts
9 Sovereign A. C. tubes
1 CX310 Amplifier tube
4 Tobe by-pass condensers, 1 mfd. (C_9, C_{10}, C_{12}, C_{13})
1 Tobe grid leak, 3 meg. (R_6)
1 Jones 10 contact multi-plug
1 Excello console Style R-31
40 Soldering lugs and Kester radio solder, Acme hook-up wire, etc.

second element which is a metal sleeve coated with an electron emitting oxide. This second element is connected to the negative filament pin of the tube base (the positive pin is dead) and it high mutual conductance, low plate impedance and low inter-electrode capacity.

In operation, raw A.C. at 3 volts is fed directly to the top binding posts regular receiver circuits proper and consequently the set operates with practically no trace of A.C. hum—less than is obtained with the average B eliminator.



A rear view of the completed A. C. operated receiver with the nine Sovereign A. C. tubes and power tube in their relative sockets.



Schematic wiring diagram of the Light Socket Operated World's Record Super Ten. Twisted leads connect to the two binding posts indicated below the voltmeter and run to the top "heater" terminals of all Sovereign A. C. tubes.

takes the place of the filament or emitter in an ordinary battery operated vacuum tube. The remaining elements, the conventional grid and plate are so of each tube connecting with the heater element, which, in turn, indirectly heats the oxide coated sleeve which serves as a filament. Thus the actual

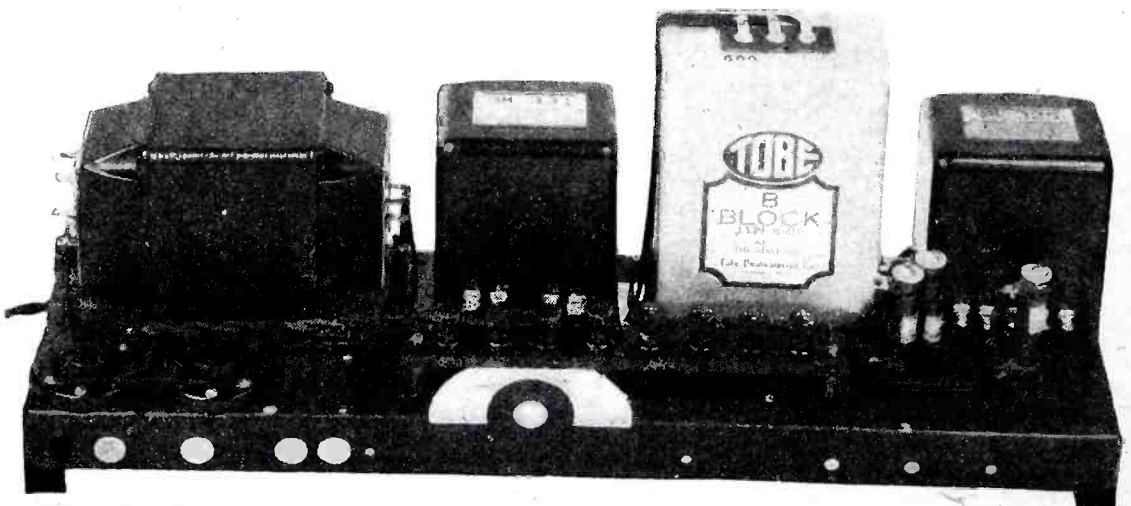


Photo showing the assembly of the power unit designed especially for use with the A. C. World's Record Super Ten.

disposed in this type of tube as to result in a high amplification constant, raw A.C. circuit is entirely isolated from and in no way connected to the

In order to employ Sovereign tubes, the method of volume and oscillation control on the short wave and intermediate radio frequency amplifiers had to be changed. It is necessary with A.C. tubes to operate them with a slightly negative grid for best results, and a 400 ohm potentiometer used as a rheostat provides a variable voltage drop serving to bias the grids of all R.F. and the first stage A.F. amplifier tube of the receiver. Oscillation is then controlled in the two R.F. amplifiers by means of a new method. This method consists of shunting the B+90 circuit with a 5,000 or 6,000 ohm wirewound potentiometer, the R.F. amplifier plate returns connecting to the arm of the potentiometer which thus allows their plate voltage to be varied from zero to the full value of 90 volts. At the same time, the grid voltage automatically adjusts itself for each change in plate voltage. This method is ex-

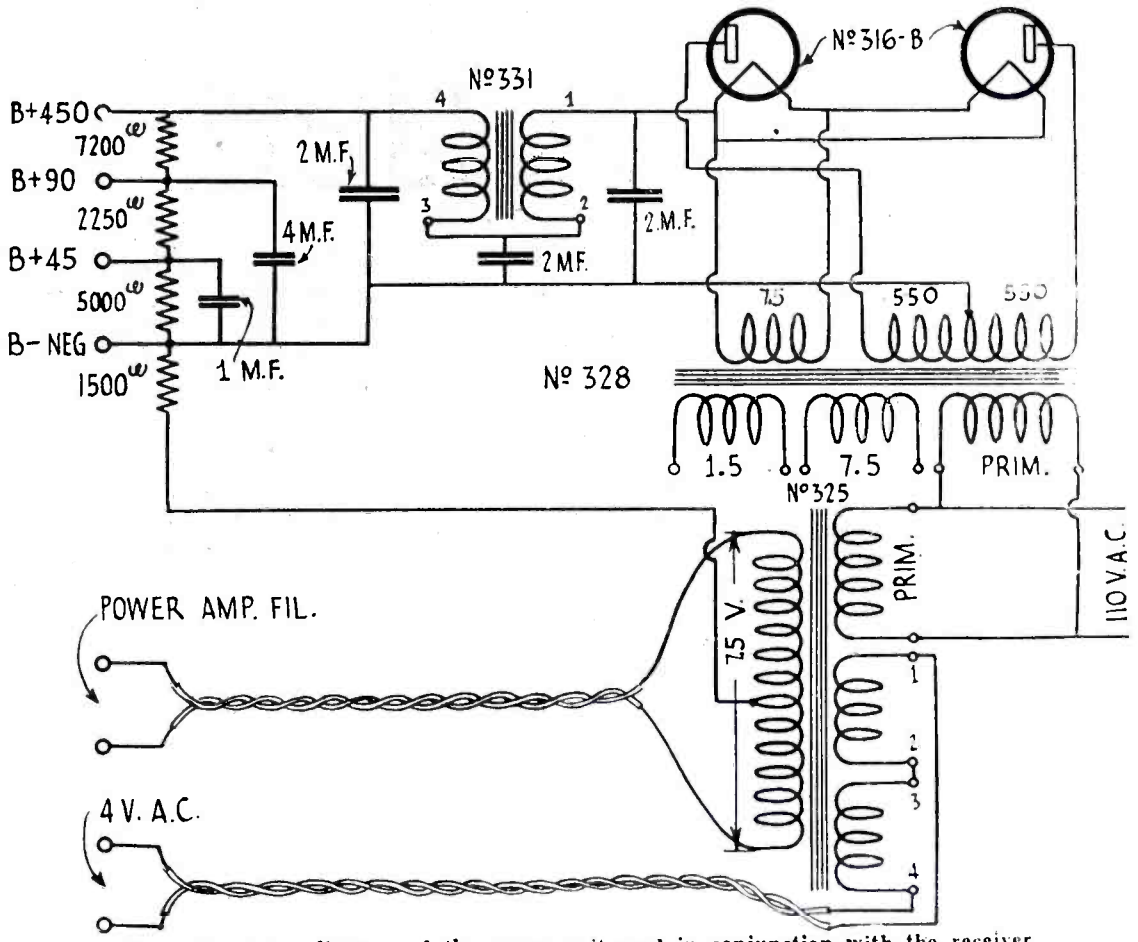
tremely satisfactory and is one of the few methods of oscillation control satisfactorily adapted to A.C. tubes. Two potentiometers are employed, one for the short wave R.F. amplifier and one for the intermediate amplifier. All grid returns eventually terminate in the heater sleeve of the AC tubes serving as a filament, these connections being made to the minus terminals of the various tube sockets, the positive filament terminals being left dead.

THE PARTS FOR THE POWER UNIT

1 S-M 328 power transformer
1 S-M 325 A supply transformer
1 S-M 331 Unichoke filter system
1 Van Doorn Unipac chassis and cabinet with hardware
1 Tobe R-210 condenser block
1 Ward-Leonard 7200 ohm resistor
1 Ward-Leonard 2250 ohm resistor
1 Ward-Leonard 5000 ohm resistor
1 Ward-Leonard 1500 ohm resistor
1 Frost FT64 balancing resistor
2 S-M 511 tube sockets
8 Eby binding posts (4 plain, B—, +45, +90, +AMP.)

All condenser values in the light-socket operated receiver are the same as those in the battery operated model. However, the filament circuit is somewhat different, the power for the operation of the A.C. tube heaters being obtained from a 4 volt filament lighting transformer source in the power unit. This 4 volts at 9 amperes is brought to the heater tube filaments through a Multi-Plug and cable with a 1/5 ohm rheostat used in the receiver to adjust the heater voltage to between

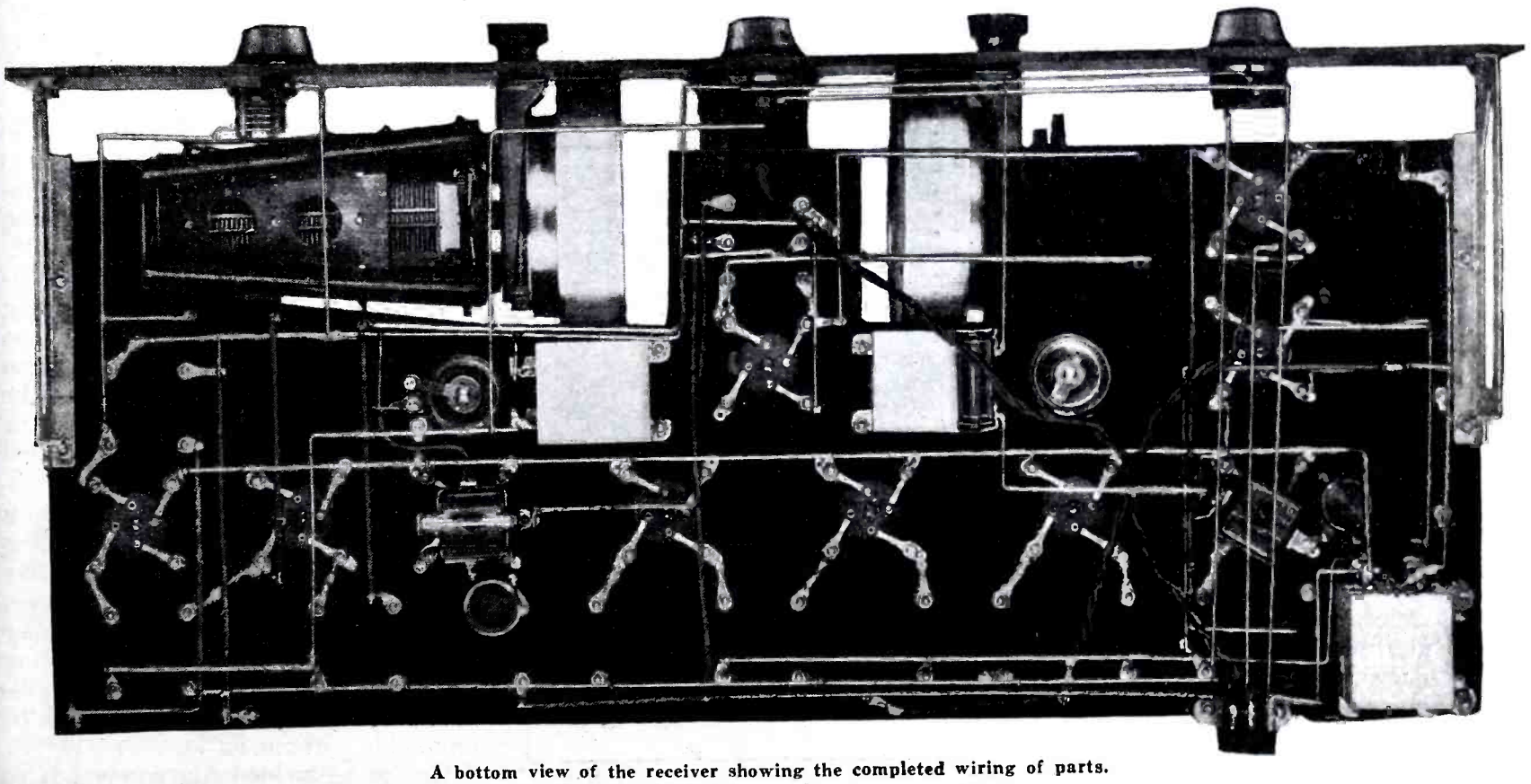
ord Super are exactly the same as in the battery operated model, the "Distance" control upon the front panel being the antenna compensating con-



Schematic wiring diagram of the power unit used in conjunction with the receiver described herewith.

denser, the "Volume" control, a 5,000 ohm potentiometer on the short wave RF amplifier, and the "Modifier" control, the second 5,000 ohm potentiometer controlling the intermediate amplifier. Upon the sub-panel are

ternating current to suitable values of direct and alternating current for receiver operation. It is illustrated in an accompanying photograph, and the schematic wiring diagram. The power unit consists of a steel chassis and case housing all equipment which consists of a high voltage, full wave, rectifier transformer furnishing 550 volts AC to the plates of two CX 316B rectifier



A bottom view of the receiver showing the completed wiring of parts.

2.75 and 3 volts—the best operating value. An A.C. voltmeter is used to determine this voltage definitely. The front and sub-panel arrangements of the light-socket operated World's Rec-

mounted the 1/5 ohm rheostat and the 400 ohm grid voltage resistance.

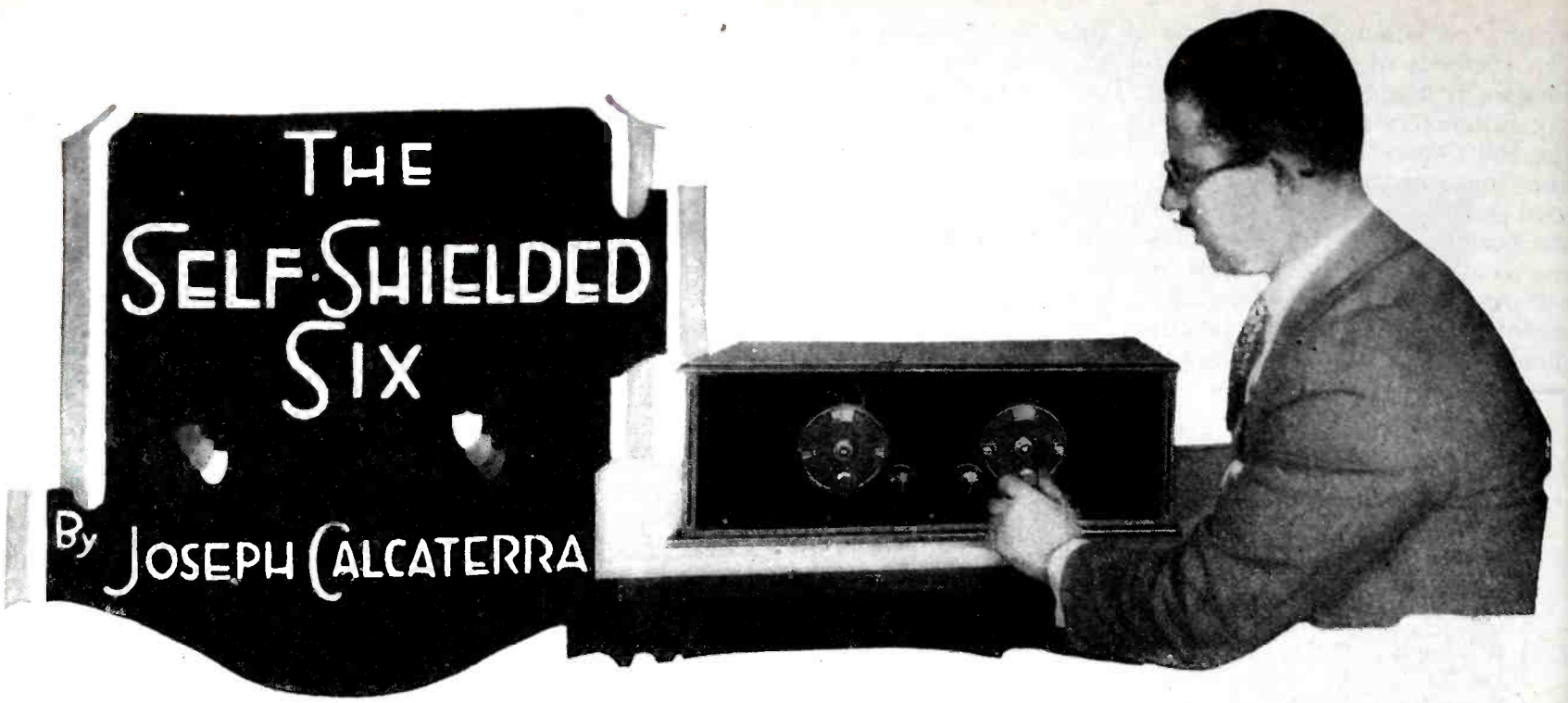
The power supply for the receiver is an extremely interesting unit, for it converts regular 60 cycle, 110 volt, al-

tubes and 7.5 volts on their filaments. The output of these tubes is filtered by a special choke combining a selective and brute-force action operating in

(*Continued on page* 158)

THE SELF-SHIELDED SIX

By JOSEPH CALCATERRA



WE are often inclined to be carried away with something new, though it may have little if any advantage over what we have been used to. In radio receivers, for instance, shielding is being resorted to on every hand. to reduce the interaction between stages in radio-frequency amplifiers. Often this shielding adds much to the price of the receiver, complicates the construction, and like as not adds nothing of value to the receiver.

Much of the shielding used today is ineffective. In many receivers the shielding could be removed entirely without any noticeable effect on the stability of the R. F. amplifier; and perhaps even with noticeable improvement in efficiency. If shielding is worth doing at all it is worth doing well, which usually means specially designed shields, metal panel and subpanel, etc.

It is a strange fact that a metal box that appears to be absolutely tight will not completely shield a coil placed within it. This is proven by the fact that in some of the most expensive commercial receivers it has been found necessary to inclose one shield within another, or in other words, provide a complete double shield. In high grade loop receivers for instance, the detector circuit is usually inclosed in such a double shield because a single shield is not sufficient to prevent some of the energy of the detector circuit feeding back to the loop and thus causing oscillation.

An interesting illustration of the ability of radio-frequency waves to get through microscopic openings is to be observed in the laboratories of a large radio manufacturer in the middle west. There a small room is built entirely of metal; the walls, ceiling and floor being of double, spaced layers of galvanized iron. There is a double metal door and this door closes like the door of an icebox or a safe. That is, after the door is swung shut, it is pulled up tight into its frame by means of a lever and bolt arrangement. By pulling the door up tight in this manner the room is absolutely sealed and is without openings or cracks of any kind.

PARTS REQUIRED

- 3 Bodine Twin-Eight R. F. transformers, T1, T2, T3.
- 1 Hammarlund No. ML-17, .00035 mfd. variable condenser, C1.
- 1 Hammarlund No. MLD-17 dual Midline variable condenser, .00035 mfd. each half, C2, C3.
- 1 Dubilier Type 640, .00025 mfd. fixed condenser with grid leak clips, C4.
- 1 Dubilier Type 601, .001 mfd. fixed condenser, C5.
- 1 Dubilier Type 907, .5 mfd. by-pass condenser, C6.
- 1 Harkness R. F. choke, CH.
- 2 Carter No. 10 tip jacks, J1, J2.
- 1 Harkness output filter unit, OF.
- 1 Carter No. M-10-S, combination 10 ohm rheostat and filament switch, R1 (S).
- 1 Lynch Type 4 Equalizor, automatic filament control resistor, R2.
- 1 Lynch Type 1 Equalizor, automatic filament control resistor, R3.
- 1 X-L Type G5 Vario-Denser, C7.
- 2 Lynch 900 ohm Suppressors, R6, R7.
- 1 Universal Clarostat, R4.
- 1 Lynch 2 megohm Metallized grid resistor, R5.
- 3 Harkness tuned double impedance couplers (1st, 2nd and 3rd stage types) T4, T5, T6.
- 6 Benjamin No. 9040 vacuum tube sockets, VT1, VT2, VT3, VT4, VT5, VT6.
- 1 Formica panel 21"x7"x3/16"
- 1 wood baseboard 20"x12"x¾".
- 1 Jones Multi-Plug Type BM.
- 2 Mar-Co No. 192 vernier dials.
- 2 X-L binding posts with markers: Aerial, Ground.
- 1 package Acme Celatsite, flexible hook-up wire.
- 1 package Kester radio solder.

During the demonstration a sensitive receiver operating with a loop antenna was in operation within this room. With the door standing open station KDKA at Pittsburgh, several hundred miles distant, was tuned in with good volume. Then the door was gradually swung shut, with a marked decrease in signal strength but when the door was as tight as it could be pulled by hand *KDKA could still be heard.*. The door was so tight that not a ray of light could be seen anywhere around it but the radio waves were nevertheless coming through the infinitesimal cracks. Then the mechanical lever-bolts were slowly thrown. These pressed the door into its frame with a pressure of several hundred pounds and made it absolutely tight. When the bolts were shot all the way the radio waves were finally and completely foiled—*but not until then.*

If an invisible crack will admit radio waves from a station several hundred miles distant it becomes pretty evident that a good deal of today's shielding is not worth its salt so far as its shielding effect is concerned. In many instances where the use of shielding seems to have a stabilizing effect on an amplifier the stability results from the losses introduced as a result of the close proximity of the metal to the coils, rather than from any decided shielding effect.

The real aim of this article is not to "unsell" anyone on the shielding idea but simply to bring out the fact that shielding, unless properly done, might better be omitted. Proper shielding is unquestionably a fine thing and efficient four stage R. F. amplifiers such as we know today would be impossible without it.

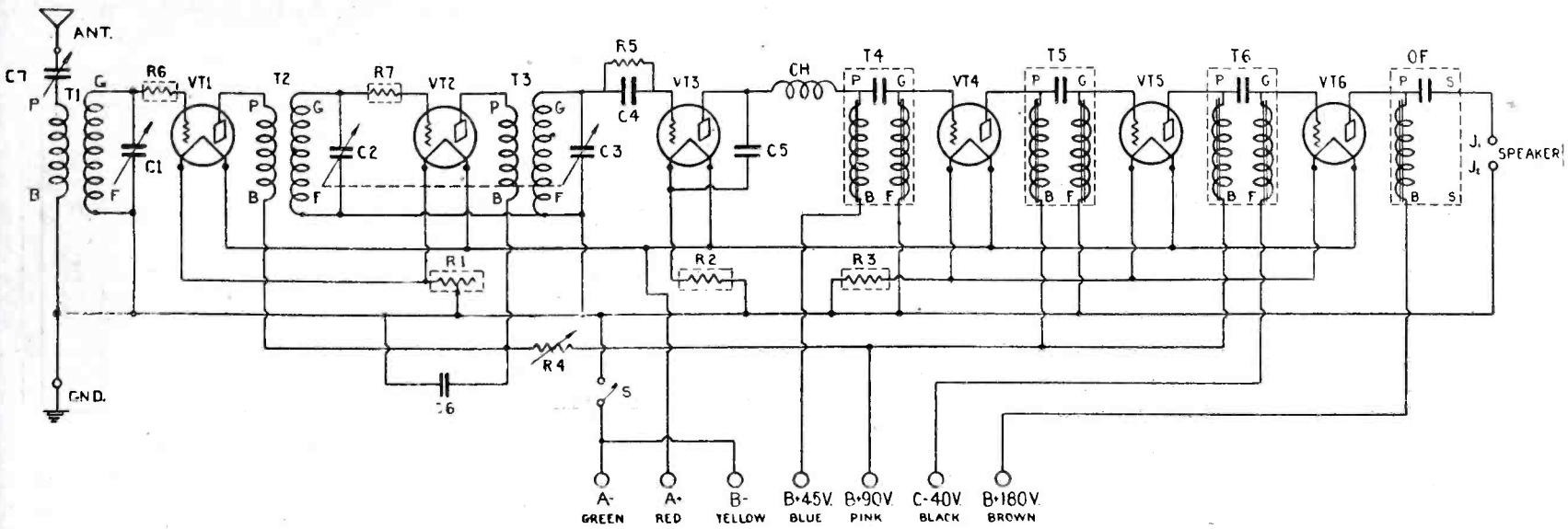
The Self-Shielded Six receiver is so called because of the inherent self-shielding properties of the coils themselves. A properly constructed coil of the "twin eight" type will have practically no stray field of its own nor will it pick up strays from associated

circuits; it isolates itself more effectively than would a slip-shod job of metal shielding. Which is another way of saying that interaction between stages of a R. F. amplifier is much decreased by the use of this type of coils.

"twin eight" coil at the same time and to an equal degree. The pick-up of one section will therefore counter-act the pick-up of the other with the result that the effective stray pick-up is reduced to practically zero.

construction of this receiver is much simplified, as is also the adjustment of the circuit. In fact this new receiver requires no preliminary adjustment of any kind.

The Self-Shielded Six receiver em-

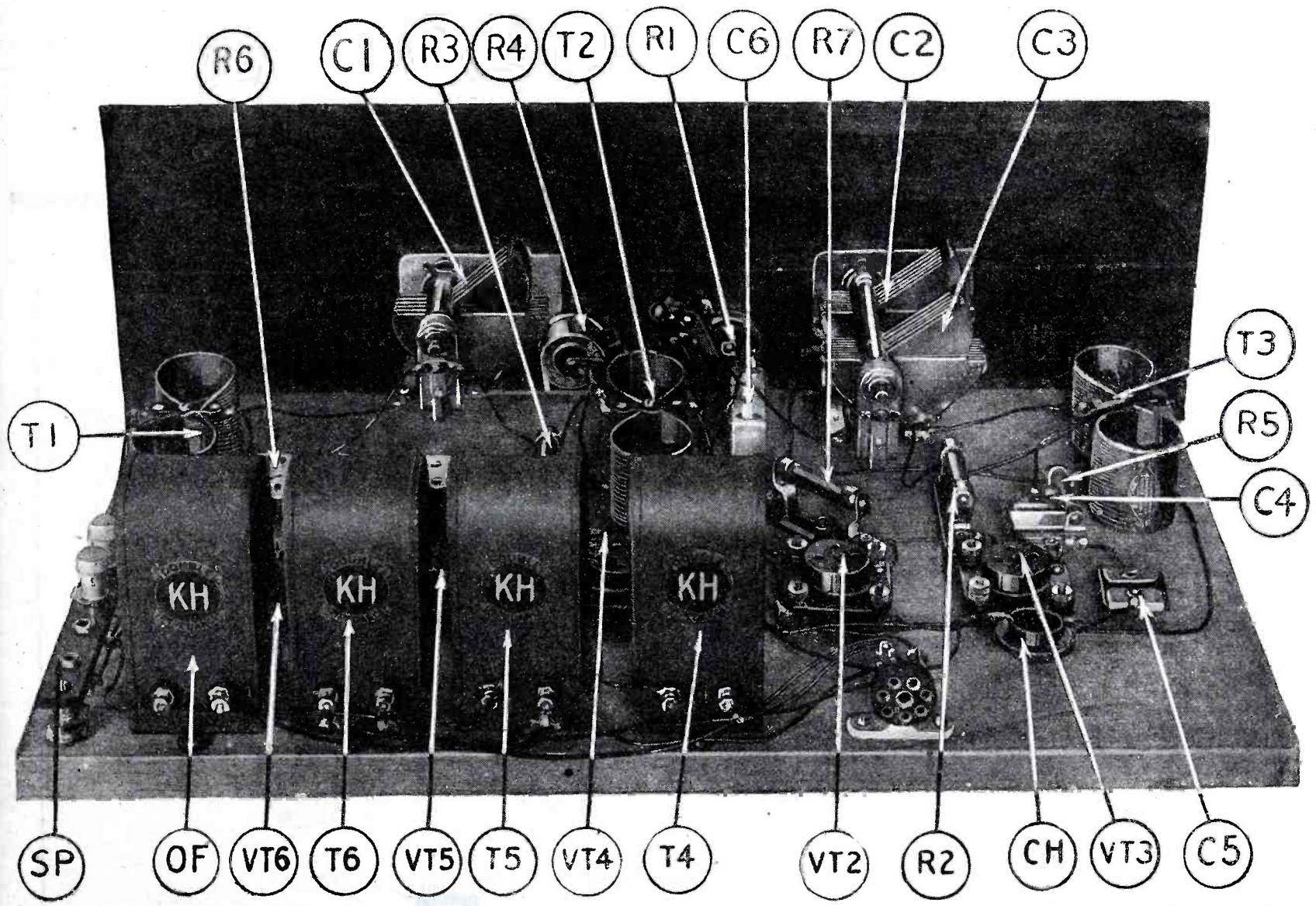


Schematic wiring diagram of the receiver. The units T4, T5 and T6 are the special double impedance couplers while OF is the output filter choke. R4 is a universal range Clarostat variable resistance employed as a volume control.

The limited field is due to the tendency of the lines of force to pass directly from one coil into the other and thus set up a circular field which is

By using Bodine Twin Eight coils, and spacing them far apart this circuit presents a degree of stability seldom attained in a two stage radio-

ploys two stages of tuned, radio-frequency amplification, detector and three stages of double impedance coupled audio-frequency amplification.



A view of the set behind the front panel. All parts are indicated with letters and numerals which correspond with those on the schematic and picture diagrams. Batteries are connected by means of the multi-plug on the rear of baseboard.

practically limited to the dimensions of the coil unit.

Stray pick-up is made practically impossible by the fact that the stray will be impressed on both sections of the

frequency amplifier without neutralizing or balancing circuits of one kind or another even though it be partially shielded with metal. And by eliminating the necessity for such schemes, the

The circuit itself is standard and has no claim to novelty. It was the intention of the designers, not to create a new circuit, but rather to take a reliable standard and make the most of

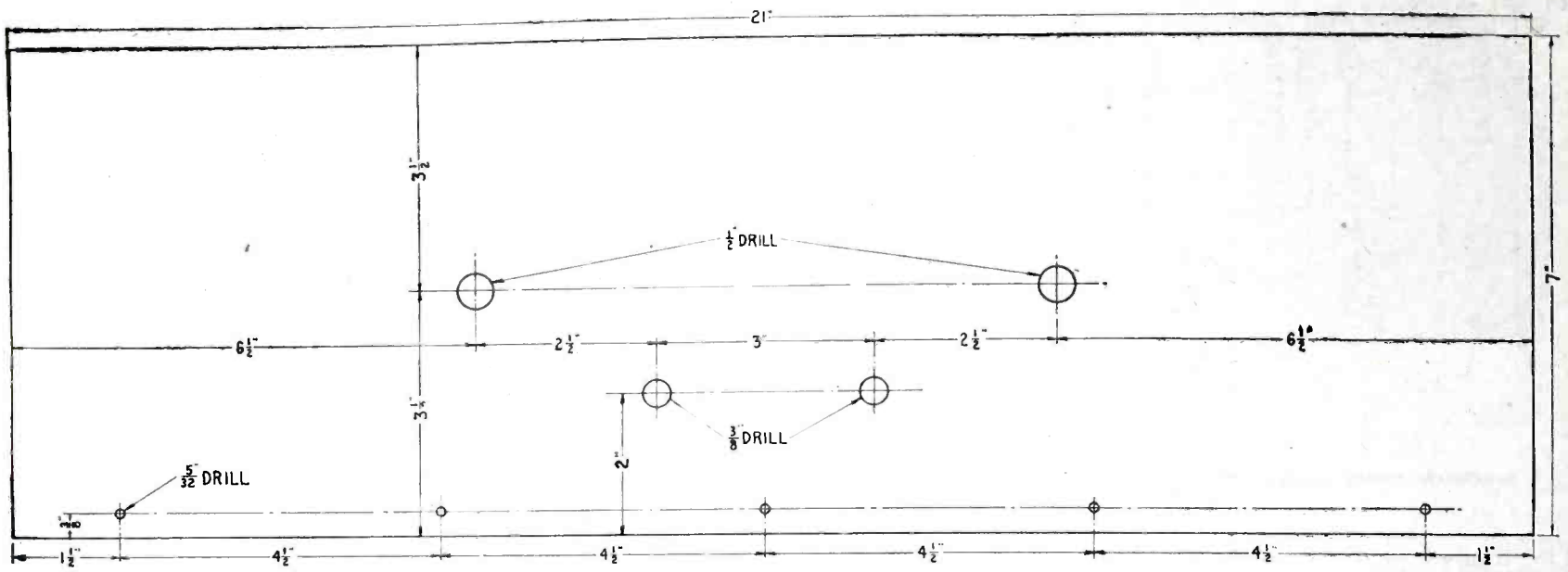
it by carefully selecting all of component parts.

High efficiency, stability without critical adjustments for neutralizing or balancing, ease of construction, ease of operation, fine volume and tone quality were the aims of the designers and

antenna circuit. Ordinarily a fixed condenser is used here in order to compensate for large antennas but such an arrangement has the disadvantage that if the builder happens to have a small antenna he will find his reception very weak. The semi-variable condenser

quires no further attention unless some change is made in the antenna.

The coils have already been discussed in some detail above so it will not be necessary to expand further on them here. The variable condensers require little to be said for them be-

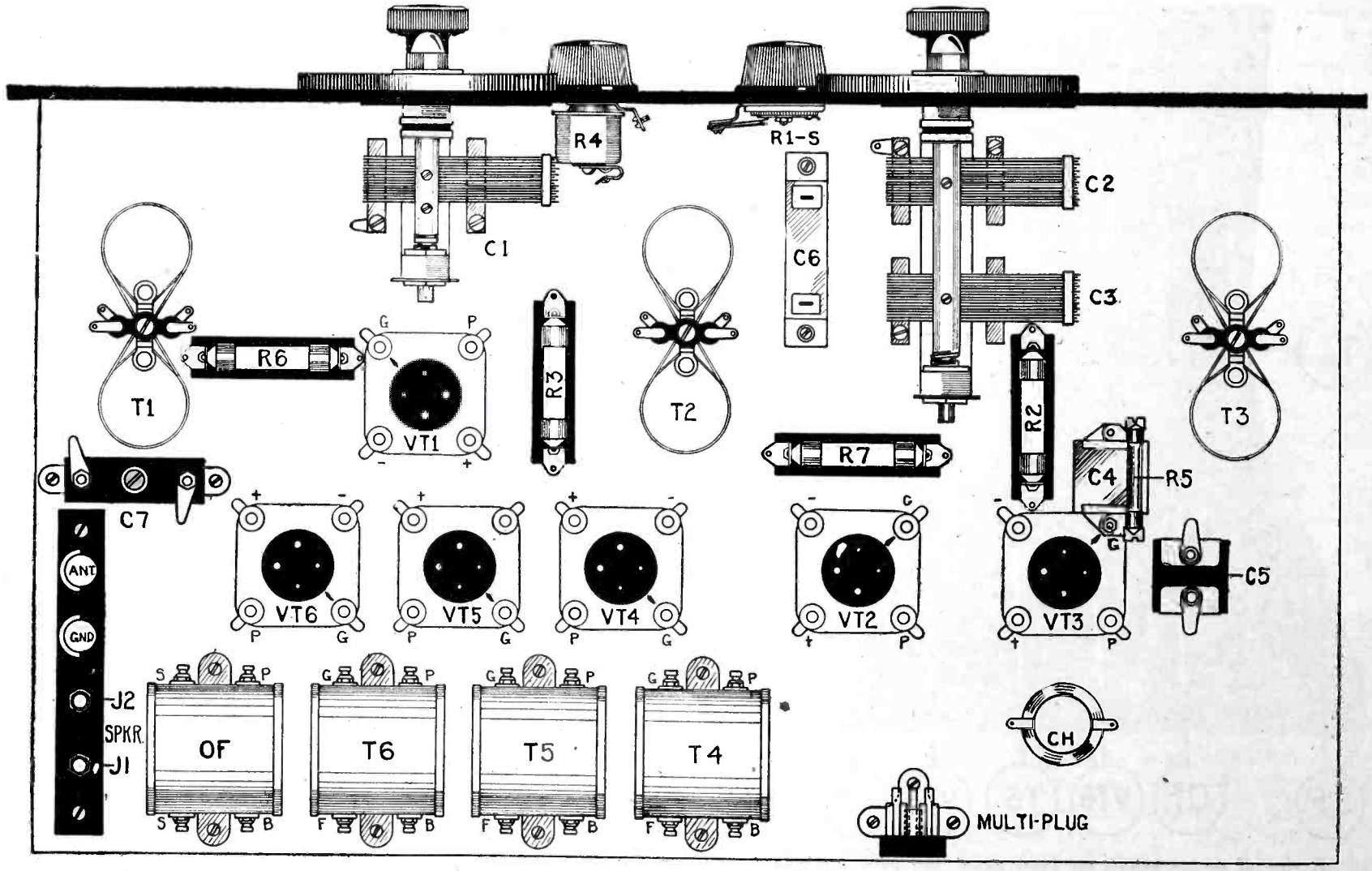


Dimensions for drilling the front panel of the set. The double variable condenser, C2 and C3 is mounted at the left of the panel while the single condenser C1 is mounted at the right.

their efforts have met with an unusual degree of success in this receiver. It seems to have all of the features one could desire in a home receiver and

used in this receiver has a capacity range between .0001 and .0005 mfd. With a screw driver, its capacity can be varied to exactly adapt the receiver

cause of their generally recognized efficiency. C2 and C3 are built in a dual unit with a common frame but separate insulated stators. This per-



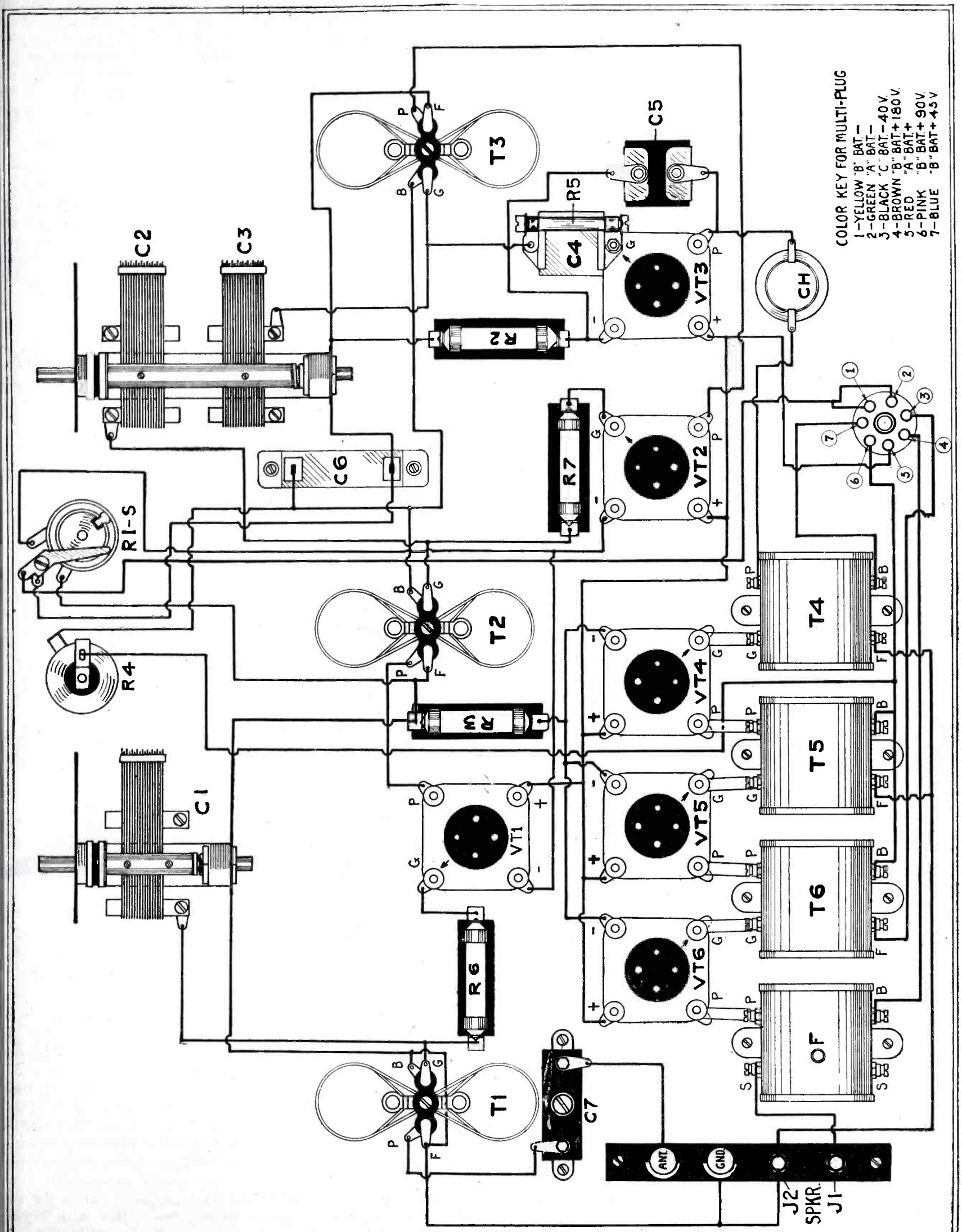
All parts are mounted on the front panel and baseboard in their relative positions as shown above.

still does not involve the complications and expense of shielding, or balancing.

To start with a small semi-variable condenser is included in series with the

to the antenna with which it is to be used. It is not a tuning control in any sense of the word because it is adjusted only once and thereafter re-

mits the control of the second R. F. and the detector stages with but a single tuning dial. The 1st R. F. stage is individually tuned in order to take



care of variations in circuit values resulting from different-sized antennas. This arrangement permits maximum efficiency in each tuned circuit, yet limits the tuning controls to two.

The filaments of the two R. F. tubes are controlled through the rheostat R1 which therefore functions as a volume control. For the latter reason this rheostat is mounted on the front panel to serve as one of the operating controls of the receiver.

A variable high resistance, R4, is also included in the "B" supply lead to the plates of the R. F. tubes. The purpose of this resistance is not so much to function as a sensitivity control but rather to provide close regulation of the current supplied to the plate circuits of these two tubes. This resistance is particularly useful where a "B" eliminator is used for the high voltage supply. If the eliminator has no variable control to regulate the voltage at the R. F. or intermediate tap, this office is performed by R4.

Two resistors, R6 and R7, are included in the grid circuits of the R. F. tubes. It will be noted that these are in series with the grids and are connected right next to the grids. The resistances are therefore not in the tuned circuits and do not alter the tuning characteristics of the circuits in any way. Their function is to prevent the flow of current in the grid circuits and thus avoid oscillation in the R. F. stages.

A word might be said here in defense of the use of these grid suppressors. There has been a feeling for a long time that the use of resistance in the grid circuit caused broad tuning. This is most certainly confirmed in cases where the resistance is placed directly in the tuned circuit which comprises the secondary coil and condenser. But if the resistance is connected between the tuned circuit and the grid the decrease in selectivity and the falling off in signal strength is so small that it cannot be noticed, if it exists at all.

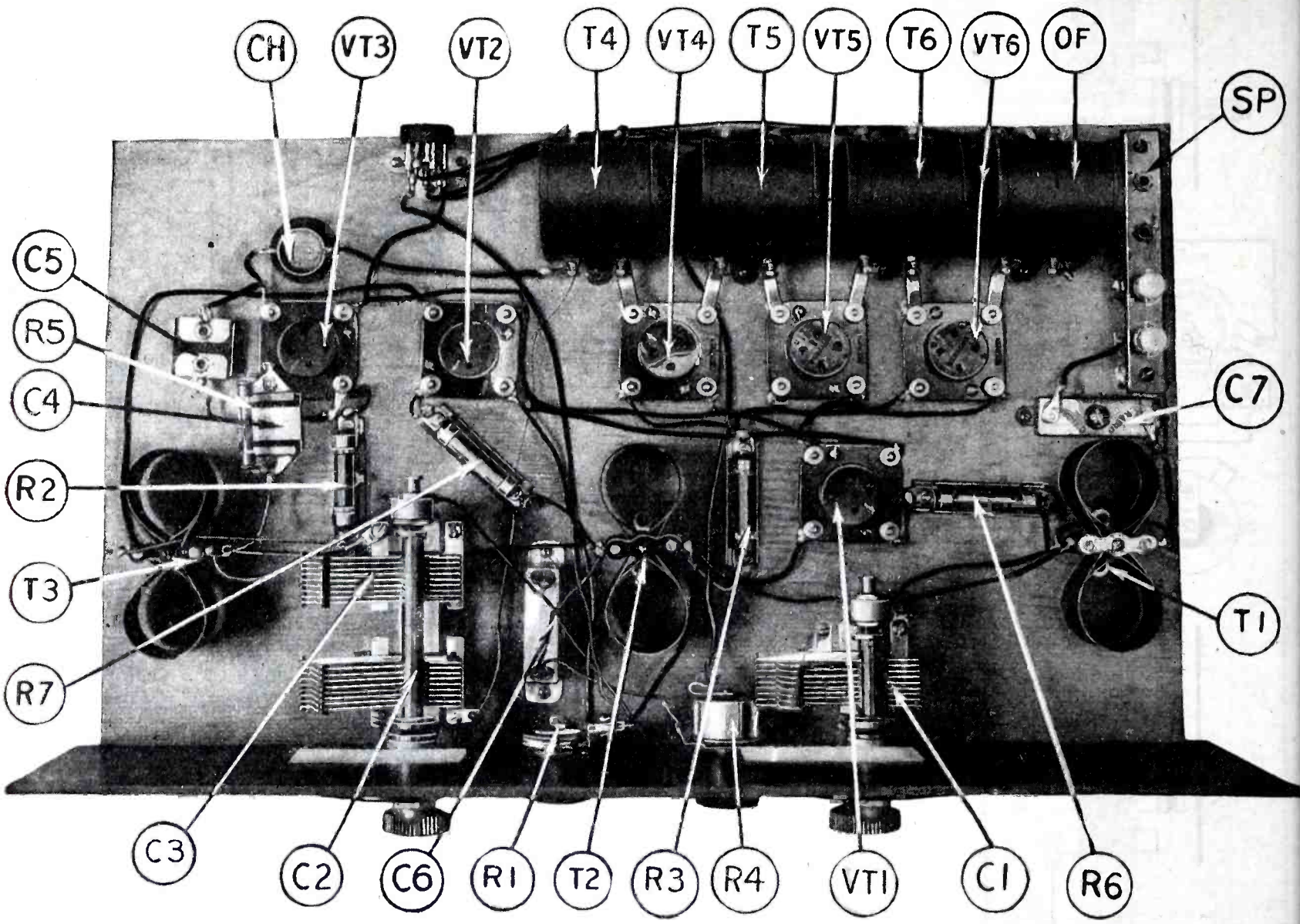
After much careful consideration the grid method of detection was decided upon as being the most practical; first, because of its greater sensitivity and second because it is believed that the distortion often credited to this detection method is a myth. In comparative tests made between grid and plate detection, the former came off with all the sensitivity honors and equalled the other in all standards of quality.

The choke coil CH and by-pass condenser C5 have been included in the plate circuit to provide a barrier to prevent the R. F. currents from passing on to the audio amplifier where they might cause distortion.

The audio amplifier is worthy of a little discussion. Transformer, resistance and single impedance coupling were all considered carefully before this double impedance type of coupling was selected. Every coupling has its advantages and disadvantages, but this double impedance scheme seems to include practically all of the best points of other types, but not their weaknesses.

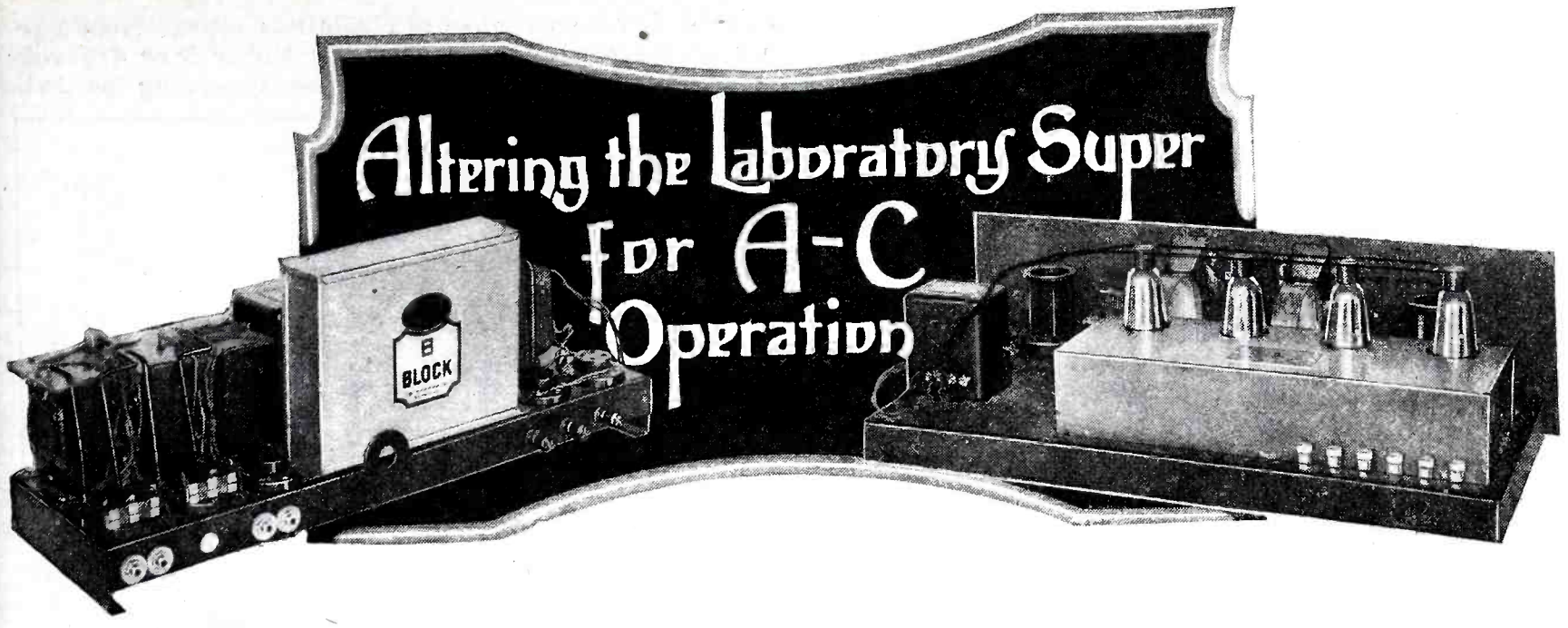
Overloading in the audio amplifier is probably the one greatest cause for distortion. At least this is true of high grade amplifiers. This is particularly true of resistance coupling as commonly used, and also of single impedance coupling. But with a good double impedance coupled amplifier it is possible to use a CX 301-A type of tube in the last audio stage without overloading it as readily as a 371 power tube would overload in some other types of amplifiers. This ability to withstand heavy loads without distortion is a decided advantage because almost without exception radio receivers overload badly on signals from powerful local stations, unless the volume is turned low. But with impedance coupling such as used in the Self-Shielded Six receiver the local stations can be enjoyed at full volume if desired, without overloading.

(*Continued on page* 154)



A top view of the Self-Shielded Six set. Regardless of appearance, the wiring is simply made in the most convenient manner. The completed set can be installed in a console and the general layout behind the front panel is not seen.

Altering the Laboratory Super for A-C Operation



SINCE describing constructional details on the Improved Laboratory Super-Heterodyne in the last edition of RADIO LISTENERS' GUIDE AND CALL BOOK, numerous requests have been received from our readers for information and data on converting this set into an A.C. operated receiver employing standard A.C. type tubes. We will therefore describe in the following how this set can be altered with the addition of the L.C. 28-Unipac.

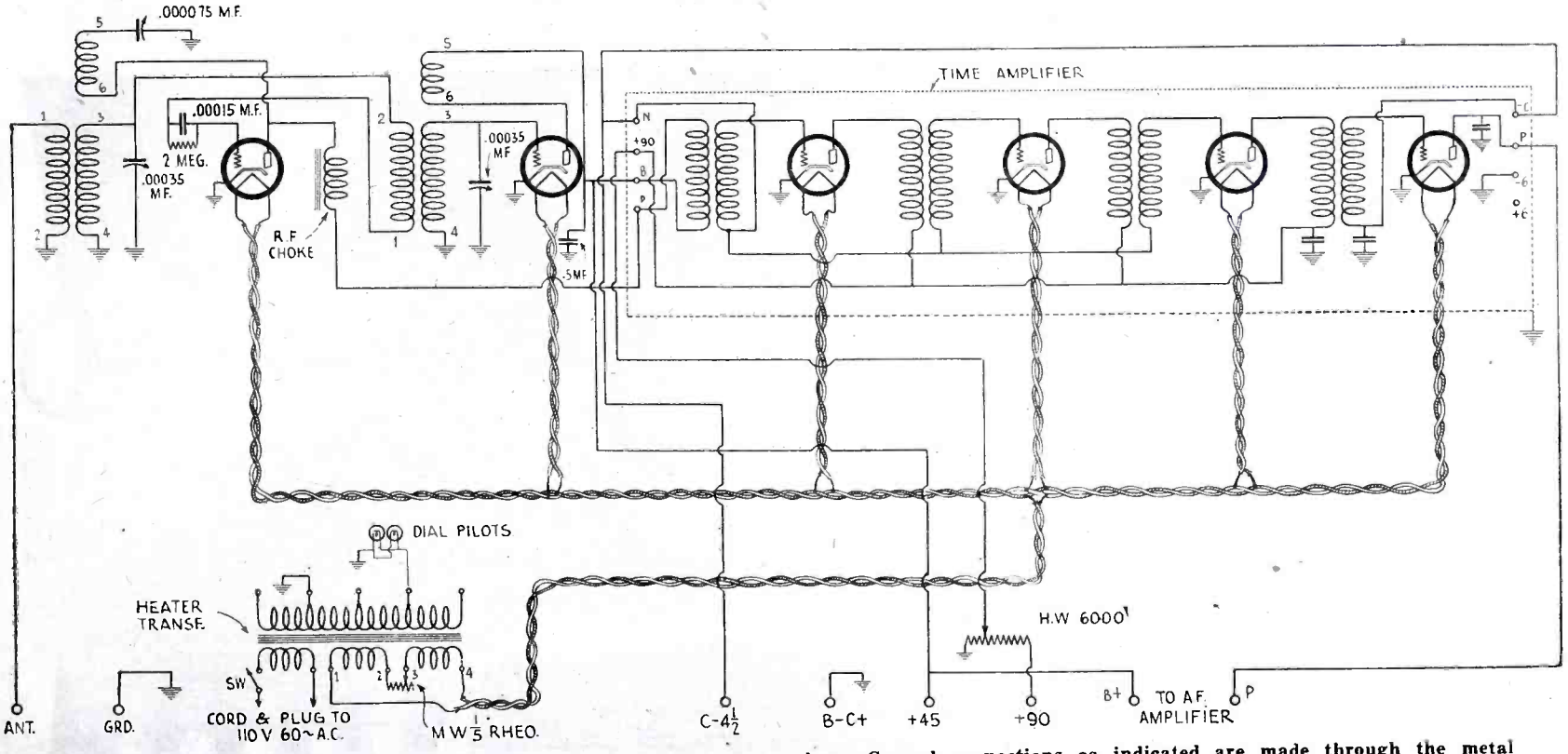
The actual construction of the receiver itself is practically identical with that of the original model, and the reader is referred to page 94 in the Fall edition of this publication.

The arrangement of parts remain almost the same with the exception of removing the two audio transformers and two tube sockets, as the audio amplifier is provided in the L.C.-28 Unipac unit. A Silver-Marshall No. 325 heater transformer is then mounted in the same location formerly occupied by the second audio transformer as shown in the accompanying photo of a rear panel view of the set. The complete circuit changes are shown in the accompanying schematic diagram.

PARTS REQUIRED FOR SET

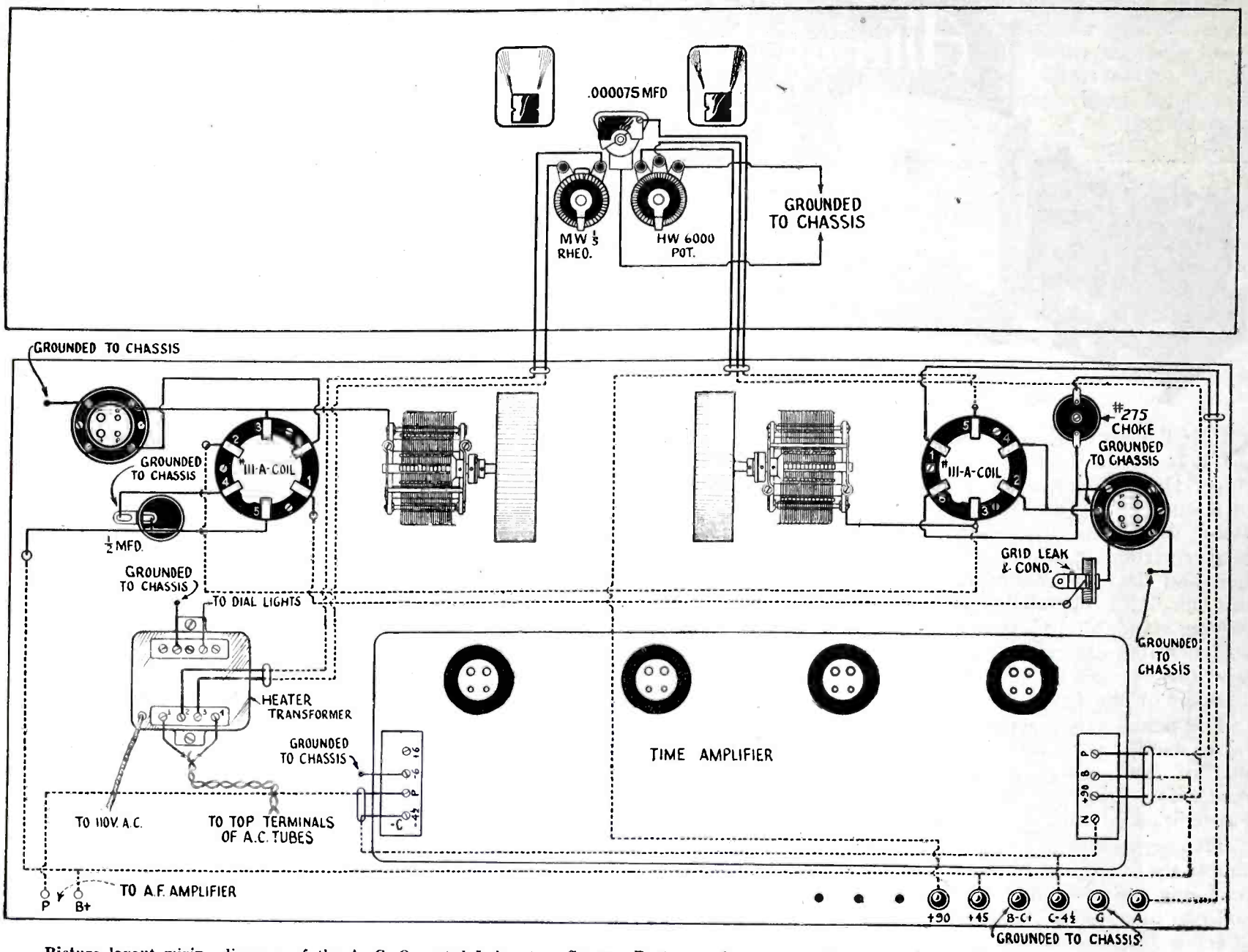
1 Van Doorn panel and chassis unit, pierced, with hardware
1 Carter .00015 mfd. condenser with grid leak clips
1 Carter potentiometer HW6000
1 Carter No. 103 ½ mfd. condenser
1 Carter 3 ohm rheostat MW ⅕
1 Carter power switch No. 110
4 Carter No. 10 tip jacks
1 Polymet 2 megohm leak
2 Silver-Marshall 511 tube sockets
2 Silver-Marshall 805 vernier drum dials
1 Silver-Marshall 275 R.F. chokes
1 Silver-Marshall 342 condenser, .000075 mfd.
1 Silver-Marshall 440 time signal amplifier
2 Silver-Marshall 515 coil sockets
2 Silver-Marshall 111A coils
6 X-L binding posts
2 Silver-Marshall 316B .00035 mfd. condensers
1 Silver-Marshall 325 filament lighting transformer
6 Sovereign A. C. tubes.

The F— filament terminals of the tube sockets are grounded, and the "A" power brought to the tubes through a pair of twisted leads connecting all the top binding posts of the A.C. tubes in parallel. All filament connections for the tubes of the set should be led directly through a pair of twisted wires to the windings of the heater transformer as shown in the diagram. The 200 ohm potentiometer, with its by-pass condenser, as well as the filament rheostat, are eliminated, the "—6" post of the long wave amplifier connecting directly to the chassis ground. The "N" post is connected to the C— 4½ volts. A 6000 ohm variable wire-wound resistor, mounted in place of the potentiometer, and insulated from the panel, should be connected between B+90 and ground, with the B+90 lead from the amplifier unit connected to the variable contact, this resistor functioning as the new "Gain" control. The battery type 3 ohm rheostat



Schematic diagram of the Laboratory Super wired for use with A. C. tubes. Ground connections as indicated are made through the metal chassis and front panel on which the various parts are mounted.

is also replaced with a heavy duty rheostat as specified and is connected across terminals 2 and 3 of the heater transformer. It is advisable to use one 4½ volt dry C battery for the second detector and first audio stage, rather than to obtain this voltage from a resistance drop. Either 3 or 4½ volts will prove best, depending on indi-



Picture layout wiring diagram of the A. C. Operated Laboratory Super. Parts are shown in smaller proportion to the metal panel and chassis. All grounded leads are clearly indicated. The cords from the heater transformer may be either connected to a power switch, mounted on the panel or plugged directly into a switch socket in the house lighting line. The twisted pair of cords from terminals 1 and 4 of the heater transformer are connected to all six A. C. tubes in the set as shown in the photo directly below. Connections for the dial lights are not shown in this diagram.

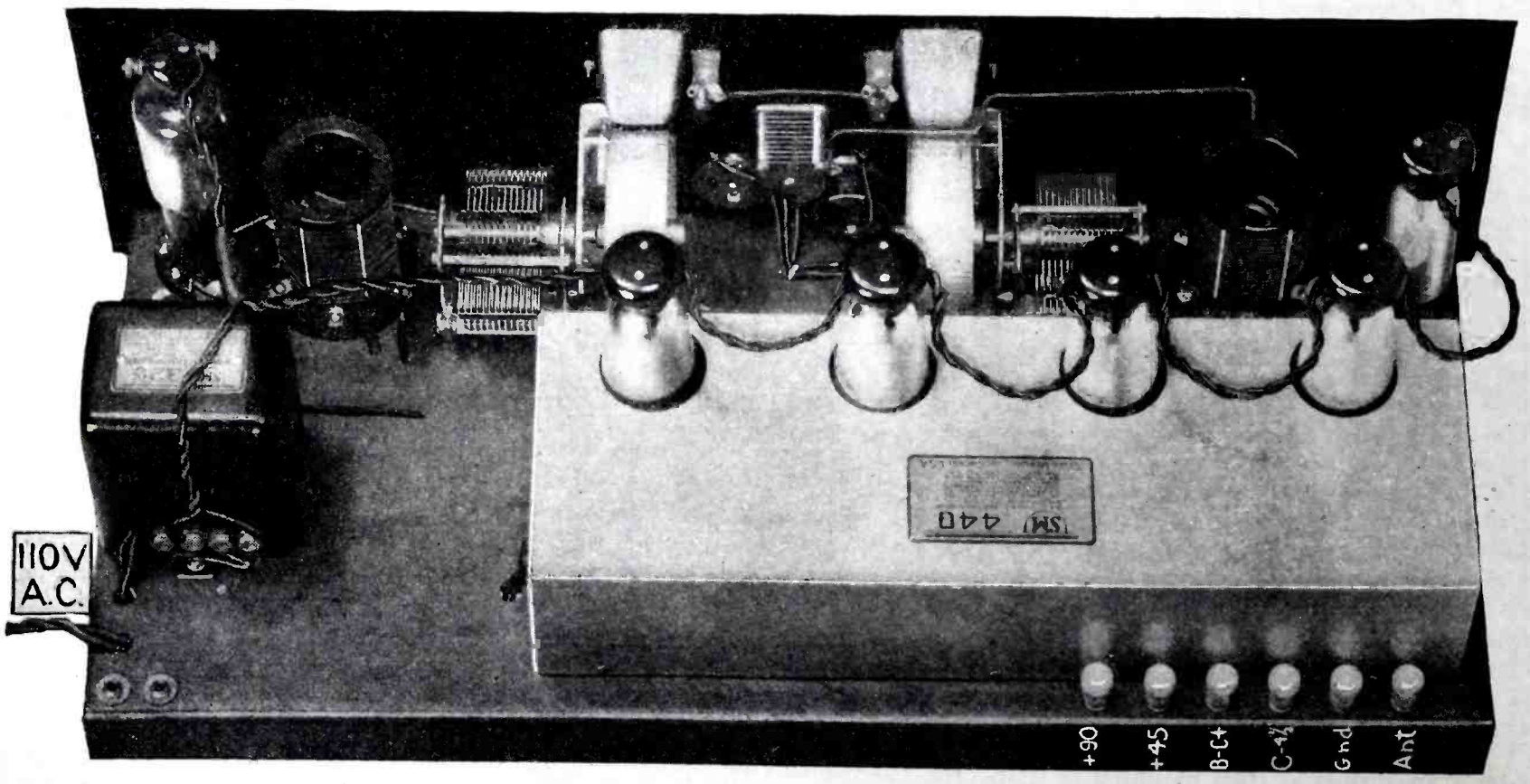
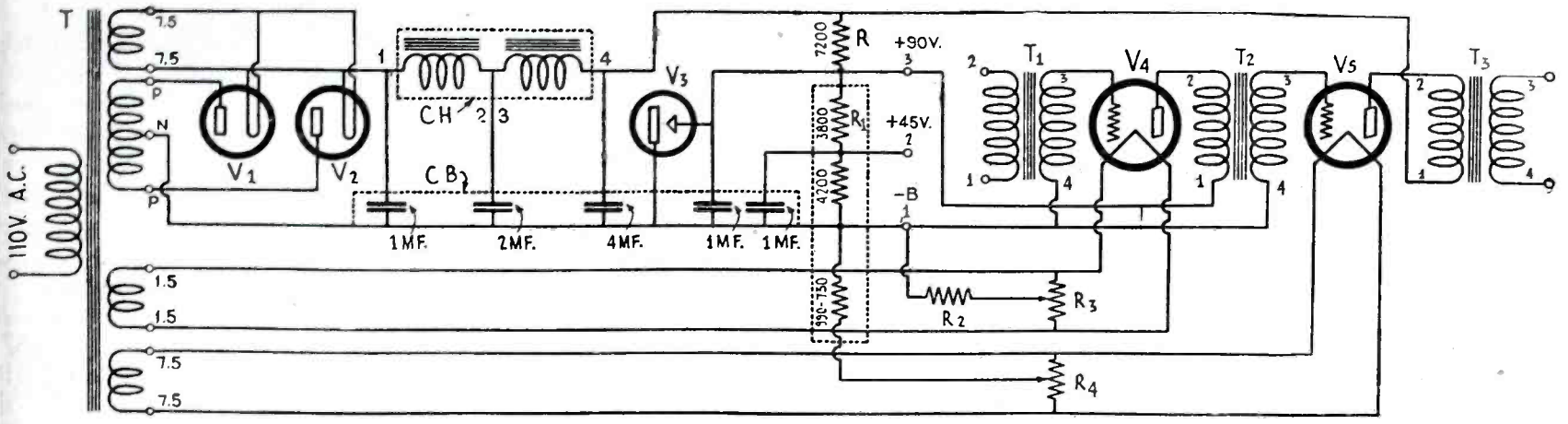


Photo of the Laboratory Super with tubes in place and completely wired. All tubes are connected in parallel. Output tip jacks in the back corner of the sub-panel connect to the P and B+ terminals of the power unit. Other connections to the binding posts are indicated.

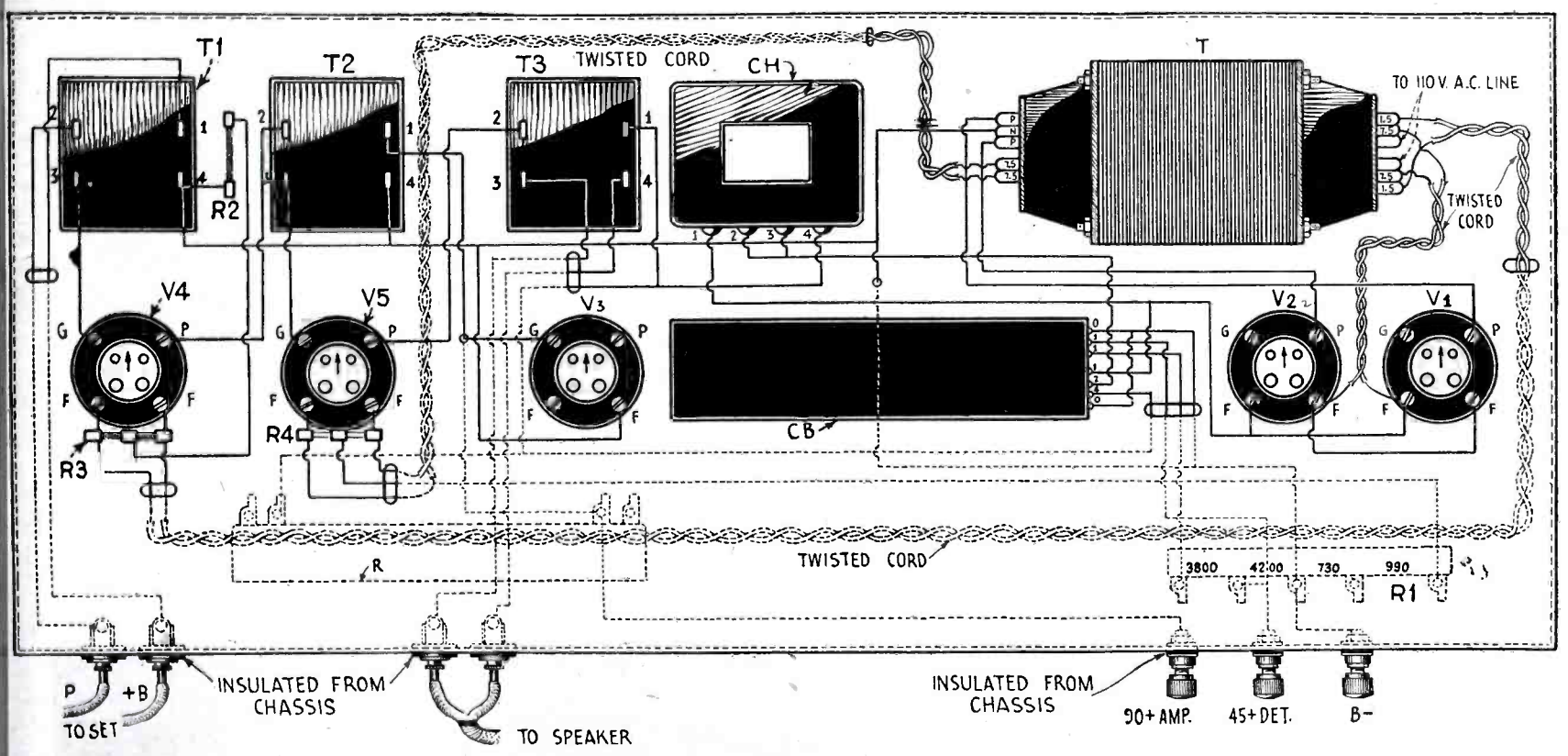
vidual conditions. A filament switch of the power type as specified in the list of parts may be substituted for the battery type on the front panel. This switch can be used as an on-off switch for the A.C. supply, with the leads brought out from the set.

The Power Unit

The L.C.-28 Unipac unit employed with the set consists of a complete two stage audio amplifier with "A" and "B" battery power supply operating entirely from a 105-120 volt, 60 cycle, light socket. This unit has been designed especially for use with the L.C.-28 receiver and it will serve as a high quality and powerful audio amplifier and "B" supply in connection with any standard receiver having no audio amplifier. It will also function as a complete light-socket operated phonograph



Schematic wiring diagram of the L. C. 28 Unipac amplifier and power unit. Dotted lines enclosing condensers, chokes and resistances indicate that the group of instruments is assembled as a single unit.



Picture layout diagram of the L. C. 28 Unipac. Wiring shown in solid lines are leads above the metal chassis while wiring and parts in dotted lines are beneath.

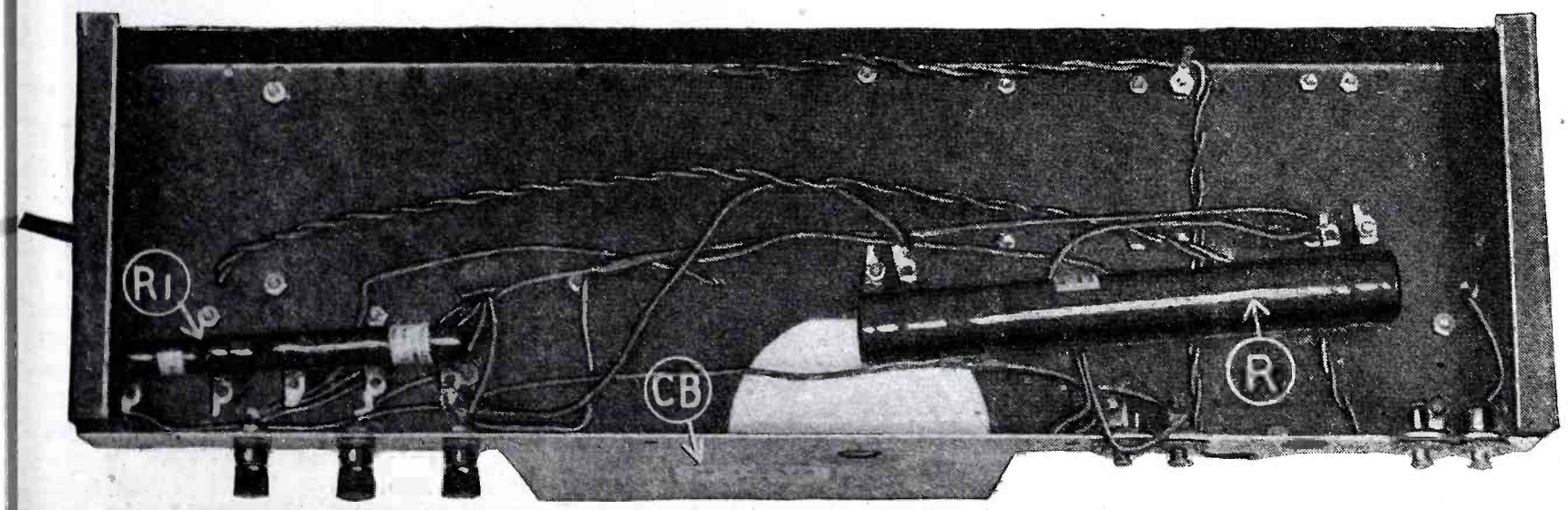


Photo of the power unit from beneath the metal chassis showing the two resistance units R and R_1 mounted in position.

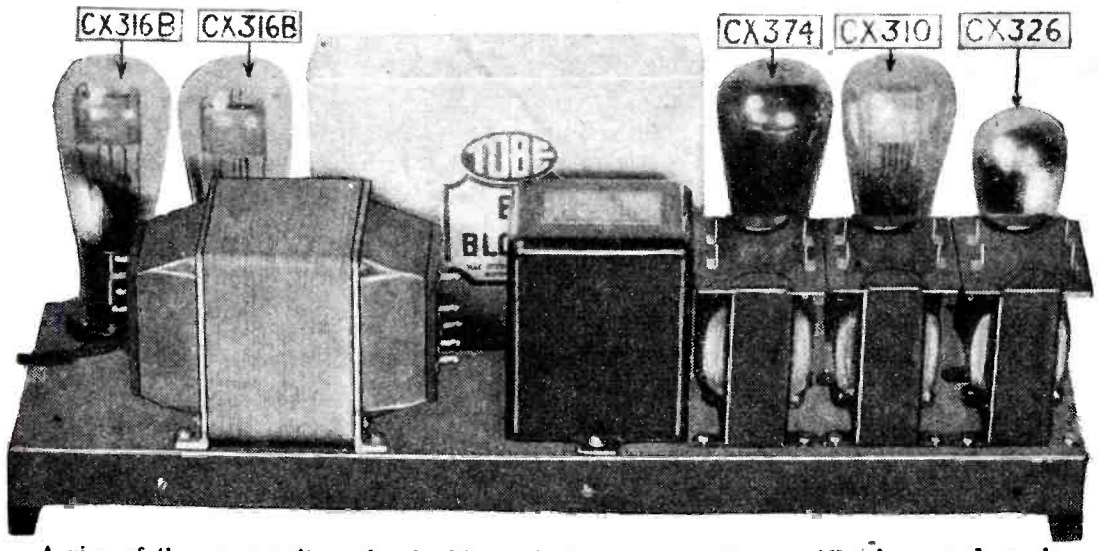
amplifier upon the addition of a loud speaker and magnetic phonograph pick-up. Thus, the amplifier, loud speaker, and pick-up allow the complete electrical reproduction of any existing mechanical phonograph with results equal or superior to those obtainable from the more expensive electrical phonographs which are today so desirable.

By carefully comparing the accompanying photos, schematic and picture wiring diagrams of the L.C.-28 Unipac, little difficulty should be experienced in assembling and wiring this unit. While parts are shown in smaller proportion to the metal chassis in the picture diagram the reader can readily note the location of the various components. Connections shown in solid lines are made above the chassis, while those shown in dotted lines are beneath the chassis.

After both the set and power unit are completely wired as shown, the latter may be placed in the console or radio table. The leads connecting the set with the power unit, B+, P., 90+ Amp., 45+ Det. and B— are made with a suitable connector cable or wire. A separate type 4½ volt "C" dry cell is then connected to the set and both cord and plug from the set and power unit are connected to the 110 v. A.C. line by means of a two way outlet.

Place a CX326 type A.C. amplifier tube in socket V4. Place a CX374 glow valve in socket V3, and CX310 in socket V5. Place two CX316B rectifier tubes in sockets V1 and V2.

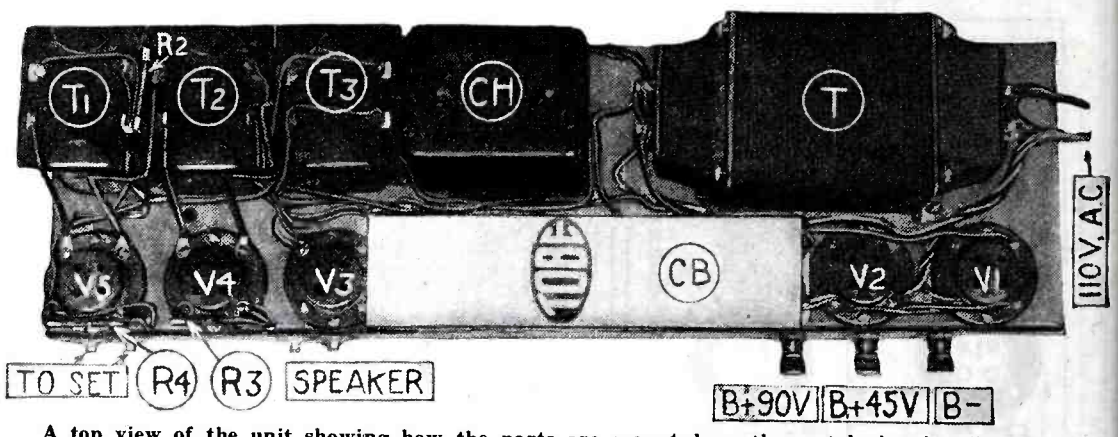
The unit is now ready for operation, either the switch on set is turned on, or the switch of the socket of the house lighting lines, providing a loud speaker has previously been connected to the two tip jacks on the power unit.



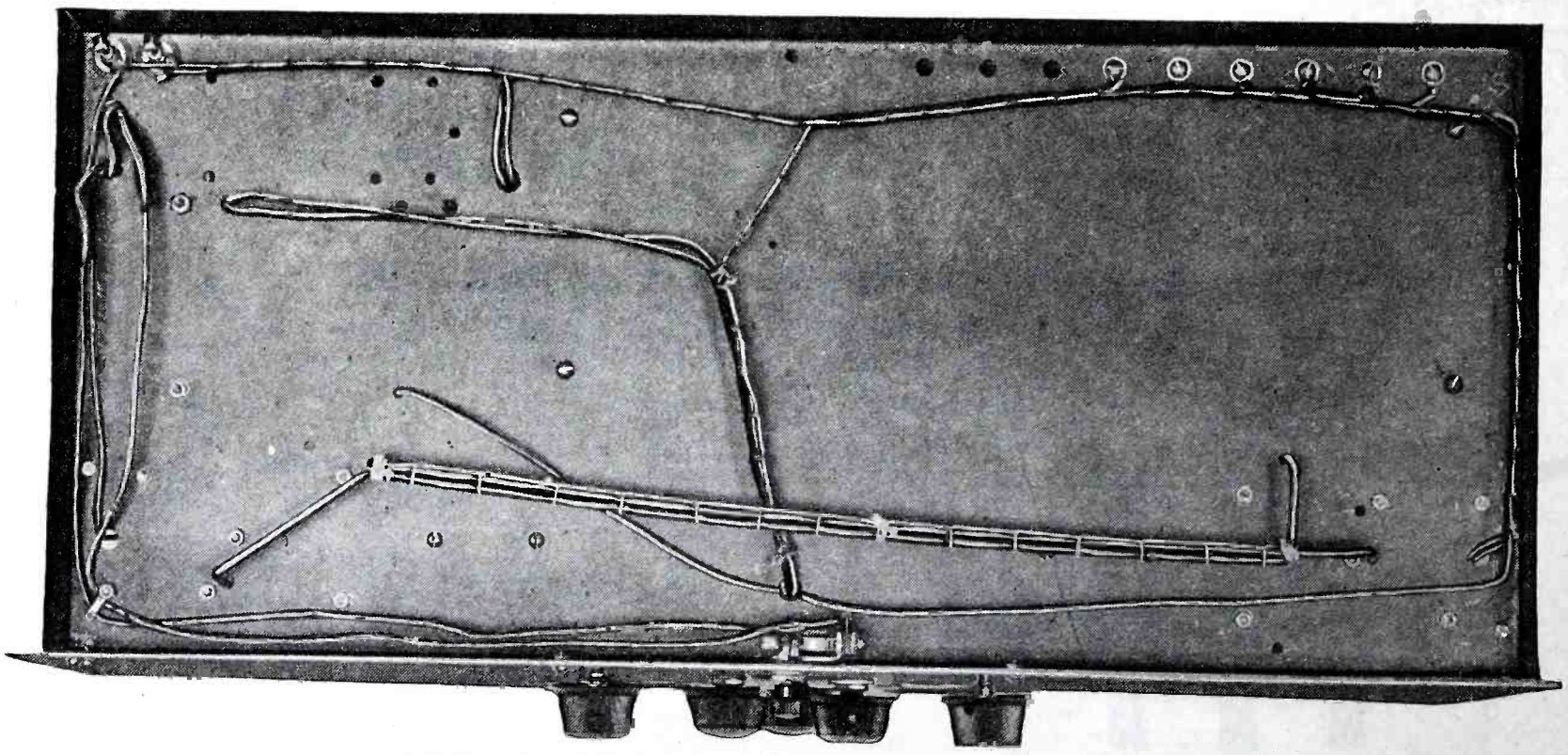
A view of the power unit employed with the A. C. Laboratory Super. All tubes are shown in their respective sockets.

PARTS FOR POWER UNIT

1 Silver-Marshall 323 full wave super power transformer, T
1 Silver-Marshall 331 Unichoke filter system, CH
2 Silver-Marshall 240 audio transformers T1, T2
1 Silver-Marshall 341 output transformer, T3
1 Tobe 682 condenser bank, CB
5 Silver-Marshall 511 tube sockets, V1, V2, V3, V4, V5
2 Ward-Leonard S651 resistors, R, R1
4 Frost 253 tip jacks
1 Van Doorn 661 steel chassis and cabinet with hardware
3 Eby binding posts, (B—, +45, +90)
2 Frost FT64 resistors, R3, R4
1 Frost F1000 resistor, R2



A top view of the unit showing how the parts are mounted on the metal chassis. Parts are indicated to correspond with diagrams, etc.



A bottom view of the Laboratory Super wired for use with A. C. tubes.

There are no further adjustments to be made either to set or the power unit and the set is operated in the usual way.

Cone Speaker with Double Magnet Unit

A new and advanced idea in design and construction of cone speakers is embodied in the cone speaker shown in the accompanying photo. Though the cone diaphragm is only seven inches in diameter, the speaker has a remarkably wide tone range.

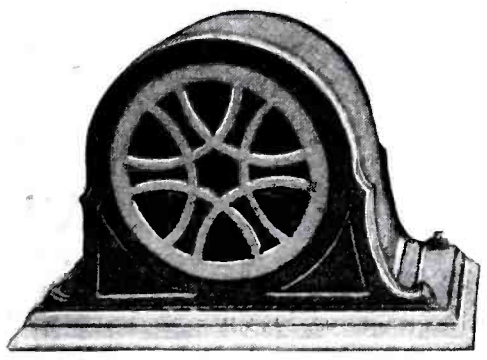


Illustration by courtesy of United States Elec. Corp.

A double magnet unit employed in the speaker illustrated above makes possible greater sensitivity and undistorted volume.

The outstanding feature of this speaker is a special double magnet unit with a balanced armature and closed field. This makes possible greater sensitivity and undistorted volume with less input energy.

This particular speaker is made in two styles, one in a plain wooden box and the model as illustrated which is enclosed in a handsomely decorative wooden cabinet.

"A" and "B" Unit for A. C. Sets

Power units, for use with receivers employing the new 226 and 227 type (A.C.) tubes, may be of very simple and compact design. This is proven by the efficient compact device shown in the photo herewith. Although it weighs less than fifteen pounds and is only 6½ inches high by 6¾ inches wide by 9 inches long, it is capable of delivering ample power for both the plate and the filament circuits of sets employing seven tubes, with a 171 type power tube in the last stage of amplification. Also the unit may be used in connection with sets employing storage-battery tubes; as it will supply plate ("B") power to all tubes and filament ("A" battery) current for the power tube.

Electrically, the unit consists of a standard plate-power-supply device, together with a special transformer having three additional secondary windings for providing filament current for the A.C. tubes. The plate-power-supply circuit has a maximum output of 180 volts at 50 milliamperes, and there are three taps which provide the voltages usually required. The three low-voltage windings of the transformer deliver the operating potentials required by the filaments of the A.C. tubes. A 1½ volt winding has ample capacity for supplying seven 226 type (A.C. filament) tubes; a 2½ volt winding will provide power to as many as four 227 type (heated-cathode) tubes; and the 5 volt secondary supplies current for the filament of the 112 or 171 type power tube in the last audio stage.

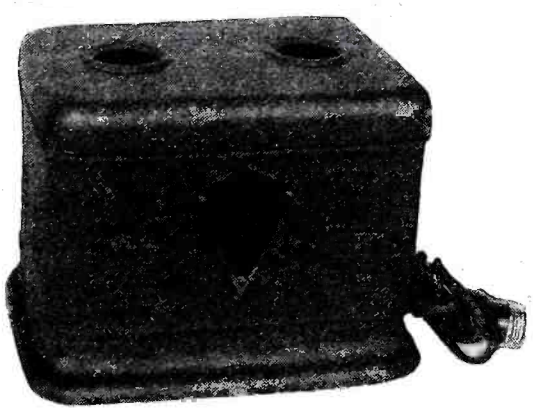


Illustration by courtesy of Harold Powers, Inc.

Photo of the "A" and "B" unit for receivers employing new A. C. type tubes. This unit is capable of delivering sufficient power for both plate and filament circuits of sets using seven tubes.

Although there is no variable voltage regulator on the front panel, it is possible to obtain the exact plate voltage required by making a simple adjustment inside the unit.

To place this device in operation, the top is removed to insert the rectifier tube and for making connections to the low-voltage windings of the transformer. The high voltage output terminals of the unit are located on the bottom and are accessible from the outside. The voltage adjustor is located in the top compartment.

No separate "C" voltage terminals have been incorporated in the power unit; but these potentials may be obtained by the use of proper biasing resistors in the receiving set.

New Fan-Type Loudspeaker

Since the advent of the cone type loudspeaker the advantages of vibrating a large surface as compared with the small diaphragms used in horn speakers have been very forcibly demonstrated. From the standpoint of faithful reproduction the cone type is to be favored. In the loudspeaker illustrated, a large pleated paper disc, resembling a fan in appearance, from which it gets its name, is employed. In operation the speaker is more like the cone than the horn species, and since the disc is 20" in diameter, it functions very well on the low or bass notes, giving a rich, mellow natural tone to the reproduced music.

The beauty of this new fanspeaker can be only partly appreciated from the illustration. The ornamental diaphragm, being center-supported on the drive pin of the unit, is totally free-edged, and can be removed from the unit at will. It is clamped at the center with two metal discs, which may be removed, thus making it possible to collapse the diaphragm and place it in a small cardboard tube for portability. The diaphragm may be opened up again, turned inside-out so that the former center becomes the edge and the edge becomes the center, giving new color schemes. Thus, each diaphragm has *four* different designs, two in brown and gold on one side, and two in black and silver on the other.

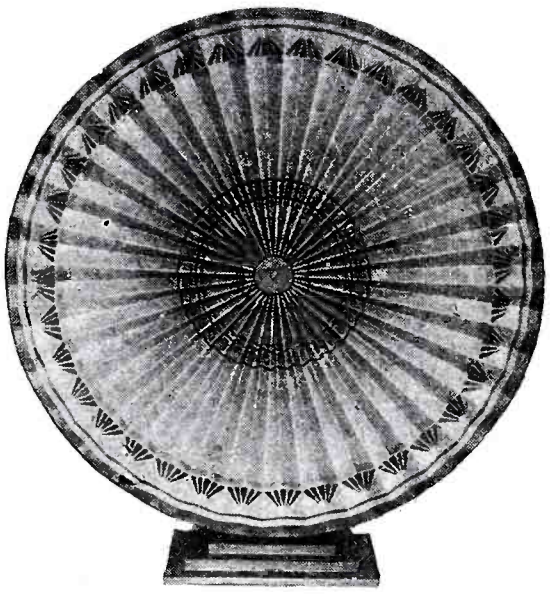


Illustration by courtesy of Fanspeaker Radio Co.

The speaker shown in the above photo employs an ornamental paper diaphragm in the form of a fan.

This adapts it to the most beautiful of home interiors; it enhances the beauty of any radio set.

In addition to its ornamental features, the collapsible diaphragm is ideal for portable receivers. The wall type model, same as illustrated except without base, may be used for this purpose.

The unit is of the direct-drive type, with a thumb-nut adjustment on the rear. Thus it can be adjusted to suit any set, with or without power amplification. It is of special rugged construction so as to insure rigid support of the diaphragm.

An Electrolytic "A" Power Unit

A new system, which is totally different from that used in the various storage battery trickle-charger types of "A" power units, is employed in the device shown herewith. The unit, when connected with the 110-volt, 60 cycle power line, will provide two amperes of direct current at a potential of six volts for heating the filaments of tubes in a radio receiver. In design

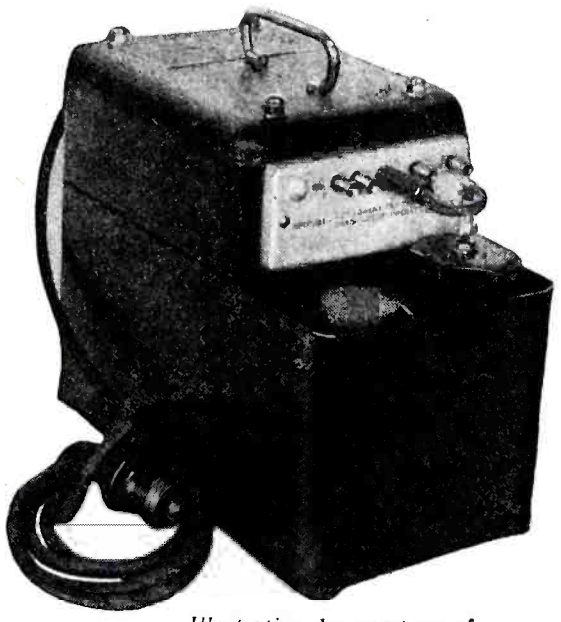


Illustration by courtesy of Fansteel Products Co., Inc.

The "A" battery power unit described herewith consists of an electrolytic rectifier and filter.

the device consists of a rectifier and filter circuit, built into a compact unit which weighs less than fifteen pounds. It does not contain a storage battery of any kind, and requires practically no attention of any kind.

For the rectifier an electric cell of the electrolytic type is employed. This cell is connected to the light-socket circuit through a step-down transformer which changes the lighting voltage to the value required by the power unit. The electrolyte used in the rectifier consists of an alkaline solution, which is covered by a thin film of oil to prevent evaporation. When shipped the unit is dry, and the cell contains only the solid alkaline substance and a small quantity of oil. When the user wishes to place it in operation, it is necessary merely to add distilled water. With continued use over long periods of time, the quantity of water may depreciate to some extent, and after three or four months it may be advisable to add a slight amount of distilled water to the cell. However, even if water is not added, the unit will not be injured.

In the filter circuit of the power unit there are a condenser and choke coil, connected in the usual arrangement. The condenser is also of the electrolytic type and employs the same electrolyte that is used in the rectifier cell. The condenser has two sets of plates submerged in the liquid and electrically, is employed as two separate condensers.

An "A, B and C" Unit with Automatic Relay

This new unit comprises a storage battery, a trickle charger, a power-control relay, and a plate-supply device with provision for obtaining grid potentials. It provides a compact, automatic accessory suitable for electrifying any type of radio receiver using standard 6 volt tubes. The unit requires practically no attention, it has ample power for all types of receivers, and its operation is controlled by the battery switch on the panel of the receiving set.

Dry electrolytic rectifier cells are used in the trickle charger circuit of the power unit. These cells are very convenient, for they do not require any attention such as adding water, etc. A step-down transformer connected in the 110 volt, 60 cycle power circuit supplies the low-voltage alternating current used by the rectifier; and after it has been converted into pulsating direct current, the rectifier delivers this current to the storage battery. The

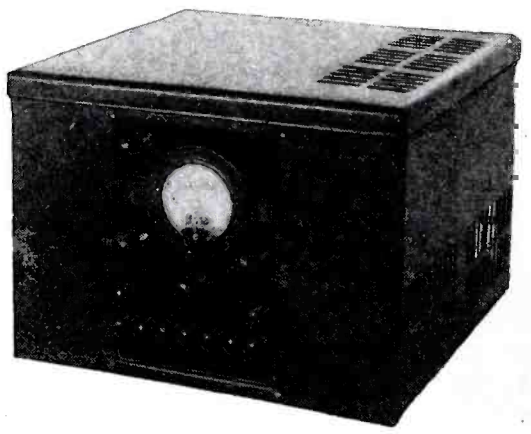


Illustration by courtesy of Sentinel Mfg. Co.

The complete "A, B and C" unit which is combined with an automatic relay device.

storage battery used is a small 6 volt, low capacity unit.

In the operation of this unit the storage battery is kept at full charge at all times which is accomplished automatically by a unique automatic power-control relay.

In the "B" power supply circuit of this unit there is a standard type of step-up transformer which supplies two half-wave rectifier tubes of special design. The filter circuit is standard, consisting of a condenser block and two iron-core choke coils. In the voltage dividing circuit there are three variable resistors, regulating the potentials delivered to the detector, the radio and audio amplifiers, and the grid of the power tube. Still another variable resistor is connected in series with the filament circuit of the rectifier tube, and used to control the output voltage of the entire plate power supply unit.

The power available in the plate-supply or "B" circuit is ample, even for the operation of large receivers. The plate voltage is more than is required for the operation of a set using a 171 type power tube, and the grid bias is adjustable up to 40 volts. On the front panel is a meter which enables the owner to check up on the voltage of the various circuits.

An Automatic "A" Battery Charger

An automatic "A" battery charger employing a rectifier of the new "dry" type is shown in the accompanying photo. The device is entirely enclosed

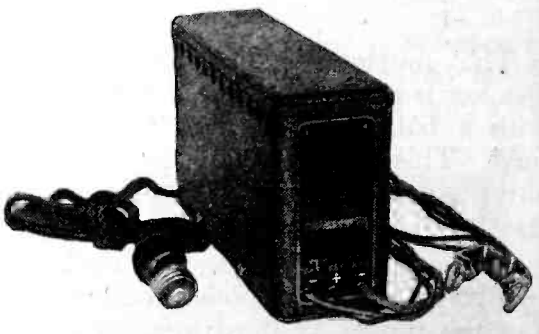


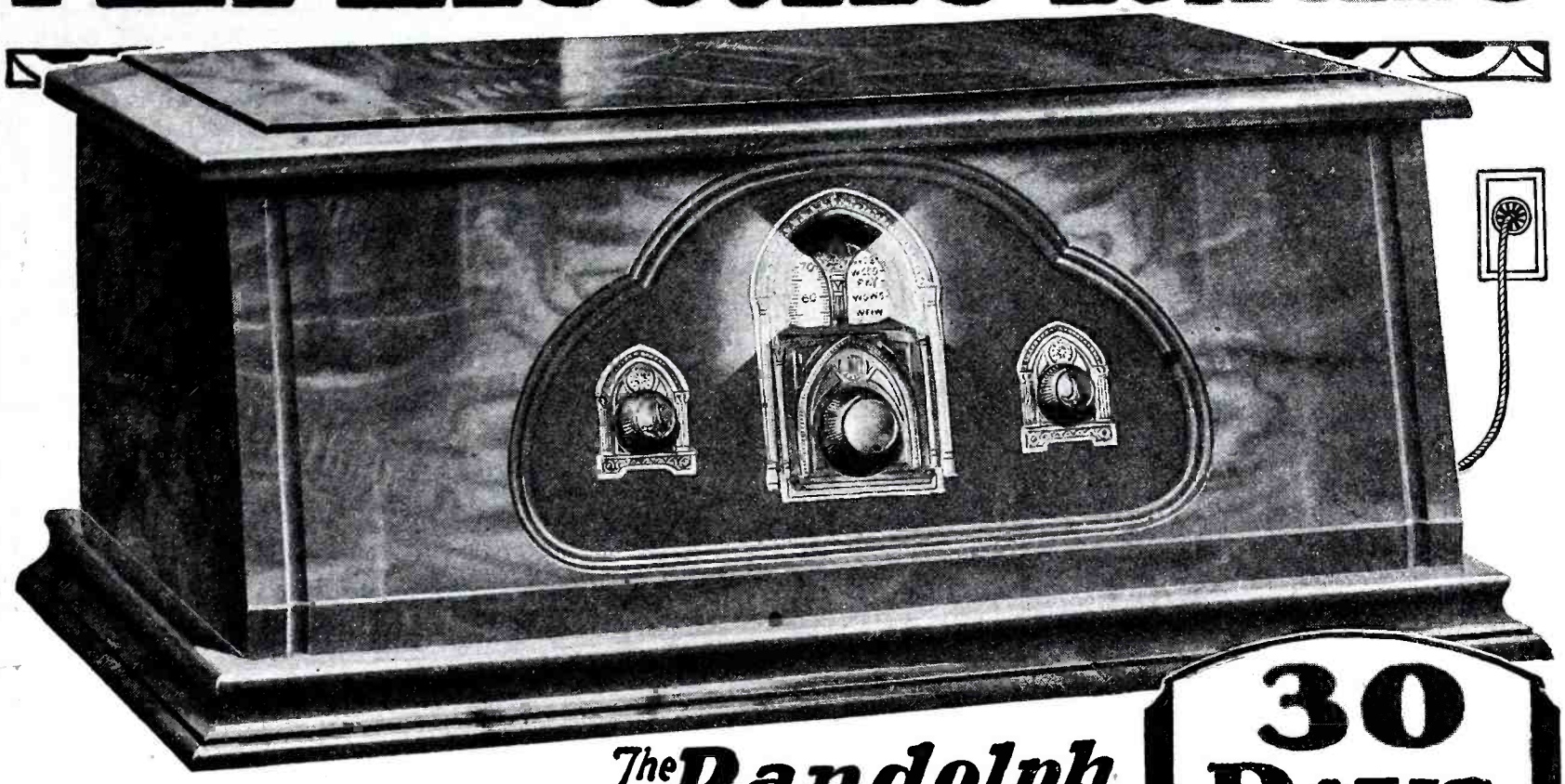
Illustration by courtesy of Apco Mfg. Co.

The complete charger as it appears ready for service.

in a steel case, 9 inches long, 3 inches wide, and 5½ inches high. The metal case is coated with a pleasing, brown crystalline finish. The unit is of the trickle-charger type, designed to charge the battery at 0.75 amperes; and is equipped with a series relay, so that it starts charging automatically when the set is turned off. When the set is switched on, the charger is automatically disconnected and the "B" power unit commences operation. Once the set is switched off again, the charger comes into action at a rate sufficient to keep the battery always at maximum efficiency. These advantages makes it a real trouble-saver. In addition to its automatic switching, it is absolutely noiseless in operation and, once installed, keeps the "A" battery in good condition.

(*Continued on page* 166)

All Electric Radio



The Randolph 7 Tubes-Single Control

JUST plug this Randolph Radio into the electric light socket—and tune in. A powerful, selective radio that gives dependable coast to coast reception. **No batteries, chargers, eliminators, acids or liquids.** Here is complete radio satisfaction whenever you want it. The easy tuning with one control brings on all stations. Illuminated drum allows you to operate the radio in the dark and has space for logging stations. Every detail of the Randolph is modern and perfected—it is the utmost in radio—unsurpassed regardless of price. It is this wonderful radio that you test and try for 30 days FREE before you buy. Listen to it in your own home. When it convinces you by actual performance it is the ideal radio—the one you have always hoped for—**you can buy it direct at factory prices.** Be sure you write for free descriptive literature today.

Beautiful Ampliphonic Console

Illustrated here is one of the beautiful Randolph Seven Console Models—made of the finest carefully selected heavy solid walnut, hand-rubbed and with burl finish. Has built-in genuine large cone speaker that compares with any on the market. Assures unlimited reception of high notes and low notes clear as a bell. Completely electric—**uses no batteries of any kind.** Be sure you send for fully illustrated, full color folder giving complete details.

Genuine Walnut Cabinets

The finest of heavy, genuine, solid burl finish walnut is used in the making of all Randolph cabinets. No picture can do them justice. You must see them to appreciate them.

6-Tube Radio

New, modern, single-control, six-tube radio. Do not compare this set with old-style, 2-dial, 6-tube sets selling for about the same price. The Randolph 1928 Senior Six has also been tested and approved by the leading radio engineers. Comes in beautiful solid walnut cabinet of hand-rubbed finish. Single control. Illuminated drum with space for logging. Absolutely dependable and very selective. **Send for 30 days free trial. You test it before you buy.**

All Sets Guaranteed

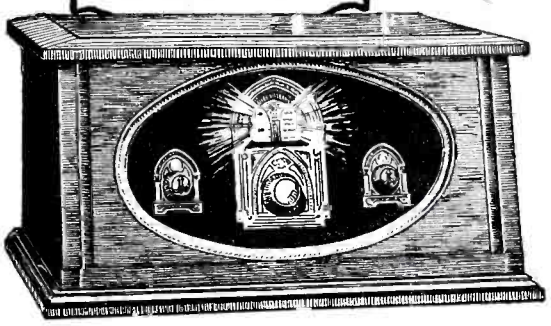
Biggest Discounts to Agents

Work either full or part time and make big money. Sensationally big discounts to agents. No experience required. Randolph All-Electric Sets sell on first demonstration. Tremendous advertising campaign helps you. Men and women both make big money this way. Demonstrating set sent on 30 Days TRIAL. WRITE NOW for proposition.

30 DAYS FREE TRIAL

6 Tube $55 Retail Price

Biggest Discounts To Agents



RANDOLPH RADIO CORPORATION
711 West Lake Street Dept. 255 Chicago, Ill.

USE THIS COUPON TODAY!

Randolph Radio Corporation
711 West Lake Street, Dept. 255
Chicago, Illinois

Send me full particulars about the RANDOLPH Six and Seven-Tube Electric and Battery Table and Console Sets with details of your **30 Day FREE Trial Offer.**

Name.....

Address.....

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

Mark here ☐ if interested in Agent's proposition.

The Perfam A. C. Four

(*Continued from page 93*)

and grid return of the first audio transformer. This is a very satisfactory method and controls the volume from a whisper to full tones.

The transformers used give a rising amplification curve necessary to good reproduction for 30 cycles to 5000 cycles and over.

The Assembly

Before starting the actual assembly of the receiver, each part should be examined with the utmost care to make sure that it has suffered no damage in transit or handling before being received by the builder.

The layout and circuit drawings should be studied for all important points. The front panel should be laid out first as the drilling for the drum dials requires quite a few additional holes. Particular care should be used in following the instructions which accompany each dial. The other parts require only one hole each and are easy to mount. After arranging the front panel, this may be laid to one side for the time being while the sub-panel should be laid out, due care being taken that the apparatus on both panels when placed together do not overlap.

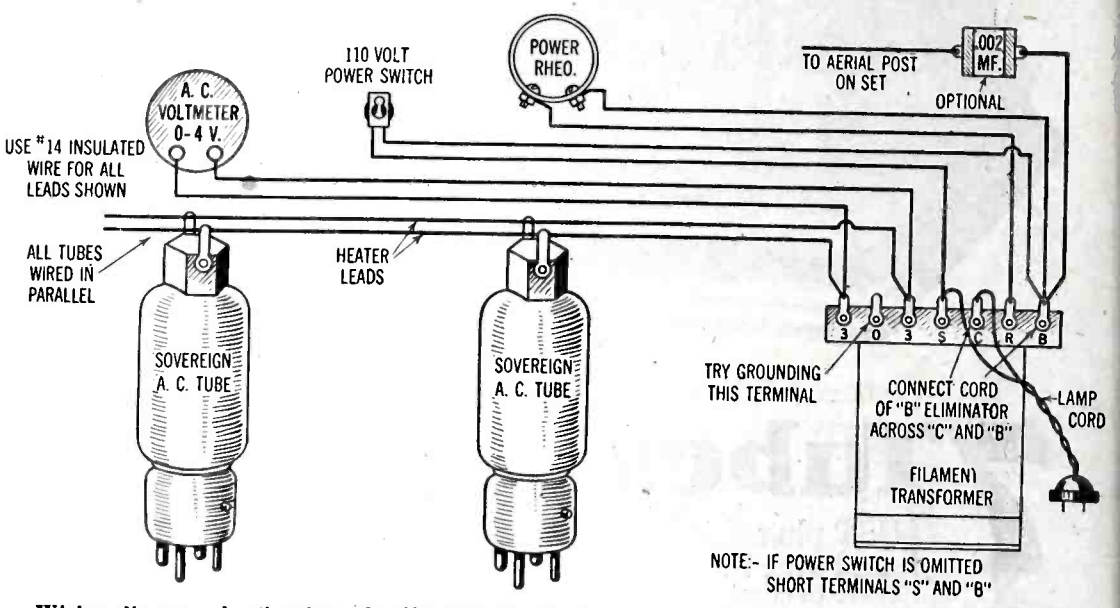
Wiring of the receiver itself is quite simple. Flexible wire such as Acme Celatsite which comes in colors should be used; the various colors will serve for identification purposes. Also with the use of such wire, the danger of the possibility of closed loops and other causes for feed back as with bus-bar wire is eliminated. Small holes should be drilled in the sub-panel near the terminals of the various parts, to permit connections from underneath the panel to object assembled above.

All grid and plate connections from tube sockets to their connecting terminals on coils and condensers, should be made above the sub-panel. By referring to the schematic and pictorial wiring diagrams, all wiring of the set can be easily followed. Leads should, of course, be as short as possible. The wiring for the grid returns should lead to one side of the socket marked F minus. As there may be some confusion at this point, the two F posts on the socket may be connected together. This is a sure way and no harm will result as one of the posts is dead at all times. As the two wires which run to the power switch have alternating current flowing through them, it is better to enclose these two leads in flexible metal tubing such as Belden's ¼" copper tubing.

The wiring for the filaments is shown in the separate sketch for tubes and transformers. Loops should be placed in the wires to allow sufficient slack in case it is desired to change a tube. The lead to the house supply should leave the set as near the transformer as possible, as these wires carry 110 volts A.C. The connecting cord should be standard rubber covered and approved by the Board of Fire Underwriters for such purposes. All other connections to the "B" supply are made with the Yaxley cable plug. It is easily seen how quickly a set can be disconnected should it be desired to move it, only two operations being required.

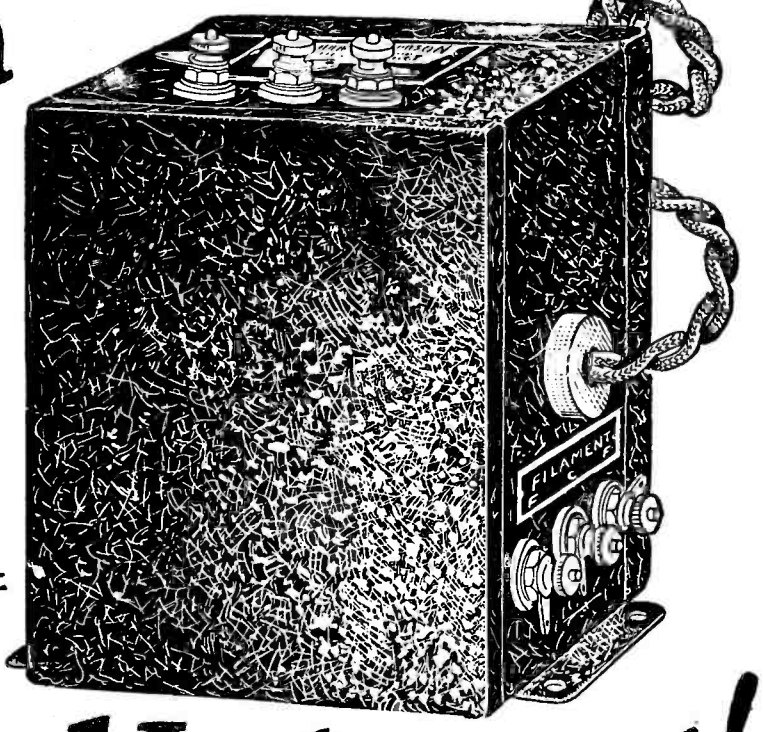
Assuming that all the connections have been made correctly, connect the "B" battery or current supply to its respective leads in cable. The radio frequency stage should have from 67½ to 90 volts, while the detector battery should be near 4 volts, and up to 180 volts may be used for the audio stages.

Connect the antenna and ground. In some cases the receiver will operate without an antenna by putting a .002 mfd. fixed condenser between aerial post and point "B" on filament transformer. However, when the antenna is used, the .002 mfd. condenser should be disconnected.

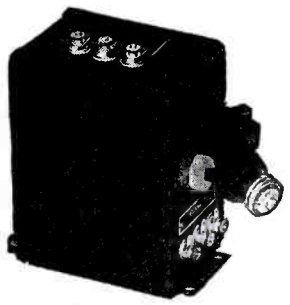


Wiring diagram showing how the filament circuit of the set is wired from the heater transformer.

Build Your Own Power Amplifier



Transform your Receiver into a Real Musical Instrument!

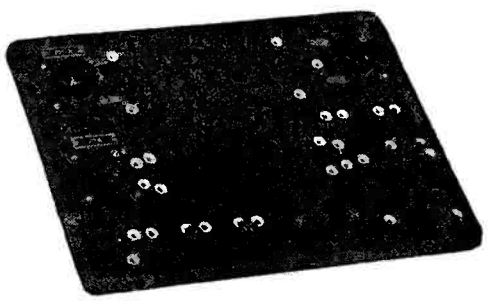


R-210 Power Compact . $20

With a screw driver, a pair of pliers, and a soldering iron you can build a Thordarson Power Amplifier and B-supply in your own home that will equal the finest commercial amplifier on the market. Complete constructional booklet and simple diagram accompany every transformer.

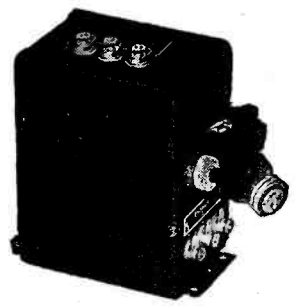
Thordarson R-210 Power Compact

The Thordarson R-210 Power Compact is scientifically designed to give maximum electrical efficiency and to make home assembly of power amplifiers as simple as possible. The R-210 Power Compact is the foundation unit and contains the following apparatus: (1) A power supply transformer designed for UX-216-B rectifier; (2) Two filter chokes of 30 henries inductance and 65 M. A. current carrying capacity; (3) A 7½ volt supply center tapped for the filament of one UX-210 power tube. Wiring of the complete amplifier is simple—20 leads complete the assembly.



R-211 Metal Baseboard, including sockets, binding posts, mounting screws, and hook-up wire $5

New Metal Baseboard for R-210 Compact Amplifier .



R-171 Power Compact . $15

To further simplify home construction of the R-210 type amplifier, you can now buy this new crackled finished metal baseboard. All spring sockets and binding posts are mounted and included in the list price. All mounting holes are drilled. All holes for sub-panel wiring are carefully insulated. Location of all sub-panel wiring is marked under baseboard.

R-171 Power Compact

This power compact is similar to the R-210 type, but is adapted for home construction of power amplifiers using the Raytheon BH rectifier and UX-171 power tube. Designed to meet the popular demand for a low priced yet highly efficient power amplifier. Delivers 320 volts either side of center to the Raytheon BH rectifier. The two choke coils are rated at 85 M. A. 30 henries. The filament winding of 5 volts center tapped is suited to one UX-171 power tube. Two 0.1 Buffer Condensers are also included in the case. Wiring the complete amplifier and B-supply is merely a matter of connecting 18 leads.

No. 2098 Power Supply Transformer . . $20

T-2098 Power Supply Transformer—T-2099 Double Choke Unit

Here is an extra heavy duty power amplifier supply that will satisfy the most exacting demands for excess power. An amplifier using this transformer and choke unit will deliver 425 volts at 130 M. A. drain, sufficient for the heaviest receiver using two UX-210 tubes in power push-pull. Transformer T-2098 delivers 550 volts each side of center tap and is designed to supply two UX-216-B rectifiers (full wave). The 7½ volt filament supply will easily handle two UX-210 power tubes. The double choke unit T-2099 consists of two 30 henries 130 M. A. choke coils mounted in a compound-filled case.

No. 2099 Double Choke Unit $14

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500 West Huron St., Chicago, Ill.

Gentlemen:

Please send me a copy of your free booklet *"Power Amplification Simplified."*

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THORDARSON POWER COMPACT

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.

Operating the Set

The set is now ready for testing and operation. Attach the cord from transformer to house supply. Connect the speaker to proper posts. No sounds will be heard for 12 to 20 seconds, as the heater unit requires a certain amount of time to heat up; just as does an electric flat iron. After waiting the necessary interval, tune the receiver in the regular manner; having tuned in a station, preferably one of the locals, advance the tickler coil until a squeal is heard. Now, by rotating the antenna coil condenser, the squeal will vary in pitch and intensity, if the set is not neutralized. By adjusting the position of the Phasatrol, the squeal can be brought to a point where it will vary only in intensity—not in pitch. This is the point where neutralization is obtained. If the builder has an A.C. voltmeter reading from zero to 5 volts, the greater life of the tubes and maximum efficiency can be obtained when the voltage to the tubes is set at 3 volts. This voltage is regulated by the power rheostat on the front panel.

These tubes will not operate from direct current and if the set is connected to D.C. even for a short space of time, the transformer will be ruined. This is very important as many good radio devices have been ruined by so doing, by people who only wanted to test the tubes to see if they would light, or what not.

When using the set, if a hum is produced, be sure "O" on the transformer is grounded, also try changing the detector tube. A tube that produces a hum as a detector, will work satisfactorily as an amplifier tube.

To test for burnt out tubes, remove one of the wires to the heater terminals and make and break their connections. A slight movement on the voltmeter when this is done is an indication that the tube is good.

After a little experience in operating the set, results obtained will be very gratifying. One of the most important things in radio reproduction is a good speaker, and when a cone is used, it is necessary to protect the windings from the direct current.

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 attach upon supporting metals.* Such slow corrosion in wiring causes a steadily increasing resistance to the flow of electrical energy.

Kester Rosin Core Radio Solder scientifically combines radio's premier flux, Rosin, with a solder alloy of unvarying quality. The use of Kester Radio Solder furnishes the user with a means of accomplishing Safer, Faster, and Cleaner set wiring. Constructors who solder-protect wiring with Kester Radio Solder enjoy increased receptive range, improved tonal quality and the satisfying assurance that their receivers will never be forced into the discard through the corrosive and conductive action of a chloride flux.

A Kester Soldered Receiver Is a Better Set

Manufacturers of Radio Sets and Equipment: Tests conducted with the various types of commercial fluxes are under constant observation in our laboratory. Can we assist you in your soldering problems?

KESTER *Radio* SOLDER

CHICAGO SOLDER COMPANY

4252 Wrightwood Avenue, Chicago, U. S. A.

Originators and World's Largest Manufacturers of Self-fluxing Solder

Convince Yourself Without Expense

USE THIS COUPON NOW!

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4252 Wrightwood Ave., Chicago, U.S.A.

Gentlemen: Please send me a test sample of Kester Radio Solder, together with descriptive literature.

Name .....

Address .....

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

Dealer .....

The Knickerbocker Four

(*Continued from page* 85)

not oscillate regardless of the wavelength to which it is tuned. By moving the secondary coil toward or away from the tickler coil the amount of feed-back at the maximum setting may be regulated to just that required to produce maximum sensitivity but not enough to cause the circuit to break into oscillation. Then the minimum limit of the range can be fixed by changing the angle of the coils in their relation to the panel, so that the feed-back at minimum coupling is just that required for maximum sensitivity on the low waves. With the two limits of coupling thus set, the coupling at any intermediate wavelength will be just right to produce highest efficiency throughout the waveband.

Regeneration in the detector circuit provides amplification that is at least equivalent to that of another stage of highly efficient tuned radio-frequency amplification. If this is added to the single efficient stage of R.F. that is included in the Knickerbocker Four we have the equivalent of not just a five tube receiver but a five tube receiver of unusually high efficiency. This is a fair assumption because the one R.F. stage included in this receiver is of more than usual efficiency as a result of the use of the variable coupling with its attendant high and equal amplification of all signals regardless of wavelength.

The best feature of this arrangement is that, in spite of its high efficiency, only two controls are required, with no necessity for "ganging" or gearing controls together or any of the schemes usually resorted to in reducing the number of tuning controls of a receiver. Tuning is accomplished without any whistles or squeals—another unusual thing for a regenerative receiver.

It may seem that an unusually large amount of space has been devoted to the description of the coupling and tuning control of this receiver. It is entirely logical that this should have been done, however, because after all it is only in these points in which this receiver excels others that its justification for existence lies. But to come back to the general description of this new receiver, and a discussion of its other good points.

The radio-frequency stage employs a standard circuit except that the method for neutralizing it is somewhat out of the ordinary. Instead of using a very small neutralizing capacity which is most difficult to adjust, this circuit employs a simple neutralizing system that requires a neutralizing capacity in

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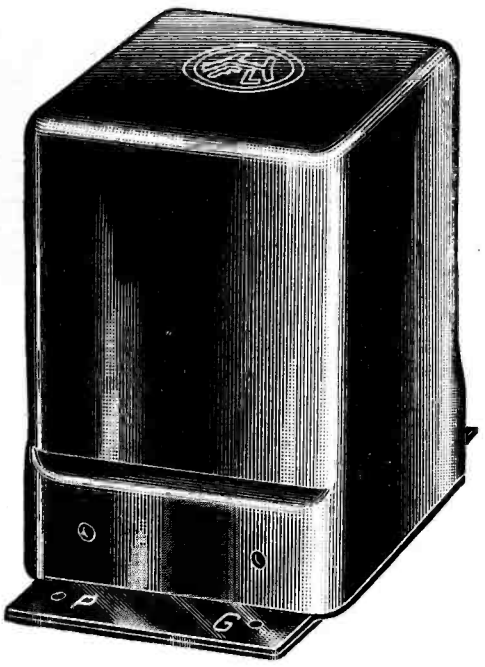

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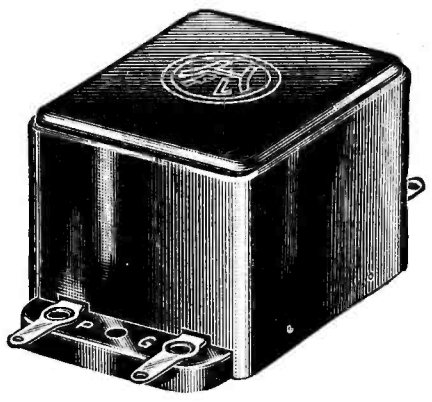

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The H. F. L. C-16 Audio Transformer is so designed as to bridge over and under amplification. Therefore the amplification of all frequencies throughout the entire musical scale is accomplished with amazing, life-like truthfulness. A specially treated silicon steel alloy, combined with proper gapping and right proportion in density, make saturation of core practically impossible.

In conjunction with this core the correct size of wire and the correct balance of primary turns has been determined and is being used to insure the proper impedance and to make possible distinct amplification of low notes and frequencies of low amplitude with a marked absence of harmonics. The H. F. L. C-16 Audio Transformer is especially designed to operate with all power tubes as well as the standard type of tubes.

An important feature in connection with our C-16 audio is our H. F. L. C-25 Output Transformer. Its ability to handle the voltage output of the power amplifying tubes and at the same time match the impedance of the average speaker to the tubes, makes it a very desirable addition to audio amplification. It is especially recommended because of the protection it renders to the loud speaker unit without reducing the plate voltage.

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the neighborhood of .0001 mfd. The variable neutralizing condenser employed is adjusted by means of a thumb knob on the top. The whole adjustment can be made in a few seconds and doesn't even require the use of a screw driver. Moreover the setting of this condenser is not critical and thus one of the most unsatisfactory features of neutralized circuits is eliminated. The R.F. choke coil CH and the by-pass condenser C4 are part of this neutralizing system and are therefore essential to the circuit.

The detector circuit is unusual only in the automatic control of regeneration that has already been discussed in some detail. Otherwise it is the standard tickler feed-back circuit of many years standing.

Individual filament control rheostats have been included for the R.F. and the detector tubes. The first functions as a volume control while the detector rheostat controls sensitivity. When this rheostat is turned up to normal the detector operates at its most sensitive point—just below oscillation. By turning the rheostat down when this unusual sensitivity is not desired the noise level is decreased and local reception is generally improved. The R.F. rheostat provides a complete control over the volume, from maximum right down to a whisper.

There is little need for discussing the audio amplifier which is incorporated in this receiver. It is standard circuit design and the transformers used are so well known as to quality that this portion of the receiver may be dismissed with the statement that the tone quality and volume are all that one could expect or desire. The two audio tubes receive their filament supply through the automatic filament control units R3 and R4 so that there are no variable controls at all in this portion of the circuit.

Assembly of the Receiver

The front panel and sub-panel are first prepared according to the detailed drilling specifications shown in the illustrations. Then all of the parts are mounted. The proper positions are readily determined from the photos.

It will be noted that everything is made secure to the panel and sub-panel. Even the fixed condensers are attached to the sub-panel by means of bolts. This leaves little possibility for broken connections after the wiring is completed and the receiver put into operation.

The wiring of the receiver is a simple job if the picture wiring diagram is followed. Most of the connecting wires are under the sub-panel, out of sight. Wherever practical the leads are dropped straight down from the terminals of the instruments, through holes in the sub-panel and then are run along under the sub-panel to the other

terminal or to a point directly beneath the other terminal if it should happen to be the terminal of an instrument that is mounted on the top of the sub-panel. It is a good plan to complete as much of the wiring on the sub-panel as is possible before attaching the front panel.

All connections to the batteries and ground are made by means of a battery cable and plug. Thus instead of having a string of binding posts in the receiver there is only the small plug and mounting shown at the rear left hand corner of the sub-panel. This arrangement has several advantages. First of all, the plug takes up much less space than would a binding post strip. Secondly, all battery connections can be made before the plug is slipped into its mounting thus eliminating any chance for short circuits because of loose wires. Finally, the receiver can be completely disconnected from the batteries in a fraction of a second through the simple expedient of pulling out the plug at the rear of the sub-panel. This latter is a decided convenience when it is desired to move the receiver or when for any reason it is necessary to disconnect the power source from the receiver. In some homes, for instance, where there are small children, the parents make a practice of leaving the plug out when the receiver is not in use. Then if the youngsters should turn on the filament switch there could be no harm done, as the supply circuits are open.

The completed set can be installed either in a distinctive console such as the "Excello" or in a table type cabinet. If the latter is used, the set can be placed directly on top of an "Ensco" 3-foot cabinet type speaker which makes an ideal combination.

The receiver employs four CX-301-A tubes. For greater sensitivity, three CX-301-A tubes may be used in the R.F. and the two audio stages and a CX-300-A tube in the detector stage. Either of these combinations represents a total filament current drain of one ampere per hour. For the fan who has no facilities for frequent recharging of his storage battery this offers a decided advantage because a single charge of a standard size "A" battery will operate these four tubes for a month or more of average service.

To install the receiver the ends of the battery cable are connected with their respective terminals of the batteries and to the ground. Five of the leads are tagged with metal markers for A—, A+, B—, B+Det., and B+Amp. There are also two wires in the cable which have no tags. One of these should be used for the ground connection of the receiver. The other one remains unused. The antenna lead-in wire is connected directly to rear left-hand corner of the sub-pan-

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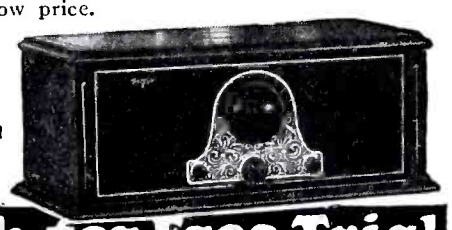

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el. The loudspeaker tips are inserted in the tip jacks, J1 and J2, which are next to the antenna binding post. This completes the connections.

With the four tubes inserted in their sockets everything is in readiness for the preliminary adjustment of the neutralizing and coupling devices. To neutralize the radio-frequency stage a low wave station is tuned in while the neutralizing condenser knob is all the way out and the R.F. rheostat is turned up full. The R.F. circuit should oscillate freely with this adjustment. Then, keeping the station tuned in, turn the neutralizing condenser knob to the right a little at a time until a point is reached where the circuit no longer oscillates. If this neutral point cannot be found it may be that the tickler coupling used is so "tight" that the detector is oscillating, or the coupling between the primary and secondary of the detector coupling coil may be too great. By loosening both the primary and tickler couplings the R.F. circuit can easily be neutralized. Then the primary of the detector coupling transformer can be adjusted to the position that provides best results and the tickler can be adjusted according to the suggestions given earlier in this article.

Once these adjustments have been made they will require no further attention unless either a new R.F. tube or a new detector tube is installed at some later date. In either of these cases a slight readjustment of the neutralizing or tickler coupling adjustments may be needed.

The operation of the receiver is like that of any two dial receiver. Stations will tune in and out as the dials are turned, without any accompanying whistles or other noises. After a station is tuned in the volume is readily controlled with the R.F. rheostat knob. Also, a given broadcasting station will always come in at the same point on the dials, and the dial settings of the various stations can therefore be "logged" for future reference.

On the whole this receiver represents an ideal set for any home. Its operating cost is extremely low. It is so easy to operate that even a child can work it at top efficiency. It has selectivity, volume, fine tone and sensitivity. And what is perhaps most unusual for a four tube receiver, it operates extremely well with a small antenna or even with an indoor antenna.

An interesting example of the adaptability and all around usefulness of this little receiver is found in the following news item regarding the yacht "Siren," winner of the 1927 Mackinac Cup-Races:

"We had been doing considerable off-shore cruising in our 44-foot racing sloop during the summer. About every second week-end our racing schedule took us across Lake Michigan to one port or another and during these long trips, especially with light winds, the

time hung rather heavy on our hands, as our only source of diversion was a small tin-pan phonograph.

"It was decided to equip the boat with a radio set which would combine fine tone and good selectivity, and above all sufficient sensitivity to permit the use of a poor antenna system. Such a set had to be designed to consume little filament current because it would have to use the storage battery which supplied our boat's lights and there were no facilities for charging this battery while under way. 'B' current consumption must be low too, so as to permit the use of the smaller sized 'B' batteries.

"The antenna requirements were the most difficult. The only way to erect an antenna was to suspend it from the spar and run it down through the deck to the receiver. This meant that the antenna wire would be surrounded by the steel cables of the rigging, most of which were grounded to the keel and therefore acted as a very capable and highly undesirable shield. There was no choice in the matter, however, so we had to be satisfied with this arrangement—and build a receiver with such a high degree of sensitivity that it could overcome the obstacle of a highly inefficient antenna.

"We decided upon the Knickerbocker Four receiver as one which would meet our requirements and, we hoped, would provide the required amount of sensitivity. It was built and installed shortly before the Mackinac Cup Race, the longest fresh-water race in the world. We were most agreeably surprised by the results obtained not only in the sweet tone quality but in the ability of the receiver to penetrate through the barrage of local Chicago stations and bring in distant stations.

"Needless to say the Knickerbocker Four accompanied us during our participation in the Mackinac Race. Constantly during the race (at 300 miles as readily as at the start) we were able to receive the weather reports broadcast by KYW giving us the weather conditions at the various points on the lake. We were able with the aid of these reports to anticipate the weather conditions. There is no doubt in any of our minds but that the information received over the radio was a great factor in our success and strategy in navigation which resulted in our winning of this famous fresh-water classic. The constant reports we received indicated consistent wind and weather conditions over the entire lake and we were therefore able to lay a course to Mackinac which contained only five compass courses instead of the twelve variations ordinarily adhered to."

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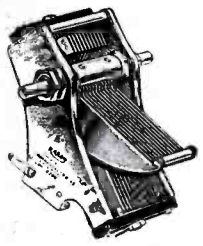
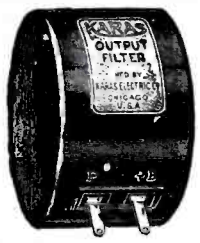
2 Karas Type 28 Audio Transformers are used in the 2-Dial Equamatic. Price, each . $8.00

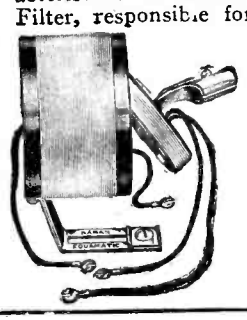


3 Karas S. F. L. Variable Condensers, with removable shafts, are used in the 2-Dial Equamatic. Price, each . $5.25



The new Karas Output Filter, price $8.00, is used in the 2-Dial Equamatic.

NO receiver ever designed offers you greater volume, distance, selectivity and simplicity of operation from five tubes than does the NEW 2-Dial Karas Equamatic. Here is a five-tube circuit, controlled by but two dials, that has been so perfectly balanced and completely neutralized that it is not a task but a real joy to operate the receiver under any and all conditions. You do not have to be an expert to tune this receiver, any more than you need to be an expert to build it. The panel is but 24 inches in length. The Karas and other parts are compactly assembled, insuring short leads, ease in building, and more perfect results in operation. And due to the utilization of the famous Karas Equamatic principle the energy transfer between primary and secondary of each Karas Equamatic Inductance Coil is constantly, automatically and positively maintained at every wave length setting of the dials. There are so many splendid features about the 2-Dial Karas Equamatic that we might devote several pages of this magazine to a description of them, and still not cover all of them. For example, the 2-Dial Equamatic employs two of the New Type 28 Karas Audio Transformers, giving superb volume. It utilizes 3 New Karas S. F. L. Variable Condensers, with their marvelous straight frequency line characteristics. It utilizes the New Karas Output Filter, responsible for its clear, sweet, pure tone. And Karas Inductance Coils and Micrometric Dials combine to give perfect, hair-line precision tuning at all broadcast wavelengths.



The Karas Equamatic Inductance Coil is the heart of the 2-Dial Equamatic. Per set of 3 coils, $12.00

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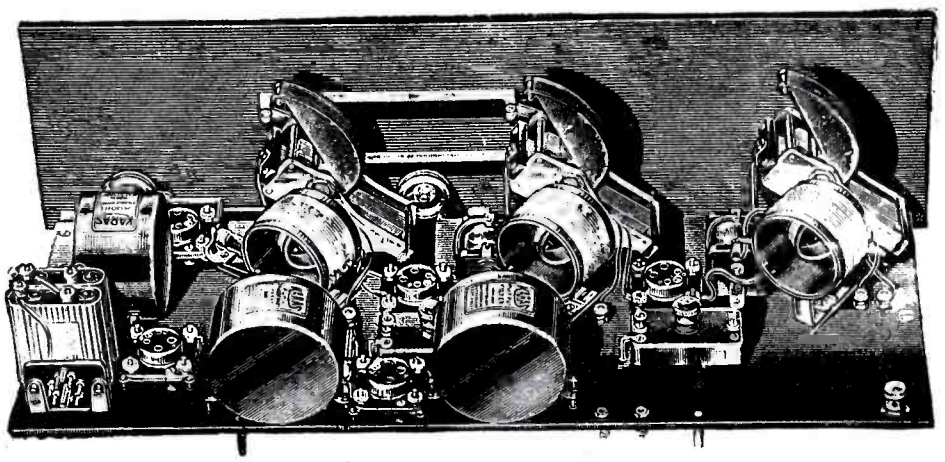

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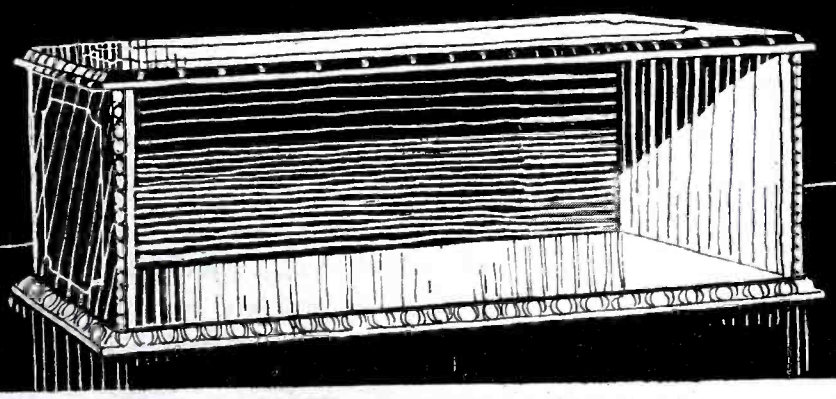

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Manufacturers
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The "Hot Spot" Fourteen

(*Continued from page* 105)

by means of transformers. The design of these transformers is such that three may be used without any of the instability and tendency toward audio oscillation usually encountered where this number of transformers is used. So stable is this amplifier that it requires no doctoring with shunt condensers, shunt resistances, etc.

Across one of the secondary windings a variable high resistance is employed. This is not in the way of "doctoring" but is for use solely as a volume control. To a certain extent the potentiometer which controls the grid potential of the intermediate amplifier tubes also serves as a volume control. However the main purpose of the potentiometer is to provide a control over sensitivity and for that reason a separate volume control is considered desirable. This resistance across the secondary of the second audio transformer, T13, serves this purpose and is mounted on the front panel of the receiver where it is readily accessible.

The quality of reproduction obtained from this receiver is indeed pleasing. This is largely accounted for by the design of the audio transformers which differ considerably from the fundamentals employed in the more usual transformer design.

Of the fourteen tubes employed in the receiver, eight are of the CX-299 type. These are the eight intermediate-frequency amplifier tubes. Tubes of the CX 301-A type are employed for the oscillator, the two detectors and the first two audio stages. In the last audio stage either a 112 or 371 type may be used. The latter is to be preferred because of its greater power handling ability.

In spite of the large number of tubes employed the filament current consumption for the entire receiver is only 2¼ amperes at 6 volts. This is not an inconveniently large drain and a storage battery and trickle charger combination will be adequate for the supply source. A ½ ampere trickle charger will keep the battery charged if the receiver is employed not more than four hours per day. If used more than this, a charger with a proportionately higher rate should be used.

The "B" current consumption is also surprisingly low for this large number of tubes. It runs about 35 milliamperes under normal conditions. This is increased somewhat if a power tube such as the 371 is used in the last audio stage.

The filaments of the six 5 volt tubes are regulated through the rheostats R1 and R4. These rheostats need be ad-

justed only once and thereafter may be left untouched. The eight 3 volt tubes are served through a fixed resistance and rheostat connected in series. The purpose of the fixed resistance is to prevent the voltage on these filaments from going over 3.5 volts, even should the rheostat be turned up full.

The filament supply for the eight intermediate amplifier tubes is the only variable one, and for that reason the rheostat in this circuit, R3, is the only one included on the front panel. R1, R2 and R4 are mounted within the receiver, on the sub-panel. As an aid in maintaining the 3 volt tubes at the normal filament voltage the voltmeter M1 has been included on the front panel. This meter also shows the total "B" voltage applied to the receiver. To permit the operator to keep a visual check on the action of the receiver at all times a milliammeter with a range of 0 to 100 milliamperes is also included on the front panel.

The assembly of the receiver, and the wiring, are both surprisingly simple, considering the complexity of the circuit and the number of tubes used. All of the transformers and the tubes are mounted on a sub-panel and this sub-panel is completely wired up before it is attached to the front panel. The careful attention put into the design of the layout has resulted in much saving of time and labor. About half of the connections between instruments on the sub-panel do not require any wire at all but instead are completed by means of soldering lugs alone.

All of the connections leading from instruments on the sub-panel to instruments on the front panel are made to terminate in soldering lugs at the front edge of the sub-panel. This permits the complete wiring of the sub-panel as a unit. Then, after this sub-panel has been mounted on the baseboard, connections are run from these terminals to their eventual destination on the front panel.

It will be noted that all of the wiring is done beneath the sub-panel. To make this possible the mounting screws of all the instruments on the sub-panel also serve as connection terminals, thus extending all of the terminals through the panel without the necessity for bringing any of the wiring through to the top.

The illustration will give an exact idea of the location of the various instruments and of the construction as a whole and there should be no difficulty whatsoever in following this layout. In the wiring of the sub-panel it is well to wire all the plates and grid circuits first and follow these by the filament bus lines which extend nearly the whole length of the panel. If this wiring has all been kept down close to the sub-panel there will be plenty of room for the other miscellaneous wiring, without any chances for short circuits, etc.

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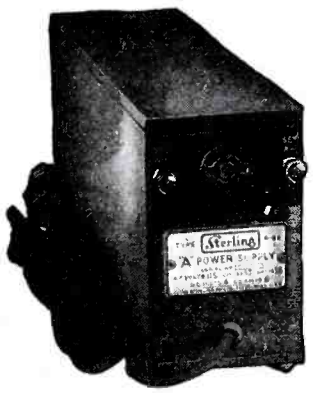
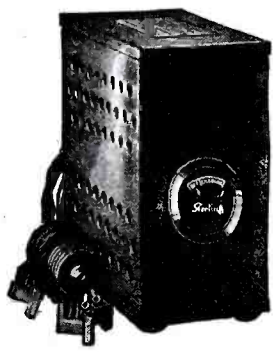


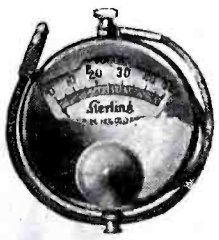
"A" Power R-94

For Radiolas and other 4-volt requirements. Also two 6-volt "A" Power Units.



Double Automatic "A" Battery Charger R-109

Starts when battery is low, stops when battery is full.



Sterling Pocket Meters

For every radio need—ammeters, voltmeters, voltameters.

–for TONE that will AMAZE you
–for POWER that is PERMANENT

YOUR set may give you good results when batteries are fresh and strong, but its performance will reach new heights when it is operating by Sterling full-powered "A" and "B" units connected to your light socket. And, it will be *always* ready.

For as little as $28.50, you can now equip your set with the improved Sterling "B" Socket Power Unit that not only does away with "B" batteries, but, because of its added feature of *exact current regulation,* brings out far finer tone quality than is obtained with the fixed units of "B" battery power.

Likewise, a Sterling "A" Socket Power Unit brings you steady, never failing "A" filament current. With these Sterling "A" and "B" Socket Power Units, complete control is reduced to one single switch.

Investigate Sterling Power Units. Hear the difference they make to reception, then think of the freedom from battery bother that will be yours when you install them. Remember, Sterling Power Units are backed by 21 years of electrical reliability and experience —your assurance of quality products throughout.

A Sterling Demonstration will be a Revelation. Your Dealer will prove it.

Sterling
Socket Power Units

THE STERLING MFG. COMPANY, 2831 PROSPECT AVE., CLEVELAND

Raytheon *Light-Socket Your Set the Sterling Way*

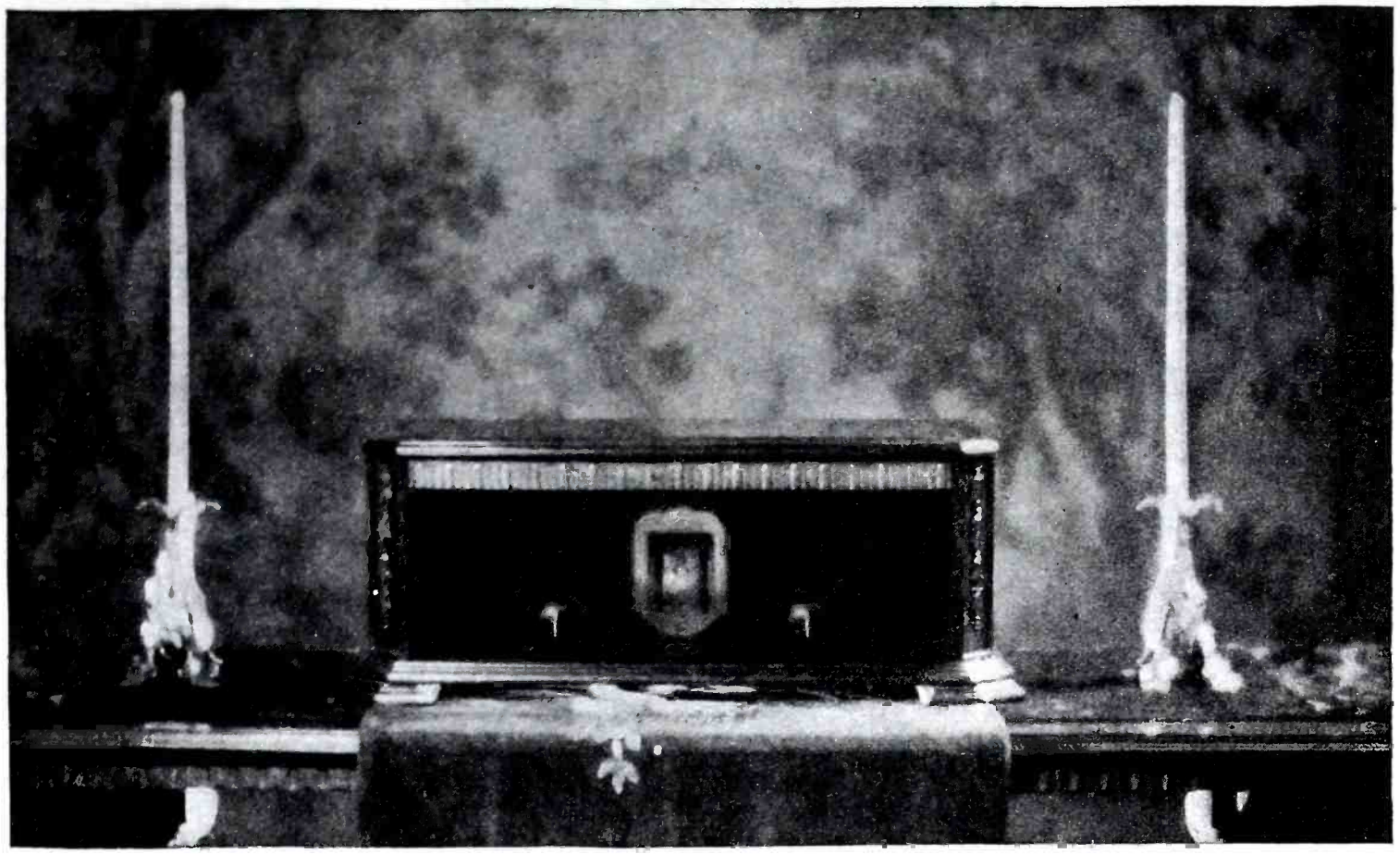
The operation of the receiver is like that of any other super-heterodyne. The fact that it has more intermediate frequency stages makes no difference in the tuning. All tuning is accomplished by means of the two vernier dials, the oscillator tuning on the left and the loop tuning dial on the right. Between these is found the knob which controls the amount of regeneration employed in the loop circuit. This latter is readily regulated as needed and when a high degree of regeneration is used there is a noticable increase in the sensitivity and volume, particularly on very weak signals. For local reception this regeneration control can be turned to minimum, of course, as there is no need for employing this feature except in the case of most difficult, distant reception.

The three knobs to the right of the tuning controls are for sensitivity, volume and intermediate amplifier filament control. These are used for the purposes indicated by the foregoing designations.

The source of power supply for this receiver may be the same source that would be used for any other good receiver. The "A" battery and charger have been mentioned above. The "B" supply may be obtained from batteries or from an eliminator. The latter is to be preferred, particularly if a 371 type power tube is used in the last audio stage. It will be found that a "B" eliminator is more economical than batteries.

The receiver is designed for use with a loop antenna exclusively. The sensitivity is so great that there is no occasion to use an antenna of any other type.

When this receiver is finished and mounted in a neat console or cabinet, it is an instrument of which the builder or owner may well be proud. Not only insofar as appearance goes, but also because of its extreme efficiency; its ability to step out and haul in those distant stations.



The New Improved Hi-Q Six—the creation of ten foremost American Radio Engineers — a receiving instrument that is far in advance of its time.

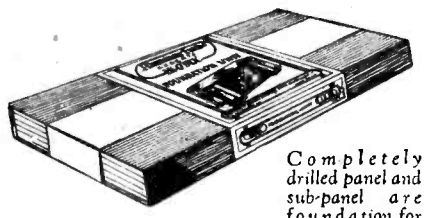
Exclusively CUSTOM-BUILT

By Yourself at Home . . . from our Simple Instructions . . . and at Great Savings!

No ordinary standards can be applied to this latest improved Hammarlund-Roberts Receiver, for it is the result of a determination to produce America's very finest instrument—absolutely regardless of cost!

Every modern constructional feature has been incorporated. Each part is the most efficient known to radio science, and the entire group has been purposely selected for perfect synchronization.

Complete isolation of four tuned circuits plus Automatic Variable Coupling effects maximum and uniform amplification over the entire wave band. Distortion is totally eliminated. Oscillation is utterly absent. Symphonic transformers and a power tube faithfully reproduce the full musical scale. Selectivity, even in crowded areas, is something to marvel at. And tonal quality simply MUST be heard to be appreciated!



Completely drilled panel and sub-panel are foundation for easy building.

Such a set, factory made, and sold through usual channels, would possibly cost around $300.00, but, through following our simple instructions, you can purchase all parts for only $95.80 and build this supreme receiver yourself — a CUSTOM BUILT set which gives you CUSTOM BUILT results at a saving of $100 to $150.

Get the complete Hi-Q Instruction Book from your dealer—or write us direct. Price 25 cents.

Hammarlund ROBERTS Hi-Q* SIX

HAMMARLUND-ROBERTS INC. 1182-Z Broadway New York City

Associate Manufacturers

YAXLEY Samson Carter DURHAM SAMSON Hammarlund AMPERITE ACME EBY MICARTA BENJAMIN

How to Build the Intertrol Five

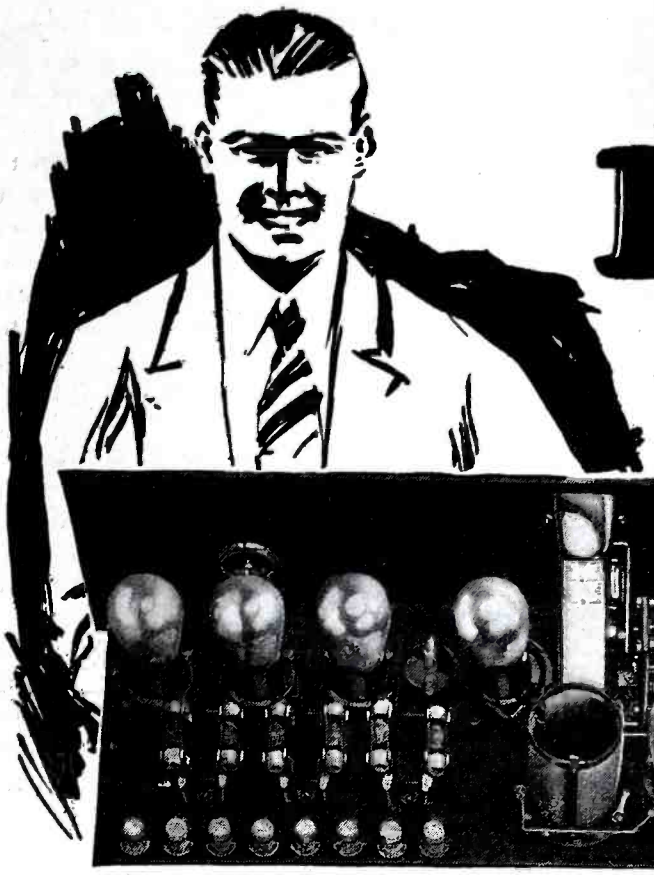
(*Continued from page* 116)

each end of the panel. These give the exact position of the shielding and in turn the shielding gives the height of the condenser shaft holes. The brackets are next fastened. Then the sockets are mounted on the sub-panel. The sockets located within the shields are raised about 7/8" above the sub-panel, using 1¼" machine screws. Lock nuts are used to hold the sockets at the desired position. Raising these two sockets prevents the possibility of a short-circuit through the bottom shields and in the case of the detector tube, gives an additional cushioning effect. After mounting all the sockets, the transformer, audio chokes and 30 henry choke are mounted. Next the R. F. chokes are put in place and the fixed condensers are mounted. The Variodenser and the by-pass condensers are also mounted at this time. The Amperites are then placed directly in back of the sockets. The next step is to center punch and drill holes in the panel for the variable condensers, two switches and variable resistances. The two variable condensers with their auto-couple coils are securely fastened to the panel, using two flat-headed screws for each condenser. The grid by-pass condenser is fastened horizontally to the variable condenser, as shown in the top-view illustration. The grid leak is mounted above the grid condenser by means of clips provided for this purpose. The binding posts and the tip jacks are then mounted. Finally the condensers C_5, C_7 and C_9 are fastened beneath the panel and also the cable mounting, CM.

In wiring the set, flexible Acme Celatsite is used, all wiring being done beneath the panel, as far as possible. Kester rosin core solder is recommended for all soldering. After the wiring has been completed, the dials are fastened in place and the set should be put in the cabinet to protect it from dust or possible injury.

If the "Intertrol Five" is to be used with ordinary "B" batteries instead of an eliminator, resistance R_{10} is not required, and in fact should not be used. R_{10} prevents motor-boating where an eliminator is used.

The secondary of the auto-couple coil L_1 is shown connected to A—. This is correct, where a special detector tube is used, but if a general purpose "A" type tube is used at V_2, the connection should theoretically go to A+ instead of A—. In actual practice, however, there does not seem to be much difference, except that there is a slight reduction of volume when the A— connection is used with the general purpose tube.



AERO-SEVEN RECEIVER

10-Kilocycle Selectivity

Utilizing New 340 Tubes

Electric, A. C. or Battery Operation

THE Aero-Seven Receiver, which is being featured in the prominent radio magazines and newspapers, 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 resistance-coupled 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.

The Aero-Seven 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.

The extremely sharp selectivity of the Aero-Seven circuit is due to the low resistance of the coils. The high voltage gain per stage, due to the extremely low loss construction, assures extreme distant reception and greatest volume and sensitivity is assured through the high efficiency of the coil windings.

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.

Resistance Coupled Audio Amplification

Resistance coupled audio amplification in the Aero-7 attains a quality of reproduction unapproachable in other systems. It preserves the extraordinary quality consistently achieved by Aero-7's 10-kilocycle selectivity.

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.
Resistance coupled amplification.
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.

See article in this issue on the A C Model

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.

The Aero-Seven-tube Receiver assures you of the very latest in radio. It has everything—beautiful tone, 10 kilocycle selectivity—extreme long range and a volume at your command that can be raised to music-hall proportion or lowered to slumbering whispers. The particularly meritorious application of resistance coupling creates a most remarkable tone. It gives you a receiver that is in a class all its own—a real conqueror of space—a companion that you can depend upon absolutely in any emergency. It delivers quality that is quality, and yet its construction is so low in cost as to be almost unbelievable.

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 or jobber cannot supply you, order direct giving your dealer's name and we will see that you are supplied promptly.

A booklet of assembly and operating instructions with complete data is furnished, which makes it both practical and easy to build this circuit quickly. Build yours early—get the jump on the other fellow.

Get the facts. Mail the coupon for this valuable booklet. Send today—NOW!

Aero Products Inc.
Dept. 110 1768 Wilson Ave., Chicago.

Dear Sirs: Please send me construction data and all the facts in building the new Aero-Seven Receiver.

Name .....

Address .....

Get the Facts—MAIL NOW →

AERO PRODUCTS, INC.
1768 Wilson Ave., Dept. 110 Chicago, U. S. A.

ASSOCIATED MANUFACTURERS—AMSCO, AERO, CARTER, WESTINGHOUSE-MICARTA, SILVER-MARSHALL, X-L.

The Self-Shielded Six

(*Continued from page* 124)

In addition to its high power-handling ability this amplifier provides excellent tone quality and does not require the high voltage used with resistance coupling; moreover, the volume obtained with the three stages is tremendous. An output filter is included in the plate circuit of the last tube to protect the loudspeaker winding from the heavy power tube plate current. The three audio tubes receive their filament supply through a single automatic filament control unit and a separate unit of this type is provided for the control of the detector tube.

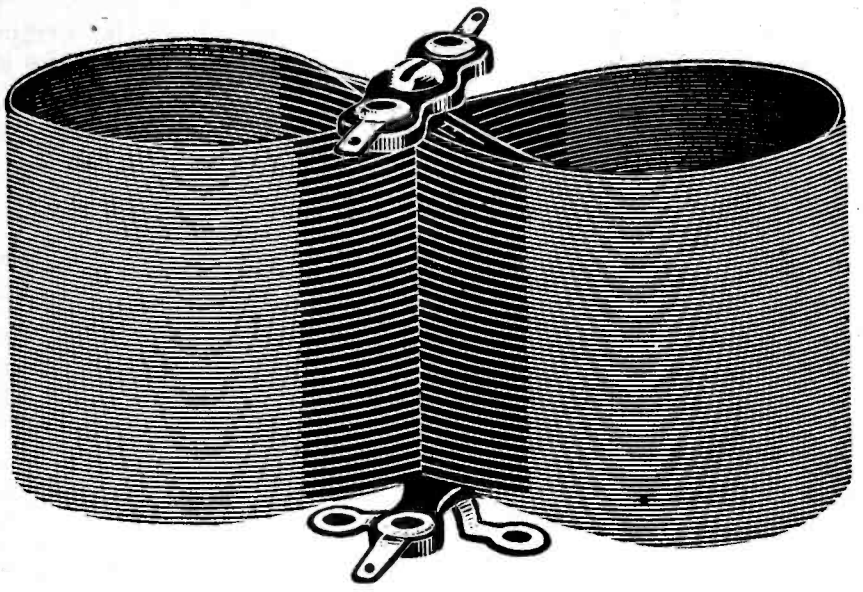
The baseboard layout diagram will give all the information necessary to duplicate the model Self-Shielded Six receiver previously pictured. It will be noted that the radio-frequency and detector portions of the receiver occupy the whole front of the baseboard. This permits wide spacing between the coils and thus decreases the possibility for undesirable interstage coupling. The first R. F. stage is located at the front right-hand corner of the baseboard while the second and third tuned circuits are located in the middle and at the left respectively. Thus the incoming signal progresses from right to left as it passes along to successive stages, until it reaches the detector. There it doubles back and passes through the three audio stages, winding up at the rear right-hand corner. The tubes in the row, leading from left to right, are: detector, 2nd R. F., 1st audio, 2nd audio and 3rd audio. The single tube toward the front is the 1st R. F. tube.

The coils, tandem condenser and tubes of the 2nd R. F. and detector stages have been laid out in a symmetrical position in an effort to keep the circuit values approximately alike. This is desirable because any great discrepancy between them would result in slightly different tuning and therefore poor efficiency from the tandem control system.

In wiring the receiver there are no special instructions to be given. It will probably be found best to first perform the wiring which necessitates wires running from back to front, and keep these wires as low down as possible. The terminal strips provided with the A. F. coupling units permit their connection directly to the corresponding tube terminals, which simplifies this part of the wiring. In general it is best to keep all wires as close to the baseboard as possible, except the grid and plate leads and these should be run as direct as possible, particularly in the R. F. circuits.

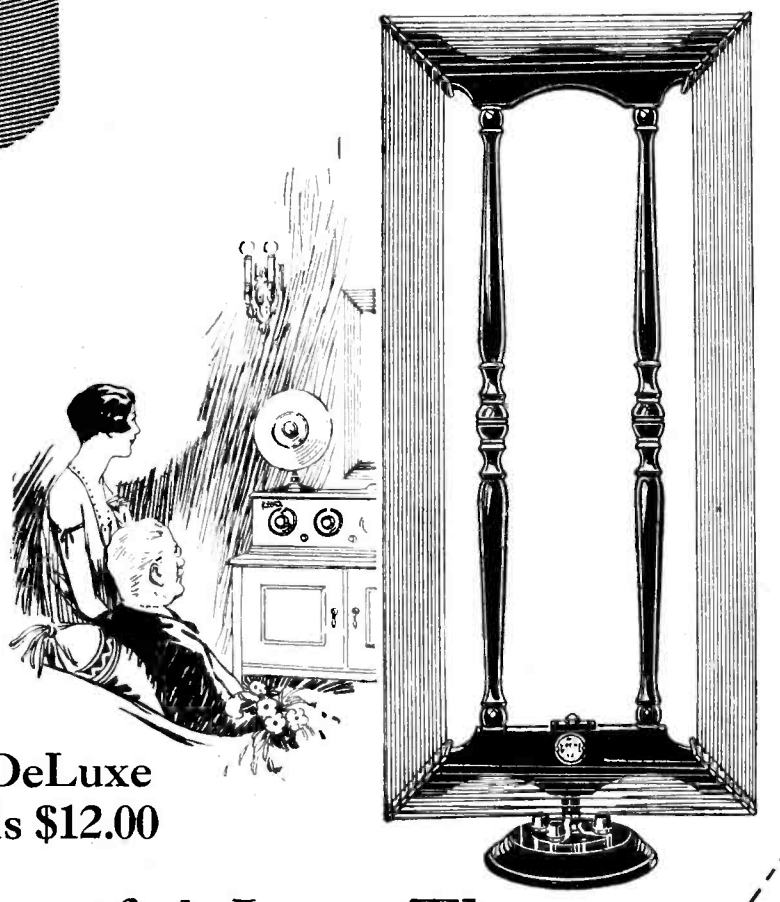
If the constructor studies the accompanying diagrams and photos, no difficulty will be experienced in actually wiring the set.

Twin-Eight Coils Specified for the Self-Shielded Six



Twin-Eight Coils
$2.00 Each
3 Matched Coils
$6.00

Tune out interference and secure great volume with marvelous tone quality.



All DeLuxe Models $12.00

Because of Amazing Selectivity, Stupendous Amplification, Unequaled Tone Quality

Due to the unique winding of Bodine Twin-Eight Radio Frequency Transformers, they provide outstanding selectivity with an amplification per stage heretofore undreamed of. Because of its self-contained magnetic field, losses due to interference from adjacent coils and other apparatus are avoided. Control of oscillation is quite simple even with three stages of tuned radio frequency. No energy is lost. Unusual selectivity also results from close magnetic field. The resulting sharp tuning adds a new thrill to radio reception.

Select a Circuit That Uses Twin-Eights

Bodine Twin-Eight Coils can be used with any T. R. F. circuit. Their selection for a circuit is evidence of the quality of the circuit itself. When you build a set, it is safe to follow the instructions of the man who recommends Twin-Eight Coils.

Rejuvenate Your Old Set

Replace the R. F. coils in your old set with Bodine Twin-Eight Coils. Enjoy the thrill of receiving long distance stations on the loud speaker.

A Beautiful Loop That is Remarkably Efficient

Today beauty is essential in a radio loop. The Bodine DeLuxe Loop combines harmonious beauty with remarkable efficiency and selectivity. The solid hand-rubbed walnut frame is a pleasing bit of exquisite furniture. The beautiful silk-covered winding harmonizes perfectly with the frame. The complete unit enhances the most artistically furnished room.

Brings in Long Distance Stations

The pickup of the DeLuxe Loop is thoroughly remarkable. It brings in long distance stations with great volume. It is a great aid in tuning and thus improves tone quality.

A unique feature of the DeLuxe Loop is a plug and jack mounting which permits it to be mounted on the set, thus eliminating trailing connecting wires. The loop may be rotated continuously in either direction without disturbing connections. Provision is made for keeping the wires taut so that the loop looks neat and attractive.

Order a Bodine DeLuxe Loop today. If your dealer cannot supply you, mail your order direct, enclosing remittance of $12.00, and specifying the capacity of condenser for which the loop will be used.

MAIL THIS COUPON

for free constructional articles showing how to use Bodine Twin-Eight Coils, and also how to use the Bodine DeLuxe Loop with tuned radio frequency receivers.

Bodine Electric Company,
2262 West Ohio Street,
Chicago, Illinois.

Name .....

Address .....

A cable plug is used to provide all connections between the receiver and the batteries. The color code marked on the code tag which accompanies the plug is followed except that the black lead is used for the C— 40 volt connection instead of the ground and the brown lead is used for the B+180 volt lead instead of for the antenna. Binding posts are provided for the antenna and ground connections.

After the receiver wiring has been completed and checked the receiver may be set up for operation. Connect the cable ends to their respective terminals on the batteries before the cable plug is slipped over its mounting socket on the baseboard. Then insert a CX 300-A detector tube in the first socket from the left-hand end of the baseboard (looking at the receiver from the front). If the rheostat knob is now turned slightly so as to engage the battery switch which is incorporated in the rheostat, this tube should light to normal brilliancy. Then turn the rheostat knob all the way off in a counter-clockwise direction and insert CX 301-A tubes in all of the other sockets except the one at the extreme right, in which position a CX 371 tube should be used. Do not turn the rheostat knob on until all five of the other tubes are in position because unless both the R. F. tubes and all three audio tubes are in their sockets before the current is turned on, the tubes that are in place will be subjected to abnormally high filament current and may be damaged. For this same reason the filament switch should always be turned off when changing tubes around or when a tube is withdrawn for any reason.

The antenna and ground are connected to the binding posts provided at the right hand end of the baseboard and the loudspeaker tips should be inserted in the tip jacks provided on the same strip with the antenna and ground binding posts. The adjustment screw of the antenna series condenser C7 should at first be turned down as far as it will go without forcing.

The receiver is now ready to be put into operation. The rheostat is turned about half way to the right from the off position and the knob of the high resistance R4 is turned to the right as far as it will readily turn. Then the two tuning dials are rotated together until a station is heard, preferably one down around 35 or 40 on the dials. If a heterodyne whistle is heard instead of broadcast signals, turn the high resistance knob to the left until the whistle stops and at this point the signals from the broadcast station will be clearly heard. Then proceed to tune in several stations to get the "feel" of the tuning and operation.

It will be noted that volume can be controlled by either of the knobs which control R1 and R4. R4 should be set

Bremer-Tully Discard Old Standards of Comparison

THREE WINNERS

B-T Speaker Coupler Guarantees Improved Tone, Increased Volume, and Saves Speaker's Life.

Here's a real answer to Distortion,—the B-T Audio Coupler.

B-T "A" Transformer Makes a Power-Six "Electric"

Six Years' Success Back These New Products

Bremer-Tully have released a new product which should create world-wide discussion.

The old idea of "Amplification Curves" as a basis for comparing audio transformers has been discarded. *It never was anything more than a very secondary matter.*

B-T have always maintained that the real problem was "Harmonic Distortion,"—and—

Now *they have proved it* in the new B-T AUDIO COUPLER.

It is more than a transformer,—and better,—although no one has ever produced a better transformer than BREMER-TULLY.

A constant Impedance Core,—an air-gap,—Tertiary Loading Coil,—and finest laminations, combine to produce UNEQUALLED QUALITY in any product, regardless of size or price.

"Harmonic Distortion" has had practically no attention,—the attempts being to improve transformers by *increased size, cast cores,* etc. You can readily appreciate that BREMER-TULLY could not release this product if it was not superior.

Type 3-31 is for First Stage; Type 2-22 for second stage or for all stages where three stages are used,—as in replacing Resistance Coupling. Bring your set up to date with a set. Price each, $6.00.

Read more in BETTER TUNING—See Coupon.

BETTER TUNING is a booklet of 80 pages answering the latest questions in radio. Thousands praise it, and profit by it.

SEND THE COUPON.

Bremer Tully

The POWER-SIX "Electric"

Everyone knows the record of the B-T Power Six.

You can now run yours from the light-socket, without batteries.

Use the new B-T "A" Transformer, instead of storage battery and charger. Price $7.50.

Complete Diagrams and Instructions for making the change or building a new electric set, $1.00.

This is what you've been waiting for.

The Speaker Coupler

Put a B-T Speaker Coupler between your power tube and speaker and improve reception wonderfully. The difference is amazing.

You will get Better Tone, and particularly with air column speakers or horns, much Greater Volume.

You will protect your speaker from heavy current flow and prolong its life.

You can match your speaker and power tube through various combinations, as shown, without the use of tools. Simply insert cord tips.

Speaker Coupler, suitable for table use, or may be mounted inside cabinet. Price $7.50.

520 So. CANAL BREMER-TULLY MFG. CO. CHICAGO, ILL.

COUPON

Send 80-page Booklet.

I am interested in Sets ..... Parts .....

I am a Dealer ..... Consumer ..... or .....

Print Name .....

Address .....

once and should be left at that adjustment thereafter. To find its best adjustment, tune in a fairly distant station at about 300 meters and turn the rheostat knob about three-quarters of the way to the right. Then turn the right hand control knob until the receiver is just below the oscillation point. This will usually be the best position at which to leave this knob. Thereafter all control of volume and sensitivity is obtained through the knob of the rheostat.

The Light-Socket Operated World's Record Super Ten

(*Continued from page* 119)

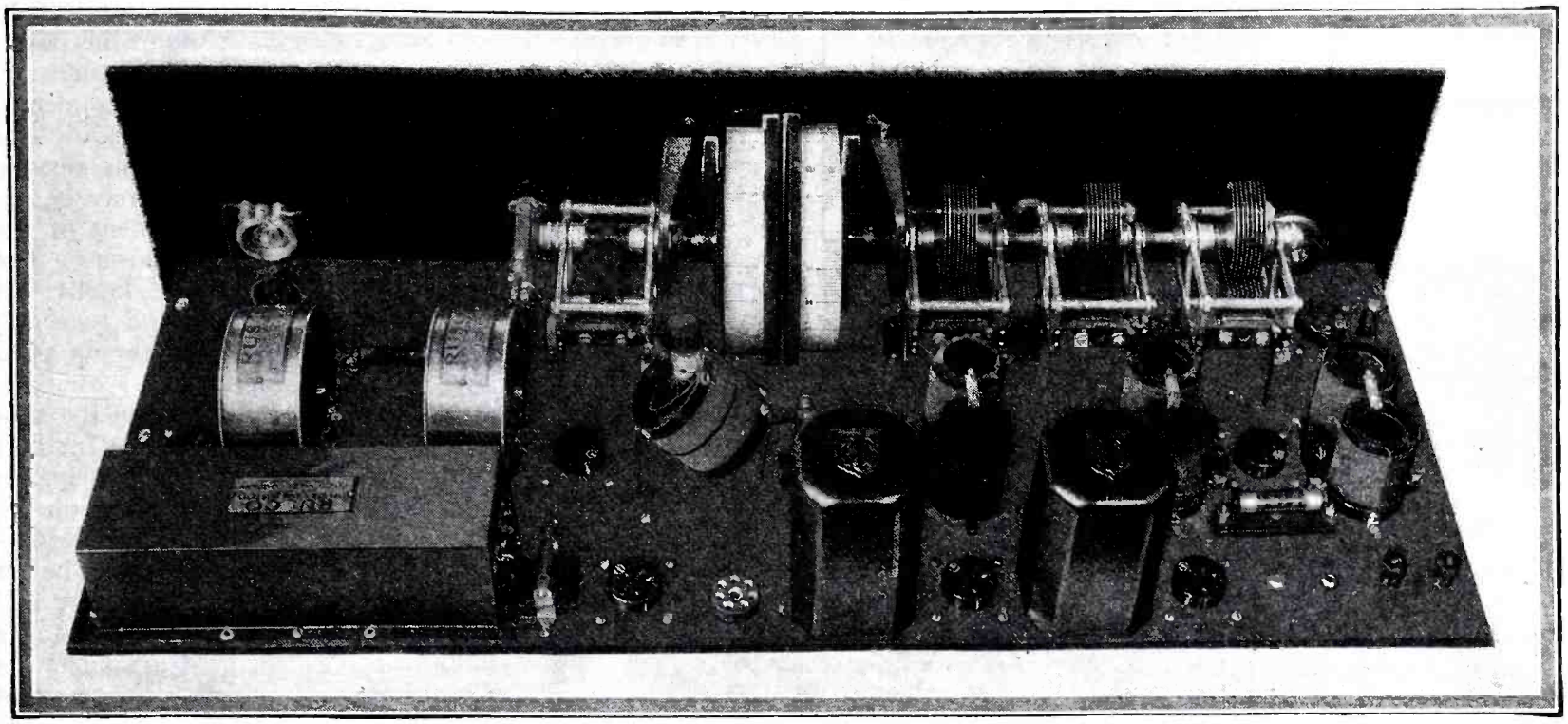
conjunction with a suitable condenser bank. Filament power for the CX 310 amplifier tube of the receiver and for the nine A.C. tubes is obtained from a special filament transformer delivering 4 volts, by means of 1.5 and 2.5 volt windings in series, and 7.5 volts. All of these parts are illustrated in the assembly view photograph herewith in which can also be seen the three low value resistances of the voltage divider, the larger 7,200 ohm resistance being fastened beneath the chassis. On the binding post strip are the six power unit connections, the left two being 4 volt AC, the next pair 7.5 volt AC, followed by B—, B+45, B+90, and B+450. No C bias taps are taken out as these are obtained through resistance drops either in the receiver or in the power unit itself.

This power unit which is 17½ inches long, 5½ inches wide, and 7½ inches deep, connects to the receiver by means of a Multi-Plug and cord and furnishes absolutely all power to the set, no batteries being required and the power unit operating only when the set is turned on.

The assembly of the receiver will be made clear by a reference to the drawings and photographs both herewith and in the previous issue of RADIO REVIEW. The assembly of the power unit is very simple and is well illustrated in the photograph and schematic diagram and should involve no special difficulties. The small Ward-Leonard resistors are mounted upon the chassis, using long machine screws and nuts, with fibre washers to keep them clear of the chassis. The larger resistor is mounted beneath the chassis by means of ¾ inch spacing collars and the dummy mounting lugs found at the extreme ends.

Once the receiver has been assembled, the testing and operation is very simple, indeed. The four A power leads of the Jones cable should be connected to the proper binding posts of the power unit, tubes inserted in the

Camfield Super-Selective "10"
2 DIAL CONTROL



Showing Complete Built-up Camfield 10 Receiver

CAMFIELD has again come to the front with a 10-tube super selective circuit of exceptional merit, possessing many features never before incorporated in a radio receiving set. It is a simplified receiver, having two easily operated drum dial controls. Another feature is that it may be operated as a six-tube radio frequency set, or as a ten-tube super selective receiver, by the simple turn of a switch on the front panel.

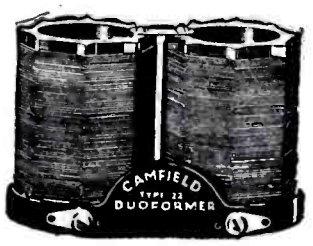
Again the famous Rusco Band Pass Filter in the intermediate frequency amplifier comes to the front as one of the most remarkable things in radio. This Filter is designed to pass a band of frequencies 10 kilocycles wide. The amplification over this band is uniform and the cut-off on either side is extremely sharp. The result is perfect selectivity between wave bands of only 10 kilocycle separation in the frequency. The uniform amplification over the band maintains perfect tone quality. The selectivity of this device is so perfect that it permits the use of radio frequency amplification ahead of the super and the operation of the set on an antenna, making it one of the most sensitive receivers ever developed. This makes possible the simultaneous increasing of both sensitivity and selectivity to a degree heretofore unknown.

This new circuit embodies all the latest improvements—simplified control by means of two Tyrman Drum Dials, Tyrman Audio Transformers, Camfield Condensers, Rusco Band Pass Filters and especially selected parts to make a perfectly balanced receiver of the highest quality yet available at a very modest price. It is easy to construct and simple to operate and will outperform any radio set you have ever used.

Prices—Camfield Products

Type		Capacity	Price
151	(Single)	.00015	$ 5.00
251	(Single)	.00025	5.50
252	(Two-Gang)	.00025	10.00
253	(Three-Gang)	.00025	14.00
351	(Single)	.00035	5.75
352	(Two-Gang)	.00035	10.50
353	(Three-Gang)	.00035	15.00
354	(Four-Gang)	.00035	18.00
355	(Five-Gang)	.00035	21.00
501	(Single)	.0005	6.00
502	(Two-Gang)	.0005	11.50
503	(Three-Gang)	.0005	16.00
11	Mounting Brackets (per pair)		.25
22K	(Duoformer Kit)		10.00
620	(Coupling Unit)		3.50

TYPE 22R DUOFORMER



Kit of Three Matched Duoformers, $10

The following features of the Camfield Equaltune Condensers are not to be found in any other one Condenser on the market:

1. To facilitate sharp tuning and perfect balancing in sets of the unit-control type, condensers are adjustable, which makes possible the perfect equalization of all circuits after the receiver has been completely wired. This eliminates use of vernier or trimmer condensers. Complete instructions and a special tool for making adjustment are packed with each double and three-gang condenser.
2. The shaft may be shortened or lengthened or entirely removed without affecting the adjustment of the rotor plates. This provides a simple means for connecting several units together with a single shaft anywhere from one to six condenser units may be operated with one dial.
3. May be mounted from either end by reversing the shaft cap nut and the panel mounting nut. After shaft cap nut has been removed, shaft may be extended from opposite end of condenser by loosening set screws on rotor hub.
4. A variable spring tension is provided and the rotor is mounted on ball bearings which insure extremely smooth running over a long period.
5. Beautifully finished. Rotor and stator plates are of bright dipped brass. All other parts are hand buffed and nickel plated.
6. A pair of special brackets for mounting condensers on base-board or sub-panel furnished at a slight additional cost. With the use of these backets, several single condensers may be mounted in a row on a base-board or sub-panel and all operated with a single shaft.

"A Tribute to a Leader"

Camfield Equaltune Condensers are the unanimous choice of discriminating manufacturers, jobbers, dealers and set builders. There is proof of this in the fact that they are being officially specified in the following circuits for the 1927-28 season:

Camfield Super-Selective 9 and 10.
The Tyrman Ten.
Madison Moore Super.
Madison Moore AC Operated Radio Frequency Circuit.
Citizens Super 8.
Camfield Duoformer 7.
Camfield Shield-Plate 7.
The New St. James U240.
Camfield Duoformer 5.
Thompson Super 7.
Hagerman's Organtone.
Dar-Mac Nine.
Strobodyne.
And Many others.

On actual demonstration the Camfield Super-Selective 9 will out-perform any other receiver. Its exclusive features mean real service and satisfaction to the man who builds his own. Do not pass up this wonderful opportunity. Set Builders in all parts of the country who have built the Camfield Super-Selective 9 are enthusiastic. We stand back of this circuit and are ready to help you in every way. If you have any special questions regarding this circuit we will welcome a personal call or a letter from you. Either will receive our immediate attention.

Send for free booklet, "Wherever You Require Quality," or get complete parts from your jobber or dealer.

CAMFIELD RADIO MANUFACTURING CO.

35 E. WACKER DRIVE DEPT. LG1 CHICAGO, ILL.

MEMBER RMA

CAMFIELD RADIO MFG. CO.,
Dept. LG1, Chicago, Ill.

Please send me information on your Super-Selective "10," also on the new Shield-Plate Seven.

Name .....

Address .....

.....

receiver and power turned on (connections are made directly from the terminals of the voltmeter to the top heater leads of all Sovereign tubes, these heaters being connected in parallel). The rheostat in the receiver should be adjusted to give 2.75 or 3 volts on the Sovereign tubes which can be observed to glow slightly after a moment's operation. The CX 310 tube will light up. The remaining four connections may be made to the power unit, and the two CX 316B tubes inserted. If a loud speaker is connected to the receiver, the set is ready for operation, the two drum dials serving to tune in stations which may be intensified by proper adjustment of the small "Distance" condenser. The "Volume" and "Modifier" knobs will serve to control volume and tone and should never be turned so far up as to cause the RF amplifiers to oscillate. The 400 ohm grid rheostat on the subpanel should be adjusted once for best results on a weak station, bearing in mind that its adjustment reacts on the setting of the "Volume" and "Modifier" knobs. It should generally be set at approximately the half-way or 200 ohm position, and if a high resistance B eliminator voltmeter is available, the voltage across it should be measured and should be in the neighborhood of 1.5 to 4 volts for best operation, the proper value being determined by trial.

The La Peer AR-9

(*Continued form page* 111)

ate-frequency amplification, using this latter type of transformer, could be incorporated in a receiver an unusually high degree of sensitivity could be obtained. However, two stages seemed to be the maximum practical limit because more than this made the receiver unstable. The resulting regeneration in the intermediate-amplifier upset the whole receiver and made its operation unsatisfactory.

The La Peer intermediate-frequency transformers which have just been presented to the public under the name of the La Peer "D" radio-frequency coils seem not only to have attained this ideal but to go a step further inasmuch as no iron whatsoever is used in their core construction. They are coils of the air-core type and can be used in a three-stage intermediate-frequency amplifier and still provide perfectly adequate stability.

One reason for this stability lies in the fact that instead of having "scramble" windings as most transformers had in the past, or the honeycomb type of windings used in some transformers, the La Peer units are of the "D" coil type. That is, each turn of wire is in the form of a double

assemble the Ensco

"THE WORLD'S FINEST LOUD SPEAKER" in less than an hour

at a fraction of the cost!

The Three-Foot Pedestal

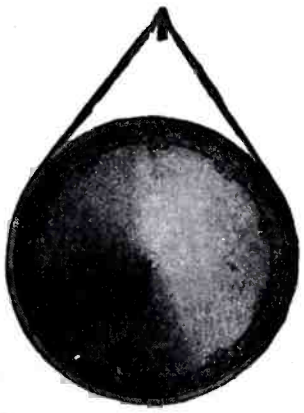
This new art model is beautifully finished in polychrome with a heavy metal base, making it practically impossible to tip over. Complete Kit, including pedestal. A practical, beautiful floor model.

Model F-175-36 .....$17.50
In Canada.....$22.50

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

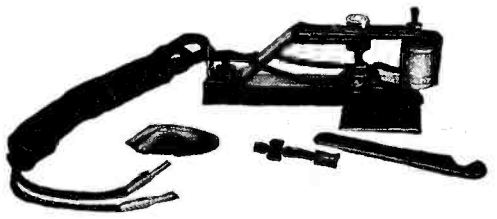
WHY pay a high price for a manufactured speaker when you can buy an "Ensco" Kit and assemble the "World's Finest Loud Speaker" at a fraction of the cost. No manufactured speaker, regardless of price, will give you any better reproduction.

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 screw driver and a pair of pliers, you can build the "Ensco" as perfectly as an expert mechanic. Within an hour from 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 "Ensco" 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 "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.

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 "Ensco" 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 "Ensco" 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.

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.

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(Send to nearest office)

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	U. S. Prices	Canada Prices
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3 foot " "	10.00	11.50
2 foot Wall Kit	11.00	12.50
3 foot " "	11.00	12.50
2 foot Pedestal Kit	13.50	17.50
3 foot " "	17.50	22.50

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Money Order
Cash (registered letter)
Send C. O. D.
(All shipping charges paid on Standard and Wall Kits only)

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Address.....

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

R.L.G.

D, with the flat sides of the D's toward each other. The result of this arrangement is a coil which has no external field. The lines of force circulate entirely within the coil winding and do not spread out to affect the coils in the other stages. In effect this type of coil provides practically perfect interstage shielding without the necessity for recourse to metal shielding. This limitation of undesirable interstage coupling naturally makes the amplifier unusually stable even with three stages.

Another unusual feature of the "D" coil transformers is that each transformer is individually tuned by means of a fixed condenser that is built into the transformer during manufacture. The purpose of this arrangement is to eliminate the element of doubt always present in obtaining exactly accurate fixed condensers of the required capacity in the open market, and to permit the accurate matching of the transformers at the factory without any possibility of this careful matching being subsequently upset during the assembly of the receiver.

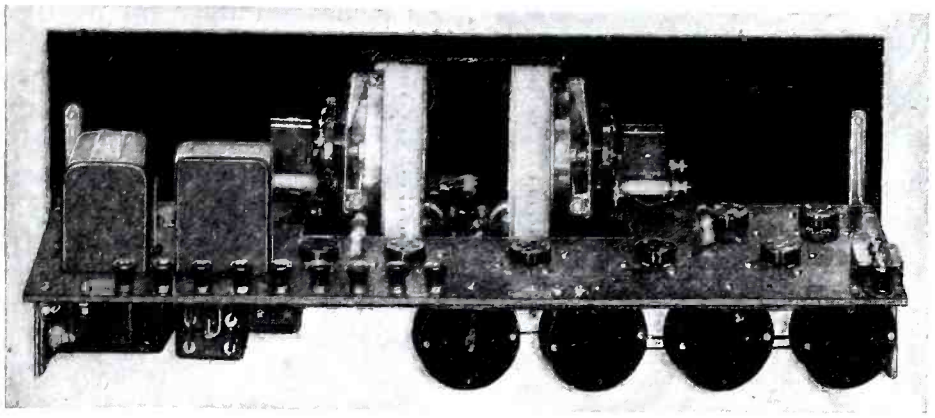
The design is also intended to cause each transformer to function as a ten kilocycle band-pass filter so that while it has a narrow resonance peak the curve will show a flat top. The purpose of this arrangement is to provide a high degree of selectivity but at the same time to prevent the selectivity reaching such a high degree that it will cut side-bands and thus cause distortion of the modulated signals.

With all this care taken to prevent distortion in the intermediate amplifier it is natural that the designers of the circuit for use with the "D" coils should follow this idea right through the detector and the audio-frequency amplifier. The use of a push-pull detector system is therefore an entirely consistent and logical move.

This detector system functions in much the same way as the push-pull audio amplification system with which most fans are familiar. The secondary of the detector input transformer has a split winding. The center tap functions as the common grid return for the two detector tubes while the extremities of the windings are connected to the grids of the two tubes, as shown in the schematic wiring diagram. The output of this dual second detector is obtained by connecting the plates of the two tubes in parallel and thence to the primary winding of the first audio transformer in the usual manner.

The employment of the push-pull idea is usually chosen for the sole purpose of preventing overloading of the tubes. Its use in this case is not for this alone however, but also to provide greater sensitivity to weak signals. It is frequently found that detector overloading is troublesome in receivers that provide an unusually high degree of

La Peer AR-9



New Construction Design

Main Parts Under Sub-Panel

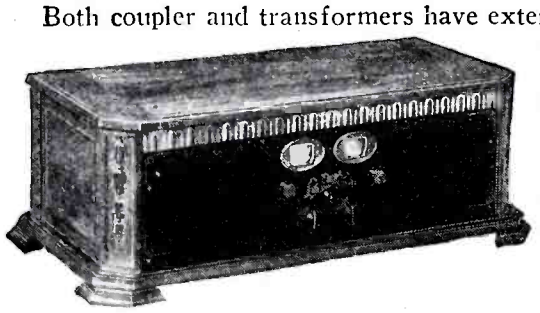
THE newest radio creation, the La Peer AR-9 receiver, is designed along new, scientific lines from parts of leading manufacturers, and embodying highly refined principles found in no other receiver. It has the appearance of a high class factory-built set and the performance of a radio engineering masterpiece.

The illustration above clearly shows why the La Peer AR-9 is different. Note that practically all the apparatus is mounted *underneath* the sub-panel, wiring thus being reduced to a minimum and leaving only the dials, condensers, tubes and audio transformers in view and keeping the R. F. transformers, wiring and minor apparatus hidden entirely, protecting these essential parts from handling, possible breakage and tinkering. Thus you have a complete set that looks and is clean cut, efficient and attractive.

Easiest Wiring Job on the Market

One of the really big surprises furnished by the La Peer AR-9 is the small amount of wiring required. This is due to the workmanlike sub-panel mounting. Most builders of multi-tube sets have a confusing maze of wiring to handle, whereas in the La Peer 9 about one-half the usual wire is used. Think of the greater stability this gives a set—and how much easier it is to build when direct connections can be made quickly and conveniently. There is a big saving in time and trouble.

Both coupler and transformers have extended grid and plate terminals which are connected *directly* to the terminals of the tube socket, thus assuring a direct, positive connection. The very heart of the La Peer AR-9 lies in the "D" shaped construction of the La Peer R. F. air core transformers. The windings are "D" shaped, the two "D's" facing each other and forming a closed magnetic circuit, assuring perfect selectivity and greatest amplification.



Showing built-up set in Fritts Cabinet

What "D" Coil Construction Means

"D" SHAPED construction means a completely confined field within the transformer itself, thus there is no effect on adjoining coils or circuit windings. These coils cannot be affected by outside influences or broadcast interference. The inherent shielding is so complete that you can place the La Peer AR-9 directly under the antenna of a high-powered broadcasting station and still not hear that station unless it is actually tuned in.

10 KC Separation

Another feature is that their low resistance and condenser tuned secondaries act as a 10 kilocycle band pass filter as well as an intermediate frequency amplifier. This produces hairline selectivity and perfect quality reception, powerful nearby stations being tuned out easily with one or two divisions of the oscillator dial.

Double Second Detector

Another interesting feature of the La Peer AR-9, found in no other receiver, is that the La Peer "D" transformers furnish a double second detector, because with their especially developed windings the exact center of the secondary coil is located and tapped. This tap goes to a grid bias of about 1½ to 3 volts. The "G" side of the transformer goes to the grid of the 1st tube of the 2nd detector and the "F" side to the grid of the 2nd tube. Thus the plates of both detector tubes are hooked in parallel and returned to the "P" of the 1st audio transformers.

There are no better parts and accessories to be had than those specified. The names speak for themselves: *La Peer, Remler, Silver-Marshall, Carter, Muter, Benjamin, X-L, Westinghouse Micarta* and *Fritts.*

Read the article in Radio Listeners' Guide and Call Book. Then build the La Peer AR-9 and enjoy reception of the highest order. Build now and you will forever be proud of this exceptional receiver. Your friends will wonder at its performance as much as you yourself.

Be the First to Possess Radio's Best

Your dealer or jobber has the parts. Get them now and get in on the ground floor of a real opportunity to possess radio's best.

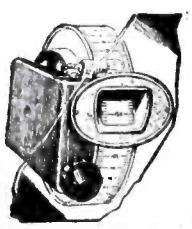
Write for full details. Jobbers and dealers, get our proposition at once.

LA PEER ELECTRICAL MFG. CO.

326-28 W. Madison St., Suite 604, Chicago, Ill.

Remler Condensers and Dials

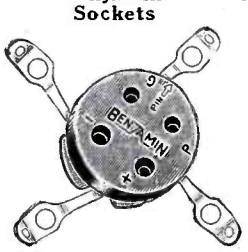
Silver-Marshall Transformers



Carter Parts

Muter Condensers

Benjamin Sockets



X-L Binding Posts

***REMEMBER:* "YOU CAN BUILD BETTER THAN YOU CAN BUY."**

radio amplification and therefore anything that can be done to prevent this trouble is well worth while, particularly if the sensitivity of the receiver can be improved in so doing.

Actually a normally sensitive detector is all that is needed in a superheterodyne receiver because if an incoming signal impulse is so weak that, when built up by the three intermediate amplifier stages it still requires the use of a sensitive second detector, it is likely that the signal is too weak to be picked up at all. But the use of a "C" bias on the grid of the detector does decrease detector sensitivity and the use of the push-pull scheme is intended to compensate for this. The grid bias on this tube also helps to prevent overloading and is therefore an aid to the push-pull scheme; from which it appears that the two ideas, which are here incorporated in one receiver as far as can be determined for the first time, are mutually helpful and therefore are beneficial to the receiver as a whole.

A careful observer of the schematic diagram of the La Peer AR-9 receiver might be inclined to criticize the use of a grid bias on the first detector tube because the absolute maximum of sensitivity is required at this, the threshold of the receiver. In the first place this tube does not truly function as a detector, but this point need not be gone into. The important fact is that the first detector circuit is regenerative and any sensitivity lost through the use of the grid bias is more than made up for by the regenerative amplification obtained. So here again the grid bias makes for fine quality while another feature is added (regeneration) to maintain the sensitivity.

Passing on to the oscillator circuit, one might be surprised at the use of a grid leak and condenser in this circuit. This feature was included in the circuit by the designers to reduce the plate current consumed by the oscillator tube. It will have to be agreed that this is a laudable idea because even where the "B" supply voltage is obtained from a "B" eliminator it is always worth while to keep the current drain down to a minimum.

Little need be said about the audio amplifier. The Silver-Marshall transformers employed are generally conceded to be above reproach so far as their quality and degree of audio amplification are concerned. To handle the output of this combination a 171 type power amplifier tube is naturally the logical tube for the last stage. And the plate voltage for this tube should be not less than about 180 volts if best results are to be obtained, both in quality and volume. Many fans seem to have the idea that with a lower plate voltage there will be less tendency toward overloading. In the case of the

(*Continued on page* 172)

WHOLESALE PRICES

--- For Dealers, Community Set Builders, General Repairmen and Agents ---

WE have just issued a new catalog with net prices to the radio trade. This company is Radio's oldest radio parts mail order house, and the new confidential discounts on standard Radio Merchandise are given only for resale purposes. We are ready now to appoint several thousand additional radio dealers and radio agents all over the country, so if you are contemplating going into the radio business, be sure to get in touch with us at once.

IN SENDING IN YOUR COMMUNICATION TO US, BE SURE TO USE YOUR LETTERHEAD.

In case you are not entitled to whole sale prices, address your request for our No. 17 Catalog to our Retail Department, and note that our retail prices are considerably less than current radio prices and less than those of most radio mail order supply houses.

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If you are in need of certain small radio parts that other radio and mail order houses do not bother to carry, get the Rasco parts catalog and you will find them there, anything from a screw to copper ribbon and telephone diaphragms, as well as thousands of other small radio findings. Just to mention a few:

Lugs, nuts, dials, vernier dials, jacks, plugs, every kind of knob, cords, panels, screws, sliders, washers, selenium, tinfoil, switches, crystals, cap nuts, Litz wire, cord tips, brass rods, resistances, name plates, spring binding posts, switch parts, metal ribbon, carbon balls, binding posts, all types, switch points, switch levers, lock washers, carbon grains, ground clamps, metal pointers, insulated tubing, low melting metal, antenna connectors, bus bar wire, as well as thousands of other articles.

We carry the Largest Variety of Small Radio Parts In the World.
BUT We also carry ALL standard radio merchandise.
ANYTHING IN RADIO

RADIO SPECIALTY CO.

102W PARK PLACE NEW YORK CITY, N. Y.

The Listeners' Accessory Guide

(*Continued from page* 130)

The advantages of this charger will appeal to the radio fan who has experienced the annoyance that comes from forgetting to switch his charger on or off, not to speak of the irksome necessity of fussing with switching-attachment plugs and improvised light-socket arrangements.

New 3-Foot Double Cone Speaker

The completed three-foot double cone speaker illustrated in the accompanying photos is furnished in kit form for home assembly and gives truly remarkable reproduction of tone.

In order to appreciate fully the simplicity of the design, the method of assembly is described in the following:

The parts included in this cone-speaker kit comprise a marked and decorated sheet of special paper for the front of cone, 38 x 38 inches; a marked sheet of special paper of the same size for the back of cone; the speaker unit; one back ring with latch, nuts, bolts and washers; edging braid; one cone apex assembly; rubber bumpers; adhesive tape; one loud-speaker unit mounting; and cement.

Illustrations courtesy G. R. P. Products Co., Inc.

The completed three-foot double cone speaker as it appears when completed.

The paper for the front and back faces of the cone should be removed from the mailing tube and flattened by

Thousands Use These Ingenious

TRANSMITTER UNITS

A marvel of engineering design—a practical miniature transmitter, used by thousands of radio fans and experimenters for amplification purposes.

Every amateur should have two or three of these amplifiers in his laboratory.

ENJOY LOUD SPEAKER OPERATION FROM A CRYSTAL

Everybody can do this now with a Skinderviken Unit.

The Skinderviken Unit is fastened to the diaphragm of the speaker unit. It will act as a "microphonic relay." Every time an incoming signal actuates the diaphragm, the electrical resistance of the microphone button will be varied correspondingly and the current from the battery, in series with the button and the loud speaker, will fluctuate accordingly.

LISTENING THROUGH WALLS

This Unit makes a highly sensitive detectaphone, the real thing—you listen through walls with ease. Plenty of fun and real detective work too.

CONDUCTING SOUND THROUGH WATER

Make yourself a miniature submarine signaling apparatus like those used during the war. Simple circuit with this microphone unit gives splendid results.

Send No Money—Just Mail the Coupon

THE SKINDERVIKEN TRANSMITTER UNIT

WE PAY YOU $5 for every new published use for this unit.

Experimenter - Capitalize your efforts! We Pay You for Your Work!

WE HAVE a Radio and Electric Unit that has been adapted to nearly 1000 uses. Its application to Radio, to Electrical phenomena and to many unusual and practical household uses is limitless. This Unit is essentially a very powerful amplifier in comparison to its size—it is also an efficient and desirable transmitter.

These units are, at the present time, used in numerous Radio Circuits, they are used for Radio Transmission, for Radio Amplification permitting the operation of a loud speaker from a crystal Receiver, for phonograph and loud speaker Amplification, for Stethoscopes, Detectaphones, Telephone Transmission, etc.

There still remain hundreds of undiscovered applications that can be developed by a little experimentation.

For every new use you develop for this marvelous unit which we accept and publish on this page, we offer $5.00 in CASH.

You don't have to know all about radio or electricity to win one of these $5.00 bills. To help you work, we send free with each unit a 12-page booklet which describes this simple unit in detail and illustrates with numerous diagrams many of its common uses.

Everyone has an even chance to win $5.00 or more. Waste no more time in experimentation. Make it pay you.

SEND NO MONEY

You need send us no money to get started. Just fill out the coupon below mentioning the number of units you desire. We will send them to you. You pay the postman 95c. each plus a few cents postage upon delivery. If you order two (2) you pay the postman only $1.75 plus postage. We include our 12-page booklet FREE.

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START NOW!

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Gentlemen: Please send me at once.....Skinderviken transmitter units for which I will pay the postman 95c. plus postage, or $1.75 plus postage if I order two units.

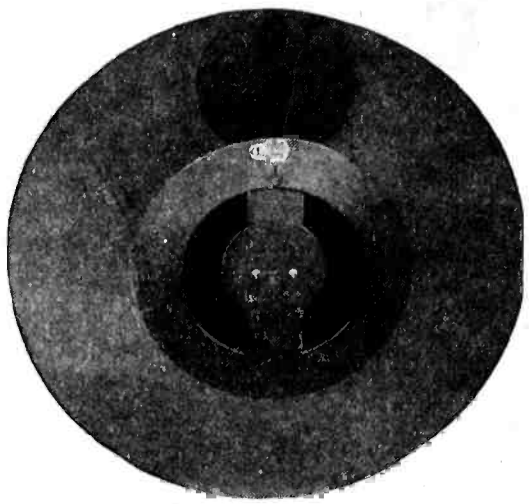
NAME .....

ADDRESS .....

CITY .....STATE.....

rolling them in the opposite way. In doing this great care must be exercised so as not to damage the paper by cracking.

The back sheet may be prepared by cutting along the solid lines with a sharp pair of shears. Next lay the paper for the front cone on the floor with



A back view of the three-foot double cone speaker showing the cut-out in the back cone and the latch on the back ring.

the decorated side down and cut out the V-shaped sector with a sharp knife.

When the two sheets have been prepared as described, place the front sheet on a smooth surface, such as a large table or floor, with the decorated-rough-side down, and place upon it the cut-out back bone, with the two smooth sides facing each other. Care should be taken to see that the edges of the back cone coincide with the dotted lines of the front cone; and the three arrow heads on the back cone, marked X, Y and Z, should meet those on the front cone. The two sheets of paper should be held in position with weights, such as heavy books, flatirons, or other objects with smooth surfaces, for the next operation.

At this stage of construction the two cone diaphragms are joined together with cement. With the forefinger of the left hand holding the back cone tightly against the front cone, so that the cement cannot seep between the two, slowly place a thin stream of cement around the circumference of the back cone.

The next step is to fasten the back ring in place. This is accomplished by spreading cement evenly over its outer ring, and then holding the ring in position with weights until dry. The back-ring latch may then be attached with brass bolts passed through the holes provided.

To form the cone, bring the two edges of the back ring together and close the latch (see photo of back view herewith). Lay the cone face down on a smooth hard surface, bring the two edges of the slit in the front cone tight up against one another and join them together on the inside of the cone with strips of adhesive fabric.

Before installing the speaker unit a small cone, about four inches in diame-

ter, should be made and fastened in the apex with cement, to reinforce the large cone, and then the apex piece is placed in position. The cross arm of the back ring should be attached and the loud-speaker unit mounted. The method of performing these four operations is obvious after examining the parts to be used.

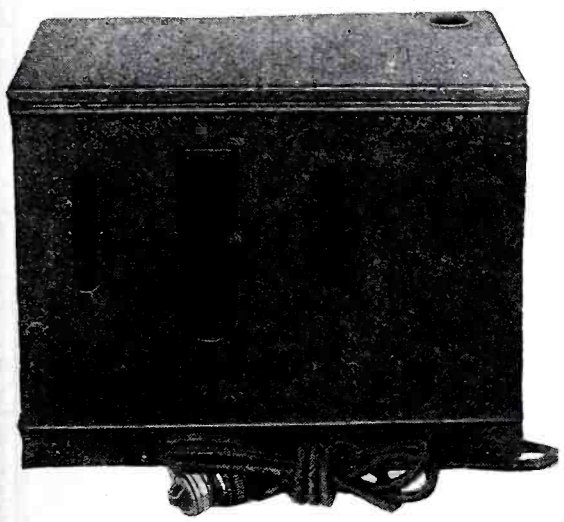
The finishing touches are made by screwing the rubber bumpers into the back ring, about three inches on each side of the back-ring latch, and fastening the binding braid around the circumference of the cone with cement—that is, half of it should be on the front and the other half on the back of the cone, and it should be held in position with clothes pins until the cement is dry.

When the loud speaker is finished it should be hung from a hook on the wall, about seven feet from the floor.

An "A-B" Socket-Power Unit

A complete "A" and "B" socket-power unit, capable of operating practically any radio receiver of from one to ten tubes, directly from an alternating-current lamp socket, is shown in the photo herewith. The device is exceptionally neat and compact, occupying little more room than is required by many storage batteries alone. The steel containing case is finished in an unobtrusive brown color, and over all is twelve inches long, eight wide and ten high. To install the instrument the radio set owner need only screw the attachment plug with which it is supplied into the nearest lamp socket or base receptacle, and then connect the "A" and "B" wires of his set to the binding posts provided for them on the terminal board inside the case.

This power-supply device, on the "A" side (which supplies the current that lights the filaments of the radio



Illustrations courtesy Briggs & Stratton Corp.

The socket-power unit as described herewith. The level of the electrolyte in the cells may be observed through the slots cut in the metal case.

tubes), employs a glass-jar storage battery which is charged during periods of radio-set idleness by an automatically - controlled, integral charging unit. Power is supplied to the radio receiver from the battery only; the A.C. house line is automatically shut off from the filament circuit during operation of the set.

The charger incorporated in the unit is not of the "trickle" type, but of considerably heavier current capacity. It is automatically turned on when the radio set is turned off; and the charging continues until the battery has been fully replenished. When the cells attain a condition of full charge the charger is automatically cut out of the circuit. A high initial charging rate is used, with a gradual tapering off in value as the battery voltage is built up. This arrangement is consistent with good battery practice.

The glass jar of the "A" battery being fully transparent, the user is able to observe the condition of the cells at all times; convenient observation windows for the purpose are cut in the side of the steel containing cabinet. Two colored balls which float in the electrolyte act as a form of hydrometer indicator, and simplify the checking of the battery's condition of charge or discharge.

A new feature introduced in this combination "A" and "B" unit is a special emergency switch, used only for reconditioning the battery after the latter has stood idle for a considerable length of time. Under normal operation conditions, a double-acting automatic relay switch operates the charger, this switch being actuated in its first stages of operation by the voltage of the battery lead to the tube filaments. However, if the battery is left standing idle over a period of months, with resultant weakening of the cells, the automatic relay is supplemented by the manual emergency switch. If this switch is turned on, the battery will be soon recharged and the former automatic operation then continues.

The "B" section of the combination power unit is of more or less familiar appearance, involving the use of the usual step-up transformer, gaseous-tube rectifier, filter condensers and choke coils.

THE FAMOUS STROBODYNE can be built at home with New Pattern See page 190

The La Peer AR-9

(*Continued from page* 164)

171 tube this is not so. The truth of the matter is that the full voltage of 180 provides the least chance for overloading; used with a suitable "C" bias, of course.

In the output circuit of the 171 tube a Silver-Marshall output transformer is employed to prevent the comparatively high plate current for the 171 tube from passing through the loudspeaker magnet winding. This is an important consideration because failure to use an output device will result in rapid deterioration of the loudspeaker and probable distortion of reproduction.

The construction and wiring of the La Peer receiver requires no written explanation. The photographs and diagrams tell the whole story. Inasmuch as the front panel and the sub-panel may both be obtained completely drilled, there are no preliminary panel layouts to bother with. The builder can go right ahead with the actual construction as soon as all of the specified parts have been obtained.

One of the outstanding features in the construction of this receiver is the method of mounting and wiring its component parts. The simplicity of this work makes it possible for the home set builder to reproduce a completed set that has every appearance of a factory built product. With the exception of the two audio transformers, and a few other small parts, most of the parts and wiring are beneath the sub-panel. Note particularly the method of mounting the intermediate transformers. The transformer terminals make direct contact with the tube socket terminals by means of mounting the transformers as shown in the illustrations.

When completed the receiver presents an impressive appearance. Practically all of the wiring is concealed from view, even when the cover of the cabinet is raised. The front panel is neatly laid out and conveys an impression of elegant simplicity. Of course the cabinet selected for the housing of the receiver will have a decided influence on the looks of the job and it is for that reason that great care in its selection is strongly recommended. The Fritts 7"x24" standard super cabinet was used for the model receiver and was found to fill the bill admirably.

About the only suggestion that need be offered regarding the operation of the receiver is in connection with the sharpness of tuning. It will be found that a station can sometimes be completely tuned out by turning one of the tuning dials only a part of one degree. It is therefore obvious that exact tuning is required to tune in stations.

Particularly when "fishing" for new stations, the tuning should be done slowly, otherwise stations may be skipped over entirely.

In all other respects this receiver tunes like any other two-dial receiver. All tuning is accomplished by means of the two knobs which are located just below the metal escutcheon plates which bear the tuning indicators. The two knobs below these serve to control volume and sensitivity. All of these controls are grouped in the center of the panel where they are handy and where the calibrated drums of the tuning controls can be observed at a glance without the necessity for constantly running the eyes and hands back and forth from one end of the panel to the other.

STATEMENT

Of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912, of RADIO LISTENERS' GUIDE AND CALL BOOK, a quarterly magazine, published at New York, N. Y., for October 1, 1927.

State of New York, } ss.
County of New York, }

Before me, a notary public in and for the State and county aforesaid, personally appeared S. Gernsback, who, having been duly sworn according to law, deposes and says that he is the Editor of the RADIO LISTENERS' GUIDE AND CALL BOOK, a quarterly magazine, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The Consrad Co., Inc., 230 Fifth Avenue; Editor, Sidney Gernsback, 230 Fifth Avenue; Managing Editor, W. G. Many, 230 Fifth Avenue; Business Manager, Chas. E. Rosenfelt, 230 Fifth Avenue.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) The Consrad Co., Inc., 230 Fifth Avenue; Hugo Gernsback, President, 230 Fifth Avenue; Sidney Gernsback, Vice-President, 230 Fifth Avenue; R. W. DeMott, 230 Fifth Avenue.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... (This information is required from daily publications only.)

S. GERNSBACK, Editor.

Sworn to and subscribed before me this 30th day of September, 1927.

[SEAL.] JOSEPH H. KRAUS.

Notary Public, Queens County Clerk's No. 985, Queens County Register's No. 2903, New York County Register's No. 9267, New York County Clerk's No. 317. (My commission expires March 30, 1929.)

The A. C. Operated Shielded-Six

(*Continued from page* 100)

rated receiver, the design of an A.C.-tube set depends upon an exact co-ordination of all parts, and substitution in even a small item may wreck the entire performance of the outfit. It is safe to change only such things as binding posts, sockets, and dials; while, of course, a choice of tubes is possible.

Should the builder desire to construct the receiver without the push-pull amplifier feature, the following substitutions should be made in the list: the push-pull transformers should be replaced by a 220 and a 221 standard transformer; one four-contact tube socket may be omitted entirely; and one of the 1000-ohm resistors should be changed to a 2000-ohm type. No other changes than these should be made.

Before the constructor begins the assembly of the receiver, all parts should be very carefully examined and inspected to make sure that they have suffered no damage in transit. Tubes particularly should be tested in the sockets for good spring contact; the R.F. transformers tried in their sockets; and the variable condensers most carefully scrutinized. All resistors should be tested with headphones and battery to make sure that they are not open-circuited. (The ¼-megohm grid leak will give only a very faint click in headphone test.)

To assemble the receiver, all parts should be mounted upon the chassis exactly as illustrated in the various pictures and diagrams, using 6/32 machine screws and nuts. The four coil sockets should be lifted above the chassis by means of ¾-inch hollow mounting studs and long screws. The three shield pans are placed as illustrated; but, before they are inserted in their place, two of them, as well as the two shield tops, must be cut away to make room for the rather large 6,000-ohm volume-control potentiometer. This potentiometer, using insulating washers to insulate it thoroughly from the front lip of the chassis in which it is mounted, should be slipped into position before attempting to fasten down the shield pans. The two central shield pans must have their adjacent front corners cut away slightly with a pair of heavy shears or tin snips in order that they may not touch the 6,000-ohm potentiometer. Similarly, the adjacent bottom front corners of the shield pans must be clipped away. This can be done with a pair of scissors, simply by cutting out a triangular section from the corner of each one; so that, when slipped into place, they will not short-circuit upon the volume-control resistor.

Don't Fail to See Page 186

Wiring

If all parts are mounted, the receiver should be wired with fabric-insulated hook-up wire. The fixed resistors R2, R3, R4 and R7 are mounted on the inside of the chassis with one end terminal of each grounded to the chassis and the other end terminals bent up free and clear of the chassis. The mounting screws of the sockets at convenient points are used to hold these resistors. The drawings show the exact location of these resistors. If desired, the wiring on the underside of the chassis may be left somewhat longer than is necessary, but grouped along common paths so far as possible so that all wires can be laced into one or two groups or cables after all wiring is completed.

Before the panel is put in place, the link motion should be attached to the three right-hand condensers, in such a fashion that, as one condenser is turned, the other two rotate with it. Care should be exercised to leave a space of at least 3/32 to ⅛ inch between the lock collars of the link motions and the variable condenser shafts; for in this space the stage-shield edges fit. The front panel is fastened to the chassis by means of the battery switch and antenna switch and the shaft bushing of the 6,000-ohm volume resistor; this last being insulated away from the chassis and panel with suitable insulating washers. The vernier dials are fastened upon the condenser shafts in such a fashion that they read zero with the condensers entirely unmeshed.

So far no connections have been made to the battery switch; though a 6-foot length of twisted loop cord should have two ends connected to its terminals, the cord running across the chassis and up through a hole in the bakelite terminal strip adjacent to the speaker tip jacks. The two free ends of this cord should later be spliced into one wire of the twisted pair joining the power transformer to an attachment plug, which must be inserted in a home-lighting socket. Thus the battery switch on the receiver panel serves to break one side of the lighting line to the power transformer and, with a single flip of the switch on the receiver front panel, automatically turns on or off all power for the set.

Power Unit Connections

The assembly of the power unit itself is very simple and is well illustrated in the accompanying view. The power transformer and condenser bank should be mounted upon the steel base, together with the two tube sockets and four binding posts; using insulating washers to insulate these posts from the steel chassis. All wiring should then be put in place, leaving

three leads for connection to the choke-coil unit, which is put in place last to avoid interference with connections 5, 6, 7, and 8 of the condenser bank. The voltage-dividing resistor is mounted by having its four lugs soldered to the ends of binding-post soldering lugs underneath the chassis. Care should be taken to see that the proper resistance values fall between the different binding posts. Four rubber feet are provided to raise the chassis from the table and prevent the scraping and marring of furniture.

To operate the receiver, it is necessary simply to connect the four binding posts of the power unit to the four similarly marked posts of the receiver terminal strip, and to connect the three filament windings of the power transformer to the six properly-marked filament binding posts on the receiver terminal strip. These connections should be made by means of a twisted No. 18 lamp cord; though, if the receiver is to be located more than two feet from the power unit, the connections of the 2.5-volt circuit should be of No. 14 lamp cord.

To operate the unit, the power-transformer plug should be inserted in the home-lighting socket and the rectifier tube placed in the inner socket of the power unit. If the voltage-regulator tube is placed in the outer socket, it should glow with a pinkish or purplish glow. The receiver tubes should be inserted in their sockets, the four CY-327 tubes in the five-prong sockets of the R.F. circuits, the CX-326 in the right rear socket, and the CX-371s in the left rear sockets adjusted to the output transformers. All of these tubes should light; and, as they are successfully inserted, the glow-tube brilliancy should vary somewhat as the filament control is turned from left to right. After current is turned on with all tubes inserted, it will be from 30 to 60 seconds before the receiver is ready for operation; for it takes this length of time for the heater tubes to come up to proper operating temperature. When they do, a considerable hum will be noticed in the loud speaker. Some of this hum should disappear with a ground connection attached to the proper receiver binding post; though it should still persist with the volume control turned half-way or fully around to the right.

The next step is to connect a wire to one side of the 2.5-volt heater lighting circuit; the other end of this wire is to be touched successively to the "B—," "B+45," and even "B+90" binding posts of the set. If this is done, hum will noticeably decrease and will practically disappear with one connection, which should be made permanent. Preference should be given to the connection between the 2.5-volt heater winding and "B—," or "B+45." If, however, the hum does not entirely

cease, an FT64 balancing resistor should be connected to the two 2.5-volt binding posts of the receiver and the center tap of this resistor connected to "B—" or "B+45." This done, the hum will be reduced to a value too low to interfere with reception.

Operation

The receiver may be operated by the connection of an aerial lead to the proper binding posts; the aerial itself may be anything between 20 feet of indoor wire around a picture molding and a 50- or even 80-foot outdoor antenna. Stations are tuned in by using the two large tuning dials, with volume adjusted by the volume-control knob.

If the volume knob is turned too far to the right, the receiver will oscillate and squeal; and in operation it should always be kept just to the left of the oscillating point. The set is most sensitive with the volume control adjusted to just below the oscillation point; though it may be, of course, turned all the way to the left to decrease the volume, as desired.

There are practically no trouble-shooting suggestions to be offered; for the receiver, if properly assembled and wired, will work without any difficulty. However, if any question arises, the power-unit voltage should be checked with a high-resistance voltmeter, and should show approximately the voltages marked on the binding posts, having from 200 to 220 volts maximum output with the receiver in operation. The glow tube should not extinguish in operation, though it will flicker as strong signals are received. The heater tubes will hardly glow at all when lit; though the small rods projecting through the internal assemblies will heat to about a cherry-red color after 30 or 40 seconds of operation. The 371 tubes should light to fair brilliancy; while the filament of the 326 will glow a dull red after 5 to 10 seconds of operation. If the tubes are believed to be defective, they may be tested, most satisfactorily by a dealer or service station. There is no reason, however, for anticipating even as much trouble with A.C. tubes as may be experienced with standard storage-battery types; for the electrical nature of the former is very much more rugged.

Grid Bias

tive potential is impressed on the grid. In this case the *characteristic curve* (q.v.) of the tube is assumed to indi-

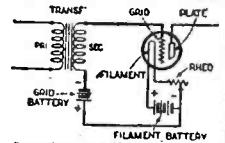


Fig. 1. Method of a 6½ volt battery to impress a negative potential on the grid of a vacuum tube.

cate that more difference in current occure between points B and C than between A and B in Fig. 2. For this

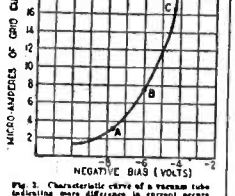


Fig. 2. Characteristic curve of a vacuum tube indicating more difference in current occure between "B" and "C" than between "A" and "B."

reason a negative potential is applied as shown in Fig. 1. (See *Grid Bias.*)

GRID BIAS—A potential of a few volts, generally from four to six, applied to the grid of a vacuum tube to influence its operation by making it more or less negative. The grid bias is usually negative and determines the point of the *characteristic curve* at which the tube will operate. In a sensitive receiver, and particularly where a tube is used as an *amplifier* (q.v.), it is essential to obtain as great a change of grid current as possible. (Note: The greater the change of grid current, the greater the change in plate current and hence the more powerful will be the output.) By applying a negative potential on the grid it is possible to hold it at the point of maximum response. (See *Grid Battery*, also *Vacuum Tube, Theory of Operation of.*)

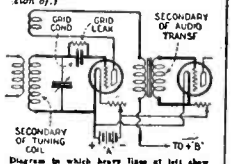
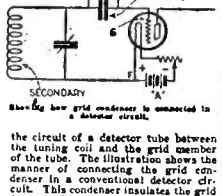


Diagram in which heavy lines at left show the grid circuit of the detector, while those on right indicate audio amplifier grid circuit.

GRID CIRCUIT—In a receiver employing vacuum tubes, the part of the cir-

cuit containing the grid of the tube or tubes, but generally referring to the tuning circuit or that part of the system which contains the tuning elements. In the illustration is shown a standard arrangement of a regenerative detector and one stage of audio-frequency amplification. The heavy lines at the left of the diagram represent the tuning circuit or detector *grid circuit*, while the section with heavy lines at the right is the grid circuit of the amplifier tube. The grid circuit of a detector tube may generally be distinguished by means of the grid leak and condenser (so marked in the illustration), which controls the incoming signals and permits the tube to function as a rectifier. (See *Detector, Grid Control*, also *Grid Condenser* and *Grid Leak.*)

GRID CONDENSER—A small fixed condenser, generally from .00025 to .0006 microfarad capacity, inserted in



Showing how grid condenser is connected in a detector circuit.

the circuit of a detector tube between the tuning coil and the grid member of the tube. The illustration shows the manner of connecting the grid condenser in a conventional detector circuit. This condenser insulates the grid from the filament by breaking the path F to G and permits the tube to act as a rectifier or detector. A resistance (called *grid leak*) is usually placed across this condenser to allow the accumulated charges on the grid to leak off. (See *Grid Leak*, also *Grid Control* and *Vacuum Tube, Theory of Operation of.*)

GRID CONTROL—The general term used to designate the various devices and associated connections placed in or allied with the grid circuit of a vacuum tube for the purpose of controlling to a greater or lesser extent the potential of the grid, or to tune or control the incoming oscillations. In the case of a vacuum tube used as a rectifier (detector) the grid condenser and grid leak are placed in series with it. (Note: the grid leak is often connected from the grid directly to the filament instead of across the grid condenser, the operation, however, being approximately the same in either case.) Here the controls permit the tube to function as a detector of the incoming oscillations. Where the tube is used as a radio-frequency (high-frequency) amplifier, the radio-frequency transformer or other amplifying unit controls the grid of the following tube by influencing the fluctuating potential differences impressed on it. (See *Amplifier, Radio-Frequency.*) The most important example of a grid control is by using some means to control the potential applied to the grid, such, for example, as a grid bias or grid battery. (See *Grid Bias, Grid Battery*, also *Vacuum Tube, Theory of Operation of.*)

GRID CURRENT—The current present in the grid circuit of a vacuum tube. This is generally very small, perhaps of the order of fifteen to twenty *microamperes* (q.v.). (See *Plate Current*, also *Grid Bias.*)

GRID LEAK—A high resistance placed in the grid circuit of a vacuum tube to permit the electrons forming the grid current to leak off after each charge, thus preventing their accumulating on the grid in such numbers as to stop the flow from the filament. The electrons being negative, a surplus of them on the grid member of the tube would act as a barrier to the free flow of other electrons from the filament through the grid to the plate, thus diminishing the plate current toward zero. It will be understood that a heavy negative charge on the grid will repel a like or negative charge, in this case the negative electrons being thrown off by the hot filament.

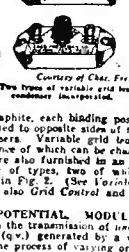
The grid leak may have a value ranging from about 250,000 ohms to several million ohms. The value of a grid leak is generally stated in *megohms*—one megohm being one million ohms. Thus a grid leak of 250,000 ohms resistance would be referred to as a ¼-megohm leak and, similarly, one having a resistance of two million ohms would be referred to as a two-megohm grid leak.

Such resistances are furnished in many forms, the most common being a strip of paper impregnated with graphite or some similar high resistance preparation, placed in a glass tube and sealed to prevent moisture from affecting the value. The illustration, Fig. 1, shows a tubular type of grid leak.

Courtesy of Chas. Freshman Co.

Fig. 1.—A tubular type of grid leak.

For experimental work a fairly satisfactory grid leak can be made by the simple expedient of drawing a line on a piece of cardboard with a soft pencil —the graphite mark acting as the resistance. At each end of the cardboard is placed a binding post in contact with



Courtesy of Chas. Freshman Co.

Fig. 2.—Two types of variable grid leaks with condenser incorporated.

the graphite, each binding post being connected to opposite sides of the grid condensers. Variable grid leaks, the resistance of which can be changed at will, are also furnished in an infinite variety of types, two of which are shown in Fig. 2. (See *Variable Grid Leaks*, also *Grid Control* and *Resistance.*)

GRID POTENTIAL MODULATION—In the transmission of *undamped waves* (q.v.) generated by a vacuum tube, the process of varying or modulating the potential of the grid element of the tube with respect to the filament. In this method an alternating potential may be applied to the grid circuit, the frequency of this varying potential being within the audio band —possibly about 500 cycles—supplied by a generator of that frequency. (See *Modulation.*)

GRID POTENTIOMETER—A potentiometer—a variable resistance unit—Fig. 1, used in the grid circuit of a vacuum tube for the purpose of controlling the potential applied to the grid. The conventional method is to place the potentiometer across the "A" battery with the center or variable contact arm connected to the grid of the tube in place of the usual connection to either positive or negative filament lead. This is shown in the illustration, Fig. 2. Here the customary circuit is

Courtesy of the Cutler-Hammer Co.

Fig. 1.—A type of potentiometer.

shown for the "A" battery to light the filament of the tube. Pri. and Sec. are respectively primary and secondary of the transformer (either radio-frequency or audio-frequency) and C the center arm of the potentiometer. The center arm may be moved either to the right or left, permitting either negative or positive potential to be applied to the grid. This system is much used in amplifying tube circuits to control the action of the tube as an amplifier. Another method would be to connect one of the ends of the potentiometer to the negative lead of the "A" battery and the center arm to the grid leak. In this way the potentiometer would be acting as a pure variable resistance, the potential applied to the grid being

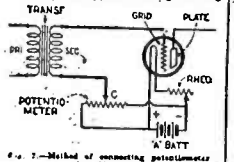


Fig. 2.—Method of connecting potentiometer in grid circuit.

always negative, but susceptible of variation within the limits of the resistance and the voltage of the "A" battery. (See *Grid Bias, Grid Battery*, also *Grid Control.*)

HINDER—Term occasionally applied to one of the various forms of atmospheric disturbance known under the general heading of *static*. This form of static is more prevalent in warm weather and does not appear to have its origin in local electric storms. Its effect is to produce rattling sounds of no definite pitch. (See *Strays*, also *Static.*)

GROUND—The earth considered as an electric conductor. In radio it is considered as the return circuit for electromagnetic waves. (See *Ground Connection*, also *Theory of Propagation of Electromagnetic Waves.*)

Guy Wire

GROUND CLAMP—A strip of metal, generally copper, having some sort of

A ground clamp for fastening the ground lead to a water or steam pipe.

arrangement for fastening rigidly to a water or steam pipe to form the ground connection for a radio receiver. The illustration shows a conventional form of clamp. (See *Ground Connection.*)

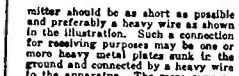
GROUND CONNECTION—In radio reception or transmission, the connection between the earth and the apparatus whereby the currents set up by the electromagnetic waves are returned to the earth as one side of the assumed circuit. The ground or earth connection from a radio receiver or transmitter should be as short as possible and preferably a heavy wire as shown in the illustration. Such a connection for receiving purposes may be one or more heavy metal plates sunk in the ground and connected by a heavy wire to the apparatus. The more common method is to connect the set to a convenient water or steam pipe, such pipes being almost invariably well grounded, especially the former. (See *Earth*, also *Ground* and *Transmission.*)

GROUND CURRENTS—Electric currents present in the ground due to the grounding of commercial electric machines. These currents very often prove a disturbing factor in radio reception. (See *Ground.*)

GROUND DETECTOR—A device for indicating an accidental ground on a power transmission line or for any conducting systems for electric currents. (See *Detector*, also *Ground.*)

GROUND RESISTANCE—See *Resistance of Ground Connection.*

GROUND SWITCH—A switch, generally of rugged construction, connected to



Switch having a break distance of not less than 6 inches.

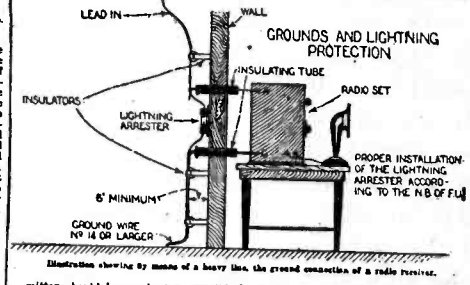


Illustration showing by means of a heavy line, the ground connection of a radio receiver.

the aerial, ground and apparatus in such manner that at one position the aerial is connected to the set, which in turn is connected to the ground, and in the other position the aerial being connected directly to the ground to protect the set from excessive static when not in use. (See *Lightning Switch*, also *Aerial Switch, Down Lead.*)

GROUND WIRE—The wire connecting a receiving or transmitting set to the earth. The underwriters specify not less than No. 14 B & S gauge copper wire. (See *Ground Connection.*)

GROUNDED ROTOR—See *Rotor, Grounded Connection.*

GROUP FREQUENCY—The number of separate trains or groups of waves per second in a damped or undamped system of radio transmission. This frequency is to be distinguished from the frequency of the individual waves. Thus in a spark transmitter, for example, the condenser in the transmitting circuit will be momentarily charged and discharged. The discharges will occur in the form of trains of oscillations, each oscillation having a certain definite frequency, but the trains or groups occurring at definite intervals, the frequency of these intervals being called the group frequency. (See *Frequency*, also *Spark Transmission* and *Undamped Waves.*)

GUARD LAMP—An incandescent lamp having a straight filament, sometimes shunted across the armature and field leads of a rotary converter used in radio transmission. Its purpose is to protect the windings from injury due to the inducing of oscillatory surges from the high-frequency circuits. (See *Rotary Converter.*)

GUTTA PERCHA—An insulating material derived from the milky secretion of certain trees, used as an insulation for submarine cables on account of its ability to resist the action of salt water. It is used to a lesser extent as a general insulating medium for wires, but owing to its scarcity and limited field of usefulness, rubber or rubber compounds are more widely used. (See *Insulating Materials.*)

GUY WIRE—Wires used to brace aerial masts for receiving or transmitting stations. Such guys are generally heavy galvanized wires attached to the mast at various points and extending radially downward and anchored to surrounding rigid objects or by means of some form of anchor in the ground. (See *Aerial.*)

The Electrified Aero-Seven

(*Continued from page* 107)

A zero to 200,000 ohms potentiometer is mounted in place of the rheostat (the right hand knob), where, connected between minus B and plus 90 volts, with the arm to the detector grid-leak, it provides a variable "D" bias for the detector tube. A plus bias of about six or seven volts is the optimum value here and is readily determined by varying the potentiometer control.

The filament switch is eliminated from the circuit.

All secondaries of the radio frequency transformers, and the grid returns from the first two resistance coupled stages are grounded.

Minus 1.5 volts is connected to ground and the plus side of the battery to the detector cathode (but not to any A.C. wire leading to the cathode). The cathode is the filament plus post.

These various connections are clearly indicated in the wiring diagram.

Five Arcturus type 28 tubes are plugged into the first, second, third, fifth and sixth sockets, a type 26 in the fourth or detector socket and a type 30 in the last or output socket.

Operation

The operation of the A.C. model is identical with that of the battery type, with the exception that fifteen volt transformer is substituted for the storage battery. A toy transformer is recommended for this purpose. The correct connections should be made and the variable tap set for fifteen volts.

In the event of necessity the A.C. model of the Aero-Seven can be operated, without loss of efficiency, as a battery set. Battery tubes and a storage battery are merely substituted for the A.C. tubes and transformer. No additional changes are necessary or recommended.

The Aero-Seven receiver can be completely electrified by the use of A.C. tubes, as described, in conjunction with a satisfactory "B" and "C" battery eliminator.

A highly satisfactory "B" and "C" battery eliminator for use with the Aero-Seven is shown in the photos and schematic diagram herewith. This eliminator will supply plate potentials of ninety volts for the r.f. tubes and 180 volts for the audio end, minus 1.5 volts for the amplifier grid returns and a variable high "C" potential for the power tube. The "D" bias voltage to the detector tube is taken care of in the receiver itself.

All terminal markings on the transformer are indicated in the accompanying schematic wiring diagram.

The eliminator is of course wired to the receiver in place of the usual "B" and "C" batteries. The minus "B" is connected in the conventional manner to the post provided for it on the set. This automatically takes care of the "C" plus connection.

The amplifier "C" potential is varied by adjusting the arm on the monostat until the receiver functions most satisfactorily—until the tone sounds most natural.

If a zero to twenty-five milliampere meter is available it should be included in the plate circuit of the power tube, while the "C" potential to this tube is being adjusted. The "C" voltage is varied until there is the least fluctuation of the needle on a loud signal.

All battery troubles are forever eliminated by the use of A.C. tubes and the eliminator described. Your receiver becomes as reliable as your power house, a consistency only comparable with its all around electrical efficiency.

Rejuvenating Old Tubes

A simple and efficient method of rejuvenating tubes which have gone dead has been revealed by the engineer of one of the large radio corporations, and is well worth the trial of any fan. It is even applicable to tubes which have, through long and faithful use, lost most of their pep. It is economical, because it does not call for any apparatus, outside of the regular receiver.

The method used, is to turn the filaments of all the tubes up to normal brilliancy, then reverse the polarity of the B battery, connecting the plus to the plus A battery, and the minus to the side which normally takes the plus B. Leave the tubes connected in this manner for a full hour, then turn the filament current down to its lowest point and leave current on for another half hour.

It will be found that an hour and a half of this treatment is sufficient in most cases to rejuvenate the tubes, but in cases where the tubes are unusually dead the treatment may be necessary for double that time. After treatment, the tubes should be allowed to cool off and then the batteries are connected in their regular manner.

Type 200-A tubes cannot be treated in this manner successfully, as once this type of tube has lost its sensitivity it is practically impossible to rejuvenate. The method will however bring back to normal sensitivity all 199, 201-A Hi-Mu and power tubes which have lost their pep. In testing this method, a set of tubes were used which were so dead that absolutely no signals were heard. After the process was completed, a matter of nearly three hours, the tubes worked as well as ever.

The Voltage of Your House-Lighting Line

By CHARLES GOLENPAUL

WHAT is the line-voltage of your house-lighting system? Why 110 volts, of course! But, is it really 110 volts? Have you tried an A.C. voltmeter on that electric supply of yours? If not, then you may be surprised to know that your so-called 110-volt current is anything but 110 volts.

The failure of some radio power units to deliver satisfactory results, particularly in the matters of volume and quality, either part time or full time, may often be traced to deficient line-voltage. Instead of 110 volts or better, the actual voltage available may be only 100 volts, or less. Especially is this true in rural districts, where the transmission lines are long and the voltage is not as carefully regulated as in the more populated sections.

Recently, in order to learn more about the input end of radio power units (and that is the real starting point of socket-power operation), the writer made a survey of various districts around New York. In the cities, he found the voltage usually better than 110 volts, and often as high as 120 and even 122; although during periods of heavy load, such as "dark spells" during the day or again in the early evening when the lights are turned on, the voltage dropped as low as 105. In suburban districts, especially northern Westchester County, the voltage during the day was found as low as 92 on some occasions, but generally hovering around 100, with an increase to 102 or 104 in the early evening, and up to 108 late at night as the lights are turned off in the many homes.

Now it goes without saying that such voltages are inadequate when operating transformers designed for 110 volts or better. The secondary voltage is very much reduced, because of the step-up ratio of 1 to 3 or 4 and even higher in the case of high-voltage radio power units. Many transformer manufacturers and radio power unit manufacturers fully appreciate the low voltage of most A.C. supplies, and are accordingly providing transformers which operate satisfactorily on lower voltages than the so-called 110. Others, aiming to take care of a variety of voltages that may be encountered, are providing their primaries with several taps, to compensate for lower voltages. Others, again going a step further, employ lower-voltage primaries with a variable resistor in the circuit, to reduce the current if necessary when the line-voltage runs high. A still greater refinement is presented in certain radio power units that are provided with a ballast tube

for automatically regulating the input current, irrespective of the voltage.

It will be noted that the usual glow-tube or regulator tube, while it does compensate for fluctuating line-voltage and fluctuating drain on the output end, by holding the 90-volt and the 45-volt taps steady, does not take care of the 135-volt and maximum-voltage taps which supply the amplifier tubes and the power tube. When "C" batteries are employed for the amplifier and power tubes, the wide fluctuation caused by line-voltage variation is sufficient to introduce marked distortion.

All of this means that the input current should be controlled to compensate for fluctuating line-voltage. The logical place for altering the radio power units to meet various voltage conditions is in the primary, or input end. This may be accomplished by means of a ballast tube, which does the work automatically in maintaining the performance at a fixed standard, or again by an adjustable resistor. The former method has its good points, notably in the automatic-regulation feature. However, there are times when the radio listener prefers to adjust the output voltages as a group for more or less power; in which event the variable-resistor method is preferable.

Many radio power unit manufacturers are now incorporating variable resistors in their products for line-voltage regulation. However, even in the existing radio power unit, without line-voltage regulation as a built-in feature, it is quite practicable to introduce this feature. All that is necessary is to place the variable resistor in one side of the input circuit; and this may be easily done by cutting the conductor cord and inserting the resistor in one lead. A 25-500-ohm power-type resistor is usually employed for this application. While it may be that the existing radio power unit is designed for 110 volts and not much less, still, there is a definite advantage in having a control for line-voltage; since it thus becomes possible to set the output-resistance values for a slightly lower voltage and then regulate the input when it is desired to strike the necessary balance.

In the case of the "A-B-C" radio power unit, the line-voltage regulator should consist of a 0-10 ohm power resistor, shunted by a 4 ohm fixed resistor of the heavy-duty type.

Until the not-distant future, when all radio power-unit manufacturers will probably incorporate a line-voltage-control device in their assemblies, the progressive radio set owner can improve his results and the stability of his outfit by means of a noiseless and reliable gradually-variable resistor in the input of his socket-power device.

Aerial Capacity and Wavelength

By S. P. O'ROURKE

IT is very interesting, when carrying out experiments with various sets and circuits, to know the capacity of your aerial to ground. There are various complicated formulas by which the capacity and inductance may be calculated fairly accurately; but these involve accurate measurements of the length and height of the aerial which are not very practicable for the average experimenter.

A much simpler method, and one which gives very accurate results, if conducted properly, is to tune in your local station, with the aerial and ground connected in the usual way and the aerial tuning condenser in parallel with the coil.

For instance, supposing WGY is tuned in at 30 degrees; now disconnect the aerial and again tune in the same station. It should appear now at about 120 degrees; in the phones, of course.

There is, therefore, a difference of 90 degrees between the two readings, which in the case of a .0005 mf. condenser, corresponds to .00025 mf. Thus .00025 mf. is the capacity of the aerial to ground. It is essential, of coure, to use an old-type variable condenser with semi-circular plates; as this is the only type which gives a straight-line-capacity reading from 0° to 180°.

Most experimenters, however, will have hidden away in the junk box one of these ancient variables, which may be connected up temporarily for the above calculations. It is a big point in short-wave work to keep the aerial capacity as low as possible, and the above method may serve as a measurement of any aerial-ground improvements that may be effected.

The usual method of determining the natural wavelength of the aerial system is by the well known formula: Wavelength equals 1885 times the square root of the microfarads multiplied by the microhenries.

Another method is described below which, in the writer's opinion, is very much more practical. It should appeal to the non-mathematical reader, since it involves no algebraical calculations or formulas.

Disconnect the aerial from the set and tune in your local station with the ground connected to its usual terminal. You should receive it at fairly good strength with an ordinarily efficient set. Take note of the aerial-tuning condenser's dial reading. Let us suppose in a particular case that this is 130°. Now connect the aerial lead and tune in any station you can, nearest to 130° on this dial. Supposing in the first instance WGY is received; now, when you have connected

up the aerial, WEAF tunes in at 130° or thereabouts. Subtracting WGY's official wavelength from that of WEAF, we have, 491.5 less 379.5= 112.0 meters. 112.0 meters then is the natural wavelength of the aerial in question.

Finally, a word about the receiving set. In order to find the wavelength accurately it is absolutely necessary to have a method of regeneration which, when varied, will produce no change in the wave to which the set is tuned; since less regeneration will be required when the aerial is disconnected. A receiver of the Hartley or Reinartz type is most suitable.

A Clean Radio Set Is Important

A radio set, like any other piece of fine mechanism, needs a little attention outside of the regular testing of batteries, tubes, antenna and ground.

The first thing that the serious broadcast listener should do is to dismantle his antenna system, wash the insulators in carbon tetrachloride or some other agent which will remove the heavy accumulation of dirt and dust. Then, examine the antenna itself. Is the lead-in joint tight and making good connection? Has natural oxidation made a poor connection? Wouldn't it be worth while to put up a new wire and attach a new lead-in? Wouldn't it be worth your while to change the direction so that some of those sought for Western stations would have a greater chance for impinging their infinitely tiny currents along the length of the antenna? While these matters, in many cases, seldom occur to the average radio set owner, they are nevertheless very important.

Then on the set itself. Take it out of the cabinet, and if a vacuum cleaner is handy, use the long hose attachment and carefully clean every last trace of dirt and dust from the set. Use a pipe cleaner folded double and clean the plates of the condensers thoroughly and see that the socket connections are bright and shiny and that the movable connections are all solid and will last. In other words thoroughly renovate or clean the set from antenna post to ground, cleaning all connections, brushing dust out of all the corners, cleaning off all surfaces where connections are made, testing all tubes, and in short giving the set a house cleaning. You will find out that much better results will be obtained from a set if it is given these periodical cleanings than if it is just dusted off from the outside with little or no attention paid to the inside.

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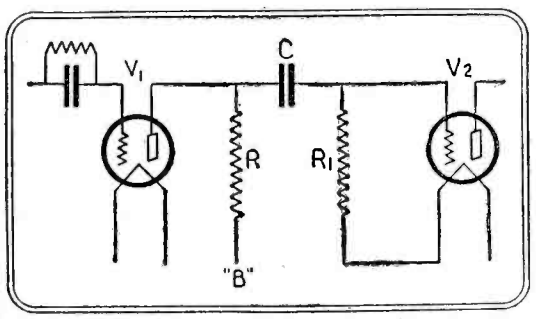
Eliminating the Detector Tap on the "B" Battery

By M. R. McCABE

IT has long been a mystery to the writer why radio designers and constructors continue to design and build radio sets employing a tapped "B" current supply with a reduced voltage for the detector tube. It is apparent that this practice puts an additional load on one section of the battery and causes it to run down more quickly than would be the case if the load were distributed over the whole battery. Possibly the first user of a multi-tube set used a tapped "B" battery, and the rest followed suit until it became a habit. Needless to say, this can be remedied in a very simple manner and expense reduced at the same time.

On the other hand, assume the use of a "B" socket-power device. The early forms of these devices were often troublesome, for want of a reliable device to control the detector-tube plate voltage. An adjustable resistor was employed for the purpose, and added to the difficulty of operation because the detector voltage had to be adjusted every time the filament control on the set was altered. The perfecting of more efficient power units remedied this condition, because of their flatter load-voltage characteristics; and the use of fixed resistors became practical.

Assuming a third case, where the set builder constructs his "B" power supply apparatus. By proper design



By the use of a suitable resistor in the detector plate lead, the drain on the battery is made uniform and its life thus prolonged.

of the set in the first place, the necessity for a detector-plate tap is done away; and this results in an appreciable saving in the cost of the equipment.

To obtain these advantages it is necessary only to employ resistance coupling between the detector and the first audio stage of the receiver.

It might be well, in passing, to mention that experiment with the value of the coupling resistor is advisable. It has been stated repeatedly that values in the neighborhood of 100,000 ohms function best; whereas the writer has on many occasions employed resistances as high a 3 megohms with superior results. The lower values did not seem to give as high amplification.

High resistance values, up to 10 megohms, will work in regular resistance-coupled circuits and save considerable on the "B" battery current. The blocking or coupling condenser between the plate and grid should be higher than usually employed; one-half microfarad is recommended in order to pass the lower audio-frequency tones. The grid leak on the first audio tube should be as high as possible without blocking or loading of the grid, which will be evidenced by distortion or periodical shutting-off of the music.

The volume resulting from this change is as great as if transformer coupling had been employed throughout the receiver. The reproduction is of course improved if there is any change; this depending upon the quality of the transformer that otherwise would be used.

Why "Kilocycles" Was Adopted

IN rearranging the licenses of stations lately, the Federal Radio Commission, like all technical men, has laid special emphasis on *kilocycles,* rather than on *wavelengths.* Yet the public has previously failed to respond to efforts to impose upon it this more scientific method of reckoning. There seems to be a popular feeling that a wavelength is something tangible, while a kilocycle is an abstract idea.

Yet the matter should be simple enough. A *cycle* is a reversal from positive to negative, and back again from negative to positive, in the electricity in an alternating-current circuit, or in the impulses creating the field of a radio wave. "Cycles," used as a measure of the rapidity of these changes, implies always *per second;* and "kilocycle" is simply a short expression for thousands of cycles (per second). A thousand kilocycles, therefore, means a million double changes per second in the *polarity* of the wave, as measured at any point in its progress; and, as the wave advances 300,000,000 meters (more accurately, 299,820,000, more or less) per second, the "peaks" will be highest at points 300 meters apart, along the path of a 1000-kc. wave. We have here the idea of a simple wave, corresponding to a wave in water, with approximately equal spaces between its highest crests. However, the water does not move steadily forward—it rises and falls—and the radio wave is *not a flow of current;* it is a *rise and fall* of voltage.

From the standpoint of classifying stations in a broadcast list, we might use either kilocycles or meters readily enough. We may also describe a distance as 66 feet, or as 1/80 of a mile, with equal accuracy; it is merely a question of convenience in reckoning.

But, in the technical problem of arranging stations so that they will not interfere with each other, it is necessary to calculate in cycles; because what is impressed on a radio carrier-wave is *not a wavelength. It is a frequency.*

A musical note is a vibration at the rate, for instance, of 300 cycles a second, causing air waves about four feet long. In an electric speech amplifier this would correspond to electric waves about six hundred miles long, because of the greater speed of electricity. But we do not add a six-hundred-mile wave to a thousand-foot wave; we impress a frequency of 300 cycles (per second) upon one of a million (per second). The result is a *"modulated wave."* The function of a radio detector is to iron out, so to speak, the million-per-second wave and leave the 300-per-second wave, which enters the loud speaker and reproduces a 300-cycle note, of sound in air.

Now, at the upper end of the broadcast band, a 300-cycle change affects the wavelength (measured in meters) about ten times as much as it does at the lower end of the band. At 5,200 meters, the wavelength used for transatlantic radiophone work, one kilocycle added to the frequency makes a difference of about 100 meters in the wavelength. At 5.2 meters, down near the very short wavelengths at which amateurs are now working, a kilocycle makes a difference of only about one ten-thousandth part of a meter in the wavelength.

Oscillation Control for R. F. Amplifiers

TO control oscillation in R. F. amplifiers, there have been suggested innumerable intricate methods, ranging from delicate balancing and neutralizing systems to the use of crude "lossers" in the forms of non-inductive resistors in the grid-return leads and the well-known potentiometer stabilizer. The use of variable plate voltage has also been suggested. A great number of these methods are either beyond the ability of the average radio layman to struggle with, or of such inefficiency as to be out of tune with engineering methods of today.

One of the simplest and most effective methods of controlling oscillation in R. F. circuits seems to be that of using, in series, across grid and plate of the R. F. tube, a midget variable condenser and a variable high resistor with a range from practically zero to several megohms if possible, and relatively fine adjustment.

An ideal arrangement comprises a .00025 mf. mica condenser, together with a universal range resistor, wired in series and connected to the grid and plate terminals of the tube socket. The resistor should be mounted alongside the tube, together with the mica condenser, to keep the R. F. wiring as short as possible. With several turns of the knob to cover a range of 200 to 5,000,000 ohms, this arrangement permits fine regulation of the R. F. stage.

The Filaments of your Vacuum Tubes

THREE types of substances are used as the source of electrons in present-day vacuum tubes. These are the oxides of certain metals, such as calcium, barium, strontium, etc.; the pure metals themselves, such as tungsten or molybdenum; and these pure metals mixed with a small amount of thoria (oxide of thorium) to produce the so-called thoriated or X-L filament.

The popular 201A, as well as the 199 type of tube, has a thoriated filament, with a tungsten base containing one or two per cent. of thoria. This thoria, at the proper operating temperature, slowly diffuses to the surface of the filament as thorium metal. The large emission of the thorium is thus secured at the high operating temperature of the tungsten filament. Some idea of the quantity of electrons given off from the hot filament is gained from the fact that 6,280,000,000,000,000 electrons per second escape from the surface when the emission current is one milliampere.

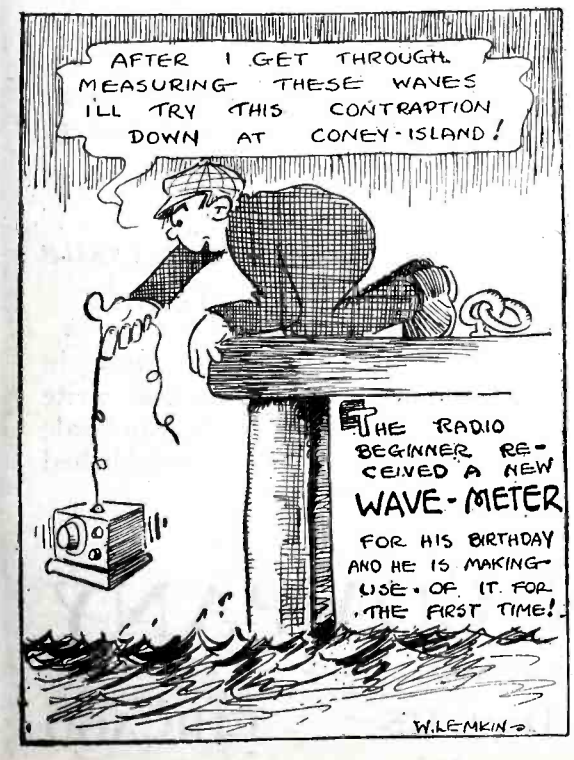
Duties of Condensers in Power-Supply Equipment

THE filter condensers used in "B" socket-power units should have sufficient dielectric to withstand the full voltage of the device over many years of service, and also to withstand the occasional peaks or surges which may run two or three times the maximum output voltage. It is wise practice, says Harry Houck, eminent radio engineer, to employ filter condensers rated at twice the output voltage; in other words, for a 200-volt maximum output "B" device, the filter condensers should be of 400-volt *working* voltage rating, and so on.

There are three filter condensers in the usual two-section filter system. The first condenser (that nearest the rectifier) does not have much influence on the hum or smoothing of the output current. It is intended rather to maintain the output at a fairly fixed voltage, despite the fluctuating current drain. It serves to regulate the rectifier.

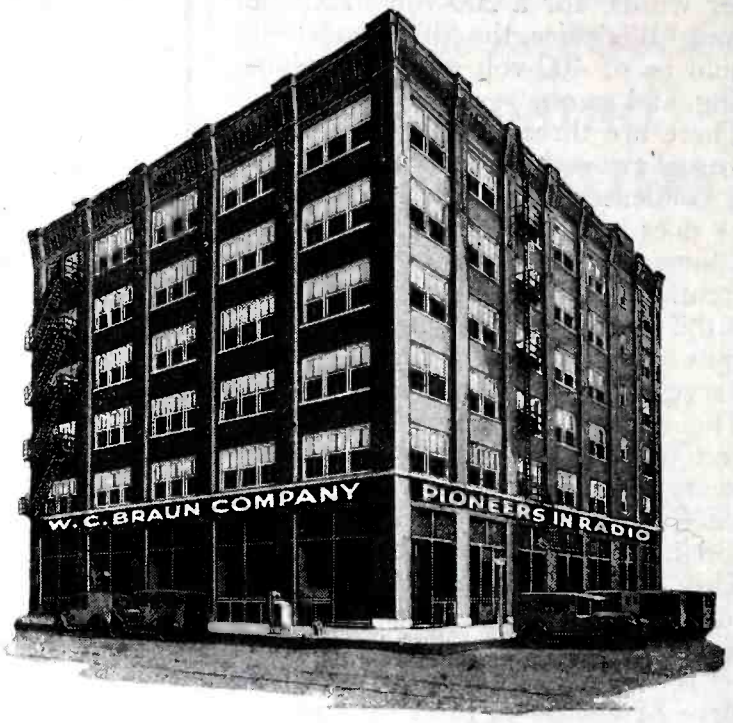
The second condenser controls the degree of hum, and any increase in the capacity of this condenser, within reasonable limits, reduces the hum in conjunction with the proper choke coils.

The third condenser controls the tone quality at full volume, because it acts as the virtual electrical flywheel of the "B" unit. It provides an ample reserve of energy to meet the unusual drains, particularly those caused by the deep, bass notes, placed on the "B" supply. This condenser should be as large as possible, say even up to 8 mf. capacity. The usual manufactured "B" socket-power unit can be materially improved by placing additional condensers, say 4 to 6 mf. in capacity, across the "B—" and highest "B+" terminals; thus building up the last condenser in the filter system for the best system for the best tone quality.



The Most Complete Lines, Quick, Intelligent Service and Fair Treatment

Have Now Made the Pioneer Distributors of Good Radio the Unquestioned Leaders!



Here the retail dealer may draw upon the largest, most complete stock of radio receivers, parts, accessories and supplies. In our book 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, Dealer's Representatives—the most highly organized staff ever brought together to assure quick, intelligent service and fair treatment for our Dealers.

All of which effort has steadily surely forged from a modest beginning to unquestioned leadership in the distribution of good radio.

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.

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Those who are in the best position to know feel that this will be the greatest year 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 will equip their homes with radio this year. We have made vast preparations to back our Dealers up in this rush of business and we are daily doing it. Nowhere else may they find such wide selections and obtain such quick service. This places the Braun Dealer in a vantage point where he may easily overcome all competition.

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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 three wholesale establishments from whom you now purchase. We want every established radio Dealer in the country and abroad to have this guide.

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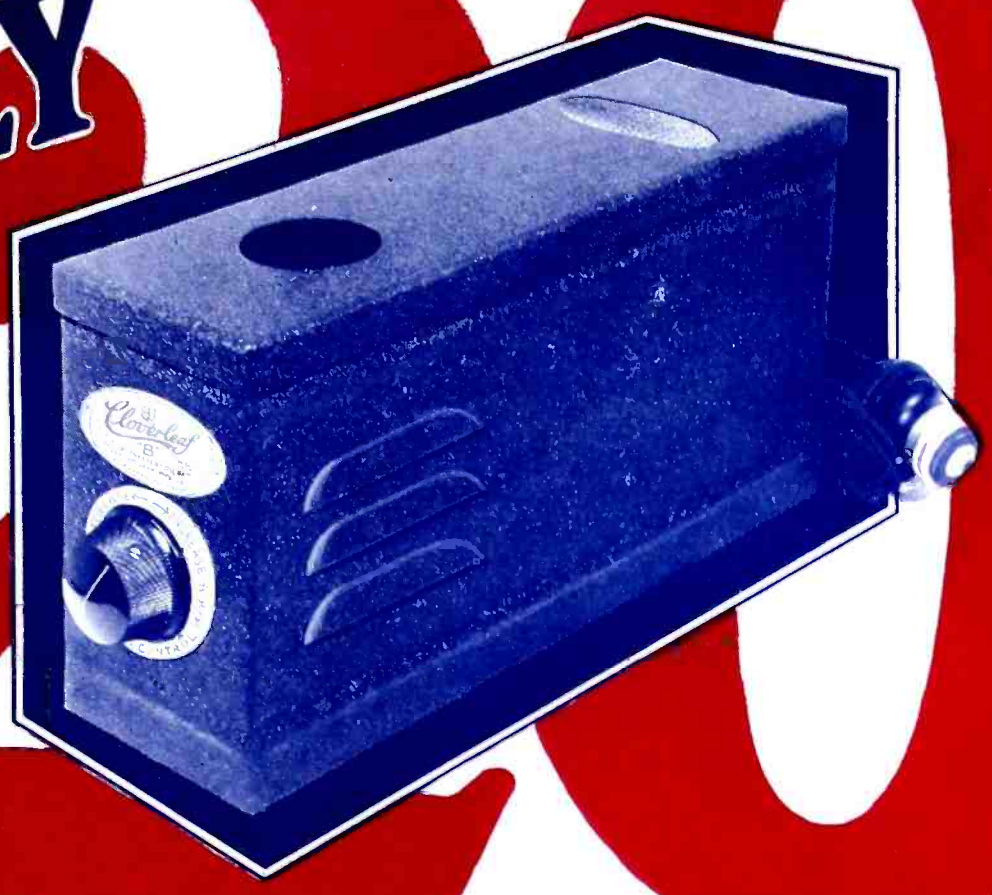


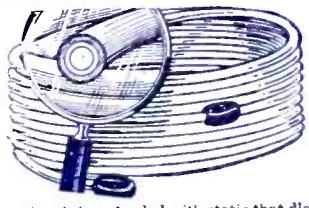
Here's a 180 volt "B" Eliminator at a Price You Don't Mind Paying

The NEW Cloverleaf Automatic "A" & "B" Control

A new and absolutely dependable automatic relay switch which localizes the control of the "B" Eliminator, trickle charger and "A" battery in the switch on the set. Easily attached in a few minutes. Only $2.75 from your dealer, or order direct, using coupon in lower right corner of this page.

Subantenna

Takes STATIC-FREE Radio Waves Out of the Ground



When the air is so loaded with static that distant reception is impossible with an "up-in-the-air" aerial, you can get loud, clear reception from your favorite far-away station, by picking it up out of the ground with a Subantenna. This amazing device is sold on an absolute guarantee of clearer, greater, better distant reception, or your money back. Send lower right coupon for explanation and particulars of Free Trial GUARANTEE OFFER.

Only $20—but it does everything that other 180 volt eliminators costing twice as much will do. In addition, it offers you positive assurance of a lifetime of dependable service. This new, advanced type unit will operate any set. 5-8-10 tubes, it makes no difference. Supplies constant voltages of 22-45-90-135 and 180 volts for a power tube, from fixed output taps. No adjustments—no exposed binding posts.

The Cloverleaf *Lifetime* "B" is, in all truth, the "B" Eliminator sensation of the season. Think of it! $20 now buys a real, *long lived*, high voltage, high current-output, heavy duty "B" backed by 2 year guarantee of satisfaction.

Obtain a Cloverleaf Lifetime "B" from your dealer—or, if your dealer cannot supply you, use the right hand coupon from this page to take advantage of the special introductory *free tube* offer we are now making.

CLOVERLEAF MANUFACTURING CO.
2712-M Canal Street - - - - CHICAGO, ILLINOIS

Genuine Q. R. S. 85 Mil.

Tube FREE

If you live in a town where we have no dealer, fill in and mail the coupon from the bottom of this column. We will send you the Cloverleaf *Lifetime* "B" Eliminator, express prepaid, and include a genuine $4.50 Q.R.S. 85 Milliampere tube *free*.

When the Cloverleaf "B" arrives, connect it to your set. Put it to every test you can think of. Make it drive a power tube. Then decide whether or not you think a better "B" eliminator can be built. If you are not satisfied, return the Cloverleaf "B" and we will immediately refund your money.

And if you do decide, despite the low price, that the Cloverleaf is the best "B" that any amount of money can buy—remember—it's backed by a two-year guarantee. Fill in and mail the coupon NOW.

DEALERS: MAIL THIS

CLOVERLEAF MFG. CO. (With your letterhead)
2712M Canal Street, Chicago, Illinois
Send me your dealer's proposition on:
- [ ] Cloverleaf *Lifetime* "B" Eliminator
- [ ] Cloverleaf Automatic "A" & "B" Control
- [ ] SUBANTENNA

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lifetime Cloverleaf "B" ELIMINATOR

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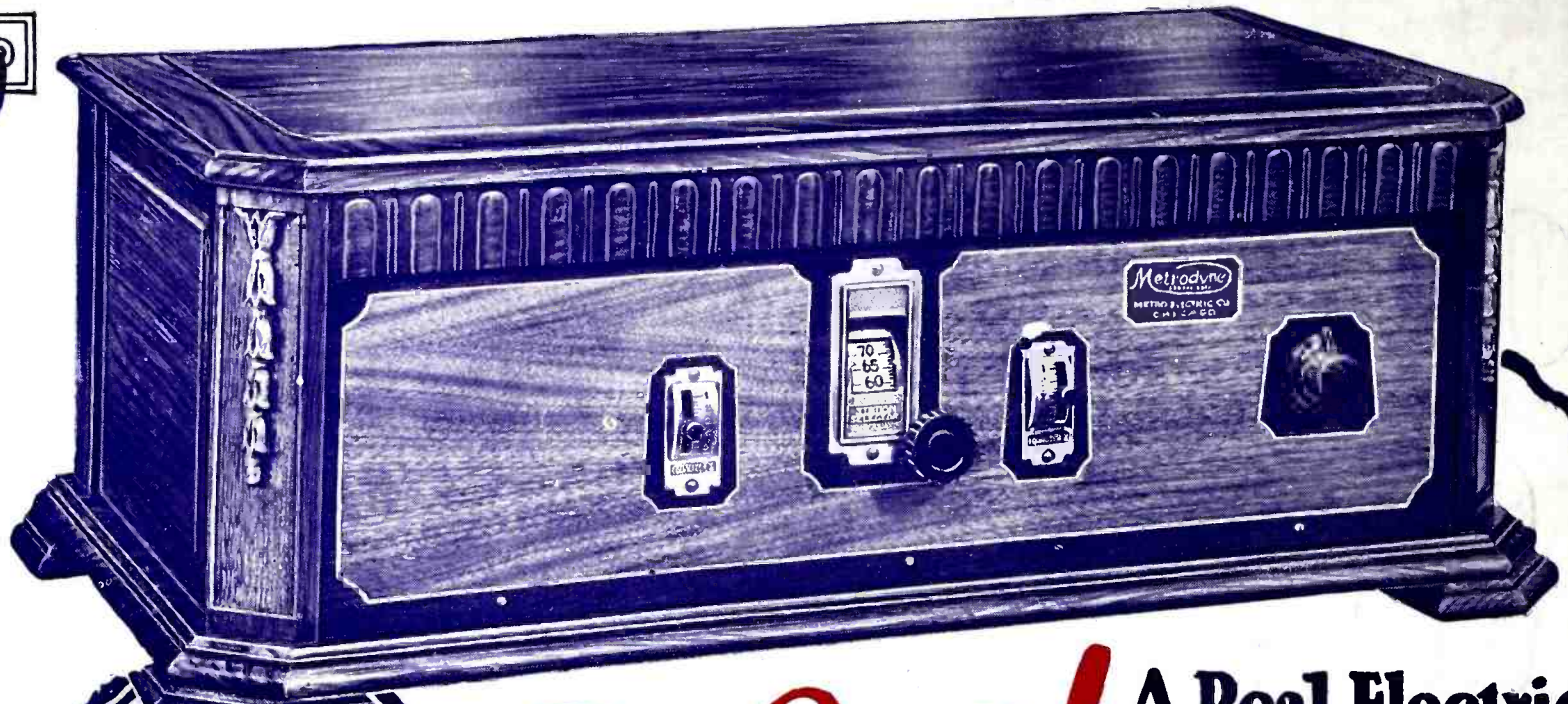
Check how you want Cloverleaf "B" shipped

- [ ] I enclose $1 deposit, for which send me one Cloverleaf Lifetime "B" Eliminator and free Q. R. S. 85 Mil. tube. I agree to pay expressman $19.00 plus small express charges.
- [ ] I enclose $20, for which ship me one Cloverleaf "B" Eliminator and free tube, express charges prepaid.
- [ ] I enclose $2.75, for which send me, postage prepaid, one Cloverleaf Automatic "A" and "B" Control.
- [ ] Send me full particulars of SUBANTENNA.

Name .....
Address .....



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ALL ELECTRIC RADIO

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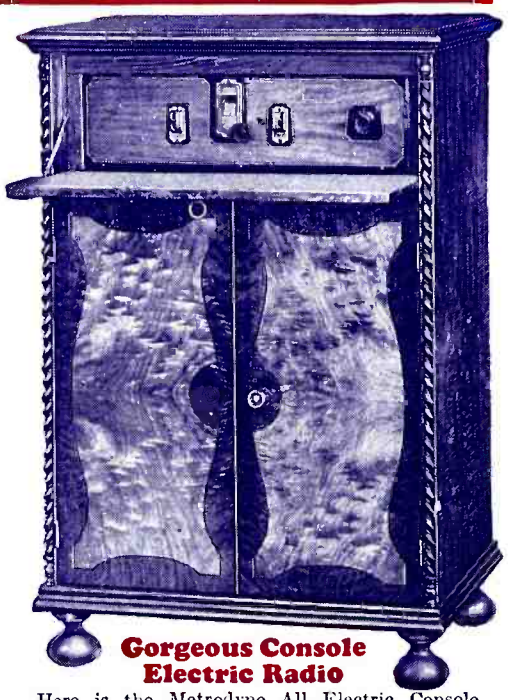

Gorgeous Console Electric Radio

Here is the Metrodyne All Electric Console Radio — a gorgeous, genuine walnut cabinet, in a beautiful two-tone finish. Has a built-in genuine Metro-Cone large size speaker. Brings in programs with great volume, reproducing the entire range from the lowest to the highest notes with remarkable clearness and distinction. All metal parts are finished in old gold. Wonderful electric radio, in a cabinet that will beautify the appearance of any home.

100% Electric Radio

At last! The radio you've dreamed about! If you have electricity in your home you can now really enjoy coast to coast radio reception without the care, bother and muss of batteries, chargers, eliminators, etc. The **Metrodyne All Electric** is a real, genuine **batteryless** radio set. Simply insert the plug in the socket, press the switch button and "tune in." You could not possibly buy a better radio set than the **Metrodyne All Electric**, no matter what price you paid.

BEAUTY—EFFICIENCY DEPENDABILITY

The Metrodyne All Electric Radio is a 7 tube, single dial set. Only the highest quality low loss parts are used throughout. Solid walnut cabinet, beautiful two-tone effect, with handsome gilt metal trimmings. Size of cabinet, 28 inches long, 13 inches deep, 10 inches high. Has electrically lighted dial so that you can log stations in the dark. Only one dial to tune in all stations. Excellent tone qualities — wonderful volume — very selective.

Costs Less Than Most Battery Sets

Do not confuse the Metrodyne electric radio with ordinary light socket sets, because the Metrodyne is truly an **all electric radio** — consumes less than 2c worth of power a day. Comes to you **direct from the factory.** Its low cost brings it down to the price of an ordinary battery set. We are so confident that you will be delighted with this wonderful, easy-to-operate **batteryless radio** that we offer to ship it to your home for **thirty days' free trial** — you to be the judge.

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We are one of the pioneers of radio. The success of Metrodyne sets is due to our liberal **30 days' free trial offer,** which gives you the opportunity of trying before buying. Thousands of Metrodynes have been bought on our liberal free trial basis — **WRITE TODAY!**

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Gentlemen:
Send me full particulars about Metrodyne All Electric Radio and your **thirty days' free trial offer.**

Name _____

Address _____

If you are interested in AGENT'S proposition place an "X" in the square →

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