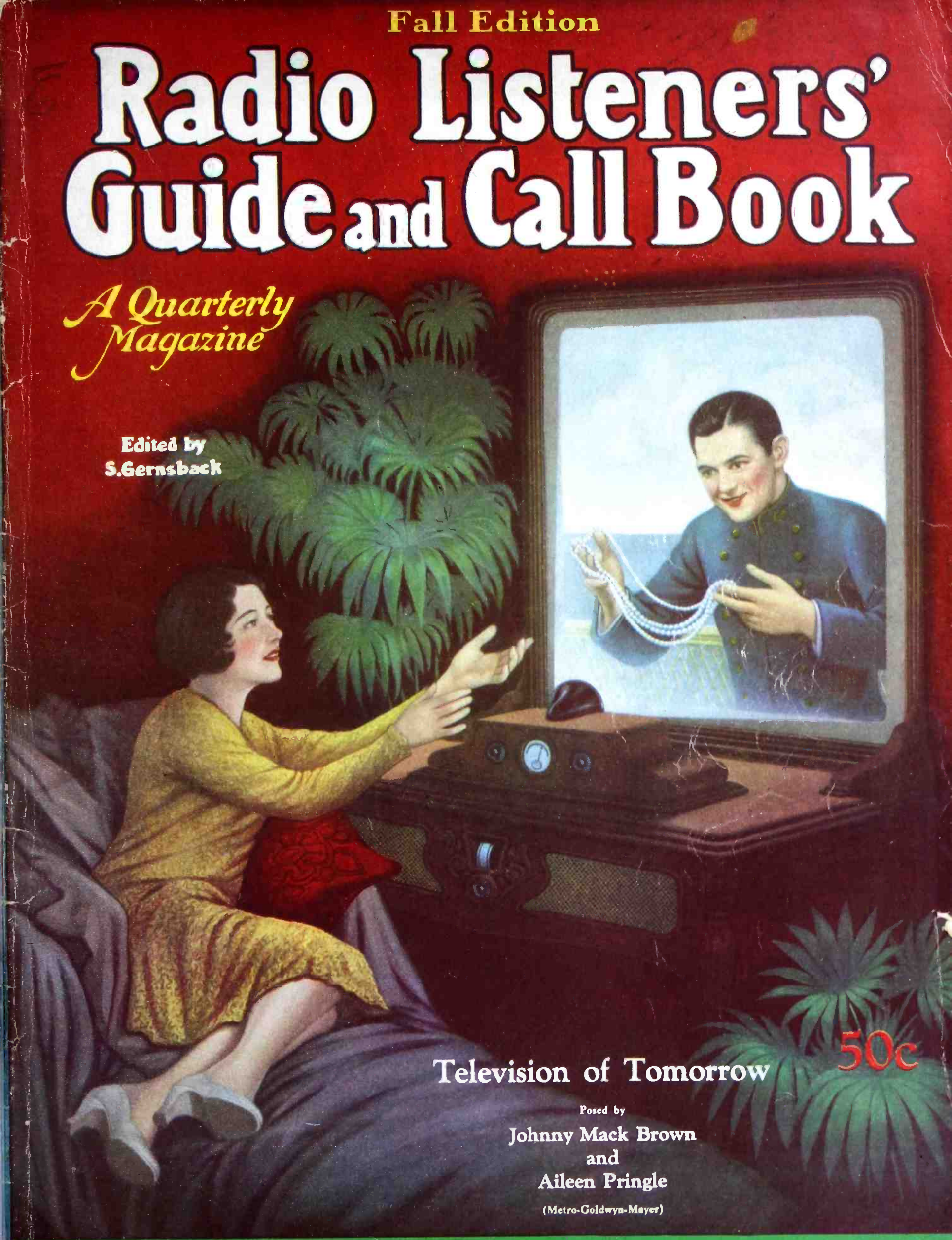
Fall Edition

Radio Listeners' Guide and Call Book

A Quarterly Magazine

Edited by
S. Gernsback



Television of Tomorrow

50c

Posed by
Johnny Mack Brown
and
Aileen Pringle
(Metro-Goldwyn-Mayer)

IN THIS ISSUE: Television for the Experimenter; The Custom Built Set vs. the Factory Built Set; How to Construct a Spanish Radio Cabinet; The Radio Set Market

CORWICO

HOOK UP WIRE

Braidite

"The Braid Slides Back"

Excellent for All A-C Work

Can Be Easily Twisted for Filament Leads

BRAIDITE is the sleeve insulated hook-up wire. It's as safe as insulated wire and as convenient as bare wire. BRAIDITE twists easily and holds its shape permanently after bending. It's quick and easy to work with, cutting wiring time in half. To make a connection, simply shove back the insulation. After soldering, the insulation slides right back into place, leaving no exposed sections of bare wire and making the neatest and most workmanlike looking job.

A Professional Set Builder Says:

"Corwico Braidite is the only stranded insulated hook-up wire that I have ever used that holds its shape permanently after bending. All others twist and get out of place."

An Amateur Set Builder Says:

"As an amateur who has built quite a number of sets, I can honestly say that Braidite is the fastest and easiest hook-up wire to work with and it also makes the neatest and most workmanlike looking job. I like the way the insulation on Braidite slides right back into place after making a connection, thus leaving no exposed sections of bare wire."

A Radio Engineer Says:

"After exhaustive laboratory tests, we have found your Braidite hook-up wire the most practical on the market. It's the one hook-up wire that you cannot scorch or burn with a soldering iron."

A Radio Repair Man Says:

"Please send us six boxes of Braidite solid, color black. There is nothing like it, we could not do business without it."

FREE

Send us the name and address of your dealer and we will send you a sample package of BRAIDITE Free. Enclose 10c to cover postage.

RADIOS BEST WIRES

CORWICO

ANTENNA WIRES

Stranded, Braided, Solid
Plain, Tinned, Enameled.

COMPLETE ANTENNA KITS

From $1.75 *to* $4.50

HOOK-UP WIRES

"Braidite," "Flexibus," Colored Rubber.

A-C ADAPTER HARNESSES

Type R for RCA type tubes.....$8.00
Type A for ARCTURUS type tubes... 5.00

Braidite

is sold at all dealers

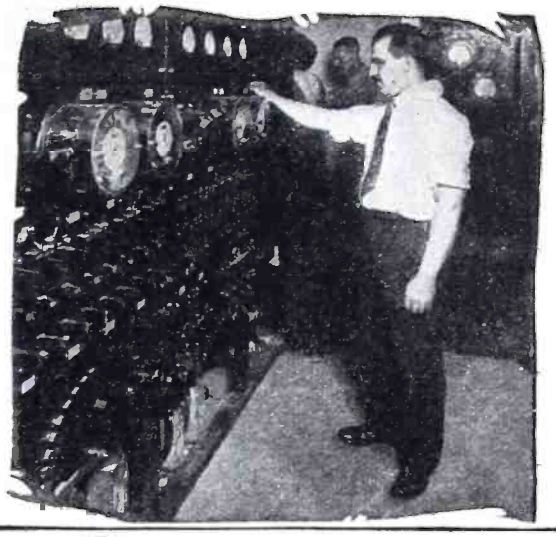
Red, Green, Yellow, Blue, Black

25 feet stranded.....35c
25 feet solid.....30c

CORNISH WIRE COMPANY

30-R CHURCH STREET, NEW YORK, CITY

I Will Train You at Home to Fill a Big-Pay Radio Job



If you are earning a penny less than $50 a week, send for my book of information on the opportunities in Radio. It's FREE. Clip the coupon NOW. A flood of gold is pouring into this new business, creating hundreds of big pay jobs. Why go along at $25, $30 or $45 a week when the good jobs in Radio pay $50, $75 and up to $250 a week. My book "Rich Rewards in Radio" gives full information on these big jobs and explains how you can quickly become a Radio Expert through my easy, practical home-study training.

Salaries of $50 to $250 a week not unusual

Get into this live-wire profession of quick success. Radio needs trained men. The amazing growth of the Radio business has astounded the world. In a few short years three hundred thousand jobs have been created. And the biggest growth of Radio is still to come. That's why salaries of $50 to $250 a week are not unusual. Radio simply hasn't got nearly the number of thoroughly trained men it needs. Study Radio and after only a short time land yourself a REAL job with a REAL future.

You Can Learn Quickly and Easily in Spare Time

Hundreds of N.R.I. trained men are today making big money—holding down big jobs—in the Radio field. Men just like you—their only advantage is training. You, too, can become a Radio Expert just as they did by our new practical methods. Our tested clear training makes it easy for you to learn. You can stay home, hold your job, and learn quickly in your spare time. Lack of education or experience is no drawback. You can read and write. That's enough.

Many Earn $15, $20, $30 Weekly on the Side While Learning

My Radio course is the famous course "that pays for itself." I teach you to begin making money almost the day you enroll. My new practical method makes this possible. I give you SIX BIG OUTFITS of Radio parts with my course. You are taught to build practically every type of receiving set known. M. E. Sullivan, 412 73rd Street, Brookiyn, N. Y., writes: "I made $720 while studying." Earle Cummings, 18 Webster Street, Haverhill, Mass., "I made $375 in one month." G. W. Page, 1807 21st Ave., Nashville, Tenn., "I picked up $935 in my spare time while studying."

Your Money Back if Not Satisfied

I'll give you just the training you need to get into the Radio business. My course fits you for all lines—manufacturing, selling, servicing sets, in business for yourself, operating on board ship or in a broadcasting station—and many others. I back up my training with a signed agreement to refund every penny of your money if, after completion, you are not satisfied with the course I give you.

ACT NOW—64-page Book is FREE

Send for this big book of Radio information. It won't cost you a penny. It has put hundreds of fellows on the road to bigger pay and success. Get it. Investigate. See what Radio has to offer you, and how my Employment Department helps you get into Radio after you graduate. Clip or tear out the coupon and mail it. RIGHT NOW.

J. E. SMITH, President,
Department 9-Q.
National Radio Institute
Washington, D. C.

Here's the PROOF

Made $185 in Three Weeks Spare Time

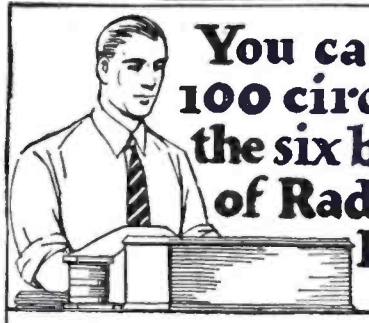
"I have met with continued success For instance, recently I realized a profit of $185 in three weeks, $1.50 an hour. I have been making good money almost from the time I enrolled. The N. R. I. has put me on the solid road to success."—Peter J. Dunn, 901 N. Monroe St., Baltimore, Md.

Made $588 in One Month

"The training I received from you has done me a world of good. Some time ago during one of our busy months I made $588. I am servicing all makes of Radio receiving sets. My boss is highly pleased with my work since I have been able to handle our entire output of sets here alone."—Herbert Roose, 2215 So. E. St., Elwood, Indiana.

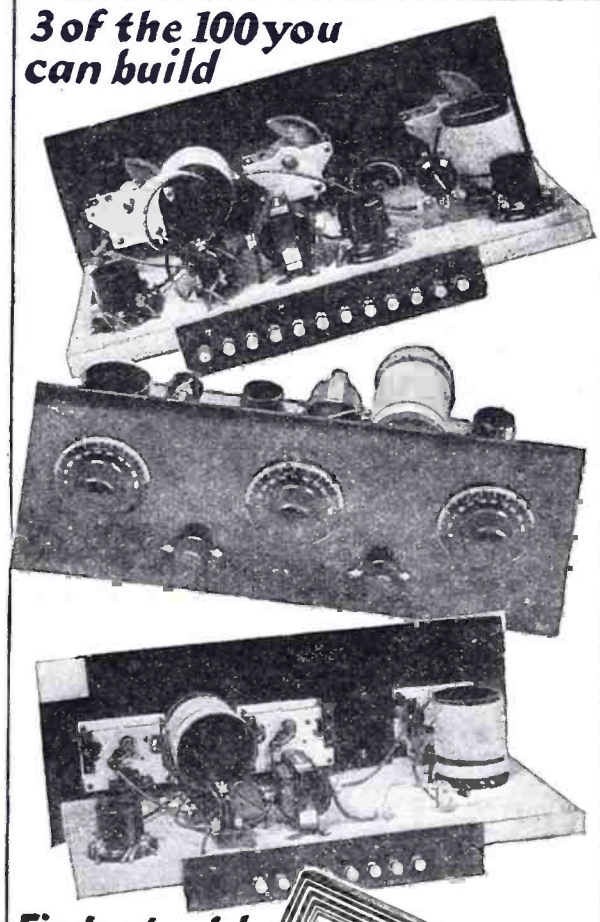
Earns Price of Course in One Week Spare Time

"I have been so busy with Radio work that I have not had time to study. The other week, in spare time, I earned enough to pay for my course. I have more work than I can do. Recently I made enough money in one month spare time to pay for a $375 beautiful console all-electric Radio. When I enrolled I did not know the difference between a rheostat and a coil. Now I am making all kinds of money."—Earle Cummings, 18 Webster St., Haverhill, Mass.



You can build 100 circuits with the six big outfits of Radio parts I give you

3 of the 100 you can build



Find out quick about this practical way to big pay

RADIO NEEDS TRAINED MEN!

Employment Service to all Graduates

Originators of Radio Home Study Training

Mail This FREE COUPON Today

J. E. SMITH, President,
Dept. 9-Q, National Radio Institute,
Washington, D. C.

Dear Mr. Smith: Kindly send me your big book "Rich Rewards in Radio," giving information on the big-money opportunities in Radio and your practical method of teaching with six big outfits. I understand this book is free, and that this places me under no obligation whatever.

Name .....Age.....
Address .....
City .....State .....
Occupation .....

Radio Listeners' Guide and Call Book

A Quarterly Magazine

Volume III — Number 2

NOVEMBER, 1928

Contents of This Issue

RADIO LISTENERS' GUIDE AND CALL BOOK

A Quarterly Magazine

VOL. III, No. 2 **NOVEMBER, 1928**

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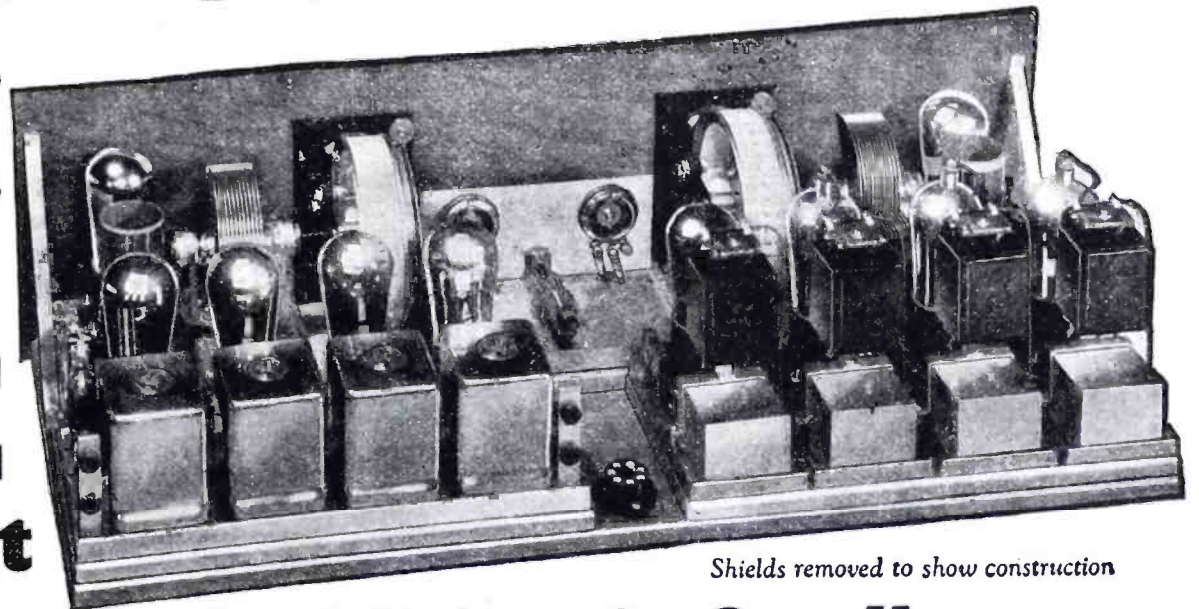
with the most sensitive and powerful radio phonograph ever designed

THE NEW MODEL 10

Screened Grid ISOTONE

Custom built



Shields removed to show construction

From Factory-wired Units—in One Hour

PROCLAIMED by dozens of famous radio engineers to be the most sensational development since the beginning of radio, the ISOtone has amazed all who have seen and heard it perform. Already this receiver has shattered the long distance records of its predecessors.

Those who have heard the ISOTONE have marveled at the uncanny way it reaches out over the American continent, bringing in stations from the farthest corners of the land—Cuba, Mexico, Canada—with full loud speaker volume.

This is the brain child of two of the greatest designing radio engineers in the world. This is the receiver on which H. F. L. has worked for over two years. The ISOTONE incorporates every modern improvement and over a dozen entirely new features which are not used in any other receiver in existence today.

Highly Selective
Great Distance Range

Here is a receiver which will stir your imagination. Here, at last, is a receiver that will thrill to your slightest touch—an instrument that will enable you to listen to stations on the four corners of the globe. Here, at last, is radio perfection.

Never—never before in the history of radio development has any one instrument been designed which is so versatile—which contains so many new features—which is so miraculous in performance, as this, the ISOTONE.

The ISOTONE will bring the voices of the earth to you. Interference, with this receiver, is unknown. In actual laboratory tests made in the City of Chicago, the most congested broadcasting center of the world, the ISOTONE tuned to a ten kilocycle band, cut through tremendous local interference and brought in stations broadcasting foreign tongues and tunes.

3 Stage Screened Grid Amplifier

This is undoubtedly the first time that screened grid tubes have been used to their greatest advantage. The sensitivity of the ISOTONIC three stage screened grid amplifier is inconceivable. Each stage of the amplifier can be hand tuned by the operator for the absolute maximum in sensitivity and selectivity. This is unquestionably the greatest achievement in sensitivity that the world will ever see. No more sensitive receiver will ever be designed, for no more sensitive one can be used.

New Audio System
Balanced Transformers

The word ISOTONE means perfect balance of tone and this instrument will reveal the true beauty of music. From the shrill whistle of the flute to the low and resonant rumbling of the kettle drum, the ISOTONE will respond magnificently to every musical frequency.

The special ISOTONIC push pull audio transformers are perfectly balanced and center tapped for resistance, capacity, inductance and impedance. Four power tubes in the audio amplifier and one in the detector circuit allow the faithful reproduction of notes which are utterly beyond all amplifiers of present existing types.

Natural Tonal Quality
Radio or Phonograph

Few people will realize the hidden beauty of music until they have heard their favorite selections recreated through an ISOTONIC audio amplifier. Whether it be radio or phonograph music, the same profusion of exquisite shades and tones bursts into life at the touch of the tiny button which automatically controls the greatest musical instrument of our time.

This is the receiver that we have promised to you. This is our greatest achievement. It is so far advanced—it is so radically different—its new features are so numerous that pages would be required for an accurate description.

FREE Circuit Diagram
And All Information

Can Be Constructed by Anyone

There is nothing complicated about the construction of an ISOTONE. Each of the three units is assembled, wired and laboratory tested at our factory. All you have to do in order to reproduce these wonderful results for yourself is to take a standard kit of ISOTONE parts and assemble the instrument with a few nuts, bolts and only ten wires. There is nothing to go wrong. Each piece fits together with absolute precision, and in less than an hour you can realize what is acclaimed by women as the most beautiful receiver of the day—and admitted, beyond a question of doubt, by radio engineers as the most efficient radio phonograph ever designed.

Absolute Guarantee

Every ISOTONE kit and each ISOTONIC unit is fully guaranteed. All H. F. L. items must be mechanically and electrically perfect. Each instrument must test up to the standard set by our laboratories. Any unit that does not operate perfectly will be immediately replaced at no charge. No arguments—no lengthy correspondence—your ISOTONE must be right or we will make it right. Our guarantee gives you absolute protection. BUILD YOUR ISOTONE NOW and have the finest receiver in your neighborhood. Send for full particulars TODAY.

HIGH FREQUENCY LABORATORIES
Office L, 28 N. Sheldon St., Chicago, Illinois

Gentlemen: Without obligation, please send complete information on the ISOTONE receiver and the ISOTONIC A. C. power supply.

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Address.....

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

(Please print plainly)

Simply Fill in the Coupon and Mail Today ☛

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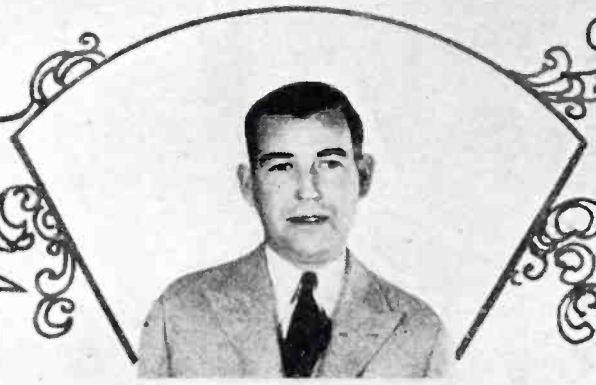

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The Kind of Instruments You Want

The kind of instruments that amateurs, experimenters, manufacturers and dealers recommend and use is the kind that you want for your radio adjusting and checking. These people are not guessing when they choose Jewell instruments for they know from past experience and from records of Jewell achievements just what sort of service may be expected.

In the field of amateur broadcasting, Jewell instruments enjoy the fullest confidence and admiration of their users. Many enviable records have been made with the Jewell "Trio" of special broadcasting instruments.

Experimenters come to Jewell for special instruments covering their specific requirements.

Radio manufacturers control their productive operations and check their finished product with Jewell instruments.

Many dealers and service men employ Jewell instruments exclusively in their service work. Their customers have confidence in Jewell equipment.

It pays to know about Jewell instruments. Ask your dealer to tell you about them or write us and ask for a copy of our radio instrument catalog No. 15-C which describes our radio instruments in detail.

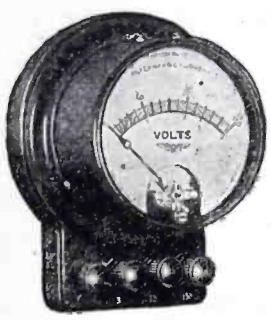
"28 Years Making Good Instruments"

Jewell Electrical Instrument Co.

1650 Walnut St., Chicago

Pattern No. 199

Pattern No. 199—the Jewell service set that all dealers are buying this year. Its many handy and advanced test features present a worth easily recognized. If your dealer uses this test equipment, you are assured of good service.



Pattern No. 77

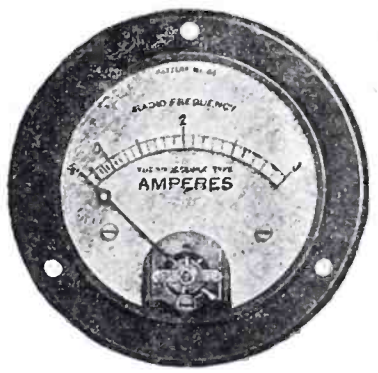
Pattern No. 77—a portable, triple range, A.C. instrument, moderate in price, but very effective for making the various alternating current tests required in the adjustment of filament and line voltage of the new A.C. sets.

Pattern No. 150

Pattern No. 150—a new A.C. tube checker for dealer use that is very simple. Merely plug the attachment cord into a light socket and it is ready to operate. Tests all tubes, from the 199 up to the 210.

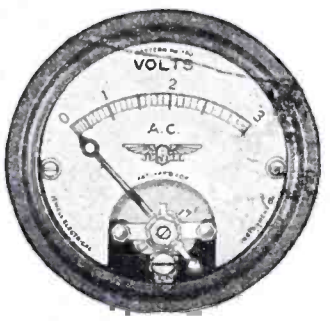
Pattern No. 139

Pattern No. 139—high resistance voltmeter of the reliable D'Arsonval moving coil type, suitable for use by the individual in checking and adjusting B eliminator voltages. The range of 0-300 volts covers all ordinary requirements.



Pattern No. 64

Pattern No. 64—a thermo couple type radio frequency ammeter. It is extremely accurate and has a guaranteed overload capacity of 50%. The losses are very low, being less than one-half the Navy minimum.



Pattern No. 190

Pattern No. 190—a flush type, panel mounting A.C. instrument for panel control of A.C. tube filament voltage and for line voltage checking. Its numerous available ranges enable a choice to cover any requirements. Case diameter, 2 inches.

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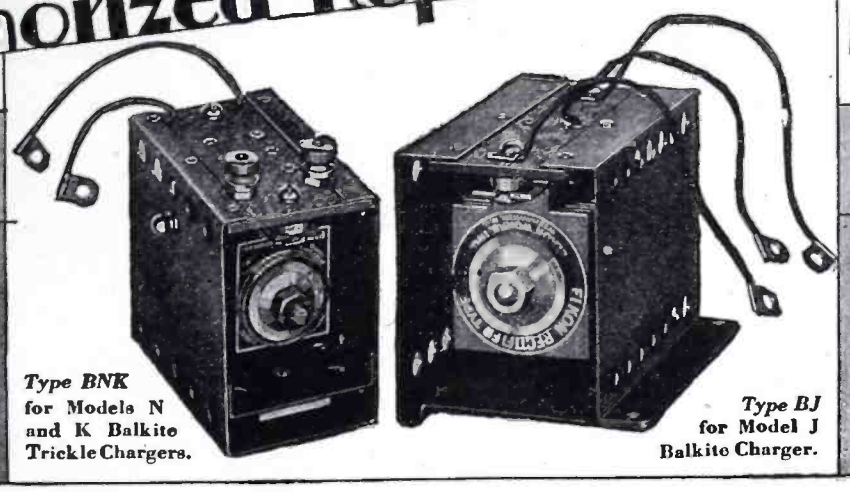
Over 900,000 Balkite Chargers Need this Authorized Replacement Rectifier



Type BNK for Models N and K Balkite Trickle Chargers.

Type BJ for Model J Balkite Charger.

ELKON *the only* authorized Replacement Unit for Balkite Chargers

The Elkon Replacement Units and those made by the Fansteel Products Co. containing the Elkon Dry Rectifier are the only ones authorized for replacing the acid jars in Balkite Power Units.

No trouble in making the change—anyone can do it. And the difference! No fussing and messing with water and dangerous acids, with the Elkon Rectifier in place all trouble, attention and adjustment is eliminated for 5000 hours!

Increased efficiency, too. With the Elkon Replacement Units, the charging rate of Model K is increased from 4/10 of an ampere to 8/10; The Model N is increased from 8/10 to 1 ampere; and all of the charging rates of the Model J are increased 20%!

Solid, dry, self-healing, not affected by line surges, noiseless—truly the trouble-free rectifier.

ELKON, INC.

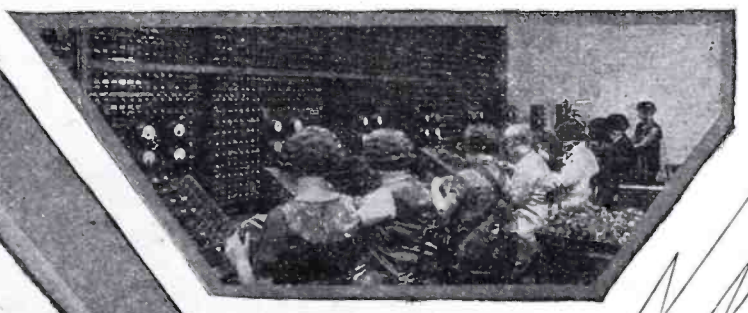
PORT CHESTER, N. Y.

Division of

P. R. MALLORY & CO., INC.

ASK ABOUT THE OTHER ELKON RECTIFIERS, TOO

M-16 for "A" Eliminators and 3 ampere chargers. V-4 for trickle chargers—and this new EBH for replacing BH tubes in "B" Eliminators.



Not a telephone switchboard—operators testing Elkon rectifiers and the seasoning boards in the background.

Radio Department, ELKON, Inc.
250 Fox Island Road, Port Chester, N. Y.
Send me full information on Elkon Radio Products

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Address.....

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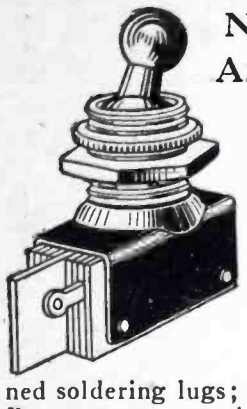
BAND CONDUCTOR

AGAIN FROST-RADIO LEADS

You now can obtain a complete line of these well known radio parts



New Frost-Radio A.C. Snap Switch

Here's a new Frost item that you'll like. This little A.C. Snap Switch handles 3 amps. at 250 volts, which is more wattage than a toaster or flat iron. Metal case; completely insulated contacts; tinned soldering lugs; single hole mounting. Be sure to use this Frost A.C. Snap Switch to insure ample safety factor. List: 75c.

New Frost-Radio Molded Mica Condensers

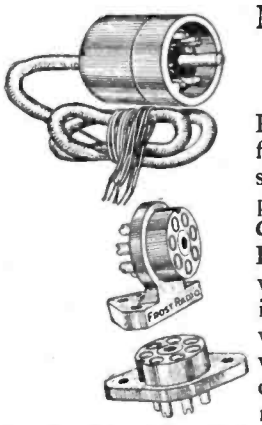
We guarantee these new Frost Molded Mica Condensers to be accurate to within 10%. Have mica dielectric. Are remarkably stable because unaffected by moisture or climatic changes. Extremely neat in appearance. Well designed terminal lugs and moulded-in Bakelite flanges (for sub-panel mounting). Capacities .0001 to .006 mfds. List: 45c to 90c. Grid leak clips, 10c per pair.

New Frost-Radio Heavy Duty Filter Condensers

These sturdy looking and finely built heavy duty filter condensers have conservative voltage ratings, are vacuum impregnated and hermetically sealed. Only the finest grade paper and foil is used in their construction. Gold bronze finish lacquer finished. Capacities: .5 to 2 mfds. Prices: $1.40 to $7.00.

You now can secure practically every part you will need in building your receiver from the well known high grade FROST-RADIO Line. This simplifies your parts-buying problem and makes the purchase of parts a one-store proposition, as your favorite dealer can furnish you with any of the following parts bearing the Frost-Radio nameplate:

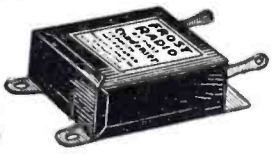
- Variable High Resistances
- Variable High Resistances with D.C. Switch
- Variable High Resistances with A.C. Snap Switch
- Gem Variable High Resistances
- Approved A.C. Snap Switches
- Air Cooled De Luxe Bakelite Rheostats
- Gem Rheostats
- Gem Hum Balancers
- Fixed Resistances
- Center Tapped Resistances
- UX Base Bakelite Sockets
- Panel Brackets
- Hook-Up Wire
- Universal Resistance Kits
- Frost Fones
- Cable Plugs
- Bakelite Adapters
- Gem-Jacs
- Pan Tab Jacks
- Loop Plugs and Jacks
- Microphones
- Plugs
- Battery Switches
- Ground Clamps
- Jack Switches
- Extension Cords
- Jac-Boxes
- By-Pass Condensers
- Medium Duty Filter Condensers
- Heavy Duty Filter Condensers
- "B" Blocks
- Molded Mica Condensers
- Convenience Outlets



New Frost-Radio Cable Plug

Easily the most finely designed and sturdily built cable plug on the market. Genuine moulded Bakelite throughout with spun-in terminals that cannot work loose even when heated in soldering. Best grade rubber covered cotton braid cable, with colored rubber code. Color markings are moulded into Bakelite. List: Plug, with 5-foot seven-wire cable, $2.25. Baseboard type mounting socket, 75c. Sub-Panel socket, 75c.

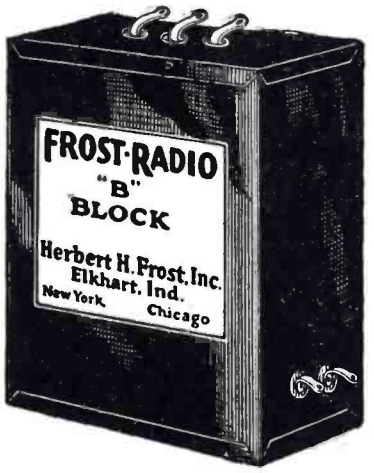
New Frost-Radio By-Pass Condensers



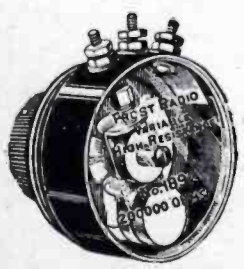
These new by-pass condensers, like our new heavy duty filter condensers, are conservatively rated, made from finest materials, (linen and flax paper stock, and the finest foils obtainable), and will give long service. Vacuum impregnated and seasoned thoroughly before shipment. Metal cases are hermetically sealed, and are finished in rich gold bronze lacquer. Capacities: .1 to 2 mfds. List: 80c to $2.00.

New Frost-Radio Universal "B" Blocks

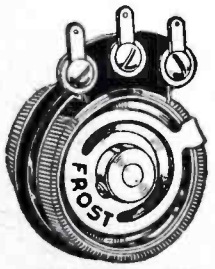
We do not know how it would be possible to make finer "B" Blocks than these new Frost items. They are rated very conservatively, are inclosed in hermetically sealed vacuum impregnated metal cases, and will give wonderful service even under the worst possible conditions to which they will ever be subject. Consists of 3 sections of 2 mfds. each, 1 section of 1,000 working volts; other two sections of 600 working volts; 1 section of 4 mfds., 400 working volts and 1 section of 1 mfd., 400 working volts. Price, $18.00 each.



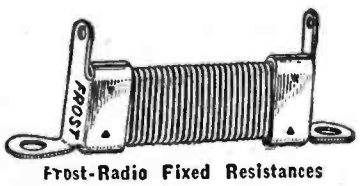
You Know These Old and Famous Parts



Frost-Radio Variable High Resistances

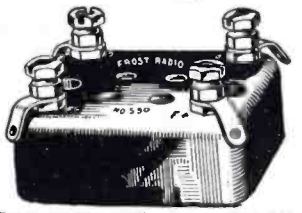


Frost-Radio Gem Rheostats



Frost-Radio Fixed Resistances

Frost-Radio Air Cooled. Bakelite Rheostats



Frost-Radio UX Base Bakelite Sockets

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The NEW KNAPP "A" POWER KIT

Improved
Design
Efficiency
Appearance
AND a New
Money-making
Plan for every
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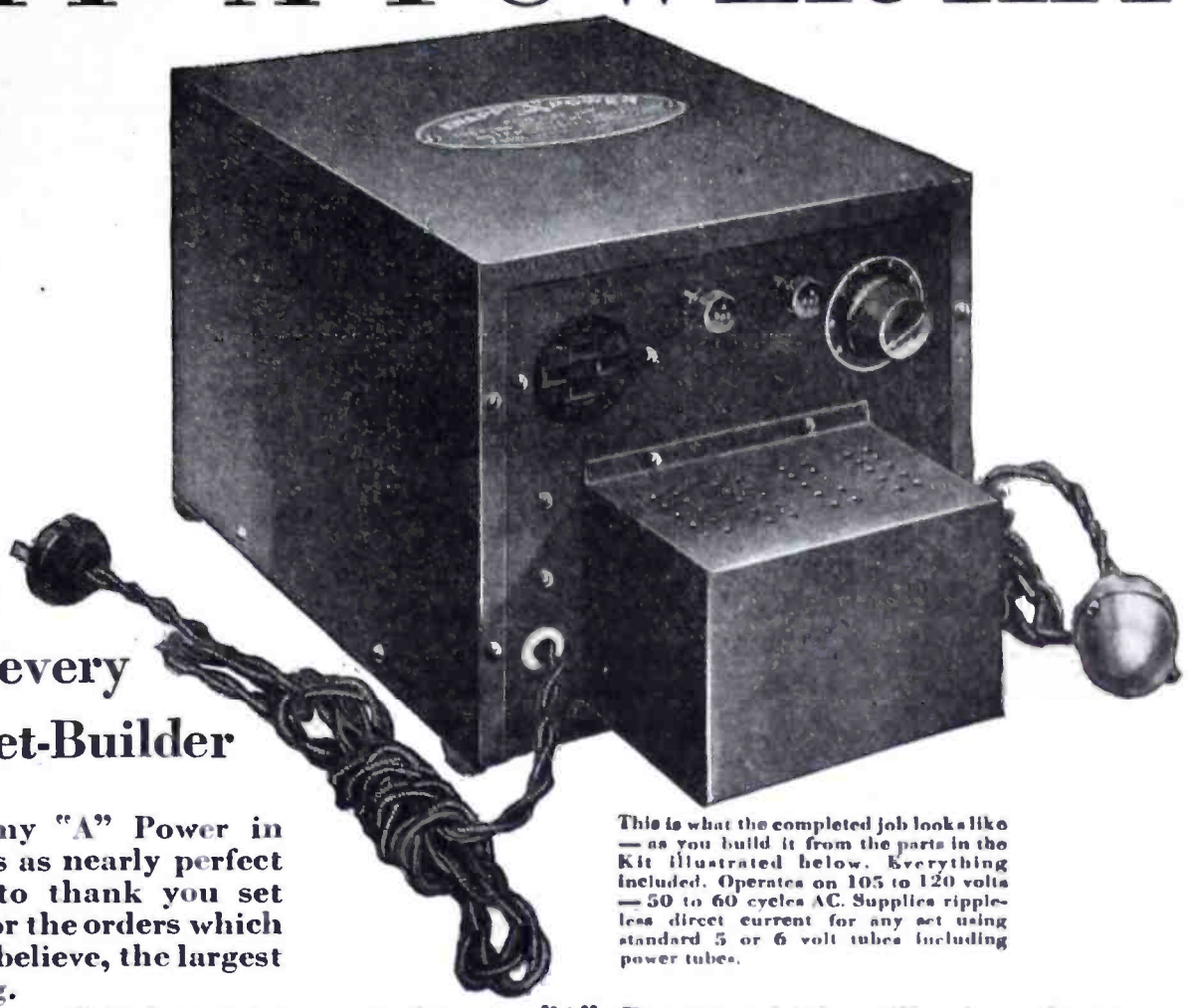


This is what the completed job looks like — as you build it from the parts in the Kit illustrated below. Everything included. Operates on 105 to 120 volts — 50 to 60 cycles AC. Supplies ripple-less direct current for any set using standard 5 or 6 volt tubes including power tubes.

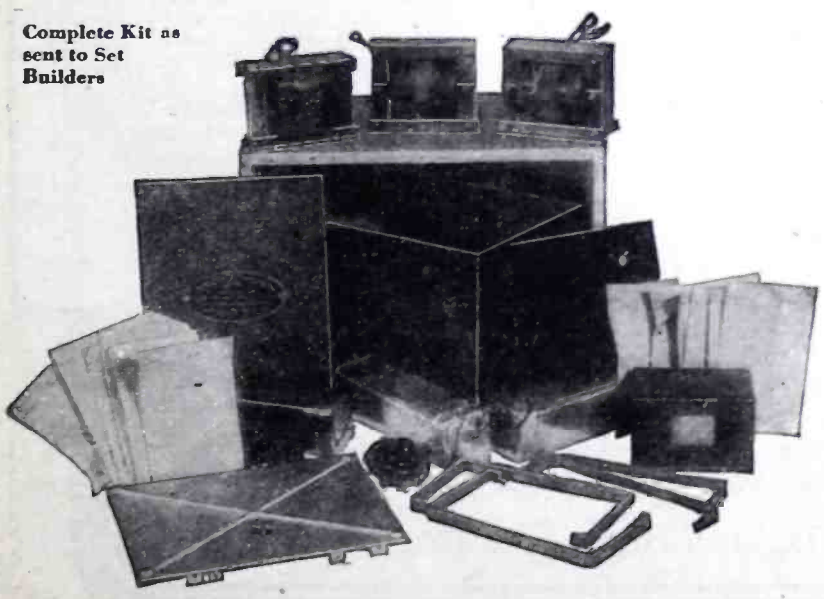
WHEN I first announced my "A" Power in January, I thought it was as nearly perfect as it could be made. I want to thank you set builders for your interest and for the orders which enabled the Knapp "A" to be, I believe, the largest selling "A" power in the Spring.

Your confidence has made it possible for me to improve my "A" Power to such an extent that from the standpoint of appearance, and design it is second to none, regardless of price. The efficiency, however, was harder to improve. You fans who bought last spring would know that — but with an additional condenser and newly designed choke coils it is even better than before. *And the price is reduced!*

Truly Magic Silence Ideal for Superhets and Short Wave Sets

The improved filter system, using 3 Elkon Bone Dry Condensers, each with a capacity of 1500 mf. plus improved choke coils makes the Knapp "A" the outstanding "A" Power in the country. The silent Knapp "A" will power any super-het using 5 or 6 volt tubes, without the trace of a hum. Short wave sets with the use of headphones require an "A" Power which will give them unfailing filament current with absolute quiet — The Knapp "A" is the only answer. The "head phone test" will prove it to you. Of course the Knapp can and should be used with any set using standard 5 or 6 volt tubes including Power Tubes.

Complete Kit as sent to Set Builders



Complete Kit

Everything is included in this remarkable Kit — every screw, wire, even a die cast base plate and the specially baked metal cover. You can't buy another thing — because you do not need anything — and the instructions are so simple that anyone can put it together.

New Money-Making Plan

That's what you are interested in — and I have it for you. I am working with the Set-Builders and I don't care who knows it. You can buy my Kit at a price which will enable you to make some real money. Send the coupon today for my special money-making proposition for Set-Builders.

DAVID W. KNAPP, *President*

Knapp Electric, Inc., Division of P. R. Mallory & Co., Inc., Port Chester, N. Y.

Just Clip and Mail ♦ !

David W. Knapp, President
Knapp Electric, Inc.,
361 Fox Island Road,
Port Chester, N. Y.

Kindly send me complete information on your Knapp "A" Power and your special profit-making proposition for Set-builders.

Name_____

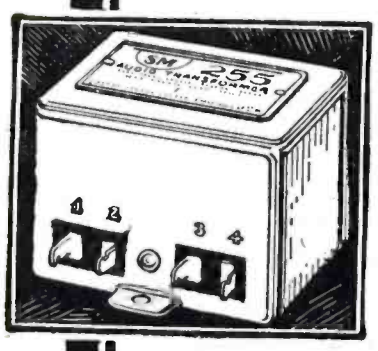
Address_____

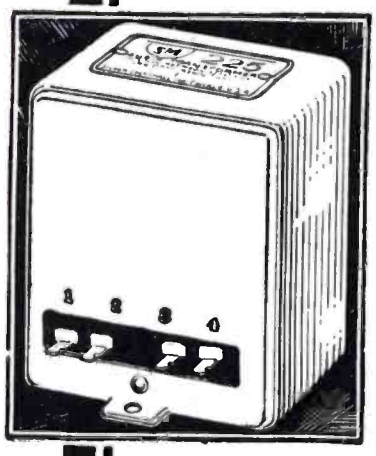
Please print name and address

SM

Down to "BRASS TACKS" ON AUDIOS

(whether it hurts or not!)





"Silver-Marshall unconditionally guarantees the new S-M Clough system audio transformers to give greater amplification, finer tone, and less distortion than any standard transformers marketed by any other American manufacturer."

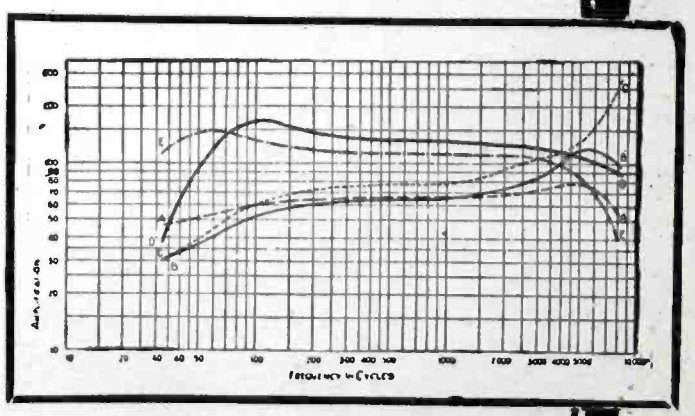
CONTRAST this straight-from-the-shoulder guarantee with the advertising phrases used by other manufacturers—not one dares offer the guarantee that S-M has given for two consecutive years—ever since the first 220 transformers were produced.

Not all radio fans have been able to attend the public comparative tests that S-M engineers have been making at the R. M. A. trade show and in the larger Eastern cities. These are the very surest proof that the new transformers are far superior to any and all other types. If you find it hard to believe that any transformers *can* be so far ahead of the audio equipment which you have been using, we can only say o you: "Buy a 225 and a 226, or a 255 and a 256; hook them up properly and test them. Then, if you're not satisfied that they are better than anything you've ever heard, return them to the factory for full credit." The fan unwilling to accept such an offer—content with transformers now far outclassed—is not the open-minded and progressive type to whom S-M appeals, and who will find in the new S-M transformers a quality of reproduction beyond his fondest expectations.

Research engineers—eminent designers—men who *know*, not guess—all acknowledge the supremacy of S-M audio transformers. This is a strong statement to make, but we back it up with a guarantee such as no other manufacturer has offered on audio transformer equipment. S-M Clough System audios are, in absolute fact, *two years ahead*—as truly as were the S-M 220's when, two years ago, they introduced the high frequency cut-off only recently adopted by other manufacturers. Remember this when selecting audio amplifying equipment—remember that S-M is the only manufacturer that has ever dared to make or encourage public comparative tests in comparison amplifiers open and accessible to minute, detailed examination by all listeners—and remember the above-quoted positive guarantee!

If you don't wish to build, yet want your radio to be custom made, with all the advantages that this implies, S M will gladly refer your inquiry to an Authorized Silver-Marshall Service Station near you. If, on the other hand, you build sets professionally, and are interested in learning whether there are valuable Service Station franchises yet open in your territory, please write us.

IN the chart at the right, E is the two-stage curve for the large-size transformers (S-M 225, 1st stage; and 226, 2nd stage, $9.00 each); D is that of the smaller ones (S-M 255 and 256, $6.00 each). Note the marked advantage over A, B, and C—all standard eight and ten dollar transformers under equal conditions.



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ATTENTION! Custom Set Builders

Our unique business building plan will triple your Custom Set business this season. Ask your jobber, or check coupon below for full particulars

"The great demand for the new Scott Shield Grid 9, which taxed our laboratory beyond its capacity and made it necessary for us to double our facilities, is simply visible proof of the statement I made at the announcement of this new set—Here is unquestionably the most powerful receiver available today. I extend a most cordial invitation to all set builders to visit our new laboratory and to see and hear our laboratory models and observe first hand the precision and care taken in matching and testing all parts of this wonderful set."

E. H. Scott

The Beautiful Scott Tasman Console—one of the three finely built cabinet models especially designed for the Scott Shield Grid Nine.

Now... the finest of all reception!

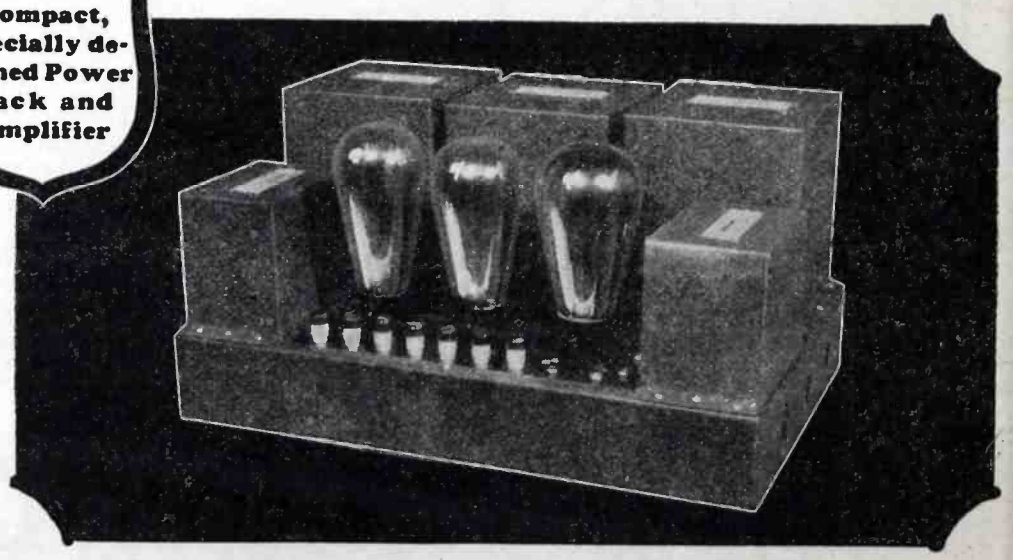
Here is the successor to a line of famous World's Record Receivers! Three years ago the first Scott SUPER broke all world's records on distance reception. It was followed by a line of SUPERS each of which was better and more powerful than its predecessor, and incorporated still more recent radio developments. And now—the greatest of all, the new Scott Shield Grid Nine, with new circuit—new shield grid tubes—and new intermediate amplifier! Such unprecedented demand followed the announcement of this new set, that an immediate doubling of our laboratory facilities was required. The amazing success predicted for this new receiver was realized before we could prepare for the flood of orders which it precipitated. But now we have caught up with the demand. Already hundreds of the new Scott Shield Grid Nines have been built, operated, tested and approved by radio builders everywhere. All agree that this new set is years ahead—and that it will maintain for years to come the traditions of this famous series of World's Record receivers.

New Exclusive Console Designs

A new beautiful Tasman Console Cabinet of Burl Walnut has been designed especially for the Scott Shield Grid Nine, combining both phonograph and radio into one unit. By means of a simple switch, the broadcast program may be varied by music from records. No tubes to pull out or adaptors to adjust. The Power Amplifier *electrically* reproduces record music, giving unbelievably life-like quality.

Another new, especially designed console model without phonograph compartment, strikingly beautiful in detail and craftsmanship, is also obtainable—as well as the new standard table type cabinet. Coupon brings full particulars. Mail today!

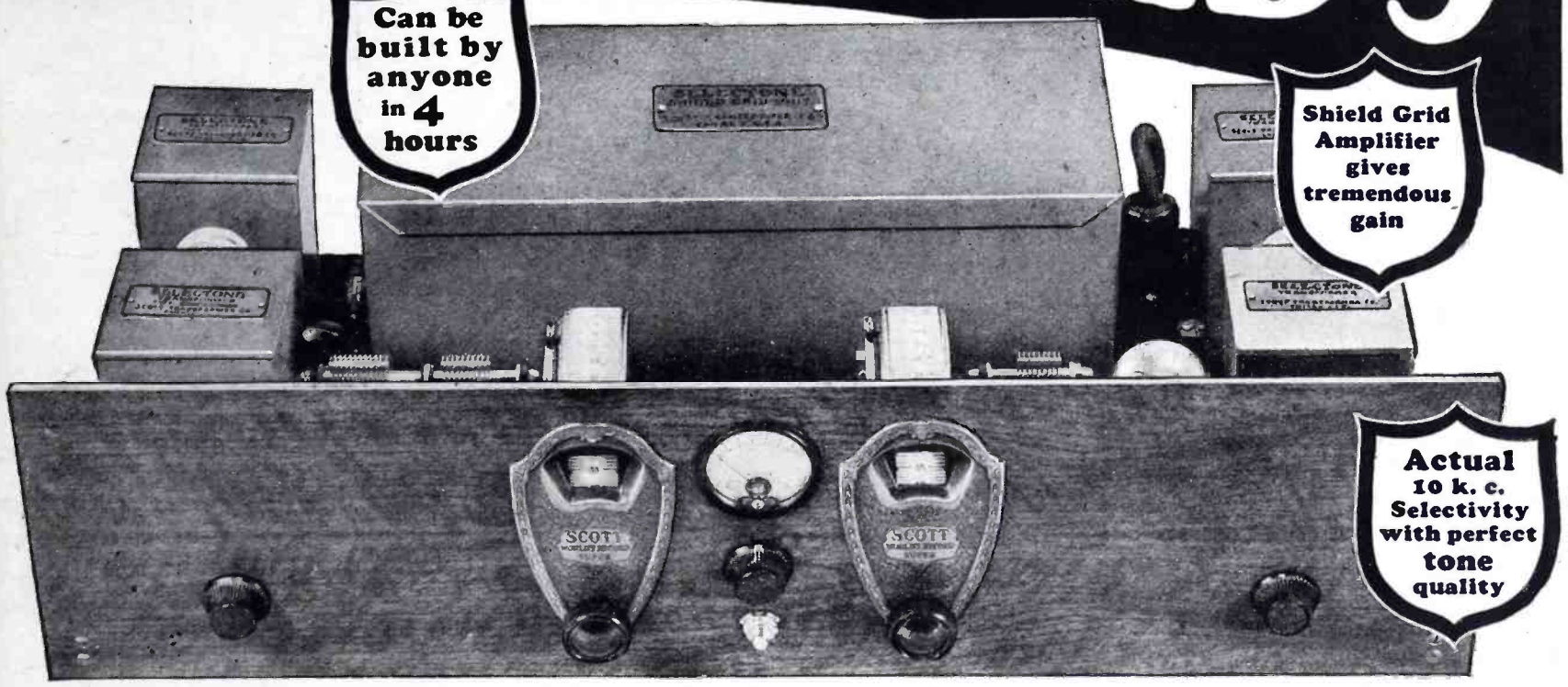
Compact, specially designed Power Pack and Amplifier



Scott Power Pack and Amplifier

This Scott unit is especially designed to supply B current for the Scott World's Record Shield Grid Nine, and also has incorporated in it the second stage of audio, using a 250 power tube. Note compact, fully shielded construction.

we have caught up with the demand now assured on the amazing NEW WORLD'S RECORD SHIELD GRID 9



Challenges the whole Radio World to any test of Distance · Volume · Selectivity and Tone

The Scott Shield Grid Nine and Power Amplifier is a standing challenge to the entire world of radio to match its superb performance. In range it is practically *unlimited*—due to the tremendous amplification of the *Shield Grid* long range amplifier employed. In amazing volume, selectivity, and life-like tonal purity, it is absolutely unrivaled.

Shielded Grid Tubes in Improved New Circuit

Perhaps the greatest single factor in increasing the efficiency of this new Scott receiver is the use of the new Shield Grid Tubes, in a new improved circuit. This gives many times the amplification obtainable from an ordinary circuit using 201A tubes, making this receiver more powerful than any other existing receiver known to us.

Perfect Matching of Parts Gives Enormous Gain

To further increase efficiency in the new Scott receiver, not only are the tubes shielded, but the transformers as well. The extreme care taken in matching and testing the transformers is another reason for the amazing volume obtained from far distant stations. All parts throughout are especially designed and painstakingly matched with precision equipment. The special Selectone Two-Gang condenser, for instance, matches the inductances of the antenna and R. F. coils so perfectly that they line up throughout the entire scale and afford astonishing selectivity with maximum amplification all the way from the lowest to the highest wave lengths.

One Spot Reception

The Scott Shield Grid Nine is a one spot Super. Stations come in at one point only on the dials. A further improvement is evidenced in the fact that both dials track practically together, making tuning extremely easy. The Scott Power Amplifier, used with receiver, makes it possible to secure immense volume without the slightest distortion. This volume is so completely under control that the turning of one knob covers the entire range from merest whisper to full auditorium volume—always with life-like clarity and beauty.

Low Operating Cost

The Scott Shield Grid Nine can be economically operated with dry batteries if desired. The eight tubes incorporated in the receiver draw only 29 mils. and will give ample volume for the average home. Where A.C. current is available, the special new Scott Power Pack and Amplifier, with the ninth tube for the second stage of audio, is used. This is the latest 250 power tube, giving great volume with matchless tone quality.

Easy to Build --- Results Guaranteed

Although the Scott Shield Grid Nine is one of the most highly perfected sets ever designed, it is an amazingly simple one to build. Anyone can assemble it in four hours. Both panel and sub-panel are drilled to receive each part and the shielded grid amplifier unit comes to you fully wired and tested—ready to be connected into the circuit as simply as hooking-up a transformer. No adjustments are required of the builder and you can't go wrong on the assembly.

We positively guarantee that you will get the same results we obtain from our own laboratory models.

SCOTT TRANSFORMER CO., 4450 Ravenswood Ave., Chicago

For the small cost of the Scott Shield Grid Nine you can get all that could be desired of radio—the very newest, finest developments of the day. Why not enjoy World's Record performance when you can have it at less cost than inferior reception? Why not have a receiver that provides actual 10 kilocycle selectivity? Why not listen in on a radio that gives you the whole world—the only range limit being the atmospheric noise level! Build the Scott Shield Grid Nine and enjoy the ultimate in radio—NOW! Mail the coupon TODAY!

FREE Circuit Diagram and Particulars

Write at once for full particulars. Let us send you FREE the Scott Circuit Diagram. Examine it yourself. See with your own eyes why it affords unequaled performance —limitless range—tremendous power—matchless tone. Proof will be sent you FREE. Also copies of 6000 and 9000 mile reception verifications and other astonishing records. Clip coupon and mail today. Do this NOW!

Clip this now and mail

SCOTT TRANSFORMER CO.
4450 Ravenswood Ave., CHICAGO, ILL.

Please send me FREE circuit diagram, records, and full particulars of the new Scott Shield Grid Nine.

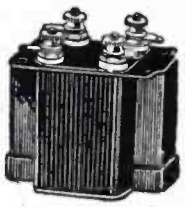
☐ I am interested in your proposition to professional set builders.

Name.....

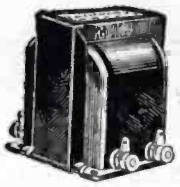
Street.....

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

Audio Transformer
R-150 ..... $4.00

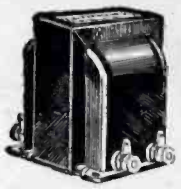


Audio Transformer
R-180 .....$4.00



Audio Transformer
R-300 .....$8.00

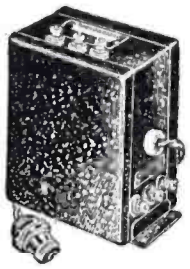
Autoformer
R-190 .....$5.00



Speaker Transformer
R-76 .....$6.00

Push-Pull Input
T-2408 .....$8.00

Push-Pull Output
T-2420 .....$8.00



Power Compacts
R-171 .....$15.00
R-280 ..... 17.00
R-210 ..... 20.00

Power Transformers
T-2098 .....$20.00
T-2900 ..... 20.00
T-2950 ..... 29.50

Double Chokes
T-2099 ..... $14.00
T-3099 ..... 16.00
T-3100 ..... 18.00

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T-2385 .....$16.00
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T-2388 ..... 30.00

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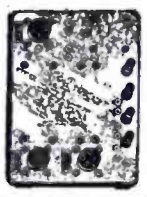
T-2353 .....$7.50
2071 ..... 16.00
2027 ..... 20.00
2073 ..... 30.00



Metal Baseboard
For use with 210 Compact—R-211—$5.00

Thordarson Power
and
Audio Transformers

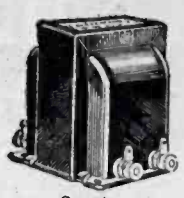
SUPREME IN MUSICAL PERFORMANCE

QUALITY performance is assured with the use of Thordarson radio transformers. The prestige of using Thordarson transformers should have the consideration of every set builder before purchasing his radio parts. Radio set manufacturers have been quick to recognize Thordarson quality and as a result you will find that Thordarson transformers predominate by a vast margin in the better receivers.

We carry a complete line of Thordarson transformers in stock for immediate delivery including all types of audio transformers, push-pull transformers, filament supply transformers, as well as the necessary parts for the extensive line of Thordarson power amplifier kits.

In addition to the Thordarson transformers listed on this page we are also jobbers of all other high quality radio apparatus. Our efficient organization is at your service. We solicit your orders and inquiries.

The Merchandise You Are Looking for We Have in Stock



Speaker Transformer
T-2876 .....$6.00

Speaker Transformer
T-2629 .....$10.00

Speaker Transformers
T-2901 .....$12.00
T-2902 ..... 12.00

Speaker Transformer
T-2903 .....$12.00

Z-Coupler
T-2909 .....$12.00

Filament Transformer
T-2445 .....$10.00

Filament Transformers
T-2610 .....$7.50
T-3081 ..... 6.00
T-2604 ..... 5.00

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"Nothing but Radio"

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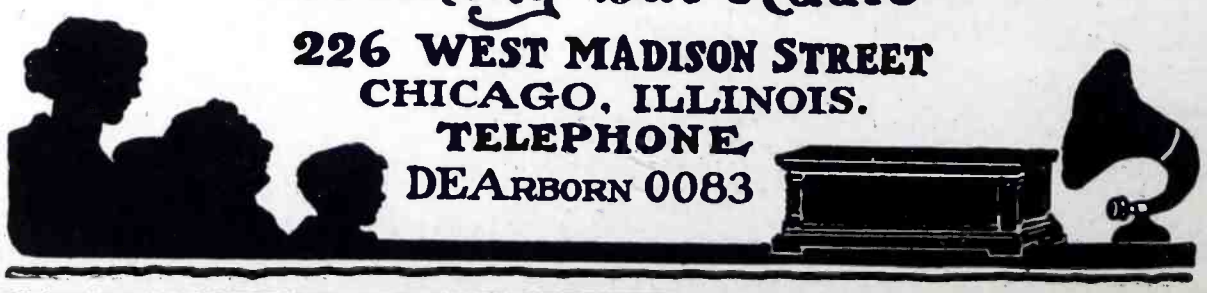
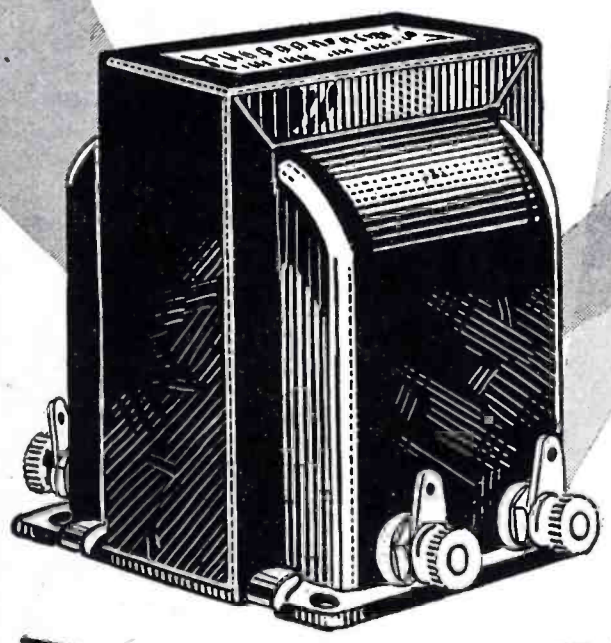


A NEW NOTE IN AUDIO AMPLIFICATION



THORDARSON R-300 AUDIO TRANSFORMER

SUPREME in musical performance, the new Thordarson R-300 Audio Transformer brings a greater realism to radio reproduction. Introducing a new core material, "DX-Metal" (a product of the Thordarson Laboratory), the amplification range has been extended still further into the lower register, so that even the deepest tones now may be reproduced with amazing fidelity.

The amplification curve of this transformer is practically a straight line from 30 cycles to 8,000 cycles. A high frequency cut-off is provided at 8,000 cycles to confine the amplification to useful frequencies only, and to eliminate undesirable scratch that may reach the audio transformer.

When you hear the R-300 you will appreciate the popularity of Thordarson transformers among the leading receiving set manufacturers. The R-300 retails for $8.00.

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.

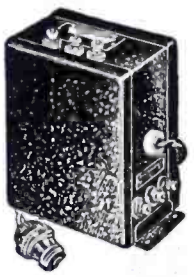
Power Supply Transformers

These transformers supply full wave rectifiers using two UX-281 tubes, for power amplifiers using either 210 or 250 types power amplifying tubes as follows: T-2098 for two 210 power tubes, $20.00; T-2900 for single 250 power tube, $20.00; T-2950 for two 250 tubes, $29.50.

Double Choke Units

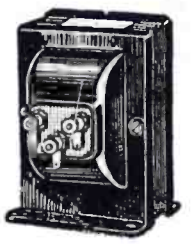
Consist of two 30 henry chokes in one case. T-2099 for use with power supply transformer T-2098, $14; T-3099 for use with transformer T-2900, $16; T-3100 for use with transformer T-2950, $18.

Power Compacts



A very efficient and compact form of power supply unit. Power transformer and filter chokes all in one case. Type R-171 for Raytheon rectifier and 171 type power tube, $15.00; Type R-210 for UX-281 rectifier and 210 power tube, $20.00; Type R-280 for UX-280 rectifier and 171 power tube, $17.00.

Speaker Coupling Transformers



A complete line of transformers to couple either single or push-pull 171, 210 or 250 power tubes into either high impedance or dynamic speakers. Prices from $6.00 to $12.00.

Screen Grid Audio Coupler

The Thordarson Z-Coupler T-2909 is a special impedance unit designed to couple a screen grid tube in the audio amplifier into a power tube. Produces excellent base note reproduction and amplification vastly in excess of ordinary systems. Price, $12.00.

THORDARSON ELECTRIC MFG. CO.
500 W. Huron St., Chicago, Ill. 3583-R

Gentlemen: Please send me your constructional booklets on your power amplifiers. I am especially interested in amplifiers using.....tubes.

*Name*_____

*Street and No.*_____

*Town*_____ *State*_____

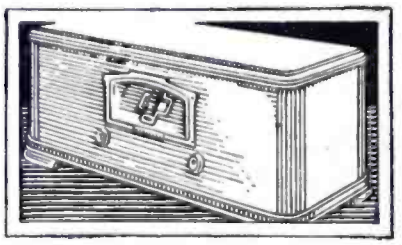
Balkite *announces the new A·C set*

in Cabinets by Berkey & Gay

The time has come for radio that will serve you just as a fine car now serves you—with no thought on your part for the mechanism.

Balkite announces such radio in this new AC set. It embodies notable inventive features, developed in the Balkite laboratories; but chiefly we wish to emphasize the engineering fineness of it.

For it is engineering refinement that makes this set so simple, compact and trouble-free; yet that gives you the same beautiful quality of reception that has hitherto been possible only with complicated devices and laboratory conditions.



Balkite A-5—*The Table Model. Walnut cabinet, by Berkey & Gay. Complete, but for tubes and speaker.*

Balkite A-3—*The same, in a simple but sightly all-metal case.*

Balkite A-7 (Highboy)—*Housed in a beautifully hand-carved walnut cabinet by Berkey & Gay. Dynamic speaker. Complete, but for tubes.*

$197.50 *to* $487.50

Prices slightly higher west of the Rockies

Balkite, as one of the important factors in radio development, has long foreseen the necessity of such a set and has devoted its energies, over a long period of time, to production of it.

This new set is AC in every sense of that loose term, a complete unit ready to operate from your light socket. It is AC without hum. It has push-pull audio, complete shielding, dynamic speaker power, a jack for reproducing records electrically, tube protection against high voltage.

Ask for a demonstration. Fansteel Products Company, Inc., North Chicago, Illinois.

FANSTEEL

Balkite Radio

In Cabinets by Berkey & Gay

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

The following lists give the new allocation of all Broadcasting Stations which is to be effective at 3 A. M. Eastern Standard Time on Nov. 11th. 1928, by order of the Federal Radio Commission.

Turn to page 44 for our new FREE SERVICE on Broadcast Station allocations

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KDKA	—E. Pittsburgh, Pa. —Westinghouse Elec. & Mfg. Co.	50000	305.9	980	Eastern
KDLR	—Devils Lake, N. Dak.— Radio Elec. Co.	100	247.8	1210	Central
KDYL	—Salt Lake City, Utah —Intermountain Broadcasting Corp., 1009 Ezra Thompson Bldg. (Divides time with KFAU)	1000	243.8	1230	Mountain
KEJK	—Los Angeles, Calif. —Macmillan Petroleum Co., 218 N. Larchmont Blvd. (Divides time with KFON)	500	239.9	1250	Pacific
KELW	—Burbank, Calif.—Earl L. White, 3702 Magnolia Ave, (Divides time with KNRC)	500	384.4	780	Pacific
KEX	—Portland, Ore.—Western Broadcasting Co. (Divides time with KOB)	2500	254.1	1180	Pacific
KFAB	—Lincoln, Nebr.—Nebraska Buick Auto Co. (Divides time with WBBM-WJBT)	5000	389.4	770	Central
KFAD	—Phoenix, Ariz.—Electrical Equipment Co.	500	483.6	620	Mountain
KFAU	—Boise, Idaho—Independent School, Dist. of Boise (Divides time with KDYL)	1000	243.8	1230	Mountain
KFBB	—Havre, Mont.—F. A. Buttrey Co.	50	249.9	1200	Mountain
KFBK	—Sacramento, Calif.— Kimball-Upson Co., 610 California St. (Limited.)	100	228.9	1310	Pacific
KFBL	—Everett, Wash.—Leese Bros., 2814 Rucker Ave. (Divides time with KUJ-KVL)	50	199.9	1500	Pacific
KFBU	—Laramie, Wyo.—St. Mathews Cathedral, Bishop N. S. Thomas	500	499.7	600	Mountain
KFCB	—Phoenix, Ariz. — Nielson Radio & Sporting Goods Co., Central Ave. at Pierce.	100	228.9	1310	Mountain
KFCR	—Santa Barbara, Calf. —Santa Barbara Broadcasting Co., 1200 Anacapa St.	100	199.9	1500	Pacific
KFDM	—Beaumont, Tex.— Magnolia Petroleum Co., (Divides time with KPRC)	1000	545.1	550	Central
KFDX	—Shreveport, La. — 1st Baptist Church (Divides time with KRMD)	50	249.9	1200	Central
KFDY	—Brookings, S. Dak.— South Dakota State College (Divides time with KFYR-KFJM)	500	545.1	550	Central
KFEC	—Portland, Ore.—Meier & Frank Co. (Divides time with KFJI)	50	218.8	1370	Pacific
KFEL	—Denver, Colo.—Eugene P. O'Fallon, Argonaut Hotel (Divides time with KFXF)	250	267.7	1120	Mountain
KFEQ	—St. Joseph, Mo.— Scroggin & Co., Bank, Hotel Robidoux, (Divides time with KFLV)	500	212.6	1410	Central
KFEY	—Kellogg, Idaho—Union High School.	10	218.8	1370	Pacific
KFGQ	—Boone, Iowa — Boone Biblical College, 924 W. Second St.	10	228.9	1310	Central
KFH	—Wichita, Kans.—Rigby-Gray Hotel Co., Hotel Lassen, First & Market Sts., (Divides time with WIBW)	500	230.6	1300	Central
KFHA	—Gunnison, Colo.— Western State College of Colo.	50	249.9	1200	Mountain
KFI	—Los Angeles, Calif. — Earle C. Anthony, Inc., 1000 So. Hope St.	5000	468.5	640	Pacific
KFIF	—Portland, Ore.—Benson Polytechnic School.	50	211.1	1420	Pacific
KFIO	—Spokane, Wash.— North Central High School, (Daytime only)	100	245.8	1220	Pacific

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KFIZ	**Fond du Lac, Wis.**—Fond du Lac Commonwealth Reporter, 22 Forest Ave.	100	211.1	1420	Central
KFJB	**Marshalltown, Iowa.**—Marshalltown Electric Co., 1603 W. Main St., (Divides time with WJAM)	100	249.9	1200	Central
KFJF	**Oklahoma City, Okla.**—National Radio Mfg. Co., Security Bldg., (Divides time with WRUF)	5000	204	1470	Central
KFJI	**Astoria, Ore.** — Liberty Theatre (Geo. Kincaid). (Divides time with KFEC)	50	218.8	1370	Pacific
KFJM	**Grand Forks, N. D.**—University of N. D., (Divides time with KFDY-KFYR)	500	545.1	550	Central
KFJR	**Portland, Ore.**—Ashley C. Dixon & Son, Fifth & Stark, Lumbermen's Bldg., (Divides time with KTBR)	500	230.6	1300	Pacific
KFJY	**Fort Dodge, Iowa.** — Tunwall Radio Co., 1004 Central, (Divides time with KWCR)	100	228.9	1310	Central
KFJZ	**Fort Worth, Tex.**—Henry C. Allison, 2121 Refugio St.	100	218.8	1370	Central
KFKA	**Greeley, Colo.**—Colorado State Teachers College, (Divides time with KPOF)	500	296.9	1010	Mountain
KFKB	**Milford, Kans.**—J. R. Brinkley, M.D.	5000	265.3	1130	Central
KFKU	**Lawrence, Kans.**—University of Kansas (Divides time with WREN-KSAC)	500	296.9	1010	Central
KFKX	**Chicago, Ill.** — Westinghouse Elec. & Mfg. Co., 508 Michigan Ave.	5000	299.8	1000	Central
KFKZ	**Kirksville, Mo.**—State Teachers College.	50	247.8	1210	Central
KFLV	**Rockford, Ill.**—Swedish Evangelical Mission Church, (Divides time with KFEQ)	500	212.6	1410	Central
KFLX	**Galveston, Tex.**—Geo. R. Clough, 3327 Avenue P.	100	247.8	1210	Central
KFMX	**Northfield, Minn.** — Carleton College (Divides time with WCAL-WRHM-WLB)	1000	243.8	1230	Central
KFNF	**Shenandoah, Iowa** — Henry Field Seed & Nursery Co. (Divides time with WNAX-KSUD)	500	336.9	890	Central
KFOA	**Seattle, Wash.**—Rhodes Department Store, (Divides time with KTW)	1000	234.2	1280	Pacific
KFON	**Long Beach, Calif.** — Nichols & Warinner, Inc., Jergins Trust Cldg., (Divides time with KEJK)	1000	239.9	1250	Pacific
KFOR	**Lincoln, Nebr.**—Howard A. Shuman	100	247.8	1210	Central
KFPL	**Dublin, Tex.**—C. C. Baxter, 205 Grafton St.	15	218.8	1370	Central
KFPM	**Greenville, Tex.** — The New Furniture Co.	15	228.9	1310	Central
KFPW	**Sulphur Springs, Ark.**—St. Johns M. E. Church, 120 W. Main St. (Daytime only)	50	223.7	1340	Central
KFPY	**Spokane, Wash.**—Symons Investment Co.	100	247.8	1210	Pacific
KFQB	**Fort Worth, Tex.**—W. B. Fishborn, Inc., 205 Worth Bldg., (Divides time with WJAD)	1000	241.8	1240	Central
KFQU	**Holy City, Calif.**—W. E. Riker (Divides time with KRE-KGTT)	100	199.9	1500	Pacific
KFQW	**Seattle, Wash.**—KFQW Inc., Continental Hotel. (Divides time with KGY-KKP)	100	211.1	1420	Pacific
KFQZ	**Hollywood, Calif.**—Taft Radio & Broadcasting Co., Inc., 1641 N. Argyle. (Limited)	250	352.7	850	Pacific
KFRC	**San Francisco, Calif.**—Don Lee, Inc.	1000	491.5	610	Pacific
KFRU	**Columbia, Mo.**—Stephens College, Administration Bldg., (Divides time with WOS-WGBF)	500	475.9	630	Central
KFSD	**San Diego, Calif.**—Airfan Radio Corp., U. S. Grant Hotel.	500	499.7	600	Pacific
KFSG	**Los Angeles, Calif.**—Echo Park Evangelistic Ass'n, Angelus Temple (Divides time with KMIC)	500	267.7	1120	Pacific
KFUL	**Galveston, Tex.**—Will H. Ford, 2126 Market St. (Divides time with KTSA)	500	232.4	1290	Central
KFUM	**Colorado Springs, Colo.**—Corley Mountain Highway, Mining Exchange Bldg., (Divides time with KOW)	1000	215.7	1390	Mountain
KFUO	**St. Louis, Mo.**—(Transmitter in Clayton)—Lutheran Church of the Missouri Synod Concordia Theological Seminary (Divides time with KSD)	500	545.1	550	Central
KFUP	**Denver, Colo.** — Fitzsimons General Hospital, Red Cross Bldg., Educational & Recreational Dept., U. S. Army (Divides time with KFXJ)	100	199.9	1500	Mountain
KFUR	**Ogden, Utah.** — Peery Building Co., 420 Twenty-fifth St.	50	228.9	1310	Pacific
KFVD	**Venice, Calif.**—(Transmitter in Culver City)—McWhinnie Elec. Co. 1825 So. Pacific Ave., (Limited)	250	428.3	700	Pacific
KFVS	**Cape Girardeau, Mo.**—Hirsch Battery & Radio Co., 312 S. Frederick St., (Divides time with WEBQ)	50	247.8	1210	Central
KFWB	**Los Angeles, Calif.**—Warner Bros. Pictures (Inc.), 5842 Sunset Blvd. (Divides time with KPSN)	1000	315.6	950	Pacific

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters	Frequency (Kilocycles)	Time at Station
KFWC	**— San Bernardino, Calif.** - (Transmitter in Ontario) —James R. Fouch, Valley Blvd., (Divides time with KPPC)	100	249.9	1200	Pacific
KFWF	**—St. Louis, Mo.**—St. Louis Truth Center, 4030 Lindell Blvd. (Divides time with WMAY)	100	249.9	1200	Central
KFWI	**—San Francisco, Calif.** —(Transmitter in So. San Francisco)—Radio Entertainments, Inc., 1182 Market St. (Divides time with KFWM)	500	322.4	930	Pacific
KFWM	**—Oakland, Calif.** — Oakland Educational Society, 1520—8th Ave. (Divides time with KFWI)	500	322.4	930	Pacific
KFWO	**—Avalon, Catalina Island, Calif.**—Major Lawrence Mott, Signal Corps. U.S. Army (Divides time with KWTC)	100	199.9	1500	Pacific
KFXD	**—Jerome, Idaho** — The Service Radio Co., Main St.	15	211.1	1420	Mountain
KFXF	**—Denver, Colo.** — Pikes Peak Broadcasting Co., Brown Palace Hotel (Divides time with KFEL)	250	267.7	1120	Mountain
KFXJ	**—Edgewater, Colo.**—R. G. Howell (Divides time with KFUP)	50	199.9	1500	Mountain
KFXR	**—Oklahoma City, Okla.** —Exchange Avenue Baptist Church, 416 W. Grand St.	50	228.9	1310	Central
KFXY	**—Flagstaff, Ariz.**—Mary M. Costigan Orpheum Theater.	100	211.1	1420	Mountain
KFYO	**—Breckenridge, Tex.** — Kirksey Bros. Battery, Elec. & Radio Siervce.	100	199.9	1500	Central
KFYR	**—Bismarck, N. D.** — Hoskins Meyer Inc., 200 Fourth St. (Divides time with KFDY-KFJM)	500	545.1	550	Central
KGA	**—Spokane, Wash.** — Northwest Radio Service Co., 325 E. Rowan Ave.	5000	204	1470	Pacific
KGAR	**—Tucson, Ariz.**—Tucson Citizen, 80 South Stone St.	100	218.8	1370	Mountain
KGB	**—San Diego, Calif.**—Southwestern Broadcasting Corp.	100	223.7	1340	Pacific
KGBX	**—St. Joseph, Mo.** — Foster-Hall Tire Co., 1221 Fred. Ave.	100	247.8	1210	Central
KGBY	**—Shelby, Nebr.**— (Transmitter in Columbus)— Dunnings & Taddiken. (Consolidated with KGBZ)	500	322.4	930	Central
KGBZ	**—York, Nebr.** — Federal Live Stock Remedy Co., 715 Grand Ave. (Divides time with KMA)	500	322.4	930	Central
KGCA	**—Decorah, Iowa**—Chas. W. Greenley. (Divides time with KWLC). (Daytime Only)	50	236.1	1270	Central
KGCB	**—Oklahoma City, Okla.** —Wallace Radio Inst., 103 W. 13th St.	50	247.8	1210	Central
KGCH	**—Wayne, Nebr.**— Farmers & Merchants Cooperative Radio Corp. of America. (Consolidated with KGBZ)	500	322.4	930	Central
KGCI	**—San Antonio, Tex.**— Liberto Radio Sales, 409 So. Flores St.	100	218.8	1370	Central
KGCN	**—Concordia, Kans.** — Concordia Broadcasting, 105 E. 5th St.	50	211.1	1420	Central
KGCR	**—Brookings, S. Dak.** — Cutler's Radio Broadcasting Service (Inc.), 415 Main St.	100	247.8	1210	Central
KGCU	**—Mandan, N. Dak.** — Mandan Radio Association, 320 Main Street.	100	249.9	1200	Mountain
KGCX	**—Vida, Mont.** — First State Bank of Vida.	10	218.8	1370	Mountain
KGDA	**—Dell Rapids, S. Dak.**— Home Auto Co.	15	247.8	1210	Central
KGDE	**—Barrett, Minn.**—Jaren Drug. Co.	50	249.9	1200	Central
KGDM	**—Stockton, Calif.**—E. F. Peffer, 42 S. California St.	10	260.7	1150	Pacific
KGDP	**—Pueblo, Colo.**—Pueblo Council, Boy Scouts of Amer.	10	247.8	1210	Mountain
KGDR	**—San Antonio, Tex.** — Joe B. McShane.	100	199.9	1500	Central
KGDW	**—Humboldt, Nebr.** — Frank J. Rist (Consolidated with KGBZ)	500	322.4	930	Central
KGDY	**—Oldham, S. Dak.**—J. Albert Loesch	15	249.9	1200	Central
KGEF	**—Los Angeles, Calif.**— Trinity Methodist Church, 1201 So. Flower St. (Divides time with KTBI)	1000	230.6	1300	Pacific
KGEK	**—Yuma, Colo.**—Beehler Electrical Equipment Co., 109 W. Second Ave.	10	249.9	1200	Mountain
KGEN	**—El Centro, Calif.**—E. R. Irey & F. M. Bowels, Chamber of Commerce Bldg.	15	249.9	1200	Pacific
KGEO	**—Grand Island, Nebr.**— Hotel Yancey, 116 N. Locust St. (Consolidated with KGBZ)	500	322.4	930	Central
KGER	**—Long Beach, Calif.**— C. Merwin Dobyns, 435 Pine Ave.	100	218.8	1370	Pacific
KGES	**—Central City, Nebr.**— Central Radio Elec. Co. (Consolidated with KGBZ)	500	322.4	930	Central
KGEW	**—Fort Morgan, Colo.**— City of Fort Morgan, City Hall Bldg. (Divides time with KGEK)	100	249.9	1200	Mountain
KGEZ	**—Kalispell, Mont.** — Flathead Broadcasting Assoc.	100	228.9	1310	Mountain
KGFF	**—Alva, Okla.**—Earl E. Hampshire, 718—5th St.	100	211.1	1420	Central
KGFG	**—Oklahoma City, Okla.** —Full Gospel Church.	50	218.8	1370	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KGFH	**La Crescenta, Calif** (Transmitter in Glendale) Frederick Robinson, Box 163	250	299.8	1000	Pacific
KGFI	**San Angelo, Tex.**—San Angelo Broadcasting Co.	15	228.9	1310	Central
KGFJ	**Los Angeles, Calif.**—Ben S. McGlashan, 2333 W. Twenty-first St.	100	211.1	1420	Pacific
KGFK	**Hallock, Minn.**—Kittson County Enterprise.	50	249.9	1200	Central
KGFL	**Trinidad, Colo.**—(Transmitter in Raton, N. M.)—Norbert L. Cotter, 219 W. Main St.	50	247.8	1210	Mountain
KGFW	**Ravenna, Nebr.**—Otto F. Sothman, 318 Grand Ave.	50	211.1	1420	Central
KGFX	**Pierre, S. Dak.**—Dana McNeil, 510 Summit Ave. (Daytime only)	200	516.9	580	Central
KGGF	**Picher, Okla.**—Dr. D. L. Connell. (Divides time with WNAD)	500	516.9	580	Central
KGGH	**Cedar Grove, La.**—Bates Radio & Elec. Co. (Divides time with KWEA)	50	218.8	1370	Central
KGGM	**Inglewood, Calif.** — Jay Peters.	100	211.1	1420	Pacific
KGHA	**Pueblo, Colo.**—Geo. H. Sweeney & N. S. Walpole.	50	249.9	1200	Pacific
KGHD	**Missoula, Mont.**—Elmore-Nash Broadcasting Corp., 542 S. Third St. West.	5	211.1	1420	Mountain
KGHF	**Pueblo, Colo.**—Curtis P. Ritchie & Joe E. Finch.	250	227.1	1320	Mountain
KGHG	**McGehee, Ark.**—Chas. W. McCollum.	50	218.8	1370	Central
KGHI	**Little Rock, Ark.** — Berean Bible Class, 1201 Louisiana St.	15	199.9	1500	Central
KGHL	**Billings, Mont.**—Northwestern Auto Supply Co., Fifth Ave. & North B'way.	250	315.6	950	Mountain
KGHX	**Richmond, Texas.**—Fort Bend County School Board.	50	199.9	1500	Central
KGJF	**Little Rock, Ark.** — First Church of the Nazarene.	100	218.8	1370	Central
KGKB	**Goldthwaite, Tex.** — Eagle Publishing Co.	100	199.9	1500	Central
KGKL	**Georgetown, Tex.**—M. L. Cates, 1263 Brushy St.	100	218.8	1370	Central
KGKO	**Wichita Falls, Tex.**—Highland Heights Christian Church, 2146 Avenue H.	100	218.8	1370	Central
KGO	**Oakland, Calif.**—General Electric Co.	10000	379.5	790	Pacific
KGRC	**San Antonio, Tex.**—Paramount Radio Co., 103 San Pedro Ave.	100	228.9	1310	Central
KGRS	**Amarillo, Tex.**—Gish Radio Service, 108 E. 8th St. (Divides time with WDAG)	1000	212.6	1410	Central
KGTT	**San Francisco, Calif.** —Glad Tidings Temple & Bible Inst. (Divides time with KFQU-KRE)	50	199.9	1500	Pacific
KGW	**Portland, Ore.** —The Oregonian Pub. Co., 806 Oregonian Bldg.	1000	508.2	590	Pacific
KGY	**Lacey, Wash.**—St. Martins College. (Divides time with KKP-KFQW)	50	211.1	1420	Pacific
KHJ	**Los Angeles, Calif.**—Don Lee, (Inc.).	1000	333.1	900	Pacific
KHQ	**Spokane, Wash.**—Louis Wasmer, Davenport Hotel.	1000	325.9	920	Pacific
KICK	**Atlantic, Iowa**—(Transmitter in Red Oak)—Red Oak Radio Corp. (Divides time with WIAS). (Daytime only)	100	535.4	560	Central
KJBS	**San Francisco, Calif.** —Julius Brunton & Sons Co., 1380 Bush St. (Divides time with KZM)	100	218.8	1370	Pacific
KJR	**Seattle, Wash.**—Northwest Radio Service Co., 604 Home Savings Bldg.	5000	309.1	970	Pacific
KKP	**Seattle, Wash.**—City of Seattle, Harbor Dept. (Divides time with KGY-KFQW)	15	211.1	1420	Pacific
KLCN	**Blytheville, Ark.** — Daily Courier News.	50	232.4	1290	Central
KLDS	**Independence, Mo.** — Midland Broadcasting Co. & Reorganized Church of Jesus Christ of Latter Day Saints. (Divides time with WHB)	1000	315.6	950	Central
KLRA	**Little Rock, Ark.**—Arkansas Broadcasting Co., 210 Center St. (Divides time with KUOA)	1000	239.9	1250	
KLS	**Oakland, Calif.**—Warner Bros. Radio Supplies Co., 2201 Telegraph Ave. (Divides time with KWG)	100	211.1	1420	Pacific
KLX	**Oakland, Calif.** — The Oakland Tribune. (Divides time with KTAB)	500	236.1	1270	Pacific
KLZ	**Denver, Colo.**—(Transmitter in Dupont) Reynolds Radio Co., Shirley Savoy Hotel.	1000	535.4	560	Mountain
KMA	**Shenandoah, Ia.** — May Seed & Nursery Co. (Divides time with KGBZ)	500	322.4	930	Central
KMBC	**Kansas City, Mo.**—Midland Broadcasting Co. (Divides time with WHB)	1000	315.6	950	Central
KMED	**Medford, Ore.**—W. J. Virgin.	50	211.1	1420	Pacific
KMIC	**Inglewood, Calif.**—J. R. Fouch, 219 N. Market St. (Divides time with KFSG)	250	267.7	1120	Pacific

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KMJ	**Fresno, Calif.**—Fresno Bee.	50	249.9	1200	Pacific
KMMJ	**Clay Center, Nebr.**—M. M. Johnson Co. (Daytime only).	1000	405.2	740	Central
KMO	**Tacoma, Wash.**—KMO, Inc., Hotel Winthrop. (Divides time with KVI).	500	223.7	1340	Pacific
KMOX	**St. Louis, Mo.**—(Transmitter in Kirkwood)—The Voice of St. Louis, Inc., Mayfair Hotel.	5000	275.1	1090	Central
KMTR	**Hollywood, Calif.**—KMTR Radio Corp., 1025 N. Highland Ave. (Divides time with KPLA).	1000	526	570	Pacific
KNRC	**Santa Monica, Calif.**—C. B. Juneau. (Divides time with KELW).	500	384.4	780	Pacific
KNX	**Los Angeles, Calif.**—Western Broadcasting Co., 6116 Hollywood Blvd.	5000	285.5	1050	Pacific
KOA	**Denver, Colo.**—General Electric Co., 1370 Krameria St.	12500	361.2	830	Mountain
KOAC	**Corvallis, Ore.**—Oregon Agricultural College. (Divides time with KXL).	1000	239.9	1250	Pacific
KOB	**State College, N. Mex.**—New Mexico College of Agriculture and Mechanic Arts. (Divides time with KEX).	5000	254.1	1180	Mountain
KOCW	**Chickasha, Okla.**—Oklahoma College for Women.	100	211.1	1420	Central
KOIL	**Council Bluffs, Iowa**—Mona Motor Oil Co.	1000	238	1260	Central
KOIN	**Portland, Ore.**—(Transmitter in Sylvan)—KOIN, Inc.	1000	319	940	Pacific
KOMO	**Seattle, Wash.**—Fisher's Blend Station, Inc., Metropolitan Center.	1000	483.6	620	Pacific
KORE	**Eugene, Ore.**—Eugene Broadcast Station, 475-21st St.	100	211.1	1420	Pacific
KOW	**Denver, Colo.**—Associated Industries, Inc., 1429 Champa St. (Divides time with KFUM).	500	215.7	1390	Mountain
KPCB	**Seattle, Wash.**—Pacific Coast Biscuit Co., 505 Central Bldg. (Divides time with KPQ).	100	247.8	1210	Pacific
KPJM	**Prescott, Ariz.**—Frank Wilburn, Journal Miner Bldg.	15	199.9	1500	Mountain
KPLA	**Los Angeles, Calif.**—Pacific Development Radio Co. (Divides time with KMTR).	1000	526	570	Pacific
KPO	**San Francisco, Calif.**—Hale Bros. and the San Francisco Chronicle.	5000	440.9	680	Pacific
KPOF	**Denver, Colo.**—Pillar of Fire, Inc., Belleview College, 1631 California St. (Divides time with KFKA).	500	296.9	1010	Mountain
KPPC	**Pasadena, Calif.**—Pasadena Presbyterian Church. (Divides time with KFWC).	50	249.9	1200	Pacific
KPQ	**Seattle, Wash.**—Louis Wasmer & Archie Taft, 1107—2nd Ave. (Divides time with KPCB).	100	247.8	1210	Pacific
KPRC	**Houston, Tex.**—Houston Post Dispatch. (Divides time with KFDM).	1000	545.1	550	Central
KPSN	**Pasadena, Calif.**—The Star-News. (Divides time with KFWB).	1000	315.6	950	Pacific
KQV	**Pittsburgh, Pa.**—Doubleday-Hill Electric Co., 719 Liberty Ave. (Divides time with WCSO).	500	217.3	1380	Eastern
KQW	**San Jose, Calif.**—Fred J. Hart, Sherman Clay & Co. Bldg.	500	296.9	1010	Pacific
KRE	**Berkeley, Calif.**—First Congregational Church of Berkeley & Pacific School of Religion. (Divide stime with KFQU-KGTT).	100	199.9	1500	Pacific
KRGV	**Harlingen, Texas**—Harlingen Music Co, (Divides time with KWWG).	500	296.9	1010	Central
KRLD	**Dallas, Texas**—Dallas Radio Laboratories, 208 North St. Paul St. (Divides time with WFAA).	10000	288.3	1040	Central
KRMD	**Shreveport, La.**—Robert M. Dean, 504 Wall St. (Divides time with KFDX).	50	249.9	1200	Central
KRSC	**Seattle, Wash.**—Radio Sales Corporation, 1202 Fifth Avenue. (Daytime only).	50	267.7	1120	Pacific
KSAC	**Manhattan, Kans.**—Kansas State Agricultural College. (Divides time with KFKU-WREN).	500	296.9	1010	Central
KSBA	**Shreveport, La.**—Shreveport Broadcasting Corp.	1000	206.8	1450	Central
KSCJ	**Sioux City, Iowa**—Perkin Bros. Co. (Divides time with WTAG).	1000	225.4	1330	Central
KSD	**St. Louis, Mo.**—Pulitzer Publishing Co., 12th & Olive Sts. (Divides time with KFUO).	500	545.1	550	Central
KSEI	**Pocatello, Idaho**—KSEI Broadcasting Association.	250	227.1	1320	Mountain
KSL	**Salt Lake City, Utah**—Radio Service Corp. of Utah, Vermont Bldg.	5000	265.3	1130	Mountain
KSMR	**Santa Maria, Calif.**—Santa Maria Valley R. R. Co.	100	249.9	1200	Pacific

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KSO	**Clarinda, Iowa**—Berry Seed Co. (Divides time with WKBH-WHBL).	1000	217.3	1380	Central
KSOO	**Sioux Falls, So. Dak.**—Sioux Falls Broadcast Assoc., 609 Minnehaha Bldg. (Daytime only). (Divides time with WTFF)	1000	302.8	990	Central
KSTP	**St. Paul, Minn.**—(Transmitter in Wescott)—Nat'l Battery Broadcasting Co. (Divides time with WTFF).	10000	205.4	1460	Central
KTAB	**Oakland, Calif.**—The Associated Broadcasters, 1410 Tenth Ave. (Divides time with KLX).	500	236.1	1270	Pacific
KTAP	**San Antonio, Tex.**—Alamo Broadcasting Co., Robert B. Bridge, 822 W. Mulberry St.	100	247.8	1210	Central
KTBI	**Los Angeles, Calif.**—Bible Institute of Los Angeles, 536 So. Hope St. (Divides time with KGEF).	1000	230.6	1300	Pacific
KTBR	**Portland, Ore.**—M. E. Brown, 525 Morrison St. (Divides time with KFJR).	500	230.6	1300	Pacific
KTHS	**Hot Springs National** Park, Ark.—Arlington Hotel Co. (Divides time with WBAP).	1000	374.8	800	Central
KTNT	**Muscatine, Iowa**—Norman Baker. (Divides time with WOWO-WCBD-WMBI).	5000	258.5	1160	Central
KTSA	**San Antonio, Tex.**—Alamo Broadcasting Co. (Divides time with KFUL).	1000	232.4	1290	Central
KTUE	**Houston, Tex.**—Uhalt Electric Co., 614 Fannin St.	5	218.8	1370	Central
KTW	**Seattle, Wash.**—The First Presbyterian Church of Seattle. (Divides time with KFOA).	1000	234.2	1280	Pacific
KUJ	**Seattle, Wash.**—(Transmitted in Longview)—F. W. Lovejoy & R. W. Kerfoot, 5811 Fifth Ave. N. E. (Divides time with KFBL-KVL).	10	199.9	1500	Pacific
KUOA	**Fayetteville, Ark.**—University of Arkansas. (Divides time with KLRA).	500	239.9	1250	Central
KUOM	**Missoula, Mont.**—State University of Montana.	500	325.9	920	Mountain
KUSD	**Vermillion, So. Dak.**—University of South Dakota. (Divides time with WNAX-KFNF).	500	336.9	890	Central
KUT	**Austin, Tex.**—University of Texas. (Divides time with WTAW).	500	267.7	1120	Central
KVI	**Tacoma, Wash.**—Puget Sound Radio Broadcasting Co., 15 No. Tacoma Ave. (Divides time with KMO).	1000	223.7	1340	Pacific
KVL	**Seattle, Wash.**—A. C. Dailey, 844 East 58th St. (Divides time with KFBL-KUJ).	100	199.9	1500	Pacific
KVOO	**Tulsa, Okla.**—Southwestern Sales Corp., Tulsa & Bristow.	1000	535.4	560	Central
KVOS	**Bellingham, Wash.**—L. Kessler, Henry Hotel. (Divides time with KWSC-KXA).	250	526	570	Pacific
KWBS	**Portland, Ore.**—Schaeffer Manufacturing Co., 226 E. Forty-first St.	15	199.9	1500	Pacific
KWCR	**Cedar Rapids, Ia.**—H. F. Paar, Cedar Rapids Broadcasting Corp., 1444 Second Ave. E. (Divides time with KFJY).	100	228.9	1310	Central
KWEA	**Shreveport, La.**—Wm. Erwin Anthony. (Divides time with KGGH),	100	218.8	1370	Central
KWG	**Stockton, Calif.**—Portable Wireless Telephone Co., Commercial & Savings Bank Bldg. (Divides time with KLS).	100	211.1	1420	Pacific
KWJJ	**Portland, Ore.**—Wilbur Jerman, 220 Broadway.	50	199.9	1500	Pacific
KWK	**St. Louis, Mo.**—Greater St. Louis Broadcasting Co., Hotel Chase. (Divides time with WIL).	1000	222.1	1350	Central
KWKC	**Kansas City, Mo.**—Wilson Duncan Broadcasting Studios, Werby Building.	100	218.8	1370	Central
KWKH	**Shreveport, La.**—W. K. Henderson. (Divides time with WWL).	5000	352.7	850	Central
KWLC	**Decorah, Ia.**—Luther College. (Divides time with KGCA). (Daytime only).	50	236.1	1270	Central
KWSC	**Pullman, Wash.**—State College of Washington, Mechanic Arts Bldg. (Divides time with KXA-KVOS).	500	526	570	Pacific
KWWG	**Brownsville, Tex.**—Chamber of Commerce. (Divides time with KRGV).	500	296.9	1010	Central
KWTC	**Santa Ana, Calif.**—Pacific Broadcasting Federation, 1101 North Ross Street. (Divides time with KFWO.	100	199.9	1500	Pacific
KXA	**Seattle, Wash.**—American Radio Tel. Co. (Divides time with KWSC-KVOS).	500	526	570	Pacific
KXL	**Portland, Ore.**—KXL Broadcasters, 719 Bedell Bldg. (Divides time with KOAC).	1000	239.9	1250	Pacific
KXRO	**Seattle, Wash.**—KXRO, Inc., Heron & South H. Sts.	50	247.8	1210	Pacific
KYA	**San Francisco, Calif.**—Pacific Broadcasting Co.	1000	245.8	1220	Pacific
KYW	**Chicago, Ill.**—Westinghouse Electric & Mfg. Co., 508 S. Michigan Ave.	5000	299.8	1000	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
KZM	**Oakland, Calif.**—(Transmitter in Hayward)—Leon P. Tenney, 13th & Harrison Streets. (Divides time with KJBS).	100	218.8	1370	Pacific
NAA	**Arlington, Va.**—United States Navy.	1000	434.5	690	Eastern
WAAD	**Cincinnati, Ohio**—Ohio Mechanics Institute.	25	218.8	1370	Eastern
WAAF	**Chicago, Ill.**—Chicago Daily Drovers Journal. (Daytime only).	500	319	940	Central
WAAM	**Newark, N. J.**—I. R. Nelson, 1 Bond St., Studio at 626 Central Ave, East Orange.	500	239.9	1250	Eastern
WAAT	**Jersey City, N. J.**—Bremer Broadcasting Corp., 210 Jackson Ave. (Divides time with WBMS-WNJ-WIBS-WKBO.)	250	206.8	1450	Eastern
WAAW	**Omaha, Neb.**—Omaha Grain Exchange. (Daytime only).	500	454.3	660	Central
WABC	**New York, N. Y.**—Atlantic Broadcasting Corp., 113 W. 57st St. (Consolidated with WBOQ).	5000	348.6	860	Eastern
WABF	**Kingston, Pa.** — Markle Broadcasting Corp., 294 Wyoming Ave. (Divides time with WRAX).	250	208.2	1440	Eastern
WABI	**Bangor, Me.** — First Universalist Church, Park St.	100	249.9	1200	Eastern
WABO	**Rochester, N. Y.**—Hickson Elec. Co. (Divides with WMAC-WOKO).	250	208.2	1440	Eastern
WABY	**Philadelphia, Pa.** — John Magaldi, Jr.	50	228.9	1310	Eastern
WABZ	**New Orleans, La.**—Colis Place Baptist Church, 1376 Camp St. (Divides with with WJBW).	50	249.9	1200	Central
WADC	**Akron, Ohio**—Allen T. Simmons, Towell-Cadillac Bldg. (Divides time with WFJC).	1000	223.7	1340	Eastern
WAFD	**Detroit, Mich.**—Albert B. Parfet Co., Charlotte St. & Woodward Ave. (Divides time with WRAV).	100	211.1	1420	Eastern
WAGM	**Royal Oak, Mich.**—Robert L. Miller, 309 So. Main St.	50	228.9	1310	Eastern
WAIU	**Columbus, Ohio**—American Insurance Union Deshler-Walleck Hotel. (Divides time with WEAO).	5000	468.5	640	Eastern
WALK	**Willow Grove, Pa.**—Albert A. Walker.	50	199.9	1500	Eastern
WAPI	**Auburn, Ala.** — Alabama Polytechnic Inst. (Divides time with WJAX).	5000	263	1140	Central
WASH	**Grand Rapids, Mich.**—Baxter Laundries Inc. (Divides time with WOOD).	250	236.1	1270	Eastern
WBAA	**West Lafayette. Ind.**—Purdue University. (Divides time with WCMA-WKBF).	500	214.2	1400	Central
WBAK	**Harrisburg, Pa.**—Pennsylvania State Police. (Daytime only).	500	267.7	1120	Eastern
WBAX	**Wilkes-Barre, Pa.** — John H. Stenger, Jr., 66 Gildersleeve St. (Divides time with WBRE).	100	247.8	1210	Eastern
WBAL	**Baltimore, Md.**—(Transmitter in Glen Morris)—Consolidated Gas, Elec. Light & Power Co. (Divides time with WTIC).	5000	282.8	1060	Eastern
WBAO	**Decatur, Ill.** — James Millikin University. (Daytime).	100	267.7	1120	Central
WBAP	**Fort Worth, Tex.**—Carter Publishing Co. Inc. (Divides time with KTHS).	5000	374.8	800	Central
WBAW	**Nashville, Tenn.**—Waldrum Drug Co. (Divides time with WLAC).	5000	201.2	1490	Central
WBBC	**Brooklyn, N. Y.** — Brooklyn Broadcasting Corp., 16 Court St. (Divides time with WSDA-WCGU-WLTH-WSGH).	500	214.2	1400	Eastern
WBBL	**Richmond, Va.**—Grace-Covenant Presbyterian Church, 1627 Monument Ave.	100	218.8	1370	Eastern
WBBM	**Chicago, Ill.**—(Trans. in Glenview)—Atlass Investment Co., 728 Kimball Bldg.	10000	389.4	770	Central
WBBR	**Rossville, N. Y.**—Peoples Pulpit Ass'n, 117 Adams St., Brooklyn. (Divides time with WHAP-WEVD-WHAZ).	500	230.6	1300	Eastern
WBBW	**Norfolk, Va.**—Ruffner Junior High School.	100	249.9	1200	Eastern
WBBY	**Charleston, So. Car.**—Washington Light Infantry.	75	249.9	1200	Eastern
WBBZ	**Ponca City, Okla.** — C. L. Carrell, 1506 No. American Building.	100	249.9	1200	Central
WBCN	**Chicago, Ill.** — Great Lakes Broadcasting Co., Straus Bldg. (Consolidated with WENR).	5000	344.6	870	Central
WBES	**Takoma Park, Md.** — (Transmitter in Salisbury)—Tom F. Little.	100	228.9	1310	Eastern
WBET	**Boston, Mass.**—(Transmitter in Medford)—Boston Transcript. (Divides time with WMAF).	500	227.1	1320	Eastern
WBIS	**Boston, Mass.** — The Shepard Stores.	500	243.8	1230	Eastern
WBMH	**Detroit, Mich.**—Braun's Music House, 13214 East Jefferson Ave.	100	228.9	1310	Central
WBMS	**Union City, N. J.**—WBMS Broadcasting Corp., 837—34th St. (Divides time with WNJ-WAAT-WIBS-WKBO).	100	206.8	1450	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WBNY	**New York, N. Y.**—Baruchrome Corp., 400 E. 139th St. (Divides time with WMSG-WCDA-WKBQ).	250	222.1	1350	Eastern
WBOQ	**New York, N. Y.** — (Transmitter in Richmond Hill) —Atlantic Broadcasting Corp., 113 W. 57 St., N. Y. City. (Consolidated with WABC).	5000	348.6	860	Eastern
WBOW	**Terre Haute, Ind.** — Banks of Wabash Broadcasting Assn.	100	228.9	1310	Central
WBRC	**Birmingham, Ala.** — Birmingham Broadcasting Corp. Loew's Temple Theatre	500	322.4	930	Central
WBRE	**Wilkes-Barre, Pa.** — L. G. Baltimore, 16 N. Main St.	100	228.9	1310	Eastern
WBRL	**Tilton, N. H.**—Booth Radio Laboratories, 23 Summer St.	500	209.7	1430	Eastern
WBSO	**Wellesley Hillls, Mass.** —(Transmitter in Babson Park) —Babson's Statistical Organization. (Daytime only).	100	384.4	780	Eastern
WBT	**Charlotte, N. C.**—C. C. Caddington, 500 West Trade St. (Divides time with WPTF).	5000	277.8	1080	Eastern
WBZ	**Springfield, Mass.**— (Transmitter in East Springfield)—Westinghouse Elec. & Mfg. Co., Hotel Kimball. (Divides time with WBZA).	15000	336.9	990	Eastern
WBZA	**Boston, Mass.**—Westinghouse Elec. & Mfg. Co., Hotel Statler. (Divides time with WBZ).	500	302.8	990	Eastern
WCAC	**Mansfield, Conn.**— Connecticut Agricultural College. (Divides time with WDRC).	500	225.4	1330	Eastern
WCAD	**Canton, N. Y.**—St. Lawrence University. (Daytime).	500	245.8	1220	Eastern
WCAE	**Pittsburgh, Pa.**— Kaufman & Baer Co., Sixth & Smithfield Sts.	500	241.8	1240	Eastern
WCAH	**Columbus, Ohio**— Studio at Fort Hayes Hotel— Commercial Radio Service Co., 321 W. Tenth Ave. (Divides time with WSPD).	250	206.8	1450	Eastern
WCAJ	**Lincoln, Neb.**—Nebraska Wesleyan University. (Divides time with WOW-WJAG).	500	508.2	590	Central
WCAL	**Northfield, Minn.**—St. Olaf College. (Divides time with KFMX-WRHM-WLB.)	1000	243.8	1230	Central
WCAM	**Camden, N. J.**—City of Camden, Civic Centre. (Divides time with WCAP-WOAX).	500	234.2	1280	Eastern
WCAO	**Baltimore, Md.**— Monumental Radio, Inc., 848 N. Howard St.	250	499.7	600	Eastern
WCAP	**Asbury Park, N. J.**— Municipality of Asbury Park. (Divides time with WCAM-WOAX).	500	234.2	1280	Eastern
WCAT	**Rapid City, So. Dak.** South Dakota State School of Mines.	100	249.9	1200	Mountain
WCAU	**Philadelphia, Pa.** — (Transmitter in Byberry) — Universal Broadcasting Co.	5000	256.3	1170	Eastern
WCAX	**Burlington, Vt.**—University of Vermont. (Divides time with WNBX).	100	249.9	1200	Eastern
WCAZ	**Carthage, Ill.** — Carthage College. (Daytime only).	100	280.2	1070	Central
WCBA	**Allentown, Pa.** — B. Bryan Musselman, 1015 Allen St. (Divides time with WSAN).	100	199.9	1500	Eastern
WCBD	**Zion, Ill.**—Wilbur G. Voliva. (Divides time with WOWO-KTNT-WMBI).	5000	258.5	1160	Central
WCBM	**Baltimore, Md.** — Hotel Chateau, Charles St. & North Ave.	100	218.8	1370	Eastern
WCBS	**Springfield, Ill.**— Harold L. Dewing & Charles H. Messter, St. Nicholas Hotel. (Divides time with WTAX).	100	247.8	1210	Central
WCCO	**Minneapolis-St. Paul. Minn.**—(Transmitter in Anoka) —Washburn-Crosby Co.	10000	370.2	810	Central
WCDA	**New York, N. Y.** — (Transmitter in Cliffside Park, N. J.)—Italian Educational Broadcasting Co. Inc., 27 Cleveland Place. (Divides time with WBNY-WMSG-WKBQ).	250	222.1	1350	Eastern
WCFL	**Chicago, Ill.**—Chicago Federation of Labor, 623 S. Wabash Ave. (Divides time with WJJD and WRM).	1000	483.6	620	Central
WCGU	**Brooklyn, N. Y.** — U. S. Broadcast Corporation. (Divides time with WSGH-WSDA-WLTH-WBBC).	500	214.2	1400	Eastern
WCLB	**Brooklyn, N. Y.** — Arthur Faske, 1515 Eastern Parkway. (Divides time with WWRL-WMBQ-WLBY).	100	199.9	1500	Eastern
WCLO	**Kenosha, Wis.**—C. E. Whitmore. (Divides time with WRJN).	100	249.9	1200	Central
WCLS	**Joliet, Ill.** — M. A. Felman Co., 301 E. Jefferson St. (Divides time with WKBB-WEHS-WKBI-WHFC).	100	228.9	1310	Central
WCMA	**Culver, Ind.**—Culver Military Academy. (Divides time with WBAA-WKBF).	500	214.2	1400	Central
WCOA	**Pensacola, Fla.**—City of Pensacola, City Hall.	500	267.7	1120	Central
WCOC	**Columbus, Miss.** — Crystal Oil Co.	500	340.7	880	Central
WCOH	**Greenville, N. Y.** — WestchesterBroadcasting Corp. (Divides time with WJBI-WGBB-WINR).	100	247.8	1210	Eastern
WCRW	**Chicago, Ill.**—Clinton R. White, 2756 Pine Grove Ave, Embassy Hotel. (Divides time with WEDC-WSBC).	100	247.8	1210	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WCSH	**— Portland, Me.** — Henry P. Rines, Congress Square Hotel Co.	500	319	940	Eastern
WCSO	**—Springfield, Ohio** — Wittenberg College. (Divides time with KQV).	500	217.3	1380	Eastern
WCWK	**—Fort Wayne, Ind.**— Chester W. Keen, 1729 Lafayette St. (Daytime only).	500	227.1	1320	Central
WCX	**—Detroit, Mich.**—(Transmitter in Pontiac.)—Detroit Free Press.	5000	399.8	750	Eastern
WDAE	**—Tampa, Fla.**—Tampa Daily Times. (Divides time with WDBO).	1000	483.6	620	Eastern
WDAF	**—Kansas City, Mo.**— The Kansas City Star, 18th & Grand Ave. (Divides time with WOQ).	1000	491.5	610	Central
WDAG	**—Amarillo, Tex.** — J. Laurance Martin, 605 E. 4th St. (Divides time with KGRS).	1000	212.6	1410	Central
WDAH	**—El Paso, Tex.**—Trinity Methodist Church, Cor. Blvd. & Mesa Ave.	100	228.9	1310	Mountain
WDAY	**—Fargo, N. D.**—WDAY, Inc., 119 Broadway. (Divides time with WEBC)	1000	234.2	1280	Central
WDBJ	**—Roanoke, Va.** — Richardson-Wayland Elec. Corp., 106 Church Ave. S.W. (Divides with WRBX).	250	322.4	930	Eastern
WDBO	**—Orlando, Fla.**—Orlando Broadcasting Co., Fort Gatlin Hotel. (Divides time with WDAE).	1000	483.6	620	Eastern
WDEL	**—Wilmington, Del.** — WDEL Inc., 405 Delaware Ave. (Divides time with WMAL).	250	475.9	630	Eastern
WDGY	**—Minneapolis, Minn.** —Geo. W. Young, Falvey Cross Rd., Superior Blvd. Studio at 217 Loeb Arcade. (Divides time with WHDI).	500	212.6	1410	Central
WDOD	**—Chattanooga, Tenn.** —Chattanooga Radio Co. Inc., 615 Market St.	1000	234.2	1280	Central
WDRC	**—New Haven, Conn.**— Doolittle Radio Corporation, 70 College St. (Divides time with WCAC).	500	225.4	1330	Eastern
WDSU	**—New Orleans, La.**— Uhalt Bros., Hotel De Soto.	1000	236.1	1270	Central
WDWF	**—Cranston, R. I.**—Dutee W. Flint and Lincoln Studios (Inc.), 335 Westminster St., Providence. (Divides time with WFCI).	100	218.8	1370	Eastern
WDZ	**—Tuscola, Ill.**—Jas. L. Bush. (Daytime only). (Divides time with WCAZ).	100	280.2	1070	Central
WEAF	**—New York, N. Y.** | (Transmitter in Bellmore, L. I.) National Broadcasting Co., Inc. 711-5th Ave.	50000	454.3	660	Eastern
WEAN	**—Providence, R. I.**— The Shephard Co., 122 Mathewson St.	500	258.5	1160	Eastern
WEAO	**—Columbus, Ohio**—The Ohio State University. (Divides time with WAIU).	750	468.5	640	Eastern
WEAR	**—Cleveland, Ohio**—Willard Storage Battery Co., 1100 Chester Ave. (Divides time with WTAM).	1000	280.2	1070	Eastern
WEBC	**—Superior, Wis.**—Head of the Lakes Broadcasting Co. (Divides time with WDAY).	1000	234.2	1280	Central
WEBE	**—Cambridge, Ohio**—Roy W. Waller, 319 Wall Ave.	10	247.8	1210	Eastern
WEBH	**—Chicago, Ill.** — Edgewater Beach Hotel Co., 5300 Sheridan Rd. (Consolidated with KFKX-KYW).	5000	299.8	1000	Central
WEBQ	**—Harrisburg, Ill.**—Tate Radio Co., 1 N. Main St. (Divides time with KFVS).	50	247.8	1210	Central
WEBR	**—Buffalo, N. Y.**—Howell Broadcasting Co., Inc., 50 W. Eagle.	100	228.9	1310	Eastern
WEBW	**—Beloit, Wis.** — Beloit College. (Daytime only).	250	499.7	600	Central
WEDC	**—Chicago, Ill.** — Emil Denemark Broadcasting Station, 3860 Ogden Avenue. (Divides time with WCRW-WSBC).	100	247.8	1210	Central
WEDH	**—Erie, Pa.**—Erie Dispatch-Herald.	30	211.1	1420	Eastern
WEEI	**—Boston, Mass.** — The Edison Electric Illuminating Co.	500	508.2	590	Eastern
WEHS	**—Evanston, Ill.**—A. T. Becker, 1318 Elmwood Ave. (Divides time with WHFC-WCLS-WKBB — WKBI).	100	228.9	1310	Central
WEMC	**—Berrien Springs, Mich.** —Emmanuel Missionary College. (Daytime only).	1000	440.9	680	Central
WENR	**—Chicago, Ill.** — Great Lakes Radio Broadcasting Co., 310 S. Michigan Ave. (Consolidated with WBCN).	5000	344.6	870	Central
WEPS	**—Gloucester, Mass.**— Matheson Radio Co., 209 Main St. (Divides time with WKBE).	100	249.9	1200	Eastern
WEVD	**—New York, N. Y.** — (Transmitter in Woodhaven)— Union Course Labs. Debs Memorial Radio Fund. (Divides time with WBBR-WHAP-WHAZ).	500	230.6	1300	Eastern
WEW	**—St. Louis, Mo.** — St. Louis University. (Daytime only).	1000	394.5	760	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WFAA	**Dallas, Tex.**—Dallas News and Sears Roebuck & Co., Baker Hotel. (Divides time with KRLD).	5000	288.3	1040	Central
WFAN	**Philadelphia, Pa.** — Keystone Broadcasting Co., Hotel Lorraine. (Divides time with WIP).	500	491.5	610	Eastern
WFBC	**Knoxville, Tenn.**— First Baptist Church.	50	249.9	1200	Central
WFBE	**Cincinnati, Ohio**— Park View Hotel.	100	249.9	1200	Eastern
WFBG	**Altoona, Pa.** — The William F. Gable Co.	100	228.9	1310	Eastern
WFBJ	**Collegeville, Minn.** — St. John's University.	100	218.8	1370	Central
WFBL	**Syracuse, N. Y.**—The Onondaga Co. (Divides time with WMAK).	750	333.1	900	Eastern
WFBM	**Indianapolis, Ind.** — (Transmitter in Perry Township)—Indianapolis Power & Light Co. (Divides time with WSBT).	1000	325.9	920	Central
WFBR	**Baltimore, Md.**—Baltimore Radio Show Inc., Hoffman & Bolton Sts.	250	267.7	1120	Eastern
WFCI	**Pawtucket, R. I.** — Frank Crook (Inc.), 103 Exchange St. (Divides time with WDWF).	100	218.8	1370	Eastern
WFDF	**Flint, Mich.** — Frank D. Fallain, 513 So. Saginaw St.	100	228.9	1310	Eastern
WFI	**Philadelphia, Pa.**— Strawbridge & Clothier. (Divides time with WLIT).	500	535.4	560	Eastern
WFIW	**Hopkinsville, Ky.** — Acme Mills, Inc.	1000	319	940	Central
WFJC	**Akron, Ohio.**—W. F. Jones Broadcasting, Inc.	500	223.7	1340	Eastern
WFKD	**Philadelphia, Pa.**— Foulkrod Radio Engineering Co.	50	228.9	1310	Eastern
WFLA	**Clearwater, Fla.**— (Transmitter in City Park at Causeway), Chamber of Commerce. (Divides time with WSUN).	1000	333.1	900	Eastern
WGAL	**Lancaster, Pa.** Lancaster Elec. Supply & Construction Co., 23 E. Orange St.	15	228.9	1310	Eastern
WGBB	**Freeport, N. Y.**— Harry H. Carman, 217 Bedell St. (Divides time with WJBI-WINR-WCOH).	100	247.8	1210	Eastern
WGBC	**Memphis, Tenn.** — First Baptist Church, Linden & Lauderdale Sts. (Divides time with WNBR).	500	209.7	1430	Central
WGBF	**Evansville, Ind.**— Evansville On The Air, Inc.	500	475.9	630	Central
WGBI	**Scranton, Pa.**— Scranton Broadcasters, Inc., 318 Adams Ave. (Divides time with WQAN).	250	340.7	880	Eastern
WGBS	**New York, N. Y.** — (Transmitter in Astoria, L. I.) —Gimbel Bros., 33rd St. & Broadway. (Limited time).	500	254.1	1180	Eastern
WGCM	**Gulfport, Miss.**— Gulf Coast Music Co., 1319—26th Ave.	15	218.8	1370	Central
WGCP	**Newark, N. J.**—Paramount Broadcasting & Artists' Service, 591 Broad St. (Divides time with WKBO-WBMS).	250	239.9	1250	Eastern
WGES	**Chicago, Ill.**—(Transmitter in Oak Park) — Oakleaves Broadcasting Corp., 128 N. Crawford Ave. (Divides time with WJKS-WPCC).	500	220.4	1360	Central
WGHP	**Mount Clemens, Mich.**—(Transmitter in Fraser) —Geo. H. Pehlps Studio, 1408 Maccabee Bldg., Detroit.	750	245.8	1220	Eastern
WGMS	**St. Paul—Minneapolis, Minn.**—Wasburn-Crosby Co. (Divides time with WCAL-KFMX-WRHM).	1000	243.8	1230	Central
WGN	**Chicago, Ill.**—The Chicago Tribune, Drake Hotel.	15000	416.4	720	Central
WGR	**Buffalo, N. Y.**—Federal Radio Corp., Hotel Statler. (Divides time with WSYR).	750	545.1	550	Eastern
WGST	**Atlanta, Ga.**—Georgia School of Technology. (Divides time with WMAZ).	500	336.9	890	Central
WGY	**Schenectady, N. Y.** — General Electric Co. (Limited).	50000	379.5	790	Eastern
WHA	**Madison, Wis.**—University of Wisconsin. (Divides time with WTMJ).	750	750	526	Central
WHAD	**Milwaukee, Wis.** — Marquette University. (Divides time with WISN).	250	267.7	1120	Central
WHAM	**Rochester, N. Y.** — (Transmitter in Victor Township)—Stromberg-Carlson Telephone Mfg. Co.	5000	258.5	1160	Eastern
WHAP	**New York, N. Y.** — (Transmitter in Carlstadt, N. J.) —Defenders of Truth Society, Inc., 9 W. 96th St. (Divides time with WBBR-WEVD-WHAZ).	500	230.6	1300	Eastern
WHAS	**Louisville, Ky.**—Courier-Journal and Louisville Times, 3rd & Liberty Sts. (Divides time with WWVA).	5000	293.9	1020	Central
WHAZ	**Troy, N. Y.**—Rensselaer Polytechnic Institute. (Divides time with WBBR-WHAP-WEVD).	500	230.6	1300	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WHB	**Kansas City, Mo.** — Sweeney Automotive & Elec. School, Sweeney Building. (Divides time with WMBC-KLDS)	1000	315.6	950	Central
WHBC	**Canton, Ohio** — St. John's Catholic Church, 627 McKinley Ave. N. W.	10	249.9	1200	Eastern
WHBD	**Bellefontaine, Ohio**— First Presbyterian Church.	100	218.8	1370	Eastern
WHBF	**Rock Island, Ill.** — Beardsley Specialty Co., 217 Eighteenth St.	100	247.8	1210	Central
WHBL	**Sheboygan, Wis.**— Press Publishing Co. & C. L. Carrell, 1506 No. American Bldg. (Divides time with WKBH-KSO).	1000	217.3	1380	Central
WHBP	**Johnstown, Pa.**— Johnstown Automobile Co., 101 Main St.	100	228.9	1310	Eastern
WHBQ	**Memphis, Tenn.**— WHBQ, Inc., Dermon Bldg.	100	218.8	1370	Central
WHBU	**Anderson, Ind.** Citizens Bank, 1101 Meridian St.	100	247.8	1210	Central
WHBW	**Philadelphia, Pa.** — D. R. Kienzle, 4916 Chestnut St.	100	199.9	1500	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 WDGY).	500	212.6	141	Central
WHEC	**Rochester, N. Y.** — Hickson Electric Co., 36 South Ave. (Consolidated with WABO) (Divides time with WMAC-WOKO).	250	208.2	1440	Eastern
WHFC	**Chicago, Ill.** — Goodson & Wilson, Inc., Hotel Flanders—4145 Broadway. (Divides time with WKBI-WKBB-WCLS-WEHS).	100	228.9	1310	Central
WHK	**Cleveland, Ohio**—Radio Air Service Corp., 1116 Carnegie Hall. (Divides time with WJAY).	500	215.7	1390	Eastern
WHN	**New York, N. Y.** — Marcus Loew Booking Agency, Inc., 1540 Broadway. (Divides time with WQAO-WPAP-WRNY).	250	296.9	1010	Eastern
WHO	**Des Moines, Ia.**—Bankers Life Co., 1110 Liberty Bldg. (Divides time with WOI).	5000	285.5	1050	Central
WHPP	**New York, N. Y.** — (Transmitter in Englewood Cliffs, N. J.)—Bronx Broadcasting Co., 958 St. Nicholas Ave. (Divides time with WLBH-WMRJ).	10	211.1	1420	Eastern
WHT	**Chicago, Ill.**—(Transmitter in Deerfield)—Radiophone Broadcasting Corp., 410 N. Michigan Blvd. (Divides time with WJAZ-WORD).	5000	204	1470	Central
WIAD	**Philadelphia, Pa.**— Howard R. Miller, Hotel Vendig.	100	228.9	1310	Eastern
WIAS	**Ottumwa, Iowa**—Poling Electric Co., 107 E. 2nd St. (Daytime only). (Divides time with KICK).	100	535.4	560	Central
WIBA	**Madison, Wis.**—Capital Times Studio & Strand Theatre Corp., 14 E. Mifflin St.	100	247.8	1210	Central
WIBG	**Elkins Park, Pa.**—St. Paul's Protestant Episcopal Church. (Sunday Daytime only)	50	322.4	930	Eastern
WIBM	**Jackson, Mich.**—C. L. Carrell.	100	218.8	1370	Central
WIBO	**Chicago, Ill.** — (Transmitter in Desplaines, WIBO Broadcasters Inc. 6312 Broadway. (Divides time with WHT-WJAZ-WORD).	5000	202.6	1480	Central
WIBR	**Steubenville, Ohio** — Thurman A. Owings.	50	249.9	1200	Eastern
WIBS	**Elizabeth, N. J.**—New Jersey Broadcasting Corp., 80 Broad St. (Divides time with WBMS-WAAT-WNJ-WKBO-WSAR-WNBH).	250	206.8	1450	Eastern
WIBU	**Poynette, Wis.**—Wisconsin State Journal.	100	228.9	1310	Central
WIBW	**Topeka, Kans.**—C. L. Carrell, 901 National Reserve Life Ins. Co. Bldg. (Divides time with KFH).	1000	230.6	1300	Central
WIBX	**Utica, N. Y.**—WIBX, Inc., Hotel Utica.	100	228.9	1310	Eastern
WIBZ	**Montgomery, Ala.** — A. D. Trum, 217 Catoma St.	15	199.9	1500	Central
WICC	**Bridgeport, Conn.** — (Transmitter in Easton) — Bridgeport Broadcasting Co., Inc. (Divides time with WBRL).	500	209.7	1430	Eastern
WIL	**St. Louis, Mo.**—Missouri Broadcasting Corp. (Divides time with KWK).	1000	222.1	1350	Central
WINR	**Bay Shore, N. Y.** — Radiotel Mfg. Co., Carleton Hall. (Divides time with WJBI-WGBB-WCOH).	100	247.8	1210	Eastern
WIOD	**Miami Beach, Fla.** — Isle of Dreams Broadcasting Co. (Divides time with WQAM)	1000	241.8	1240	Eastern
WIP	**Philadelphia, Pa.**—Gimbel Bros., Market St. Bldg. (Divides time with WFAN).	500	491.5	610	Eastern
WISN	**Milwaukee, Wis.**—Wisconsin News, 115 Michigan St. (Divides time with WHAD).	250	267.7	1120	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WJAD	**—Waco, Tex.** — Frank P. Jackson, 801 Austin Ave. (Divides time with KFQB).	1000	241.8	1240	Central
WJAG	**—Norfolk, Nebr.**—Norfolk Daily News, Hotel Norfolk. (Divides time with WCAJ-WOW).	500	508.2	590	Central
WJAK	**—Kokomo, Ind.**—J. A. Kautz, Y.M.C.A. Bldg. (Divides time with WLBC).	50	228.9	1310	Central
WJAM	**—Cedar Rapids, Ia.** — (Transmitter in Waterloo)—Waterloo Broadcasting Co., 322 Third Ave W. (Divides time with KFJB).	100	249.9	1200	Central
WJAR	**—Providence, R. I.** — The Outlet Co.	250	340.7	880	Eastern
WJAS	**—Pittsburgh, Pa.**—M. H. Pickering Furniture Co.	500	232.4	1290	Eastern
WJAX	**—Jacksonville, Fla.** — City of Jacksonville, Waterworks Park, 1st & Main Sts. (Divides time with WAPI).	1000	263	1140	Eastern
WJAY	**—Cleveland, Ohio**—Cleveland Radio Broadcasting Corp., Hotel Hollenden. (Divides time with WHK).	500	215.7	1390	Eastern
WJAZ	**—Chicago, Ill.**—(Transmitter in Mount Prospect)—Zenith Radio Corporation, 3620 Iron St. (Divides time with WORD-WIBO-WHT).	5000	202.6	1480	Central
WJBB	**—St. Petersburg, Fla.**—(Transmitter in Sarasota)—Financial Journal, 126—13th St. N.	100	218.8	1370	Eastern
WJBC	**—LaSalle, Ill.**—Hummer Furniture Co., 2nd and Joliet Streets. (Divides time with WJBL).	100	249.9	1200	Central
WJBI	**—Red Bank, N. J.**—Robt. S. Johnson, 63 Broad St. (Divides time with WINR-WCOH)	100	247.8	1210	Eastern
WJBK	**—Ypsilanti, Mich.**—Ernest F. Goodwin, 803 Congress St.	50	218.8	1370	Central
WJBL	**—Decatur, Ill.** — Wm. Gushard Dry Goods Co., 301 N. Water St. (Divides time with WJBC).	100	249.9	1200	Central
WJBO	**—New Orleans, La.** — Valdemar Jensen, 119 S. St. Patrick St.	100	218.8	1370	Central
WJBT	**—Chicago, Ill.**—John S. Boyd, Kimball Bldg.	10000	389.4	770	Central
WJBU	**—Lewisburg, Pa.**—Bucknell University, Engineering Bldg.	100	247.8	1210	Eastern
WJBW	**—New Orleans, La.**—C. Carlson, Jr., 2743 Dumaine St. (Divides time with WABZ).	30	249.9	1200	Central
WJBY	**—Gadsden, Ala.**—Electric Construction Co., 517 Broad St.	50	247.8	1210	Central
WJJD	**—Mooseheart, Ill.**— Supreme Lodge, Loyal Order of Moose. (Divides time with WCFL-WRM).	1000	483.6	620	Central
WJKS	**—Gary, Ind.** — Johnson Kennedy Radio Corp., 540 Lake St. (Divides time with WGES-WPCC).	500	220.4	1360	Central
WJR	**—Detroit, Mich.**—(Transmitter in Pontiac)—Good Will Station WJR, Inc. & Detroit Free Press, General Motors Bldg. & Book Cadillac Hotel.	5000	399.8	750	Eastern
WJZ	**—New York, N. Y.**—(Transmitter in Bound Brook, N. J.)—National Broadcasting Co., 711—5th Ave.	30000	394.5	760	Eastern
WKAR	**—East Lansing, Mich.**—Michigan State College. (Daytime only).	500	288.3	1040	Central
WKAV	**—Laconia, N. H.**—Laconia Radio Club, Auditorium Public Service Co. of N. H.	50	228.9	1310	Eastern
WKBB	**—Joliet, Ill.** — Sanders Bros., 607 Jefferson St. (Divides time with WCLS-WEHS-WKBI WHFC).	100	228,9	1310	Central
WKBC	**—Birmingham, Ala.**— H. L. Ansley, 1428 North Twelfth Ave.	10	228.9	1310	Central
WKBE	**—Webster, Mass.**—K. & B. Electric Co., 59 Emerald Ave. (Divides time with WEPS),	100	249.9	1200	Eastern
WKBF	**—Indianapolis, Ind.**— Noble B. Watson, Hoosier Athletic Club. (Divides time with WBAA-WCMA).	500	214.2	1400	Central
WKBH	**—LaGrosse Wis.**—Callaway Music Co., 221 Main St. (Divides time with KSO-WHBL)	1000	217.3	1380	Central
WKBI	**—Chicago, Ill.**—Fred L. Schoenwolf, Lincoln Trust & Savings Bank Bldg., (Divides time with WHFC-WKBB-WCLS-WEHS).	50	228.9	1310	Central
WKBN	**—Youngstown, Ohio**—RadioElectricService, Y.M.C.A, (Divides time with WMBS).	500	209.7	1430	Eastern
WKBO	**—Jersey City, N. J.**—Camith Corporation, 2866 Boulevard. (Divides time with WBMS-WNJ-WAAT-WIBS).	250	206.8	1450	Eastern
WKBP	**—Battle Creek, Mich.**— Battle Creek Enquirer & News.	50	211.1	1420	Eastern
WKBQ	**—New York, N. Y.**— Standard Cahill Co., Inc., 1100 East 177th St. (Divides time with WBNY-WMSG-WCDA).	250	222.1	1350	Eastern
WKBS	**—Galesburg, Ill.** — P. N. Nelson, 227 Duffield Ave. (Divides time with WLBO).	100	228.9	1310	Central
WKBT	**—New Orleans, La.**— First Baptist Church.	50	211.1	1420	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WKBV	**Brookville, Ind.**—Knox Battery & Electric Co., 1058 Main St.	100	199.9	1500	Central
WKBW	**Buffalo, N. Y.**—(Transmitter in Amherst)—Churchill Evangelistic Assoc., 1420-1428 Main St. (Divides time with WKEN).	5000	204	1470	Eastern
WKBZ	**Ludington, Mich.** — Karl L. Ashbacker, First National Bank Bldg.	50	199.9	1500	Eastern
WKEN	**Buffalo, N. Y.**—(Transmitter in Grand Island)—WKEN, Inc., 2 E. Hazeltine Ave. (Divides time with WKBW)	750	204	1470	Eastern
WKJC	**Lancaster, Pa.** — Kirk Johnson & Co., 16 West King St.	50	228.9	1310	Eastern
WKRC	**Cincinnati, Ohio**—Kodel Radio Corp., 507 E. Pearl St.	500	545.1	550	Central
WKY	**Oklahoma City, Okla.**—WKY Radiophone Co., Huckins Hotel.	1000	333.1	900	Central
WLAC	**Nashville, Tenn.** — Dad's Auto Accessory & Radio Store and The Life & Casualty Insurance Co. (Divides time with WBAW).	5000	201.2	1490	Central
WLAP	**Louisville, Ky.** — Virginia Avenue Baptist Church, 2600 Virginia Ave.	30	249.9	1200	Central
WLB	**Minneapolis, Minn.** — University of Minnesota. (Divides time with WCAL-KFMX-WRHM).	1000	243.8	1230	Central
WLBC	**Muncie, Ind.**—D. A. Burton 2224 So. Jefferson St. (Divides time with WJAK).	50	228.9	1310	Central
WLBF	**Kansas City, Mo.** — Everett L. Dillard, 32nd & Main St.	100	249.9	1200	Central
WLBG	**Petersburg, Va.**—R. A. Gamble.	100	249.9	1200	Eastern
WLBH	**Farmingdale, N. Y.**—Joseph J. Lombardi. (Divides time with WHPP-WMRJ).	30	211.1	1420	Eastern
WLBL	**Stevens Point, Wis.**—Wisconsin Department of Markets. (Daytime only).	2000	333.1	900	Central
WLBO	**Galesburg, Ill.** — Frederick Trebbe, Jr. (Divides time with WKBS).	100	228.9	1310	Central
WLBV	**Mansfield, Ohio**—Mansfield Broadcasting Assoc. Chamber of Commerce Bldg.,	100	247.8	1210	Eastern
WLBW	**Oil City, Pa.**—Petroleum Telephone Co.	500	238	1260	Eastern
WLBX	**Long Island City, N. Y.**—John N. Brahy, 283 Crescent Street. (Divides time with WCLB-WWRL-WMBQ).	100	199.9	1500	Eastern
WLBZ	**Dover-Foxcroft, Me.**—Thompson L. Guernsey.	250	526	570	Eastern
WLCI	**Ithaca, N. Y.**—Lutheran Assoc. of Ithaca.	50	247.8	1210	Eastern
WLEX	**Lexington, Mass.** — The Lexington Air Station, 131 Willow Ave. (Divides time with WSSH).	50	211.1	1420	Eastern
WLIB	**Chicago, Ill.** — (Transmitter in Elgin)—Liberty Weekly.	15000	416.4	720	Central
WLIT	**Philadelphia, Pa.**—Lit Bros., 8th & Market Sts. (Divides time with WFI).	500	535.4	560	Eastern
WLOE	**Chelsea, Mass.**—New England Broadcasting Co., 56 Washington Ave. (Divides time with WMES).	100	199.9	1500	Eastern
WLS	**Chicago, Ill.** — (Transmitter is in Crete) — Prairie Farmer (Divides time with WENR).	5000	344.6	870	Central
WLSI	**Cranston, R. I.**—Dutee W. Flint and Lincoln Studios, Inc., 335 Westminster St., Providence. (Divides time with WFCI).	100	218.8	1370	Eastern
WLTH	**Brooklyn, N. Y.** — Flatbush Radio Labs., 1421 E. 10th St. (Divides time with WCGU - WBBC - WSGH - WSDA).	250	214.2	1400	Eastern
WLW	**Cincinnati, Ohio**—(Transmitter in Harrison)—Crosley Radio Corp. (Divides time with WSAI).	5000	428.3	700	Central
WLWL	**New York, N. Y.** — (Transmitter in Kearney, N. J.) —Paulist Fathers, 415 W. 59th St. (Divides time with WPG).	5000	272.6	1100	Eastern
WMAC	**Cazenovia, N. Y.**—Clive B. Meredith. (Divides time with WHEC - WABO - WOKO).	500	208.2	1440	Eastern
WMAF	**South Dartmouth, Mass.** — Round Hills Radio Corp. (Divides time with WBET).	500	227.1	1320	Eastern
WMAK	**Buffalo, N. Y.** — (Transmitter in Martinsville)—WMAK Broadcast Station. (Divides time with WFBL).	750	333.1	900	Eastern
WMAL	**Washington, D. C.**—M. A. Leese Radio Co., 720 Eleventh St. N. W. (Divides time with WDEL)	250	475.9	630	Eastern
WMAN	**Columbus, Ohio**—W. E. Heskett Radio Stations, 507 N. High St.	50	247.8	1210	Eastern
WMAQ	**Chicago, Ill.**—Chicago's Daily News, 15 North Wells St.	5000	447.5	670	Central
WMAY	**St. Louis, Mo.**—Kings Highway Presbyterian Church.	100	249.9	1200	Central
WMAZ	**Macon, Ga.**—Mercer University. (Divides time with WGST).	500	336.9	890	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WMBA	**Newport, R.I.**—LeRoy, Joseph Beebe. 19 B'way.	100	199.9	1500	Eastern
WMBC	**Detroit, Mich.**—Mich. Broadcasting Co., Savoy Hotel.	100	211.1	1420	Eastern
WMBD	**Peoria Heights, Ill.**—Peoria Heights Radio Laboratory, 107 E. Glen Ave. (Divides time with WTAD).	500	208.2	1440	Central
WMBF	**Miami Beach, Fla.**—Fleetwood Hotel Corporation.	500	535.4	560	Eastern
WMBG	**Richmond, Va.**—Havens & Martin, 914 West Broad St.	100	247.8	1210	Eastern
WMBH	**Joplin, Mo.**—Edwin Dudley Aber, 1526 E. Fifty-Third St.	100	247.8	1210	Central
WMBI	**Chicago, Ill.**—(Tranmitter in Addison)—Moody Bible Institute of Chicago, 153 Institute Place. (Divides time with WOWO-KTNT and WCBD).	5000	258.5	1160	Central
WMBL	**Lakeland, Fla.**—Benford Radio Studios, 121 No. Kentucky Ave.	100	228.9	1310	Eastern
WMBM	**Memphis, Tenn.** — Seventh Day Adventist Church.	10	199.9	1500	Central
WMBO	**Auburn, N. Y.**—Radio Service Laboratories, 17 South St.	100	218.8	1370	Eastern
WMBQ	**Brooklyn, N. Y.** — Paul J. Gollhofer, 95 Leonard St. (Divides time with WCLB-WLBX-WWRL).	100	199.9	1500	Eastern
WMBR	**Tampa, Fla.**—F. J. Reynolds.	100	247.8	1210	Eastern
WMBS	**Harrisburg, Pa.**—(Transmitter in Lemoyne)—Mack Battery Co. (Divides time with WKBN).	250	209.7	1430	Eastern
WMC	**Memphis, Tenn.**—Memphis Commercial Appeal, Inc., Commercial Appeal Bldg.	500	384.4	780	Central
WMCA	**New York, N. Y.**—(Transmitter in Hoboken, N.J.)—Associated Broadcasters, Inc., HotelMcAlpin. (Divides time with WNYC).	500	526	570	Eastern
WMES	**Boston, Mass.** — Educational Society, Barristers Hall. (Divides time withWLOE)	50	199.9	1500	Eastern
WMPC	**Lapeer, Mich.**—First Methodist Protestant Church.	30	228.9	1310	Eastern
WMRJ	**Jamaica, N. Y.**—Peter J. Prinz, 10 New York Blvd. (Divides time with WLBH-WHPP).	10	211.1	1420	Eastern
WMSG	**New York, N. Y.** — Madison Square Garden Broadcasting Corp., 319 W. 49th St. (Divides time with WBNY-WCDA-WKBQ).	250	222.1	1350	Eastern
WNAC	**Boston, Mass.**—The Shepard Stores.	500	243.8	1230	Eastern
WNAD	**Norman, Okla.**—University of Oklahoma. (Divides time with KGGF).	500	516.9	580	Central
WNAT	**Philadelphia, Pa.** — Lennig Bros. Co., Spring Garden & 9th Sts.	100	228.9	1310	Eastern
WNAX	**Yankton, S. Dak.** — Gurney Seed and Nursery Co. (Divides time with KUSD-KFNF).	500	336.9	890	Central
WNBF	**Endicott, N. Y.**—Howitt-Wood Radio Co. Inc., 117 W. Main St., Hotel Frederick.	50	199.9	1500	Eastern
WNBH	**New Bedford, Mass.**—New Bedford Broadcasting Co., New Bedford Hotel. (Divides time with WSAR).	250	206.8	1450	Eastern
WNBJ	**Knoxville, Tenn.**—Lonsdale Baptist Church, 122 W. Conn. Ave.	50	228.9	1310	Central
WNBO	**Washington, Pa.** — John B. Spriggs, So. Main St.	15	249.9	1200	Eastern
WNBQ	**Rochester, N. Y.** — Gordon P. Brown, 192 S. Goodman St.	15	199.9	1500	Eastern
WNBR	**Memphis, Tenn.** — Popular Radio Shop, 883 Poplar Ave. (Divides time with WGBC)	500	209.7	1430	Central
WNBW	**Carbondale, Pa.**—Home Cut Glass & China Co., 21 Salem Ave.	5	249.9	1200	Eastern
WNBZ	**Saranac Lake, N. Y.**—Smith and Mace. (Daytime only).	10	232.4	1290	Eastern
WNBX	**Springfield, Vt.**—First Congregational Church. (Divides time with WCAX).	10	249.9	1200	Eastern
WNEW	**Norfolk, Va.** — Radio Corp. of Virginia.	100	228.9	1310	Eastern
WNJ	**Newark, N. J.**—Radio Investment Co., 89 Lehigh Ave. (Divides time with WAAT-WIBS).	250	206.8	1450	Eastern
WNOX	**Knoxville, Tenn.** — People's Telephone & Telegraph Co., 313 Commerce Ave. (Divides time with KVOO).	1000	535.4	560	Central
WNRC	**Greensboro, N. C.**—Wayne M. Nelson.	500	208.2	1440	Eastern
WNYC	**New York, N. Y.** — Dept. of Plants and Structures, Municipal Bldg. (Divides time with WMCA).	500	526	570	Eastern
WOAI	**San Antonio, Tex.**—Southern Equipment Co., 1031 Navarro St. (Divides time with WRR).	5000	252	1190	Central
WOAN	**Lawrenceburg, Tenn.**—Church of the Nazarene & Vaughan School of Music. (Divides time with WREC).	500	499.7	600	Central

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WOAX	**—Trenton, N. J.** — Franklyn J. Wolff, The Monument Pottery Co. (Divides time withWCAM-WCAP).	500	234.2	1280	Eastern
WOBT	**—Union City, Tenn.**— Tittsworth's Radio & Music Shop, 114 South First St.	15	228.9	1310	Central
WOBU	**—Charleston, W. Va.**— Charleston Radio Broadcasting Co., 1026 Quarier St. (Divides time with WSAZ).	250	516.9	580	Eastern
WOC	**—Davenport, Iowa**—The Palmer School of Chiropractic, 1002 Brady St. (Divides time with WSUI).	5000	309.1	970	Central
WOCL	**—Jamestown, N. Y.** — A. E. Newton.	25	247.8	1210	Eastern
WODA	**—Paterson, N. J.**—James K. O'Dea, Inc., 115 Ellison St. (Divides time with WGL).	1000	293.9	1250	Eastern
WOI	**—Ames, Iowa**—Iowa State College. (Divides time with WHO).	5000	285.5	1050	Central
WOKO	**—Poughkeepsie, N. Y.** —(Transmitter at Mt. Beacon Summit)—Harold E. Smith, Hotel Windsor. (Divides time with WHEC-WABO-WMAC).	500	208.2	1440	Eastern
WOMT	**—Manitowoc, Wis.**— Mikadow Theatre.	100	247.8	1210	Central
WOO	**—Philadelphia, Pa.**—John Wanamaker.	100	199.9	1500	Eastern
WOOD	**—Grand Rapids, Mich.** —(Transmitter in Furnwood) —Walter B. Stiles, Inc., Hotel Rowe. (Divides time with WASH).	500	236.1	1270	Central
WOQ	**—Kansas City, Mo.** — Unity School of Christianity. (Divides time with WDAF).	1000	491.5	610	Central
WOR	**—Newark, N. J.** — (Transmitter in Kearney)—L. Bamberger & Co.	5000	422.3	710	Eastern
WORD	**—Chicago, Ill.** — (Transmitter in Batavia)—Peoples Pulpit Assn., 124 Columbia Heights, Brooklyn, N. Y. (Divides 1-4 time with WHT-WIBO — WJAZ).	5000	202.6	1480	Central
WOS	**—Jefferson City, Mo.** — Missouri State Marketing Bureau. (Divides time with KFRU-WGBF).	500	475.9	630	Central
WOV	**—New York, N. Y.** — (Transmitter in Secaucus, N.J.) —International Broadcast Corp. 485 5th Ave. (Divides time with WODA).	1000	265.3	1130	Eastern
WOW	**—Omaha, Nebr.**—Woodmen of the World Life Insurance Ass'n. (Divides time with WJAG-WCAJ).	1000	508.2	590	Central
WOWO	**—Fort Wayne, Ind.** — The Main Auto Supply Co., 213 West Main St. (Divides time with KTNT-WCBD-WMBI).	5000	258.5	1160	Central
WPAP	**—New York, N. Y.** — (Transmitter in Cliffside, N. J.) —Palisades Amusement Park, 1540 Broadway. (Divides time with WHN-WRNY).	250	296.9	1010	Eastern
WPCC	**—Chicago, Ill.** — North Shore Congregational Church. (Divides time with WJKS and WGES).	500	220.4	1360	Central
WPCH	**—New York, N. Y.** — (Transmitter in Hoboken, N. J.) —Concourse Radio Corp., Hotel McAlpin, Broadway & 34th St. (Daytime only).	500	370.2	810	Eastern
WPG	**—Atlantic City, N. J.** — Municipality of Atlantic City. (Divides time with WLWL).	5000	272.6	1100	Eastern
WPOR	**—Norfolk, Va.**—Reliance Elec. Co., 519 W. 21st St. (Divides time with WSEA).	500	384.4	780	Eastern
WPRC	**—Harrisburg, Pa.**—Wilson Printing & Radio Co., Fifth and Kelker Streets.	100	249.9	1200	Eastern
WPSC	**—State College, Pa.** — Pennsylvania State College. (Daytime only).	500	243.8	1230	Eastern
WPSW	**—Philadelphia, Pa.** — Philadelphia School of Wireless Telegraphy, 1533 Pine St.	50	199.9	1500	Eastern
WPTF	**—Raleigh, N. C.**—Durham Life Ins. Co., 226½ Fayetteville St. (Divides time with WBT).	5000	277.6	1080	Eastern
WQAN	**—Scranton, Pa.** — Scranton Times, Penn Ave. & Spruce St. (Divides time with WGBI).	250	340.7	880	Eastern
WQAM	**—Miami, Fla.**—Electrical Equipment Co., 42 Northwest Fourth St. (Divides time with WIOD).	1000	241.8	1240	Eastern
WQAO	**—Cliffside, N. J.** — Calvary Baptist Church, 123 W. 57th St. New York City. (Divides time with WHN-WRNY).	250	296.9	1010	Eastern
WQBC	**—Utica, Miss.** — Utica Chamber of Commerce.	100	247.8	1210	Central
WQBJ	**—Clarksburg, W. Va.**— John Raikes, Willow Beach Club.	65	249.9	1200	Eastern
WQBZ	**—Weirton, W. Va.**—J. H. Thompson, 3337 Elm St.	60	249.9	1200	Eastern
WRAF	**—Laport, Ind.** — The Radio Club, Inc., 719 Michigan Ave. (Divides time with WWAE)	100	249.9	1200	Central
WRAK	**—Erie, Pa.** — C. R. Cummins, 1931 State St.	50	218.8	1370	Eastern
WRAW	**—Reading, Pa.**—Avenue Radio & Electric Shop, 460 Schuylkill Ave.	100	228.9	1310	Eastern
WRAX	**—Philadelphia, Pa.** — Berachah Church, Inc., 1608 Alleghany Ave.	250	211.1	1420	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WRBC	**—Valparaiso, Ind.**—Immanuel Lutheran Church.	250	241.8	1240	Central
WRBH	**—Manchester, N. H.**—New Hampshire Broadcasting Co., 33 Kimball St.	500			Eastern
WRBI	**—Tifton, Ga.** — Kent s Furniture & Music Store. (Divides time with WTHS).	100	228.9	1310	Central
WRBJ	**—Hattiesburg Miss.** — Woodruff Furniture Co., 119 West Pine St.	10	199.9	1500	Central
WRBL	**—Columbus, Ga.** — R. E. Martin.	50	249.9	1200	Central
WRBQ	**—Greenville, Miss.** — J. Pat Scully.	100	249.9	1200	Central
WRBT	**—Wilmington, N. C.**—Wilmington Radio Ass'n, 720 North Fourth St.	50	218.8	1370	Eastern
WRBU	**—Gastonia, N. C.**—A. J. Kirby Music Co., 221 E. Main St.	50	247.8	1210	Eastern
WRBW	**—Columbia, S. C.** — Paul S. Pearce, 2011 Green St.	15	228.9	1310	Eastern
WRBX	**—Richmond, Va.**—Richmond Development Corporation, 20 Salem Ave. S.E. (Divides time with WDBJ).	250	322.4	930	Eastern
WRC	**—Washington, D. C.** — Radio Corporation of America.	500	315.6	950	Eastern
WREC	**—Memphis, Tenn.** — WREC, Inc. (Divides time with WOAN).	500	499.7	600	Central
WREN	**—Lawrence, Kans.** — Jenny Wren, Inc. (Divides time with KFKU-KSAC).	500	296.9	1010	Central
WRHF	**—Washington, D. C.**—American Broadcasting Co., Hotel Annapolis. (Daytime only).	150	236.1	1270	Eastern
WRHM	**—Minneapolis, Minn.**—Rosedale Hospital Co., Inc., Andrews Hotel. (Divides time with WCAL-KFMX-WLB).	1000	243.8	1230	Central
WRJN	**—Racine, Wis.**—Racine Broadcasting Corp., Hotel Racine. (Divides time with WCLO)	100	249.9	1200	Central
WRK	**—Hamilton, Ohio**—Doron Bros. Electrical Co., 325-329 North "B".	100	211.1	1420	Eastern
WRM	**—Urbana, Ill.** — University of Illinois. (Divides time with WJJD-WCFL).	500	483.6	620	Central
WRNY	**—New York, N. Y.**—(Transmitter in Coytesville, N. J.). Experimenter Publishing Co., 230—5th Ave. (Divides time with WQAO-WPAP-WHN).	250	296.9	1010	Eastern
WRR	**—Dallas, Tex.**—City of Dallas, Police and Fire Signal Department. (Divides time with WOAI).	5000	252	1190	Central
WRUF	**—St. Petersburg, Fla.**—(Transmitter in Gainesville)—University of Florida. (Divides time with KFJF).	5000	204	1470	Eastern
WRVA	**—Richmond, Va.**—Larus & Brother Co., Inc., 22nd & Cary Sts.	5000	270.1	1110	Eastern
WSAI	**—Cincinnati, Ohio** — (Transmitter in Mason)—United States Playing Card Co., Crosley Radio Corp. Lessee. (Divides time with WLW).	5000	428.3	700	Central
WSAJ	**—Grove City, Pa.**—Grove City College.	100	228.9	1310	Eastern
WSAN	**—Allentown, Pa.**—Allentown Call Publishing Co. (Divides time with WCBA).	100	199.9	1500	Eastern
WSAR	**—Portsmouth, R. I.**—(Transmitter in Fall River, Mass.) — Doughty & Welch Electric Co., 46 N. Main St. (Divides time with WNBH).	250	206.8	1450	Eastern
WSAZ	**—Huntington, W. Va.**—McKellar Elec. Co., 1143-4th Ave. (Divides time with WOBU)	250	516.9	580	Eastern
WSB	**—Atlanta, Ga.**—The Atlanta Journal.	1000	405.2	740	Central
WSBC	**—Chicago, Ill.** — World Battery Co., 1219 South Wabash Ave. (Divides time with WEDC-WCRW).	100	247.8	1210	Central
WSBT	**—South Bend, Ind.** — South Bend Tribune, 225 W. Colfax Ave. (Divides time with WFBM).	500	325.9	920	Central
WSDA	**—Brooklyn, N. Y.**—Amateur Radio Specialty Co., 77 Cortlandt St., N. Y. (Divides time with WBBC-WCGU-WLTH).	500	214.2	1400	Eastern
WSEA	**—Virginia Beach, Va.**—(Transmitter at Portsmouth)—Virginia Beach Broadcasting Co., Cavalier Hotel, Main Studio at Norfolk. (Divides time with WTAR-WPOR).	500	384.4	780	Eastern
WSGH	**—Brooklyn, N. Y.** — Amateur Radio Specialty Co., 77 Cortlandt St., N. Y. (Divides time with WBBC-WCGU-WLTH).	500	214.2	1400	Eastern
WSIX	**—Springfield, Tenn.** — Six Thirty Eight Tire & Vulc. Co.	100	247.8	1210	Central
WSKC	**—Bay City, Mich.** — World's Star Knitting Co.	500	212.6	1410	Eastern
WSM	**—Nashville, Tenn.**—The National Life & Accident Ins. Co., National Bldg.	5000	461.3	650	Central
WSMB	**—New Orleans, La.** — Saenger Amusement Co. and Maison Blanche Co.	750	227.1	1320	Central
WSMK	**—Dayton, Ohio**—S. M. K. Radio Corporation, 39 East Third St.	200	526	570	Eastern

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
WSPD	**Toledo, Ohio**—Toledo Broadcasting Co. (Divides time with WCAH).	250	206.8	1450	Eastern
WSRO	**Middletown, Ohio** — Middletown Broadcasting Co., Central & Canal Sts.	100	211.1	1420	Central
WSSH	**Boston, Mass.** — Tremont Temple Baptist Church. (Divides time with WLEX).	100	211.1	1420	Eastern
WSUI	**Iowa City, Iowa**—State University of Iowa. (Divides time with WOC).	500	309.1	970	Central
WSUN	**St. Petersburg, Fla.**—(Transmitter in City Hall Park at Causeway) — Chamber of Commerce. (Divides time with WFLA).	1000	333.1	900	Eastern
WSVS	**Buffalo, N. Y.**—Seneca Vocational School, 666 E. Delavan Ave.	50	218.8	1370	Eastern
WSYR	**Syracuse, N. Y.**—Clive B. Meredith, Hotel Syracuse. (Divides time with WGR).	500	545.1	550	Eastern
WTAD	**Quincy, Ill.**—Illinois Stock Medicine Broadcasting Corp.	500	208.2	1440	Central
WTAG	**Worcester, Mass.** — Worcester Telegram Pub. Co., 18 Franklin St.	250	516.9	580	Eastern
WTAM	**Cleveland, Ohio** — Willard Storage Battery Co., 1100 Chester Ave. (Divides time with WEAR).	3500	280.2	1070	Eastern
WTAQ	**Eau Claire, Wis.** — Gillette Rubber Co. (Divides time with KSCJ).	1000	225.4	1330	Central
WTAR	**Norfolk, Va.**—Reliance Electric Co., 519 W. 21st St. (Divides time with WSEA).	500	384.4	780	Eastern
WTAS	**Batavia, Ill.** —Illinois Broadcasting Corp.	15000	461.4	720	Central
WTAW	**College Station, Tex.** —Agricultural and Mechanical College of Texas. (Divides time with KUT).	500	267.7	1120	Central
WTAX	**Streator, Ill.**—Williams Hardware Co., 115 So. Vermillion St. (Divides time WCBS).	50	247.8	1210	Central
WTAZ	**Richmond, Va.**—Thos. J. McGuire.	15	247.8	1210	Eastern
WTFF	**Mt. Vernon Hills, Va.** —Independent Publishing Co., 339 Pa. Ave. N. W. Wash., D.C. (Divides time with KSTP).	10000	205.4	1460	Eastern
WTFI	**Toccoa Falls, Ga.** — Toccoa Falls Inst.	500	206.8	1450	Eastern
WTHS	**Atlanta, Ga.**—Atlanta Technological High School. (Divides time with WRBI).	20	228.9	1310	Central
WTIC	**Hartford, Conn.**— Travelers Insurance Co. (Divides time with WBAL).	5000	282.8	1060	Eastern
WTMJ	**Milwaukee, Wis.** — (Transmitter in Brookfield)— Milwaukee Journal. (Divides time with WHA).	1000	526	570	Central
WWAE	**Chicago, Ill.**— (Transmitter in Hammond)— Dr. Geo. F. Courrier, 2024 So. Wabash Ave. (Divides time with WRAF).	100	249.9	1200	Central
WWJ	**Detroit, Mich.** — Evening News Assoc.	1000	365.6	820	Eastern
WWL	**New Orleans, La.** — Loyola University. (Divides time with KWKH).	5000	352.7	850	Central
WWNC	**Asheville, N. C.** — Asheville Chamber of Commerce, 101 Patton Ave.	1000	526	570	Central
WWRL	**Woodside, N. Y.** — W. H. Reuman. (Divides time with WMBQ-WLBX-WCLB).	100	199.9	1500	Eastern
WWVA	**Wheeling, West Va.**— West Virginia Broadcasting Corp., 1229 Main St. (Divides time with WHAS).	5000	293.9	1020	Eastern

This list has been corrected up to and including November 11th, 1928

STATION 3LO
MELBOURNE, AUSTRALIA
AL. NARASICK
WRESTLER

STATION WPG
ATLANTIC CITY, N.J.
MAX GELLERT
VIOLIN VIRTUOSO

STATION WCAP
ASBURY PARK, N.J.
ANNOUNCING STAFF

STATION KOA
DENVER, COLO.
RALPH FREESE
TENOR AND ANNOUNCER

STATION KPO
SAN FRANCISCO, CALIF.
MRS. FREDERICK CROWE
PROGRAM DIRECTOR

STATION KLX
OAKLAND, CALIF.
RAY RAYMOND
BROTHER BOB

RADIO BROADCAST STATIONS OF THE UNITED STATES

By Wavelengths and Frequencies

Meters	Kilocycles	Power	Call Letters	Location
199.9	1500	50	KFBL	Everett, Wash.
199.9	1500	100	KFCR	Santa Barbara, Cal.
199.9	1500	100	KFQU	Holy City, Cal.
199.9	1500	100	KFUP	Denver, Colo.
199.9	1500	100	KFWO	Avalon, Catalina Isl. Cal.
199.9	1500	50	KFXJ	Edgewater, Colo.
199.9	1500	100	KFYO	Breckenridge, Tex.
199.9	1500	100	KGDR	San Antonio, Tex.
199.9	1500	15	KGHI	Little Rock, Ark.
199.9	1500	50	KGHX	Richmond, Tex.
199.9	1500	100	KGKB	Goldthwaite, Tex.
199.9	1500	50	KGTT	San Francisco, Cal.
199.9	1500	15	KPJM	Prescott, Ariz.
199.9	1500	100	KRE	Berkeley, Cal.
199.9	1500	10	KUJ	Seattle, Wash.
199.9	1500	100	KVL	Seattle, Wash.
199.9	1500	15	KWBS	Portland, Ore.
199.9	1500	50	KWJJ	Portland, Ore.
199.9	1500	100	KWTC	Santa Ana, Calif.
199.9	1500	50	WALK	Willow Grove, Pa.
199.9	1500	100	WCBA	Allentown, Pa.
199.9	1500	100	WCLB	Brooklyn, N. Y.
199.9	1500	15	WIBZ	Montgomery, Ala.
199.9	1500	100	WHBW	Philadelphia, Pa.
199.9	1500	100	WKBV	Brookville, Ind.
199.9	1500	50	WKBZ	Ludington, Mich.
199.9	1500	100	WLBX	Long Island City, N. Y.
199.9	1500	100	WLOE	Chelsea, Mass.
199.9	1500	100	WMBA	Newport, R. I.
199.9	1500	10	WMBM	Memphis, Tenn.
199.9	1500	100	WMBQ	Brooklyn, N. Y.
199.9	1500	50	WMES	Boston, Mass.
199.9	1500	50	WNBF	Endicott, N. Y.
199.9	1500	15	WNBQ	Rochester, N. Y.
199.9	1500	100	WOO	Philadelphia, Pa.
199.9	1500	50	WPSW	Philadelphia, Pa.
199.9	1500	10	WRBJ	Hattiesburg, Miss.
199.9	1500	100	WSAN	Allentown, Pa.
199.9	1500	100	WWRL	Woodside, N. Y.
201.2	1490	5000	WBAW	Nashville, Tenn.
201.2	1490	5000	WLAC	Nashville, Tenn.
202.6	1480	5000	WIBO	Chicago, Ill.
202.6	1480	5000	WJAZ	Chicago, Ill.
202.6	1480	5000	WORD	Chicago, Ill.
204	1470	5000	KFJF	Oklahoma City, Okla.
204	1470	5000	KGA	Spokane, Wash.
204	1470	100	KGGM	Inglewood, Calif.
204	1470	5000	WHT	Chicago, Ill.
204	1470	5000	WKBW	Buffalo, N. Y.
204	1470	750	WKEN	Buffalo, N. Y.
204	1470	5000	WRUF	St. Petersburg, Fla.
205.4	1460	10000	KSTP	St. Paul, Minn.
205.4	1460	10000	WTFF	Mt. Vernon Hills, Va.
206.8	1450	1000	KSBA	Shreveport, La.
206.8	1450	250	WAAT	Jersey City, N. J.
206.8	1450	100	WBMS	Union City, N. J.
206.8	1450	250	WCAH	Columbus, Ohio
206.8	1450	250	WIBS	Elizabeth, N. J.
206.8	1450	250	WKBO	Jersey City, N. J.
206.8	1450	250	WNBH	New Bedford, Mass.
206.8	1450	250	WNJ	Newark, N. J.
206.8	1450	250	WSAR	Portsmouth, R. I.
206.8	1450	250	WSPD	Toledo, O.
206.8	1450	500	WTFI	Toccoa Falls, Ga.
208.2	1440	250	WABF	Kingston, Pa.
208.2	1440	250	WABO	Rochester, N. Y.
208.2	1440	250	WHEC	Rochester, N. Y.
208.2	1440	500	WMAC	Cazenovia, N. Y.
208.2	1440	500	WMBD	Peoria Heights, Ill.
208.2	1440	500	WNRC	Greensboro, N. C.
208.2	1440	500	WOKO	Poughkeepsie, N. Y.
208.2	1440	500	WTAD	Quincy, Ill.
209.7	1430	500	WBRL	Tilton, N. H.
209.7	1430	500	WGBC	Memphis, Tenn.
209.7	1430	500	WICC	Bridgeport, Conn.
209.7	1430	500	WKBN	Youngstown, Ohio
209.7	1430	250	WMBS	Harrisburg, Pa.
209.7	1430	500	WNBR	Memphis, Tenn.
211.1	1420	50	KFIF	Portland, Ore.
211.1	1420	100	KFIZ	Fond du Lac, Wis.
211.1	1420	100	KFQW	Seattle, Wash.
211.1	1420	15	KFXD	Jerome, Idaho
211.1	1420	100	KFYX	Flagstaff, Ariz.
211.1	1420	50	KGCN	Concordia, Kans.
211.1	1420	100	KGFJ	Los Angeles, Calif.
211.1	1420	50	KGFW	Ravenna, Nebr.
211.1	1420	100	KGGF	Picher, Okla.
211.1	1420	5	KGHD	Missoula, Mont.
211.1	1420	50	KGY	Lacey, Wash.
211.1	1420	15	KKP	Seattle, Wash.
211.1	1420	100	KLS	Oakland, Calif.
211.1	1420	50	KMED	Medford, Ore.
211.1	1420	100	KOCW	Chickasha, Okla.
211.1	1420	100	KORE	Eugene, Ore.
211.1	1420	100	KWG	Stockton, Cal.
211.1	1420	100	WAFD	Detroit, Mich.
211.1	1420	30	WEDH	Erie, Pa.
211.1	1420	10	WHPP	New York, N. Y.
211.1	1420	50	WKBP	Battle Creek, Mich.
211.1	1420	50	WKBT	New Orleans, La.
211.1	1420	30	WLBH	Farmingdale, N. Y.
211.1	1420	50	WLEX	Lexington, Mass.
211.1	1420	100	WMBC	Detroit, Mich.
211.1	1420	10	WMRJ	Jamaica, N. Y.

Meters	Kilocycles	Power	Call Letters	Location
211.1	1420	250	WRAX	Philadelphia, Pa.
211.1	1420	100	WRK	Hamilton, O.
211.1	1420	100	WSRO	Middletown, Ohio
211.1	1420	100	WSSH	Boston, Mass.
212.6	1410	500	KFEQ	St. Joseph, Mo.
212.6	1410	500	KFLV	Rockford, Ill.
212.6	1410	1000	KGRS	Amarillo, Tex.
212.6	1410	1000	WDAG	Amarillo, Tex.
212.6	1410	500	WDGY	Minneapolis, Minn.
212.6	1410	500	WHDI	Minneapolis, Minn.
212.6	1410	500	WSKC	Bay City, Mich.
214.2	1400	500	WBAA	West Lafayette, Ind.
214.2	1400	500	WBBC	Brooklyn, N. Y.
214.2	1400	500	WCGU	Brooklyn, N. Y.
214.2	1400	500	WCMA	Culver, Ind.
214.2	1400	500	WKBF	Indianapolis, Ind.
214.2	1400	250	WLTH	Brooklyn, N. Y.
214.2	1400	500	WSDA	Brooklyn, N. Y.
214.2	1400	500	WSGH	Brooklyn, N. Y.
215.7	1390	1000	KFUM	Colorado Springs, Colo.
215.7	1390	500	KOW	Denver, Colo.
215.7	1390	500	WHK	Cleveland, Ohio
215.7	1390	500	WJAY	Cleveland, Ohio
217.3	1380	500	KQV	Pittsburgh, Pa.
217.3	1380	1000	KSO	Clarinda, Iowa
217.3	1380	500	WCSO	Springfield, O.
217.3	1380	1000	WHBL	Sheboygan, Wis.
217.3	1380	1000	WKBH	LaCrosse, Wis.
218.8	1370	50	KFEC	Portland, Ore.
218.8	1370	10	KFEY	Kellogg, Idaho
218.8	1370	50	KFJI	Astoria, Ore.
218.8	1370	100	KFJZ	Fort Worth, Tex.
218.8	1370	15	KFPL	Dublin, Tex.
218.8	1370	100	KGAR	Tucson, Ariz.
218.8	1370	100	KGCI	San Antonio, Tex.
218.8	1370	10	KGCX	Vida, Mont.
218.8	1370	100	KGER	Long Beach, Calif.
218.8	1370	50	KGFG	Oklahoma City, Okla.
218.8	1370	50	KGGH	Cedar Grove, La.
218.8	1370	50	KGHG	McGehee, Ark.
218.8	1370	100	KGJF	Little Rock, Ark.
218.8	1370	100	KGKL	Georgetown, Tex.
218.8	1370	100	KGKO	Wichita Falls, Tex.
218.8	1370	100	KJBS	San Francisco, Cal.
218.8	1370	5	KTUE	Houston, Tex.
218.8	1370	100	KWEA	Shreveport, La.
218.8	1370	100	KWKC	Kansas City, Mo.
218.8	1370	100	KZM	Oakland, Cal.
218.8	1370	25	WAAD	Cincinnati, Ohio
218.8	1370	100	WBBL	Richmond, Va.
218.8	1370	100	WCBM	Baltimore, Md.
218.8	1370	100	WDWF	Cranston, R. I.
218.8	1370	100	WFBJ	Collegeville, Minn.
218.8	1370	100	WFCI	Pawtucket, R. I.
218.8	1370	15	WGCM	Gulfport, Miss.
218.8	1370	100	WHBD	Bellefontaine, O.
218.8	1370	100	WHBQ	Memphis, Tenn.
218.8	1370	100	WIBM	Jackson, Mich.
218.8	1370	100	WJBB	St. Petersburg, Fla.
218.8	1370	50	WJBK	Ypsilanti, Mich.
218.8	1370	100	WJBO	New Orleans, La.
218.8	1370	100	WLSI	Cranston, R. I.
218.8	1370	100	WMBO	Auburn, N. Y.
218.8	1370	50	WRAK	Erie, Pa.
218.8	1370	50	WRBT	Wilmington, N. C.
218.8	1370	50	WSVS	Buffalo, N. Y.
220.4	1360	500	WGES	Chicago, Ill.
220.4	1360	500	WJKS	Gary, Ind.
220.4	1360	500	WPCC	Chicago, Ill.
222.1	1350	50	KGFL	Trinidad, Colo.
222.1	1350	1000	KWK	St. Louis, Mo.
222.1	1350	250	WBNY	New York, N. Y.
222.1	1350	250	WCDA	New York, N. Y.
222.1	1350	1000	WIL	St. Louis, Mo.
222.1	1350	250	WKBQ	New York, N. Y.
222.1	1350	250	WMSG	New York, N. Y.
223.7	1340	50	KFPW	Sulphur Springs, Ark.
223.7	1340	250	KGB	San Diego, Cal.
223.7	1340	500	KMO	Tacoma, Wash.
223.7	1340	1000	KVI	Tacoma, Wash.
223.7	1340	1000	WADC	Akron, Ohio
223.7	1340	500	WFJC	Akron, Ohio.
225.4	1330	1000	KSCJ	Sioux City, Iowa
225.4	1330	500	WCAC	Mansfield, Conn.
225.4	1330	500	WDRC	New Haven, Conn.
225.4	1330	1000	WTAQ	Eau Claire, Wis.
227.1	1320	250	KGHF	Pueblo, Colo.
227.1	1320	250	KSEI	Pocatello, Idaho
227.1	1320	500	WBET	Boston, Mass.
227.1	1320	500	WCWK	Fort Wayne, Ind.
227.1	1320	500	WMAF	South Dartmouth, Mass.
227.1	1320	750	WSMB	New Orleans, La.
228.9	1310	100	KFBK	Sacramento, Cal.
228.9	1310	100	KFCB	Phoenix, Ariz.
228.9	1310	10	KFGQ	Boone, Iowa
228.9	1310	100	KFJY	Fort Dodge, Ia.
228.9	1310	15	KFPM	Greenville, Tex.
228.9	1310	50	KFUR	Ogden, Utah
228.9	1310	50	KFXR	Oklahoma City, Okla.
228.9	1310	100	KGEZ	Kalispell, Mont.
228.9	1310	15	KGFI	San Angelo, Tex.
228.9	1310	100	KGRC	San Antonio, Tex.
228.9	1310	100	KWCR	Cedar Rapids, Ia.
228.9	1310	50	WABY	Philadelphia, Pa.
228.9	1310	50	WAGM	Royal Oak, Mich.
228.9	1310	100	WBES	Takoma Park, Md.
228.9	1310	100	WBMH	Detroit, Mich.
228.9	1310	100	WBOW	Terre Haute, Ind.
228.9	1310	100	WBRE	Wilkes-Barre, Pa.
228.9	1310	100	WCLS	Joliet, Ill.
228.9	1310	100	WDAH	El Paso, Texas
228.9	1310	100	WEBR	Buffalo, N. Y.
228.9	1310	100	WEHS	Evanston, Ill.
228.9	1310	100	WFBG	Altoona, Pa.
228.9	1310	100	WFDF	Flint, Mich.
228.9	1310	50	WFKD	Philadelphia, Pa.
228.9	1310	15	WGAL	Lancaster, Pa.
228.9	1310	100	WHBP	Johnstown, Pa.

Meters	Kilocycles	Power	Call Letters	Location
228.9	1310	100	WHFC	Chicago, Ill.
228.9	1310	100	WIAD	Philadelphia, Pa.
228.9	1310	100	WIBU	Poynette, Wis.
228.9	1310	100	WIBX	Utica, N. Y.
228.9	1310	50	WJAK	Kokomo, Ind.
228.9	1310	50	WKAV	Laconia, N. H.
228.9	1310	100	WKBB	Joliet, Ill.
228.9	1310	10	WKBC	Birmingham, Ala.
228.9	1310	50	WKBI	Chicago, Ill.
228.9	1310	100	WKBS	Galesburg, Ill.
228.9	1310	50	WKJC	Lancaster, Pa.
228.9	1310	50	WLBC	Muncie, Ind.
228.9	1310	100	WLBO	Galesburg, Ill.
228.9	1310	30	WMPC	Lapeer, Mich.
228.9	1310	100	WMBL	Lakeland, Fla.
228.9	1310	100	WNAT	Philadelphia, Pa.
228.9	1310	50	WNBJ	Knoxville, Tenn.
228.9	1310	100	WNEW	Norfolk, Va.
228.9	1310	15	WOBT	Union City, Tenn.
228.9	1310	100	WRAW	Reading, Pa.
228.9	1310	100	WRBI	Tifton, Ga.
228.9	1310	15	WRBW	Columbia, S. C.
228.9	1310	100	WSAJ	Grove City, Pa.
228.9	1310	20	WTHS	Atlanta, Ga.
230.6	1300	500	KFH	Wichita, Kans.
230.6	1300	500	KFJR	Portland, Ore.
230.6	1300	1000	KGEF	Los Angeles, Calif.
230.6	1300	1000	KTBI	Los Angeles, Calif.
230.6	1300	500	KTBR	Portland, Ore.
230.6	1300	500	WBBR	Rossville, N. Y.
230.6	1300	500	WEVD	New York, N. Y.
230.6	1300	500	WHAP	New York, N. Y.
230.6	1300	500	WHAZ	Troy, N. Y.
230.6	1300	1000	WIBW	Topeka, Kans.
232.4	1290	500	KFUL	Galveston, Tex.
232.4	1290	50	KLCN	Blytheville, Ark.
232.4	1290	1000	KTSA	San Antonio, Tex.
232.4	1290	500	WJAS	Pittsburgh, Pa.
232.4	1290	10	WNBZ	Saranac Lake, N. Y.
234.2	1280	1000	KFOA	Seattle, Wash.
234.2	1280	1000	KTW	Seattle, Wash.
234.2	1280	500	WCAM	Camden, N. J.
234.2	1280	500	WCAP	Asbury Park, N. J.
234.2	1280	1000	WDAY	Fargo, N. D.
234.2	1280	1000	WDOD	Chattanooga, Tenn.
234.2	1280	1000	WEBC	Superior, Wis.
234.2	1280	500	WOAX	Trenton, N. J.
236.1	1270	50	KGCA	Decorah, Iowa
236.1	1270	500	KLX	Oakland, Cal.
236.1	1270	500	KTAB	Oakland, Cal.
236.1	1270	50	KWLC	Decorah, Ia.
236.1	1270	250	WASH	Grand Rapids, Mich.
236.1	1270	1000	WDSU	New Orleans, La.
236.1	1270	500	WOOD	Grand Rapids, Mich.
236.1	1270	150	WRHF	Washington, D. C.
238	1260	1000	KOIL	Council Bluffs, Ia.
238	1260	500	WLBW	Oil City, Pa.
239.9	1250	500	KEJK	Los Angeles, Calif.
239.9	1250	1000	KFON	Long Beach, Calif.
239.9	1250	1000	KLRA	Little Rock, Ark.
239.9	1250	1000	KOAC	Corvallis, Ore.
239.9	1250	500	KUOA	Fayetteville, Ark.
239.9	1250	1000	KXL	Portland, Ore.
239.9	1250	500	WAAM	Newark, N. J.
239.9	1250	250	WGCP	Newark, N. J.
239.9	1250	1000	WODA	Paterson, N. J.
241.8	1240	1000	KFQB	Fort Worth, Tex.
241.8	1240	500	WCAE	Pittsburgh, Pa.
241.8	1240	1000	WIOD	Miami Beach, Fla.
241.8	1240	1000	WJAD	Waco, Tex.
241.8	1240	750	WQAM	Miami, Fla.
241.8	1240	250	WRBC	Valparaiso, Ind.
243.8	1230	1000	KDYL	Salt Lake City, Utah
243.8	1230	1000	KFAU	Boise, Idaho
243.8	1230	1000	KFMX	Northfield, Minn.
243.8	1230	500	WBIS	Boston, Mass.
243.8	1230	1000	WCAL	Northfield, Minn.
243.8	1230	1000	WGMS	St. Paul-Minn., Minn.
243.8	1230	1000	WLB	Minneapolis, Minn.
243.8	1230	500	WNAC	Boston, Mass.
243.8	1230	500	WPSC	State College, Pa.
243.8	1230	1000	WRHM	Minneapolis, Minn.
245.8	1220	100	KFIO	Spokane, Wash.
245.8	1220	1000	KYA	San Francisco, Cal.
245.8	1220	500	WCAD	Canton, N. Y.
245.8	1220	750	WGHP	Mt. Clemens, Mich.
247.8	1210	100	KDLR	Devils Lake, N. D.
247.8	1210	50	KFKZ	Kirksville, Mo.
247.8	1210	100	KFLX	Galveston, Tex.
247.8	1210	100	KFOR	Lincoln, Neb.
247.8	1210	100	KFPY	Spokane, Wash.
247.8	1210	50	KFVS	Cape Girardeau, Mo.
247.8	1210	100	KGBX	St. Joseph, Mo.
247.8	1210	50	KGCB	Oklahoma City, Okla.
247.8	1210	100	KGCR	Brookings, S. Dak.
247.8	1210	15	KGDA	Dell Rapids, S. Dak.
247.8	1210	10	KGDP	Pueblo, Colo.
247.8	1210	100	KPCB	Seattle, Wash.
247.8	1210	100	KPQ	Seattle, Wash.
247.8	1210	100	KTAP	San Antonio, Tex.
247.8	1210	50	KXRO	Seattle, Wash.
247.8	1210	100	WBAX	Wilkes-Barre, Pa.
247.8	1210	100	WCBS	Springfield, Ill.
247.8	1210	100	WCOH	Greenville, N. Y.
247.8	1210	100	WCRW	Chicago, Ill.
247.8	1210	10	WEBE	Cambridge, Ohio
247.8	1210	50	WEBQ	Harrisburg, Ill.
247.8	1210	100	WEDC	Chicago, Ill.
247.8	1210	100	WGBB	Freeport, N. Y.
247.8	1210	100	WHBF	Rock Island, Ill.
247.8	1210	100	WHBU	Anderson, Ind.
247.8	1210	100	WIBA	Madison, Wis.
247.8	1210	100	WINR	Bay Shore, N. Y.
247.8	1210	100	WJBI	Red Bank, N. J.
247.8	1210	100	WJBU	Lewisburg, Pa.
247.8	1210	50	WJBY	Gadsden, Ala.
247.8	1210	100	WLBV	Mansfield, Ohio
247.8	1210	50	WLCI	Ithaca, N. Y.

Meters	Kilocycles	Power	Call Letters	Location
247.8	1210	50	WMAN	Columbus, O.
247.8	1210	100	WMBG	Richmond, Va.
247.8	1210	100	WMBH	Joplin, Mo.
247.8	1210	100	WMBR	Tampa, Fla.
247.8	1210	25	WOCL	Jamestown, N. Y.
247.8	1210	100	WOMT	Manitowoc, Wis.
247.8	1210	100	WQBC	Utica, Miss.
247.8	1210	50	WRBU	Gastonia, N. C.
247.8	1210	100	WSBC	Chicago, Ill.
247.8	1210	100	WSIX	Springfield, Tenn.
247.8	1210	50	WTAX	Streator, Ill.
247.8	1210	15	WTAZ	Richmond, Va.
249.9	1200	50	KFBB	Havre, Mont.
249.9	1200	50	KFDX	Shreveport, La.
249.9	1200	50	KFHA	Gunnison, Colo.
249.9	1200	100	KFJB	Marshalltown, Ia.
249.9	1200	100	KFWC	San Bernardino, Cal.
249.9	1200	100	KFWF	St. Louis, Mo.
249.9	1200	100	KGCU	Mandan, N. Dak.
249.9	1200	50	KGDE	Barrett, Minn.
249.9	1200	15	KGDY	Oldham, S. Dak.
249.9	1200	10	KGEK	Yuma, Colo.
249.9	1200	15	KGEN	El Centro, Calif.
249.9	1200	100	KGEW	Fort Morgan, Colo.
249.9	1200	50	KGFK	Hallock, Minn.
249.9	1200	500	KGHA	Pueblo, Colo.
249.9	1200	50	KMJ	Fresno, Cal.
249.9	1200	50	KPPC	Pasadena, Cal.
249.9	1200	50	KRMD	Shreveport, La.
249.9	1200	100	KSMR	Santa Maria, Cal.
249.9	1200	100	WABI	Bangor, Me.
249.9	1200	50	WABZ	New Orleans, La.
249.9	1200	100	WBBW	Norfolk, Va.
249.9	1200	75	WBBY	Charleston, S. C.
249.9	1200	100	WBBZ	Ponca City, Okla.
249.9	1200	100	WCAT	Rapid City, S. D.
249.9	1200	100	WCAX	Burlington, Vt.
249.9	1200	100	WCLO	Kenosha, Wis.
249.9	1200	100	WEPS	Gloucester, Mass.
249.9	1200	50	WFBC	Knoxville, Tenn.
249.9	1200	100	WFBE	Cincinnati, Ohio
249.9	1200	10	WHBC	Canton, Ohio
249.9	1200	50	WHBY	West De Pere, Wis.
249.9	1200	50	WIBR	Steubenville, Ohio
249.9	1200	100	WJAM	Cedar Rapids, Ia.
249.9	1200	100	WJBC	LaSalle, Ill.
249.9	1200	100	WJBL	Decatur, Ill.
249.9	1200	30	WJBW	New Orleans, La.
249.9	1200	100	WKBE	Webster, Mass.
249.9	1200	30	WLAP	Louisville, Ky.
249.9	1200	100	WLBF	Kansas City, Mo.
249.9	1200	100	WLBG	Petersburg, Va.
249.9	1200	100	WMAY	St. Louis, Mo.
249.9	1200	15	WNBO	Washington, Pa.
249.9	1200	5	WNBW	Carbondale, Pa.
249.9	1200	10	WNBX	Springfield, Vt.
249.9	1200	100	WPRC	Harrisburg, Pa.
249.9	1200	65	WQBJ	Clarksburg, W. Va.
249.9	1200	60	WQBZ	Weirton, W. Va.
249.9	1200	100	WRAF	Laporte, Ind.
249.9	1200	50	WRBL	Columbus, Ga.
249.9	1200	100	WRBQ	Greenville, Miss.
249.9	1200	100	WRJN	Racine, Wis.
249.9	1200	100	WWAE	Chicago, Ill.
252	1190	5000	WOAI	San Antonio, Tex.
252	1190	5000	WRR	Dallas, Tex.
254.1	1180	2500	KEX	Portland, Ore.
254.1	1180	5000	KOB	State College, N. Mex.
254.1	1180	500	WGBS	New York, N. Y.
256.3	1170	5000	WCAU	Philadelphia, Pa.
258.5	1160	5000	KTNT	Muscatine, Iowa
258.5	1160	5000	WCBD	Zion, Ill.
258.5	1160	500	WEAN	Providence, R. I.
258.5	1160	5000	WHAM	Rochester, N. Y.
258.5	1160	5000	WMBI	Chicago, Ill.
258.5	1160	5000	WOWO	Ft. Wayne, Ind.
260.7	1150	10	KGDM	Stockton, Calif.
263	1140	5000	WAPI	Auburn, Ala.
263	1140	1000	WJAX	Jacksonville, Fla.
265.3	1130	5000	KFKB	Milford, Kans.
265.3	1130	5000	KSL	Salt Lake City, Utah
265.3	1130	1000	WOV	New York, N. Y.
267.7	1120	250	KFEL	Denver, Colo.
267.7	1120	500	KFSG	Los Angeles, Cal.
267.7	1120	250	KFXF	Denver, Colo.
267.7	1120	250	KMIC	Inglewood, Calif.
267.7	1120	50	KRSC	Seattle, Wash.
267.7	1120	500	KUT	Austin, Tex.
267.7	1120	500	WBAK	Harrisburg, Pa.
267.7	1120	100	WBAO	Decatur, Ill.
267.7	1120	500	WCOA	Pensacola, Fla.
267.7	1120	250	WFBR	Baltimore, Md.
267.7	1120	250	WHAD	Milwaukee, Wis.
267.7	1120	250	WISN	Milwaukee, Wis.
267.7	1120	500	WTAW	College Station, Tex.
270.1	1110	5000	WRVA	Richmond, Va.
272.6	1100	5000	WLWL	New York, N. Y.
272.6	1100	5000	WPG	Atlantic City, N. J.
275.1	1090	5000	KMOX	St. Louis, Mo.
277.6	1080	5000	WBT	Charlotte, N. C.
277.6	1080	5000	WPTF	Raleigh, N. C.
280.2	1070	100	WCAZ	Carthage, Ill.
280.2	1070	100	WDZ	Tuscola, Ill.
280.2	1070	1000	WEAR	Cleveland, O.
280.2	1070	3500	WTAM	Cleveland, O.
282.8	1060	5000	WBAL	Baltimore, Md.
282.8	1060	5000	WTIC	Hartford, Conn.
285.5	1050	5000	KNX	Los Angeles, Cal.
285.5	1050	5000	WHO	DesMoines, Ia.
285.5	1050	5000	WOI	Ames, Ia.
288.3	1040	10000	KRLD	Dallas, Tex.
288.3	1040	5000	WFAA	Dallas, Tex.
288.3	1040	500	WKAR	East Lansing, Mich.
293.9	1020	5000	WHAS	Louisville, Ky.
293.9	1020	5000	WWVA	Wheeling, W. Va.
296.9	1010	500	KFKA	Greeley, Colo.
296.9	1010	500	KFKU	Lawrence, Kans.
296.9	1010	500	KPOF	Denver, Colo.

Meters	Kilocycles	Power	Call Letters	Location
296.9	1010	500	KQW	San Jose, Cal.
296.9	1010	500	KRGV	Harlingen, Tex.
296.9	1010	500	KSAC	Manhattan, Kans.
296.9	1010	500	KWWG	Brownsville, Tex.
296.9	1010	250	WHN	New York, N. Y.
296.9	1010	250	WPAP	New York, N. Y.
296.9	1010	250	WQAO	Cliffside, N. J.
296.9	1010	500	WREN	Lawrence, Kans.
296.9	1010	250	WRNY	New York, N. Y.
299.8	1000	5000	KFKX	Chicago, Ill.
299.8	1000	250	KGFH	La Crescenta, Calif.
299.8	1000	5000	KYW	Chicago, Ill.
299.8	1000	5000	WEBH	Chicago, Ill.
302.8	990	1000	KSOO	Sioux Falls, S. D.
302.8	990	500	WBZA	Boston, Mass.
305.9	980	50000	KDKA	East Pittsburgh, Pa.
309.1	970	5000	KJR	Seattle, Wash.
309.1	970	5000	WOC	Davenport, Ia.
309.1	970	500	WSUI	Iowa City, Ia.
315.6	950	1000	KFWB	Los Angeles, Cal.
315.6	950	250	KGHL	Billings, Mont.
315.6	950	1000	KLDS	Independence, Mo.
315.6	950	1000	KMBC	Kansas City, Mo.
315.6	950	1000	KPSN	Pasadena, Cal.
315.6	950	1000	WHB	Kansas City, Mo.
315.6	950	500	WRC	Washington, D. C.
319	940	1000	KOIN	Portland, Ore.
319	940	500	WAAF	Chicago, Ill.
319	940	500	WCSH	Portland, Me.
319	940	1000	WFIW	Hopkinsville, Ky.
322.4	930	500	KFWI	San Francisco, Calif.
322.4	930	500	KFWM	Oakland, Calif.
322.4	930	500	KGBY	Shelby, Nebr.
322.4	930	500	KGBZ	York, Nebr.
322.4	930	500	KGCH	Wayne, Nebr.
322.4	930	500	KGDW	Humboldt, Nebr.
322.4	930	500	KGEO	Grand Island, Nebr.
322.4	930	500	KGES	Central City, Nebr.
322.4	930	500	KMA	Shenandoah, Ia.
322.4	930	500	WBRC	Birmingham, Ala.
322.4	930	250	WDBJ	Roanoke, Va.
322.4	930	50	WIBG	Elkins Park, Pa.
322.4	930	250	WRBX	Richmond, Va.
325.9	920	1000	KHQ	Spokane, Wash.
325.9	920	500	KUOM	Missoula, Mont.
325.9	920	1000	WFBM	Indianapolis, Ind.
325.9	920	500	WSBT	South Bend, Ind.
333.1	900	1000	KHJ	Los Angeles, Cal.
333.1	900	750	WFBL	Syracuse, N. Y.
333.1	900	1000	WFLA	Clearwater, Fla.
333.1	900	1000	WKY	Oklahoma City, Okla.
333.1	900	1000	WLBL	Stevens Point, Wis.
333.1	900	750	WMAK	Buffalo, N. Y.
333.1	900	1000	WSUN	St. Petersburg, Fla.
336.9	890	500	KFNF	Shenandoah, Ia.
336.9	890	500	KUSD	Vermillion, S. D.
336.9	890	15000	WBZ	Springfield, Mass.
336.9	890	500	WGST	Atlanta, Ga.
336.9	890	500	WMAZ	Macon, Ga.
336.9	890	500	WNAX	Yankton, S. D.
340.7	880	500	WCOC	Columbus, Miss.
340.7	880	250	WGBI	Scranton, Pa.
340.7	880	250	WJAR	Providence, R. I.
340.7	880	250	WQAN	Scranton, Pa.
344.6	870	5000	WBCN	Chicago, Ill.
344.6	870	5000	WENR	Chicago, Ill.
344.6	870	5000	WLS	Chicago, Ill.
348.6	860	5000	WABC	New York, N. Y.
348.6	860	5000	WBOQ	New York, N. Y.
352.7	850	250	KFQZ	Hollywood, Cal.
352.7	850	5000	KWKH	Shreveport, La.
352.7	850	5000	WWL	New Orleans, La.
361.2	830	12500	KOA	Denver, Colo.
365.6	820	1000	WWJ	Detroit, Mich.
370.2	810	10000	WCCO	Minn.-St. Paul, Minn.
370.2	810	500	WPCH	New York, N. Y.
374.8	800	1000	KTHS	Hot Springs Nat'l Pk, Ark.
374.8	800	5000	WBAP	Fort Worth, Tex.
379.5	790	10000	KGO	Oakland, Cal.
379.5	790	50000	WGY	So. Schenectady, N. Y.
384.4	780	500	KELW	Burbank, Calif.
384.4	780	500	KNRC	Santa Monica, Calif.
384.4	780	100	WBSO	Wellesley Hills, Mass.
384.4	780	500	WMC	Memphis, Tenn.
384.4	780	500	WPOR	Norfolk, Va.
384.4	780	500	WSEA	Virginia Beach, Va.
384.4	780	500	WTAR	Norfolk, Va.
389.4	770	5000	KFAB	Lincoln, Nebr.
389.4	770	10000	WBBM	Chicago, Ill.
389.4	770	10000	WJBT	Chicago, Ill.
394.5	760	1000	WEW	St. Louis, Mo.
394.5	760	30000	WJZ	New York, N. Y.
399.8	750	5000	WCX	Detroit, Mich.
399.8	750	5000	WJR	Detroit, Mich.
405.2	740	1000	KMMJ	Clay Center, Nebr.
405.2	740	1000	WSB	Atlanta, Ga.
416.4	720	15000	WGN	Chicago, Ill.
416.4	720	15000	WLIB	Chicago, Ill.
416.4	720	15000	WTAS	Batavia, Ill.
422.3	710	5000	WOR	Newark, N. J.
428.3	700	250	KFVD	Venice, Calif.
428.3	700	5000	WLW	Cincinnati, Ohio
428.3	700	5000	WSAI	Cincinnati, Ohio
434.5	690	1000	NAA	Arlington, Va.
440.9	680	5000	KPO	San Francisco, Cal.
440.9	680	1000	WEMC	Berrien Springs, Mich.
447.5	670	5000	WMAQ	Chicago, Ill.
454.3	660	500	WAAW	Omaha, Neb.
454.3	660	50000	WEAF	New York, N. Y.
461.3	650	5000	WSM	Nashville, Tenn.
468.5	640	5000	KFI	Los Angeles, Cal.
468.5	640	5000	WAIU	Columbus, O.
468.5	640	750	WEAO	Columbus, O.
475.9	630	500	KFRU	Columbia, Mo.
475.9	630	250	WDEL	Wilmington, Del.
475.9	630	500	WGBF	Evansville, Ind.
475.9	630	250	WMAL	Washington, D. C.
475.9	630	500	WOS	Jefferson City, Mo.

Meter	Kilocycles	Power	Call Letters	Location
483.6	620	500	KFAD	Phoenix, Ariz.
483.6	620	1000	KOMO	Seattle, Wash.
483.6	620	1000	WCFL	Chicago, Ill.
483.6	620	1000	WDAE	Tampa, Fla.
483.6	620	1000	WDBO	Orlando, Fla.
483.6	620	1000	WJJD	Mooseheart, Ill.
483.6	620	500	WRM	Urbana, Ill.
491.5	610	1000	KFRC	San Francisco, Calif.
491.5	610	1000	WDAF	Kansas City, Mo.
491.5	610	500	WFAN	Philadelphia, Pa.
491.5	610	500	WIP	Philadelphia, Pa.
491.5	610	1000	WOQ	Kansas City, Mo.
499.7	600	500	KFBU	Laramie, Wyo.
499.7	600	500	KFSD	San Diego, Calif.
499.7	600	250	WCAO	Baltimore, Md.
499.7	600	250	WEBW	Beloit, Wis.
499.7	600	500	WOAN	Lawrenceburg, Tenn.
499.7	600	500	WREC	Memphis, Tenn.
508.2	590	1000	KGW	Portland, Ore.
508.2	590	500	WCAJ	Lincoln, Neb.
508.2	590	500	WEEI	Boston, Mass.
508.2	590	500	WJAG	Norfolk, Nebr.
508.2	590	1000	WOW	Omaha, Nebr.
516.9	580	500	KGFF	Alva, Okla.
516.9	580	200	KGFX	Pierre, S. Dak.
516.9	580	500	WNAD	Norman, Okla.
516.9	580	250	WOBU	Charleston, W. Va.
516.9	580	250	WSAZ	Huntington, W. Va.
516.9	580	250	WTAG	Worcester, Mass.
526	570	1000	KMTR	Hollywood, Calif.
526	570	1000	KPLA	Los Angeles, Calif.
526	570	250	KVOS	Bellingham, Wash.
526	570	500	KWSC	Pullman, Wash.
526	570	500	KXA	Seattle, Wash.
526	570	750	WHA	Madison, Wis.
526	570	250	WLBZ	Dover-Foxcroft, Me.
526	570	500	WMCA	New York, N. Y.
526	570	500	WNYC	New York, N. Y.
526	570	200	WSMK	Dayton, O.
526	570	1000	WTMJ	Milwaukee, Wis.
526	570	1000	WWNC	Asheville, N. C.
535.4	560	100	KICK	Atlantic, Iowa
535.4	560	1000	KLZ	Denver, Colo.
535.4	560	1000	KVOO	Tulsa, Okla.
535.4	560	500	WFI	Philadelphia, Pa.
535.4	560	100	WIAS	Ottumwa, Ia.
535.4	560	500	WLIT	Philadelphia, Pa.
535.4	560	500	WMBF	Miami Beach, Fla.
535.4	560	1000	WNOX	Knoxville, Tenn.
545.1	550	1000	KFDM	Beaumont, Tex.
545.1	550	500	KFDY	Brookings, S. Dak.
545.1	550	500	KFJM	Grand Forks, N. D.
545.1	550	500	KFUO	St. Louis, Mo.
545.1	550	500	KFYR	Bismarck, N. D.
545.1	550	1000	KPRC	Houston, Tex.
545.1	550	500	KSD	St. Louis, Mo.
545.1	550	750	WGR	Buffalo, N. Y.
545.1	550	500	WKRC	Cincinnati, O.
545.1	550	500	WSYR	Syracuse, N. Y.

This list has been corrected up to and including November, 11th, 1928

A NEW SERVICE TO OUR READERS

Fill out the coupon below and mail it to Editor, Radio Listeners' Guide & Call Book, 230 Fifth Ave., New York. We will put you on our mailing list and you will receive at different times, without cost, a list containing all changes which the Federal Radio Commission may make from time to time, enabling you thus to keep all your Broadcast Station lists up-to-date.

Editor, Radio Listeners' Guide & Call Book
230 Fifth Ave., N. Y.

My name is.....

My occupation is.....

My address is.....

My town and state.....

Please put me on your free list to receive bulletin of changes made by the Radio Commission.

STATION KFJF
OKLAHOMA CITY, OKLA.
DUDLEY SHAW
CHIEF ANNOUNCER

STATION WCAP
ASBURY PARK, N.J.
EDWIN KULIN
PIANIST

STATION KFRC
SAN FRANCISCO, CALIF.
THEODORE STRONG
ORGANIST

STATION KGW
PORTLAND, ORE.
GLADYS JOHNSON
STAFF 'CELLISTE

STATION WMAQ
CHICAGO, ILL.
ROY HASENBALG
STUDIO MANAGER

STATION KOIL
COUNCIL BLUFFS, IOWA
BOB HALL
CHIEF ANNOUNCER

RADIO BROADCAST STATIONS OF THE UNITED STATES

By States and Cities

State and City	Call Letters	Wave Length
ALABAMA		
Auburn	WAPI	263
Birmingham	WBRC	322.4
Birmingham	WKBC	228.9
Gadsden	WJBY	247.8
Montgomery	WIBZ	199.9
ARIZONA		
Flagstaff	KFXY	211.1
Phoenix	KFAD	483.6
Phoenix	KFCB	228.9
Prescott	KPJM	199.9
Tucson	KGAR	218.8
ARKANSAS		
Blytheville	KLCN	232.4
Fayetteville	KUOA	239.9
Hot Springs Nat'l Pk.	KTHS	374.8
Little Rock	KGHI	199.9
Little Rock	KGJF	218.8
Little Rock	KLRA	239.9
McGehee	KGHG	218.8
Sulphur Springs	KFPW	223.7
CALIFORNIA		
Avalon, Catalina Is.	KFWO	199.9
Berkeley	KRE	199.9
Burbank	KELW	384.4
El Centro	KGEN	249.9
Fresno	KMJ	249.9
Hollywood	KFQZ	352.7
Hollywood	KMTR	526
Holy City	KFQU	199.9
Inglewood	KGGM	204
Inglewood	KMIC	267.7
La Crescenta	KGFH	299.8
Long Beach	KFON	239.9
Long Beach	KGER	218.8
Los Angeles	KFI	468.5
Los Angeles	KEJK	239.9
Los Angeles	KFSG	267.7
Los Angeles	KFWB	315.6
Los Angeles	KGEF	230.6
Los Angeles	KGFJ	211.1
Los Angeles	KHJ	333.1
Los Angeles	KNX	285.5
Los Angeles	KPLA	526
Los Angeles	KTBI	230.6
Oakland	KFWM	322.4
Oakland	KGO	379.5
Oakland	KLS	211.1
Oakland	KLX	236.1
Oakland	KTAB	236.1
Oakland	KZM	218.8
Pasadena	KPPC	249.9
Pasadena	KPSN	315.6
Sacramento	KFBK	228.9
San Bernardino	KFWC	249.9
San Diego	KFSD	499.7
San Diego	KGB	223.7
San Francisco	KFRC	491.5
San Francisco	KFWI	322.4
San Francisco	KGTT	199.9
San Francisco	KJBS	218.8
San Francisco	KPO	440.9
San Francisco	KYA	245.8
San Jose	KQW	296.9
Santa Ana	KWTC	199.9
Santa Barbara	KFCR	199.9
Santa Maria	KSMR	249.9
Santa Monica	KNRC	384.4
Stockton	KGDM	260.7
Stockton	KWG	211.1
Venice	KFVD	428.3
COLORADO		
Colorado Springs	KFUM	215.7
Denver	KFEL	267.7
Denver	KFUP	199.9
Denver	KFXF	267.7
Denver	KLZ	535.4
Denver	KOA	361.2
Denver	KOW	215.7
Denver	KPOF	296.9
Edgewater	KFXJ	199.9
Fort Morgan	KGEW	249.9
Greeley	KFKA	296.9
Gunnison	KFHA	249.9
Pueblo	KGDP	247.8
Pueblo	KGHA	249.9
Pueblo	KGHF	227.1
Trinidad	KGFL	247.8
Yuma	KGEK	249.9
CONNECTICUT		
Bridgeport	WICC	209.7
Hartford	WTIC	282.8
Mansfield	WCAC	225.4
New Haven	WDRC	225.4
DELAWARE		
Wilmington	WDEL	475.9
DIST. OF COLUMBIA		
Washington	WMAL	475.9
Washington	WRC	315.6
Washington	WRHF	236.1
FLORIDA		
Clearwater	WFLA	333.1
Jacksonville	WJAX	263
Lakeland	WMBL	228.9
Miami	WQAM	241.8
Miami Beach	WIOD	241.8
Miami Beach	WMBF	535.4
Orlando	WDBO	483.6
Pensacola	WCOA	267.7
St. Petersburg	WJBB	218.8
St. Petersburg	WRUF	204
St. Petersburg	WSUN	333.1
Tampa	WDAE	483.6
Tampa	WMBR	247.8
GEORGIA		
Atlanta	WGST	336.9
Atlanta	WSB	405.2
Atlanta	WTHS	228.9
Columbus	WRBL	249.9
Macon	WMAZ	336.9
Tifton	WRBI	228.9
Toccoa Falls	WTFI	206.8
IDAHO		
Boise	KFAU	243.8
Jerome	KFXD	211.1
Kellogg	KFEY	218.8
Pocatello	KSEI	227.1
ILLINOIS		
Batavia	WTAS	416.4
Carthage	WCAZ	280.2
Chicago	KFKX	299.8
Chicago	KYW	299.8
Chicago	WAAF	319
Chicago	WBBM	389.4
Chicago	WBCN	344.6
Chicago	WCFL	483.6
Chicago	WCRW	247.8
Chicago	WEBH	299.8
Chicago	WEDC	247.8
Chicago	WENR	344.6
Chicago	WGES	220.4
Chicago	WGN	416.4
Chicago	WHFC	228.9
Chicago	WHT	204
Chicago	WIBO	202.6
Chicago	WJAZ	202.6
Chicago	WJBT	389.4
Chicago	WKBI	228.9
Chicago	WLIB	416.4
Chicago	WLS	344.6
Chicago	WMAQ	447.5
Chicago	WMBI	258.5
Chicago	WORD	202.6
Chicago	WPCC	220.4
Chicago	WSBC	247.8
Chicago	WWAE	249.9
Decatur	WBAO	267.7
Decatur	WJBL	249.9
Evanston	WEHS	228.9
Galesburg	WKBS	228.9
Galesburg	WLBO	228.9
Harrisburg	WEBQ	247.8
Joliet	WCLS	228.9
Joliet	WKBB	228.9
LaSalle	WJBC	249.9
Mooseheart	WJJD	483.6
Peoria Heights	WMBD	208.2
Quincy	WTAD	208.2
Rockford	KFLV	212.6
Rock Island	WHBF	247.8
Springfield	WCBS	247.8
Streator	WTAX	247.8
Tuscola	WDZ	280.2
Urbana	WRM	483.6
Zion	WCBD	258.5

State and City	Call Letters	Wave Length
INDIANA		
Anderson	WHBU	247.8
Brookville	WKBV	199.9
Culver	WCMA	214.2
Evansville	WGBF	475.9
Fort Wayne	WCWK	227.1
Fort Wayne	WOWO	258.5
Gary	WJKS	220.4
Indianapolis	WFBM	325.9
Indianapolis	WKBF	214.2
Kokomo	WJAK	228.9
Laport	WRAF	249.9
Muncie	WLBC	228.9
South Bend	WSBT	325.9
Terre Haute	WBOW	228.9
Valparaiso	WRBC	241.8
West Lafayette	WBAA	214.2
IOWA		
Ames	WOI	285.5
Atlantic	KICK	535.4
Boone	KFGQ	228.9
Cedar Rapids	KWCR	228.9
Cedar Rapids	WJAM	249.9
Clarinda	KSO	217.3
Council Bluffs	KOIL	238
Davenport	WOC	309.1
Decorah	KGCA	236.1
Decorah	KWLC	236.1
Des Moines	WHO	285.5
Fort Dodge	KFJY	228.9
Iowa City	WSUI	309.1
Marshalltown	KFJB	249.9
Muscatine	KTNT	258.5
Ottumwa	WIAS	535.4
Shenandoah	KFNF	336.9
Shenandoah	KMA	322.4
Sioux City	KSCJ	225.4
KANSAS		
Concordia	KGCN	211.1
Lawrence	KFKU	296.9
Lawrence	WREN	296.9
Manhattan	KSAC	296.9
Milford	KFKB	265.3
Topeka	WIBW	230.6
Wichita	KFH	230.6
KENTUCKY		
Hopkinsville	WFIW	319
Louisville	WHAS	293.9
Louisville	WLAP	249.9
LOUISIANA		
Cedar Grove	KGGH	218.8
New Orleans	WABZ	249.9
New Orleans	WDSU	236.1
New Orleans	WJBO	218.8
New Orleans	WJBW	249.9
New Orleans	WKBT	211.1
New Orleans	WSMB	227.1
New Orleans	WWL	352.7
Shreveport	KFDX	249.9
Shreveport	KRMD	249.9
Shreveport	KSBA	206.8
Shreveport	KWEA	218.8
Shreveport	KWKH	352.7
MAINE		
Bangor	WABI	249.9
Dover-Foxcroft	WLBZ	526
Portland	WCSH	319
MARYLAND		
Baltimore	WBAL	282.8
Baltimore	WCAO	499.7
Baltimore	WCBM	218.8
Baltimore	WFBR	267.7
Tokoma Park	WBES	228.9
MASSACHUSETTS		
Boston	WBET	227.1
Boston	WBIS	243.8
Boston	WBZA	302.8
Boston	WEEI	508.2
Boston	WMES	199.9
Boston	WNAC	243.8
Boston	WSSH *	211.1
Chelsea	WLOE	199.9
Gloucester	WEPS	249.9
Lexington	WLEX	211.1
New Bedford	WNBH	206.8
South Dartmouth	WMAF	227.1
Springfield	WBZ	336.9
Webster	WKBE	249.9
Wellesley Hills	WBSO	384.4
Worcester	WTAG	516.9
MICHIGAN		
Battle Creek	WKBP	211.1
Bay City	WSKC	212.6
Berrien Springs	WEMC	440.9
Detroit	WAFD	211.1
Detroit	WBMH	228.9
Detroit	WJR	399.8
Detroit	WMBC	211.1
Detroit	WWJ	365.6
East Lansing	WKAR	288.3
Flint	WFDF	228.9
Grand Rapids	WASH	236.1
Grand Rapids	WOOD	236.1
Jackson	WIBM	218.8
Lapeer	WMPC	228.9
Ludington	WKBZ	199.9
Mt. Clemens	WGHP	245.8
Pontiac	WCX	399.8
Royal Oak	WAGM	228.9
Ypsilanti	WJBK	218.8
MINNESOTA		
Barrett	KGDE	249.9
Collegeville	WFBJ	218.8
Hallock	KGFK	249.9
Minneapolis	WDGY	212.6
Minneapolis	WHDI	212.6
Minneapolis	WLB	243.8
Minneapolis	WRHM	243.8
Northfield	KFMX	243.8
Northfield	WCAL	243.8
St.Paul	KSTP	205.4
St. Paul-Minneapolis	WCCO	370.2
St.Paul-Minneapolis	WGMS	243.8
MISSISSIPPI		
Columbus	WCOC	340.7
Greenville	WRBQ	249.9
Gulfport	WGCM	218.8
Hattiesburg	WRBJ	199.9
Utica	WQBC	247.8
MISSOURI		
Cape Girardeau	KFVS	247.8
Columbia	KFRU	475.9
Independence	KLDS	315.6
Jefferson City	WOS	475.9
Joplin	WMBH	247.8
Kansas City	KMBC	315.6
Kansas City	KWKC	218.8
Kansas City	WDAF	491.5
Kansas City	WHB	315.6
Kansas City	WLBF	249.9
Kansas City	WOQ	491.5
Kirksville	KFKZ	247.8
St. Joseph	KFEQ	212.6
St. Joseph	KGBX	247.8
St. Louis	KFUO	545.1
St. Louis	KFWF	249.9
St. Louis	KMOX	275.1
St. Louis	KSD	545.1
St. Louis	KWK	222.1
St. Louis	WEW	394.5
St. Louis	WIL	222.1
St. Louis	WMAY	249.9
MONTANA		
Billings	KGHL	315.6
Havre	KFBB	249.9
Kalispell	KGEZ	228.9
Missoula	KGHD	211.1
Missoula	KUOM	325.9
Vida	KGCX	218.8
NEBRASKA		
Central City	KGES	322.4
Clay Center	KMMJ	405.2
Grand Island	KGEO	322.4
Humboldt	KGDW	322.4
Lincoln	KFAB	389.4
Lincoln	KFOR	247.8
Lincoln	WCAJ	508.2
Norfolk	WJAG	508.2
Omaha	WAAW	454.3
Omaha	WOW	508.2
Ravenna	KGFW	211.1
Shelby	KGBY	322.4
Wayne	KGCH	322.4
York	KGBZ	322.4
NEW HAMPSHIRE		
Laconia	WKAV	228.9
Manchester	WRBH	
Tilton	WBRL	209.7
NEW JERSEY		
Asbury Park	WCAP	234.2
Atlantic City	WPG	272.6
Camden	WCAM	234.2
Cliffside	WQAO	296.9
Elizabeth	WIBS	206.8
Jersey City	WAAT	206.8
Jersey City	WKBO	206.8
Newark	WAAM	239.9
Newark	WGCP	239.9
Newark	WNJ	206.8
Newark	WOR	422.3
Paterson	WODA	239.9
Red Bank	WJBI	247.8
Trenton	WOAX	234.2
Union City	WBMS	206.8

State and City	Call Letters	Wave Length
NEW MEXICO		
State College	KOB	254.1
NEW YORK		
Auburn	WMBO	218.8
Bay Shore	WINR	247.8
Brooklyn	WBBC	214.2
Brooklyn	WCGU	214.2
Brooklyn	WCLB	199.9
Brooklyn	WLTH	214.2
Brooklyn	WMBQ	199.9
Brooklyn	WSDA	214.2
Brooklyn	WSGH	214.2
Buffalo	WEBR	228.9
Buffalo	WGR	545.1
Buffalo	WKBW	204
Buffalo	WKEN	204
Buffalo	WMAK	333.1
Buffalo	WSVS	218.8
Canton	WCAD	245.8
Cazenovia	WMAC	208.2
Endicott	WNBF	199.9
Farmingdale	WLBH	211.1
Freeport	WGBB	247.8
Greenville	WCOH	247.8
Ithaca	WLCI	247.8
Jamaica	WMRJ	211.1
Jamestown	WOCL	247.8
Long Island City	WLBX	199.9
New York	WABC	348.6
New York	WBNY	222.1
New York	WBOQ	348.6
New York	WCDA	222.1
New York	WEAF	454.3
New York	WEVD	230.6
New York	WGBS	254.1
New York	WHAP	230.6
New York	WHN	296.9
New York	WHPP	211.1
New York	WJZ	394.5
New York	WKBQ	222.1
New York	WLWL	272.6
New York	WMCA	526
New York	WMSG	222.1
New York	WNYC	526
New York	WOV	265.3
New York	WPAP	296.9
New York	WPCH	370.2
New York	WRNY	296.9
Poughkeepsie	WOKO	208.2
Rochester	WABO	208.2
Rochester	WHAM	258.5
Rochester	WHEC	208.2
Rochester	WNBQ	199.9
Rossville	WBBR	230.6
Saranac Lake	WNBZ	232.4
Schenectady	WGY	379.5
Syracuse	WFBL	333.1
Syracuse	WSYR	545.1
Troy	WHAZ	230.6
Utica	WIBX	228.9
Woodside	WWRL	199.9
NORTH CAROLINA		
Asheville	WWNC	526
Charlotte	WBT	277.8
Gastonia	WRBU	247.8
Greensboro	WNRC	208.2
Raleigh	WPTF	277.6
Wilmington	WRBT	218.8
NORTH DAKOTA		
Bismarck	KFYR	545.1
Devils Lake	KDLR	247.8
Fargo	WDAY	234.2
Grand Forks	KFJM	545.1
Mandan	KGCU	249.9
OHIO		
Akron	WADC	223.7
Akron	WFJC	223.7
Bellefontaine	WHBD	218.8
Cambridge	WEBE	247.8
Canton	WHBC	249.9
Cincinnati	WAAD	218.8
Cincinnati	WFBE	249.9
Cincinnati	WKRC	245.8
Cincinnati	WLW	428.3
Cincinnati	WSAI	428.3
Cleveland	WEAR	280.2
Cleveland	WHK	215.7
Cleveland	WJAY	215.7
Cleveland	WTAM	280.2
Columbus	WAIU	468.5
Columbus	WCAH	206.8
Columbus	WEAO	468.5
Columbus	WMAN	247.8
Dayton	WSMK	526
Hamilton	WRK	211.1
Mansfield	WLBV	247.8
Middletown	WSRO	211.1
Springfield	WCSO	217.3
Steubenville	WIBR	249.9
Toledo	WSPD	206.8
Youngstown	WKBN	209.7
OKLAHOMA		
Alva	KGFF	211.1
Chickasha	KOCW	211.1
Norman	WNAD	516.9
Oklahoma City	KFJF	204
Oklahoma City	KFXR	228.9
Oklahoma City	KGCB	247.8
Oklahoma City	KGFG	218.8
Oklahoma City	WKY	333.1
Picher	KGGF	516.9
Ponca City	WBBZ	249.9
Tulsa	KVOO	535.4
OREGON		
Astoria	KFJI	218.8
Corvallis	KOAC	239.9
Eugene	KORE	211.1
Medford	KMED	211.1
Portland	KEX	254.1
Portland	KFEC	218.8
Portland	KFIF	211.1
Portland	KFJR	230.6
Portland	KGW	508.2
Portland	KOIN	319
Portland	KTBR	230.6
Portland	KWBS	199.9
Portland	KWJJ	199.9
Portland	KXL	239.9
PENNSYLVANIA		
Allentown	WCBA	199.9
Allentown	WSAN	199.9
Altoona	WFBG	228.9
Carbondale	WNBW	249.9
E. Pittsburgh	KDKA	305.9
Elkins Park	WIBG	322.4
Erie	WEDH	211.1
Erie	WRAK	218.8
Grove City	WSAJ	228.9
Harrisburg	WBAK	267.7
Harrisburg	WMBS	209.7
Harrisburg	WPRC	249.9
Johnstown	WHBP	228.9
Kingston	WABF	208.2
Lancaster	WGAL	228.9
Lancaster	WKJC	228.9
Lewisburg	WJBU	247.8
Oil City	WLBW	238
Philadelphia	WABY	228.9
Philadelphia	WCAU	256.3
Philadelphia	WFAN	491.5
Philadelphia	WFI	535.4
Philadelphia	WFKD	228.9
Philadelphia	WHBW	199.9
Philadelphia	WIAD	228.9
Philadelphia	WIP	491.5
Philadelphia	WLIT	535.4
Philadelphia	WNAT	228.9
Philadelphia	WOO	199.9
Philadelphia	WPSW	199.9
Philadelphia	WRAX	211.1
Pittsburgh	KQV	217.3
Pittsburgh	WCAE	241.8
Pittsburgh	WJAS	232.4
Reading	WRAW	228.9
Scranton	WGBI	340.7
Scranton	WQAN	340.7
State College	WPSC	243.8
Washington	WNBO	249.9
Wilkes-Barre	WBAX	247.8
Wilkes-Barre	WBRE	228.9
Willow Grove	WALK	199.9
RHODE ISLAND		
Cranston	WDWF	218.8
Cranston	WLSI	218.8
Newport	WMBA	199.9
Pawtucket	WFCI	218.8
Portsmouth	WSAR	206.8
Providence	WEAN	258.5
Providence	WJAR	340.7
SOUTH CAROLINA		
Charleston	WBBY	249.9
Columbia	WRBW	228.9
SOUTH DAKOTA		
Brookings	KFDY	545.1
Brookings	KGCR	247.8
Dell Rapids	KGDA	247.8
Oldham	KGDY	249.9
Pierre	KGFX	516.9
Rapid City	WCAT	249.9
Sioux Falls	KSOO	302.8
Vermillion	KUSD	336.9
Yankton	WNAX	336.9
TENNESSEE		
Chattanooga	WDOD	234.2
Knoxville	WFBC	249.9
Knoxville	WNBJ	228.9

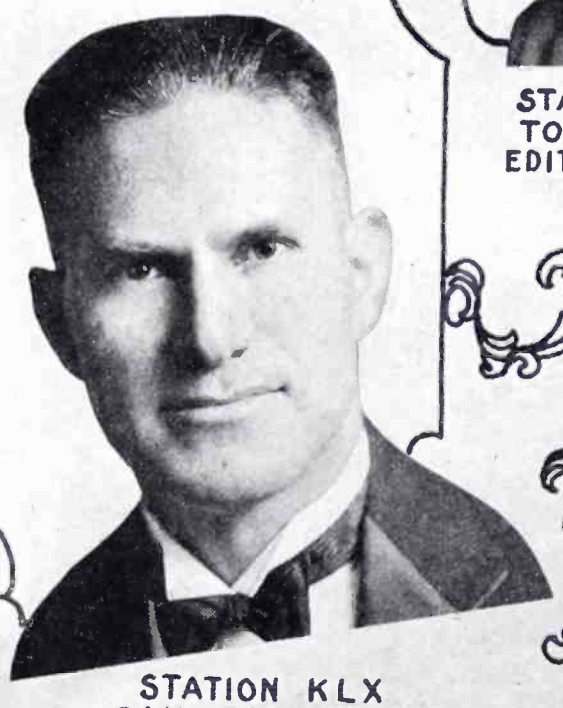
State and City	Call Letters	Wave Length
TENNESSE		
Knoxville	WNOX	535.4
Lawrenceburg	WOAN	499.7
Memphis	WGBC	209.7
Memphis	WHBQ	218.8
Memphis	WMBM	199.9
Memphis	WMC	384.4
Memphis	WNBR	209.7
Memphis	WREC	499.7
Nashville	WBAW	201.2
Nashville	WLAC	201.2
Nashville	WSM	461.3
Springfield	WSIX	247.8
Union City	WOBT	228.9
TEXAS		
Amarillo	KGRS	212.6
Amarillo	WDAG	212.6
Austin	KUT	267.7
Beaumont	KFDM	545.1
Breckenridge	KFYO	199.9
Brownsville	KWWG	296.9
College Station	WTAW	267.7
Dallas	KRLD	288.3
Dallas	WFAA	288.3
Dallas	WRR	252
Dublin	KFPL	218.8
El Paso	WDAH	228.9
Fort Worth	KFJZ	218.8
Fort Worth	KFQB	241.8
Fort Worth	WBAP	374.8
Galveston	KFLX	247.8
Galveston	KFUL	232.4
Georgetown	KGKL	218.8
Goldthwaite	KGKB	199.9
Greenville	KFPM	228.9
Harlingen	KRGV	296.9
Houston	KPRC	545.1
Houston	KTUE	218.8
Richmond	KGHX	199.9
San Angelo	KGFI	228.9
San Antonio	KGCI	218.8
San Antonio	KGDR	199.9
San Antonio	KGRC	228.9
San Antonio	KTAP	247.8
San Antonio	KTSA	232.4
San Antonio	WOAI	252
Waco	WJAD	241.8
Wichita Falls	KGKO	218.8
UTAH		
Ogden	KFUR	228.9
Salt Lake City	KDYL	243.8
Salt Lake City	KSL	265.3
VERMONT		
Burlington	WCAX	249.9
Springfield	WNBX	249.9
VIRGINIA		
Arlington	NAA	434.5
Mt. Vernon Hills	WTFF	205.4
Norfolk	WBBW	249.9
Norfolk	WNEW	228.9
Norfolk	WPOR	384.4
Norfolk	WTAR	384.4
Petersburg	WLBG	249.9
Richmond	WBBL	218.8
Richmond	WMBG	247.8
Richmond	WRBX	322.4
Richmond	WRVA	270.1
Richmond	WTAZ	247.8
Roanoke	WDBJ	322.4
Virginia Beach	WSEA	384.4
WASHINGTON		
Bellingham	KVOS	526
Everett	KFBL	199.9
Lacey	KGY	211.1
Pullman	KWSC	526
Seattle	KFOA	234.2
Seattle	KFQW	211.1
Seattle	KJR	309.1
Seattle	KKP	211.1
Seattle	KOMO	483.6
Seattle	KPCB	247.8
Seattle	KPQ	247.8
Seattle	KRSC	267.7
Seattle	KTW	234.2
Seattle	KUJ	199.9
Seattle	KVL	199.9
Seattle	KXA	526
Seattle	KXRO	247.8
Spokane	KFIO	245.8
Spokane	KFPY	247.8
Spokane	KGA	204
Spokane	KHQ	325.9
Tacoma	KMO	223.7
Tacoma	KVI	233.7
WEST VIRGINIA		
Charleston	WOBU	516.9
Clarksburg	WQBJ	249.9
Huntington	WSAZ	516.9
Weirton	WQBZ	249.9
Wheeling	WWVA	293.9
WISCONSIN		
Beloit	WEBW	499.7
Eau Claire	WTAQ	225.4
Fond du Lac	KFIZ	211.1
Kenosha	WCLO	249.9
La Crosse	WKBH	217.3
Madison	WHA	526
Madison	WIBA	247.8
Manitowoc	WOMT	247.8
Milwaukee	WHAD	267.7
Milwaukee	WISN	267.7
Milwaukee	WTMJ	526
Poynette	WIBU	228.9
Racine	WRJN	249.9
Sheboygan	WHBL	217.3
Stevens Point	WLBL	333.1
Superior	WEBC	234.2
West De Pere	WHBY	249.9
WYOMING		
Laramie	KFBU	499.7

STATION WKBN
YOUNGSTOWN, OHIO.
ARTHUR BROCK
DIRECTOR

STATION KGO
OAKLAND, CALIF.
HOWARD MILHOLLAND
STUDIO MANAGER

STATION WCFL
CHICAGO, ILL.
MAURICE WETZEL
OFFICIAL ANNOUNCER

STATION CKGW
TORONTO, ONT.
EDITH MAY SMITH
SOPRANO



STATION KLX
OAKLAND, CALIF.
PRESTON D. ALLEN
MANAGER

STATION KHJ
LOS ANGELES, CALIF.
GLENN R. DOLBERG
NIGHT DIRECTOR

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
CFAC	**Calgary, Alberta** — The Calgary Herald, Herald Bldg.	500	434.5	690	Mountain
CFBO	**St. John, N. B.**—C. A. Munro, Ltd., Imperial Theatre, King Square.	50	336.9	890	Atlantic
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
CFCO	**Chatham, Ont.**—Western Ontario "Better Radio" Club, 49 Park Ave E.	25	247.8	1210	Eastern
CFCT	**Victoria, B. C.**—Victoria Broadcasting Assoc., 1405 Douglas St.	500	475.9	630	Pacific
CFCY	**Charlettetown, P. E. Island**—Island Radio Company, 143 St. George St.	100	312.3	960	Atlantic
CFJC	**Kamloops, B. C.**—N. S. Dalgleish & Sons and Weller & Weller, 186 Victoria St.	15	267.7	1120	Pacific
CFLC	**Prescott, Ont.** — Radio Association of Prescott, Victoria Hall.	50	296.9	1010	Eastern
CFMC	**Kingston, Ont.**—Monarch Battery Co., Montreat St.	20	267.7	1120	Eastern
CFNB	**Fredericton, N. B.** — James S. Neill & Sons, Limited, 212 Waterloo Row.	50	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	312.3	960	Eastern
CFRC	**Kingston, Ont.** — Queen's University, Dept. of Electrical Engineering, Fleming Hall.	500	267.7	1120	Eastern
CHCA	**Calgary, Alberta** — The Albertan Publishing Co., Ltd. (Uses Station CJCJ).	250	434.5	690	Mountain
CHCK	**Charlottetown, P. E. Island** — W. E. Burke, 36 Upper Hillsboro St.	30	312.3	960	Atlantic
CHCS	**Hamilton, Ont.** — The Hamilton Spectator, Spectator Bldg.	10	340.7	880	Eastern
CHCT	**Red Deer, Alberta** — G. F. Tull & Ardern, Ltd. (Uses Station CKLC).	1000	356.9	840	Mountain
CHGS	**Summerside, P.E.I.** —R. T. Holman, Ltd., Holman Bldg.	25	267.7	1120	Atlantic
CHLS	**Vancouver, B. C.**—W. G. Hassell (Uses Station CKCD).	50	410.7	730	Pacific
CHMA	**Edmonton, Alberta**—Christian and Missionary Alliance, 9618—106A Ave.	250	516.9	580	Mountain
CHML	**Mt. Hamilton, Ont.**—Maple Leaf Radio Co., Ltd., Yale Ave.	50	340.7	880	Eastern
CHNC	**Toronto, Ont.** — Toronto Radio Research Society, Hillcrest Park (Uses Station CKNC).	500	516.9	580	Eastern
CHNS	**Halifax, Nova Scotia**—Northern Electric Co., Carleton Hotel, Cor. Prince and Argyle Sts. (New 500 Watt Station under construction).	100	322.4	930	Atlantic
CHRC	**Quebec, Que.** — E. Fontaine, 46 Palace Hill.	5	340.7	880	Eastern
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
CJBC	**Toronto, Ont.**—Jarvis Street Baptist Church (Uses one of the stations in Toronto City or District).	500	516.9 356.9	580 840	Eastern
CJBR	**Regina, Sask.** — Saskatchewan Co-Operative Wheat Producers, Ltd. (Uses Station CKCK).	500	312.3	960	Mountain
CJCA	**Edmonton, Alberta** — The Edmonton Journal, Ltd., Journal Bldg.	500	516.9	580	Mountain
CJCJ	**Calgary, Alberta** — Radio Service and Repair Shop, 18th Ave. and 7th St., E.	250	434.5	690	Mountain
CJGC	**London, Ont.** — London Free Press Printing Co., Ltd., Hotel London.	500	329.5	910	Eastern
CJGX	**Yorkton, Sask.** — The Winnipeg Grain Exchange.	500	475.9	630	Mountain
CJHS	**Saskatoon, Sask.** — Radio Service, Ltd., 238—1st Ave S.	250	329.5	910	Mountain
CJOC	**Lethbridge, Alberta** — J. E. Palmer, 1235—5th Ave. A, South.	50	267.7	1120	Mountain

Radio Call Letters	BROADCAST STATIONS Location and Owner	Power (Watts)	Wave Length (Meters)	Frequency (Kilocycles)	Time at Station
CJOR	**—Sea Island, B. C.**— Geo. C. Chandler, Block 20.	50	291.1	1030	Pacific
CJRM	**—Moose Jaw, Sask.** — Jas. Richardson & Sons, Ltd., 337 Coteau St., W.	500	296.9	1010	Mountain
CJRW	**—Fleming, Sask.**—Jas. Richardson & Sons, Ltd.	500	296.9	1010	Mountain
CJSC	**—Toronto, Ont.** — The Evening Telegram (Uses Station CKCL).	500	516.9	580	Eastern
CKAC	**—Montreal, Que.**—La Presse Publishing Co., Ltd., Cor. St. James St. and St. Lawrence Blvd.	1200	410.7	730	Eastern
CKCD	**—Vancouver, B. C.** — Vancouver Daily Province, 142 Hastings St., W.	50	410.7	730	Pacific
CKCI	**—Quebec, Que.** — Le "Soleil", Ltd., 46 Palace Hill.	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 St. (Call signal CFCL used during Sunday broadcasts only).	500	516.9	580	Eastern
CKCO	**—Ottawa, Ont.** — Dr. G. M. Geldert (for Ottawa Radio Assoc.), 282 Somerset St., W.	100	434.5	690	Eastern
CKCR	**—Brantford, Ont.**— John Patterson, Arcade Bldg.	50	296.9	1010	Eastern
CKCV	**—Quebec, Que.** — G. A. Vandry, 66 St. Joseph St.	50	340.7	880	Eastern
CKFC	**—Vancouver, B. C.** — United Church of Canada, Cor. Thurlow and Pendrell Sts.	50	410.7	730	Pacific
CKGW	**—Bowmanville, Ont.**— Gooderham & Worts.	5000	312.3	960	Eastern
CKLC	**—Red Deer, Alberta** — Alberta Pacific Grain Co., Ltd.	1000	356.9	840	Mountain
CKMC	**—Cobalt (East Side), Ont.**—R. L. MacAdam.	15	247.8	1210	Eastern
CKMO	**—Vancouver, B. C.** — Sprott-Shaw Radio Co., Bekins Bldg.	50	410.7	730	Pacific
CKNC	**—Toronto, Ont.**—Canadian National Carbon Co., Ltd., Hillcrest Park.	500	516.9	580	Eastern
CKOC	**—Hamilton, Ont.**— Wentworth Radio and Auto Supply Co., Ltd., Royal Connaught Hotel.	100	340.7	880	Eastern
CKOW	**— Toronto, Ont.** — Nestle's Food Co. of Canada. (Uses Station CFCA).	500	356.9	840	Eastern
CKPC	**—Preston, Ont.**—Wallace Russ, 40 Russ Ave.	25	247.8	1210	Eastern
CKPR	**—Midland, Ont.**—E. O. Swan.	50	267.7	1120	Eastern
CKSH	**—St. Hyacinthe, Que.**— City of St. Hyacinthe, Que., Mondor and Cascades St.	50	296.9	1010	Eastern
CKUA	**—Edmonton, Alberta** — University of Alberta.	500	516.9	580	Mountain
CKWX	**—Vancouver, B. C.** — A. Holstead & W. Hanlon, 1220 Seymour St.	100	410.7	730	Pacific
CKY	**—Winnipeg, Manitoba** — Manitoba Telephone System, Sherbrooke St.	500	384.4	780	Central
CNRA	**—Moncton, N. B.** — Canadian National Railways.	500	475.9	630	Atlantic
CNRC	**—Calgary, Alberta** — Canadian National Railways (Uses Station CFAC).	500	434.5	690	Mountain
CNRE	**—Edmonton, Alberta** — Canadian National Railways (Uses Station CJCA).	500	516.9	580	Mountain
CNRM	**—Montreal, Que.**—Canadian National Railways (Uses Stations, CHYC, CKAC and CFCF).	1000-1650	410.7	730	Eastern
CNRO	**—Ottawa, Ont.** — Canadian National Railways, Jackson Bldg.	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).	500	312.3	960	Mountain
CNRS	**—Saskatoon, Sask.** — Canadian National Railways (Uses Station CFQC).	500	329.5	910	Mountain
CNRT	**—Toronto, Ont.** — Canadian National Railways (Uses Station CFCA).	500	356.9	840	Eastern
CNRV	**—Vancouver, B. C.** — Transmitter is on Lulu Island, —Canadian National Railways.	500	291.1	1030	Pacific
CNRW	**—Winnipeg, Manitoba** —Canadian National Railways (Uses Station CKY).	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	CHCA	434.5	250
"	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
"	Lethbridge	CJOC	267.7	50
"	Red Deer	CHCT	356.9	1000
"	Red Deer	CKLC	356.9	1000
BRITISH COLUMBIA	Chilliwack	CHWK	247.8	5
"	Kamloops	CFJC	267.7	15
"	Sea Island	CJOR	291.1	50
"	Vancouver	CHLS	410.7	50
"	Vancouver	CKCD	410.7	50
"	Vancouver	CKFC	410.7	50
"	Vancouver	CKMO	410.7	50
"	Vancouver	CKWX	410.7	100
"	Vancouver	CNRV	291.1	500
"	Victoria	CFCT	475.9	500
MANITOBA	Winnipeg	CKY	384.4	500
"	Winnipeg	CNRW	384.4	500
NEW BRUNSWICK	Fredericton	CFNB	247.8	50
"	Moncton	CNRA	475.9	500
"	St. John	CFBO	336.9	50
NOVA SCOTIA	Halifax	CHNS	322.4	100
ONTARIO	Bowmanville	CKGW	312.3	5000
"	Brantford	CKCR	296.9	50
"	Chatham	CFCO	247.8	25
"	Cobalt	CKMC	247.8	15
"	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	25
"	Toronto	CFCA	356.9	500
"	Toronto	CHNC	516.9	500
"	Toronto	CJBC	516.9–356.9	500
"	Toronto	CJSC	516.9	500
"	Toronto	CKCL	516.9	500
"	Toronto	CKNC	516.9	500
"	Toronto	CKOW	356.9	500
"	Toronto	CNRT	356.9	500
"	York Co.	CFRB	312.3	1000

Provinces	Cities	Call Letters	Wave Length (Meters)	Power (Watts)
P. E. ISLAND	Charlottetown	CFCY	312.3	100
"	Charlottetown	CHCK	312.3	30
"	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	296.9	50
SASKATCHEWAN	Fleming	CJRW	296.9	500
"	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	CJHS	329.5	250
"	Saskatoon	CNRS	329.5	500
"	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, Cities and Owners	Call Letters	Wave Length (Meters)	Power (Watts)
ALASKA			
Anchorage—Anchorage Radio Club (Divides time with KHJ)	KFQD	333.1	100
Juneau—Alaska Elec. Light & Power Co.	KFIU	228.9	10
Ketchikan—Alaska Radio & Service Co. (Divides time with KFRC)	KGBU	491.5	500
ALGERIA			
Algiers—Colin & Fils	8DB	310	2000
ARGENTINE			
Buenos Aires	LOJ	270	1000
Buenos Aires—Radio America	LOL	236	2000
Buenos Aires—Radio Fenix	LON	210	5000
Buenos Aires—Radio Prieto	LOO	252	1000
Buenos Aires—Radio Buenos Aires	LOQ	261	500
Buenos Aires—Sociedad Radio Argentina	LOR	344.8	1000
Buenos Aires—Municipality of Buenos Aires	LOS	291.2	5000
Buenos Aires—Radio Broadcasting	LOT	400	1000
Buenos Aires—Francisco J. Brusa	LOV	361.5	1000
Buenos Aires—Grand Splendid	LOW	303	1000
Buenos Aires—Radio Cultura	LOX	380	1000
Buenos Aires—Sociedad Radio Nacional	LOY	315.8	1000
Buenos Aires—"La Nacion"	LOZ	330	1000
Buenos Aires—Gino Bocci y Hno.	B2	275	100
Buenos Aires	D3	253.3	100
Cordoba—Antonio Vanelli	H5	275	100
Cordoba—Diario "Los Principios"	H6	250	20
La Plata, FCS.—Universidad Nacional	LOP	425	1000
Mendoza—Ministerio de Obras Publicas	LOU	380	500
Rosario—Manuel Fugardo	F2	270	100
Santa Fe—Jose Roca Soler	F1	279	20
AUSTRALIA			
Adelaide—Central Broadcasters Ltd.	5CL	395	5000
Adelaide—5 DN Pty. Ltd.	5DN	313	500
Adelaide—Sports Radio Broadcasting Station	5KA	250	1000
Adelaide—Millswood Auto & Radio Co.	5MA		
Adelaide—Marshall & Co.	5MC	273	500
Bathurst—Mockler Bros.	2MK	275	250
Brighton	3PB		
Brisbane—Dr. V. McDowell	4CM	278	250
Brisbane—Radio Manufacturers Ltd.	4MB	337	250
Brisbane—Queensland Radio Service	4QG	385	5000
Hobart—Tasmanian Broadcasting Pty.	7ZL	516	3000
Melbourne—Associated Radio Co.	3AR	481	3000
Melbourne—Druleigh Business & Technical College	3DB	225	500
Melbourne—Broadcasting Co. Australia	3LO	371	5000
Melbourne—O. J. Nilson & Co.	3UZ	319	100
Melbourne—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 Gov't	4RN	323	500
Sydney—The Electrical Utilities Supply Co.	2UE	293	250
Sydney—Burgin Electric Co.	2BE	316	100
Sydney—Theosophical Broadcasting Service	2GB	316	3000
Sydney—Trades Hall Broadcasting Station	2KY	280	1500
Sydney—Farmer & Co., Ltd.	2FC	442	5000
Sydney	2WA	462	100
Sydney—Broadcasters Sydney Ltd.	2BL	358	5000
Sydney—Otto Sandel	2UW	267	500
Toowomba—Gold Radio Elec. Service	4GR	294	100
Wagga—Otto Sandel	2UX	300	500
AUSTRIA			
Graz—Oesterreichische Radio-verkehrs Gesellschaft		357.1	500
Innsbruck		294.1	500
Klagenfurt		272.7	1500
Vienna—Oesterreichische Radio-verkehrs Gesellschaft	ORV	577	750
Vienna		517.2	20000
BELGIUM			
Brussels—Radio Belgique Co.	BAV	508.5	1500
Brussels—Radio Belgique Co.	SBR	481	1500
BOLIVIA			
La Paz		175–300	50
La Paz		300	50
BRAZIL			
Bahia—Radio Sociedade de Bahia	SQAD	350	50
Bello Horizonte—Radio Sociedade de Mina Geraes		400	500
Ceare—Radio Club Cearense			50
Curytiba—Livio Moreira			
Fortazela—Radio Club			300
Goyanna—Benedicto Ravello			
Juiz de Fora	SQAY	380	200
Matto Grosso—Radio Club de Campo Grande			
Minas Geraes—Luiz 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
Pernambuco—Cia Radiotelegrafica Brasileira		250–380	500
Pernambuco—Radio Sociedade de Jader de Andrada			
Pernambuco—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	SQAA	400	2000
Rio de Janeiro	SQAB	320	500
Rio de Janeiro	SQAJ	260	250
Sao Paulo	SQAG	365	1000
Sao Paulo	SQBO	225.4	1000
Sorocaba		425	....

Countries, Cities and Owners	Call Letters	Wave Length (Meters)	Power (Watts)
CANARY ISLANDS			
La Laguna—Servando Ortoll Delmotte	**EAJ5**	280	50
Las Palmas—Canary Islands Radio Club		300	6
Teneriffe—Servando Ortoll Delmotte	**EAR5**	350	200
CEYLON			
Colombo		800	1500
CHILE			
Antofagasta—Sr. J. Pedreny	**CHAO**		
Concepcion	**CMAI**	345	1500
Santiago—"El Mercurio"	**CMAC**	360	1200
Santiago—Castagneto Felli	**CMAD**	320	1000
Santiago—Radio Comercial	**CMAE**	280	100
Santiago—Sociedad Broadcasting de Chile	**CRC**	385	350
Tacna—Ministerio de Relaciones Exteriores	**CMAT**	550	200
Tacna—Chilean Government	**CRCT**	550	200
Temuco	**CMAK**	245	100
Valparaiso		400	50
CHINA			
Hong Kong—Government	**GOW**	300	1500
Kharbin—Chinese Government	**COHB**	340	50
Mukden	**COMK**	425	2000
Peking—Chinese Government	**COPK**		
Shanghai—Kellogg Switchboard & Supply Co.		335	150
Shanghai—Shinsho Co.	**KRC**	335	150
Tientsin—Gisho Electric Co.	**NKS**	318	50
Tientsin—Chinese Government	**GEC**	288	50
Victoria (Hongkong)—Hongkong Radio Society	**COTN**	480	500
CHOSEN	**5HK**	475	150
Seoul	**JODK**	345	1000
COSTA RICA			
San Jose—Government			
CUBA			
Caibarien—Maria J. Alvarez	**6EV**	250	50
Caibarien—Manuel A. Alvarez	**6LO**	325	250
Camaguey—Pedro Nogueras	**7AZ**	225	10
Camaguey Armanda Vaquer	**7GT**	195	5
Camaguey—Melchor Aguero	**7KP**	300	15
Camajuani—Diego Iborra	**6YR**	200	20
Caney—Juan Fdez. de Castro	**8KP**	30	100
Caney	**8LO**	300	100
Central Elia—Salvador Rionda	**7SR**	350	500
Central Tuinucu—Frank H. Jones	**6KW**	368	100
Central Tuinucu—Frank H. Jones	**6JK**	272	100
Ciego de Avila—Eduardo V. Figueroa	**7BY**	235	20
Ciego de Avila—Feliciano Isaac	**7FU**	200	15
Ciego de Avila—Porfirio de la Cruz	**7HS**	192	15
Florida—Leonard B. Fox	**7JQ**	42	5
Cienfuegos—Jose Ganduxe	**6BY**	260	200
Cienfuegos—Eduardo Terry	**6DW**	225	10
Cienfuegos—Gustavo Rodriguez	**6GR**	150	10
Cienfuegos—Juan Pablo Ros	**6GT**	190	50
Colon—Leopoldo V. Figueroa	**5EV**	360	100
Guanajay—Antonio Zarazola	**1AZ**	275	30
Havana—Ulpiano Muniz	**2MU**	265	10
Havana—Casimiro Pujadas	**2CP**	280	10
Havana—Cristina W. Vda. de Crucet	**2HP**	205	200
Havana—Julio Power	**2JP**	312	30
Havana—Frederick W. Borton	**2CX**	320	10
Havana—Alberto S. Bustamante	**2AB**	250	10
Havana—Cuban Telephone Co.	**PWX**	400	500
Havana—Jose Leiro	**2JL**	275	5
Havana—Alvara Daza	**2K**	200	20
Havana—E. Sanchez de Fuentes	**2KD**	350	50
Havana—"El Pais"	**2EP**	355	400
Havana—Bernardo Barrie	**2BB**	250	15
Havana—Frederick W. Borton	**2BY**	260	100
Havana—Jose Lara	**2LR**	215	15
Havana—Manuel y Guillermo Salas	**2MG**	284	15
Havana—R. B. Waters	**2MK**	32	100
Havana—Mario Garcia Velez	**2OK**	360	100
Havana—Oscar Collado	**2OL**	257	100
Havana—Roberto E. Ramirez	**2TW**	270	30
Havana—Benito Veita Ferro	**2UF**	265	20
Havana—Raul Karman	**2RK**	315	100
Havana—Homero Sanchez	**2SZ**	180	10
Havana—Miguel Troncoso	**2WX**	340	150
Havana—Lecuona Music Co.	**2XA**	230	200
Havana—Raul Perez Falcon	**2JD**	105	20
Havana—Heraldo de Cuba	**2HC**	275	500
Hershey—Alberto Alvarez	**2FG**	200	20
Marianao—Jose L. Ferriol	**2JF**	245	5
Marianao—Jose Leiro	**2JL**	294	5
Marianao—Modesto Alvarez	**2MA**	215	50
Marianao—Samuel I. Wheeldon	**2WD**	274	7½
Mariano—Antonio A. Genard	**2XX**	225	5
Nueva Gerona—Isle of Pines Telephone Co.	**8JQ**	130	20
Sagua la Grande—Santiago Ventura	**6HS**	200	10
Sancti Spiritus-Antonio Galguera	**6KP**	250	20
Santiago—Alfredo Vinnet	**8FU**	225	15
Santiago—Pedro C. Anduz	**8DW**	275	50
Santiago—Alfredo Broock Galo	**8AZ**	240	50
Santiago—Ceferino Ramos	**8IR**	190	20
Santiago—Alberto Ravelo	**8BY**	250	20
Santiago—Guillermo Polanco	**8HS**	200	30
CZECHOSLOVAKIA			
Bratislava	**OKR**	300	500
Brunn—Radio Journal	**OKB**	441.2	3000
Kbely		1100	1000
Koszice (Kassa)		1870	5000
Prague—Radio Journal	**OKP**	348.9	5000
DANZIG			
Danzig		272.7	750
DENMARK			
Copenhagen—Copenhagen Radio Broadcasting Station		337	1000
Kalundborg		1153.8	7500
Ryvang		1150	1000
Soro—Ministry of War		1153.8	1500
EGYPT			
Cairo	**SRE**	255	
ESTONIA			
Tallinn		408	2200
Tallinn		1200	100
FINLAND			
Bjorneborg—Nuoren Voiman Liiton Radiohydistys		311	200
Hango—Nuoren Voiman Liiton Radiohydistys		260	250

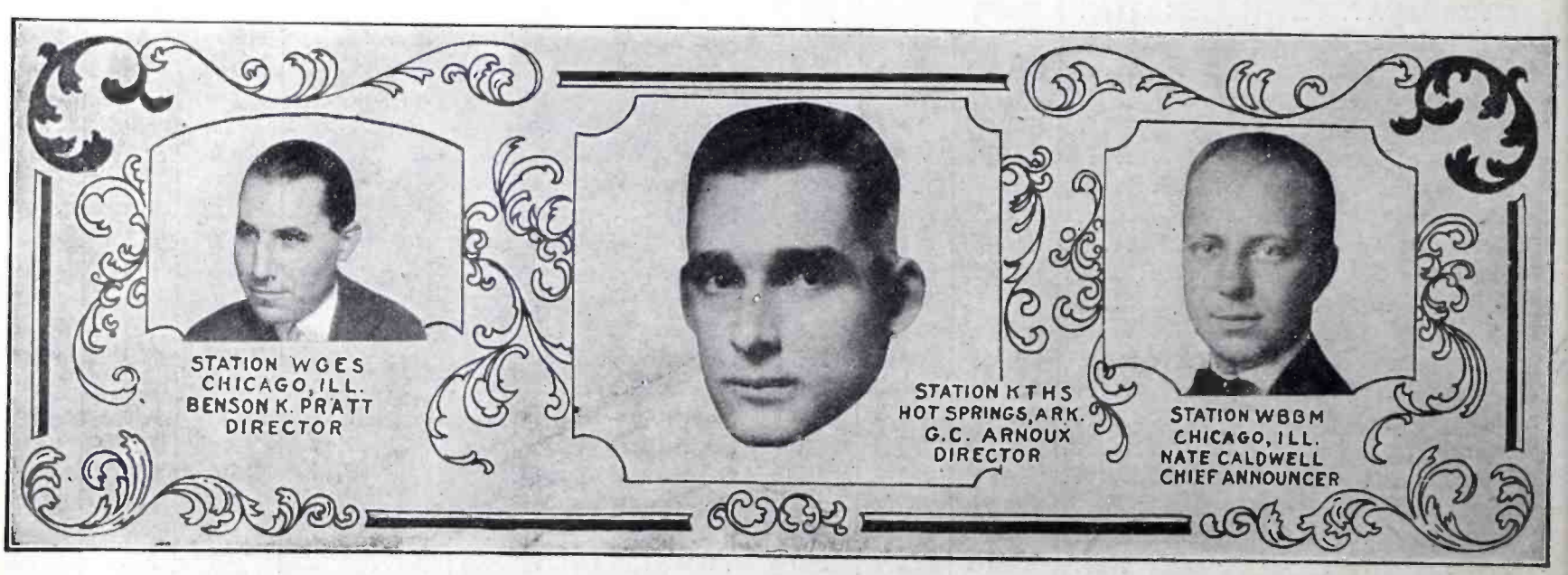
Countries, Cities and Owners	Call Letters	Wave Length (Meters)	Power (Watts)
FINLAND			
Helsingfors—Civil Guards of Finland		375	1200
Jacobstad		275.2	200
Jyvaskyla—Nuoren Voiman Liiton Radiohydistys		297	250
Lahti		1522	20000
Mikkeli—Nuoren Voiman Liiton Radiohydistys		566	250
Pori—Nuoren Voiman Liiton Radiohydistys		255.3	100
Skatudden—Military Station Radio-Div		318	750
St. Michel—Nuoren Voiman Liiton Radiohydistys		566	250
Tammerfors—Nuoren Voiman Liiton Radiohydistys	3NB	400	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
Beziers		158	500
Biarritz—Cote d'Argent		200	250
Bordeaux		275	1000
Bordeaux		238.1	1500
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
Limoges		273	500
Lyon—Ministry of P. T. T.	YN	476	1000
Lyon—Radio Lyon		291.3	1500
Marseilles—Ministry of P. T. T.		309	500
Mont-de-Marsan—Radio Club Landrais		400	4000
Montpelier—Societe Languedocienne de T. S. F.		252.1	250
Paris—Ecole Superieure de P. T. T.	FPTT	464	500
Paris—Eiffel Tower, Army	FL	2650	5000
Paris—Societe Francaise Radioelectrique	8AJ	1780	100
Paris—Lucien Levy		350	250
Paris—Petit Parisien	5NG	340.9	500
Paris—Cie. Francaise de Radiophone		1750	6000
Paris—Radio Paris	CFR	1765	12000
Paris—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	260	1000
Toulouse—La Radio		391	3000
GERMANY			
Aix-la-Chapelle		401	750
Augsburg		566	1500
Berlin—Koenigswusterhausen Deutsche Welle A. G.	AFP	4000-2900	8000
Berlin—Koenigswusterhausen Station	AFT	1250	35000
Berlin—Vox Haus Funkstunde	AB	566	2000
Berlin—Witzleben Funkstunde A. G.		483.9	4000
Berlin—Wolff's Bureau		2525	5000
Bremen—Nordischer Rundfunk	BMN	400	1500
Breslau—Schlessische Funkstunde		322.6	5000
Cologne	SMXQ	283	4000
Dortmund—Westdeutsche Funkstunde		283	750
Dresden—Mitteldeutscher Rundfunk		275.2	700
Elberfeld—Westdeutsche Funkstunde		468.8	750
Frankfort-on-the-Main — Sudwestdeutscher Rundfunkdienst	LP	428.6	4000
Freiburg im Breisgau—Suddeutscher Rundfunk		574.7	750
Gleiwitz—Schlesische Funkstunde		250	750
Hamburg—Nordischer Rundfunk	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		535.7	4000
Muenster—Westdeutsche Funkstunde	MS	241.9	1500
Norddeich	KAV	1829	
Nuremberg—Deutsche Stunde in Bayérn		303	4000
Stettin—Funkstunde A. G.		236.2	500
Stuttgart—Suddeutscher Rundfunk	OKP	379.7	4000
HAITI			
Port-au-Prince—Haitien Government	HHK	361.2	1000
HAWAII			
Honolulu—Radio Sales Co	KGHB	227.1	250
Honolulu—Honolulu Advertiser	KGU	319	500
HUNGARY			
Budapest—Hungarian States' Post and Telegraph	MTI	555.6	20000
Budapest—Magyar Tavirati Iroda		1050	2000
ICELAND			
Reykjavik		333.3	1000
INDIA			
Bangalore—Indian Broadcasting Co.			
Bombay—Walter Rogers & Co.	2AX	226	
Bombay	7BY	357.1	3000
Bombay—Bombay Residency Radio Club	2FV	375	220
Calcutta—Radio Club of Bengal	2BZ	800	500
Calcutta—Indian States & Eastern Agency	5AF	425	1500
Calcutta	7CA	370.4	3000
Karachi—Karachi Radio Club		425	40
Madras—Crampton Elec. Co.		220	120
Madras—Madras Presidency Club	2GR	400	200
Rangoon—Radio Club of Burmah	2HZ	350	350
IRISH FREE STATE			
Cork	6CK	400	1500
Dublin—Government	2RN	319.1	1500
ITALY			
Milan		547.4	7000
Milan—Unione Radiofonica Italiana	IMI	315.8	1500
Naples—Unione Radiofonica Italiana	INA	333.3	1500
Nice		362	1000
Rome—Unione Radiofonica Italiana	IRO	450	3000
JAPAN			
Hiroshima—Broadcasting Corp. of Japan	JOFK	353	10000
Keijo—Keijo Broadcasting Associaton	JODK	366	1000

Countries, Cities and Owners	Call Letters	Wave Length (Meters)	Power (Watts)
JAPAN			
Kumamoto — Broadcasting Corp. of Japan	**JOGK**	380	10000
Nagoya—Broadcasting Corp. of Japan	**JOCK**	370	1000
Osaka—Broadcasting Corp. of Japan	**JOBK**	385–400	10000
Sapporo—Broadcasting Corp. of Japan	**JOIK**	361	10000
Sendai—Broadcasting Corp. of Japan	**JOHK**	396	10000
Tokyo—Broadcasting Corp. of Japan	**JOAK**	345–375	10000
JAVA			
Batavia—Bataviasche Radio Vereening-ing	**JFC**	220	40
KWANTUNG			
Dairen—Government Bureau of Communications	**JQAK**	395	5000
LATVIA			
Riga	**KCX**	526.3	2000
LITHUANIA			
Kovno		2000	15000
LUXEMBURG			
Luxemburg	**LOAA**	217.4	250
MEXICO			
Chihuahua—Federal Government	**CZF**	310	250
Guadalajara—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
Mexico City—Jose J. Reynosa (El Buen Tono)	**CYB**	275	500
Mexico City—Miguel S. Castro (La High Life)	**CYH**	375	100
Mexico City—General Electric Co.	**CYJ**	400	2000
Mexico City—"El Universal"	**CYL**	400	500
Mexico City—Martinez y Zetina	**CYO**	425	100
Mexico City—Excelsior Compania Editorial	**CYX**	325	500
Mexico City—Departamento de Educacio	**CZE**	350	500
Monterey—D. Constantino de Tarnava, Jr.	**CYH**		
Monterey—Constantino de Tarnava	**CYS**	311	250
Oaxaca—Federico Zonilla	**CYF**	265	100
Puebla—Augustin del P. Saenz	**CYU**	312	100
Tampico	**CYQ**	322	100
Torreon	**CYM**	225	1500
Vera Cruz—Ministerio de Comunicacaciones	**CYC**	337	50
Vera Cruz	**CYD**		
MOROCCO			
Casablanca—Radio Club de Moroc	**CNO**	305	2500
NETHERLANDS			
Amsterdam		760	
Bloemendaal		566	
De Bilt	**PCFF**	1100	1250
Eindhoven—Phillips Lamp Works	**PCJJ**	30.2	
Huizen			1950
Hilversum—Nederlandische Seintoellen Fabriek	**HDO**	1060	5000
Scheveningen		1950	2500
NETHERLANDS EAST INDIES			
Soe abaya—Radiotelegraph Club		90	

Countries, Cities and Owners	Call Letters	Wave Length (Meters)	Power (Watts)
NEW ZEALAND			
Auckland—Newcomb (Ltd.)	**1YL**	260	500
Auckland—The Radio Broadcasting Co. of New Zealand	**1YA**	333	500
Auckland—La Gloria Gramophone Co.	**1YB**	275	50
Auckland—L. R. Keith	**1ZO**	330	50
Christchurch—Radio Broadcasting Co. of New Zealand	**3AC**	240	10
Christchurch—Radio Broadcasting Co. of New Zealand	**3YA**	306	500
Dunedin—Otago University	**4XO**	140	
Dunedin—Radio Broadcasting Co. of New Zealand	**4YA**	463	750
Dunedin—Radio Supply Co.	**4YO**	370	500
Dunedin—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
Wellington—Radio Broadcasting Co. of New Zealand	**2YA**	420	5000
Whangerei—N. C. Shepherd	**1YC**	250	15
NORWAY			
Bergen—Bergen Broadcasters		370.4	1500
Fredrikstad—Broadcasting Co. A. S.		434.8	750
Hamar—Broadcasting Co. A. S.		566	750
Natodden—Broadcasting Co. A. S.		423	700
Oslo—Broadcasting Co. A. S.	**OSLO**	461.5	1500
Porsgrund—Broadcasting Co. A. S.		524	1000
Rjuken—Broadcasting Co. A. S.		443	250
Stavanger		277.8	250
Tromso—Tromso Broadcasters		500	
Trondhjem		243.9	
PARAGUAY			
Asuncion			12
PERU			
Lima—Peruvian Broadcasting Co.	**OAX**	360	1500
PHILIPPINE ISLANDS			
Baguio	**KZUY**	359.9	500
Iloilo	**KPM**	400	500
Manila—Radio Corp. of the Philippines	**KZIB**	260	500
Manila—Radio Corp. of the Philippines	**KZKZ**	270	500
Manila—Radio Corp. of the Philippines	**KZRM**	413	1000
Manila—Radio Corp. of the Philippines	**KZRQ**	400	1000
POLAND			
Cracow		567	1500
Kattowitz		422	10000
Posen		344.8	1500
Vilna		435	500
Warsaw—Government	**PTR**	380	700
Warsaw	**AXO**	1111.1	8000
PORTO RICO			
San Juan—Radio Corp. of Porto Rico	**WKAQ**	340.7	500
PORTUGAL			
Lisbon—Grandes Armazens do Chiado	**PIAA**	267.8	500
Montesanto—Government Wireless Station	**CTV**	2450	1500
SAN SALVADOR			
San Salvador—Government of el Salvador	**AQM**	482	500
SENEGAL			
St. Louis—Senegal Radio Club		300	100

Countries, Cities and Owners	Call Letters	Wave Length (Meters)	Power (Watts)
SIBERIA			
Tomsk	**RA21**	300	250
SPAIN			
Almeria	**EAJ18**	323.8	1000
Barcelona—Radio Barcelona (Hotel Colon)	**EAJ1**	344.8	1500
Barcelona—Radio Catalana	**EAJ13**	462	1000
Bilbao—Radio Club Vizcaina	**EAJ9**	436	1000
Bilbao—Radio Vizcaya	**EAJ11**	418	2000
Bilbao—Armando de Otera		383	200
Cadiz—Radio Cadiz	**EAJ3**	400	500
Cadiz—Radio Lahera	**EAJ10**	297	1000
Cartagena—Enrique de Orbe	**EAJ16**	335	1000
Cartagena	**EBX**	1200	1000
Madrid—Radio Espana	**EAJ2**	393	3000
Madrid—Escuela Superior	**PTT**	458	1000
Madrid—Antonio Castilla	**EAJ4**	375	6000
Madrid—Radio Iberica	**EAJ6**	392	1000
Madrid—Union Radio	**EAJ7**	373	1500
Madrid	**EAJ12**	306	2000
Madrid—Radio Espanola	**EAJ15**	490	1000
Madrid	**EGC**	1650–2200	2000
Malaga—Spanish Telecommunication Co.	**EAJ25**	325	1000
Malaga—Alfonso Villota		325	200
Oviedo (Cima)—Arturo Cima Fernandez	**EAJ19**	340	100
Salamanca	**EAJ22**	405	1000
San Sebastian—Sabino Ucelayeta	**EAJ8**	335	500
Sevilla—Manuel Garcia Ballesta	**EAJ17**	400	1000
Sevilla—Jorge la Riva	**EAJ21**	300	1000
Sevilla—Radio Club Sevillano	**EAJ5**	344.8	1000
Valencia	**EAJ24**	360	1000
Valencia—Jose Lopez Aznar	**EAJ14**	500	500
Zaragoza	**EAJ23**	325	1500
STRAITS SETTLEMENTS			
Singapore—Malaya Amateur Wireless Society		330	150
SWEDEN			
Boden—Radiotjanst	**SASE**	1200	1000
Boras	**SMBY**	230.8	1000
Eskilstuna—Radio Club	**SMUC**	250	250
Falun—Radiotjanst	**SMZK**	357	2000
Gaevle—Radio Club	**SMXF**	204.1	250
Goteborg—Radiotjanst	**SASB**	416.7	1000
Halmstad	**SMSB**	215.8	250
Helsingborg	**SMYE**	229	250
Hudiksvall	**SMSL**	272.7	250
Jonkopings—Jonkopings Rundradiostation	**SMZD**	201.3	500
Kalmar	**SMSD**	254.2	250
Kalmar	**SMSW**	252.1	250
Karlsborg—Radiotjanst	**SASF**	1350	50
Karlsborg	**SAJ**	1365	5000
Karlskrona	**SMSM**	196	250
Karlstadt—Radio Club of Karlstad	**SMXG**	221	250
Karlstadt	**SMXZ**	221	250
Kiruna		238.1	250
Kristinehamm	**SMTY**	202.7	250
Linkoeping—Radio Club	**SMUV**	588.2	250
Linkoeping	**SMUW**	497.5	250
Malmo—Radiotjanst	**SASC**	260.9	1000
Motala		1380	20000
Norrkoeping—Radio Club	**SMVV**	275.2	250
Orebro	**SMTI**	236.2	250
Ostersund		720	2000
Saffle	**SMTS**	252.1	500
Stockholm—The Swedish Broadcasting Co.	**SASA**	454.5	1500
Sundsvall—Radiotjanst	**SASD**	545.8	800
Trolhattan — Trolhattans Rundradiostation	**SMXQ**	277.8	1000
Uddevalla	**SMZP**	294.1	250
Umea	**SMSN**	229	250
Uppsala		500	250
Varborg	**SMSO**	297	250
SWITZERLAND			
Basle	**HB3**	1000	250
Berne—Radio—Genossenschaft	**HBA**	411	1500
Geneva—Radio Broadcasting Soc. of Geneva	**HBI**	760	500
Lausanne—Lausanne Radio Society	**HB2**	680	600
Zurich—Zurich University	**RGZ**	515–650	500
Zurich—Zurich Radio Genossenschaft	**HBZ**	500	1000
TUNISIA			
Carthage	**TNV**	1850	5000
Carthage		1840	4000
Tunis—French Army	**OCTU-TUA**	1450–45	500
TURKEY			
Angora		1800	6000
Osmanieh—Broadcasting Co.		1200	6000
Stamboul		1800	15000
UNION OF SO. AFRICA			
Cape Town—African Broadcasting Assn.	**WAMG**	375	1500
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
Kharkov	**RA24**	475	4000
Kiev	**RA5**	775	1000
Kniepropetrovsk		560	1000
Krasnodar	**RA38**	513	1000
Leningrad	**RA6**	940	2000
Leningrad	**RA42**	1000	10000
Minsk	**RA18**	950	1250
Moscow—Sokolniki		1010	2000
Moscow—Trade Union	**KAZ**	450	2000
Moscow—Lubovitch		365	
Moscow	**MSK**	650	2000
Moscow—Union of Soviet Workers	**RA4**	675	500
Moscow—Kominern	**RDW**	1450	40000
Moscow—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

Countries, Cities and Owners	Call Letters	Wave Length (Meters)	Power (Watts)
UNION OF SOVIET SOCIALIST REPUBLICS (formerly Russia)			
Tver	**RA44**	965	1250
Ust-Syssolsk	**REG**	1000	1250
Veliky-Ustjuk	**RA16**	1010	1250
Vladivostok	**RA17**	456	1250
Vladivostok—Union of Soviet Worker's Radio Club	**RL20**	480	1500
Voronesh	**RA12**	950	1250
UNITED KINGDOM			
Aberdeen—British Broadcasting Corp.	**2BD**	306.1	1000
Belfast—British Broadcasting Corp.	**2BE**	500	1000
Bournemouth—British Broadcasting Corp.	**6BM**	326.1	1000
Bradford	**2LS**	252.1	200
Cardiff—British Broadcasting Corp.	**5WA**	353	1000
Chelmsford—British Broadcasting Corp.	**5SW**		
Daventry (Experimental)	**5GB**	491.8	25000
Daventry—British Broadcasting Corp.	**5XX**	1604.8	25000
Dundee—British Broadcasting Corp.	**2DE**	294.1	200
Edinburgh—British Broadcasting Corp.	**2EH**	288.5	200
Glasgow—British Broadcasting Corp.	**5SC**	405.4	1000
Hull—British Broadcasting Corp.	**6KH**	294.1	200
Leeds—British Broadcasting Corp.	**2LS**	277.8	200
Liverpool—British Broadcasting Corp.	**6LV**	297	200
London—British Broadcasting Corp.	**2LO**	361.4	2000
Manchester—British Broadcasting Corp.	**2ZY**	384.6	1000
Newcastle—British Broadcasting Corp.	**5NO**	312.5	1000
Nottingham—British Broadcasting Corp.	**5NG**	275.2	200
Plymouth—British Broadcasting Corp.	**5PY**	400	200
Sheffield—British Broadcasting Corp.	**6FL**	272.7	200
Stroke-on-Trent—British Broadcasting Corp.	**6ST**	294.1	200
Swansea—British Broadcasting Corp.	**5SX**	294.1	200
URUGUAY			
Montevideo—Diario "El Dia"	**CWOR**	350	500
Montevideo—Danree & Cia	**CWOF**	300	100
Montevideo—Templo Metodista	**CWOG**	280	10
Montevideo—General Electric Co. of Uruguay	**CWOS**	380	500
VENEZUELA			
Caracas—Empresa Venezolana de Radio-telefonia	**AYRE**	375	1000
YUGOSLAVIA			
Agram (Zagreb)		310	350
Belgrade—Cie. Generalle De T.S.F.	**HFF**	225.6	1000



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PHILADELPHIA, PA.
STAN LEE BROZA
DIRECTOR

STATION KYW
CHICACO, ILL.
ZOLA HAYNES
STAFF ORGANIST

STATION WSKC
BAY CITY, MICH.
STANLEY F. NORTHCOTT
ANNOUNCER

STATION WGBS
NEW YORK, N.Y.
S. THEODORE GRANIK
VERSATILE MEMBER
OF STAFF

STATION KVL
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CHESTER L. SWAN
TENOR

STATION WBAL
BALTIMORE, MD.
ARTHUR MORGAN
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SHORT-WAVE RADIO STATIONS OF THE WORLD

Operating on Wavelengths Below 100 Meters

Stations by Call Letters

(Note: U. S. Stations will use new prefix after October 1.—W or K. Other new prefixes after Jan. 1.)

Call Letters	Stations and Location	Wave Length (Meters)	Remarks
AFI	Konigswusterhausen	26.3	
AFJ	Konigswusterhausen	53.5	
AFK	Doberi, †2 (Berlin)	45.3, 42.12, 41.5	
AFL	Hamburg	52.0, 70.0	
AFU	Konigswusterhausen	39.7	
AGA	Nauen	14.9, 12.25, 13.5, 14.25, 16.0, 26.0	
AGB	Nauen	25.5, 26.6, 27.0	
AGC	Nauen	17.2, 26.0, 39.8, 40.2	Phone occasionally.
AGJ	Nauen	56.7	Phone after 1800 G.M.T.
AGK	Nauen	11.0, 20.0 (2 kw.).	
AJN	Casablanca, Ain Bordja	51.0	Weather reports, 0830 & 1930 G.M.T.
AKA	German Naval Vessel, M.81.	54.0	
AKB	German Naval Vessel, M.82.	54.0	
ANC	Tjililin, Java	26.2, 40.2	Code
AND	Tjililin, Java	18.8, 28.8, 37.5	Code
ANDIR	Malabar, Java (Military Aerodrome)	38.5	
ANE	Bandoeng, Java	17.4	Code and Phone
ANF	Tjililin, Java	20.3, 36.5	Code
ANH	Malabar, Java	17.4, 27.0, 32.0	Code. Phone Sat. 1200-1700G.M.T.
ANK	Malabar, Java	19.4, 30.20	Exp. Tests
AQE	SS. Sir James Clark Ross	33.5	
ARCX	Norwegian Whaler Nielsen Alonso	30.5	After 0700 G.M.T.
ARDI	SS. C. A. Larsen	32.0	
AYG	Guayra, Venezuela	31.8	
A 2FC	Sydney, N. S. W.	32.0	Phone
A 2ME	Sydney, Australia	28.50	Phone Sun., 1830–2000 G.M.T.
A 3LO	Melbourne	29.8, 32 or 36	Phone Sun., 1830–2030 G.M.T.
BAM	Tahiti	40.0	
BVJ	R. N. College, Dartmouth	46.0	
BWW	Gibraltar, North Front (Naval Station)	35.0	
BXW	Seletar, Singapore (Naval)	35.0	
BXY	Stonecutters Island, Hong-Kong	35.0	
BYB	Whitehall R. C. (Naval)	35.0	
BYC	Horsea (Naval)	35.0	
BYZ	Rinella, Malta (Naval)	35.0	
BZC	Portsmouth Signal School	35.5	
BZE	Matara, Ceylon (Naval)	35.0	
BZF	Aden (Naval)	35.0	
B82	Uccle, Belgium	40.0	Temporary
CF	Drummondville, Montreal (Beam Station)	32.0	
CG	Drummondville, Montreal	16.501, 32.128	
CH	Quilicura, Chile	15–20	
CJRX	Winnipeg, Man.	25.60	
CRHA	Lourenco Marques, Portuguese East Africa	18.360	
CRHB	Praia, Cape Verde Islands	18.094	
CRHC	Loanda, Angola	18.182	
DCP	SS. Cap Polonio (German)	25.0, 34.0	
DNSC	Royal Danish Dockyard Copenhagen	47.0	
DS	H.M.S. Renown	36.0	
EAM	Madrid	30.7	
EAR 55	Barcelona	22.30	
EATH	Vienna	37.00	
EB 4A2	Brussels	42.00	
EH 9OC	Berne	32.00	
EH 9XD	Zurich	85.00	
EK 4ZZZ	Dantzig	40.00	
FAMJ	French SS. Jeane d'Arc (French Navy)	26–60	
FL	Eiffel Tower	54.02, 32.0, 75.0	
FTJ	SS. Jacques Cartier (France)	75.0	
FW	St. Assize, Cie. Radio, France	14.28, 23.25, 25.0, 41.95, 43.0	Traffic with Buenos Aires
FUA	Bizerta-Sidi-Abdallah, Tunis	42.5, 56.0, 73.0	
FUE	Mengam, France	38.5	
FUL	Beyrouth-Djedeide, Lebanon	28.0, 80.0	
FUM	Montebourg (Air Station)	37.0	
FUT	Toulon-Mourillon, France	36.5	
F 8AV	Nogent, France	80.0	
F 8GA	Clichy	30.0	
F 8GB	St. Assize, Paris (S.F.R.)	75.0	S.F.R. Bulletins
F 8GC	Radio LL, Paris	60.0	Phone
F 8KR	Constantine, Algeria	42.8	
GBH	Grimsby (Beam Station)	25.906	
GBI	Grimsby (Beam, Indian Circuit)	16.216, 34.168	
GBJ	Bodmin (Beam, S. Africa Circuit)	16.146, 34.013	
GBK	Bodmin (Beam Station)	16.574, 32.397	
GBL	Leafield (P. O. Station)	17.5, 21.5, 24.0, 30.0, 56.0	
GBM	Leafield (P. O. Station)	17.5, 21.5, 24.0, 30.0, 56.0	
GBO	Leafield (P. O. Station)	17.5, 21.5, 24.0, 30.0, 56.0	
GDKB	SS. Dorsetshire	24.0, 41.7	
GFA	Air Ministry, London	44.0	
GFR	Winchester (R.A.F. School)	20.0	
GFY	Royal Air Force, Henlow	76.0	
GLG	Royal Air Force, Henlow	15.740, 15.707	
GLH	Dorchester (Beam Station)	22.091	U.S. Circuit
GLQ	Ongar (for communication with New York, Buenos Aires, and Rio de Janeiro)	24.5	
GLS	Ongar	15.0	
GLSQ	SS. Olympic	20.0	
GLW	Dorchester (Beam Station, South American Circuit)	15.707	
GLYX	SS. Derbyshire	37.0	
G 2BR	Chelmsford	15.0, 17.0	
G 2NM	G. Marcuse, Caterham	32.5	Phone Tues., Thurs., Sat., Sun., 0600–0700, and Sun., 1600–1800 G.M.T.
G 2YT	Poldhu	25.0, 32.0, 60.0, 92.0, 94.0	
G 5DH	Dollis Hill (P. O. Station)	21.7, 27.6, 35.3, 47.0	
G 5SW	Chelmsford (B.B.C. Exp.)	24.0	Phone 1330, 1430, and 1930 onwards
HBC	Berne, Switzerland	34.2	
HJG	Bogotá, Colombia	22.0	
HVA	Hanoi, Tonkin	32.0	
HZA	Saigon	25.0	
H 90C	Telegraphic and Radio Service, Case No. 63, Poste Transit, Berne	32.0	Relays, Berne, Mon., Thurs. and Sat., 2000–2100
H 9XD	Radio Club of Zurich	32.0, 85.0	
ICC	Coltano	18.0	
ICD	Rome (Cento Celle)	63.0	
ICF	Messina, Sicily	49.0	
ICJ	Bengasi, Cyrenaica	26.0, 53.0	
ICK	Tripoli	45.0	
ICO	Derna, Cyrenaica	54.0	

Call Letters	Stations and Location	Wave Length (Meters)	Remarks
ICU	Tobruk, Cyrenaica	54.0	
ICX	Massawa	47.0	
IDO	Rome, San Paulo	33.0–37.5	
IDX	Amara, Erythrea	32.5, 64.0	
IHF	Catania, Italy	53.5	
IST	Chisimaio, It. Somaliland	38.0	
I 1AX	Rome, Via Savoia 80	45.0	Phone occasionally
I 1AY	Rome	45.00	
I 1EA	Rome	40.20	
I 1FC	Royal Frederico Cesi School, Rome	33.0, 34.0	
I 1MA	Rome, Via Bramante 3	43	Sun., 1700–1930 G.M.T.
I 1RG	"Radiogiornale," Lake Como	10.0, 18.0, 35.0 65.0	
JB	Johannesburg	32.0	Phone
JBK	Kagoshima, Japan	30.0, 40.5, 70.0	
JES	Osaka, Japan	24–71	
JEW	Osaka, Japan	24–71	
JFAV	Taipeh, Formosa	39.5	0900 G.M.T.
JHBB	Ibarakiken	37.50	
JHL	Hiroshima, Japan	32.0, 58.0, 74.0	
JKV	Kanasawa, Japan	37.5	Temporary
JKZB	Tokyo Electric Co.	20.5	
JOC	Otchishi, Japan	43.0	
JPP	Tokyo, Japan	16–73	
JPS	Sapporo, Japan	29.0, 38.0, 60.0	
JYB	Tokyo, Japan	16–73	
JYZ	Tokyo, Japan	16–73	
J 1AA	Iwatsuki, Japan	40.5	
J 1PP	Tokyo	20.0, 21.5, 35.0	
KAV	Norddeich	39.0, 68.0	
KDKA	East Pittsburgh, Pa. (Westinghouse E. & M. Co.)	26.3, 42.95, 62.5	Phone from 2300 G.M.T.
KDO	SS. Esparta (United Fruit Co. U. S. A.)	33.0	
KDZ	Point Barrow, Alaska	21.4, 42.08, 74.77	
KEB	Oakland, Calif. (G. E. Co.)	18.62, 21.8	
KEG	Vancouver, Washington (Pacific Air Transport)	45.0	
KEL	Bolinas, Calif. (R.C.A.)	14.1, 29.3, 95.0	
KEMM	Bolinas, Calif. (R.C.A.)	14.29, 28.58	
KESS	Bolinas, Calif. (R.C.A.)	14.40, 28.80	
KET	Bolinas, Calif. (R.C.A.)	99.0	
KEU	Los Angeles, Calif. (Pacific Air Transport)	45.02	
KEUN	Bolinas, Calif. (R.C.A.)	14.08, 38.38	
KEWE	Bolinas, Calif. (R.C.A.)	14.08, 28.15	
KFD	Denver, Colo. (G. E. Co.)	17.7, 24.3	
KFHW	SY. Poinsettia	40.0	
KFQU	Holy City, Calif.	31.0, 53.0, 63.0	
KFVM	SS. Idalia	17.0, 37.0, 74.0	
KFWB	Los Angeles, Calif.	40.0	
KFY	Poinciana, Florida	68.4	
KFZG	Port Barrow	45.32, 69.25	
KFZH	Fairbanks, Alaska	44.71, 68.32	
KFZQ	SS. Robador	37.5	
KGBB	U. S. SS. Ungava (R. B. Metcalf)	22.0, 37.0	
KGDU	SS. Four Winds	35.03	
KGE	Medford, Oregon (Pacific Air Transport)	46.06	
KGFT	Portable Station, Texas	50.0	
KGH	Hillsbro', Oregon (Fed. Telegraphic Co.)	36.52, 46.99	
KGT	Fresno, Calif. (Pacific Air Transport)	46.06	
KIO	Kahuku, Hawaii (R.C.A.)	90.04	
KKC	Palo Alto, Calif. (Fed. Telegraphic Co.)	17.0, 27.5	
KLL	Bolinas, Calif. (R.C.A.)	21.85	
KMM	Bolinas, Calif. (R.C.A.)	14.29, 28.58	
KMV	Bandini, Calif. (Western Air Express, Inc., Morse)	49.5	
KNN	Honolulu (Mackay, R. & T. Co.)	17.2, 23.0, 23.7, 28.0, 34.4, 46.0, 47.4, 56.0	
KNR	Clearwater, Calif. (Fed. Telegraphic Co.)	29.5, 49.15	
KNW	Palo Alto, Calif. (Mackay, R. & T. Co.)	16.7, 17.0, 24.0, 33.4, 34.0, 48.0, 51.0	
KQS	Lone Pine, Calif. (City of Los Angeles)	45.77	
KQT	Los Angeles, Calif. (City of Los Angeles)	45.77	
KRP	Salt Lake City, Utah (Western Air Express, Inc.)	49.5	
KSS	Bolinas, Calif. (R.C.A.)	14.40, 28.80	
KSZ	McCamey, Texas	48.05	
KTA	Guam (Mackay R. & T. Co.)	18.0, 21.8, 22.0, 23.5, 36.0, 43.6, 44.0, 47.0	
KTF	Midway Island (Mackay R. & T. Co.)	21.6, 33.2, 43.2, 66.4	
KUN	Bolinas, Calif. (R.C.A.)	16.93, 33.88	
KUY	Bear Creek, Alaska	82.0	
KVR	Las Vegas, Nev. (Western Air Express, Inc.)	49.5	
KWE	Bolinas, Calif. (R.C.A.)	14.08, 28.15	
KWJJ	Portland, Ore.	53.54	¼ kw.
KWT	Palo Alto, Calif. (Fed. Telegraphic Co.)	34.86, 48.05, 49.97, 58.10	
KWV	Bakersfield (Pacific Air Transport)	66.48	
——	Lyons, Radio Lyon	39.5	Phone 1700–1800 G.M.T. except Sun.
LA1E	Meteorological Hut, Bergen	43.0	
LA 1M	Meteorological Inst., Oslo	45.0	
LCHO	Telegraph Administration, Oslo	33.0	
LPI	Buenos Aires	34.0	
LPZ	Buenos Aires	36.0, 75.0	
LY	Bordeaux, Lafayette	32.0	
——	Matagora (Spain), Cie. Transatlantic Espagnola	70.0	
NAA	Washington	24.9, 37.4, 74.7	
NAJ	Great Lakes, Illinois	40.0, 76.0, 34.0	
NAL	Navy Yard, Washington, D. C.	20.0, 30.6	
NAS	Pensacola, Florida	40.0	
NBA	Balboa, Canal Zone	54.0	
NEL	Lakehurst, N. J.	80.0	
NEPQ	U. S. SS. Relief	20.0	
NERM	U. S. SS. Los Angeles	70.0–84.5	
NFV	U. S. Marine Corps, Quantico, Va.	77.4, 77.5	
NIRX	U. S. SS. Canopus	75.0	
NKF	Naval Lab., Bellevue, Anacostia	16.0, 17.0, 20.8, 21.0, 25.5, 41.3, 54.4, 61.0, 71.3, 81.5	
NKL	Arlington	29.0, 37.4, 74.7	
NOSN	U. S. Submarine Base, Coco Solo, Panama	40.0	
NPC	Puget Sound, Washington	37.0	
NPG	San Francisco, Calif.	16.49, 32.98	
NPL	U. S. Training Ship, San Diego, Calif.	71.7	
NPM	Honolulu, Hawaii	35.0 and 36.8	
NPO	Cavite, Philippine Islands	68.0, 70.0	
NPU	Tutuila, Samoa	37.0–40.0, 53.0	
NQC	San Diego, Calif.	75.0, 86.0	
NQW	U. S. SS. Mexico	40.0	
NRRG	Winter Park, Florida	39.5, 82.0	
NRRL	U. S. SS. Seattle	40.0	
NUQB	U. S. SS. Pope	75.0	
OCBA	Bamako (Soudan)	41.50	
OCBV	French Military Station at Beyreuth	58.0	
OCCO	Conakry (French W. Africa)	33.0	
OCDA	Dakar (French W. Africa)	35.0	
OCDB	Djibouti	72.0	
OCDJ	Issy-les-Moulins	33.0	1008–1028 G.M.T., Corresponding with OCDB
		65.0	
		32.0	Time Signal 0756 and 0955

	Stations and Location	Wave Length (Meters)	Remarks
OCMV	French Military Station, Mont Valerien, Suresnes (Seine)	39.0, 44.0, 46.0	At 1000, 1100 1230, 1330, 1600, 1900, 2000, 2100 and 2200 G.M.T. on either 600 cycles or D.C.
OCNG	Nogent-le-Rotrou	29.0, 32.0, 45.0, 48.0, 72.0	
OCRB	Rinck, Meteo Aviation, Rabat, Morocco	36.0	
OCRF	Reggu, Morocco	74.0	2130–2145 G.M.T.
OCRU	Rufisque (French W. Africa)	39.0	
OCTN	Mourillon, Toulon	20.0	Series of "a" from 1530–1540 G.M.T.
		33.0	Series of "b" from 1545–1555 G.M.T.
		57.0	Series of "c" from 1600–1610 G.M.T. daily, except Sun.
OCTP	The Military Station of Nogent-le-Rotrou.	——	
OCTU	Tunis la Casbah	48.0, 50.0	
OHK	Vienna	39.5, 40.6	
OLQ	SS. Slamat	19.0, 22.5, 37.0	
——	Paris, Radio LL	61.0	Phone
——	Paris, Radio Vitus	37.0	Phone Wed., Fri., Sun., 2100 – 2245 G.M.T.
OU 7MK	Copenhagen, Denmark	32.90	
OU 7RL	Copenhagen	42.12, 84.25	
PCA	Amsterdam	33.33	
PCG	Malabar, Java	17.0	
PCH	Scheveningen Port	20.0, 20.6, 20.69, 21.127, 28.800, 29.226, 29.283	
PCJJ	Hilversum, Holland (Philips Lamp Works)	30.2	
PCLL	Kootwijk, Holland	46.0, 32.0, 18.0	Phone Wed., 1400–1600 G.M.T. and occasionally on Mon. and Fri., and other wavelengths below 60 meters (40 kw.)
PCMM	Ministry of Posts and Telegraphs, Kootwijk	25.0, 27.5, 36.0	and other wavelengths below 60 meters
PCPP	Kootwijk, Holland	27.0	and other wavelengths below 60 meters
PCRR	Kootwijk, Holland	20.0, 25.0, 37.0	and other waveledgths below 60 meters
PCTT	Kootwijk, Holland	21.0, 29.5	and other wavelengths below 60 meters (10 kw.)
PÇUU	Dutch Colonial Ministry, The Hague	34.0	
PKD	Koebang	32.0	
PKE	Amboina	24.0	
PKH	Soerabaja, Java (D. E. Indies)	23.0	
PKP	Medan	21.5, 31.5	
PKX	Java	27.0, 32.0	
POF	Nauen	13.5, 18.0	
POX	Nauen	20.0	
POY	Nauen	25.0	
POZ	Nauen	47.0	
POS	Alfragidi, Lisbon (Beam)	18.270	

Call Letters	Stations and Location	Wave Length (Meters)	Remarks
OP	Alfragidi, Lisbon (Beam)	15.641	
PTQ	Quartel-General, Brazil	30.5	
PVC	Curacao	15.0–20.0	
RABL	Habarousk	22.0	
RAU	Tashkent	23.0, 34.0	
RA 19	Tomsk	37.0	
RCRL	Central Lab., Leningrad	27.0	
RCT	Sebastopol	64.0	
RDI	Petrozavadosk	34.2	
RDRL	Leningrad	28.5	
RDW	Moscow	83.0	
RFM	Khabarousk	70.2	
RFN	Moscow	29.0	800-1000 G. M.T.
RKV	Moscow	21.0, 34.0	
RLT	Tommot	23.0	
RRP	Nijni Novgorod	20.0–42.0	
RTRL	Tiflis	22.0–42.0	
SAA	Karlskrona	44.0	
SAB	Goteborg	36.5	
SAD	Flottads Stations, Stockholm	31.0–51.0	
SAJ	Karlesborg, Sweden	50.0	
SDK	SS. Kiruna	54.0	
SFR	Paris	75.0, 85.0	
SGT	Motorship Suecia	42.0, 50.0	
SIC	SS. Masilia	42.0, 51.5	
SKB	Motorship Gripsholm	37.5	
SMHA	Stockholm	41.0	
SOJ	Brazilian SS. Jaquarao	100.0	
SOK	Moskwa Sokoleniki Radio	37.0	
SPM	Radio Laboratory, Ministry of Posts, Helsingfors	47.0	
SPR	Sepetiva, Rio de Janeiro, Brazil	22.180	Meteorological reports, 1530 local time
SPU	Santa Cruz (Beam)	15.576	
SPW	Rio de Janeiro	29.3	
SPX	Rio de Janeiro	40.5	
SP 1	Rio de Janeiro	17.0, 44.5, 47.0	
SUC 2	Abuzabal (Cairo)	47.0	
TFA	Reykjavik, Iceland	42.5, 49.5	
TSB	Norwegian SS. Helder	46.5, 51.0	
TUK	Tomsk, Siberia	20.0	
TVE	SS. Solderijk	31.1	
U1XAO	Belfast, Maine	40.0, 56.0, 60.0, 70.0	
U 1XAB	Portland, Maine (Congress Square Hotel Co.)	63.79	250 watts
U 1XR	Manila, Philippine Islands	30.0	
U 2XAA	Houlton, Maine	22.99	Phone after 2300 G.M.T,
U 2XAC	G. E. Co., Schenectady, N. Y.	50.0	
U 2XAD	G. E. Co., Schenectady, N. Y.	21.96	Phone, Mon. Wed., Fri., 2300; Sat., 1900 – 2200 G.M.T.
U 2XAF	G. E. Co., Schenectady, N. Y. transmitting program from WGY	32.7	Phone Tues., Thurs., and Sat., 2300 G.M.T.
2XAI	Newark, N. J. (Westinghouse Electric Co.)	43.0	
2XAL	New York, short-wave transmitter of WRNY (Experimenter Publ. Co.)	30.91	Phone and Television
U 2XAO	Belfast, Maine	40.0, 56.0, 60.0, 70.0	
U 2XAP	New York (Bull Insular Line)	18.3, 18.7, 36.6, 37.5	
U 2XAW	G. E. Co., Schenectady, N. Y.	3.0–20.0, 15.0	
U 2XBA	Newark, N. J. (Short-wave Station of WAAM)	65.18	Phone Mon., Wed., Fri., 2355 – 0500 G.M.T.
U 2XBB	New York (R.C.A.)	1–5	1 kw.
U 2XBC	Rocky Point, N. J. (R.C.A.)	14.09 and 5.35–18.74	
U 2XBI	Rocky Point, N. Y. (R.C.A.)	1–15	10 kw.

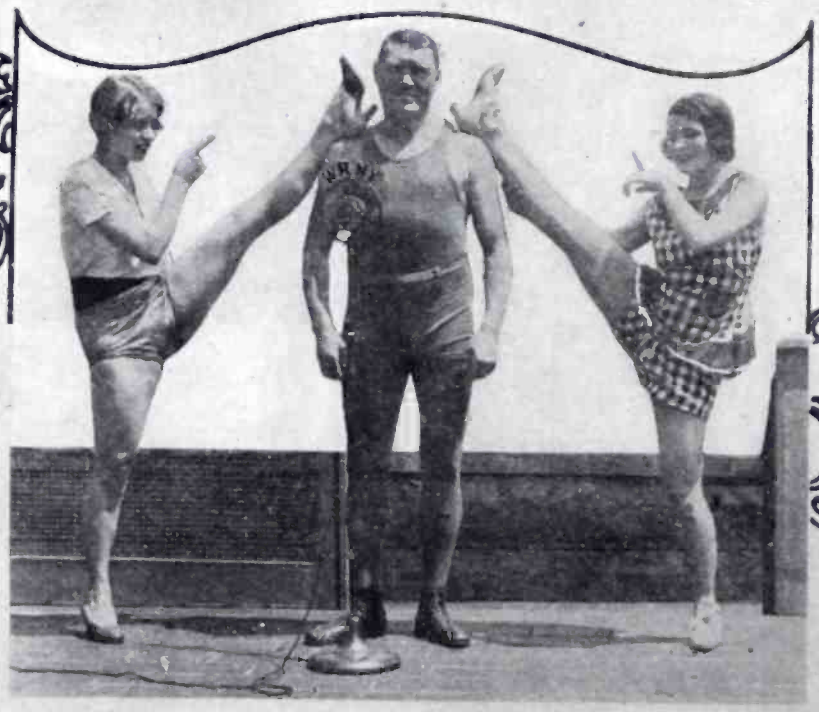
Call Letters	Stations and Location	Wave Length (Meters)	Remarks
2XE	Richmond Hill, N. Y. (Short-wave of WABC)	22.1	Phone after 2300 G.M.T.
2XG	Rocky Point, N. J. (Western Electric Co.)	16.02	Phone Mon. and Fri. after 1700 G.M.T.
2XH	Schenectady, N. Y.	50.0	
2XI	Schenectady, N. Y.	30.0, 35.0, 38.0	
2XK	South Schenectady, N. Y. (General Electric Co.)	65.5	
2XN	Rocky Point (R.C.A.)	5–80	150 watts
2XS	Rocky Point (R.C.A.)	14.93	80 kw.
2XT	Rocky Point, N. Y. (R.C.A.)	16.17	80 kw.
3XK	Washington, D. C.	46.72	Radio Movies)
3XL	Bound Brook, N. J.	60.0	30 kw.
3XQ	Mountain Lakes, N. J.	37.95, 75.9	
4XK	San Juan, Porto Rico (Bull Insular Line)	18.3, 18.7, 36.6, 37.5	
5XH	New Orleans (Tropical Radio Telegraphic Co.)	42.0	
6XAI	Inglewood, Calif.	66.04	Phone 2400 G.M.T. onwards
6XAR	San Francisco, Calif.	33.00	Phone 2400 G.M.T. onwards
6XI	Bolinas, Calif.	29.3	
8XAO	Detroit, Mich.	32.0	
8XAV	East Pittsburg, Pa.	62.50	(Radio Movies)
6XO	Kahuhu, Hawaii	90.0	
8XJ	Columbus, Ohio	54.02	
8XK	East Pittsburgh (Westinghouse Co.)	26.8	Mon. and Fri. 1900–2100 G.M.T.
8XS	East Pittsburgh, Pa.	67.0, 96.0	
9XU	Council Bluffs, Iowa	61.06	Phone
AS	Louisburg, Nova Scotia	52.0	Press reports
GJL	SS. Canadian Commander	43.0	
S	Sydney	22.0, 26.0, 32.0, 42.0, 51.5	
T	Townsville, Queensland	22.0, 42.0	
Z	Ballan, Melbourne (Beam Station)	25.728	
Z	Rabaul, New Britain	22.0, 26.0, 32.0, 42.0	
KQ	Garden Island, Sydney	35.0	
JB	Klipheuval, South Africa (Beam)	16.077, 33.708	
OF	Kuching, Sarawak	32–38	
VZ	Kirkee, Bombay (Beam)	16.286, 34.483	
ZDK	SS. Jervis Bay	33.0	
WABC	Richmond Hill, N. Y. (Atlantic Broadcasting Cpn.)	64.0	
WAJ	Rocky Point, N. Y. (R.C.A.)	22.24, 44.48	
WAQ	Newark, N. J. (Westinghouse Elec. & Mfg. Co.)	44.03	
WBO	Dearborn, Mich. (Ford Motor Co.)	44.62	
WBU	Rocky Point, N. Y. (R.C.A.)	14.09	
WBZ	Springfield, Mass. (Westinghouse E. & M. Co.)	50.0, 70.0	20 kw.
WCFL	Chicago, Ill. (Fed. of Labor)	37.24	
WCGB	Brooklyn, N. Y.	54.0	½ kw.
WCSH	Portland, Maine	63.79	½ kw.
WDJ	Harrison, Ohio (Crosley Radio Corporation)	21.4, 26.3	
WDS	Rocky Point, N. Y. (R.C.A.)	15.86, 31.73	
WEAJ	Rocky Point, N. Y. (R.C.A.)	22.24, 44.48	
WEAO	Columbus, Ohio (Ohio State University)	54.02	
WEDS	Rocky Point, N. Y. (R.C.A.)	15.86, 31.73	
WEEM	Rocky Point, N. Y. (R.C.A.)	16.41, 32.84	
WEFX	Rocky Point, N. Y. (R.C.A.)	15.79, 31.39	
WEGT	S. Juan, Porto Rico (R.C.A.)	21.75, 65.3	
WEHR	Rocky Point, N. Y. (R.C.A.)	15.93, 31.96	
WEM	Rocky Point, N. Y. (R.C.A.)	16.41, 32.84	
WEOP	Rocky Point, N. Y. (R.C.A.)	21.57, 43.14	
WEP	Cape Charles, Virginia (Norfolk Cape Charles Radio Telegraph Co.)	99.9	
WEPE	Rocky Point, N. Y. (R.C.A.)	21.63, 43.33	
WEQA	Rocky Point, N. Y. (R.C.A.)	14.13, 28.26	
WEQB	Rocky Point, N. Y. (R.C.A.)	16.71, 33.42	
WEQC	Rocky Point, N. Y. (R.C.A.)	16.78, 33.37	
WEQX	Rocky Point, N. Y. (R.C.A.)	14.85, 29.71	
WEQY	Rocky Point, N. Y. (R.C.A.)	14.91, 29.83	
WFV	Poinciana, Florida (Florida RT Co.)	70.54	
WFX	Rocky Point, N. Y. (R.C.A.)	15.70, 31.59	
WGI	Alpena, Mich. (Alpena Marine Radio Service)	98.3	
WGT	S. Juan, Porto Rica (R.C.A.)	21.75, 65.3	
WGW	Vieques, Porto Rico (Bureau of Insular Telegraphs)	52.0	
WGY	Schenectady, N. Y. (G. E. Co.)	35.0	
WHD	Sharon, Pa. (Westinghouse Co.)	49.0	
WHK	Cleveland, Ohio	66.04	½ kw.
WHR	Rocky Point, N. Y. (R.C.A.)	15.93, 31.96	
WHW	Highland Park, Ill. (Wireless Telegraph & Communication Co.)	45.02	
WIK	New Brunswick, N. J.	21.48, 21.5	
WIR	New Brunswick, N. J. (R.C.A.)	74.0	20 kw.
WIZ	New Brunswick, N. J. (R.C.A.)	43.35	Phone occasionally from 2300 G.M.T.
WJD	New York International News Service	37.01	
WJZ	Boundbrook, N. J. (R.C.A.)	18.17	
WKC	Newark, N. J.	17.5, 27.9	
WKI	Newark, N. J. (Fed. Telegr. Co.)	17.3, 27.9	
WKK	Cuba, Porto Rico (Bureau of Insular Telegraphs)	52.0	
WLL	Rocky Point, N. Y. (R.C.A.)	16.57	
WLW	Cincinnati, Ohio (Crosley Radio Corporation)	52.02	2200 – 0400 G.M.T. except Fri.
WNBT	Elgin, Ill.	33.5	Special Time Signals
WND	Ocean Township, N. J. (American Telephone & Telegraph Co.)	13.88, 16.35, 22.38, 32.69, 46.48	
WNU	New Orleans, La.	26.0, 40.0	Press reports
WOBD	SS. Radio	37.0, 43.74, 77.0	
WOBV	U. S. SS. Nippekontu	36.2, 72.4	
WOP	Rocky Point, N. Y. (R.C.A.)	21.57, 43.14	
WOWO	Fort Wayne, Ind. (Main Auto Supply Co.)	22.80	1 kw. Phone after 2300 G.M.T.
WPE	Rocky Point, N. Y. (R.C.A.)	21.63, 43.14	
WQA	Rocky Point, N. Y. (R.C.A.)	14.13, 28.26	
WQB	Rocky Point, N. Y. (R.C.A.)	16.71, 33.42	
WQC	Rocky Point, N. Y. (R.C.A.)	16.78, 33.57	
WQN	Rocky Point, N. Y. (R.C.A.)	51.5, 54.5, 57.0	
WQO	Rocky Point, N. Y. (R.C.A.)	35.03, 44.0	
WQQ	Rocky Point, N. Y. (R.C.A.)	14.8	
WQX	Rocky Point, N. Y. (R.C.A.)	14.85, 29.71	
WQY	Rocky Point, N. Y. (R.C.A.)	14.91, 29.83	
WRB	Miami, Florida (Florida Radio Telegraph Co.)	70.74	
WRNY	Coytesville, N. J. ("Radio News")	30.91	Phone Mon., Wed., Fri., 1930 – 2215 G.M.T.; other days, 2355 –0500
WSS	Rocky Point, N. Y. (R.C.A.)	16.0, 20.0	
WTT	Rocky Point, N. Y. (R.C.A.)	16.02	
XC 51	Mexico City	44.00	From 0400
XDA	Mexico City, Mex.	34.0	Press reports 0500 G.M.T.
XEK 4AP	German Aeroplane	42.5	
YN	Lyons, France	58.0, 16.30, 17.30	
YR	Lyons	40.20	
YZ	Fort d'Issy, France	45–47	
ZWT	Bremerhaven	53.0	
ZZ	Fort d'Issy (Portable)	45–47	

STATION WRNY
NEW YORK, N.Y.
SOPHIE, IRENE LOEB
CHILD'S WELFARE

STATION WRNY
NEW YORK, N.Y.
THE HUMMING BIRDS
VOCAL TRIO

STATION WRNY
NEW YORK, N.Y.
GUISEPPE INZERILLO
OPERATIC TENOR

STATION WRNY
NEW YORK, N.Y.
PHIL SCULLY
TENOR



STATION WRNY
NEW YORK, N.Y.
PHILA. JACK OBRIEN AND HIS TWO PUPILS

ARE YOU REPRESENTED IN THE RADIO MARKET

Custom setbuilders! Here is a FREE service that will place your name before over 100,000 readers and identify you as a recognized custom setbuilder. RADIO LISTENERS' GUIDE and CALL BOOK has instituted this service to help you increase your sales. We stand behind the custom setbuilders' cause and have devoted a section of our magazine to it in an effort to educate our readers to a full appreciation of the custom setbuilder and the high quality of workmanship and results which are usually always had from them.

By way of publicity, the Spring issue of our magazine carried the first of a series of articles the purpose of which was to acquaint our readers with the custom setbuilders and instill a true appreciation for their work. This has already borne fruit and proved extremely successful as has each article on the subject in the succeeding issues of RADIO LISTENERS' GUIDE and CALL BOOK.

If your name is not on the list on page 132 fill in the coupon (this is essential) and mail it to us. You must be a custom setbuilder—not just a radio dealer. THIS IS OF GREAT IMPORTANCE. Read the conditions of our offer below, and then mail us the coupon today.

CONDITIONS

Each advertisement will be keyed and listed geographically in the "RADIO SET MARKET" section as seen on page 132.

No advertisement more than fifty words. Each must be clearly written on a piece of white paper and attached to the coupon herewith. No request will be considered without the coupon.

No ad will be accepted from persons merely desiring to sell a set and who are not bonafide custom setbuilders.

We invite you to take advantage of this service. Fill in the coupon and mail it to us with your ad.

Radio Listeners' Guide and Call Book
230 Fifth Avenue, N. Y. C., N. Y.

11/28

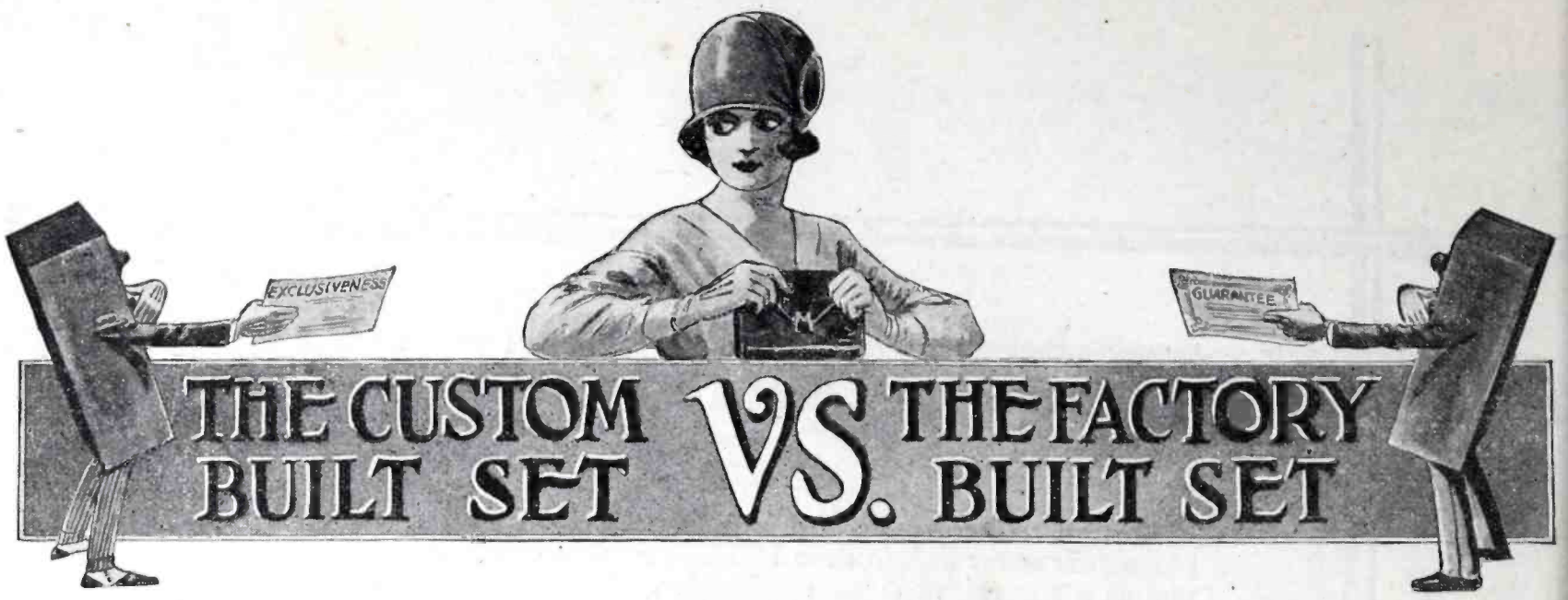
Radio Listeners' Guide and Call Book,
230 Fifth Avenue, New York, N. Y.

Gentlemen:—Without cost or obligation to me kindly insert the attached custom made set offer in your next issue.

Name .....

Address .....

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



THERE is about as much chance of settling this question as of deciding, to the satisfaction of all concerned, who won the war.

The custom set builder, putting out one set a week or one a day, each one the work of his own hands, feels sure that he achieves results that are impossible in a big factory. The set manufacturer, after planning and erecting a plant, standardizing every part and operation and working up to a production capacity of 100 or 1000 sets a day, believes that no man or small group of men, working in a home workshop, can possibly equal the results secured by factory organization and mass production.

The third point of view, which is the most important of all, is that of the customer. His experience in radio seldom is as broad as that of the community set builder or the manufacturer. If he has a friend who is enthusiastic over a custom built set, he probably will buy one like it. If his neighbors are using factory built sets and like them, he probably will choose as they did. If he listens to the arguments of salesmen who sell factory built sets, and also to those of the community set builders, he has a hard time deciding what to buy.

The answer may be different in different cases. Sets may be standardized, but customers cannot be until the science of eugenics gets a better start than it has at present. The folks who swarm about Chatham Square, at the lower end of the Bowery in New York, are hardened to noise. They have to shout to make themselves heard above the roar of the "L" trains, the banging of surface cars over worn rail joints, the rumble of the subway and the clamor of motor traffic, horse drawn trucks and countless human beings. The loud speakers that advertise radio from the doors of shops have all the wallop that the law allows. The customers down there demand volume and do not worry much about quality.

Less than two miles away, over on West 21st street opposite the quiet grounds of the General Theological Seminary, live artists and other cultured people who demand quality and who object to having a radio loud speaker heard outside their own apartment. Out on the farms of the middle west there are still other conditions. No local stations there, yet the need for dependable radio results is greater than in the city. Missing one market report may mean the loss of hundreds of dollars to a farmer. The farmer's set must reach out, and he wants good volume as well as distance.

The custom set builder putting out one set a week or one a day, each one the work of his own hands, feels sure that he achieves results that are impossible in a big factory.

No type of receiver can meet the requirements of every customer in any locality. No customer can know which is the best set for his purposes without trying several sets. But there are certain advantages and disadvantages in the different methods of producing sets that a customer can understand that may guide him in reaching a decision.

The factory system, which the workers in another land tried so hard to kill at its birth, has reached a high stage of development in America and has been one of the greatest factors in bringing our country to its present position of influence in the affairs of the world. It must be satisfactory in general to those who own and operate factories, those who work in them and those who buy their product, otherwise it would not have become the dominant system in industry.

Custom work—the making of individual articles by individual workmen for individual customers—has had no such development, yet there are many persons who prefer custom-made articles. The building of custom radio sets is increasing. There must be a reason for the increase. The customers who want custom made articles usually are more discriminating than those who are satisfied to buy something exactly like thousands of other articles turned out by the same factory.

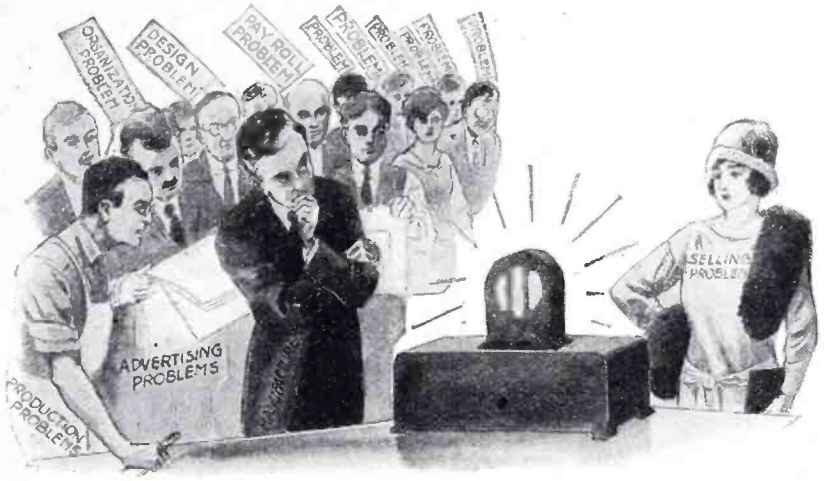
The factory set is a standardized product. The circuit, the coils, the resistances, the condensers, the cabinet, the dial and all parts are precisely like those on thousands of other sets of the same kind. The same model can be bought anywhere in the United States. The set is advertised nationally, so the buyer, when he mentions it to his friends, will find that they know about it. They may judge his financial standing by the price of the set he buys! The guarantee on the factory-built set is backed by a large concern with greater resources than an individual set builder is likely to have.

Some of these advantages, which might influence one prospective customer, are exactly the same points that another customer may consider as disadvantages. Some buyers want sets

that have individuality and do not like the standardized product. They would rather know the man who built their set than to know that it was built by a great concern with which they must deal through an agent. They may not be favorably impressed by the guarantee, because such documents usually are worded so that the manufacturers appear to be much better protected by them than the customers.

Designs may change and this, according to some dealers and customers, is one of the greatest objections to factory-built sets. Frequent changes of models must be profitable to manufacturers or they would not be so general. The rapid advance of the science and art of radio has forced changes in receivers, but the dealers are not happy when a new model is brought out with much national publicity that stops the sale of older models, and customers who are still paying installments on receivers that were considered the last word in radio two or three months ago have a feeling that they have been cheated when they see exactly the same model offered for sale at 25% or 50% less than they paid.

The custom built set is made by a man with whom the customer may talk as he does with his plumber or electrician. He can tell the community set builder what results he wants and the set builder understands the local conditions. Dealing man to man in this way, there is little chance for misunderstanding, delay or evasion of responsibility. The custom built set can be designed to fit the situation as well as a custom made suit fits the man who orders it. There is an air of distinction about a custom built article.



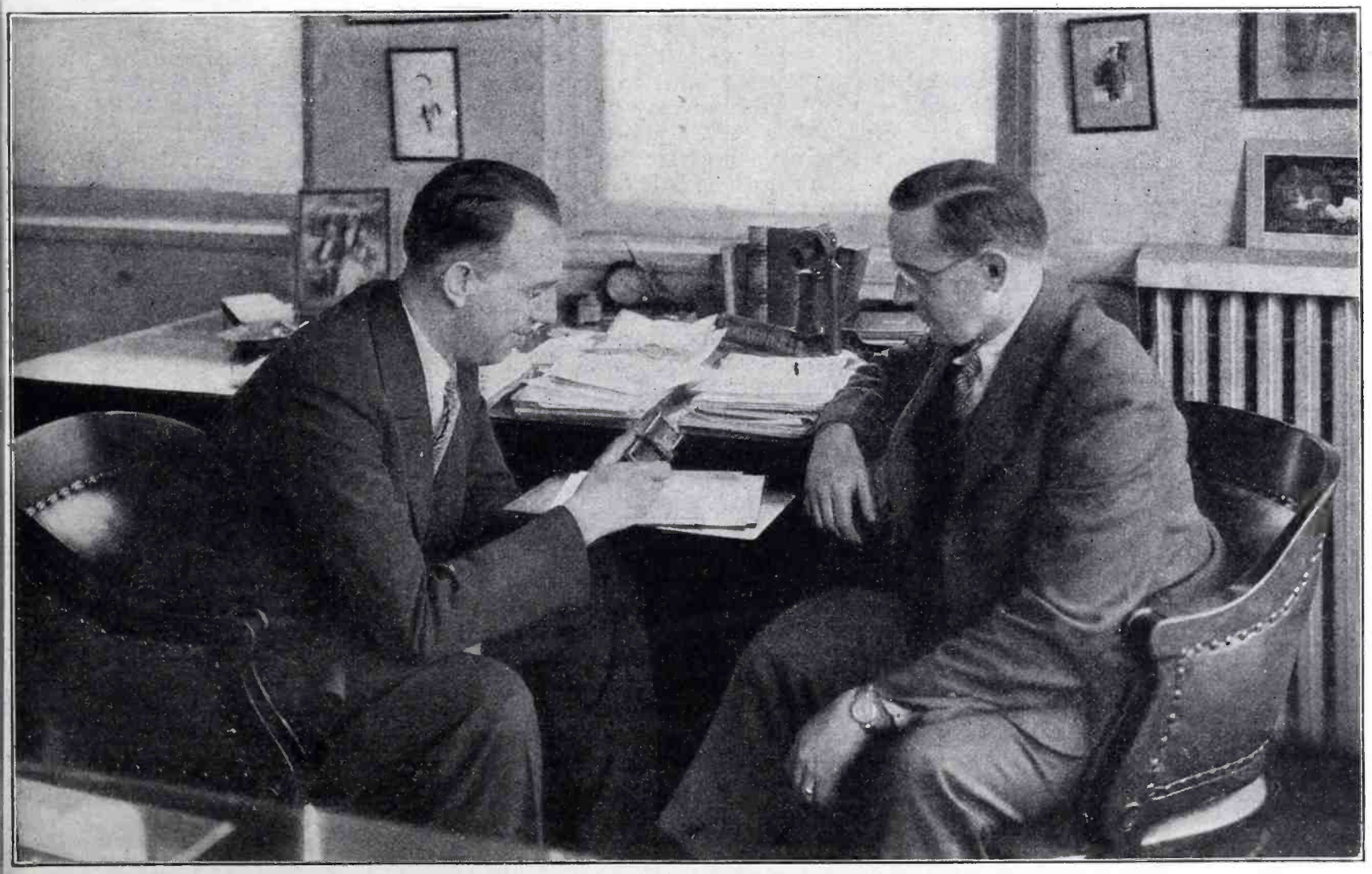
The manufacturer has to move as cautiously as a hunter stalking a herd of timid deer. Most of the radio customers are dears—the ladies do about 80% of all buying for the family—and while they may not be timid they are hard to please.

The disadvantages are that the custom built set does not bear a name that is known nationally and the owner, in talking about it to his friends, may have to explain that it is neither a freak nor an orphan. The builder may go out of business more suddenly than a well-established manufacturing concern is likely to, and the set owner may have to find someone else to service it.

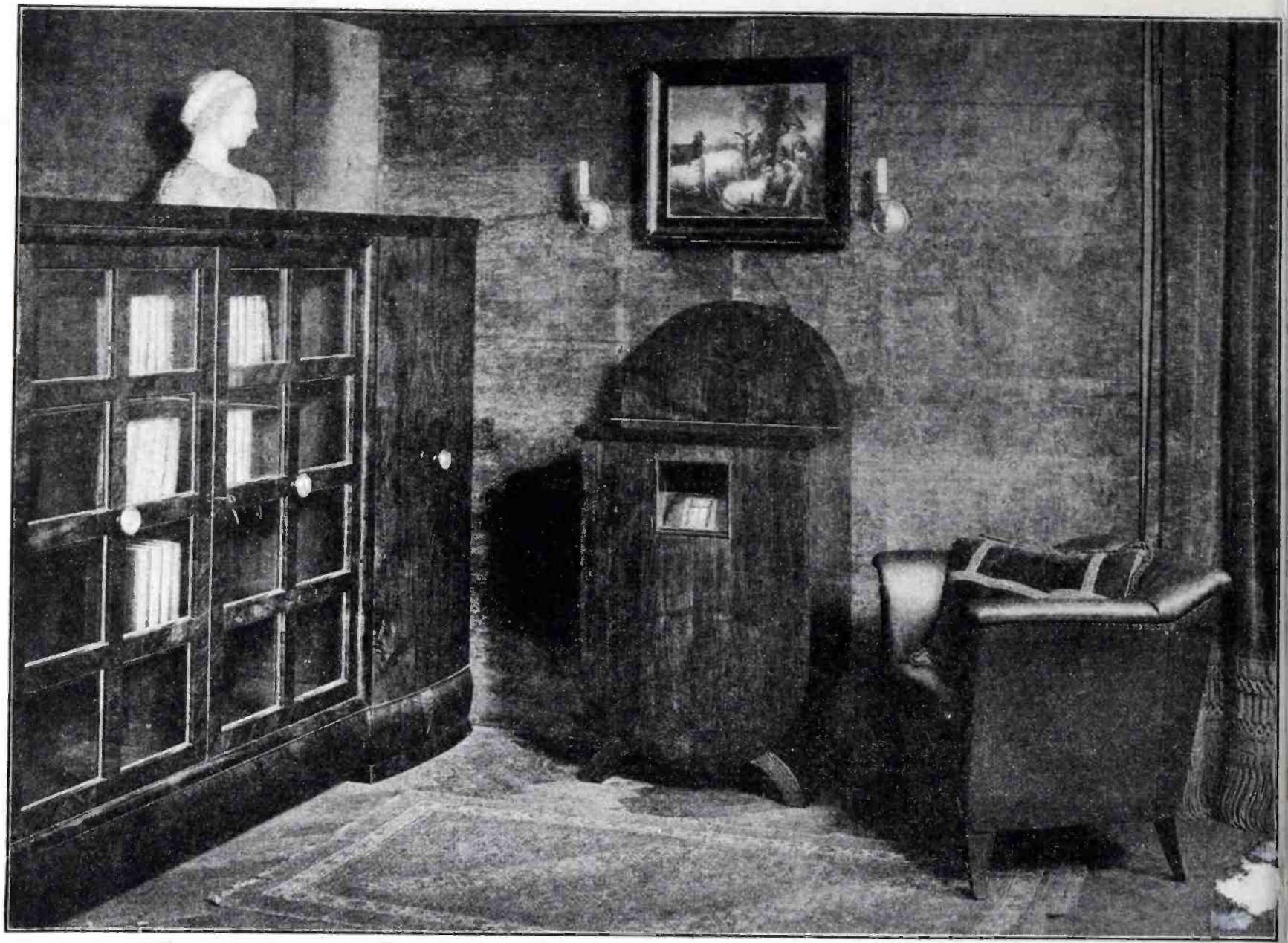
Anyone who visits a radio factory will find that a set that looks quite simple in its finished form is the result of hundreds of operations. Many of them never would be thought of by the average radio customer.

The design of a factory built receiver is a matter requiring months of time and great expense. A community set builder can read about a new circuit, or invent one, and design and build a set using that circuit within a few days. The factory cannot go into production so easily. It has to consider the fact that some of this year's models have not sold well and that new designs ought not to be permitted to come to the attention of the public until thousands of dealers have had a chance to unload their stocks.

Then the factory has to find out what new devices the radio engineers have invented and which of the newest ideas is most likely to appeal to the public. The radio users, knowing little of radio theory or practice, can not be depended on to buy the best radio set that can be produced. They want something new, striking, easy to operate. They do not know precisely



The manufacturer standardizes every part that goes into a set and plans quantity production.



The custom-made receiver can be built to suit the requirements and taste of the customer. Here is shown a modern drum-dial type set installed in a distinctive cabinet which harmonizes with other furnishings of the home.

what they want. The manufacturer must be a good guesser if he is to be a big winner.

One year the majority of buyers wanted 5-tube sets, although a good 3-tube or 4-tube set would deliver better results than a poor set with five tubes. The cone type speaker was one of the outstanding successes, because it occupied less space, was better in appearance and delivered better results than many of the horns. The power pack, which took the place of batteries, excited great interest and sold freely. Before that was any more than well started, the manufacturers raced each other to get into the market with A.C. tubes that made the power pack unnecessary. The one-dial set drove out most of those with more dials within a year, and the tuning drum gave the dial a hard race for popularity. Television is appealing to the popular imagination now and manufacturers and community set builders must decide what to do about that.

The manufacturer has to move as cautiously as a hunter stalking a herd of timid deer. Most of the radio customers are dears—the ladies do about 80% of all buying for the family—and while they may not be timid they are hard to please. An unpopular design may put a factory out of business. A month's delay in placing a popular model in production may lose half of the biggest season's business. In selecting models, the manufacturer is at a great disadvantage as compared with the custom set builder.

In deciding what sets to manufacture, the manufacturer must make exhaustive tests to avoid mistakes. He must build a number of test sets and try them out under all sorts of conditions. One serious defect in a circuit may cause thousands of sets to be dumped back on his hands.

A few years ago some manufacturers were unfortunate in using amplifying transformers that were quickly put out of commission by the current or the weather. Replacements and loss of sales through injury to the reputation of the product ran into large figures. A.C. tubes that died in early infancy have hurt the sale of A.C. sets. One manufacturer bought 70,000 pieces of the wrong kind of wood for a cone type loud speaker, not realizing until a large number of speakers had been made up that the kind of wood specified by the inventor was necessary.

The community set builder tries out a set in his workshop, delivers it to a customer and is paid for it. If it proves satisfactory, he has given the set all the test that it needs, for his purposes. If it develops faults, he can change it or give the customer another without serious loss. Any custom built set can be changed completely at the expense of a few hours' work and a little material. Any parts removed can be used in other sets unless they are damaged beyond repair. A mistake in one set is not repeated in thousands of sets as it may be in a factory.

The customer who buys a set from a reliable community set builder is in a better position than one who buys a factory mistake, for he can have the set rebuilt or exchange it for a new one without loss of time. But a customer who buys the product of a well-established factory, from an authorized dealer, at list price, is not likely to find it a failure.

No new radio set becomes popular spontaneously. It must have publicity. Radiola 17 came as near

to selling itself as any receiver on the market in the fall of 1927, because it was one of the first successful electric sets and the ease of installation and operation appealed to the public, but the sales were started and kept up by advertising that cost big money.

The radio manufacturer has a tremendous publicity problem. He must advertise. He must take his chances on the results of the advertising. The community set builder has an advantage over the manufacturer in the matter of publicity. It may actually cost him as much, or more, to sell every set as it does the manufacturer, but the expense may be in time rather than in money, and, while "time is money," he can spend time on prospective customers without getting into trouble with his bank.

The production methods of a community set builder, working alone in his attic or cellar, and those of the great factory with hundreds of employees, may seem to be very different. The fact is, however, that the parts for most of the custom built sets are made in factories. Community set builders seldom wind their own coils or build their own condensers. They merely assemble their sets from factory-made parts. Some factories that produce complete sets buy many of the parts from other factories.

Both the factory executive and the community set builder have the problem of selecting parts and the success of their sets will depend on the quality of the parts used.

The buyer for a factory sometimes is under considerable pressure from the management to save money. The manufacturer of parts, in trying to sell to the factory, may cut his prices and lower the quality of his product. Community set builders sometimes point out parts, in factory-built sets, that they say they would be ashamed to use in their custom sets.

It may seem strange to the customer that a manufacturer would try to save five cents on a coil or condenser for a $100 receiver instead of buying those that are obviously better and cost only a little more. The answer is that the bulk of the list price paid by the ultimate user goes to pay the cost of placing a set in the salesroom, selling it to him, and collecting his payments. The manufacturing cost and the manufacturer's profit on many an article is less than 25% of the list price. The saving of five cents on a part when millions of parts are used in a year makes a considerable difference in the profits of a factory.

The community set builder likes to handle and use good parts. So does the factory worker, but he has no choice in the matter. Good parts make the work easier and more satisfactory. The community set builder always advises his customers to pay the price and get the best. The factory, having no direct contact with the users of its product and depending on local dealers who are thinking primarily of immediate profits, is more likely to try to save money on parts in order to make a price that will sell the goods.

One of the easiest ways to get a line on the practices of a manufacturer or community set builder is to examine the condensers used in a set. Generally they are in plain sight and their construction can be examined without difficulty.

A good condenser has sturdy

(*Continued on page* 150)

An elaborate custom-built receiver, designed for distance reception, installed in the home of a prominent Pennsylvanian.

TELEVISION FOR THE EXPERIMENTER

A LITTLE more than a year ago engineers predicted that television might be practical for home use within ten years or so. This, of course, is only guesswork based on the present development of the art, but hardly anyone is able to judge just how soon the time will come when television will be perfected to the stage where it can be accepted as practical for home entertainment such as radio telephony was in the early days of broadcasting. People who have neither knowledge nor interest to consider matters of this nature are led to believe television is now perfected to the extent that they hope to see in television by radio the kind of picture they have been accustomed to at the movies or something approaching them in quality within a very short time, according to the vivid newspaper reports on demonstrations conducted to show the advancement of television technique.

In view of any misapprehension on this score we can simply say that television is far from perfect and that practically all demonstrations have been conducted merely for the purpose of showing the status of extensive laboratory experimental work. Nevertheless, it is sufficiently advanced to provide an interesting and fruitful field for the radio experimenter. In several localities, there are television signals being broadcast, ready to be received with relatively simple and inexpensive equipment, while in others television service is promised in the not distant future. Therefore, this is an opportune time for a study of the elements of television reception and experimentation, to which end we are presenting the necessary data for building a television receiver in this article.

While there are different television systems being employed at present, they have many points in common, and an outfit designed to receive images from one source may readily be altered to work from other transmitting stations. The system employed at WRNY, New York; WOR, Newark, N. J.; WLEX, Lexington, Mass.; WGY, Schenectady, N. Y., etc., is typical of that most generally followed.

An example of the equipment employed in the transmission and reception of television is illustrated in the accompanying photographs. This apparatus was used for demonstration purposes at station WCFL, Chicago, late last June and was designed by Ulises A. Sanabria, a young experimenter who has been working quietly on television for the past five years, and by his assistant, M. L. Hayes.

In general arrangement, the television transmitter built by Sanabria is a development of the well-known Ives system, but it is considerably simpler than the complex machines used by the Bell Telephone Laboratories and the General Electric Company in the demonstrations these companies gave during the past year. One of the photos on page 73 shows the complete instrument set-up at WCFL. The transmitter, the parts of which are designated by the letters P, L, D andA, is in the background, while the "check" machine, which is a television receiver connected by direct wire to the transmitter for monitoring purposes, is in the foreground.

As shown in the smaller photo on page 73, the first unit of the television transmitter is a powerful spotlight, A, which may be an arc light but which in this case is a 1,000 watt mazda lamp inside a protecting case. Revolving in front of the aperture through which the light of this lamp issues is a disc D, drilled with a spiral of very small holes. The motor M drives this disc through the belt B. The shaft to which the disc is attached revolves in ball bearings in a heavy cast-iron frame, which in turn is bolted to a massive cast-iron base which also supports the driving motor. The disc itself is of thin metal, but faced with two steel flanges ¼ inch thick, which overcome any tendencies on its part to wobble.

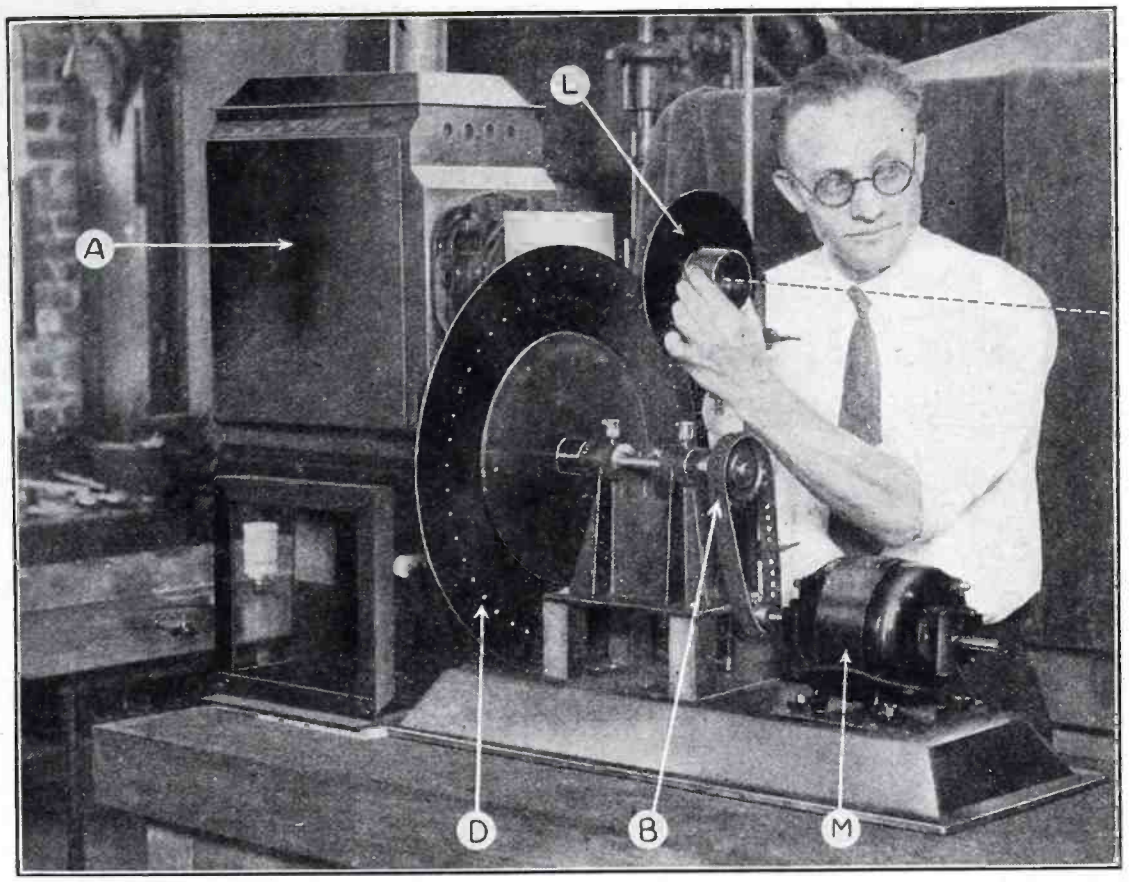
After the light from the lamp passes through the holes in the disc, it is concentrated by a powerful condensing lens, L, in such a manner that tiny pinhead beams are projected straight forward. One such beam is indicated by the dotted line. Of course, as the disc revolves, a continual series of beams will be thrown forward.

The person to be televised sits in a shaded booth, facing directly into the lens, but about four feet from it. In front of him is a large wooden

box with a square hole in its center to allow the light to pass through. Surrounding this opening is a bank of four photoelectric cells, marked P in the photo below. A close-up of this booth and the photoelectric-cell box is shown in the heading of this article.

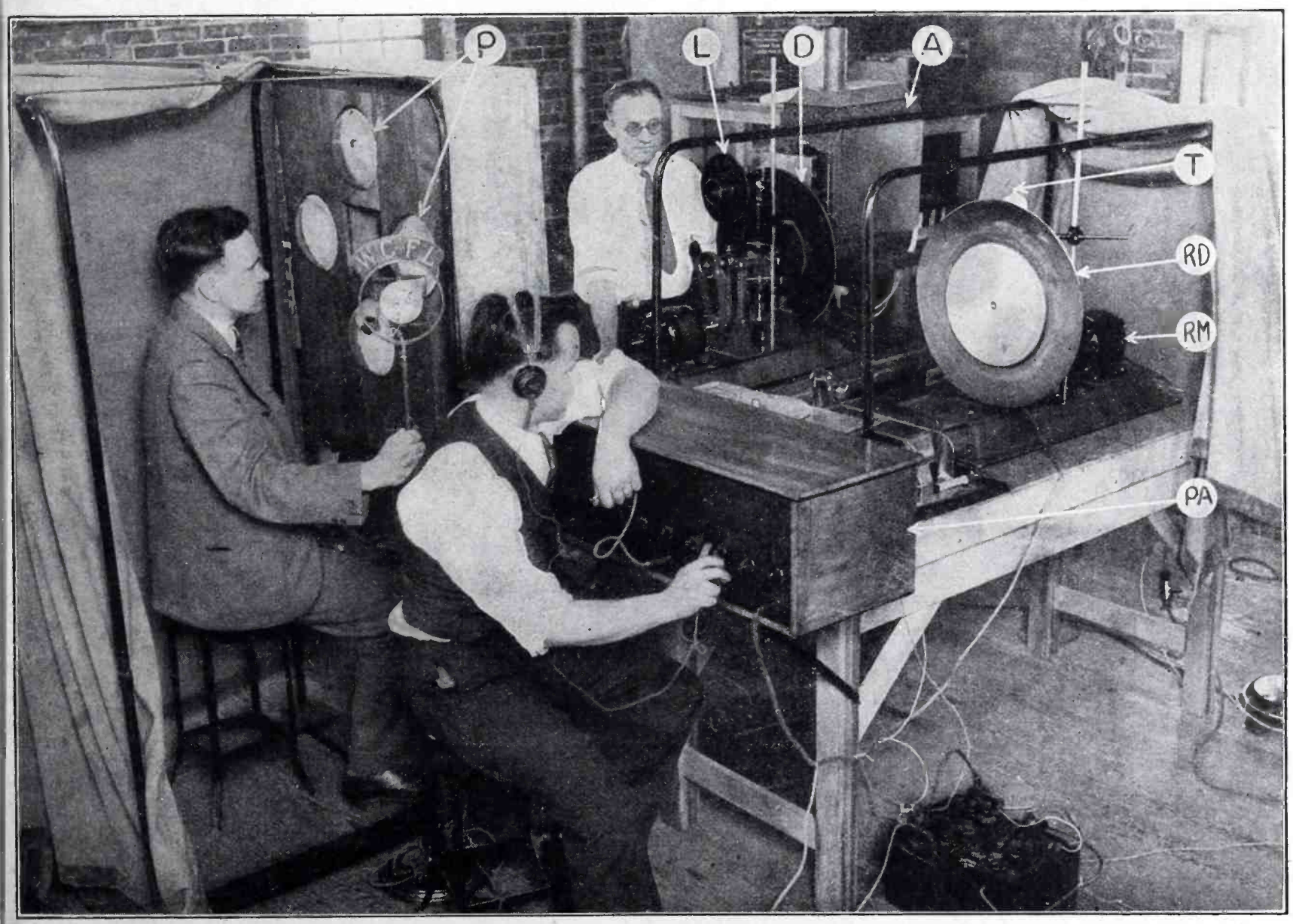
The operation of the apparatus now becomes evident. As the disc revolves, it causes beams of light to pass over or "scan" the face of the person sitting in the booth from top to bottom; with the result that the face is "swept" by a series of concentric arcs of light. The light is reflected from the subject's face and falls into the photoelectric cells, which set up varying electric currents corresponding in amplitude to the light and dark portions of the skin, hair, eyes, etc. These currents, which are extremely weak, are amplified by a six-stage resistance-coupled audio amplifier indicated at PA.

For testing purposes the output of this amplifier is carried directly to the checking receiver, which comprises the neon tube T, the revolving disc RD and the driving motor RM. For actual television broadcasting, an additional five-stage amplifier is hooked in before the impulses are allowed to actuate the broadcast transmitter proper.



A close-up of the disc assembly of the check receiver used in experiments at station WCFL. A, 1,000-watt lamp unit; D, scanning disc; B, driving belt; M, driving motor; L, condensing lens. The dotted line represents a beam of light as it is directed upon the subject's face.

The receiver, it will be seen, is a comparatively simple affair. The disc is a duplicate of the one used in the transmitter, while the neon glow-tube T, which responds to the television impulses just as a loud speaker responds to musical impul-



The complete experimental television apparatus at station WCFL. The parts of the transmitter are: P, photoelectric cells; L, condensing lens; D, scanning discs; A, source of light. Receiver (in foreground): PA, amplifier; RM, driving motor for scanning disc, RD; T, neon glow tube. M. L. Hayes, left; U. A. Sanabria, wearing phones; V. A. Schoenberg, chief engineer of the station in the rear.

ses, is a standard bulb. The images visible in the check receiver, as viewed by the managing editor of this magazine, were really very good. It is difficult to describe the exact grade of their definition, but it can be said that the televised faces were distinctly recognizable. The images were streaked with the fine lines characteristic of television disc systems, but they were distinct enough to show the reflection of eyeglasses on the subject's face and the shadow of smoke from a cigar in his mouth.

Much of the success of this television work at WCFL was due to the photoelectric cells. They were nine inches in diameter, potassium type and extremely sensitive. The direct output of three of the four cells shown in the illustration, when led through only five stages of resistance - coupled amplification, was sufficient to operate the check receiver quite satisfactorily.

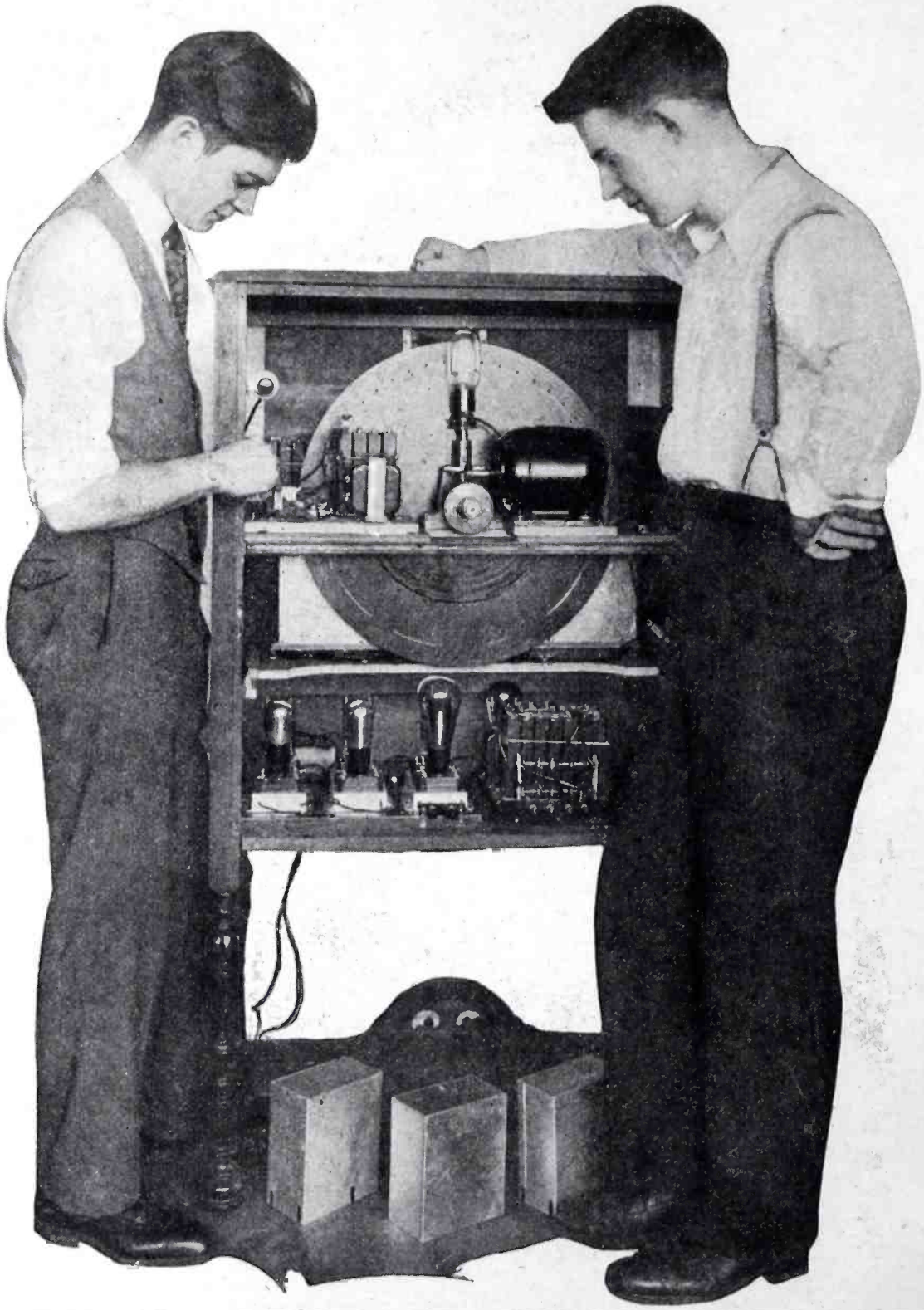
These cells, as well as three twelve-inch bulbs acquired by WRNY, were made by Lloyd Preston Garner, a graduate of the University of Illinois, in the laboratories of that institution. They represent an enormous amount of technical experimentation and constructional skill, and are probably the finest devices of their kind in existence to-day. Some idea of the size of these cells may be obtained from the photos accompanying this article.

Television broadcasting on the regular broadcasting band was successfully demonstrated late in August when images of living people were put on the air through WRNY at Coytesville, N. J., and received in New York City, several miles away.

The outstanding feature of this demonstration was the confinement of the television impulses within the 5,000 cycle modulation channel to which all broadcast stations are limited by law. At the present writing, Station WRNY broadcasts television for five minutes every hour the station is on the air both on its regular 326 meter wave, and also through its associated short wave station W2XAL, operating on 30.91 meters.

Because of the relatively wide channel ordinarily required for television signals, most of the present transmissions take place on the higher frequencies or short waves. Therefore, we will describe the construction of our experimental television receiver for use on short wavelengths.

Practically any type of short wave receiver may be used in connection with the television receiver; the photos herewith show typical one- and two-tube sets. The compact one-tube outfit is a standard short wave converter unit the output of which can be connected directly to the audio amplifier. This of course is only suggested in cases where the receiver is located near the station broadcasting television and when signals are quite strong. However, it has been found that a receiver employing one stage of untuned shield-grid radio frequency amplification is generally preferable. In any event, the plug-in coil type receiver will be most practical for reception over a wide range of wavelengths. In selecting or building your own short wave receiver special attention should be given to the rigidity of construction. This applies to the coils and their mountings as well as the wiring and other parts of the set.



A rear view of the experimental receiver which was used in the demonstration of television broadcast from station WRNY. Note the gear arrangement on the shaft of the scanning disc which gives much slower speed. The receiver and amplifier of this set were installed in the same cabinet.

The perfection of the picture received depends upon how good a signal is transmitted in the first place, and how well it is reproduced at the receiving end. The audio amplifier, therefore, plays a vital part. If the signal to be received contains frequencies of from 18 to 20,000 cycles, it is obvious that the audio amplifier must be capable of amplifying all frequencies within these limits.

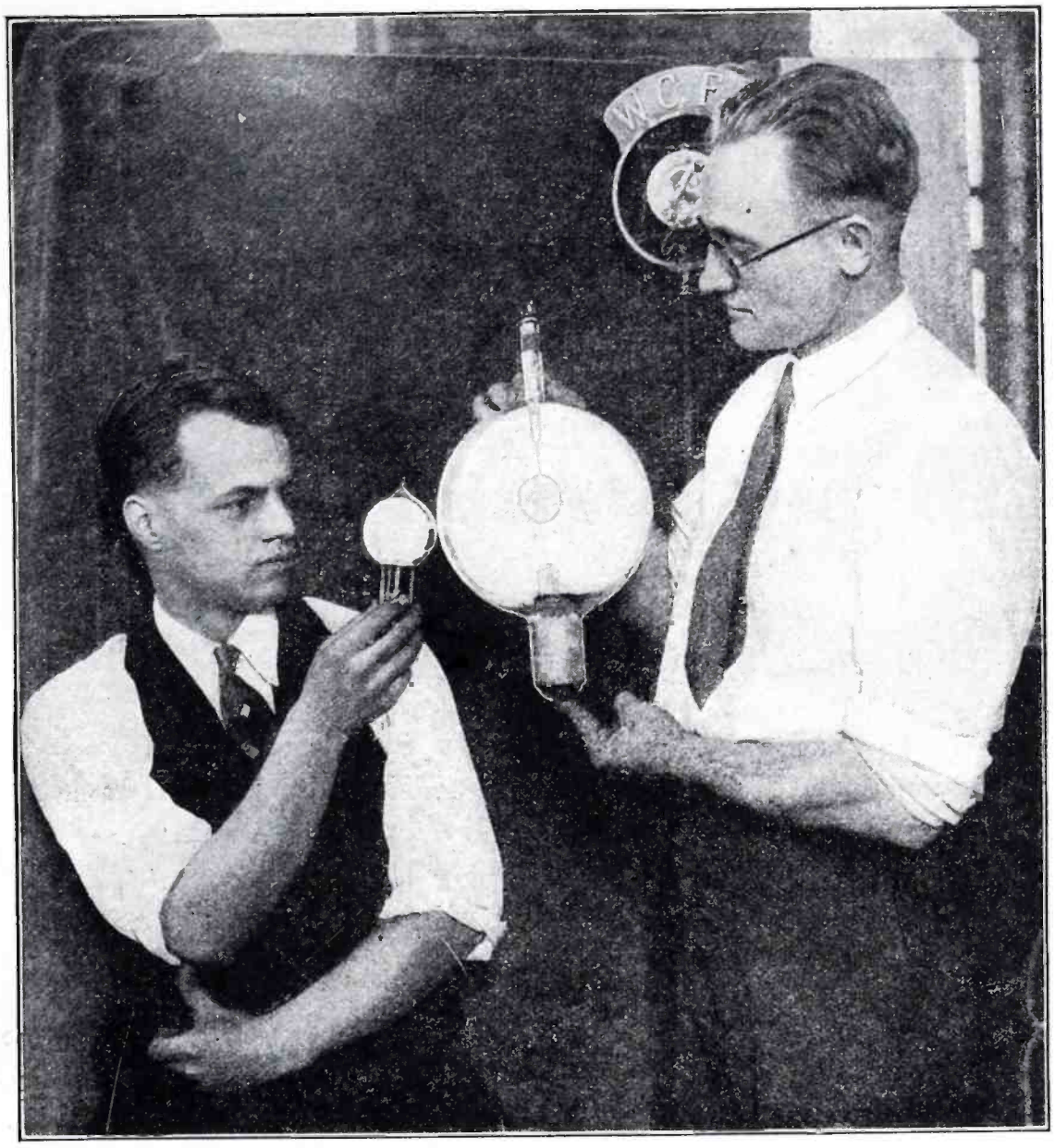
The ordinary audio amplifier may be employed for fair results, although as the experiments progress it will be necessary to build a

better amplifier than is ordinarily employed for broadcast reception.

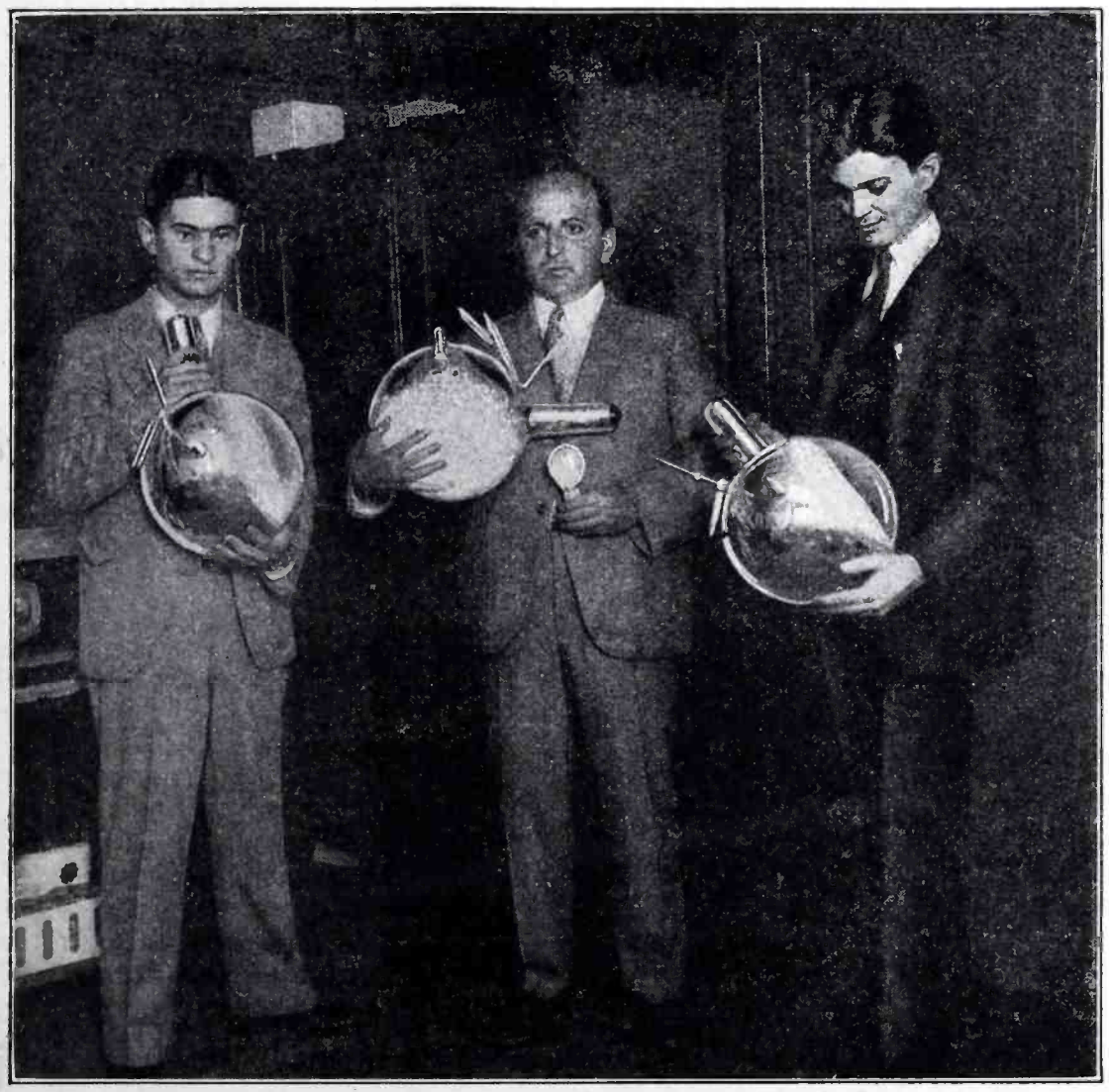
The amplifier shown in the accompanying diagram is one of considerably higher frequency range than the usual broadcast amplifier, and when employed for television provides ample detail. It is essentially a resistance-coupled hook-up, with a 240 or 340 high Mu tube for the first stage, a 112 for the second, and a 171 for the third. The values of the coupling condensers, resistors, etc., are given directly on the diagram.

Each of the three stages is provided with an Amperite for automatic control of the filament current to each tube. In the circuit diagram of the complete set employing three audio stages the grid leak in the last stage is replaced by an audio frequency choke in series with a radio frequency choke. All coupling resistors used in the amplifier should be of the non-inductive type of good quality such as Aerovox lavite or Durham heavy duty resistors.

Poor coupling resistors is one of the common causes of trouble in the television amplifier. It is suggested that a pair of headphones be connected to the output of each stage in order to determine defects in the coupling resistors. Of course



U. A. Sanabria, left, and V. A. Schoenberg, chief engineer of the station, right, showing the difference in size between an ordinary photoelectric cell and the large type used in experiments at station WCFL.



The three giant photoelectric cells used in the television transmitter at station WRNY.

there will be some noise present due to the gain in amplification of the amplifier. However, the experimenter will soon be able to determine the amount of noise permissible in the amplifier by tapping the tubes and comparing microphonic noise with any amplifier noise.

Another important consideration in the construction of the amplifier is that of providing for the least amount of vibration. Spring or cushion type sockets should be employed for all stages and the more stages used the greater the precautions should be to prevent microphonic tube disturbances. For this reason we have shown the short wave set, audio amplifier and scanning cabinet in separate cabinets in the accompanying sketch of the apparatus layout on two separate tables. The cabinet containing the audio amplifier can be mounted on sponge rubber cushion pieces at all four corners in order to reduce the possibilities of disturbances being transmitted through the table.

In the six stage amplifier used by Sanabria in his experiments at station WCFL the tube and socket of

each stage was suspended by small coiled springs attached to upright brackets. Besides this, the sockets were weighted in order that the tubes would have a slow motion period in the event of any mechanical jarring. Vibration from the receiving disc or its motor transmitted to the amplifier or especially the detector tube, will introduce a periodic noise that will cause black streaks across the picture. Hence the reason for having the television scanning set assembled in a separate cabinet and sitting on an isolated table of its own. Any periodic interference such as a sixty cycle hum that may get into the signal will also cause streaks across the picture, but these will not remain stationary, but will move upward or downward across the field of the picture.

The complete three stage audio amplifier shown in the diagram can be assembled and wired in the usual manner on a wood baseboard about 7x15 inches. The four stage amplifier shown in another diagram can be assembled on a baseboard 7 x 18 inches. The parts of each stage should be completely shielded in copper or aluminum shields.

In the diagram of the four stage amplifier a few changes in the circuit and values of condensers and resistors will be noted. Duplex and universal type Clarostats may be used as indicated instead of the fixed resistors. Thus, one "B" and one "C" voltage can be employed and the Clarostats adjusted for the best operation. The "B" voltages for the amplifier can be furnished by practically any good power supply unit providing the filter system will not be the cause of introducing sixty cycle hum.

The general construction of a cabinet for the scanning set is shown in the accompanying sketches. The parts of the output circuit neon lamp, motor speed controls, etc., are installed in this cabinet and output leads connected to the amplifier. If a 24-inch scanning disc is used the cabinet should be a few inches oversize, and deep enough to accommodate the driving motor mounted on a shelf as shown in the illustrations. Both front and back of the cabinet are hinged and provided with hook catches making all parts within the cabinet readily accessible. The power type Clarotat speed control can be mounted directly in the lower right hand corner on the front side of the cabinet and the line switch for the motor at the lower left hand corner. When mounting the Clarostat, a piece of asbestos about six inches square should be placed in back of the device as it become quite hot especially when passing heavy current. Flexible twisted cords for the phase adjusting push button can also be brought out from the front side of the cabinet. A line outlet is mounted on the left side of the cabinet for a standard lighting plug as indicated in the sketch.

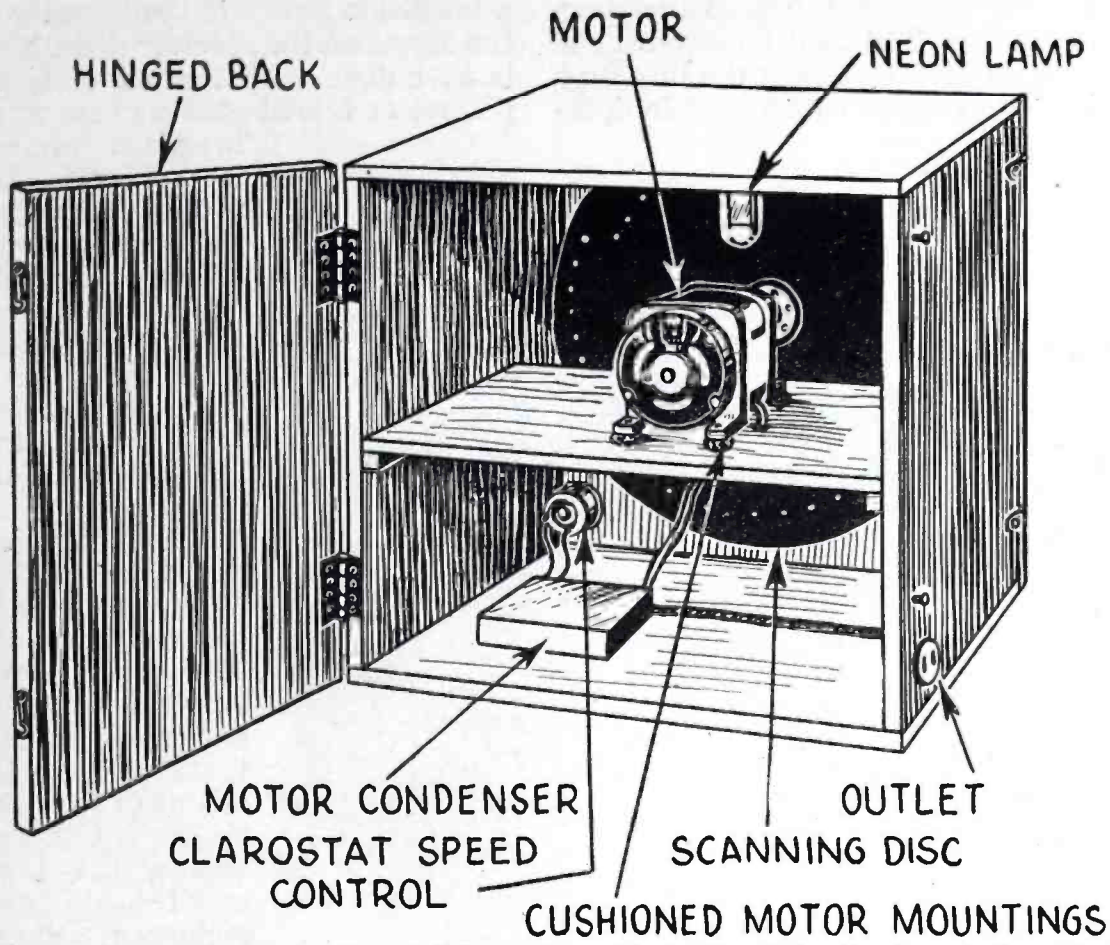
Operating the test receiver employed for demonstration of television reception from station WRNY. Directly beneath the scanning cabinet is an ordinary tuned R. F. broadcast receiver.

There are various types of neon lamps now on the market designed especially for experimental use. Among the most popular and efficient of these is the Raytheon Kino-Lamp. The characteristics and best methods of operation are given by the manufacturers in the data slip with each lamp.

The output circuit is so arranged that the neon lamp is always illuminated, and when a signal is received, the brilliancy of illumination merely varies in accordance with the signal. A resistance must be connected in series with the lamp because, as with all gas conductors, it has a negative resistance coefficient.

With the Raytheon Kino-Lamp a good background will be obtained if the current is limited to 10 or 20 milliamperes. More current will cause the lamp to glow brighter, but there is no advantage in this so far as the picture is concerned, and it only serves to shorten the life of the lamp. In fact, quite satisfactory results can be obtained by adjusting the D.C. voltage just below the starting voltage for the lamp. In this case a black background is obtained and the image stands out in sharp contrast.

There are two ways of adjusting the current through the neon lamp, once it has started, namely, by varying either the D.C. voltage or the series resistance. The latter method is more practical. A fixed resistance of 10,000 ohms in series with the lamp can be used, however, with satisfactory results. If this is done, the D.C. voltage on the lamp should



Sketch showing the construction of the scanning cabinet. If a 24-in. disc is used the cabinet should be about 29½x30 inches and about 12 inches deep. The parts of the output circuit can be mounted in the bottom of the cabinet. The center support for motor shelf is omitted in this sketch.

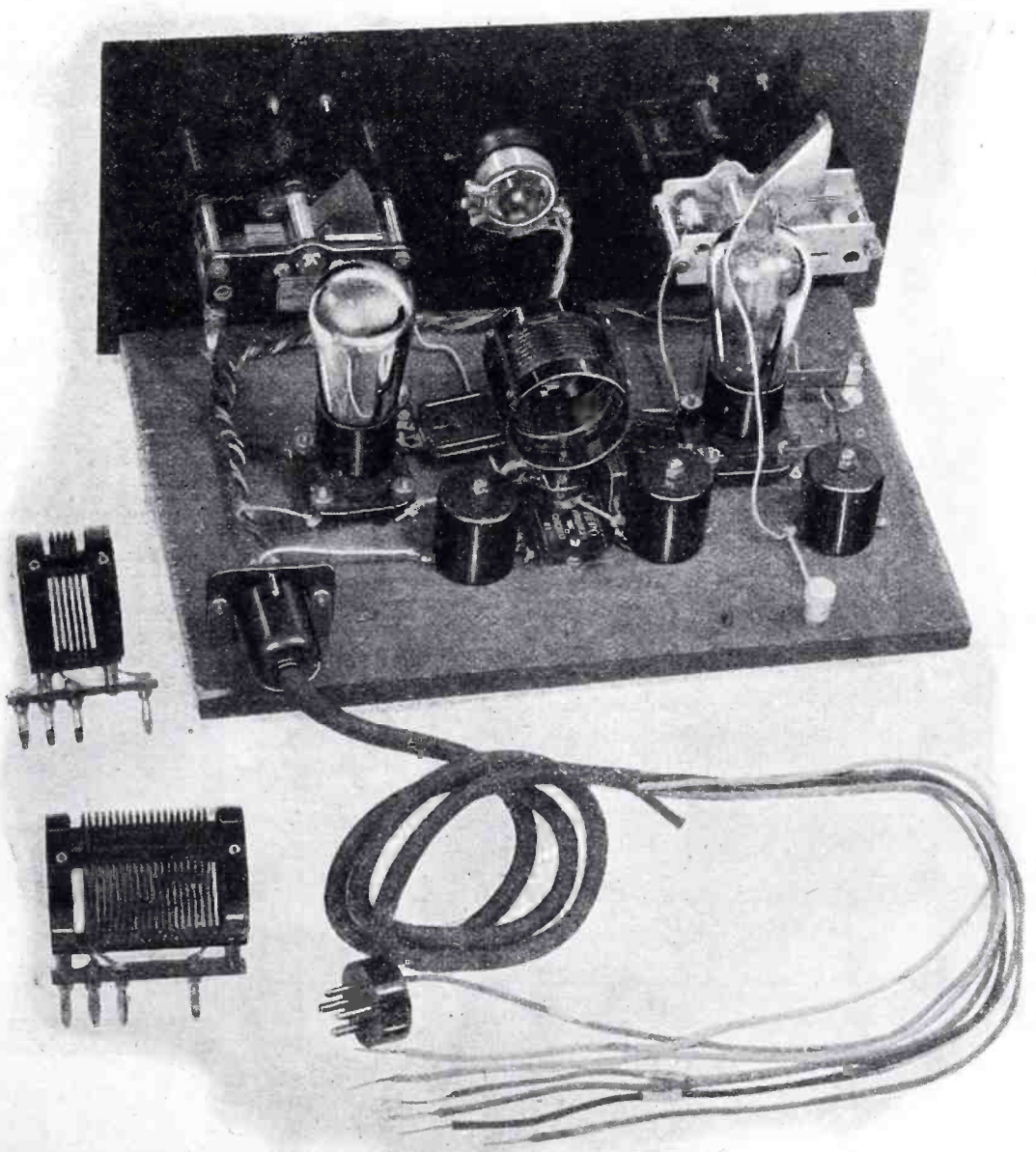
vary until it will light with a soft, medium glow. If a variable resistance is used, it should be of 10,000 ohm maximum resistance, having a carrying capacity of at least five watts in series with a one-thousand ohm fixed resistance. The resistance should be decreased until the plate of the lamp is covered with a soft glow.

Several different concerns are manufacturing scanning discs suitable for use with the apparatus described here. The experimenter can make his own disc, but the degree of accuracy to which the spiral and size of holes can be drilled in the disc by the average experimenter is usually far from what can be done by a manufacturer with special machines. A defective scanning disc with holes out of line is sure to cause black lines and streaks through the fields of the image. Therefore, if the experimenter is not equipped to make a disc to the highest possible degree of precision it would be recommended that he purchase one of the several makes of manufactured discs.

A tapered light shade having an opening about three inches in diameter at one end and one and a half, or the size of picture on the scanning disc, at the other should be fitted in the cabinet as shown in the accompanying illustration. This shade can be made out of thin cigar box wood or tin and painted dull black on the inside. It provides an important accessory for shading outside light from the image when it is being viewed by the operator.

One of the most accurate types of discs which has come to our attention is that manufactured by Pohl Brothers. The standard type 24 inch disc for a picture one and one-half inches square has 48 holes .0315 inches in diameter spaced seven and one-half degrees in width and .0312 inches in radius or height. The standard Pohl discs are made in two sizes, 24 inches and 16 inches with 48 or 50 scanning holes in either size disc.

While successful results can be obtained with a number of different types of small motors for driving the scanning disc, it is preferable to use one of the special television motors now available through several well-known motor manufacturers. The one illustrated in the photo in this article is an especially designed Baldor television motor. This motor is a ⅛ horsepower variable speed condenser type for operation on 110 volts single phase 60 cycles A.C. It is a ball bearing motor that operates very smoothly and quietly. The swish of the disc through the air constitutes the major portion of the noise and this is quite insignificant.

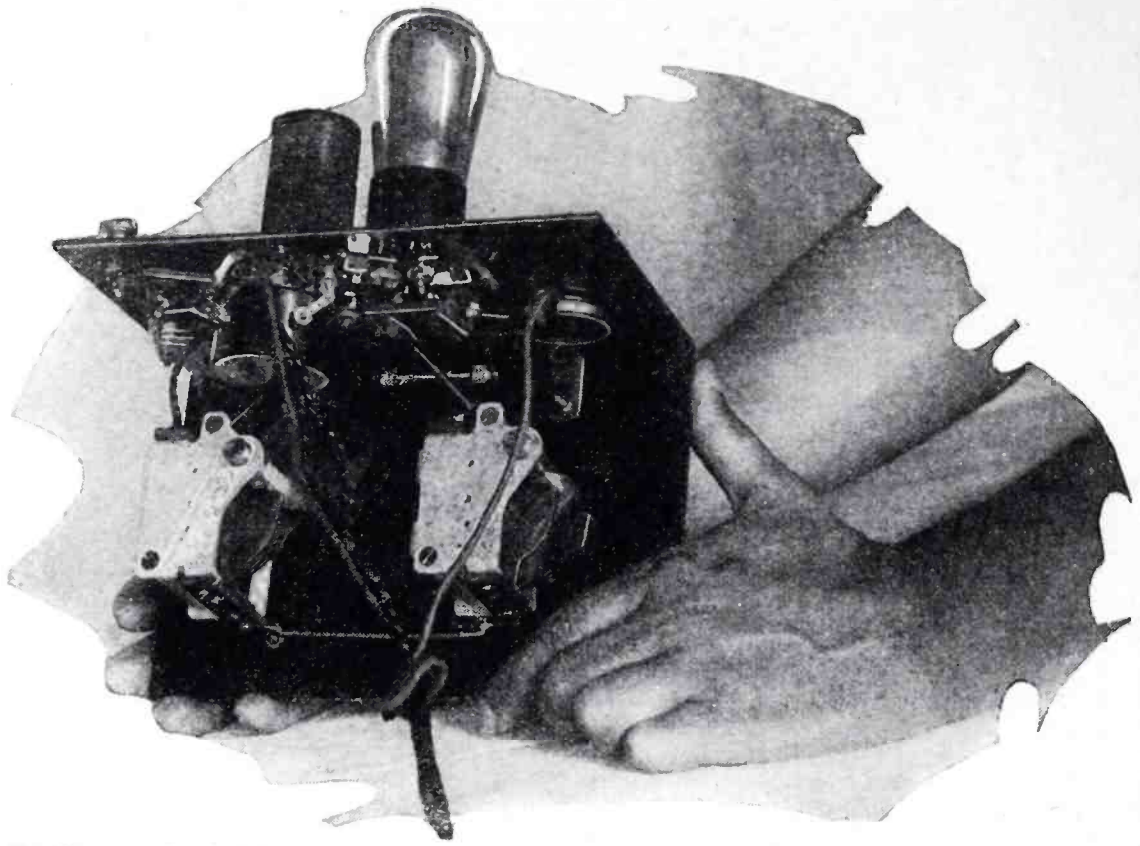


The Aero two-tube short wave receiver employing one stage of shield-grid tuned radio frequency amplification. At the lower right hand corner are short wave plug-in coils for different wave bands.

Another simple and much smaller type is the Bodine television type motor which gives very satisfactory results and can be controlled with an ordinary wire wound type rheostat.

A seven to ten ohm resistor having a carrying capacity of at least ten watts is connected in series with the line leads to the motor so that a "pear" push button can be shunted across it for a phase regulator or a device for momentarily increasing the speed of the motor in order to obtain synchronous phase or step with the disc at the transmitter.

A very practical arrangement for driving the scanning disc of a television receiver is that employed in the Jenkins radio movie receiver. This method may also be employed in the construction of the television receiver with very good results and we are therefore giving the experimenter constructional details in an illustration herewith. It will be noted that with this mechanism the general scanning cabinet construction with a direct motor drive will of course have to be altered, and a heavier scanning disc will be necessary, due to the pressure of the friction drive against the disc. The support for the disc may be an old motor which idles in operation, or a small polishing head will serve the purpose. The speed of the disc is varied by moving the driving motor either to or from the center of the disc and thus no variable speed control of the motor itself is necessary. Once the proper position for the motor base slide has been found it can be fastened securely with a wood screw so that the motor will not "walk."



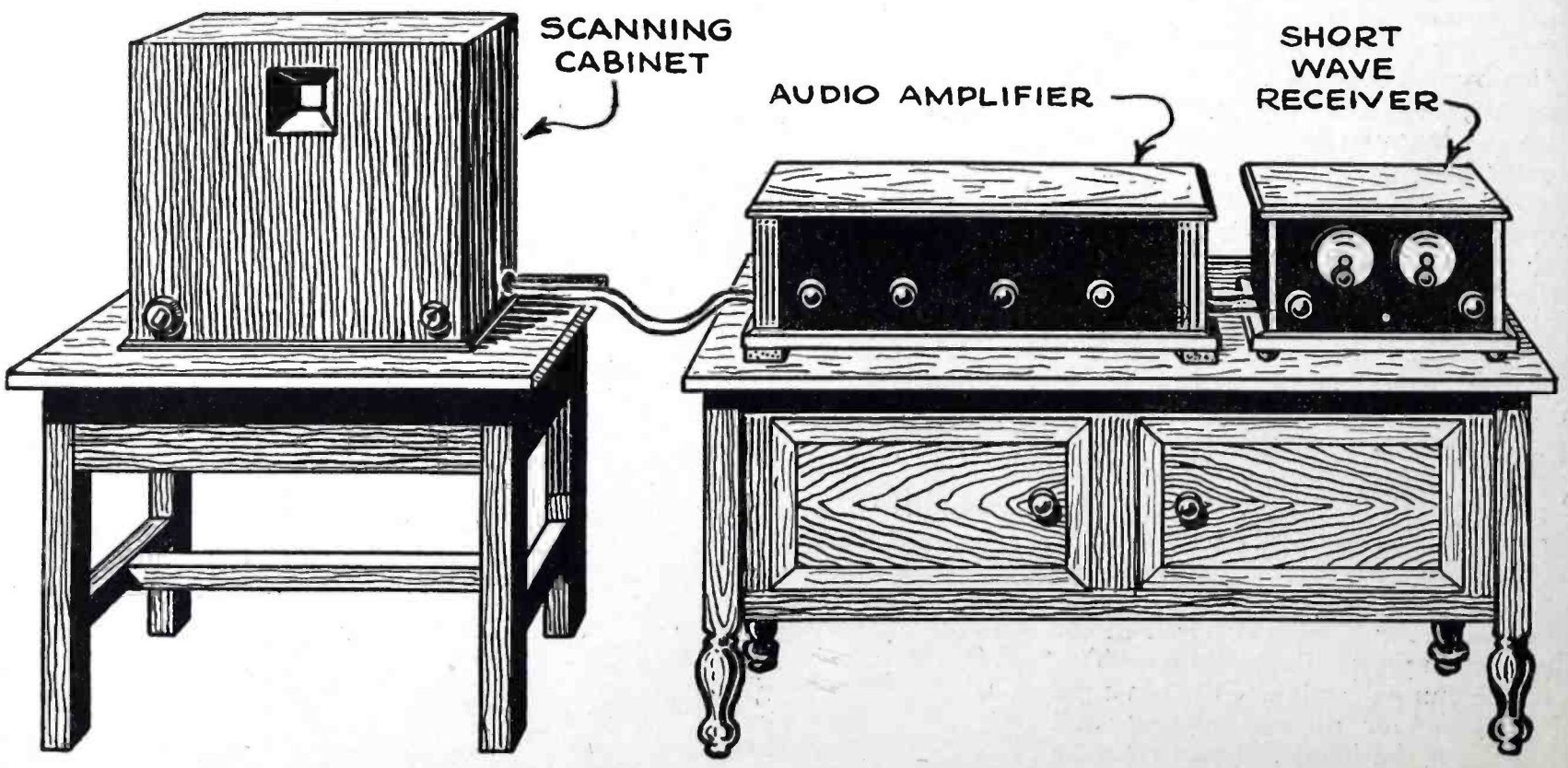
The Dresner single-tube short wave converter unit which can be used for reception of television on short waves when the transmitter is within the local area.

The first step in the reception of a television image is the locating of the signal on the receiver dials. This is best done with the aid of headphones or a loud speaker connected in place of the neon lamp. Do not fail, however, to have a fixed condenser of about 1 mfd. capacity in series with the 'phones when connecting in place of the lamp or across its terminals.

The television signal has a distinctive sound, but unfortunately the short wave band contains several signals that may easily be mistaken for television. For instance, the high speed code and picture transmission are quite like a television signal because of the flutter or what may be called a group frequency.

In addition to a low group frequency which is the rate at which complete pictures are transmitted and which is around 18 to 20 cycles per second, the television signal contains high frequency notes whose character depends upon the nature and the position of the subject before the transmitter pick-up.

The experimenter will hear a signal that sounds at first like a flutter,



Layout of the experimental television apparatus as described in this article. The scanning cabinet is placed on a separate table to avoid mechanical vibration of the amplifier from the motor which drives the scanning disc.

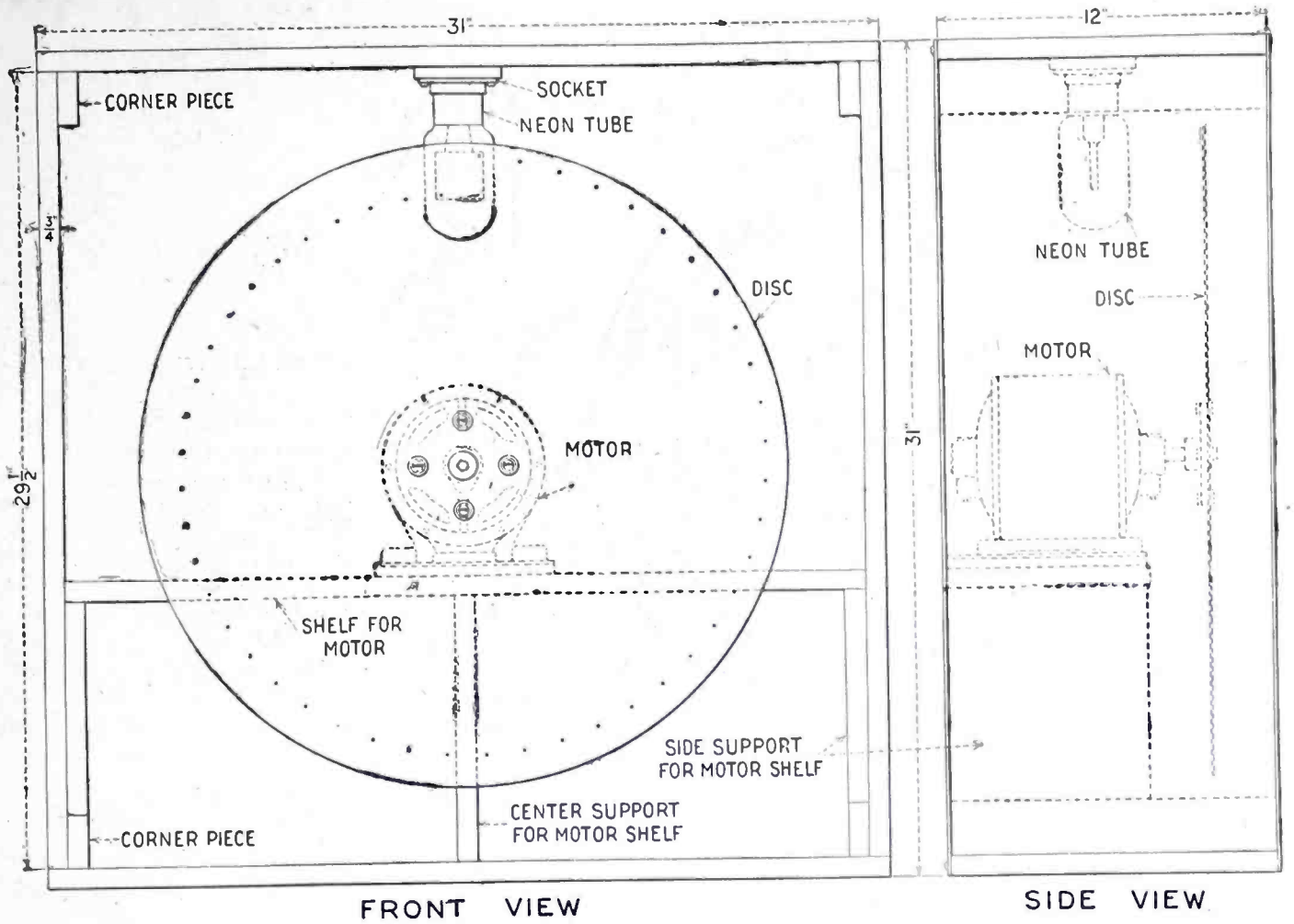
and will then note that this flutter is really the rapid repetition of a high frequency note. The nature of this note and its loudness constantly change as the subject before the transmitter moves or is changed.

The television experimenter may, upon his first attempts, be puzzled to find his received picture either turned upside down or else reversed as when looking through a photographic negative the wrong way. Both of these faults can be corrected quite easily.

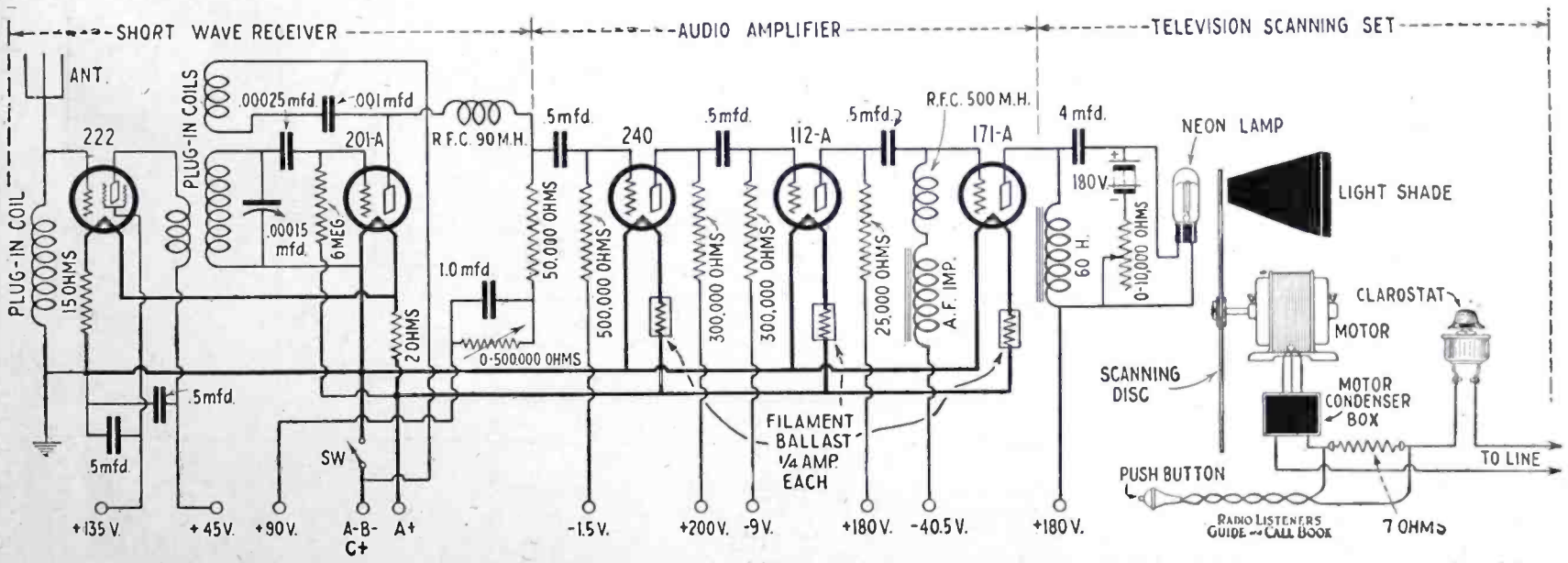
It is quite obvious when an image is upside down, and the correction of this fault is equally obvious. The subject before the transmitters of most stations is scanned from top to bottom during one rotation of the disc. Accordingly, if the receiving disc is so rotated that the plate of the neon lamp is scanned from bottom to top, the picture will be inverted. To reverse the manner in which the neon lamp plate is scanned vertically, it is necessary either to reverse the direction of the disc or to remove the disc from the shaft of the driving motor and turn it around. The latter operation may involve the removal of the hub and remounting on the opposite side of the disc.

Whether or not the received image is reversed horizontally, is impossible to tell unless one happens to know the scene being transmitted, or unless printed matter is held before the transmitter pick-up. The correction of any such fault as this is not so obvious. It is plain that whether the experimenter scans the plate from the top to bottom or from bottom to top, makes the difference between the picture being right side up or upside down. Similarly, whether the experimenter scans the plate from left to right makes the difference between seeing the image correctly or reversed.

How can we make the holes pass the plate in the opposite direction and still progress from top to bot-



Above shows constructional details of the scanning cabinet. For additional rigidity it is recommended that three shelf supports be placed beneath the motor shelf. Soft rubber cushion pieces should be used in mounting the motor on the shelf to protect against cabinet vibrations.



Wiring diagram of the complete television receiver employing a short wave set with one shield grid R.F. amplifier and three stages of resistance coupled audio amplification. The line shown at the right is the 110-volt house line.

tom? Reversing the rotation of the disc alone will turn the image upside down. The disc must also be turned around on the shaft of the motor. Thus if the image is right side up but reversed, we must reverse the direction of rotation of the disc, and also remove the disc from the shaft and turn it around with the other side out.

In spite of the fact that these two factors make three wrong combinations and only one correct one, the wrong combinations provide perfectly recognizable images whose worse fault is to be upside down.

Should the image obtained be a negative instead of a positive, the trouble is due to reversed A.C. connections to the neon lamp. Interchanging these connections will correct the trouble.

In experimental work at stations WRNY and WLEX, it is said it was found that the television signal may be almost submerged in noise and yet provide a picture.

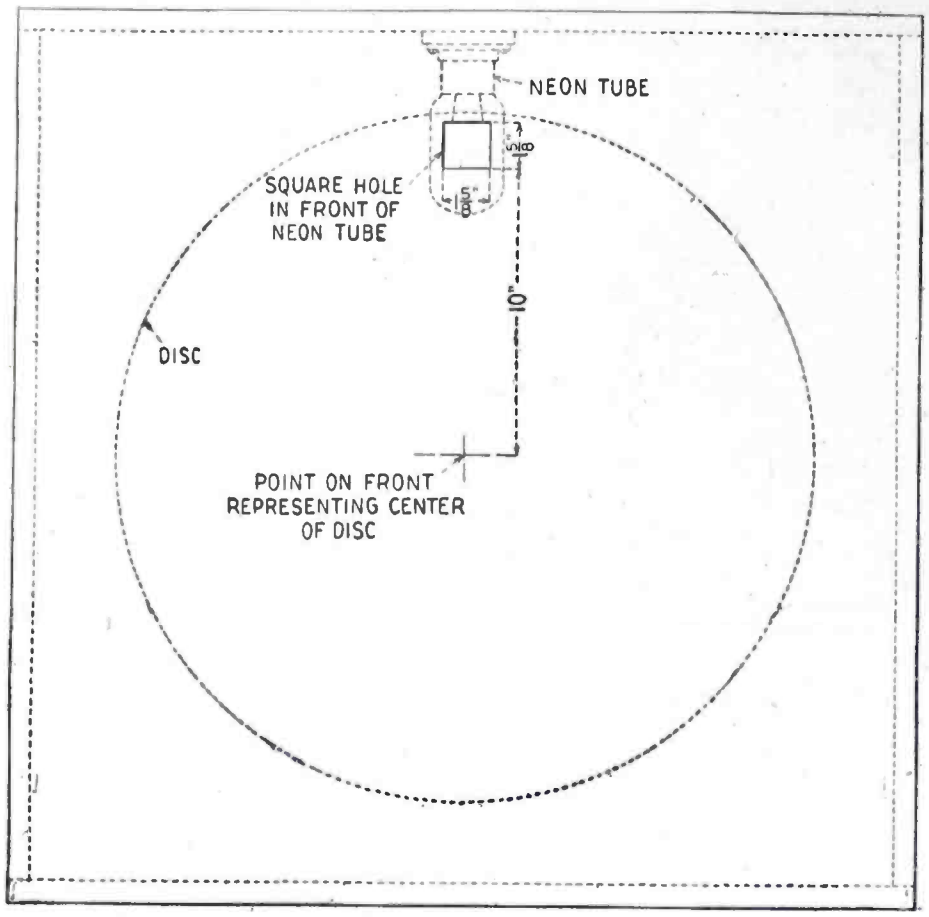
It is true that when we are interested in listening to a signal, the noise level is an important determining factor; but in the case of television, the noise level may be high and, in fact, so high as to make speech transmission hopeless, and still a fair picture can be received. Of course noise does not help matters. It produces a mottled background and tends to speckle the picture itself. Extreme noise will produce dark lines of varying width across the field of the picture. But in spite of this, the picture is there and since the noise is non-periodic unless introduced by vibration from the motor and disc, the speckle and dark lines are continually shifting position while the picture remains generally stationary or moves in an orderly fashion.

Therefore, if in the experimenter's attempts to receive television pictures he finds the signal more or less accompanied by noise, he should not judge the noise by sound broadcasting standards, but should go right ahead and try the signal on the disc. It goes without saying that the minimum of noise should be introduced by the set itself.

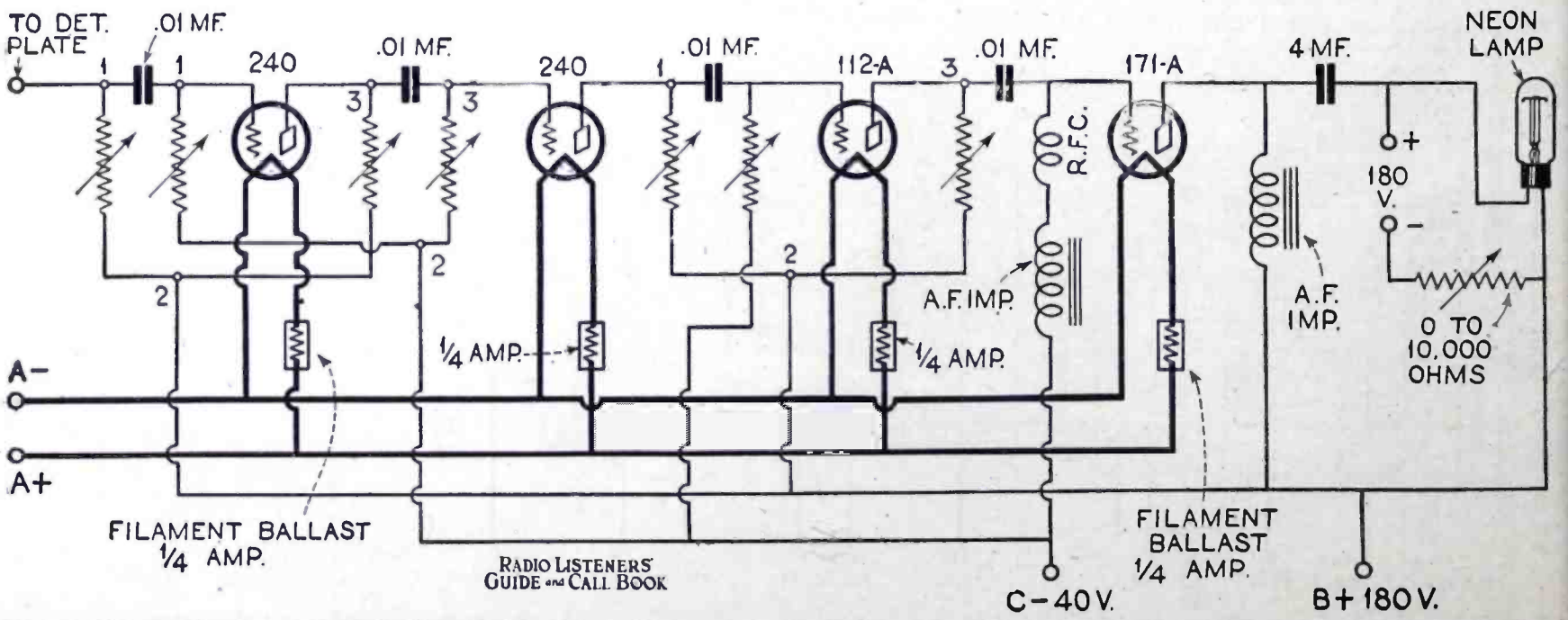
When a good television signal is being received, it sounds quite like a slowly revolving circular saw which is slightly off center. In other words, one hears a high-pitched note which might correspond to the tooth frequency, and which is broken up into groups whose frequency corresponds to the rate at which the saw (the disc) rotates. The latter we have referred to as the group frequency, while the high-pitched note is the modulation introduced by the scanning spot. If the disc speed is high and the signal weak, it may easily happen that the only sound audible in a pair of 'phones will be the group frequency. Even so this is no indication that a fair picture cannot be received.

The actual operation of the television receiving apparatus shown in the diagram on page 79 is comparatively simple, as controls have been minimized wherever possible. All variable controls are confined to the short wave receiver and scanning set.

After having received television signals on the short wave set by



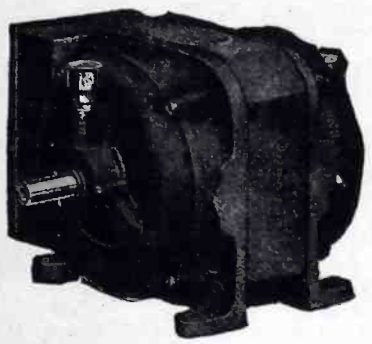
Front view of the television cabinet showing positions of lamp and disc.



Wiring diagram of a four stage television amplifier. The variable resistances with terminals marked 1, 2 and 3 are Duplex Clarostats while the resistance in the grid circuit of the third tube is a grid leak type Clarostat. The same B+ voltage can be applied to all resistances and adjusted to obtain proper voltages.

means of headphones connected across the output of the detector, the three-stage resistance-coupled amplifier can then be connected in the circuit. The amplifier should also be tested on actual reception of the television signal with headphones before connecting the scanning set.

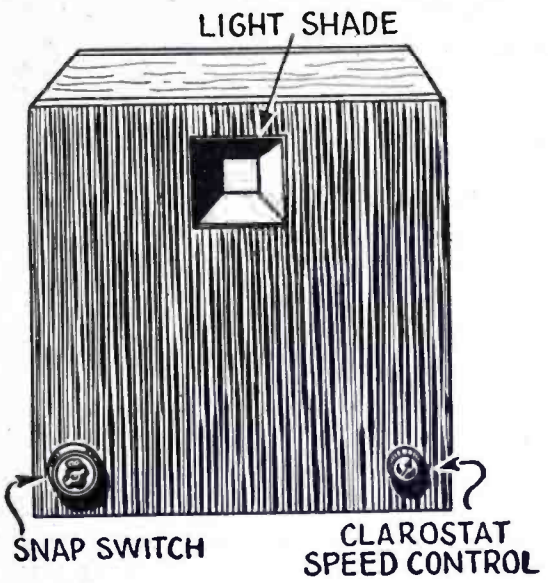
Before it is possible to receive television signals it is necessary to know whether sufficient amplification is being obtained to properly operate the neon tube. With the neon tube connected and the scanning disc revolving, tune in the signal of the station broadcasting television and note the results. If the station has a strong signal, the impulses will immediately cause the



This is one of the motors especially designed for driving the scanning disc of a television receiver.

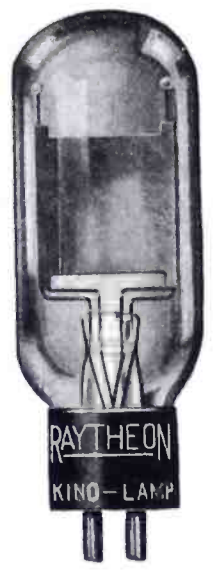
appearance of distinct geometric designs on the revolving disc through the light-shade observation window. Also, when a signal is not being received, the neon tube should give off a steady glow; and, on looking through the holes of the disc while in motion, the screen should appear perfectly clear with the exception of fine parallel lines—which are hardly noticeable when a well made scanning disc is used and the set is operating properly.

When all of the foregoing suggestions have been carried out and tests



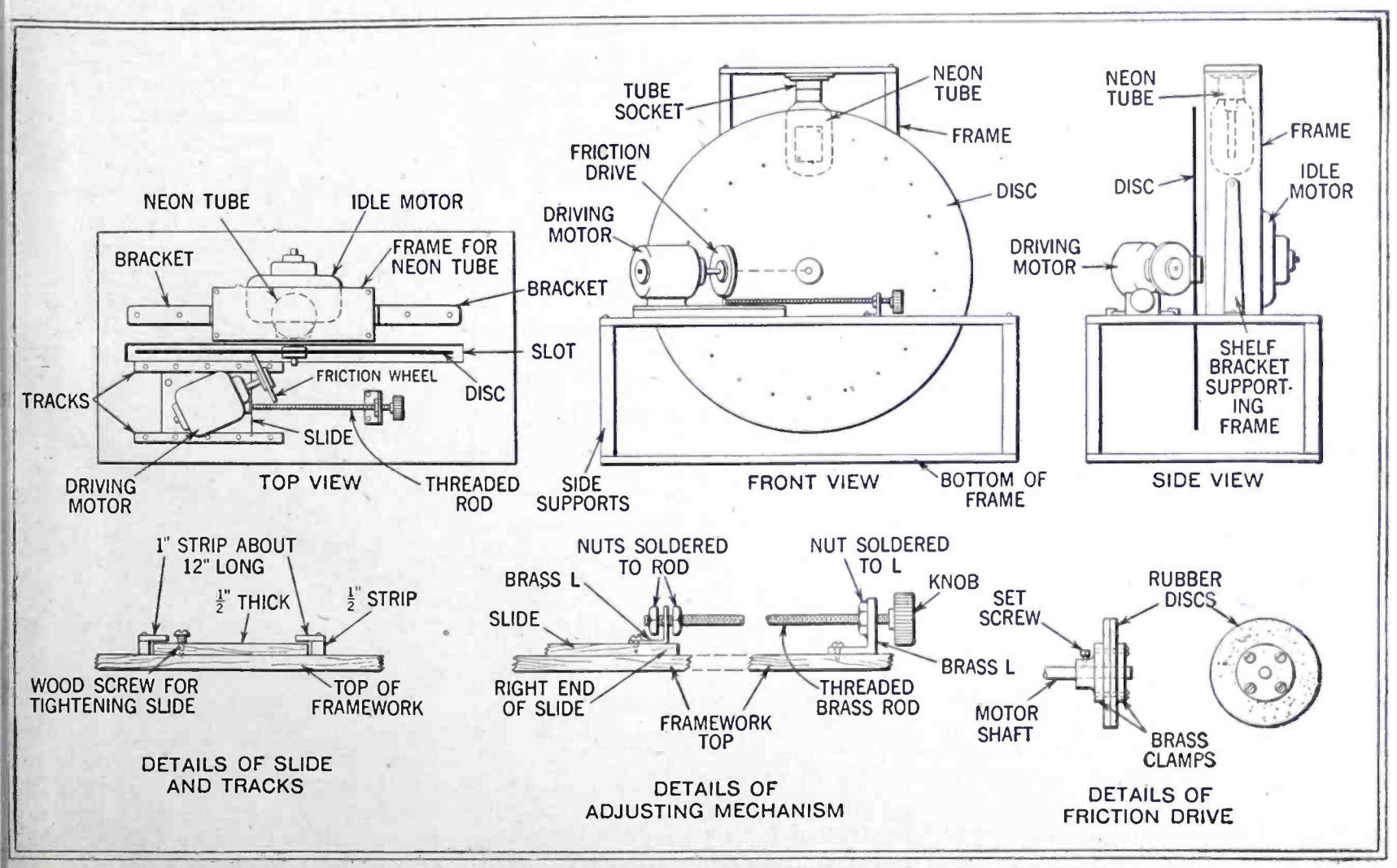
A front view sketch of the scanning cabinet (with cover closed) for the experimental television receiver. The finished cabinet should be given a coat of dull black paint on the inside and the outside can be stained in any dark color to suit the builder.

have been made to the complete satisfaction of the experimenter, the television receiver should give some degree of successful results. The only problem is to adjust the speed of the disc to synchronism with the disc of the transmitting station. This is accomplished in the circuit given on page 79, with the Clarostat speed control and push button. It may require considerable experimenting before the receiving disc is brought into synchronism; but after a little practice is will be found not as difficult as might be expected. It is well to use a revolution-counter or "tachometer" to determine



This neon lamp has a plate measuring 1½x1½ inches.

whether the disc is running at the same speed as that of the station being received.



Details of the Jenkins method of driving the scanning disc. With this arrangement a universal type motor may be used without any speed control of the motor itself. The speed of the disc is controlled by moving to or from the center of the disc.

THE H.F.L. MODEL 10 ISOTONE SCREEN-GRID RECEIVER

THE receiver shown in the photos and diagrams of the article to follow is a custom built kit of the type which can be completely assembled and wired in less than one hour. The totally new features which are incorporated in the design and construction of the set makes it one of the most up-to-date, efficient and finest in appearance at the present time.

Inasmuch as the three main units which make up the H. F. L. Isotone are subjected to very rigid factory inspections, there is no occasion to go into the details pertaining to the wiring and assembly work which is done at the factory. The reader may gain a comprehensive idea of these operations by referring to the diagrams and photos which accompany this article. We may therefore devote this space to a general description of the features of the Isotone and some of the new ideas which will of course be quite interesting to everyone.

Fundamentally the H. F. L. Isotone is a standard screened grid super-heterodyne receiver utilizing nine tubes (the 10th tube is for phonograph operation) which is capable of allowing the extremely high radio frequency gain of 65 per stage.

This unusual sensitivity is a product of the specially designed screened grid amplifier which operates at the highly desirable frequency of 450 kilocycles. This allows the receiver to be operated in an absolute one spot fashion.

The ten kilocycle selectivity so much required by the set constructor is a consideration that is easily met by virtue of the high frequency intermediate transformers. These transformers have small variable condensers shunted across the secondary windings which allows the owner of the receiver to hand tune his instrument for maximum selectivity.

LIST OF PARTS IN KIT

1 H.F.L. assembled and wired tuning unit, TU1, TU2, TU3.
1 H.F.L. assembled and wired screened grid amplifier, SGA 1, 2, 3 and 4.
1 H.F.L. assembled and wired audio amplifier, AA.
8 H.F.L. copper shield cans with tops.
1 H.F.L. silver finished steel base assembly plate.
1 H.F.L. drilled and engraved front panel.
1 H.F.L. seven wire cable and socket.
2 H.F.L. gold escutcheon plates with knobs, attached to the tuning unit.
2 H.F.L. six volt dial lights.
3 H.F.L. walnut finished bakelite knobs.
Miscellaneous nuts, bolts, hardware and instructions.

The three stage push pull audio amplifier which is automatically controlled for either phonograph or radio reproduction places the Isotone up in line with the finest musical instruments.

The front panel has been stripped of all of the pretentious frills that are ordinarily found on receivers of this type, and one simply sees two well designed gold tuning dials which are illuminated through pyralin strips. The small amount of lettering is embossed with gold leaf into the panel itself which has a grained walnut finish. All of the shielding is polished to a jewelry finish and given a good coat of lacquer. Even the steel bases are satin silver finished and it can be truthfully said that the appearance of the H. F. L. Isotone equals that of the finest factory built receivers.

The dimensions of the receiver chassis are standard. The length of the front panel is 26 inches and the height 7 inches. The receiver measures 10⅜ inches from the front of the panel to the back edge of the base plate. The Isotone was designed as a battery operated receiver, although the special ballasting system will allow very satisfactory operation from an A supply and a B unit.

In the first place a set builder desiring to construct an H. F. L. Isotone is not required to go out and pick up the various pieces required to make the assembly. Everything necessary comes in a sealed carton the contents of which is listed in this article.

The material found in the kit can be set up and wired in less than an hour by most anyone. On an actual test an Isotone was put together in 34 minutes after the material was removed from the carton. Most of the building consists of mechanical assembly operations in as much as the wiring itself consists of running in but ten battery connections. The wiring which is done by the set builder can be seen in the bottom view

photograph which accompanies this article.

Probably the most desirable feature of the H. F. L. Isotone is the switching and ballasting arrangement of the audio amplifier. When the set is being used as a radio receiver, three of the audio tubes and transformers are switched into the circuit forming a two-stage push pull amplifier using a 312A tube in the first stage and two 371A tubes in the second stage.

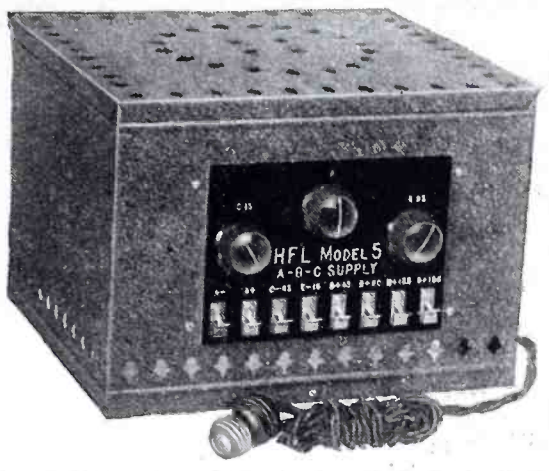
When the control switch is thrown to the phonograph position an additional stage of audio amplification is switched in ahead of the 2-stage amplifier. This stage consists of another 312A tube, a microphone input transformer, resistances, socket, etc.

When the control switch is thrown to the phonograph position the other six tubes in the receiver are not used and the special filament ballasting resistor compensates for the current load of these tubes. This is a highly desirable consideration in cases of operation with an A supply where the voltage being applied to the tubes is proportional to the current load.

When the control switch is thrown to the radio position nine of the tubes light up and the entire first stage of the audio amplifier is disconnected. Since all of the tubes are on individual filament resistors, applied voltages must remain steady and a considerable saving in tubes is affected by thus operating them slightly below their rated voltages.

Due to the carefully engineered balancing and winding of the audio-frequency coils the amplifier will furnish an unusually large undistorted power output. The Isotone easily handles cones of the dynamic type and while it has heretofore been considered impossible to handle low notes with a pair of 371 A tubes in push pull this theory has been exploded very nicely for the Isotone reproduces low notes with a natural intensity and does not over accentuate them or slight them.

For phonograph operation the flexible leads from the magnetic pick-up can be plugged right into the tip jacks of the audio amplifier



Here is an especially designed A, B and C battery power supply unit for use with the Isotone receiver.

and left in this position permanently, the control switch taking care of all of the necessary switching operations.

Before describing the other two units, it might be well to take up the method of unit construction. Each of the three main units of the Isotone has an individual steel sub panel and practically all of the wiring is done underneath this base. When any single unit is mounted on the main steel assembly plate the wiring becomes automatically shielded by virtue of the half inch of space between the bottom of the unit panel and the top of the main base plate. The only wires that are not completely shielded are the ten battery connectors on the bottom of the Isotone and inasmuch as 14 large by-pass condensers are built into the instrument it is probably the most perfectly isolated receiver that has as yet been introduced to the set building public.

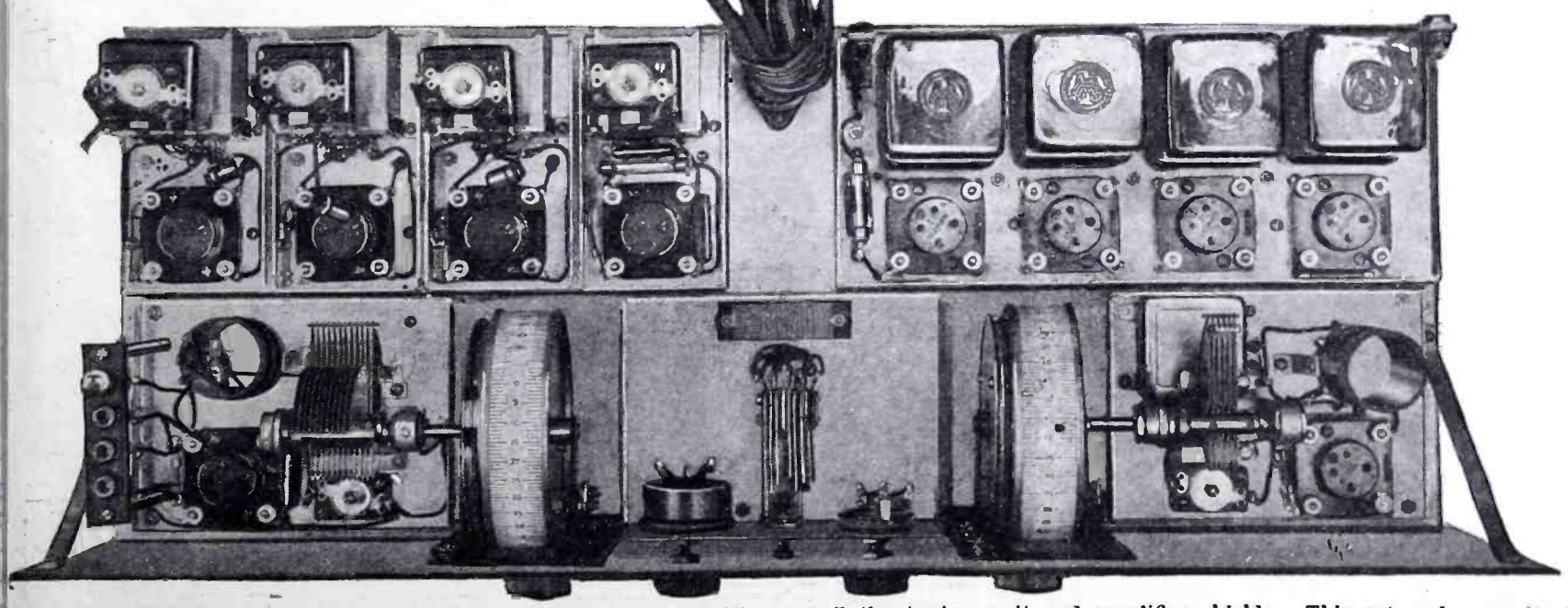
These by-pass condensers are, in a large part, responsible for the exceptionally fine distance range of the H.F.L. Isotone. Twelve of them are placed where they are used as tank condensers in the screened grid amplifier. These 12 condensers have a capacity of one microfarad each and the extremely low radio-frequency resistance of 1/10 of an ohm.

While this is an expensive practice the results seem to justify the expenditure, for the receiver is perfectly stable in operation and cannot be made to oscillate under any normal condition. The only way in which the set can be operated as an oscillating receiver is by the removal of the shield cans which cover the screened grid amplifier stages.

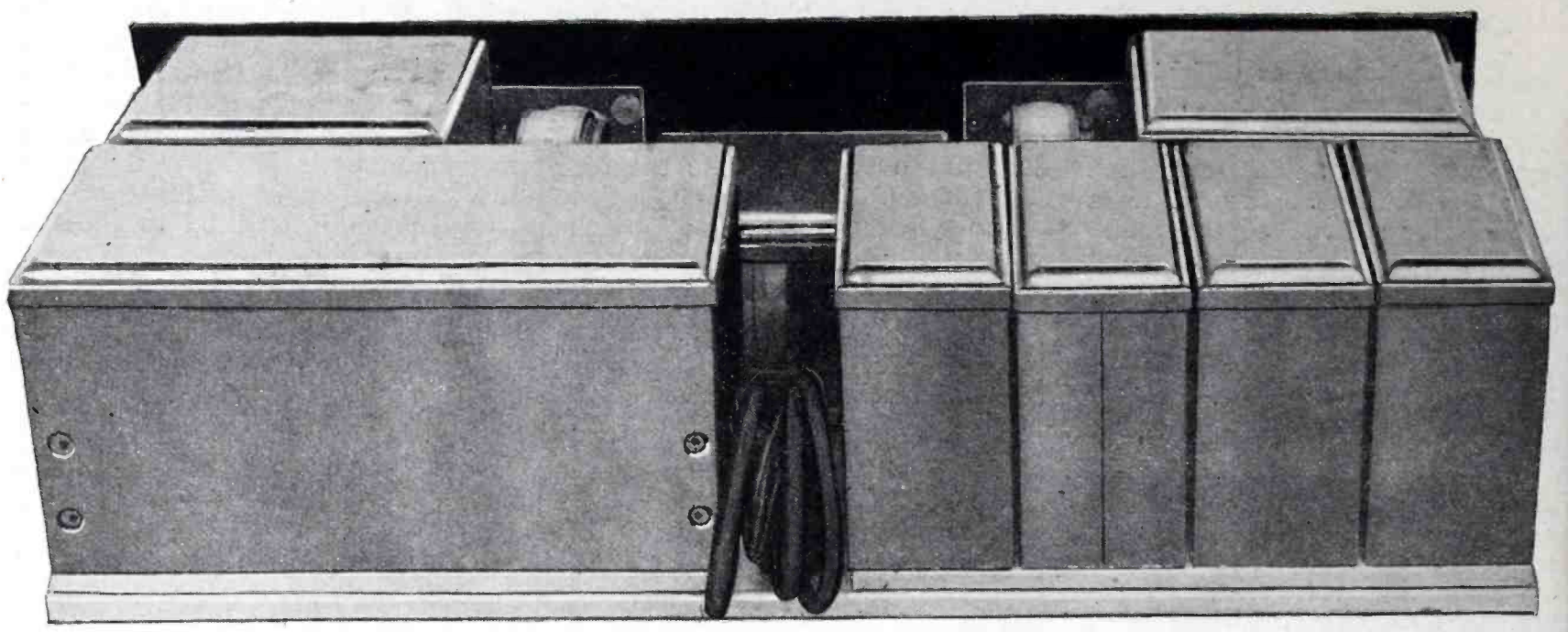
By reviewing the circuit diagram of the screened grid amplifier it will be seen that the conventional form of impedance coupling is not used. A very careful balance of transformer windings allows the use of transformers and their importance may be readily appreciated when it is realized that this allows a system of secondary tuning.

These circuits can be hand tuned by means of the small 25 micro-microfarad condensers which are shunted across the larger .0001-mfd. condensers.

Inasmuch as this automatically compensates for variations in the tube capacities it will be seen that the four transformers are really



A top view of the H. F. L. model 10 Isotone screen-grid receiver with tops off the tuning unit and amplifier shields. This set makes an ideal outfit for simplicity of assembly and wiring for the custom setbuilder.



The appearance of the H. F. L. model 10 Isotone receiver with covers of the shielded compartments in place as seen from the rear.

filter transformers and that the amplifier is maintained at all times in its most selective form. The sensitivity of the screened grid amplifier is controlled by an ingenious method of varying the voltage being applied to the screen grids.

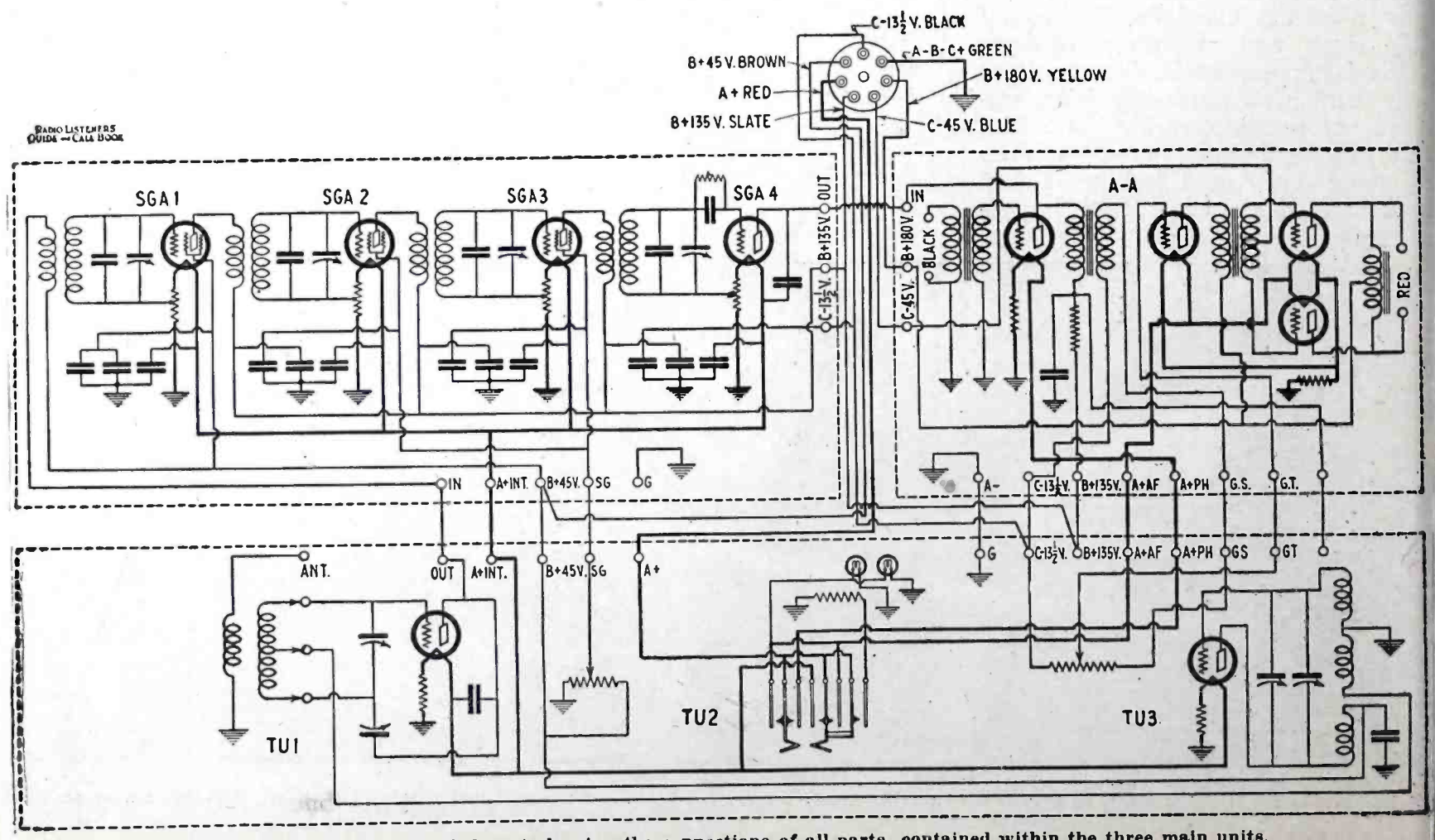
The front tuning unit has some new features which are well worthy of mention. The antenna-tuning circuit has a detachable coil which is a desirable feature inasmuch as it allows the set to be operated with both loop and outside antennas. The antenna-coupling coil has approximately the same characteristics as most popular types of loops. Thus, when the two-dial readings are matched up for consecutive alignment the dials will read in approximately the same position with either kind of an antenna.

This dial balancing operation is made possible by the small trimmer condenser which is shunted across the oscillator circuit. A fraction of a turn one way or the other brings the oscillator reading right up to the reading of the antenna-tuning dial for any given station. There is another small trimmer in the antenna-tuning circuit which serves as a regeneration control for the input circuit.

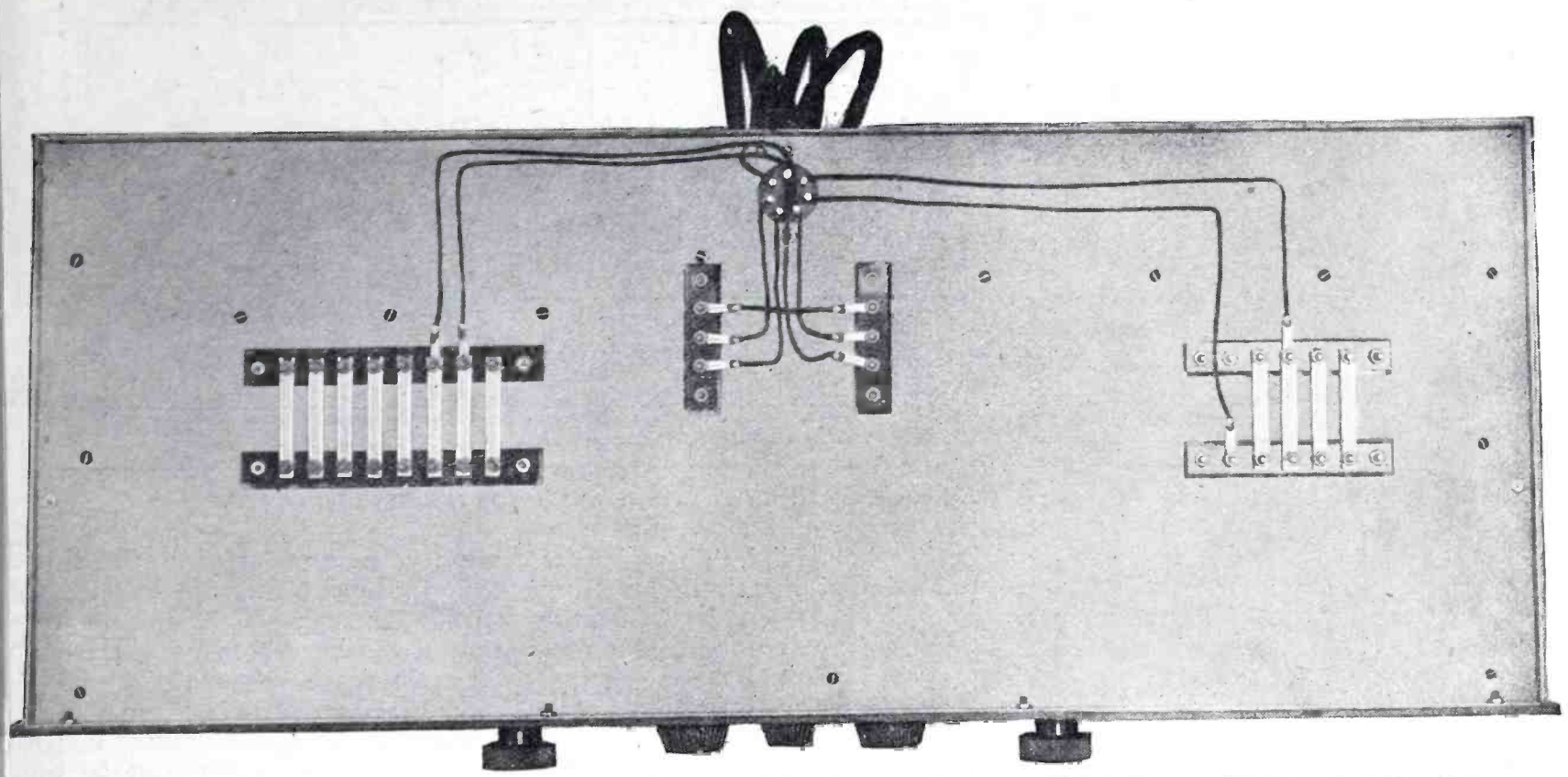
One nice feature about this antenna-tuning unit is the gold-plated hand-hammered dials. These dials are driven by a heavy cord held tight by a spring. The cord works in a vernier arrangement which gives very smooth control and eliminates any tendency toward back lashing of the dials.

The manufacturers of the H. F. L. Isotone have also designed a special power pack which furnishes all of the required voltages to the receiver. This power pack is sold completely assembled and wired and provides the following currents and voltages. A current 2½ amperes at 6 volts. C voltages variable 0 to 15, and fixed 45 volts. B voltages 45 (variable 0-90) 135 and 180.

There is a variable resistor in



Schematic wiring diagram of the set showing the connections of all parts contained within the three main units.



A view of the set from the bottom showing the simplicity of wiring the units by means of bus bars and leads to the cable plug.

he A supply circuit which allows he filament voltage being applied o the tubes to be increased or lecreased.

Careful attention has been paid o the design of the Isotonic Model ; ABC power supply. Oversize :ondenser sections and heavy :hokes totally eliminate all ten- lency toward motor boating and roltage fluctuation. The instrument ıses dry rectifiers and condensers hroughout and the plate current s furnished by means of a CX380 ectifier tube.

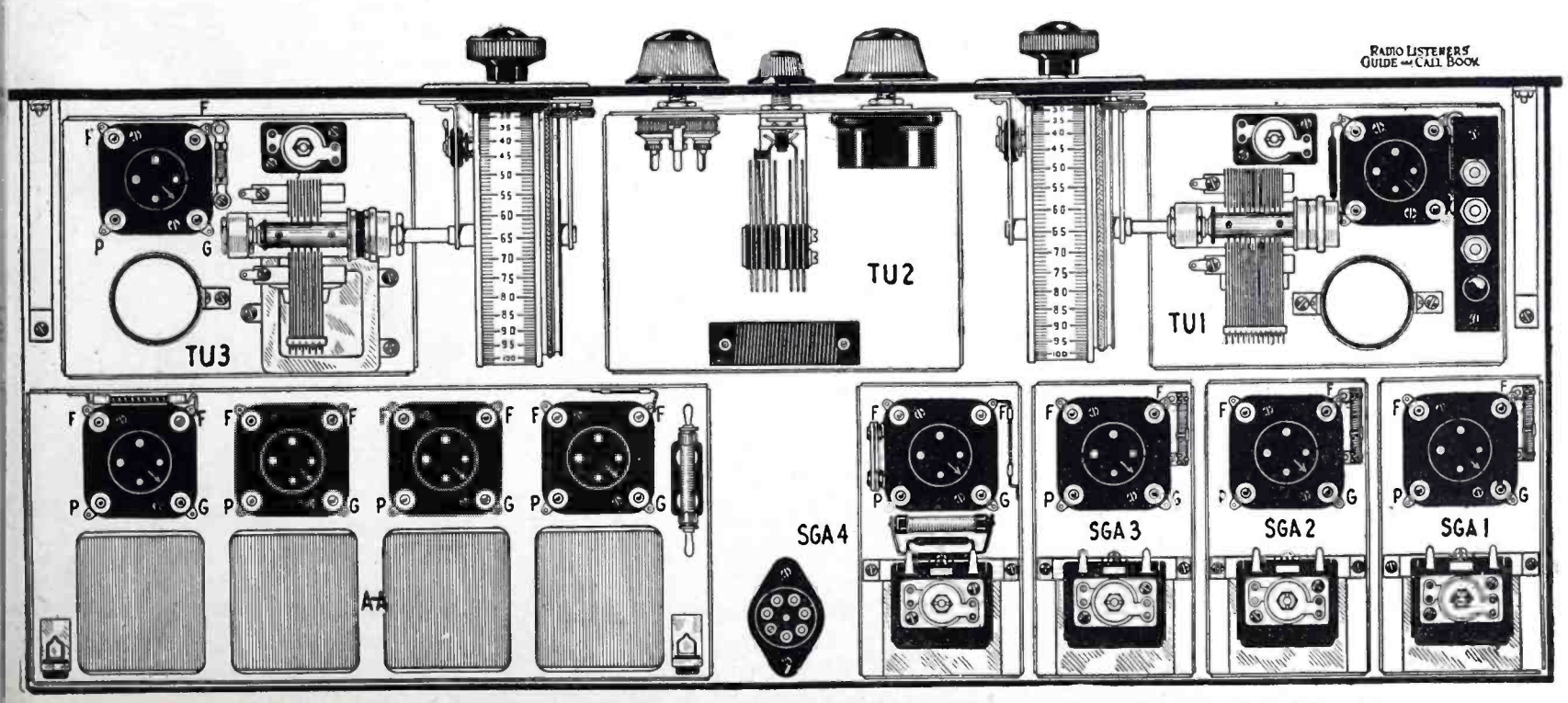
The accompanying photo of the nodel 5 ABC power supply will show these three variable controls ınd give the reader a general idea ıs to the appearance of the in- strument.

The battery equivalent of the special ABC supply would be four heavy duty 45 volt B batteries, one small 45 volt B battery (used as a C battery) two 7½ volt C batteries (connected in series) and one 6 volt 120 ampere hour A battery. The plate current drain of this set is approximately 30 milliamperes for the entire instrument and the filament current drain of the receiver is 1.9 amperes.

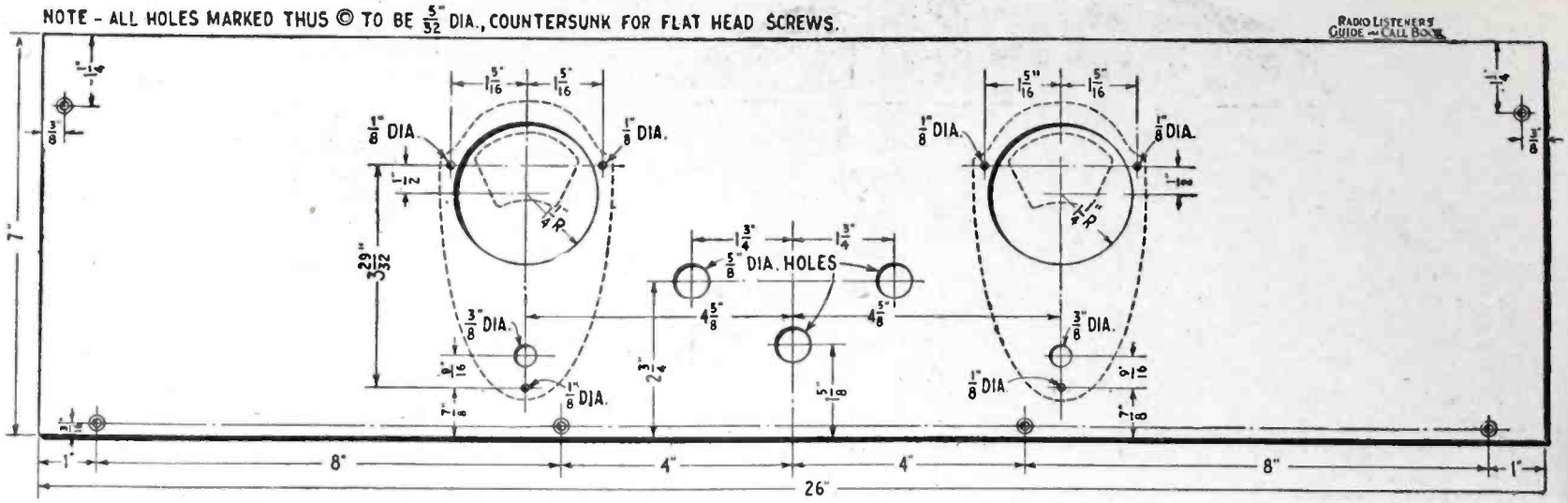
Assuming that many of our readers will construct the H. F. L. Isotone we will present a few hints in operating the receiver. To place the Isotone in operation you will require 3 type CX322; 3 CX312A; 2 CX371A, and 2 CX301A tubes. Instructions for the proper positioning of these tubes come with the kit of parts, and a glance at the accompanying pictorial and schematic diagrams will show where they fit into the circuit.

After the set has been connected up to its operating accessories there is a definite way in which to go about balancing the instrument, for best results. It is highly desirable to have an additional screened grid tube available to use as a substitute and thus eliminate the chance that one of these important items might not be operating efficiently.

Throw the control switch to the radio position and advance the two large control knobs around to the right as far as they will go. The left hand knob controls the screened grid



Instrument layout indicating the location of the units. All parts are marked to correspond with the wiring diagram.



Drilling layout of the front panel is given above for the constructor who prefers to drill his own panel.

voltage and at this point it is in an excellent position to act as a sensitivity control for the receiver. The right hand control is the voltage dividing resistance across the secondary of the first audio transformer.

Inasmuch as the individual units are balanced at the factory, the operator will undoubtedly locate a local station within a very short time by the simple process of rotating the two drum dials with their numbers reading numerically alike. The set will not squeal. The stations will simply come in and go out as the dials are turned over and the set tunes so easily that one's first sensation is a lack of power. This impression will be immediately dispelled when the first distant station is encountered coming in with full loud speaker volume.

The first balancing operation is to line up the 2 dials so that they tune as nearly alike as possible all over the wave band. This dial balancing should be done on a station coming in at about number 45 on the left hand dial. To make the right hand dial match this setting the small trimmer condenser in the right hand front compartment (oscillator can) should be tightened or loosened until the two dials read numerically alike. There will be a slight variation in the settings at the upper and lower ends of the dials but in general they will run fairly close together.

To balance the intermediate amplifier the operator will be required to tune in a weak signal. If a far distant station can be located before the amplifier is balanced so much the better. At the start of this operation all of the shield cans and tops should be in place. Assuming that a station has been tuned in, leave all controls set just as they are and remove the shield top from the left hand screened grid stage. The trimmer condenser may be adjusted with a screw driver or socket wrench and it will be found that a variation of this capacity will have a large effect upon the intensity of the received signal. Tune the circuit for maximum volume and replace the shield cover. Repeat this operation right across the amplifier, taking care that the other three covers are always in place when any one individual stage is being tuned. The right hand or audio volume control may be reduced from time to time during this operation if it is found that tuning the transformers brings the signals in so loud that it is difficult to tell whether any improvement is being made by further tuning.

Once the intermediate amplifier is balanced it should be left that way permanently until such time as any of the screened grid tubes are changed. There is absolutely nothing to be gained by continually readjusting this amplifier inasmuch as all of these tubes are on individual filament resistors and they maintain fairly constant capacities.

The one remaining variable control is the small trimmer condenser in the antenna tuning stage. This is the regeneration control for that

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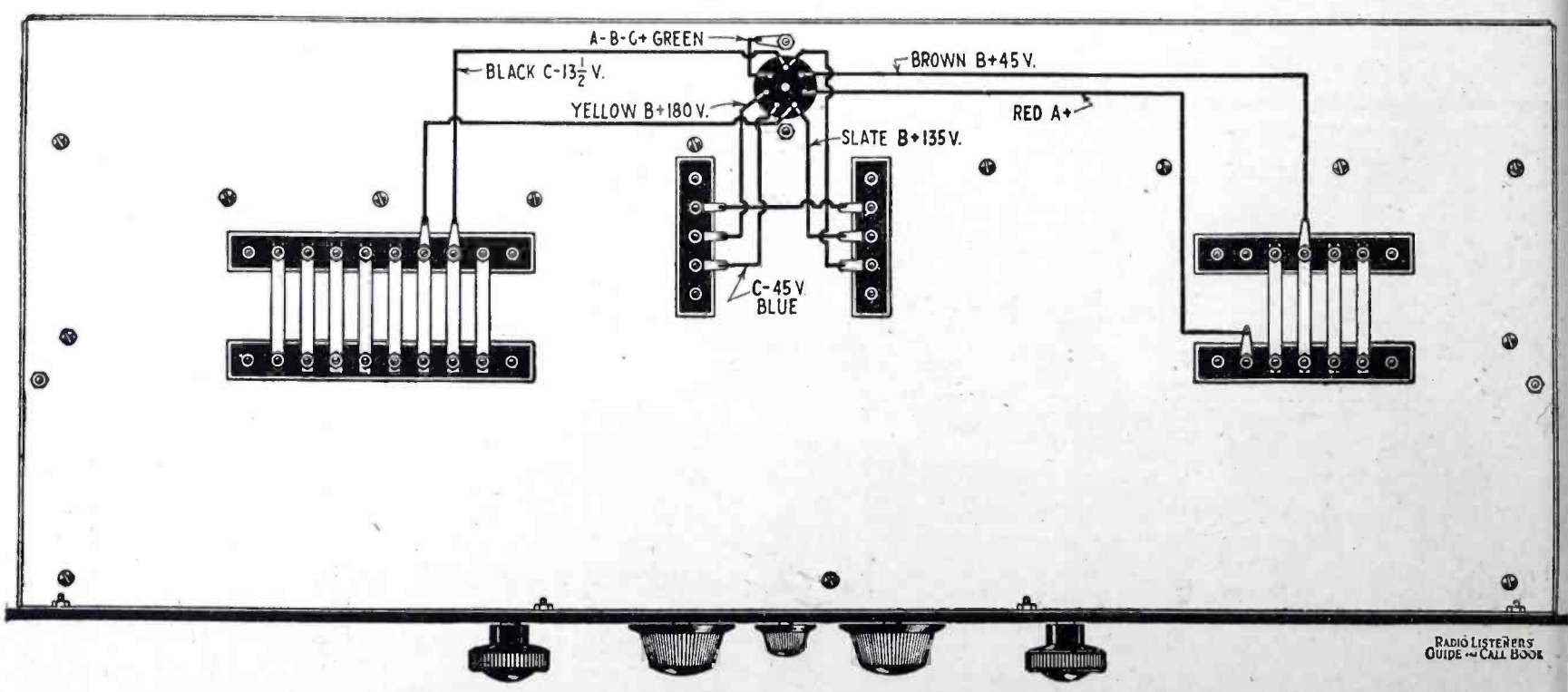
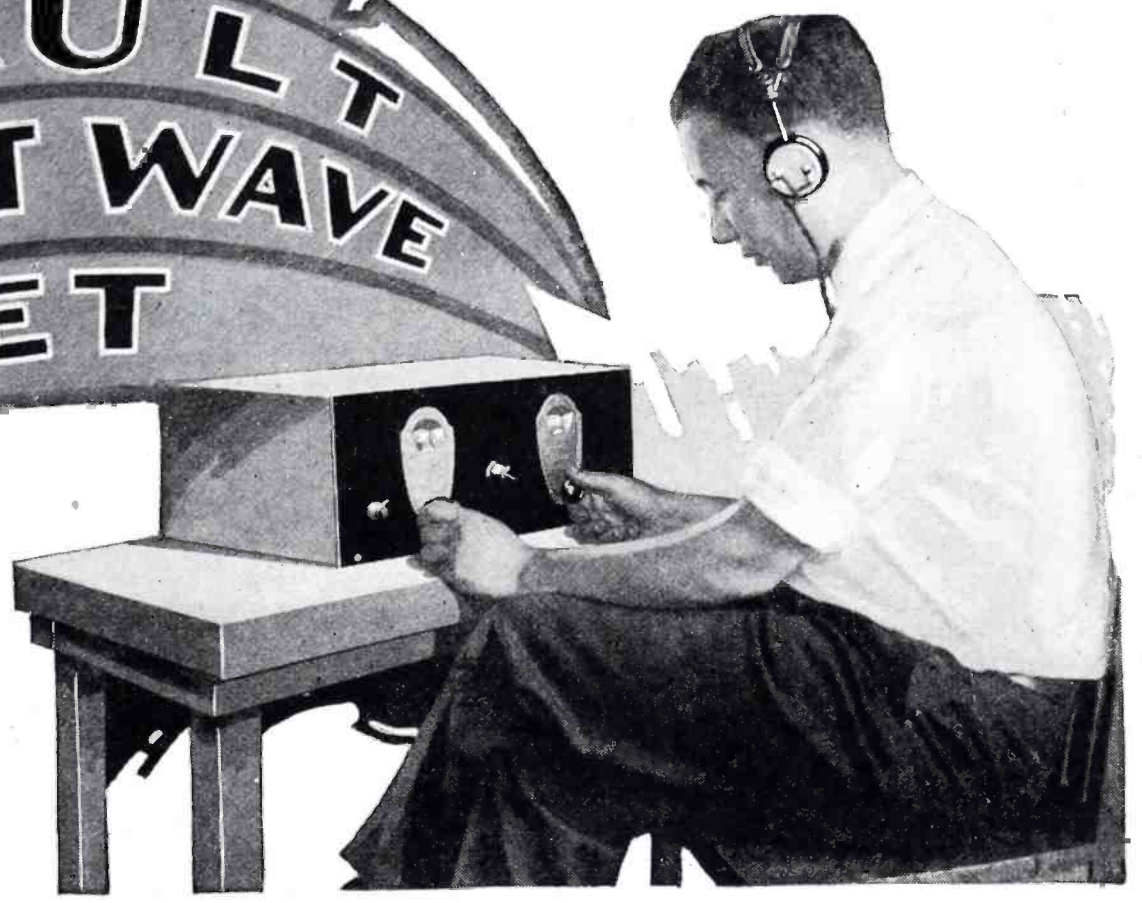


Wiring diagram of the battery leads and bus bars beneath the metal sub-panel chassis of the set.

THE LACAULT SHORT WAVE SET



SHORT wavelengths are now used for a great number of purposes and much interesting material, such as short wave broadcasting, telephotography, and television are broadcast every day. It is also possible to receive in a great many parts of the country some foreign broadcasting which is sent every day on short wavelengths. Stations in Holland and England have been received consistently on the Atlantic coast and several other foreign stations have been heard also often on the same short wave receiver.

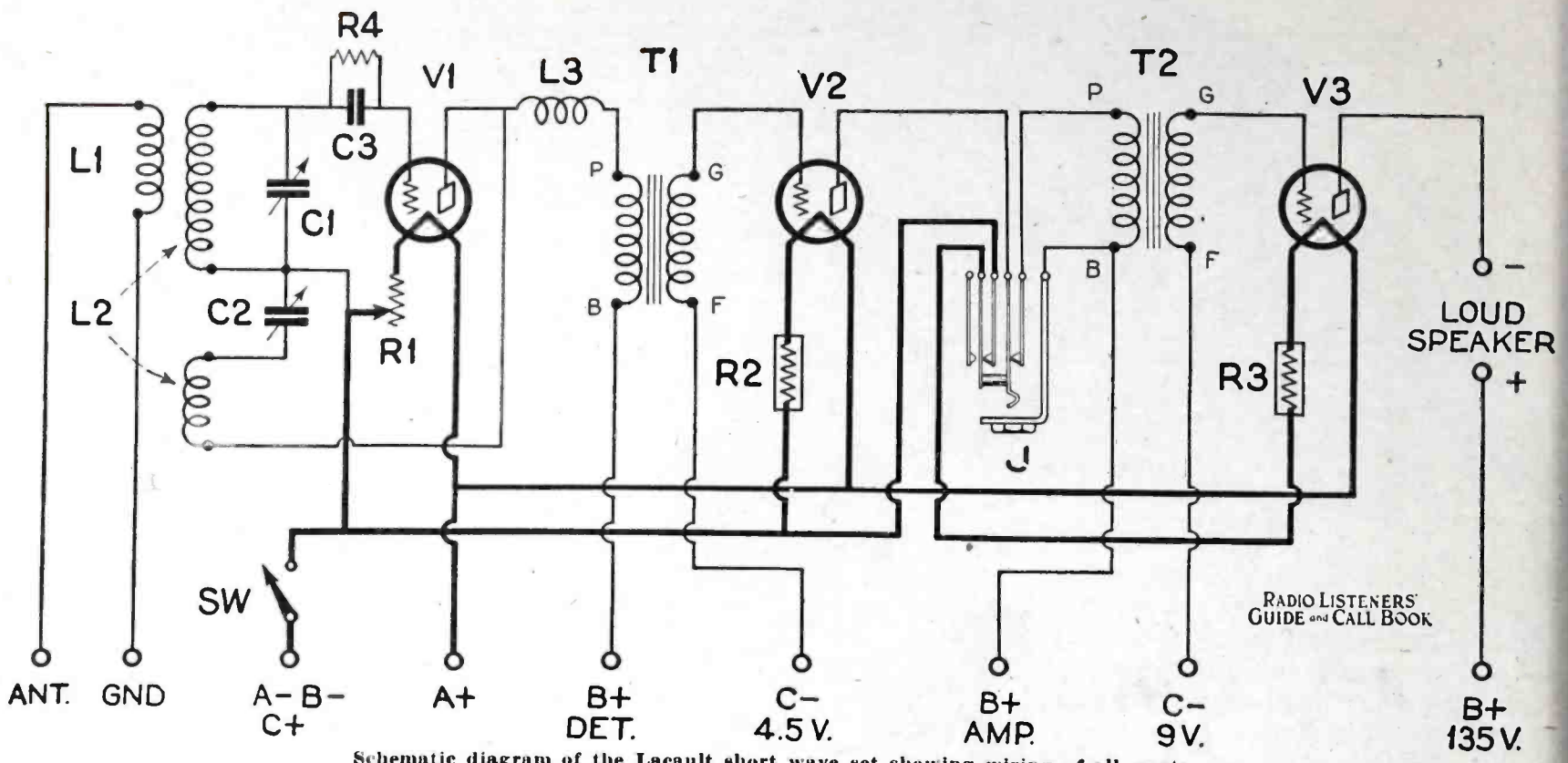
This is the receiver we intend to describe in this article because it incorporates some new features which we feel sure will be of interest to our readers. One of the great advantages of short wavelengths is that they are very sharp in tuning and a great number of channels may be used close together without interference. However, this becomes a disadvantage when tuning a short wave set because the tuning is so sharp on the average short wave receiver that one may easily pass over the stations without finding them. To remedy this trouble which is the only real drawback of a good short wave receiver the Lacault Short Wave Set is built with special inductances, which are calibrated. The chart which is furnished with the coils and the use of which will be explained in detail later, makes it quite easy to find on the dial any particular wavelength at a glance. The construction of the receiver proper is quite simple, as may be seen in the drawings which shows the position of all the parts on the baseboard and the panel. To assemble the set the parts which are listed in this article should be first procured and then laid out on the baseboard 17"x12" and ½ or ⅝" thick. The panel is 7"x18" of black bakelite. After the panel is drilled according to the drawings given herewith the parts, which are the two dials, the switch, the rheostat and the jack should be mounted upon it as shown in the drawing and the panel should be fastened on the edge of the baseboard by means of 3 flat head wood screws. The two variable condensers are then mounted on the dials which support them, the smaller one—that is the .00014 mf. condenser, being mounted on the left dial and the larger one, that is the .00035 mf. being mounted on the right dial.

All the other parts should be screwed on the baseboard exactly as shown and the whole set wired by means of bus bar or some other stiff wire which has the advantage of retaining its shape and therefore retaining the calibration of the circuit. If it is at all possible to do it and there is no reason why it could not be done by the average experimenter, it would be better to place the wires exactly as shown in the drawing because in the tuning circuit the calibration will be exactly according to the chart, while if it is wired differently in the tuning circuit, the calibration might be off slightly. However, this would only be a degree or so and would not affect the calibration very much. The reason why a small .00005 grid condenser with a high value of grid leak are specified is that it is found that with this combination of grid condenser and grid leak the regeneration is much smoother than with different values. In the case of the short wavelengths one will notice that when turning the regeneration condenser the signals amplify slowly up to the point of maximum amplification and then the set runs smoothly into oscillation without the strong click characteristic to some receivers which are not equipped with the proper grid condenser system to prevent this sudden oscillation in the detector circuit.

The connections to the antenna and ground may be made in various ways —one may use the regular antenna and ground used for broadcasting—that is an average length of wire of 100 feet or preferably less when using it on a short wave set. Another solution to get better results is to insert in series

LIST OF PARTS

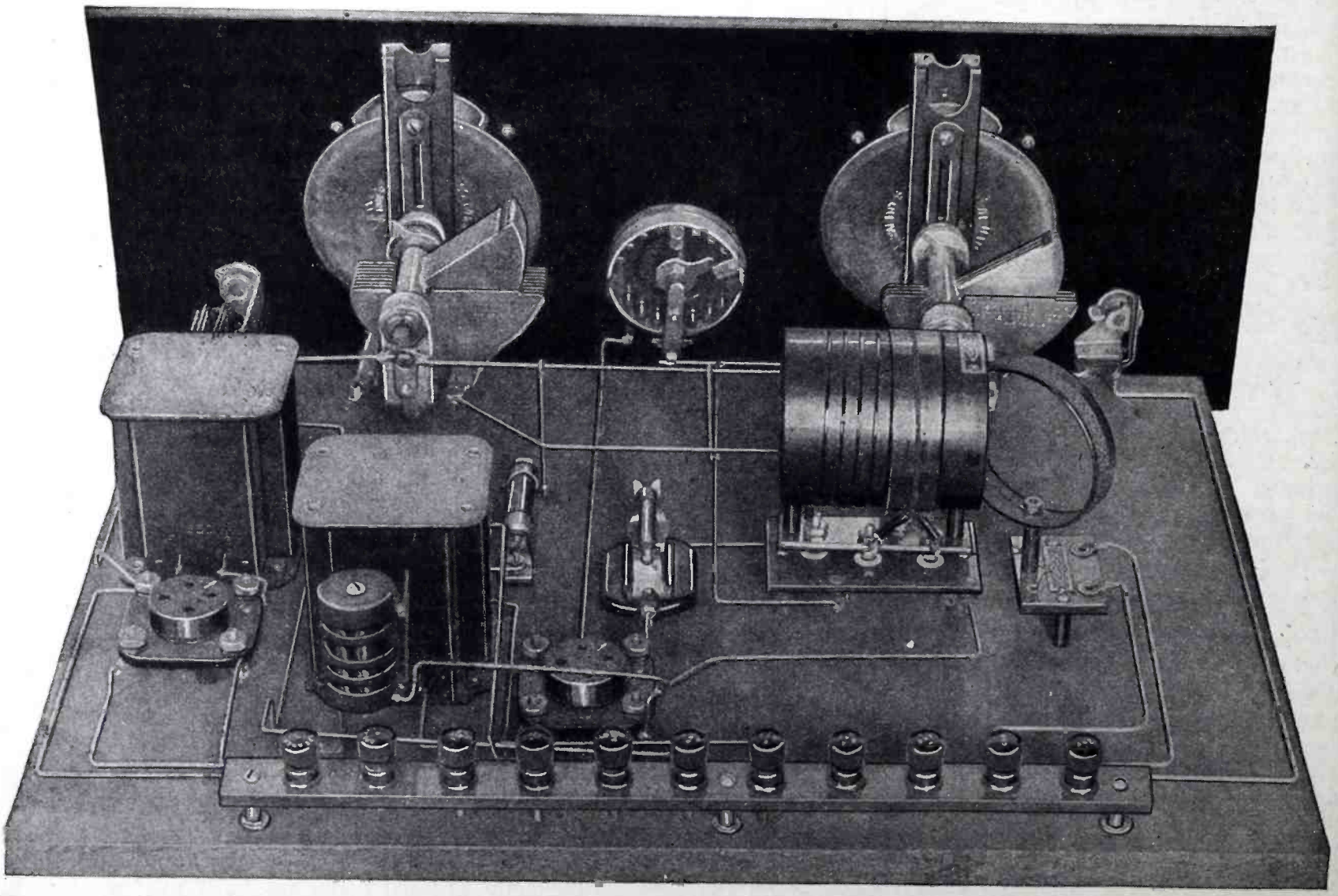
1 Formica front panel 7x18x3/16".
1 Wood baseboard 12x17x½ or⅝".
2 National dials.
1 Yaxley 20 ohm rheostat, R1.
1 Yaxley midget filament switch, SW.
1 Yaxley No. 5 jack, J.
1 Hammarlund midline .00014 mfd. condenser, C1.
1 Hammarlund midline .00035 mfd. condenser, C2.
1 Primary R.E.L. unit type P, L1.
1 Secondary with base R.E.L. unit type H1 (L2).
2 Plug-in coils R.E.L. units type H2 and H3, L2.
3 Benjamin spring sockets, V1, V2, V3.
1 1A Amperite, R2.
1 112 Amperite, R3.
2 Audio frequency transformers 3 to 1 ratio, T1, T2.
1 Aerovox .00005 mfd. grid condenser, C3.
1 Durham grid leak 5 to 8 megohms, R4.
1 R.E.L. 85 R.F. choke, L3.
1 Binding post strip.
11 Eby binding posts.
1 Pkg. Acme celatsite wire.



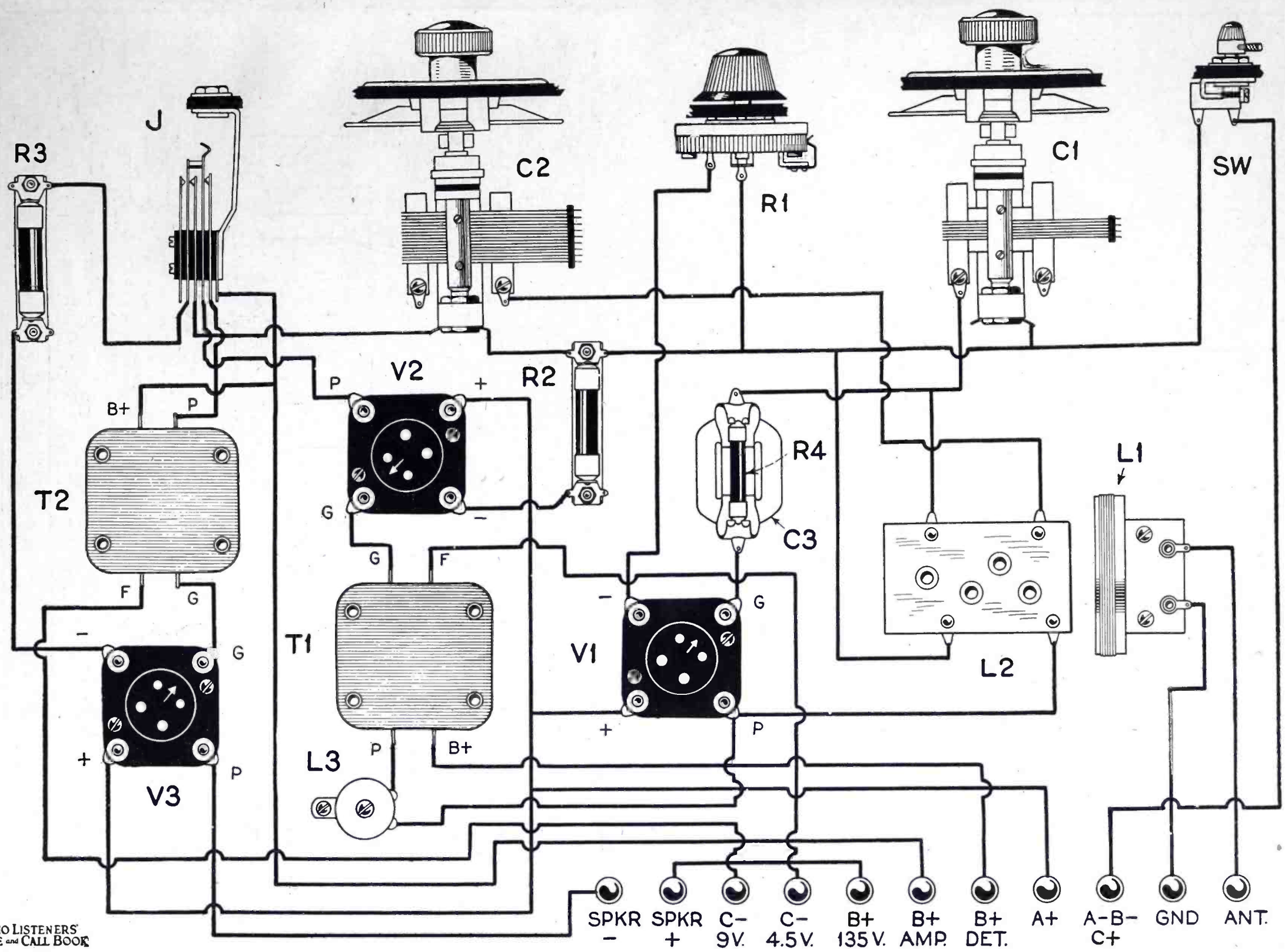
Schematic diagram of the Lacault short wave set showing wiring of all parts.

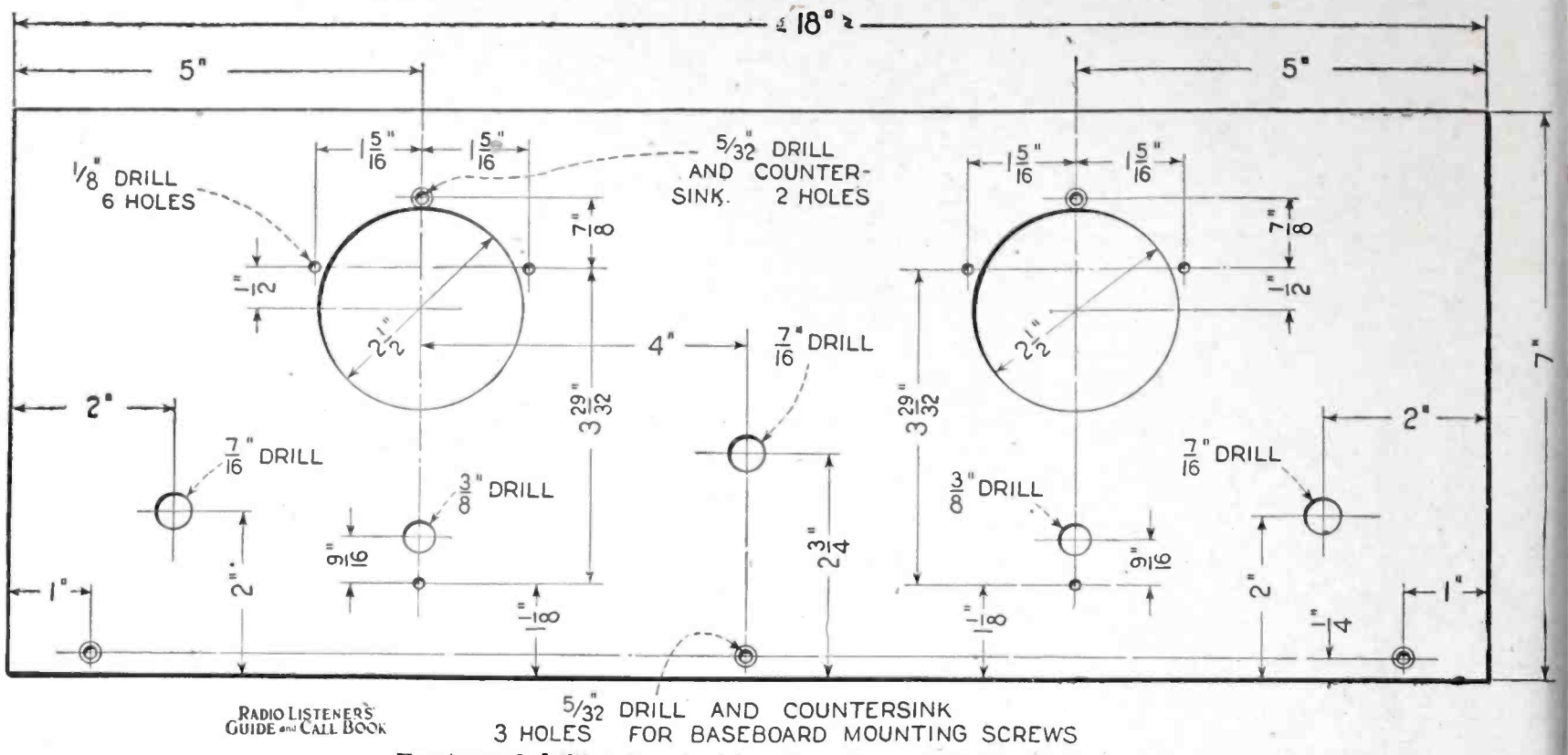
with the antenna circuit a small variable condenser of about .00025 capacity which may be used for the best results when receiving the shorter wavelengths. In some cases the antenna alone may be used without any ground connected to the set. In still some other cases it is found that using the antenna in series with the small variable .00025 condenser—the other side of the condenser being connected to the fixed plates of the tuning condenser—gives still better results.

This depends a whole lot upon the location, the type of antenna used and particularly its resistance. The resistance of an antenna may be affected by several factors such as the proximity of a fire escape, or tall metallic chimney, or some other metallic structure in the neighborhood. Moving an antenna which is erected along a steel frame building in another direction sometimes improves the result tremendously. The most fortunate of course are those who can erect an antenna in an open space such as a garden or a field or other open spaces where there are no obstructions in the neighborhood. This of course will yield the best results but since it is not always practical to do this, one has to be content with the regular antenna in-



How the set looks from the rear of the front panel. The plug-in short wave coil is at the right and audio amplifier section of the circuit at the left. The small spool-like coil in front of the audio transformer is the R.F. choke, L3.



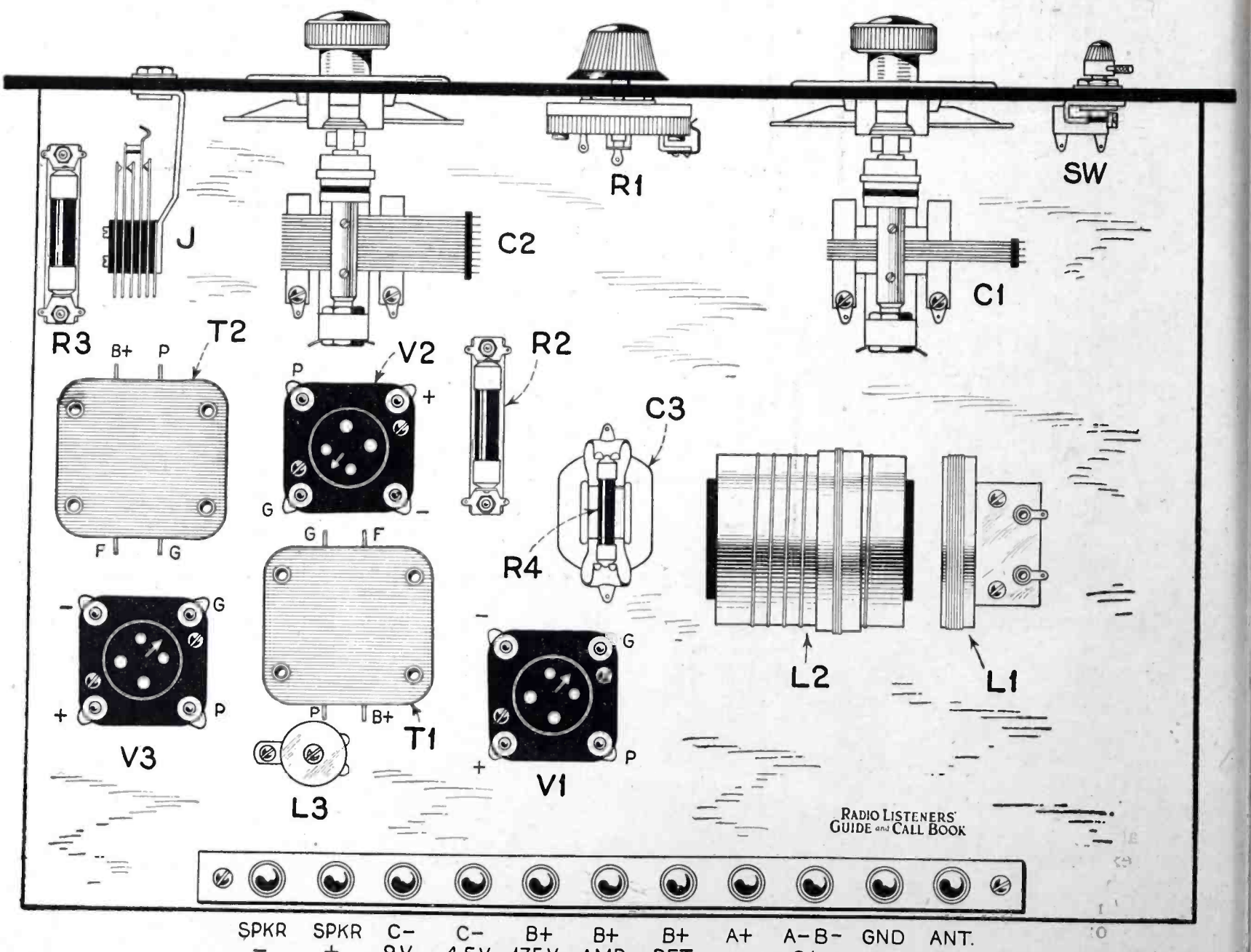


Front panel drilling layout giving dimensions of all holes to be made.

stalled in the cities on the roof, which is not always the best location.

The way to find out the proper setting on the tuning dial for any particular wavelength is to proceed as follows:

For instance, if you desire to tune the set to a wave length between 24 and 48 meters look on the calibration chart in the first column on the left marked coil H1. These numbers represent the wavelength in meters and



Instrument layout showing the location of all parts to be mounted on the baseboard and front panel. The legend of symbols corresponds with wiring diagrams and list of parts.

once you have located the wavelength to which you desire to tune the set—say for instance 34 meters—follow toward the right the horizontal line until it meets the curve marked coil H1. At the crossing point follow downward toward the dial settings and you will notice that the dial setting is 60 degrees.

If you wish to tune the set to another wavelength falling in the range of coil H2, that is, between 45 and 90 meters, you operate in the same way—that is, supposing that you wish to tune the set to 85 meters, you start horizontally and to the right from the figure 85 in the column of numbers marked "Coil H2" and follow the straight line until it meets the curve marked "Coil H2". At this point follow downward until you find 90 degrees to be the right dial setting for 85 meters when Coil H2 is plugged in the set. The same process is used for coil H3, that is when you tune stations between 80 and 165 meters. In this case the curve marked coil H3 is used to find the point at which the horizontal line crosses the vertical line.

Upon examining the chart one may see that when using coil H1, each one of the squares in the chart represents one meter of the wavelength. When using coil H2, each square represents 2½ meters, while when using coil H3, each square represents 5 meters. If the curve does not fall at the crossing of a line for a given wavelength at which you wish to tune the set it is easy to find approximately the setting at the dial where this particular wavelength will be tuned. It will only be a variation of two degrees at the most and it should be easy to find the location on the dial by moving the dial about 2 or 3 degrees at which point the station should be heard if it is on the air.

To adjust the set one may set the left dial to the proper setting and increase the right one until a click or whistle is heard indicating that the detector is oscillating. It is easy to check this by touching the stator of the tuning condenser because a strong click is heard when the tube oscillates. At this point move the tuning condenser back and forth one or two degrees on each side of the proper setting until the whistle indicates that the carrier wave is tuned in. Then decrease the right condenser until the music is heard (when listening to broadcast).

The tuning of the set is really quite simple and after one has tuned a few stations it becomes almost automatic in adjustment. The adjustment of the filament rheostat to control the detector tube is not critical and if the regular 1A type tube is used as a detector it may be left in place and is rarely used to vary the sensitivenes of the tube; although sometimes it helps to readjust it slightly especially on weak signals.

If one wishes to use a special detector tube such as the gaseous type of the 200A type or similar tubes one may do so and in this case the rheostat becomes more useful because as a rule these tubes are slightly more critical in adjustment than the regular 1A type. In the audio amplifier it would be best of course to use a 1A tube in the first stage and some power tube, such as a 112 or 171 in the second stage by connecting the proper C bias to the binding post provided for each one of the audio stages. The proper value of B and C voltage is given in the wrapper which comes with every tube and will be found in the carton containing the tube.

The performance of the set is very satisfactory as proved by reports received from various parts of the country and also from South American countries where a few of these sets have been built and are in operation at the present time.

Several of the owners report reception of English and Dutch broadcasting stations on short waves and other European stations were reported as being received fairly consistently on the Atlantic coast and even inland further. In South America the American stations such as KDKA and WGY

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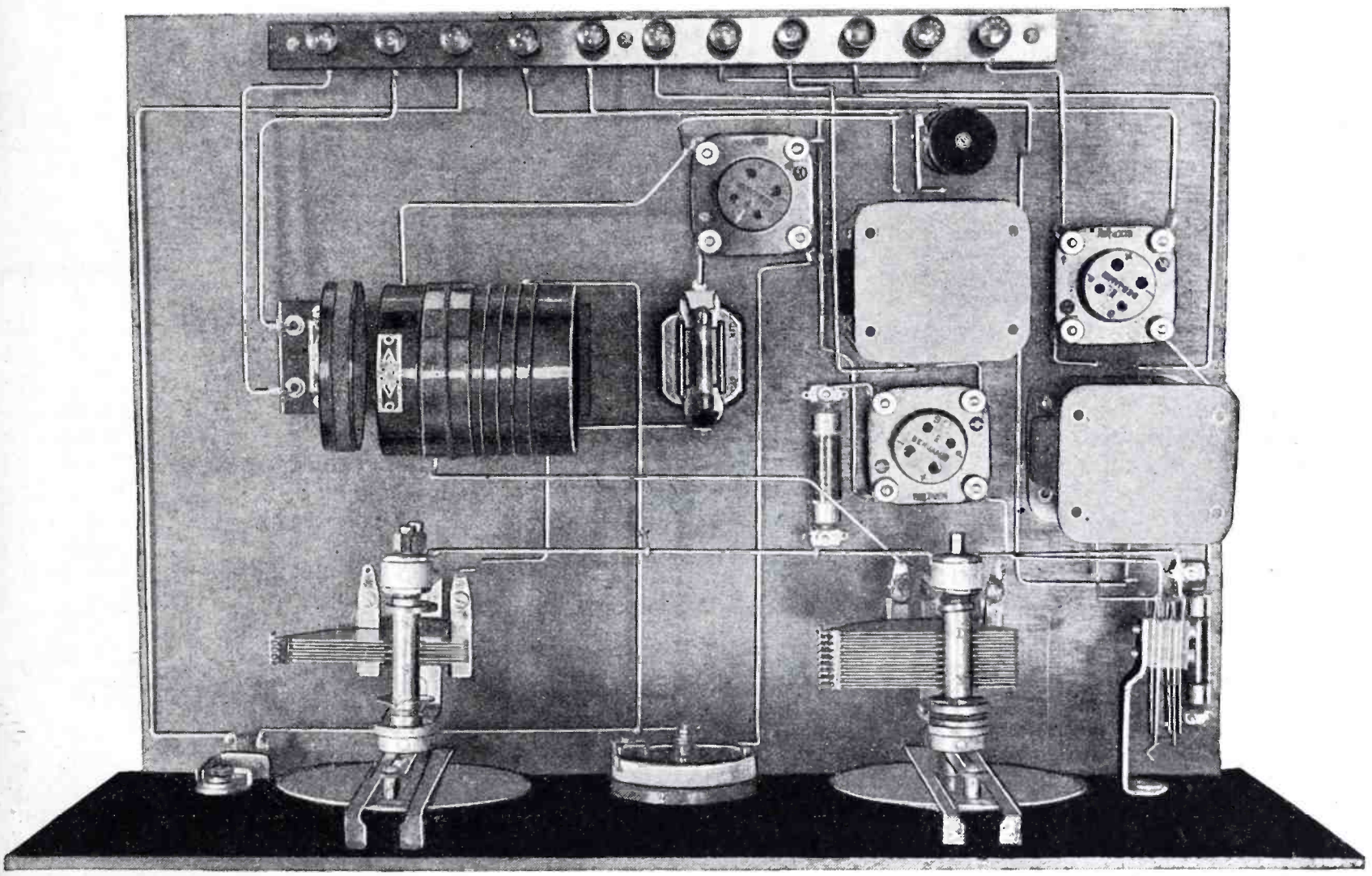


Above is a photo of the set looking down on the baseboard. The placement and wiring of the different parts is clearly shown.

The S-M 720 Screen Grid Six

DURING the past few years many radio inventions and developments have been hailed as "revolutionary," but if you try to recall any three of them you will find yourself unable to describe even the most startling of the features claimed for them. However, the introduction of the screen-grid tube eight months ago was an event truly deserving of attention by serious radio men, for the superior characteristics of this type of tube were well known before the actual advent of the device itself. This tube, with its high R.F. amplification factor, opened up a really new era in broadcast receiver design, and has changed the public conception of what radio reception can be like. Eight months, though, has been insufficient time to allow the set manufacturer to adopt the tube to his factory products, so the undisputed advantages inherent in the screen-grid tube can be obtained only by the custom radio builder, who is not handicapped by the inflexibility of cumbersome machinery. The man who builds his own radio receivers can, with the aid of the four-electrode tube, assemble at little effort a set that will far outshine the best commercial equipment available today.

One of the first tuned-radio-frequency circuits to employ the new tubes was the Silver-Marshall "Shielded Grid Six," which was brought out in January of this year. It achieved a popularity reminiscent of the halcyon days of 1922 and 1923, when anything marked "radio" sold like the proverbial hotcakes. During the spring of 1928 several thousand models of the Shielded Grid Six were built, and yielded results that surpassed the expectations of even the designers. The latter were so optimistic about the circuit that they offered the kits with the promise that it would outperform any other set at all, and recent reports show that they were not unduly enthusiastic about their claims. Less than one per cent of all the kits sold were returned as unsatisfactory. These facts, and others which have been observed in the field, justify the conclusion that the screen-grid tube has marked a definite turning point in radio reception, and has served to increase the dependable receiving range of the broadcast receptor.

With the aid of the experience furnished by the first model, the designers set about this spring to improve the Shielded Grid Six: to increase the selectivity and to reduce the cost. Some skeptics sourly agreed that the set could be improved, but then any product of man's handiwork is never perfect.

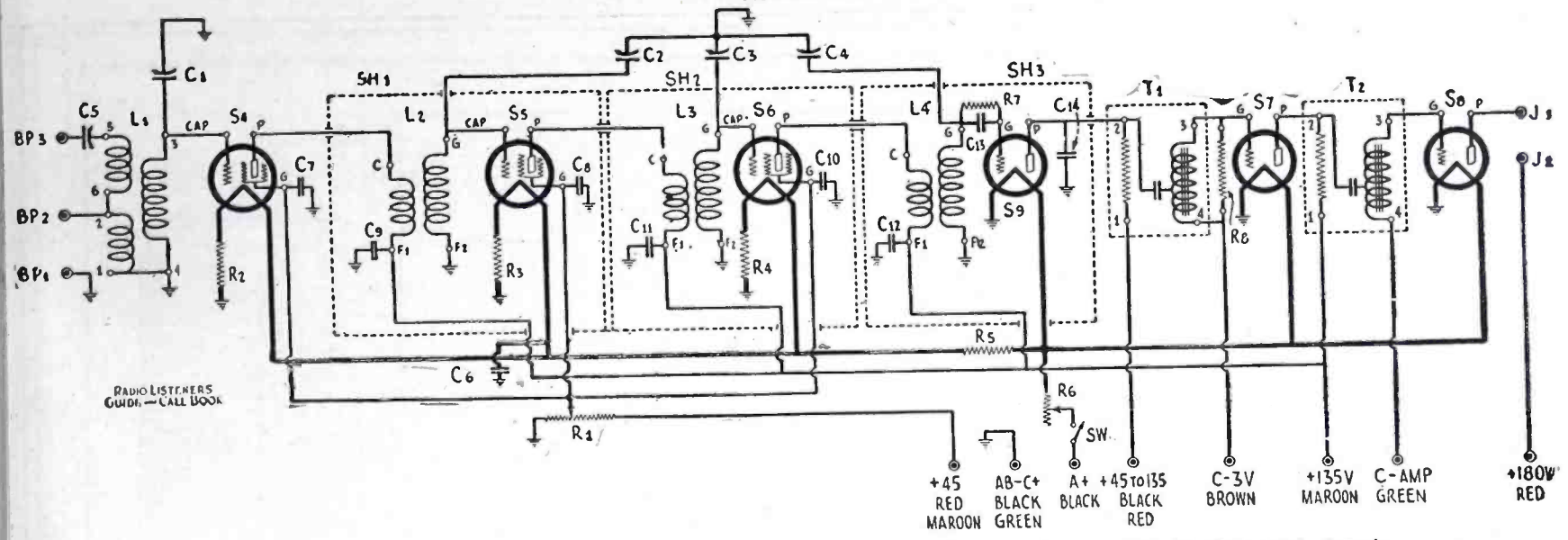
The object was to develop a superior radio receiver that would be lower in cost than the cheap ready-made sets. This was somewhat contrary to recognized kit practice, as all good standard kits cost close to one hundred dollars. However, in July the seemingly impossible task had been accomplished. A kit has been developed, and several duplicates of the original model made for a cost of less than seventy dollars. In direct comparison with the original Shielded Grid Six, the new model gave better tone quality, superior selectivity and far greater selectivity.

The new receiver has been named the 720 Screen Grid Six. It uses six tubes in a fully shielded screen-grid circuit, and possesses all the features of metal chassis, antique brass escutcheon, all-metal shielding cabinet and low cost, all providing a distinction of appearance certainly equalling that of the more costly factory-built receivers.

The results obtained from the 720 Screen Grid Six deserve that much abused adjective "startling." In the city of Chicago, a notori-

LIST OF PARTS

1 S-M 701 Universal pierced chassis.
1 S-M 809 dual control escutcheon, E.
1 S-M 806L (left) vernier drum dial, D.
1 S-M 806R (right) vernier drum dial.
1 S-M 320R .00035 mfd. Universal condenser, C1.
1 S-M .00035 mfd. 3-gang condenser, C2, C3, C4.
1 S-M 342B .000075 mfd. midget condenser, C5.
3 S-M 638 copper stage shields, SH1, SH2, SH3.
1 S-M 140 antenna coil, L1.
3 S-M 132A plug-in R.F. transformers, L2, L3, L4.
3 S-M 512 5-prong tube sockets for R.F. coils L2, L3, L4.
5 S-M 511 tube sockets, S4, S5, S6, S7, S8.
1 S-M 255 first stage A.F. transformer, T1.
1 S-M 256 second stage A.F. transformer, T2.
1 S-M 708 10 lead, 5-foot connection cable.
1 S-M 818 hook-up wire (25 ft. to carton).
1 Yaxley 53000, 3,000 ohm midget potentiometer, R1.
1 Yaxley 500 switch attachment, SW.
2 Yaxley 420 insulated tip jacks, J1, J2.
3 Carter RU10, 10 ohm resistors, R2, R3, R4.
1 Carter A6, 6 ohm sub-base rheostat, R6.
1 Carter H1½, 1½ ohm resistor, R5.
1 Polymet 1 mfd. by-pass condenser, C6.
6 Polymet ¼ mfd. midget condensers, C7, C8, C9, C10, C11, C12.
1 Polymet .00015 mfd. grid condenser with clips, C13.
1 Polymet .002 mfd. by-pass condenser, C14.
1 Polymet 2 megohm grid leak, R7.
1 Durham .15 megohm resistor with leads, R8.
1 S-M cushioned tube socket, S9.
3 Moulded binding posts consisting of 8/32 screw, nut, and moulded top, BP1, BP2, BP3.
Miscellaneous hardware.
1 Pkg. Acme celatsite hook-up wire.

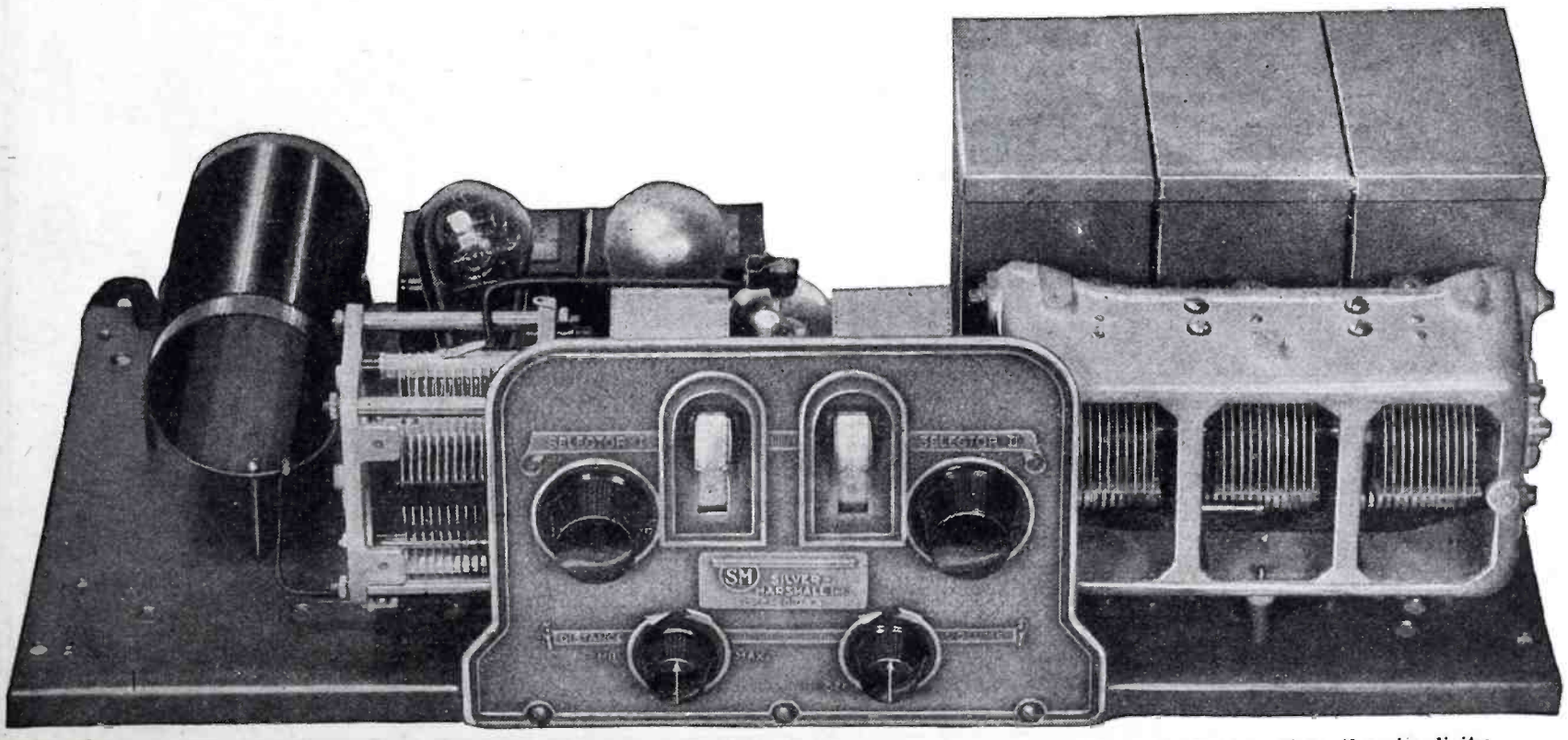


Hook-up of the set in schematic form. All leads indicated as connected to ground are made to the metal chassis.

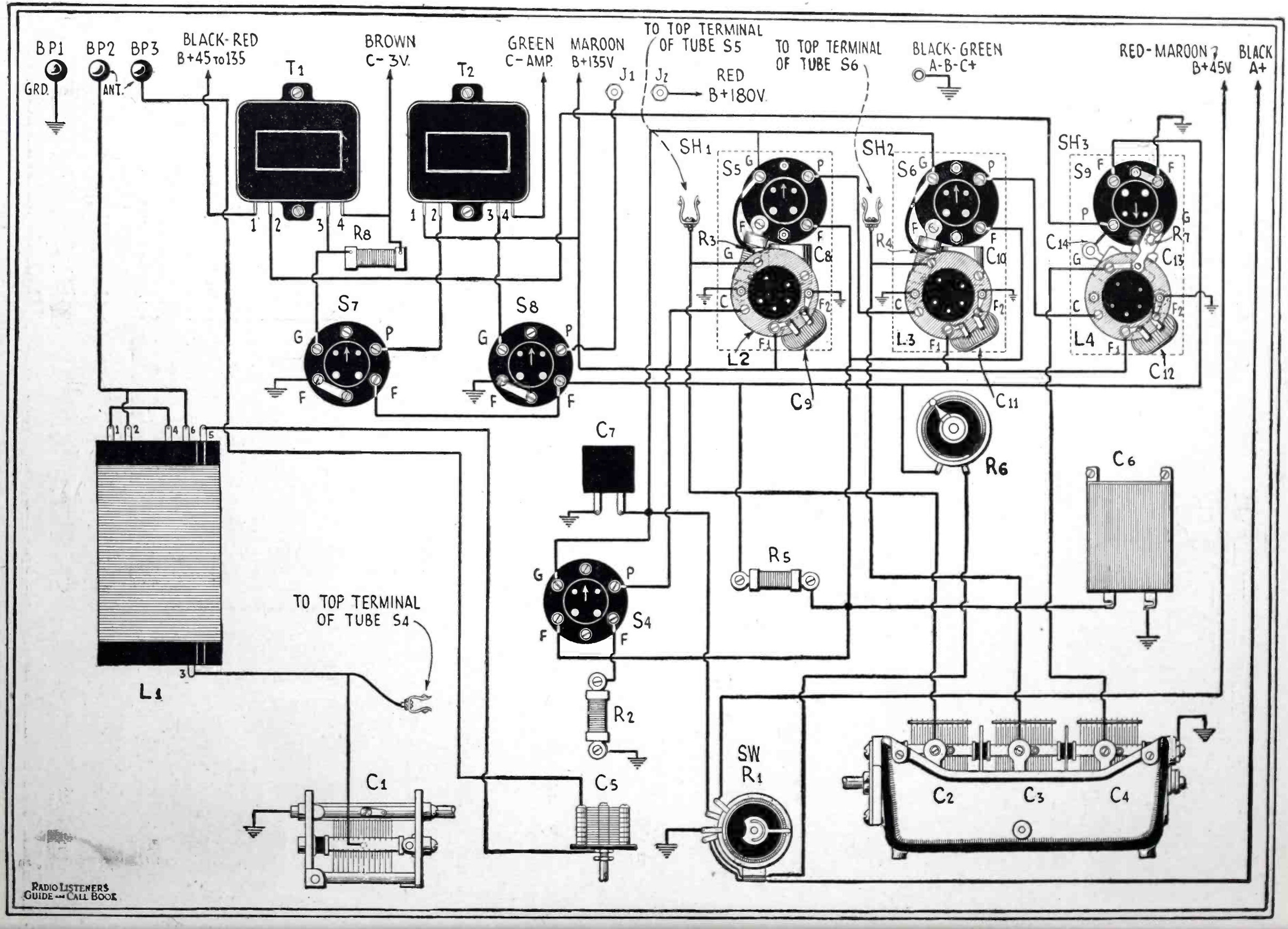
ously poor place for radio reception, the set has brought in from forty to one hundred stations in a single evening. Several models of the outfit have brought in, on the loud speaker and during the hot month of June, East Coast stations from Florida to Massachusetts, others in Canada and Texas, and half a dozen others in California, Oregon and Washington. The set gives clean-cut separation on stations only ten kilocycles apart, and develops no interference difficulties whatsoever. A new depth and brilliance of tone are provided by the Clough audio amplifier, which is different from any A.F. system now in use.

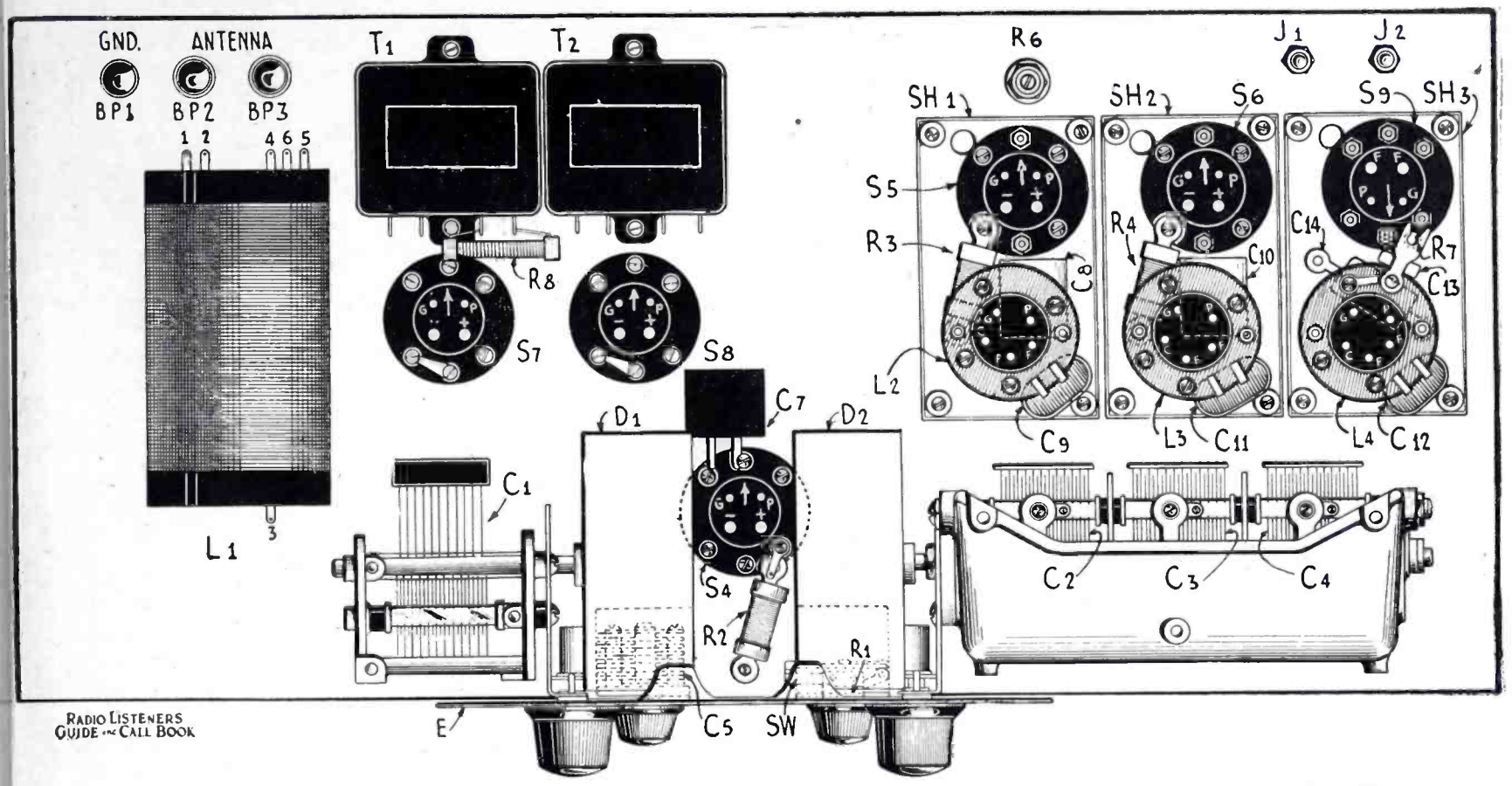
The 720 Screen Grid Six comprises three stages of tuned-radio-frequency amplification, with tuned antenna input, a detector, and two high-gain A.F. stages in which a power tube of the 171, 210 or 250 type may be used. It is arranged so that the A.F. end may be used in conjunction with a phonograph pick-up device for the reproduction of phonograph music. The R.F. stages are individually shielded, and are tuned by a three-gang die-cast condenser of great rigidity and strength. The whole set is mounted on a pierced and formed steel chassis 21-7/16 inches long, 9-15/16 inches wide and 5/8 inch high, to which all the component parts are fastened. On the front is an antique-brass escutcheon control panel, which carries two knobs for the two vernier drum controls, an antenna selectivity adjustment, and a smooth volume adjustment. The latter, in its "off" position, turns the entire set off. The receiver may be mounted in any console or table cabinet of suitable size, but is intended particularly for the new Silver-Marshall type 700 shielding cabinet.

A great deal of care and attention have been paid to every detail of the set, which shows some unusual innovations in design and construction. The antenna circuit, for instance, is out of the ordinary. In many receivers an untuned antenna stage, or one with only indifferent amplification, is employed. In the 720 Screen Grid Six, the best input circuit that could be devised is used, with the result that an R.F. voltage step-up of from 60 to 100 times is achieved. Coupled with this high gain is a considerable increase in selectivity. The increased efficiency at this part of the circuit is obtained through the use of an antenna coupling coil having only a fraction of the R.F. resistance possessed by the best previous types of inductors. This coil is tuned by the left-hand drum control, and exhibits as much apparent selectivity as does the oscillator dial of the average superheterodyne.



A front view of the S-M 720 Screen Grid Six with the metal cabinet cover removed to show the parts. Note the simplicity and ruggedness in construction.





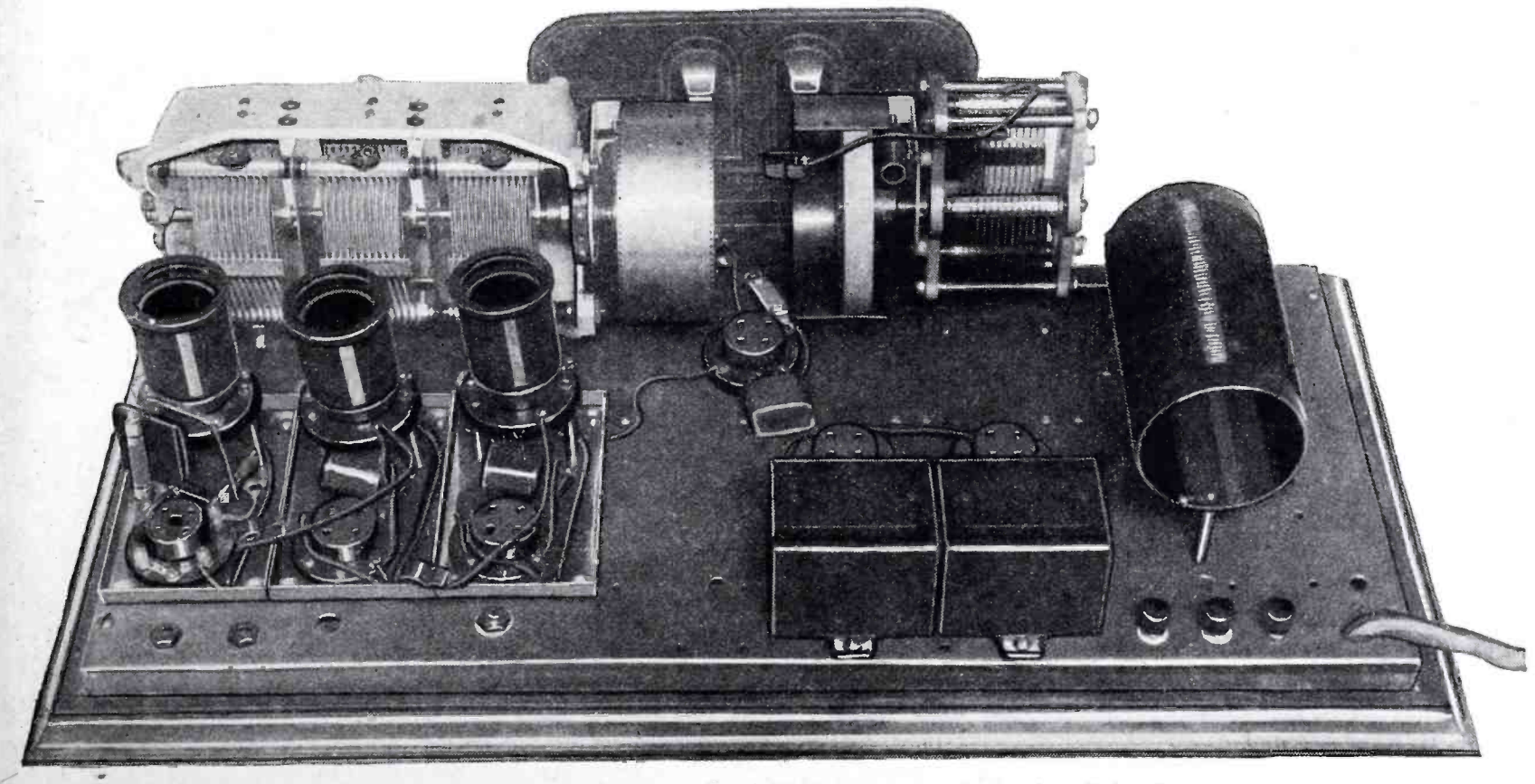
Instrument layout showing how all parts are mounted on the chassis. Coil L1 is mounted on brass upright pillars attached to the metal sub-panel.

The antenna coil feeds into the first screen-grid tube, which, in turn, feeds one of three small R.F. transformers housed in the left-hand copper can. The three screen-grid amplifier tubes each feed an identical transformer in the next can to the right, one 222 tube and a plug-in transformer being considered a stage of R.F. amplification.

The actual amplification of each stage, as measured in the laboratory, varies from 14 at 550 meters to 25 at 200 meters. These low values were deliberately selected in order to insure a good degree of selectivity, something virtually impossible on the broadcast band with any greater amplification. This sacrifice in amplification means little practical loss, as the total over all amplification is well above 250,000, from antenna to detector grid circuit. This is about 200 times the output of the average three-stage tuned-radio-frequency amplifier. The wisdom of the policy of keeping the R.F. amplification below its maximum obtainable value is evident in the selectivity curves which have been plotted for the receiver. These show a sharp 10-kilocycle cutoff, which means that the great amplification of the set can be used without having the loud speaker blanketed by the signals of local stations.

Each radio-frequency stage is separately shielded and by-passed,

(*Continued on page* 153)



Rear view of the set with covers of the shields removed and plug-in coils in place.

SCOTT'S WORLD'S RECORD SHIELD GRID NINE

AMPLIFICATION, sensitivity, selectivity and quality — the four great requisites of the perfect radio receiver, have always been hard indeed to bring together. With the ordinary set of a few tubes, it is impossible to combine all to the fullest degree; we must compromise either here or there. The radio engineer is confronted by the same dilemma as the naval engineer; he can chose volume without selectivity, sensitivity without quality, in a small set; just as the choice must be made in a small warship between guns, armor and coal in allotting each its tonnage.

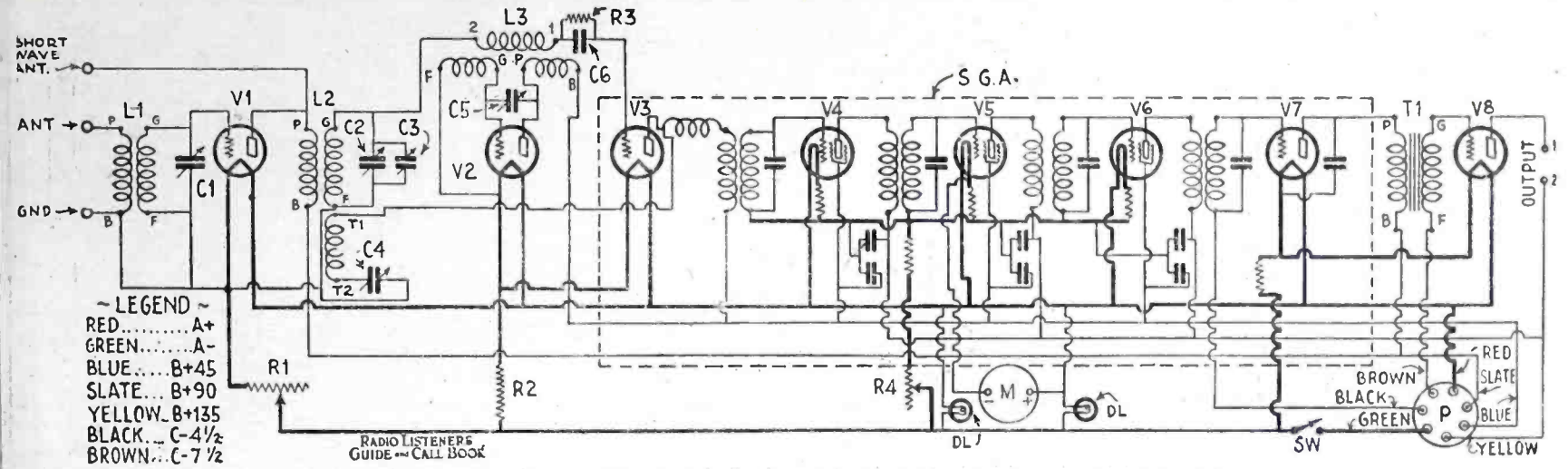
In the receiver we are describing here, no such choice is rendered necessary. In the reduction of the number of tubes from its famous predecessor, the justly-celebrated World's Record Super Ten, there is no loss in power or other qualities, but an enormous gain; due to the development during the past year of the shield-grid tube with its enormous amplification-constant and inherent stability.

The intermediate amplifier, the heart of this as of every other superheterodyne, represents a bold step forward in design. A high-mu (340-type) first detector is followed by three fully-shielded stages of amplification, each containing a shield-grid tube which is the practical equivalent of two ordinary stages. The reserve of power thus afforded is equal to any demand which may be put upon it, to bring up to full strength the faintest signal from the opposite side of the globe. The remarkably low inter-element capacity of the tubes makes for perfect stabilization; while the perfect matching of the four intermediate tuned, air-core transformers (the first and fourth of which incorporate "band-pass" filters) insures unabridged quality of the "sidebands" in the signal finally delivered at the second detector, and consequently at the loud speaker. It is in this respect that the true worth of a superheterodyne must be shown (as the constructor who may have been plagued in the past with an unmatched set of intermediates knows too well.) The amplifier of this set is tuned with delicate testing instruments under laboratory conditions, to insure that each transformer shall peak at the same frequency as its companions, within one-tenth of one per cent. This slender margin of accuracy, not to be realized with less elaborate equipment, is what makes the difference between poor, or mediocre, results, and the absolutely maximum performance in distance-getting, volume and perfection of reproduction in the final audio frequencies, attainable with the Shield-Grid Nine.

Ahead of the finest intermediate amplifier, however, it is necessary to have highly-sensitive and sharply-tuned circuits. The first stage of the Shield-Grid Nine, as in the Super Ten, is a 301A-type radio frequency amplifier feeding, in common with the oscillator, into the regenerative first detector. The controls are simple; the condenser tuning the secondary of the aerial coupler is the .0005-mfd. section of a two-gang instrument, the second section of which is the .0004-mfd. tuner of the R.F. coupler's secondary. Its knob appears below the left of the two dials seen in the panel view. The necessary compensation is obtained by a balancing condenser of .000135-mfd. capacity, whose knob appears in the center just above the battery switch. The oscillator condenser, whose knob is that just below the right drum dial, is of .00035-mfd. capacity. The difference between the two dial readings, once the trimming adjustment on the oscillator condenser has been set to bring them in unison on a station at the center of their scales, will

LIST OF PARTS

1 Wood front panel drilled, 26x7".
1 Formica sub-panel drilled, complete with sockets, 25x10".
1 Selectone 2-gang condenser, .0005-.0004 mfd., No. 650 and bracket, C1, C2.
1 Selectone variable condenser, .00035 mfd., No. 660 with bracket, C5.
1 Selectone variable condenser, .000055 mfd. and bracket, C4.
1 Selectone variable condenser, .000135 mfd., No. 671, C3.
2 Illuminated drum dials.
1 Selectone No. 640 audio transformer, T1.
1 Selectone No. 600 screen grid amplifier unit, SGA.
4 Selectone No. 680 tube shields.
1 Selectone No. 630 transformer (Ant. 200-550), L1.
1 Selectone No. 620 transformer (R. F. 200-550), L2.
1 Selectone No. 610 transformer (Oscillator 200-550), L3.
2 Pair brackets.
1 Carter rheostat, 15 ohms, R4.
1 Carter rheostat, 25 ohms, R1.
1 Carter fixed resistor, 2 ohms, R2.
1 Bronze filament switch, SW.
1 Carter fixed condenser .00025 mfd. with grid clips, C6.
1 Durham grid leak, 3 meg., R3.
1 Special voltmeter, M.
1 Special ten-wire connecting cable and plug, P.
8 X-L binding posts.
25 feet Corwico hook-up wire.
Miscellaneous screws, lugs, nuts, etc.



Schematic wiring diagram of the set. All parts within the dotted lines are contained in one unit, the screen grid amplifier. The legend of the colored wire cable plug is given at the left. Compare other symbols with list of parts and picture diagrams.

be found trifling throughout their entire range.

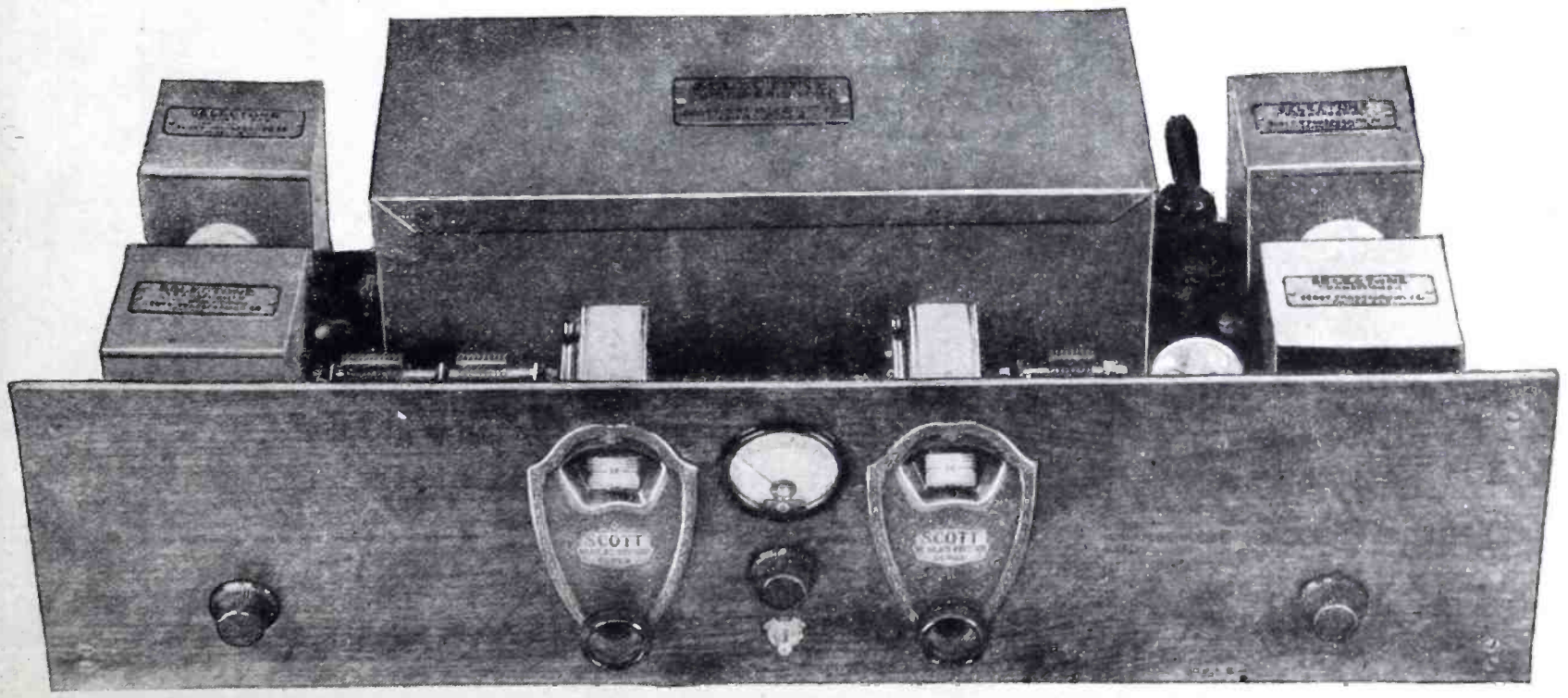
The 25-ohm rheostat controlled by the knob at the left of the panel governs the voltage on the filament of the R.F. tube and serves to keep this amplifier at its point of maximum sensitivity—that just under oscillation. A 15-ohm rheostat serves the same purpose for the three shield-grid tubes of the I.F. amplifier, whose operating condition is always in evidence from the large panel voltmeter. Since these tubes operate at a filament voltage considerably lower than that of the others in the set—it is recommended that more than 3.1 volts should never be applied to them, to lengthen their lives—the necessary reduction is normally taken care of by fixed resistors in the negative or return leg; the same is true of the remaining four tubes of the set, whose operating voltage is fixed. This 15-ohm rheostat completes the assembly of panel controls. The midget (.000055-mfd.) regeneration condenser in the plate circuit of the first detector is not critical in its setting, and therefore is located on the sub-panel; it should be adjusted when a distant station is tuned in, usually with its plates nearly at maximum capacity.

Shielding, as it is practiced with a shield-grid-tube set, is not a matter alone of cutting out nearby locals, such as the constructor has experienced with the ordinary unselective set. Each screen-grid tube and each inductor must be shielded. The aerial and R.F. couplers, with the oscillator coils, are enclosed, each in its own polished copper can. The amplifier case, containing the two detectors as well as the shield-grid intermediate-frequency tubes, is composed of pure copper and the tubes and transformers have individual shields which isolate each stage, except for its regular input and output.

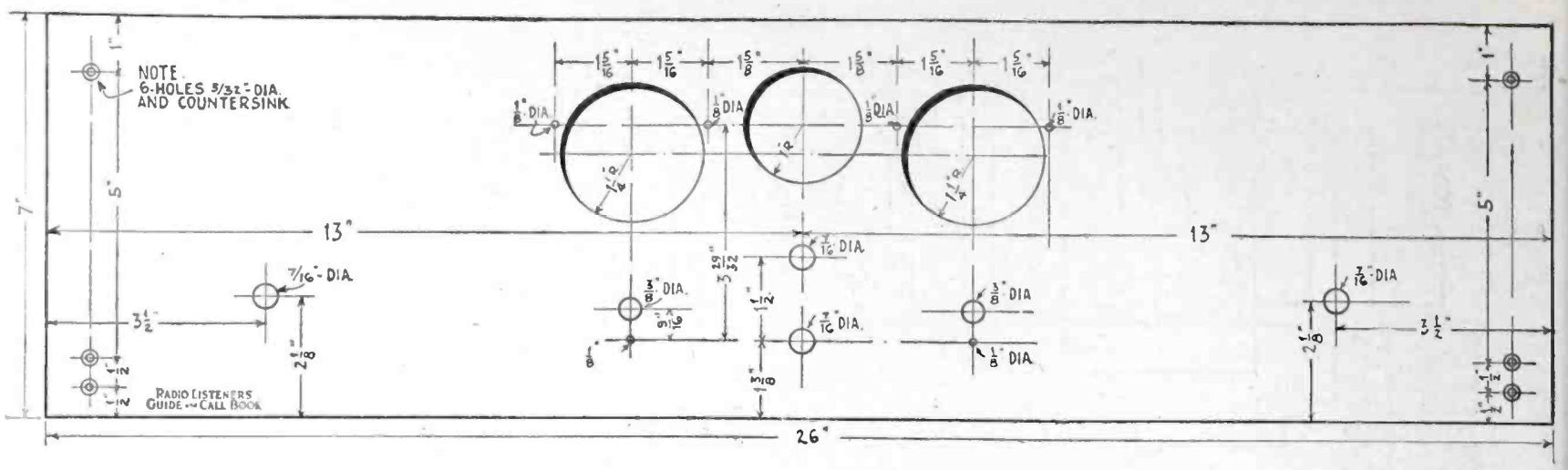
The input of the first detector, from the R.F. and oscillator stages, enters at one end of the can—the grid leak and condenser are external; and the feed-back plate lead to the regeneration condenser passes through this as well. From here on the amplified signals pass from stage to stage, through short leads; until the output of the second detector, rectified to audio frequency, passes out to the "P" post of the audio-frequency transformer.

With a receiver of such enormous powers of amplification, these precautions are highly necessary; for a single coil is sufficient to act as an antenna. So, also, the design has been so carefully worked out as to assure the shortest of interstage leads. As the amplifier is assembled at the laboratories, it comes to the constructor with each of its colored external leads brought out through the side or bottom, cut to the exact length for connection to other components; thus providing a valuable guide for the constructor as to correct placement and wiring.

A single transformer couples the output from the amplifier assembly to the final and only audio tube—



Scott's World's Record Shield Grid Nine completely assembled and ready for operation. Note the perfect balance in the arrangement of parts behind the front panel as well as the controls on the front of the panel.



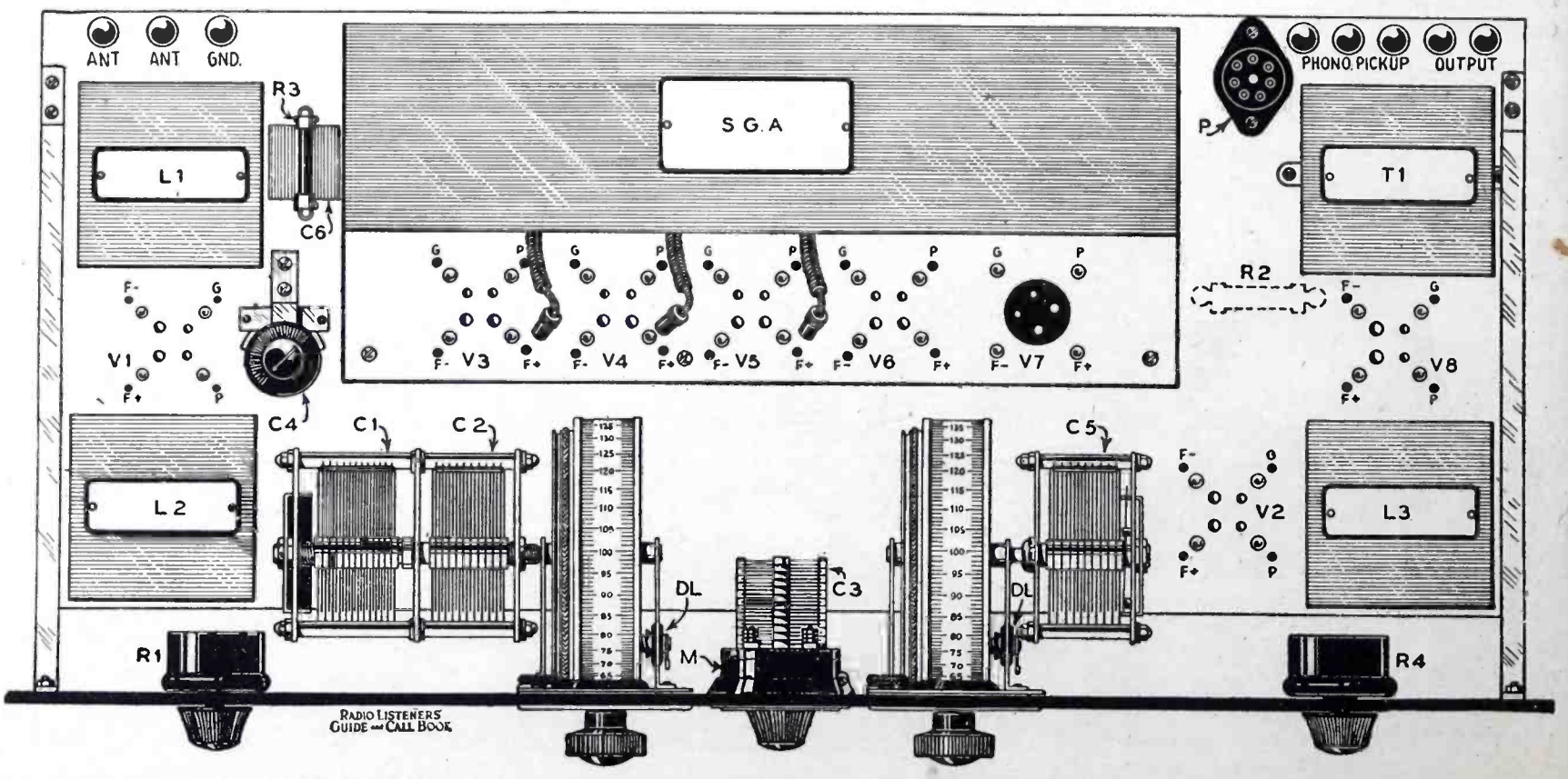
For the constructor who wishes to drill his own front panel all dimensions for drilling are given in the above layout.

a 312-type semi-power tube. The radio- and intermediate-frequency amplification of the signals has been so great that this tube will give clear signals on the loud speaker for the ordinary living room. The economy of current in the receiver is extraordinary, permitting of battery operation; it draws but 29 milliamperes of battery current, with 135 volts maximum, and but 1 2/3 amperes from the "A" battery.

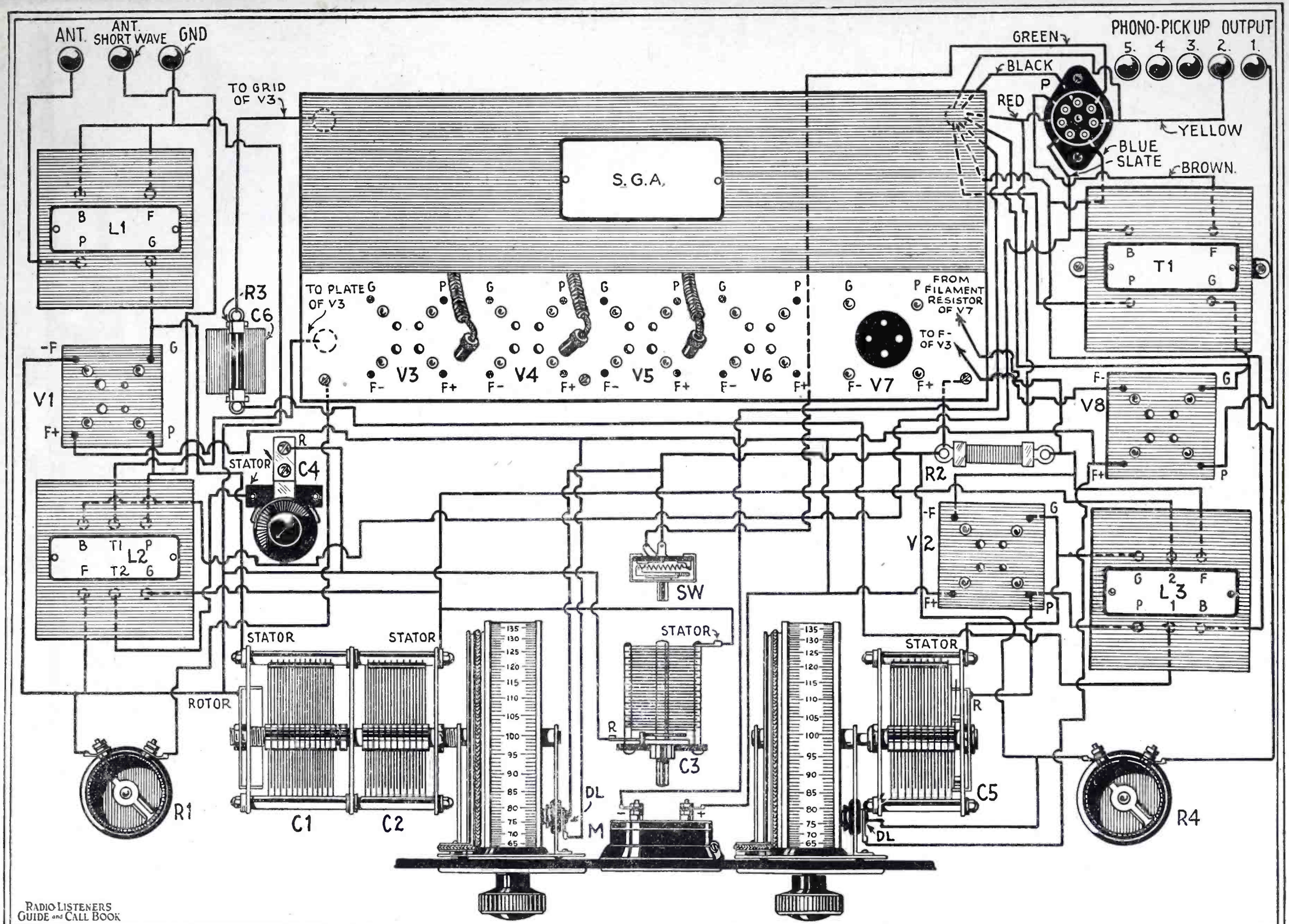
However, for the greater volume now frequently in demand, operation of several speakers at different points about the house, satisfactory phonograph reproduction and other purposes, the value of a second audio stage is often apparent; and when this is the case, power operation is necessary, and a "B and C" power unit incorporated with a high-voltage power tube is the logical answer. Such an amplifier combination has been especially designed for use with the Shield-Grid Nine; it utilizes the latest development, the 350-type tube, which is fully equal to any demands that may be put upon it. With this amplifier, either radio reception or phonograph reproduction, with full studio volume, is a matter of an instant; a switch on either receiver or phonograph makes the change-over the matter of a single flip. It is specially provided, also, with terminals which may be used to supply current for an electrodynamic speaker of the type which is the most perfect reproducer yet developed. For the filament current of the receiver itself, batteries are to be recommended; though an "A" power unit may be used, if of high purity of output.

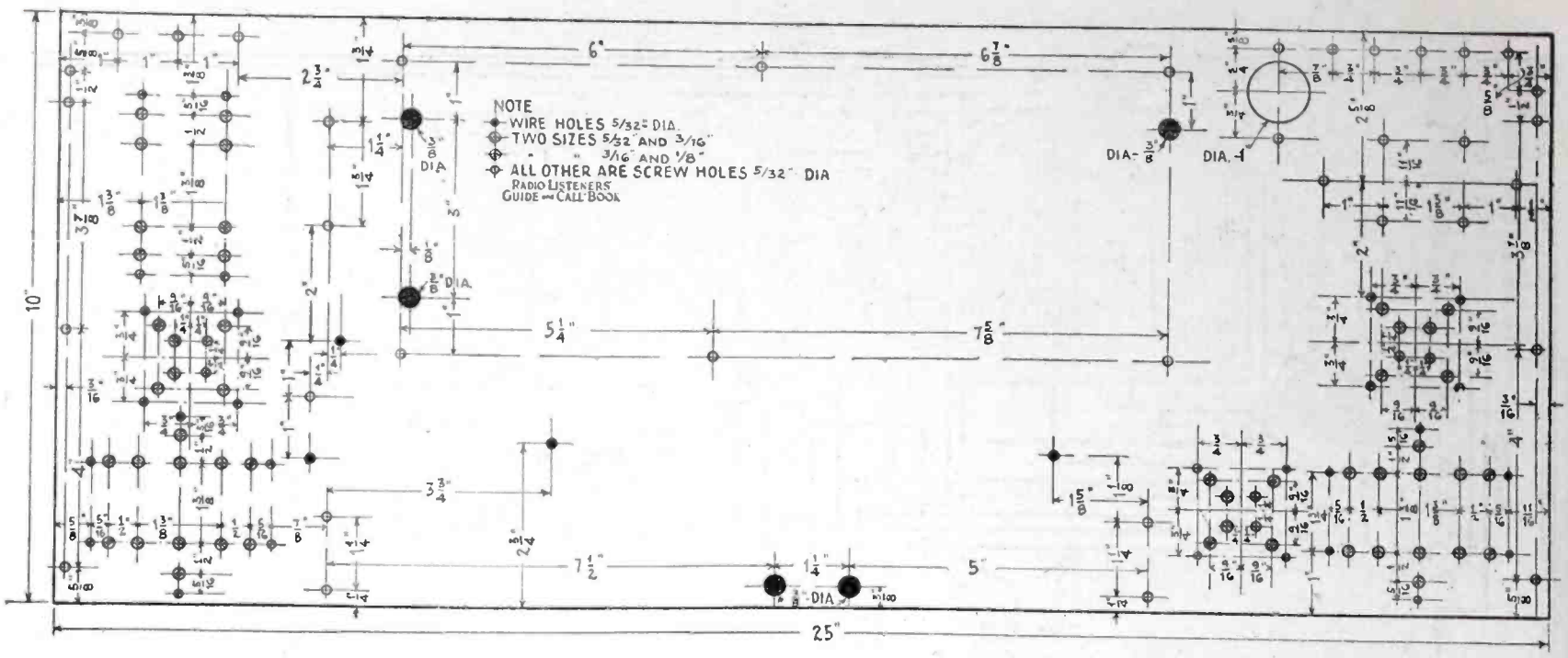
One more detail may be added; this superheterodyne has been designed with a view to the reception of the short-wave broadcast stations, which are coming more and more into prominence. These, operating below a hundred meters, are received in all parts of the globe; and their singular freedom from static interruption makes them receivable oftentimes when even so powerful a receiver as this cannot bring in the longer broadcast waves intelligibly from the same locality. When the short waves are to be received, a special coil is plugged into the socket occupied by the R.F. coupler, thus cutting out the R.F. tube; as the great carrying power of these waves renders the use of this stage superfluous. A short-wave antenna connection is indicated in the diagram. Coils adapted to the 80-, 40- and 20-meter bands are obtainable.

The veteran constructor will see in the above outline of this receiver's qualities many features long desired; but the novice need not consider its construction a task beyond him. In fact, this complicated and skillfully-balanced receiver is one of the simplest to build; because the work, except



Layout of parts on the front and sub-panels. All parts are indicated to correspond with the schematic and picture wiring diagrams.





Dimensions for drilling the sub-panel. All sizes of holes are given (see note). However, for the constructor who would rather buy the panels all drilled these can be obtained from the manufacturer.

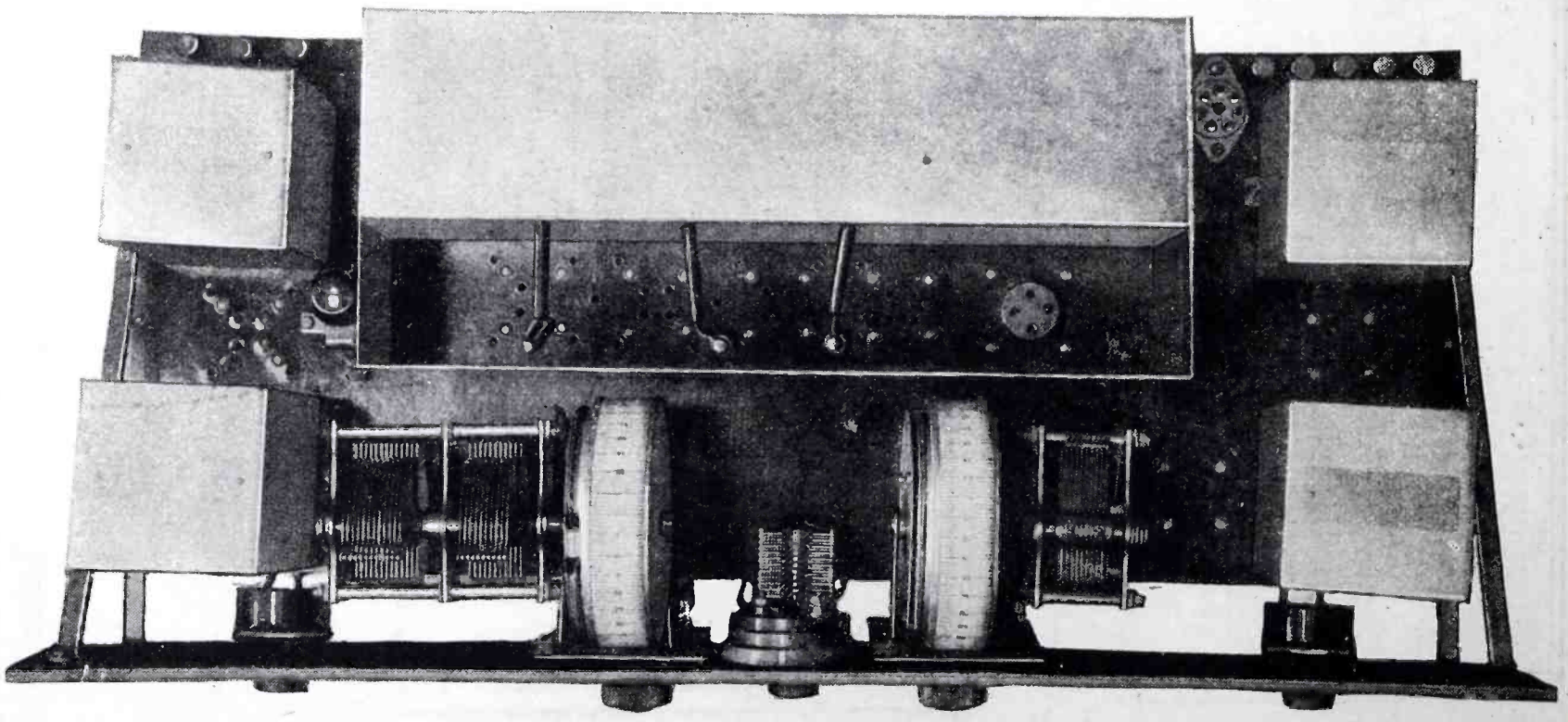
for the task of joining the connections, is already done. The elaborate calculations, the precision measurements and tests, have been already completed and incorporated in the components. The balancing and adjustment, except for the simple operating controls, has been accomplished. This means that the set builder starting in, with a few simple tools, can equal the results that the most experienced constructor can hope for—surpass them, if the veteran depends upon his own skill, without an elaborate testing equipment—and that in a short time. The assembly time, for a beginner, should not be above four hours; for everything comes cut to fit.

With all this, the finished product is not only efficient to the last degree, but attractive as well. The illustrations only partly do justice to the quiet, tasteful appearance of the completed receiver, which will harmonize with the most exacting scheme of household decoration. The beauty of the panel and the finish of its few control-knobs and escutcheons are of the type which has proven most attractive in the finest manufactured sets; and the finished appearance of the parts within receiver or amplifier is such that the completed assembly bears the stamp of good engineering, when examined by the most critical.

The schematic diagram shows a circuit which, if not intricate, is large and would be most laborious to construct by handicraft methods; and more than this, should the constructor endeavor to prepare his own coils, even with dimensions, etc., given, he could not hope, without testing apparatus, to match them to the extent of the cooperation necessary to produce such records of consistent distance reception as the World's Record receivers have for four years repeatedly given. With the necessary apparatus procured, as a glance at the instrument layout and the pictorial wiring diagram will show, the task is simplified to the last degree.

The panel is drilled precisely for the instruments it carries, and the sub-panel for the leads its passes, as well as for the instruments. The embodying of the sockets in this panel, alone, is a saving of much work.

The dials, voltmeter, rheostats, the midget condenser and the switch are easily attached to the panel; the



A top view of the Scott's World Record Shield Grid Nine showing the arrangement of parts on the sub-panel. The cover of the shield grid amplifier unit has been removed to show tube leads and sockets for the shield grid tubes.

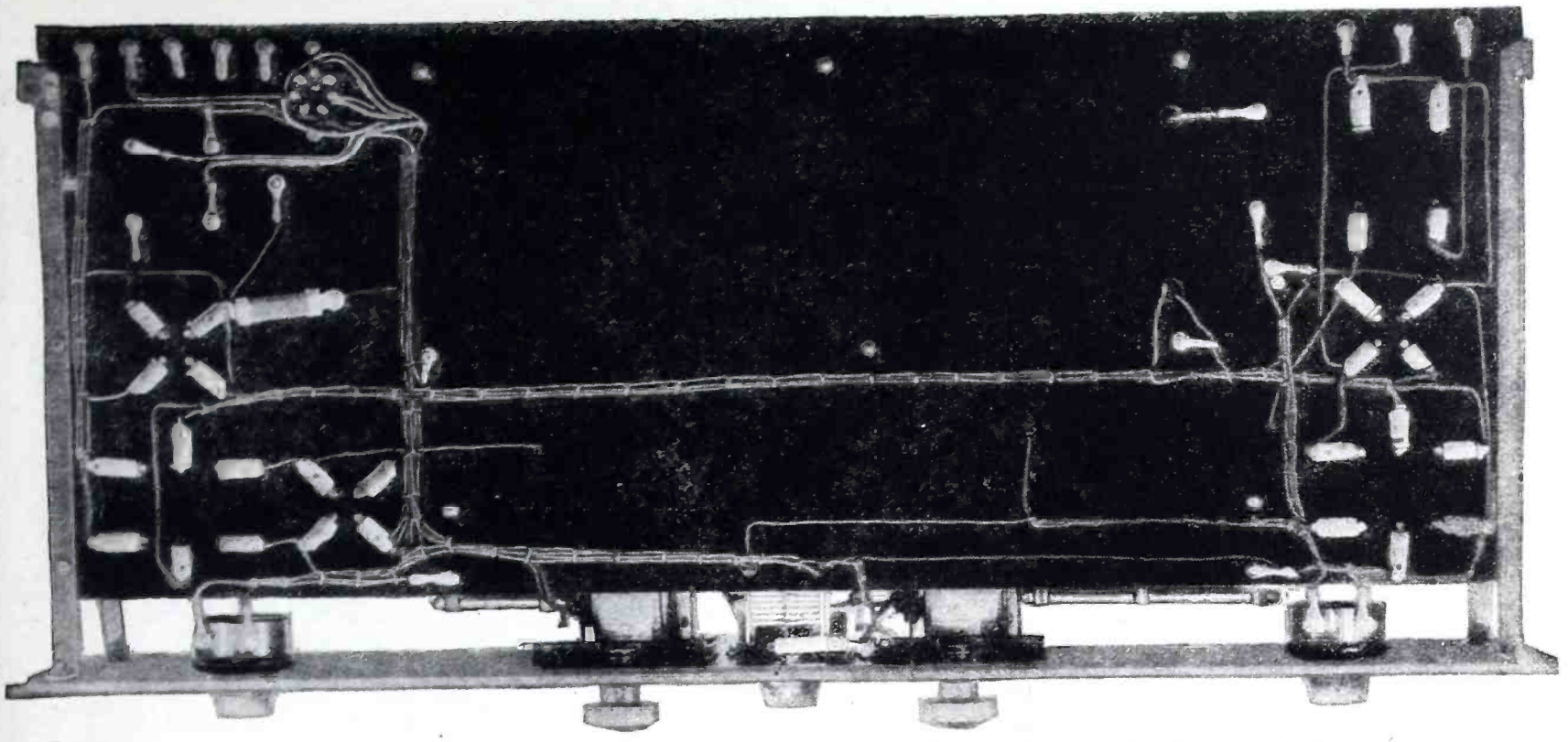
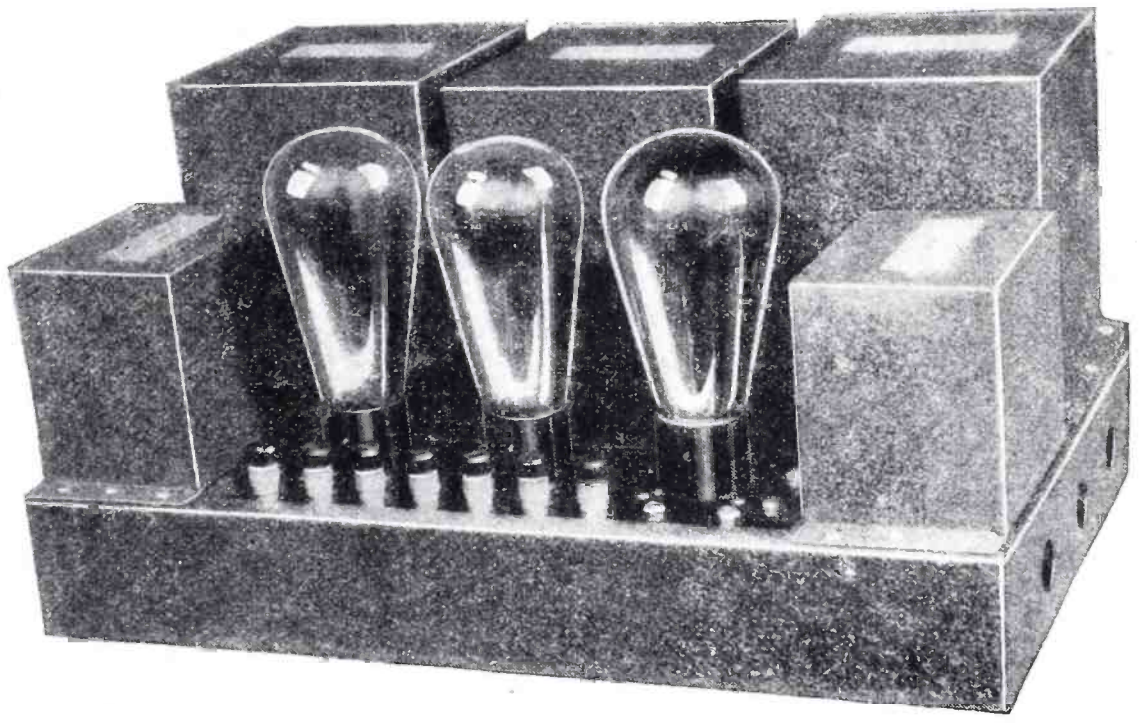


Photo showing the bottom of the set. Note how all wiring is bundled together in cable fashion with cord.

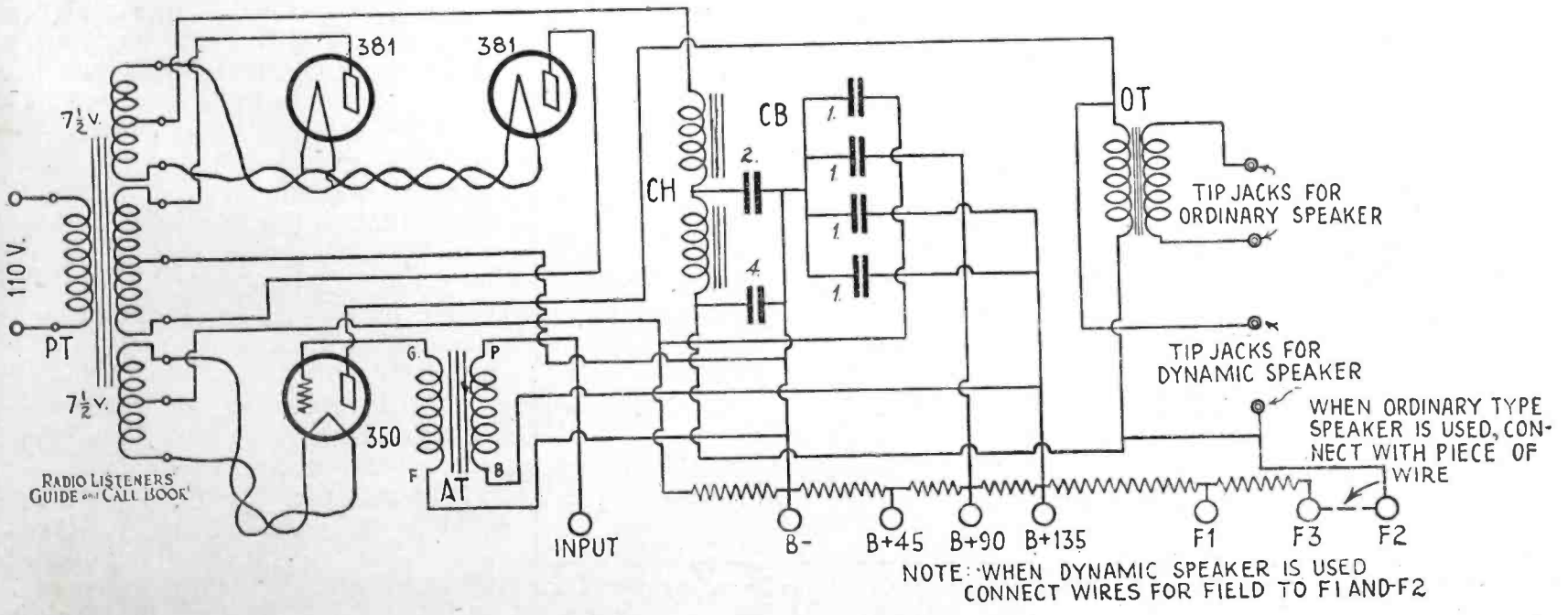
switch is passed through its mounting hole, at the bottom of the panel in the center, after simply turning its knob midway between "On" and "Off." The sub-panel is then fastened to its brackets, and then the panel is secured to the latter in its proper position, and the condensers may be mounted and connected to their dials. This is done as follows:

Unscrew the hexagonal nuts on the ends of the condenser bearings and attach the brass mounting brackets to the antenna section of the double condenser and the trimming-plate end of the single (oscillator) condenser. Slide the steel shaft through the double condenser and into the dial, and adjust the bracket to its mounting holes. Tighten the screws, with a lug for connections (see wiring dia-

(*Continued on page* 155)



This power unit is especially designed for use with the receiver described in this article. All parts are contained in metal cans mounted on a metal chassis.



Wiring diagram of the power unit employed in connection with the set described in this article. This unit employs the new 350 power tube and two half wave rectifier tubes. It will also be noted that either a dynamic or ordinary type speaker can be used.

The Halldorson Shield-Grid 56

"TO buy or to build" as a question of economy deserves some thought from the prospective owner of a single modern set, who is not minded to experiment further on the subject of a household entertainer to grace his parlor. If he is a natural-born tinkerer and an old radio bug, who has raised and tended his present set since it was a galena crystal, he will want the fun of building his own; and will ask only for a circuit that is modern and that will not be superseded soon, if at all.

But this question has a different meaning for the community radio builder who derives either a part or the whole of his income from constructing and installing sets for his neighbors. He is in direct competition with the ready-made, mass-production, factory models which the furniture or music store, the general or department store, delivers "as is," at low prices and often long terms. To the set builder the problem of meeting such competition is one of bread-and-butter. He has the advantage, usually, of personal acquaintance with his prospects and being able to render expert attention to the problems of installation which have so much to do with satisfactory operation. What he asks is to be able to obtain a fair margin for his work; in other words, to have a set whose costs including parts and labor—figured at its fair value—put him on an even or superior basis alongside the seller of the ready-made set.

The receiver described in this article was designed to meet this need by including advantages which put it far ahead of the present models of factory receivers which must sell at the same price. The cost of parts is minimized, but the remarkable efficiency of the circuit is far ahead of the popularly-priced manufactured sets which form its competition. This is possible, because models produced in mass, like certain well-known automobiles, must be slow to bring up their designs to date; and the inventive skill of parts manufacturers enables the community builder to outstrip them on the basis of quality and performance, dollar for dollar.

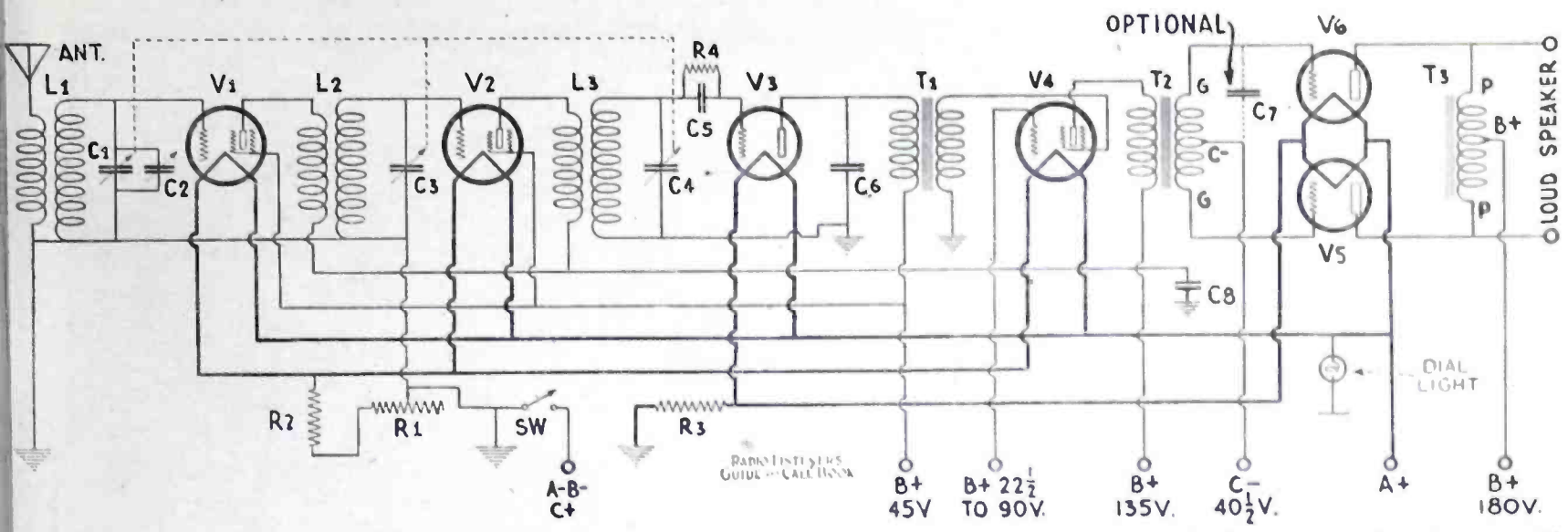
PARTS IN KIT

- 1 Halldorson 3 gang .00035 mfd. condenser, C1, C3, C4.
- 3 Halldorson shield grid R.F. transformers, L1, L2, L3.
- 3 Halldorson copper stage shields.
- 1 Halldorson overtone shield grid audio coupler, T1.
- 1 Halldorson push-pull input transformer, T2.
- 1 Halldorson push-pull output choke, T3.
- 2 Halldorson phone tip jacks.
- 2 Halldorson binding posts.
- 1 Halldorson ½ mfd. by-pass condenser, C8.
- 1 Halldorson antenna trimmer condenser, C2.
- 1 Halldorson .002 mfd. fixed condenser, C6.
- 1 Halldorson 3 meg. grid leak and grid condenser, R4, and C5.
- 1 Halldorson 7 ohm fixed resistor strip, R2.
- 1 Halldorson 1 1/3 ohm fixed resistor strip, R3.
- 1 Coil Acme celatsite hook-up wire.
- 1 Halldorson 6 ohm rheostat with switch, R1, SW.
- 1 Halldorson D.C. phonograph jack.
- 1 Halldorson 10½x20 steel crystalyne finish sub-base with sockets, battery cable and all hardware.
- 1 Halldorson front escutcheon plate with dial.
- 1 Steel walnut finish front panel 7x21".

Yet high skill is not needed in the assembly of this six-tube receiver, equal in its amplification powers to any commercial nine-tube receiver by reason of its employment of the new shield-grid tubes. The work of panel and base drilling, socket mounting, etc., is most easily done by the manufacturer; and the consequence is that the assembly is a simple matter, and the wiring highly facilitated. Also, as each receiver is like every other in placement of parts, uniform performance is insured.

The appearance of the finished set, as may be seen from the heading of this article and from the other illustrations, is most attractive, and it will grace any home. Even the finest factory sets do not surpass it, when it is mounted in a suitable cabinet. As shown, the standard steel 7x21-inch panel, with a suitable walnut finish, is used; though the bronze escutcheon which carries the control knobs may be used upon the wooden panel furnished with a console, if the owner prefers, as the panel is purely decorative. All parts are mounted firmly to the steel sub-base; so that the receiver can stand much handling, if necessary.

The receiver employs two shield-grid tuned radio-frequency stages, the equivalent in amplification of four of the ordinary type, and maintains the quality that might otherwise be impaired by the in-



Schematic wiring diagram of the set. Note that variable condensers, C1, C3 and C4 are ganged with one control. Compare this diagram with the picture diagram on the opposite page when wiring the set.

roduction of a regenerative detector and with it the need for extra controls and lossers. The inputs of both these tubes and the detector are tuned by a three-gang .00035-mfd. condenser of substantial construction.

In the popular commercial receivers, the disadvantage of an untuned first detector is suffered to lessen the efficiency of the receiver, notwithstanding that, after all, the sensitivity of its first stage must measurably govern that over all of the receiver, in spite of any amount of amplification. In the Shield-Grid 56 a .000045-mfd. midget condenser is connected across the antenna coupler, and permits the full value of the signal to be brought out by a trifling adjustment at any time; while the single tuning knob facilitates bringing in instantly any station, which may be accurately logged.

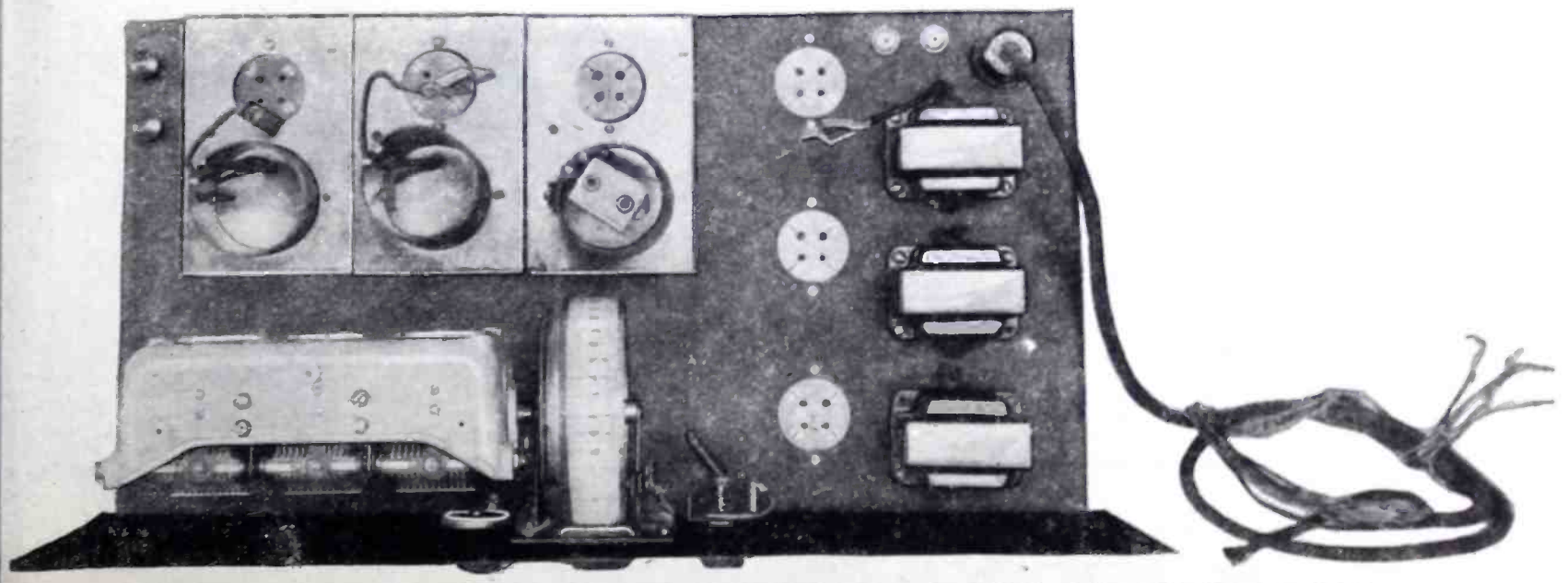
The first audio stage of the receiver is another shield-grid (322-type) tube, used, however, as a "space-charge" tube; that is to say the lead from the first A.F. transformer, to which the detector is coupled, is run to the grid post on the socket and connects to the shield-grid of the tube. The inner or control-grid (as it would be in normal use) has from 22½ to 90 volts—as experiment proves best—connected to its metallic cap, at the top of the tube, and thus promotes highly the flow of current from the filament.

The large output of this tube feeds into the primary of a push-pull transformer, out of which two 312A or 371A tubes (preferably the latter) work. The volume thus obtained is sufficient, without forcing the tubes, to operate any speaker which can be used in a residence, or to supply dance music for a good-sized hall.

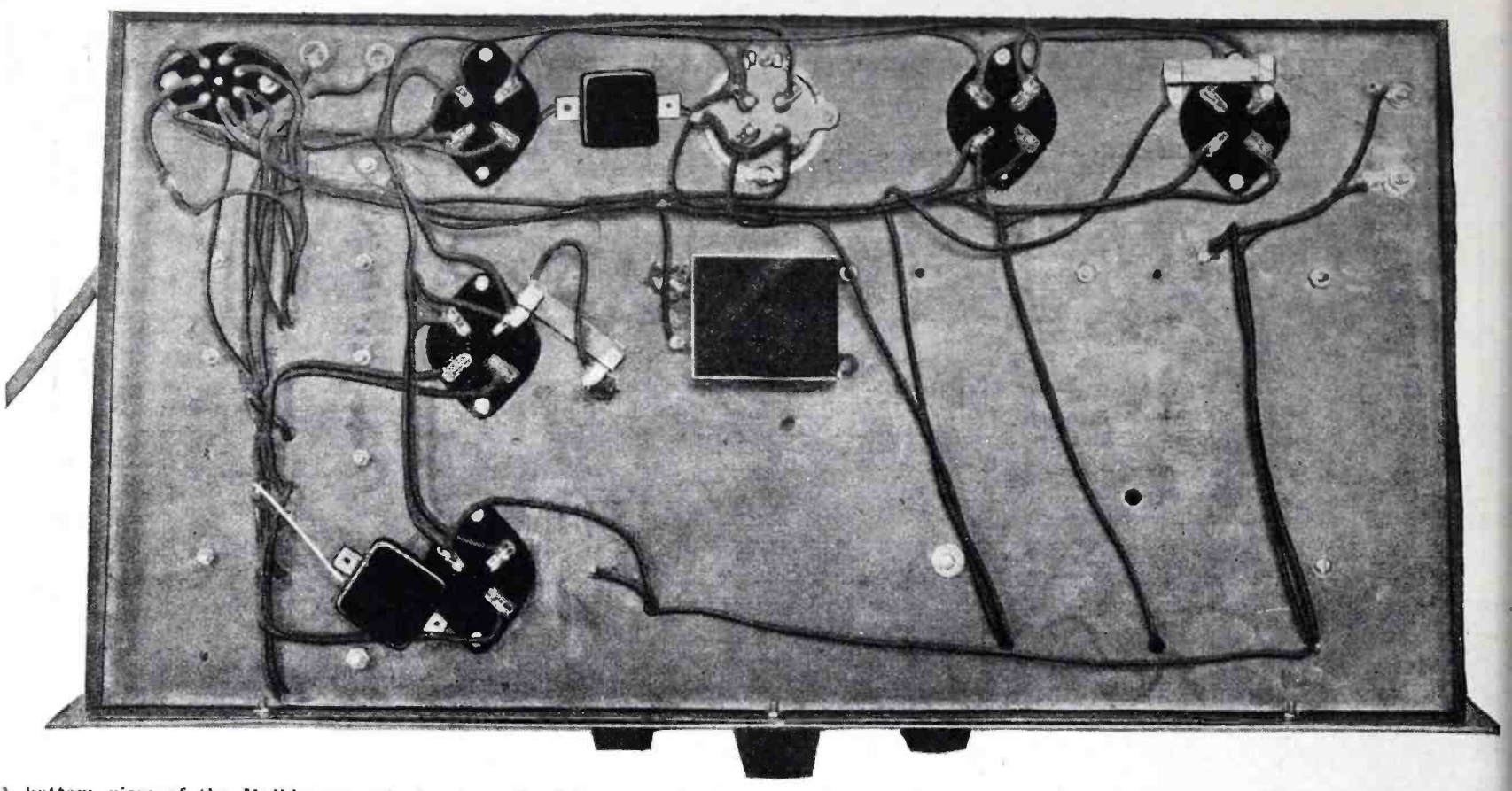
Too much emphasis, however, is usually laid upon the volume to be obtained from a receiver, and not enough upon the quality, when considering the merits of the push-pull arrangement. A single tube of this size, with its full output, will work the ordinary three-foot speaker to its capacity; but the special merit of the push-pull stage is that it renders the music or speech far more faithfully, without introducing high-pitched harmonics or other distortion. Operating these tubes, and in fact the whole receiver, under control gives quality in the utmost degree that may be expected from the signal; and the amplification is sufficient for even the most distant station that can rear its head above the "noise level." The choke which follows the last stage is also of push-pull design, and the speaker is coupled directly across its terminals.

The high amplification given to audio signals by the shield-grid first stage, and the wonderful smoothness and fidelity with which these are converted into output power by the push-pull stage, make this receiver an ideal one for the amplification of phonograph music. This popular combination is flexibly obtained by the use of the ingenious double-circuit jack which is included in the kit.

The careful design of the sub-base assembly has already been mentioned, and takes the drudgery entirely out of the work of assembly. The 10½x20-inch steel sub-base, which has the durable crystalline finish found most satisfactory, embodies the six sockets and is



A top view of the Halldorson Shield Grid 56 Receiver with the shield covers removed from the radio frequency stages.

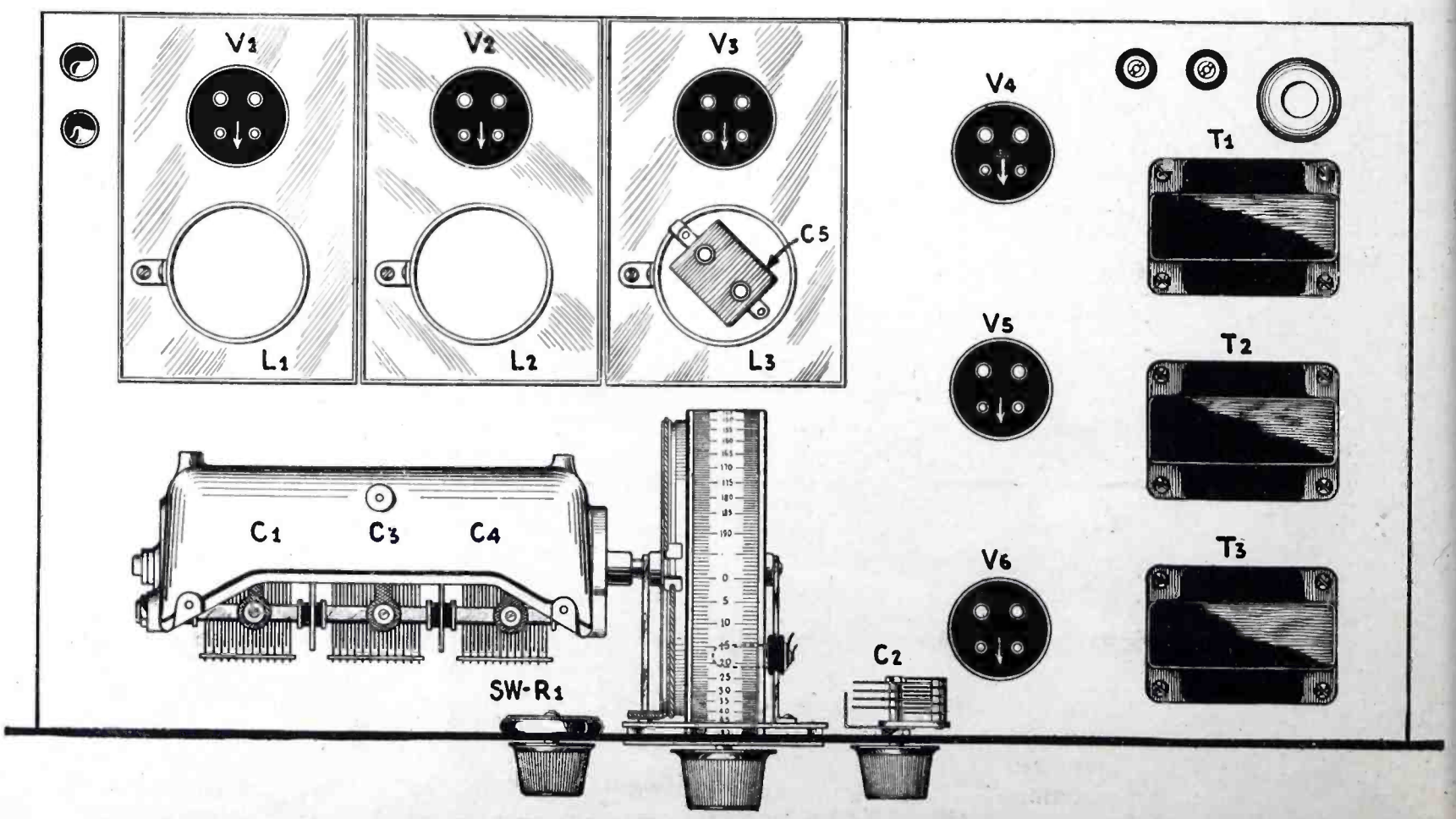


A bottom view of the Halldorson set showing all wiring beneath the metal sub-panel. Fixed condensers and resistors are mounted beneath as can be seen in this photo.

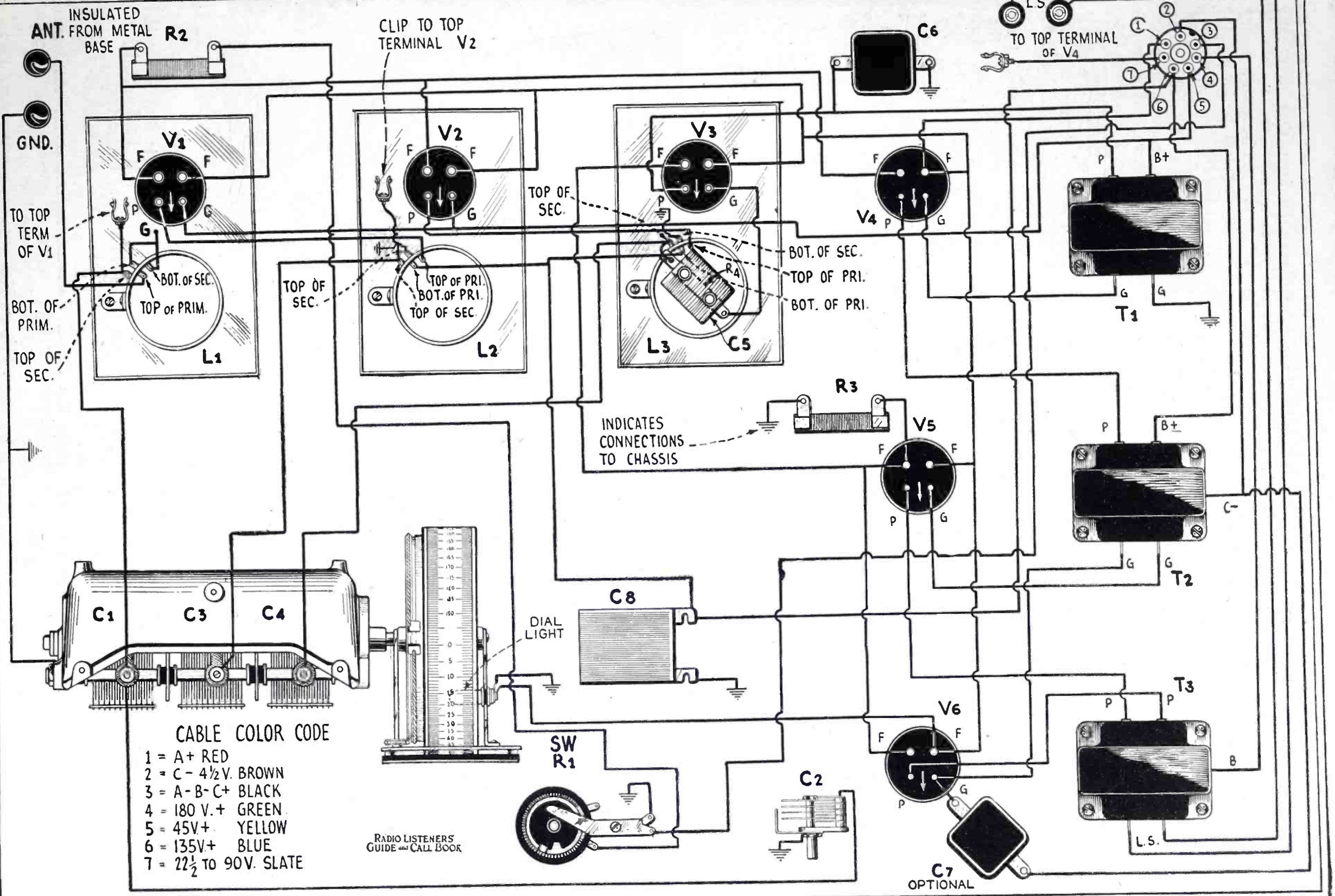
drilled for mounting the stage shield required to screen the radio-frequency and detector stages.

The cans are of burnished copper, and their inclusion lends a particularly attractive appearance to the "works" of the finished receiver, as the rear-view photograph plainly shows. Each houses compactly its tube and the transformer, which is designed especially for use with shield-grid tubes. The layout and wiring diagrams which accompany this article show how greatly the work is simplified, and how few connections are needed.

A single shaft through the panel controls the three-gang condenser, and another the antenna "trimmer" condenser. The shield-grid tubes are controlled all at once by a single rheostat, whose knob operates also the battery switch. This volume control, it will be seen, regulates the signal in the R. F. stages, where it must be kept down on all but the most distant stages, as well as in the first audio end. The R.F. transformers used are designed to have low R. F. as well as D. C. resistance; this eliminates losses at an important point—where signal currents are weakest—and leads as well to sharper tuning. They are wound with No. 28 wire, on threaded bakelite forms, and



Layout of parts on the metal front and sub-panels. The gang of three variable condensers is mounted on the sub-panel with two brass pillars underneath.



spaced the width of the wire. The self-capacity of the coils, therefore, is held down to the effective minimum and the stages are thus brought more accurately into resonance.

The cast-aluminum frame of the gang condenser strikes the observer at first glance with its strength; insuring that after years of use the condensers will be aligned as they were when they underwent their laboratory test. The compensators adjusting them can readily be turned with a screwdriver to bring them into balance. This adjustment should be made when a weak signal is tuned in; but so uniform will be the construction, by following the layout, that little adjustment should ever be needed, even with a change of tubes. The leads are short as possible in all stages, and will occasion little difference. The stage shields, too, are of soft copper whose purity insures high conductivity and a minimum of electromagnetic effects; they must be closed down tightly, however, when the highly-sensitive receiver is in operation. These cans are quickly fastened to the drilled sub-base through the holes provided. They have been correctly spaced with regard to the transformers which they contain.

The logical order, as well as simplicity, of the layout is seen at once from the diagrams, and is clearly pictured in the top-view photograph which shows the assembly in an early stage. The panel has been mounted, and the controls connected to the condensers and rheostat. The aerial and ground posts at the left adjoin the first R. F. stage, only the bottom of whose can is fastened to the sub-base; and the second R. F. and detector adjoin it. The transformers, being completely shielded from each other, are mounted vertically. Attached to the first two will be noted short leads ending in clips; they are to be snapped on the top connections (control-grid terminals) of the shield-grid tubes, after these have been put in their sockets and before fitting the tops of the copper cans into place. The detector stage uses a 301A tube and has no such clip, of course; its grid condenser and leak may be seen inside the coupling transformer.

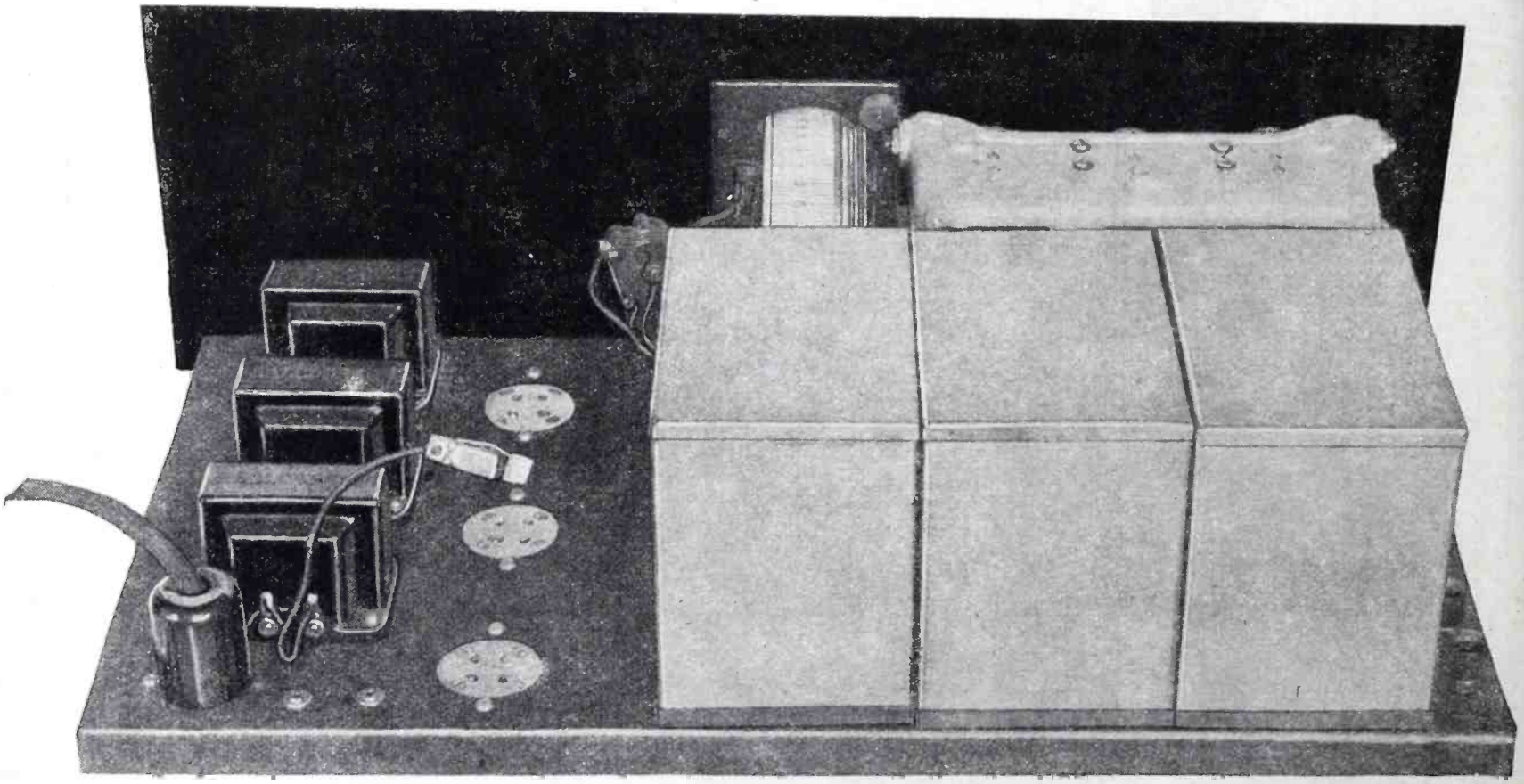
Adjacent to the detector shield is the first R. F. socket; this is coupled through the audio transformer at the rear right by means of a similar lead and clip, which may be seen in the picture, to the grid used as a space-charge attracting element, and through the socket to the shield-grid, which functions in this stage only as the regular third element. The two push-pull stage sockets are in line toward the front of the panel, and convenient to their input transformer and output choke. The position of the leads reinforces the shielding in eliminating undesired interstage coupling.

The sockets, as we have said, are integral with the sub-base; and it may be seen that practically no wires appear above this. Those which are run beneath are very few considering the power of the receiver; the parts are provided with convenient screw-and-lug terminals to which the soldered connections are quickly made with rosin-core solder in convenient strips, and a hot soldering iron. Even the most experienced constructor will find the task of connecting a short one; and if the diagrams are followed attentively; there will be no chance of error.

The numerous grounded connections to the frame, as in the best manufactured receivers, facilitate wiring. Outside of the stage-to-stage leads, two resistors (7 and 1-1/3 ohms; the first biasing the shield-grids of the 322-type tubes and reducing the voltage on their filaments, and the second protecting the detector and the push-pull second-audio filaments) and a .002 mfd. condenser by-passing the unrectified R. F. from the detector plate lead back to the filament, are the only pieces of apparatus requiring connections. A .001-mfd. condenser across the push-pull input secondary is shown, but is optional; it will be found by some ears to give better tone.

It will be observed, by following the wiring diagram, that the filament regulation for the two different filament voltages required, and the bias on the tube grids, is

(*Continued on page* 159)



A back view of the receiver with covers on the R.F. stages. The three transformers at the left are the first audio transformer T1, input transformer T2, and output choke T3.

THE "INTERNATIONAL" SHORT WAVE RECEIVER

DISTANCE! A magic word, and one which will never lose its charm for the man who is building his own set. Regular daylight reception over a thousand miles and evening reception often clear across the Atlantic and the Pacific.

And for the fan who is still enthralled by the possibility of turning a dial and, if he is lucky, hearing announcements from stations across the sea, there is nothing like a short wave receiver. Simple three-tube sets in the past have consistently given remarkable results. The following is a letter written on May 7th to Aero Products, Inc., of Chicago, by a user of such a short wave set. He is located in western Pennsylvania and the letter advised that with two stages of audio he obtained loud speaker reception about three days a week:

"It may be of interest to you to know that 5SW (Chelmsford, England) has been received every afternoon since March 19th; PCJJ at Eindhoven, Holland, comes in every Friday from 7 p.m. to 11 p.m. 2NM at Caterham, England, on Sundays, Wednesdays and Fridays. PCLL at Kootwijk, Holland, about three days a week. Listened to 2FC at Sydney, Australia, from 6:30 a.m. to 7 a.m. Thursday morning."

Every short wave receiver, of course will not show up as well as this particular one, but experience has shown that far better distance can be covered with transmitters operating on short waves than in the usual broadcast band, and radio stations all over the country, realizing this have started experimental work on short wave transmitters. At the present time there are only a few in operation but the owner of a short wave receiver can be assured of reception from Pittsburgh and Schenectady whenever they are on the air—either daylight or dark—and almost regardless of weather conditions, for seasonable decrease in signal strength and static are both almost non-existent on the short waves. (A complete list of short wave stations can be found in this magazine.) In some parts of the country, where local broadcasting stations are very few and far between, the use of short waves has been practical and pleasurable where radio heretofore has always been very unsatisfactory.

Most of the short wave receivers which have been made available to the public up to the present time have been designed primarily for the reception of continuous wave code signals, and have been more or less unsatisfactory for the reception of musical programs, but the receiver presented in the following article has been designed primarily for the reception of broadcast programs on short waves. In the design of such a receiver, several factors must be considered.

First, the receiver must be essentially non-radiating. Due to the surprising distances which may be covered by short wave transmitters with a limited amount of power, it is essential that little or none of the high frequency oscillations generated locally by the receiver shall reach the antenna, for otherwise should short wave broadcasting reach the proportions which it bids fair to do, the ether would be filled with a congestion of squeals and howls exceeding that which reigned in the present broadcast band in the days of single-circuit tuners.

Secondly, it must be adaptable to either phone or code reception. This requirement applies principally to the type of audio amplification employed in the receiver. It has been customary in receivers for C.W. operation to employ transformers having little amplification of the bass notes and which were inadequate for phone reception, due to the fact that C.W. signals are usually heterodyned to a high-pitched whistle and very low grade transformers are adequate for the amplification of the signals.

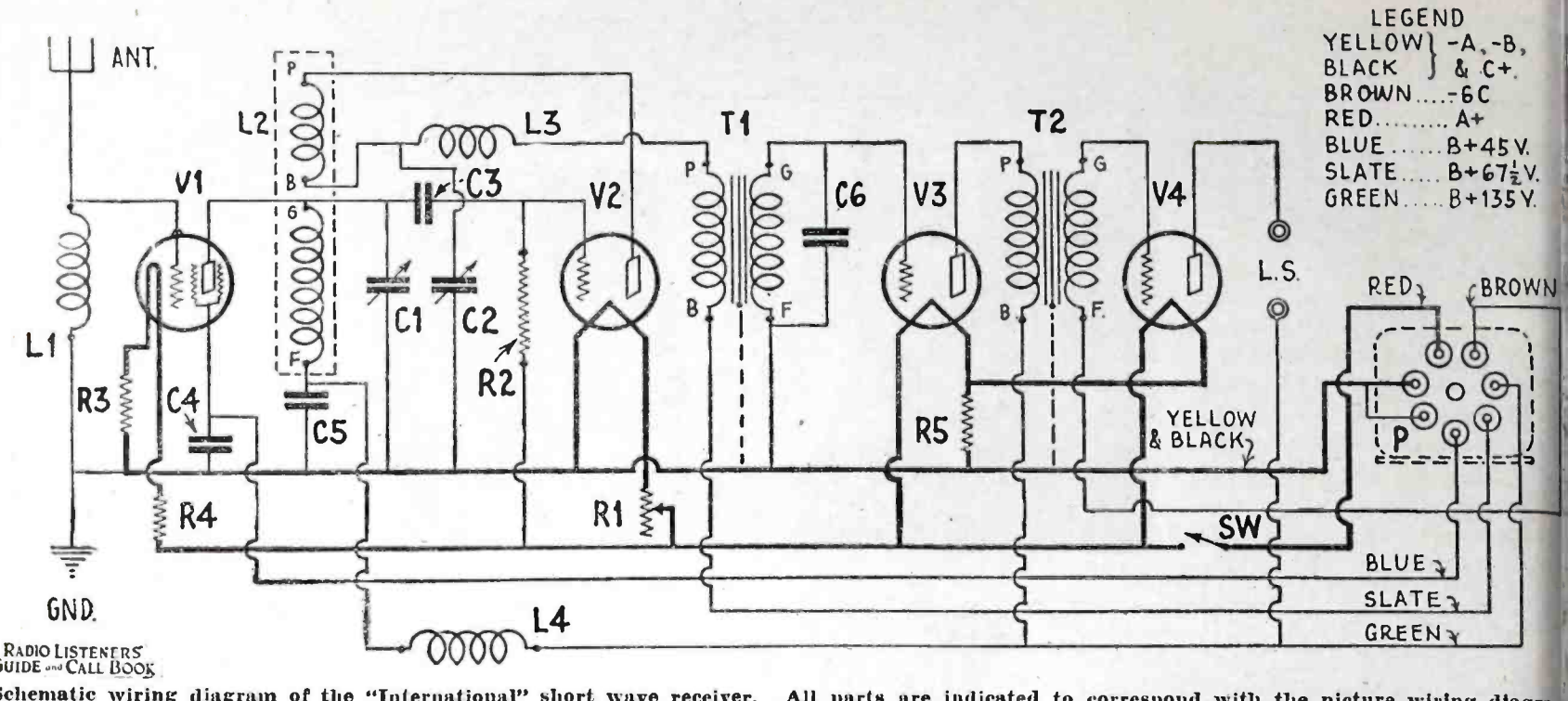
Thirdly, the oscillation control must be smooth and without extraneous noises. This requirement will be discussed more fully and is very important, due to the fact that many "noise producing" features of a design which are completely negligible in the broadcast band, assume astounding proportions in the vicinity of twenty to thirty meters.

Fourthly, it must be simple of operation. It is quite important that a receiver designed for short wave reception should be as easily controlled as the average broadcast receiver in order that the operator may not be forced to learn new procedure and new methods in order to contribute to his enjoyment.

Fifth, it must cover an adequate range of wave lengths. Due to the fact that the short wave broadcasting stations have not assumed a permanent status, it is important that

LIST OF PARTS

1 Aero Short Wave Receiver Foundation Unit, Code No. 7, including drilled and engraved panel, sub-panel with sockets, back sub-panel, all necessary machine screws to mount coils, transformers, etc.
1 Aero Coil Kit, type LWT-11, L2.
2 Aero No. 60 R.F. chokes, L3, L4.
1 Aero No. 65 R.F. choke, L1.
1 Yaxley No 669 plug and cable set, P.
1 Yaxley 25 ohm rheostat with battery switch, R1, SW.
1 Yaxley No. 810 resistance, 10 ohm, R3.
1 Yaxley No. 815 resistance, 15 ohm, R4.
1 Durham 10 megohm grid leak, R2.
1 Durham grid leak mount.
1 Aerovox .00015 mfd. mica condenser, C3.
2 Aerovox .003 mfd. mica condensers, C4, C5.
1 Aerovox .0001 mfd. mica condenser C6.
1 Eby binding post.
25 ft. Corwico hook-up wire.
1 Carter No. 342 Shield Grid Connector.
1 Amsco special short wave tuning condenser, .00014 mfd., C1.
1 Amsco No. 514 variable condenser, .00025 mfd., C2.
2 National Type "B" dials.
2 Thordarson audio frequency transformers, T1, T2.
1 Yaxley No. 802 fixed resistor, R5.

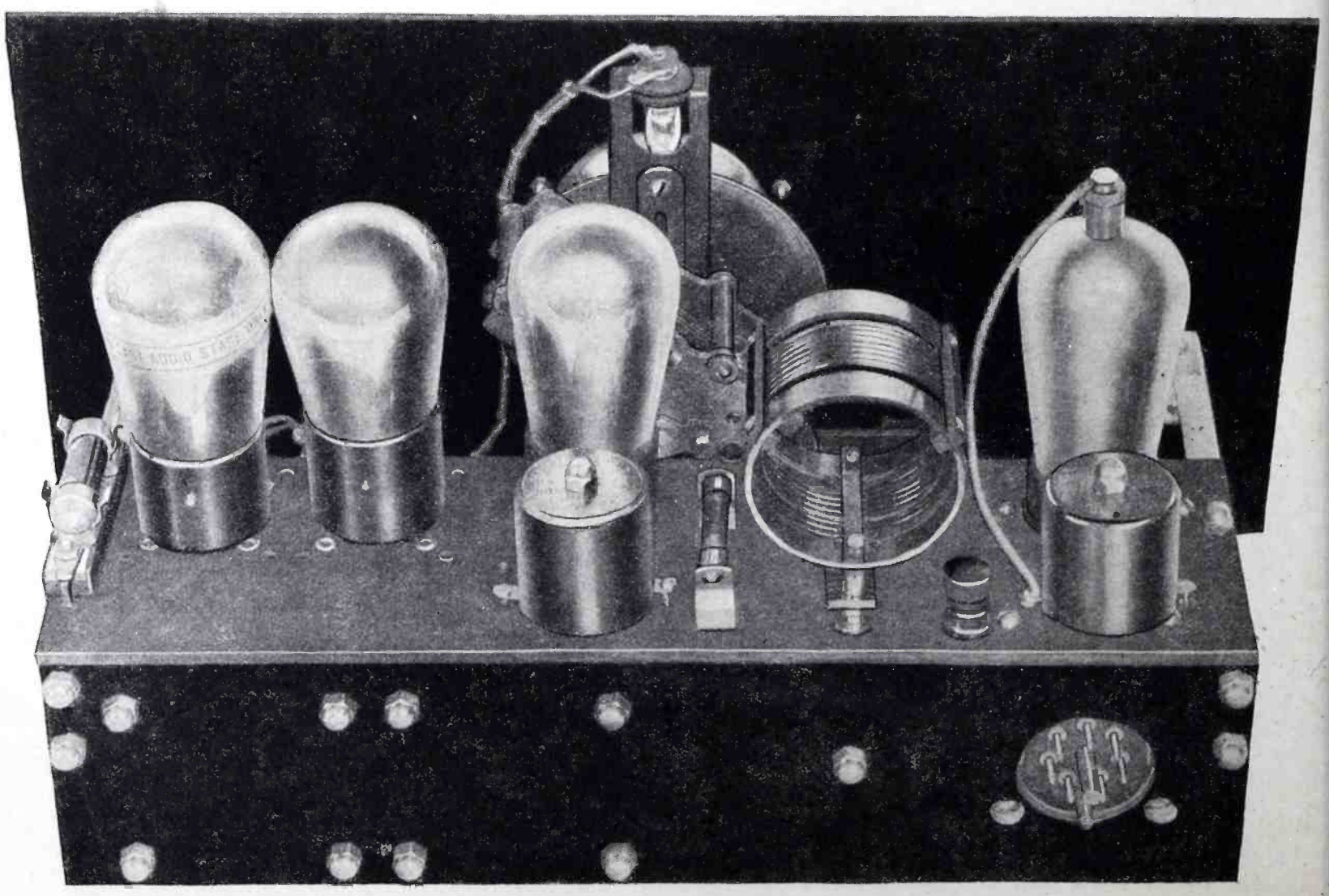


Schematic wiring diagram of the "International" short wave receiver. All parts are indicated to correspond with the picture wiring diagram layouts and list of parts.

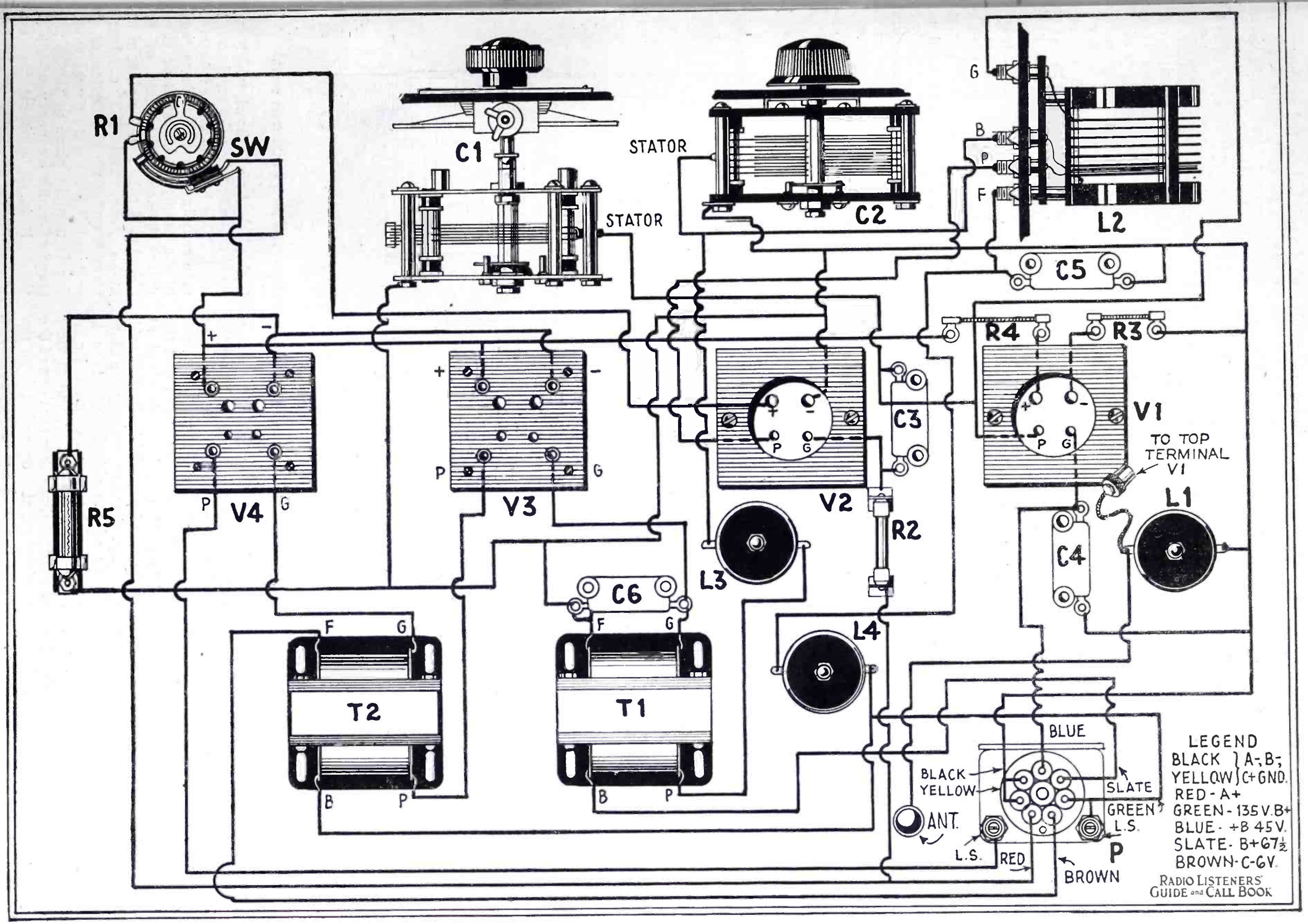
the receiver should be capable of being adapted to the many changes which will undoubtedly ensue as time goes on.

In order to limit the radiation of the receiver, the shield grid tube is the most plausible prospect. The insertion of this tube between the antenna circuit and the oscillating tuned circuit of the short wave receiver will limit the transfer of energy from the tuned circuit to the antenna, due to its extremely low grid-to-plate capacity.

It was the original intention that this tube should be used as a radio frequency amplifier with a tuned grid circuit coupled to the antenna, but the idea was abandoned for two reasons; the first being that the tube is not strictly a non-oscillating one, and when connected with tuned circuits in the grid and plate, they must be adequately and carefully shielded; also, plug-in coils must be used in order to cover the necessary band of wave lengths and to have shielded these circuits would have entailed considerable difficulty in the removal of two shield tops and the replacement of two coils for each change of wave band. In addition to these, there is the fact that the tube possesses not zero, but an appreciable, though small, grid-to-plate capacity, which causes a dis-



A view of the set from the rear showing the construction of the sub-panel and back assembled on the panel brackets.



agreeable interlocking of the two tuner controls which is an additional complication in an attempt to secure high ease of operation.

It has been found experimentally that while, due to its low distributed capacity, the choke coil serves very well as an aperiodic input circuit between the aerial and ground, across which the grid circuit of the shield grid tube is connected, as shown in the accompanying circuit diagram, somewhat better results could be obtained by an especially designed input impedance.

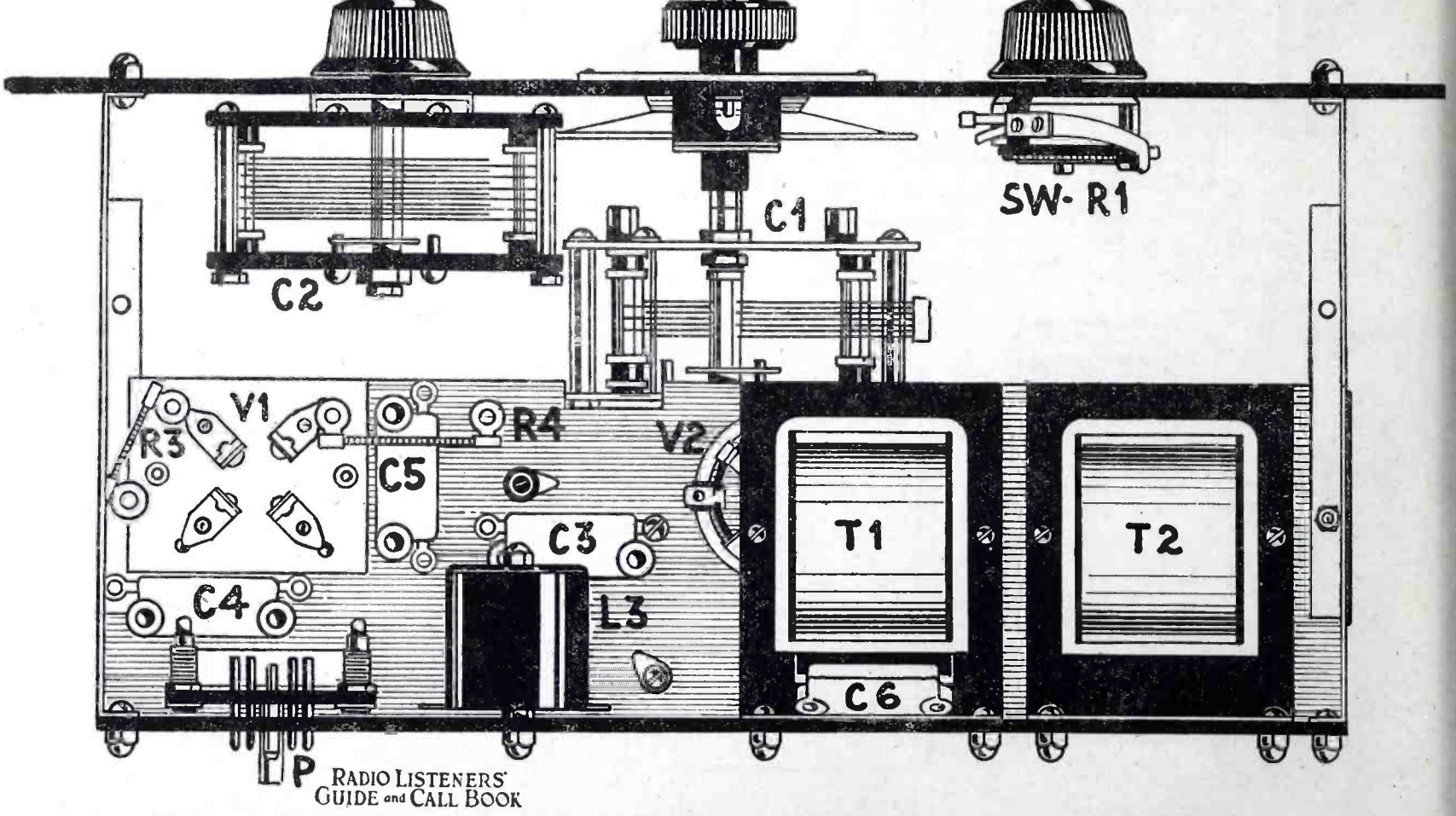
As connected in the diagrams, the shield grid tube also contributes to the ease of operation by elimination of the so-called "holes" in the tuning range of the conventional short wave receiver. These "holes" are due to the antenna at the natural period, or multiples thereof, subtracting enough energy from the tuned circuit to cause the detector tube to cease oscillating in narrow bands, whereupon the antenna coupling must be reduced and again increased as the "hole" is passed on the tuning dial. The shield grid tube, due to its low internal capacity, eliminates this objectional feature and permits a band of waves to be swept by the tuning condenser without other adjustments saving a minor manipulation of the regeneration condenser.

This receiver has also been improved for broadcast reception by the employment of audio frequency transformers of a type heretofore only used in line amplifiers of broadcasting stations, and due to the tremendous expense of manufacture, never before available to the general public. These transformers give unusually good results and when used with a 112 or 171 tube for which the receiver is wired, surprising tone quality will be encountered.

In order to give this unit the greatest possible versatility, it has been designed in two and four tube units, both built up on bakelite panels with all wiring concealed, so that a very fine appearance and compact construction are obtained with no loss of efficiency.

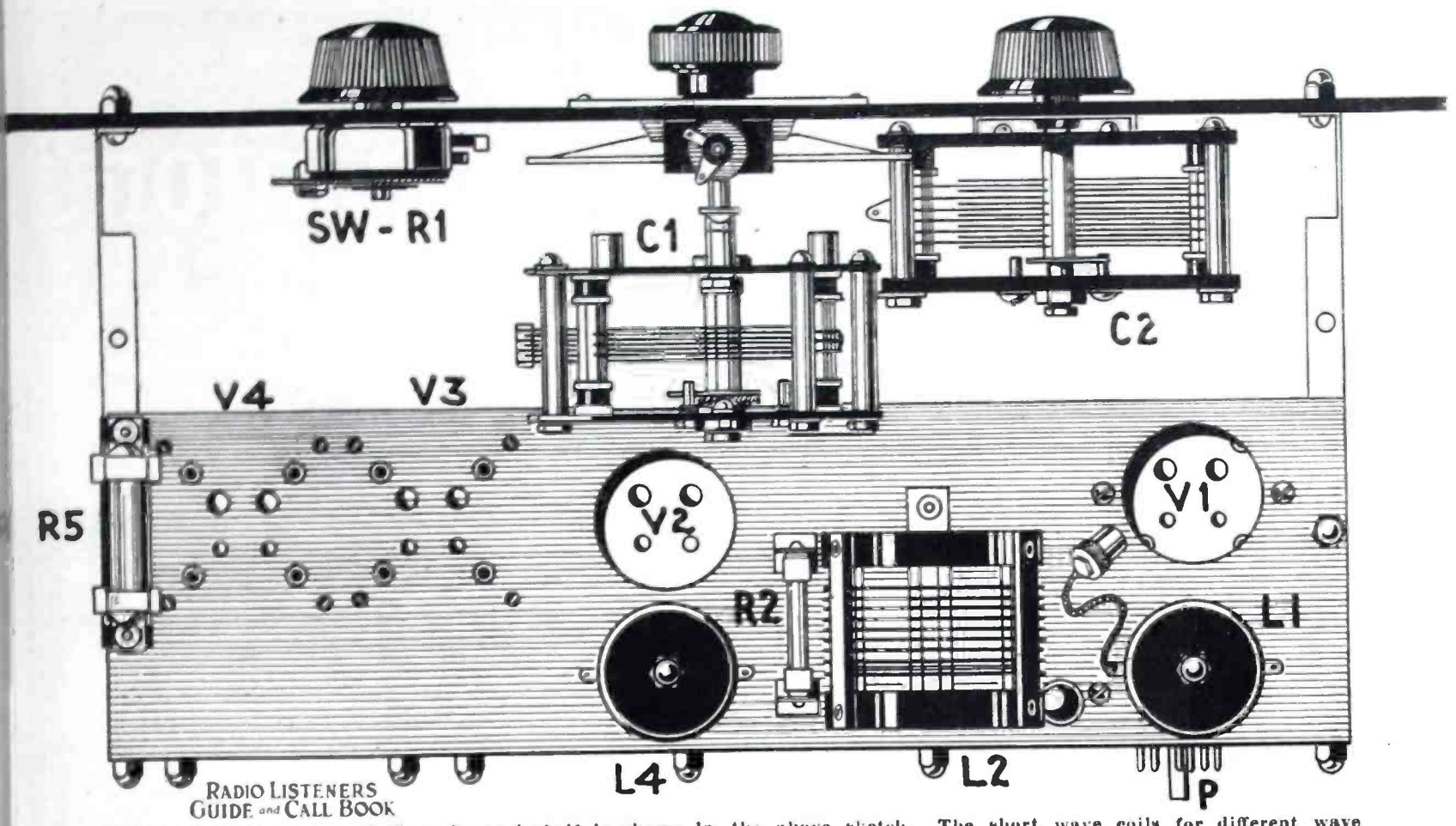
Smooth operational control has been attained by no small amount of effort. A portion of the success of this feature is due to the splendid characteristic of the choke coil, at all frequencies, which serves to isolate the regeneration circuit, consisting of the inductance and the regeneration condenser, at all frequencies to which the tuner is capable of responding. Stability of control is also obtained by isolating the various circuits as completely as possible by the following functions: the fixed condenser assures that the shield grid will be maintained at R.F. ground potential by its .003 mfd. capacity. In the same way the plate circuit of the shield plate tube is by-passed by means of a fixed condenser of .003 capacity, and in view of the fact that other portions of the receiver are also operating from the 135 volt tap of the battery, another choke coil is inserted as shown. In order to prevent small radio frequency currents from being carried through the stray wiring capacities of the audio amplifier, which is objectionable when wearing the headphones, the cores of the audio transformers are grounded, and in addition of .0001 mfd. condenser is employed across the secondary of the audio transformer, and first another fixed capacity may be put across the output terminals of the receiver. These last capacities may be left out if desired, in most instances being purely precautionary devices.

As an additional precaution it may be found desirable to connect a 4 mfd. condenser from the 135-volt side of the battery to the ground. This condenser need not always be used, but may possibly be found necessary with some B eliminators and with either somewhat depleted dry B batteries or with storage B batteries. Its need will be indicated by the presence of a rather high pitched audio howl, which will be eliminated when the condenser is used. This howl is caused by common coupling through the resistance of the supplying batteries or eliminators between the plate of the shield grid tube and the plate of the audio tube, and the condenser should, under no circumstances, be required if a separate power amplifier is used in place of the second stage of audio frequency amplification. It is an apparent fact that these improvements for eliminating



RADIO LISTENERS' GUIDE and CALL BOOK

Assembly layout of the receiver. Parts mounted beneath the sub-panel shelf are shown as well as parts on the front panel.



Layout of parts on top of the sub-panel shelf is shown in the above sketch. The short wave coils for different wave bands are placed in the mounting at L2.

udio noises in the output of the re-eiver, regulating the oscillation of , also contribute materially to the se of operation.

By the unique construction of the 00014 mfd. condenser much of the ouble of noisy operation has been one away with.

The wavelength range of the receiver with the three Aero type WT-11 plug-in coils is from seven-een to eighty-nine meters, and with ne No. INT-104, one hundred fifty-ve meters, arranged to include all hort wave stations broadcasting at present or contemplated, as well as the principal amateur phone and telegraphic bands.

The physical dimensions of the receiver have been so arranged that if the user desires to employ the "International" receiver for the broadcast band, the standard Aero coils INT-4 and INT-5 may be inserted, but due to the fact that the constants of the circuit have been arranged primarily for the most satisfactory operation on short waves where even a very sharp radiation must cover up to fifty or sixty kilocycles to retain good quality of reproduction, the receiver will be found to be quite broad on the regular broadcast bands. In sections fifty miles or more from high powered broadcasting stations, and particularly in foreign countries, the INT-4 and INT-5 coils may be used in the "International" receiver with a considerable gain in sensitivity as compared with the three tube set for which the INT-4 and INT-5 coils were designed. In sections where the ether is highly congested, as for

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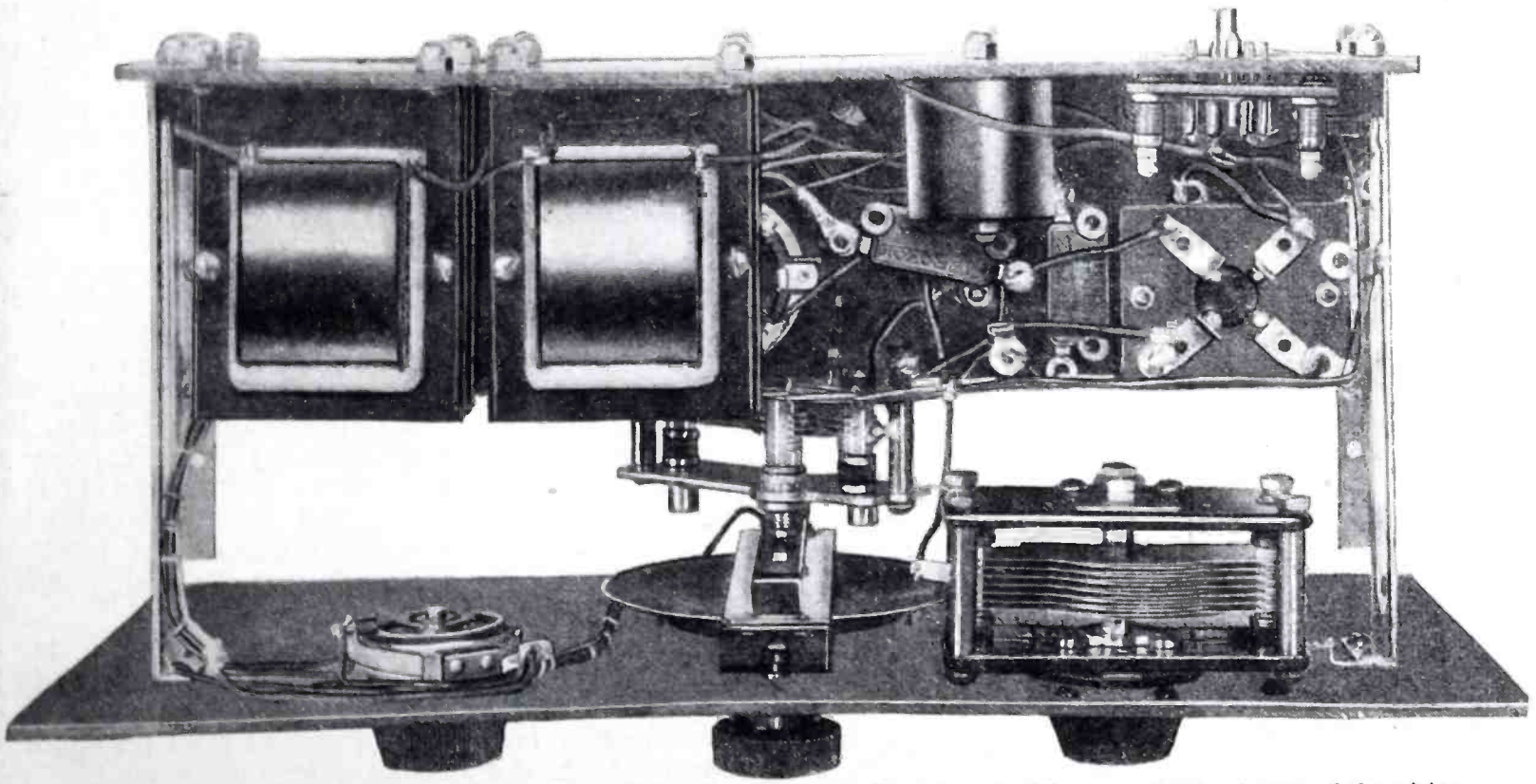
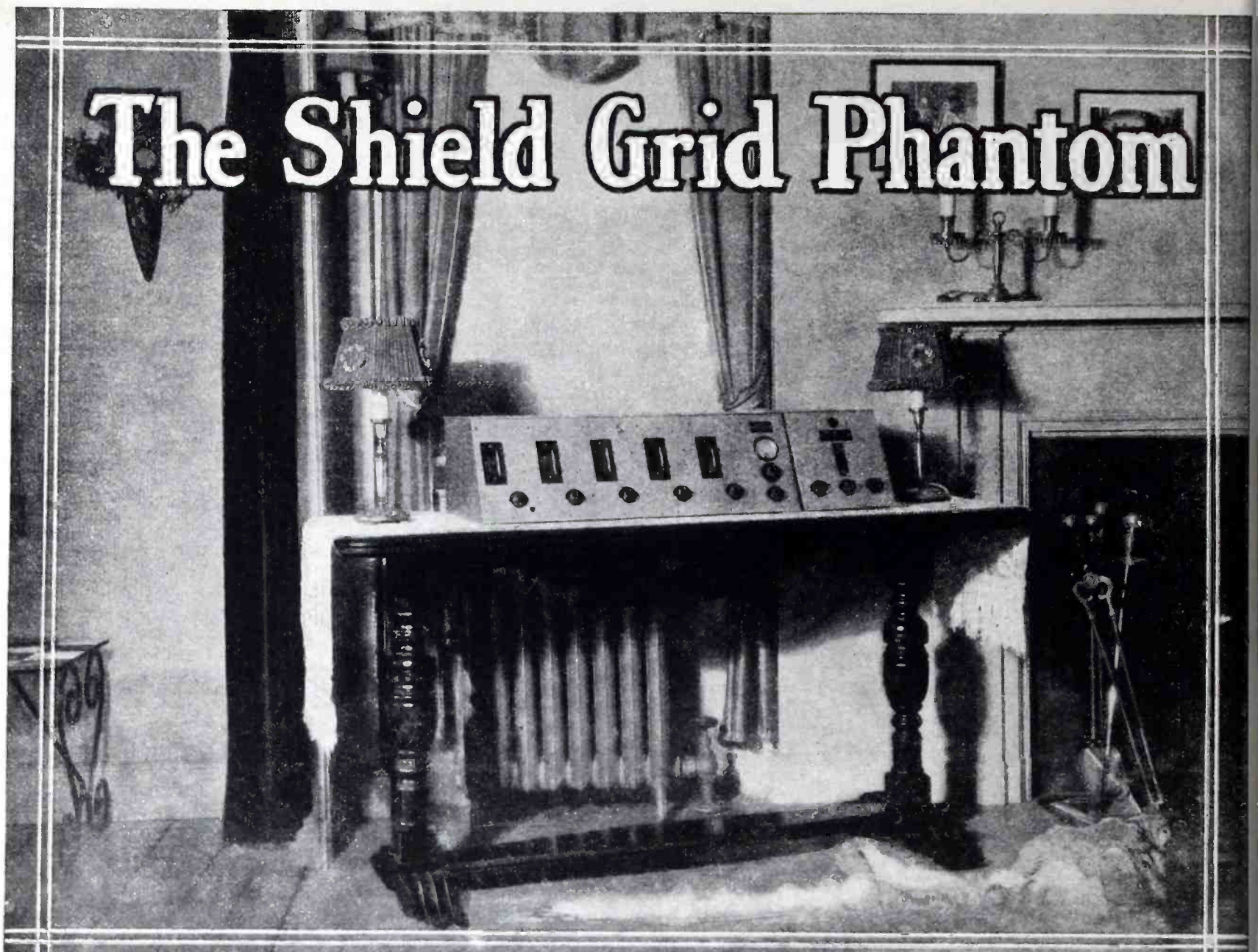


Photo showing a bottom view of the receiver. Notice how compact all parts and wiring are. Leads of some of the wiring are tied together in cable fashion.

The Shield Grid Phantom



THE Shield-Grid Phantom was not developed by just building one or two experimental laboratory models, but instead, it is the final achievement of an engineer connected with the radio industry for the last fourteen years, the last eight of which have been devoted exclusively to the design of broadcast receivers.

The gratifying public demand for the factory built Phantom during the last three months, has encouraged the presentation of the receiver in kit form, thereby allowing the experimenter to pursue his hobby to profitable advantage, knowing that upon completion he will have a receiver equal to the factory built product.

This receiver makes use of a very efficient tuned radio frequency circuit, in the four stage high frequency amplifier, using 222 type tubes in all four stages. The detector stage is specially designed for the new 200A type gaseous detector tube.

Using the interchangeable R.F. transformers, it has a wavelength range from 35 meters to 3,600 meters and can be operated either with batteries or any good current supply of suffcient power.

The four stage audio or low frequency amplifier consists of two resistance coupled stages using two 240 Hi Mu tubes and two power audio stages using the push pull system with either two type 210 or two 250 power tubes, making a total of nine tubes.

If batteries are used, the last two power stages require two UX171 or UX112 tubes, but it is recommended that the special power supply and UX210 or UX250 tubes be used.

The use of 222 tubes gives a voltage amplification of from 30 to 60 per stage according to individual receiver design, as compared with a maximum amplification of 10 per stage with the old UX201A tubes. This means that the total amplification of the Shield-Grid Phantom is 810,000 instead of only 10,000 as given by the 1927 Model Phantom.

In the audio amplifier each Hi Mu tube has an amplification factor of 30, as compared with the 201A tube which is only 8. The output of the power stages is unbelievable. One UX171 tube has a maximum undistorted output of 700 milliwatts, one 210 has an output of 1,540 milliwatts whereas by using two 210's or two 250's in the push pull system, the total undistorted output available for the speaker is not twice as much as a single tube, but about three times greater than one single power tube or approximately 10,000 milliwatts for the 250's in push-pull.

The Phantom's appearance is radically different from the ordinary run of receivers, inasmuch as the 16 Ga. sheet aluminum, with which the apparatus is shielded, is also made to serve as a cabinet. Before the shielding is assembled it is grained to a beautiful mat silver finish and when assembled with the silver etched, jet black name plates, a very pleasing effect is obtained.

This cabinet overall is 27½ inches long, 14 inches front to back and 8½ inches high, with slanting front panel at such an angle as to insure easy tuning position of the hands. A hinged lid allows instan

access to interior for inspection or changing of tubes, while a removable bottom and right hand end piece gives easy access to entire receiver at any time.

All external connections are made to special clips mounted on a bakelite strip at rear of receiver. While at first glance, the number of clips might appear excessive, a little study will show that each one is necessary to conduct the proper "A," "B" and "C" voltages to each tube so that it is performing at its maximum rated output.

Looking inside of the receiver, we find it divided into six compartments; the first four of which house the radio frequency stages, the fifth serves the detector stage, while the four audio stages are built into the sixth or right hand compartment.

Each radio frequency stage is separately shielded externally and between stages and in addition each type 222 tube is totally shielded thereby preventing undesirable interstage effect between the tube and the field of the radio frequency transformers.

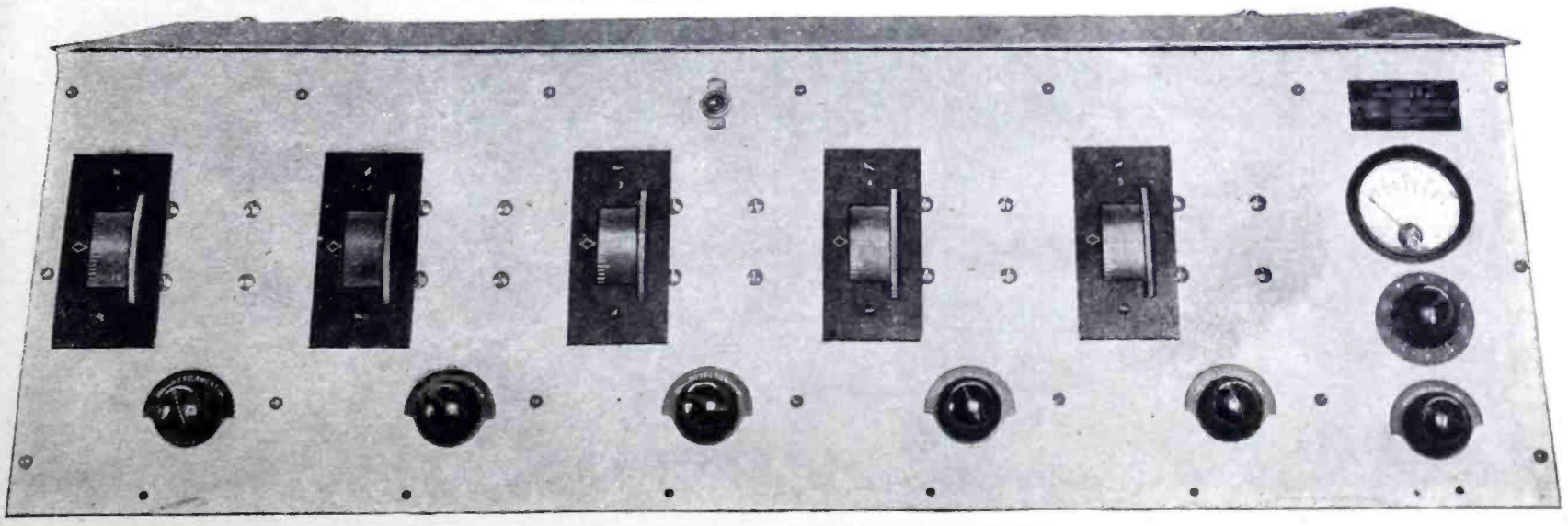
Each of the four radio frequency stages and the detector stage are provided with a wide spaced, transmitting type, individual tuning condenser of .0005 mfd. capacity. Each of these five condensers is actuated by a 5-inch dia. cast aluminum tuning drum, fastened directly to the condenser shaft and having a knurled rim projecting through the panel to allow easy rotation. On the periphery of each drum is fastened a silver and black etched scale calibrated in 100 divisions over a length of approximately 8 inches. The readings are made against an arrow etched on each drum name plate. The condenser plates are punched from heavy gauge brass and shaped to give a combination of straight line wavelength and straight line capacity, which experience has proven to be best suited for broadcast reception. All stator and rotor plates are soldered together instead of the usual nut, bolt and spacer construction, thereby obtaining an ideal electrical contact. Each condenser when mounted, is held by four 8-32 screws fastened to both the front panel and also to a rigid 16 Ga. angle reinforcing strip, thereby making a job that will remain set during rough transportation and over long operating periods. An exclusive feature of the Shield-Grid Phantom is that while each R.F. stage can be individually tuned, provision has been made so that the four R.F. tuning drums and the detector tuning drum can be coupled together making an efficient single control receiver.

This change is accomplished by tightening a clamp screw in each of the four cast bronze and fabric universal joints, riveted to the tuning dials. Due to the fact that the antenna tuning control varies slightly from the R.F. controls, due to the influence of each particular antenna system, it is recommended that the antenna stage be tuned individually and the other four drums be fastened together, making a simple tuning, two dial receiver. To compensate for differences in tube capacities and for errors in clamping condensers together, three vernier condensers C7, C8 and C9 of .000015 mfd. are provided, so that one-half of their capacity can be added or subtracted to tuning condensers; C2, C4 and C5; thereby correcting the small variations in resonance to match with condenser C3. When using the receiver with individual control, these vernier condensers function as vernier controls.

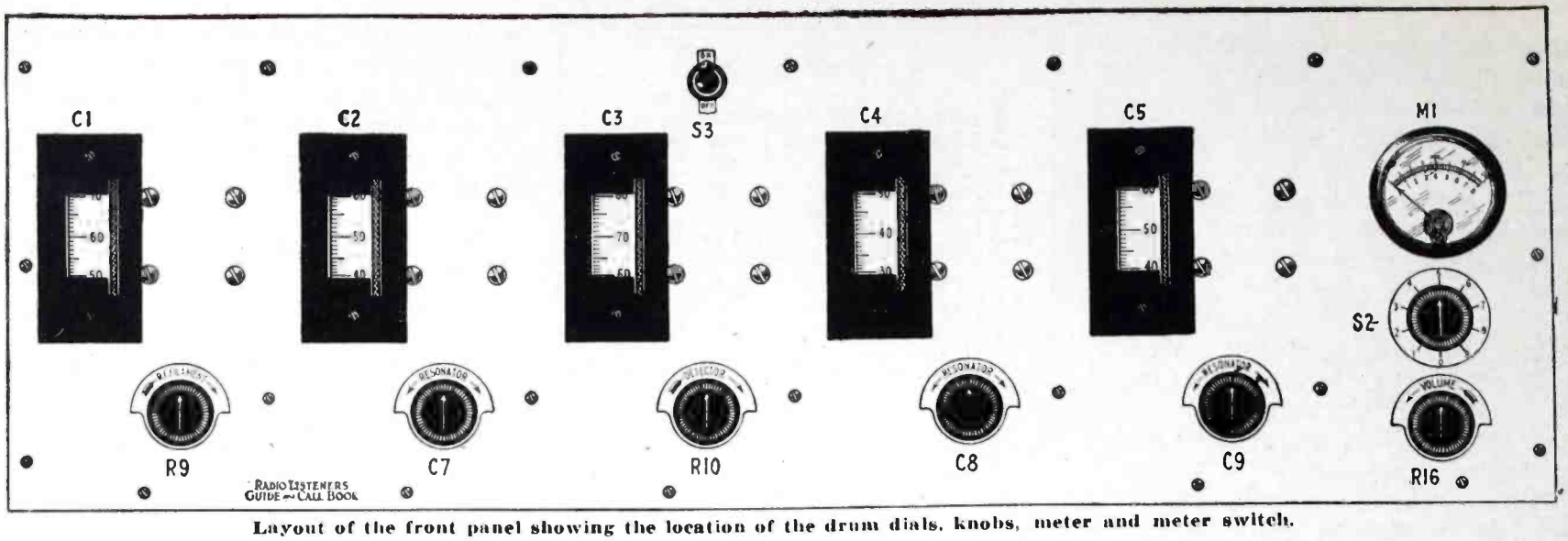
In order to efficiently cover each portion of the wavelength band of 35 meters to 3,600 meters, which this receiver is capable of doing, five separate sets of R.F. trans-

LIST OF PARTS

1 Aluminum cabinet assembled.
5 Leutz brass drum name plates.
6 Leutz brass control name plates.
1 Leutz brass meter switch plate
1 Leutz brass name plate.
7 Leutz bakelite control knobs.
1 Flush type voltmeter, M1.
1 10 point meter switch, S2.
1 Special meter multiplier, R18.
1 Toggle type filament switch, S3.
1 10 ohm R.F. filament rheostat, R9.
3 Leutz .000015 mfd. vernier condensers, C7, C8, C9.
1 Leutz 500,000 ohm variable resistance volume control, R16.
5 Leutz .0005 mfd. tuning condensers, C1, C2, C3, C4, C5.
5 Leutz die cast aluminum tuning drums and scale.
4 Leutz cast aluminum universal joints.
5 Leutz radio frequency "A" transformers, RF1, RF2, RF3, RF4, RF5.
1 Leutz loop adapter.
1 Leutz radio frequency tube shelf.
1 Bakelite, drilled and engraved tube shelf, ¼x5¾x23⅛".
20 Leutz tube contacts.
26 Leutz coil contacts.
4 Leutz grid leak holders.
1 Leutz series midget single throw antenna switch, S1.
1 Leutz bakelite binding post strip assembled.
4 Leutz 1 mfd. 200 volt by-pass condensers, C10, C11, C12, C13.
1 Leutz .0001 mfd. ser. ant. condenser, C6.
1 Leutz .00025 mfd. grid cond., C16.
1 Leutz .005 mfd. blocking condenser, C17.
4 Leutz Grid suppressors, 2,200 ohms, R1, R2, R3, R4.
4 Leutz 222 filament resistors, 10 ohms, R5, R6, R7, R8.
4 Leutz 222 tube connectors.
1 Leutz audio tube shelf, assembled.
1 Bakelite tube shelf.
16 Leutz tube contacts.
6 Leutz grid leak holders.
1 Leutz meter switch cable.
1 Leutz audio cable.
2 Leutz .01 mfd. audio condensers, C14, C15.
1 Leutz 2 ohm fil. resistance, R-17.
1 Leutz input transformer, AT1.
1 Leutz output transformer, AT2.
1 Leutz det. grid leak, 2 meg., R11.
2 Leutz 50,000 ohm grid resistors, R14, R15.
2 Leutz 100,000 ohm plate resistors, R12, R13.
1 Leutz 20 ohm det. rheostat, R10.



A front view of the set. The complete outfit is encased in a heavy sheet aluminum cabinet.



Layout of the front panel showing the location of the drum dials, knobs, meter and meter switch.

formers have been designed. The "A" transformers which are included with the receiver, cover the regular broadcast band, namely from approximately 200 to 560 meters. The high and low wavelength coils, which are optional, cover the following wavelengths: Type "C," 35 to 90 meters; type "B," 80 to 210 meters; type "AA," 500 to 1,500 meters and type "BB" 1,200 to 3,600 meters.

All transformers are of the plug in, solenoid type mounted on bakelite bases engraved with the type number and stage in which each belongs. The lengths of the "A" coil forms are 1½ times the diameter, which proportion is best for the wavelength range of 200 to 560 meters. Cotton covered wire is used, to avoid the high distributed capacity and losses encountered with enameled wire, due to the high dielectric coefficient of the enamel. The secondary is space wound to obtain equal inductance in each coil and the primary is close wound directly upon the secondary separated by thin insulating paper. In order to gain further efficiency, the primary is bunched at the filament end of the secondary coil which allows the maximum possible amplification and greatest stability of operation.

To change the receiver from the regular broadcast range to say 42 meters, it is only necessary to remove the five R.F. transformers and substitute the five "C" transformers, similar to changing tubes.

The ideal radio frequency amplifier is one that will supply as much voltage amplification to the detector tube as it will handle without overloading and at the same time give at least ten kilocycle selectivity over entire wavelength range without sacrificing any quality of the musical reproduction.

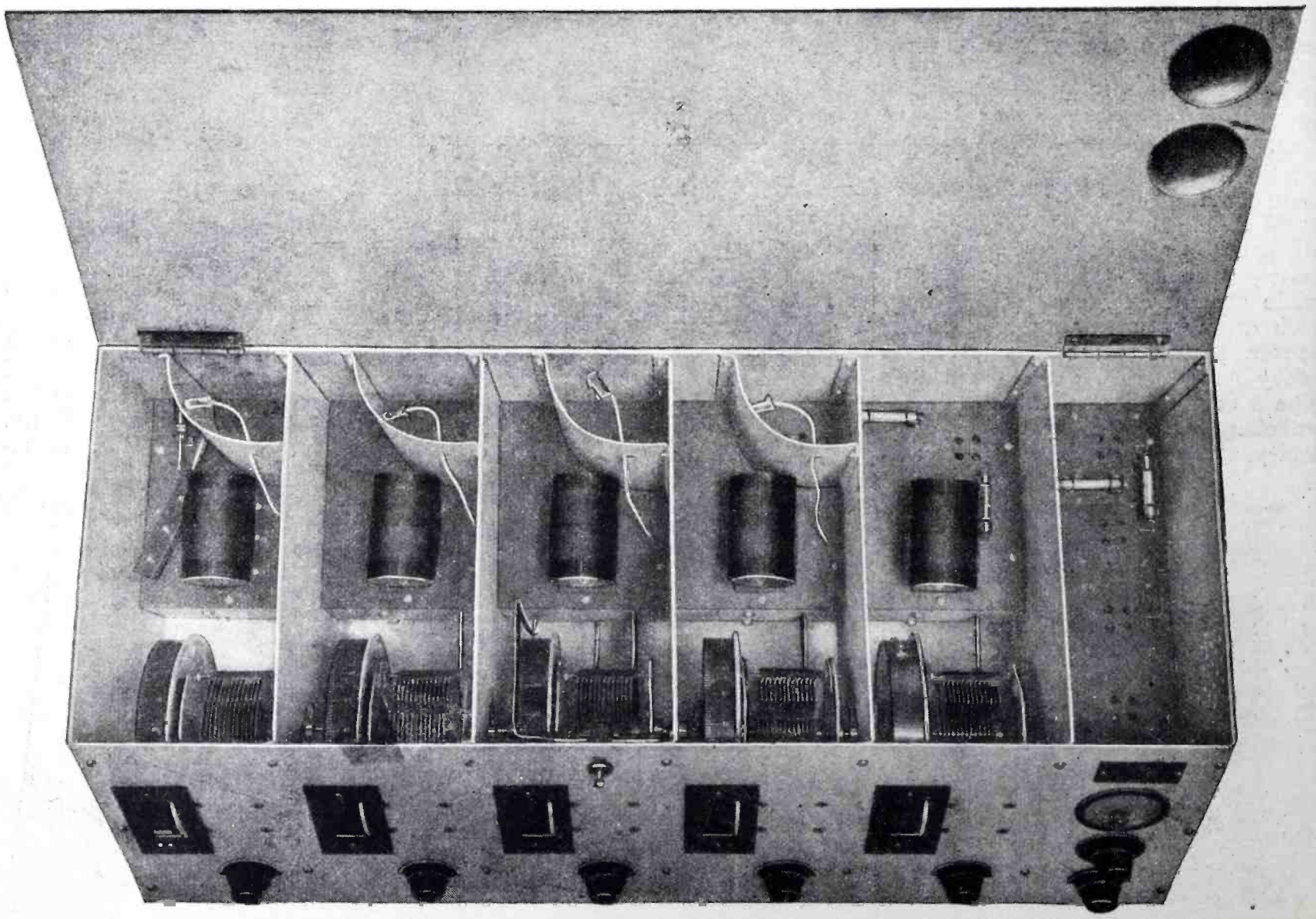
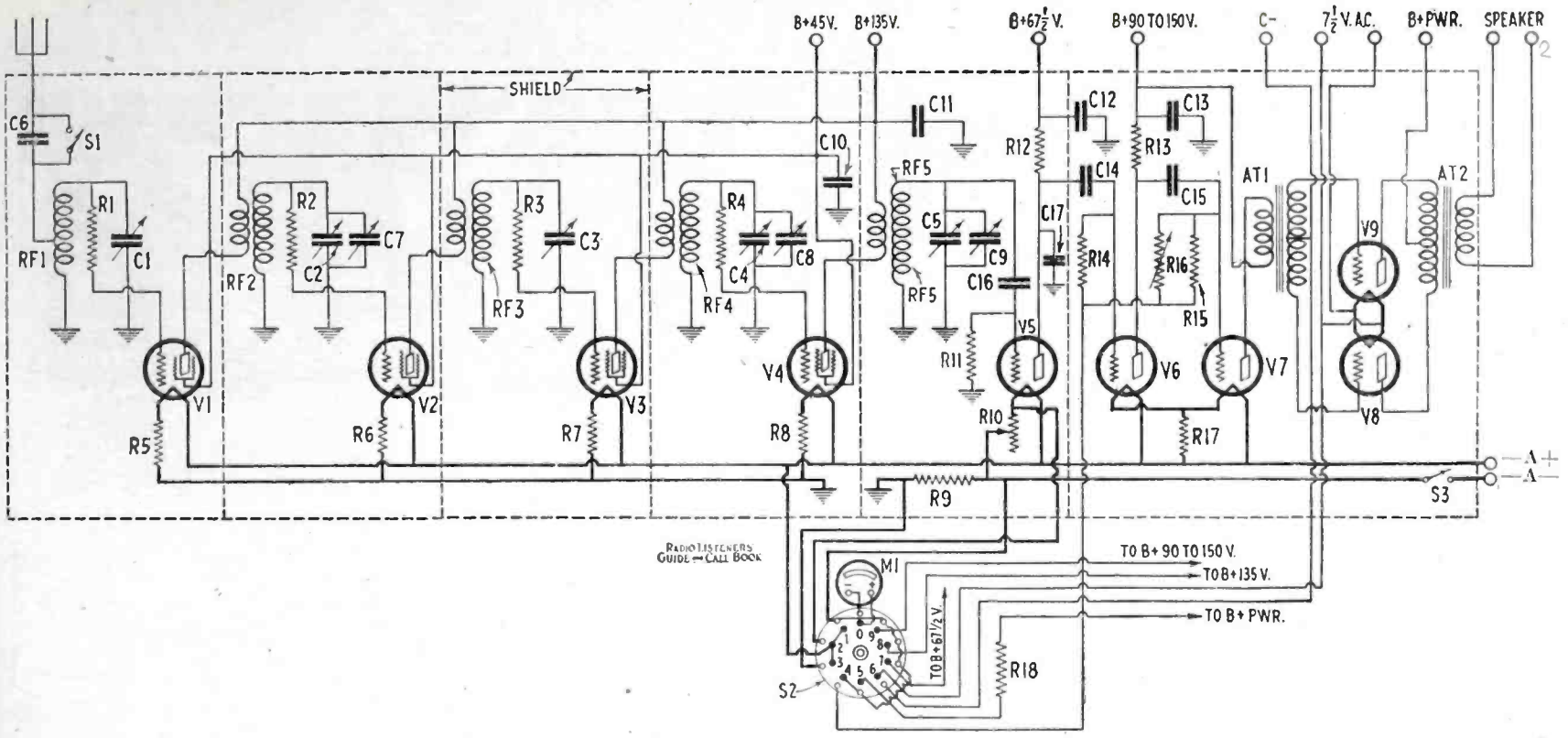


Photo of the Shield Grid Phantom looking down into the set. Note the four shield grid compartments and grid leads.

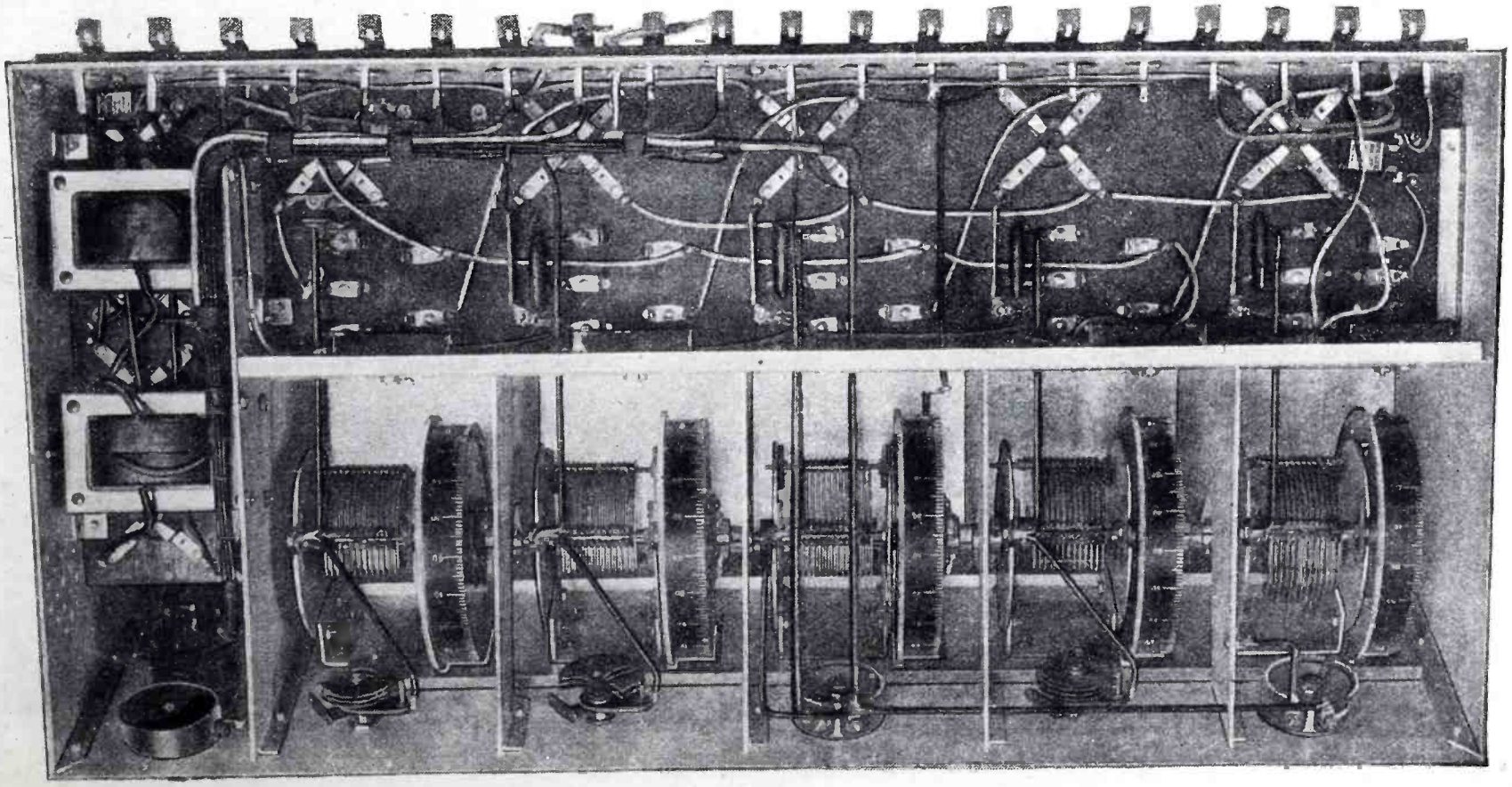


Above is a complete schematic wiring diagram of the receiver with all parts indicated to correspond with list of parts and layouts. The meter switch, S2, is employed to give voltage readings of the various circuits on the meter, M1. Resistance R9 is preferably variable.

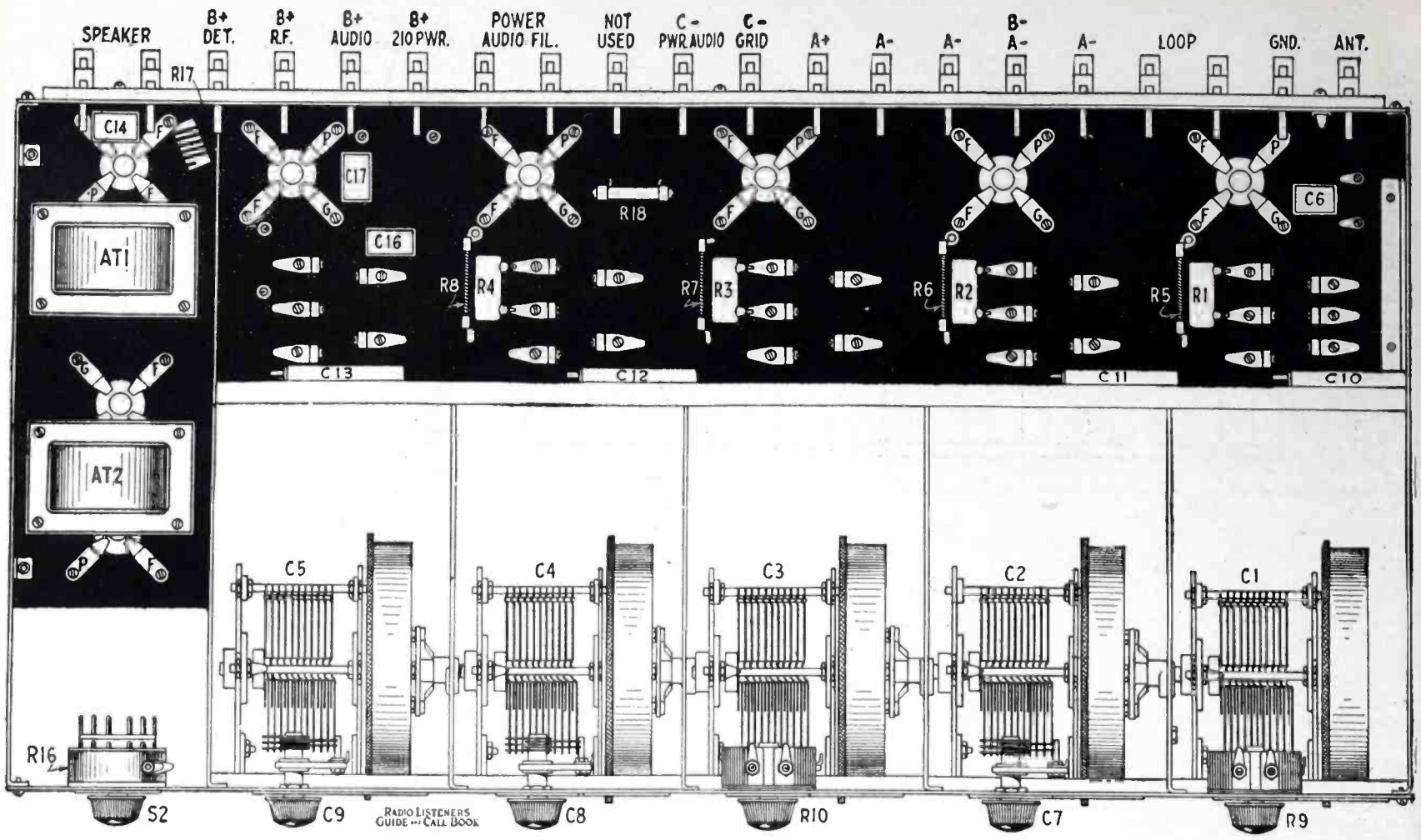
In the Screen-Grid Phantom this theoretical condition is more nearly approached than any broadcast receiver on the market today.

In order to secure the ideal degree of antenna coupling and resulting selectivity, uniformly over the entire wavelength range, the antenna of the Shield-Grid Phantom is directly coupled to the first radio frequency transformer (R.F.-1). The .0001 mfd. series antenna condenser (C-6) which can be cut in or out of the circuit by the antenna knife switch (S-1) gives the same result as using a short and long antenna, inasmuch as when two condensers of unequal capacity are connected in series, the resulting capacity is less than that of the smaller condenser. For example; when using a long antenna of large capacity which is particularly efficient for wavelengths on the order of 300 to 600 meters, this same antenna can be made equally efficient for wavelengths from 100 to 350 meters by simply opening the switch which throws the .0001 mfd. condenser into the circuit. A feature of design neglected in the ordinary screen grid circuit is that although the detrimental feed-back tendencies of the old 201A tubes themselves are eliminated by the new UX222 tubes, considerable unavoidable stray capacity is produced by the connecting leads, no matter how they are arranged. To overcome this objectionable condition, which means that the R.F. amplifier will oscillate long before the maximum amplification point is reached, the four noninductively wire wound resistances (R1, R2, R3, R4) of approximately 2,200 ohms are placed in series between the grid of each screen grid tube and its R.F. transformer.

To obtain the necessary maxi-



An underneath view of the set with the bottom removed to show the wiring arrangement of components.



A bottom layout of the receiver showing the location of the variable condensers, audio transformers, resistances, etc.

mum 3.3 filament voltage as required for the UX222 tubes, the four 10 ohm filament resistors (R5, R6, R7, R8) are connected between the shield and the negative filaments of the first four tubes. This arrangement also provides a control grid bias of 1½ volts for each 222 tube, in respect to the "A" negative filament.

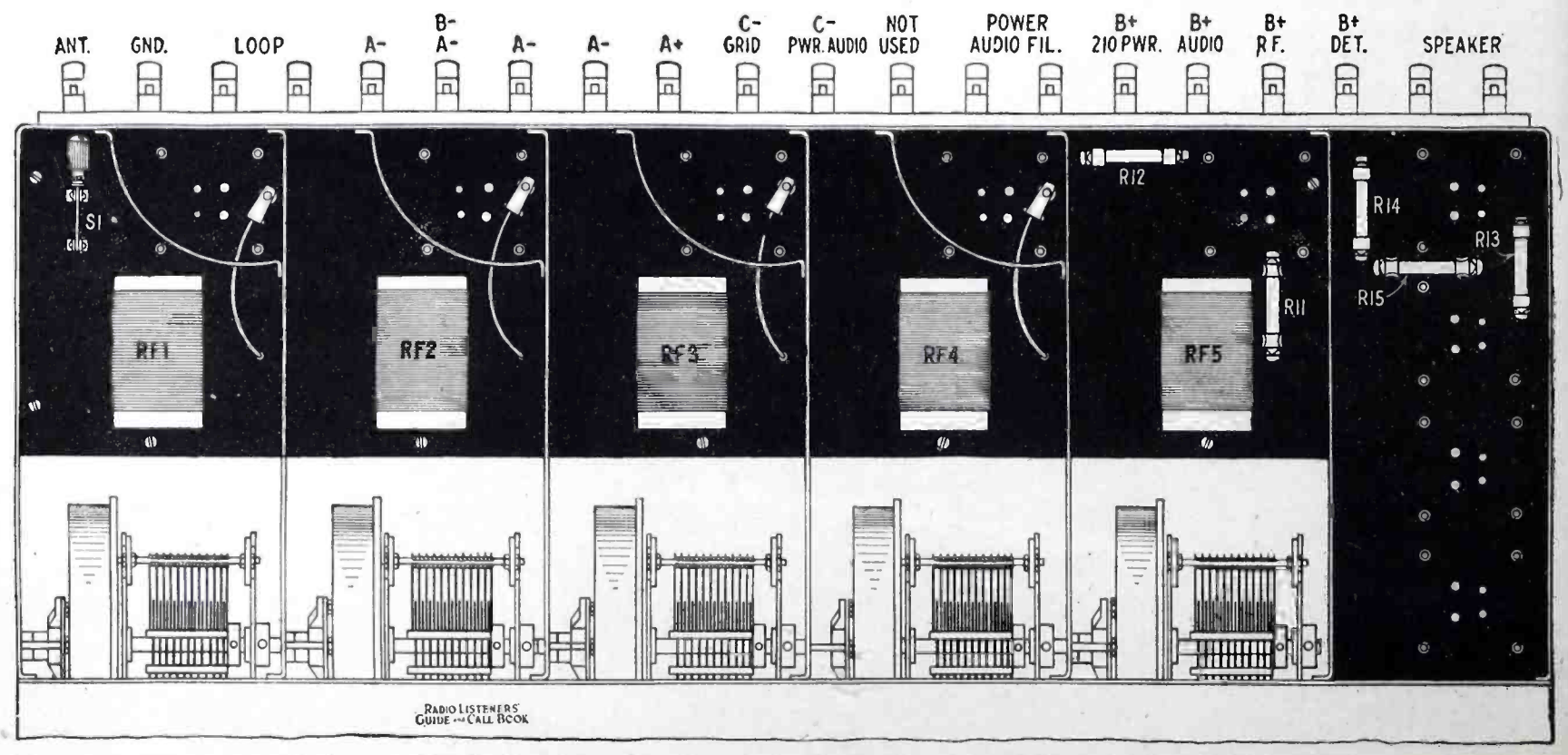
The negative sides of the four 222 tubes are bused together and connected to the shield, from which point they are picked up by the 10 ohm filament rheostat (R9) which thereby controls the filaments of these four tubes.

The 90 to 150 volt plate supply is fed to the tubes through terminal clips and is adjusted by control on power pack, whereby the tubes can be worked at maximum efficiency. The Shield Grid bias of from 22½ to 45 volts is furnished by a separate external 45 volt battery promoting stable functioning of the R.F. amplifier, or can be obtained from the "B-C" supply.

Attention is directed to the absence of the many fixed condensers and R.F. choke coils so prevalent in the usual screen grid circuit. This is made possible by the efficient design of the Screen-Grid Phantom which requires only four 1 mfd. by-pass condensers (C10, C11, C12, C13) to prevent parasitic coupling back through the plate supply leads.

In order to take advantage of the most advanced detector tube available the Shield-Grid Phantom was designed to use the UX200A detector tube. The filament is con-

(*Continued on page* 165)



Instrument layout of parts on the sub panels. The locations of the R.F. coils are indicated.

How to Construct a Spanish Radio Cabinet

THE cabinet design illustrated here is a Spanish desk adapted to house a radio receiver. The construction is reasonably simple, well within the ability of the average home mechanic. It consists of a table 20 in. by 38 in., containing the receiving set, and a box 15 in. by 34 in. by 14 in., providing space at either end for batteries and eliminators, with a tone chamber in the center. The table is figured for a panel 7 in. by 24 in., but can easily be arranged for panels up to 30 in. in length.

Preferably, walnut should be used for the cabinet, but red gum is an excellent substitute, and beautiful in its own right.

For general structural details, see the elevation and section in Figures 1 and 2. Figure 3 details a table end. Each leg is made from a piece of 1 in. by 7 in. by 30 in. rough walnut, surfaced by hand to get a thickness of 1 full inch. Choose the better face for the outside, marking it with an "X" for identification. Cut the inner edge roughly to shape, straightening those parts which join with the rails, by lining with a straight edge. The upper rail edge is parallel with the lower, but ¾ in. nearer the table end center. Square them accurately with the face. Because of the irregular shape, these parts can not be planed easily, and careful work with a chisel is needed; but there is nothing especially difficult about truing these joints.

For an upper rail, cut a piece of 5-ply walnut veneer, good one side, 8½ in. long by 11½ in. wide. For a lower, use a piece of 1 in. by 4 in. solid stock cut 13 in. long. Surface the latter to thickness, marking the face side and edge, and clean the other edge enough to show guide lines.

Set a marking gage for 5/16 in. Using the working faces as guides, score lines on the prepared straight edge sections of the legs, on the ends of the rails and down the edges 1 in. on the upper, and 2½ in. on the lower. Reset the gage for 11/16 in., and make a second set of lines. These define the widths of the mortises and tenons. Squaring from face edges only, mark the shoulders of the tenons on the face side with lines 1¼ in. and 3¾ in. from the face edge.

MATERIAL LIST

1 pc. ¾ in. 5-ply walnut, good 1 side, 30 in. by 72 in.
1 pc. ¾ in. 5-ply walnut, good 2 sides, 22 in. by 26 in.
1 pc. ¼ in. 3-ply walnut, good 1 side, 30 in. by 22 in.
1 pc. 1 in. by 7 in. by 10 ft., rough walnut.
1 pc. 1 in. by 6 in. by 8 ft., rough walnut.
1 pc. 1 in. by 4 in. by 6 ft., rough walnut.
1 pc. ¾ in. 5-ply pine, good 1 side, 14 in. by 34 in.
1 pc. 1⅛ in. by 2 in. net by 3 ft. pine, S4S.
2 pc. 1 in. by 2 in. by 10 ft. pine, S4S.
1 pc. ⅜ in. 3-ply pine veneer, good 1 side, 26 in. by 30 in.
3 Forg catches, ¼ in.
3 small knobs.
4 ft. 4 in. of piano hinge.
1 pc. cane webbing, 18 in. by 34 in.

In cutting the tenons, a too-deep cut in the thickness of the material greatly weakens the tenon. A similar cut lengthwise, however, has little effect. Therefore, rip the cheeks first, and there will be little danger of sawing too much at the shoulders, for the waste blocks will drop out as soon as cut through. Clamp the rail in the vise, and with a sharp backsaw or rip, cutting first from one edge and then the other, always with the blade of the saw in the waste wood and the inner side just splitting the line, rip the cheeks. Next rip the width lines. Then lay the piece on a pair of bench hooks and cut the shoulders, again sawing in the waste wood and splitting the lines. Finally cut the edge shoulders.

The upper rail tenons are flush on the upper edge, and 10¾ in. wide.

Mark the leg mortises for length from comparison with the rail tenons. Cut them with a ⅜ in. chisel, by making cross cuts every ¼ in., as indicated in the photograph. Take care that the mortise sides parallel the leg faces. Go a little deeper than the tenon lengths, both to prevent possible striking of the tenon ends, and to give room for imprisoned excess glue, which might otherwise interfere with the joint closing, or split the wood through hydraulic pressure.

Try the joints for fit before glueing up. If a joint does not close, being held by a long shoulder on the other face, run a saw down the tight side. If the work has been carefully done, the assembled end will lie flat, without any tendency to twist.

Apply glue to tenons and mortises both. Liquid glue is entirely satisfactory, and more convenient to handle than hot glue. If the latter is used, however, warm the wood and have the glue hot.

When the end is dry, surface down any slight unevenness of the joints, and draw a center line. Square the top from this, measuring a width of 1 ft. 4 in. The length of the end is 2 ft. 5¼ in., and the width at the bottom is 1 ft. 8 in. Cut the top to a bevel of 2 in. in 29¼ in. Retain this bevel setting for use on the rails and stiles.

Make a cardboard pattern by laying out a strip in 1 in. squares and sketching the outline through them as indicated in Fig. 3. Notice that these curves are not made up of arcs of circles, but are of con-

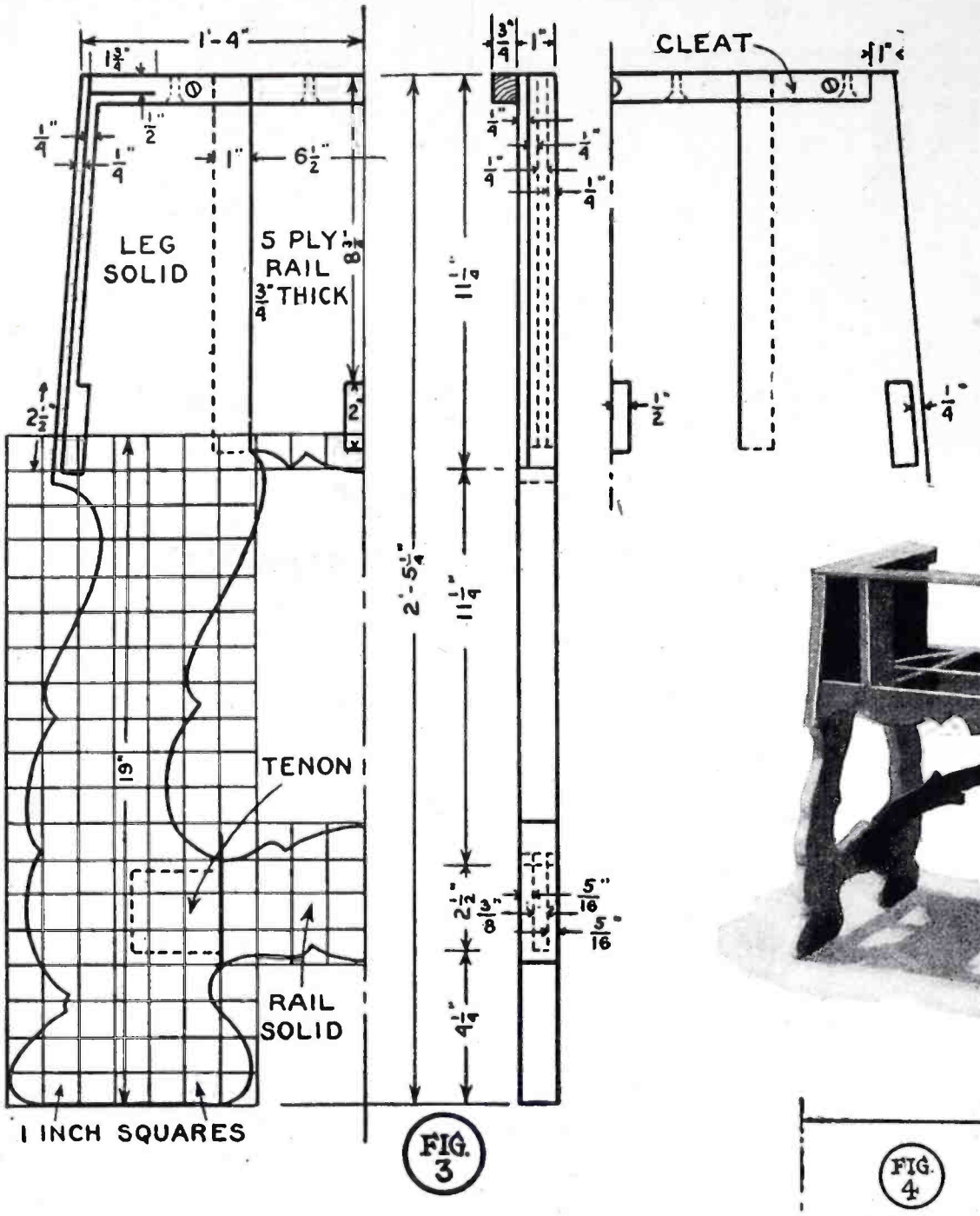


FIG. 3

stantly changing radii, giving a grace and variety that circles do not possess. With this pattern trace the outline on the table end, and cut out with a turning or keyhole saw.

Smooth the edges with a wood rasp. Hold the file square with the surface, with the point toward the inner face. Make strokes at right angles, pushing forward with a rotary motion at the same time. Lift the file on the return stroke. To avoid splintering the inner face, chamfer the corner slightly. When the edges are true with the lines, smooth them with sandpaper.

On the inner face, parallel to the front edge, a dado ¼ in. by ¼ in. is made 11¼ in. long. The lower end widens into a mortise ½ in. by 2½ in., as shown. Gage lines ¼ in. and ½ in. from the front edge for the dado. Dig out the mortise, and then saw the sides of the dado, which can be easily chiseled to depth afterward.

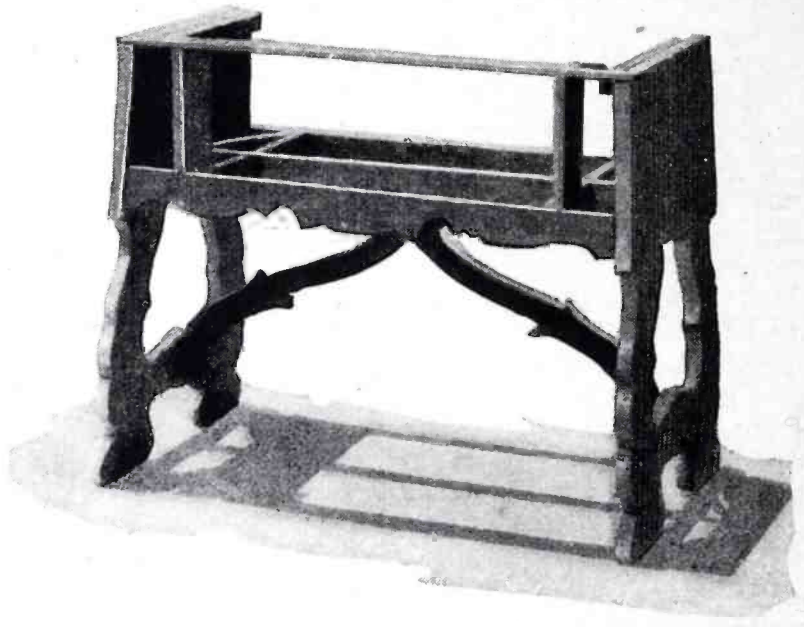
A similar mortise is made in the back edge to receive the end of the back rail, and one 1 in. by 2 in. ¼ in. deep centers on the upper rail length, alining with the upper edges of the outer mortises.

A fourth mortise ½ in. by 1¾ in. notched into the upper front edge for ¾ in. in the thickness of the table end receives the front upper rail end.

Screw and glue to the upper end a ¾ in. by ¾ in. cleat, which is drilled and countersunk for screwing to the top.

The other table end is made to pair with the first.

The table top is of ¾ in. 5-ply walnut, good one side, cut 19½ in. by 37 in. Rabbet the edge ¼ in. deep all around, leaving the upper



Above shows details of the table ends and how they are patterned. The photo shows the table ready for the top. Below are details of the rails.

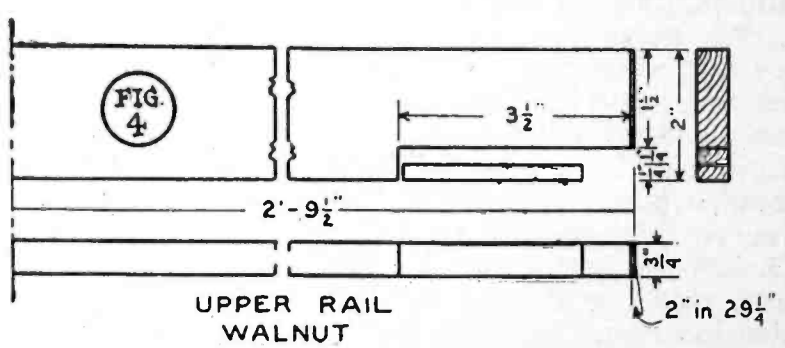


FIG. 4

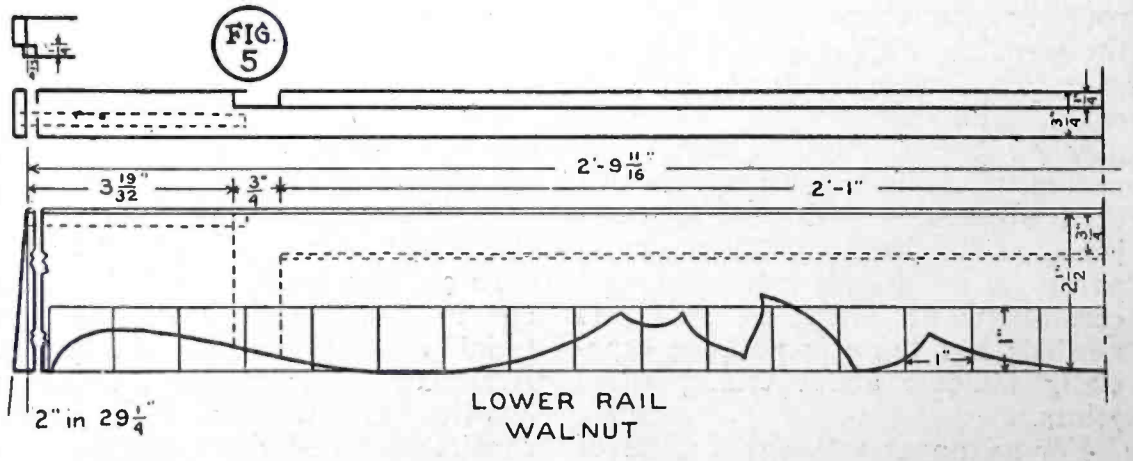


FIG. 5

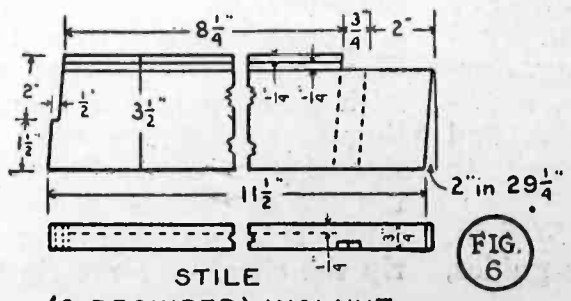


FIG. 6

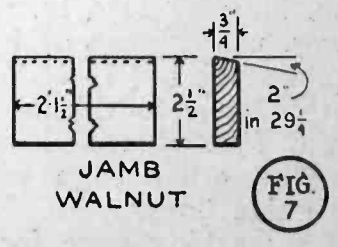
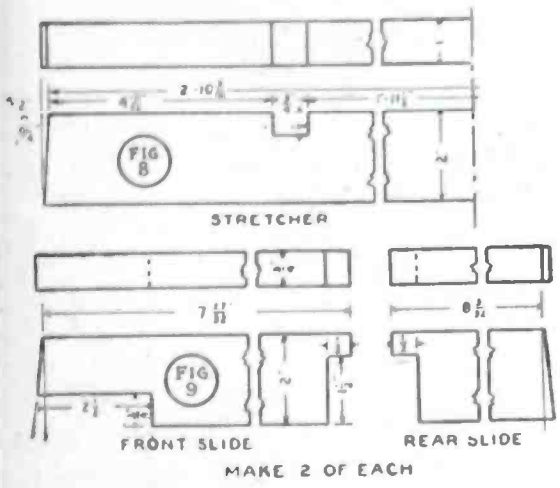


FIG. 7

veneer intact. Rip a ½ in. by ¾ in. strip for a nosing, rounding it off as shown in Fig. 2, to glue into the rabbet. Miter the corners. When dry, surface the under edge flush with the under surface.

For the upper front rail, use a walnut strip ½ in. by 2 in. by 2 ft. 9½ in. on the upper side, with the ends beveled. At the ends, notch the front edges ½ in. by 3½ in., saving the scraps. See Fig. 4.

Fig. 5 details the lower rail. This is ¾ in. by 2½ in., 2 ft. 9-11/16 in. long on the upper edge. Saw the lower edge to the ornamental form, notch each end across the face ¼ in. by ¼ in., forming



Details of stretcher and slides.

the tenons, and cut a dado ¾ in. wide ¼ in. deep squarely across the width of the back 3-19/32 in. from each end. To carry the front edge of the jamb (Fig. 7), a ¾ in. rabbet ¼ in. deep is made in the back of the upper edge. The upper edge is grooved ¼ in. by ¼ in. at the ends to receive the lower ends of the panels.

A pair of stiles as dimensioned in Fig. 6 are made next. These are ¾ in. by 3½ in. by 11½ in., with both ends cut to fit the lower. The outer face of each is grooved ¼ in. by ¼ in., ¼ in. from the front face. A ¾ in. dado ¼ in. deep in the other side carries the jamb end.

The jamb (Fig. 7), is ¾ in. by 2½ in. by 2 ft. 1½ in., with the front edge beveled to fit the rail rabbet.

The stretcher, shown in Fig. 8, is of pine, 1 in. by 2 in. by 2 ft. 10-3/16 in., with the ends cut at the angle, and ¾ in. notches ½ in. deep in the upper edge 4-19/32 in. from the ends.

The rear rail is ¾ in. by 2½ in. by 2 ft. 10-3/16 in., with the edges square, and ¾ in. dados ¼ in. deep square across the inner face 4-11/32 in. from the ends. The four drawer slides are of ¾ in. by 2 in. stock, the front ones 7-27/32 in. long, the rear, 8-3/32 in. See Fig. 9. The front ones notch around the jamb and half the stretcher thickness. The back ends of the rear slides enter the rail dados.

Fitting the table top nosing.

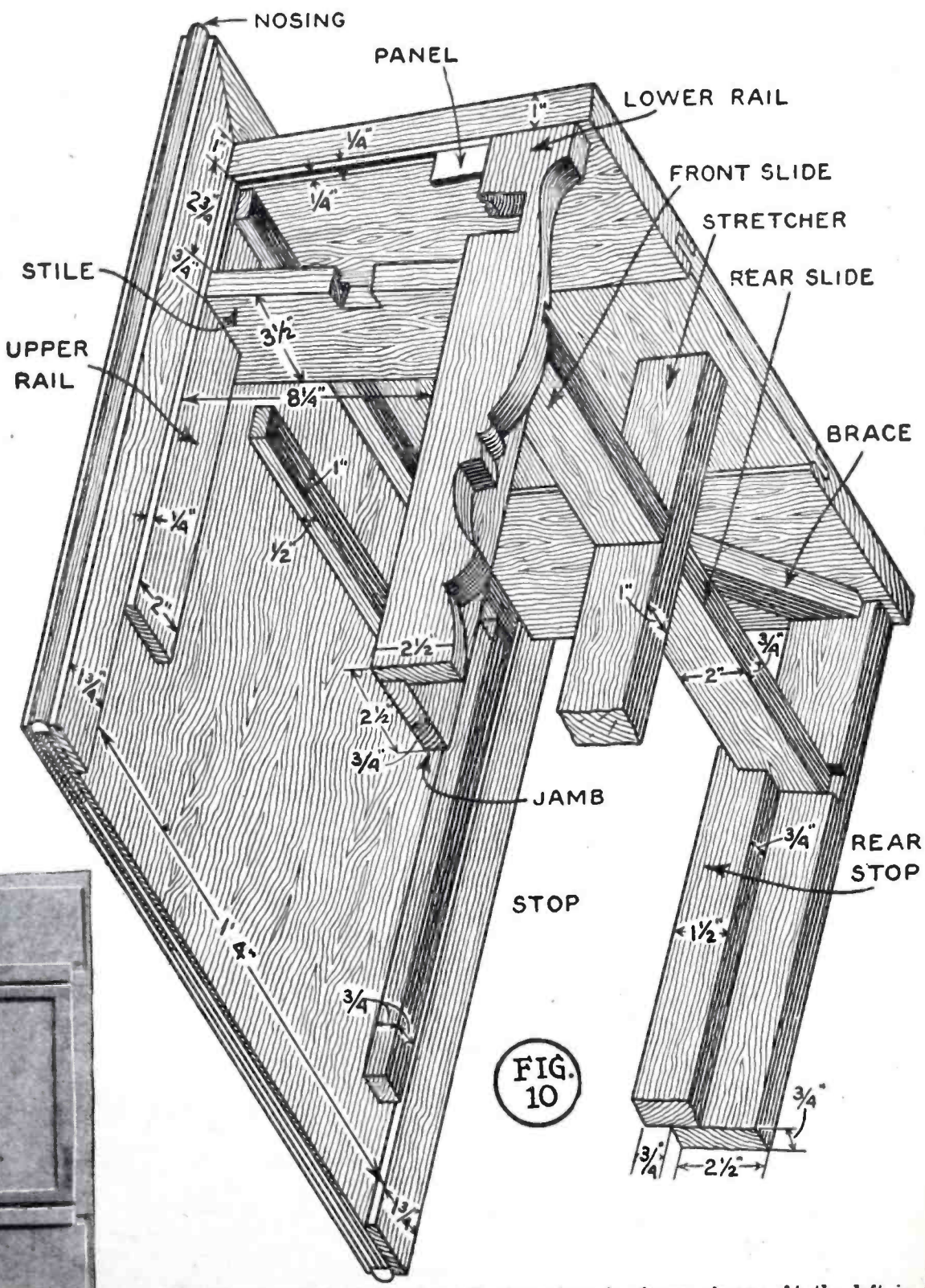
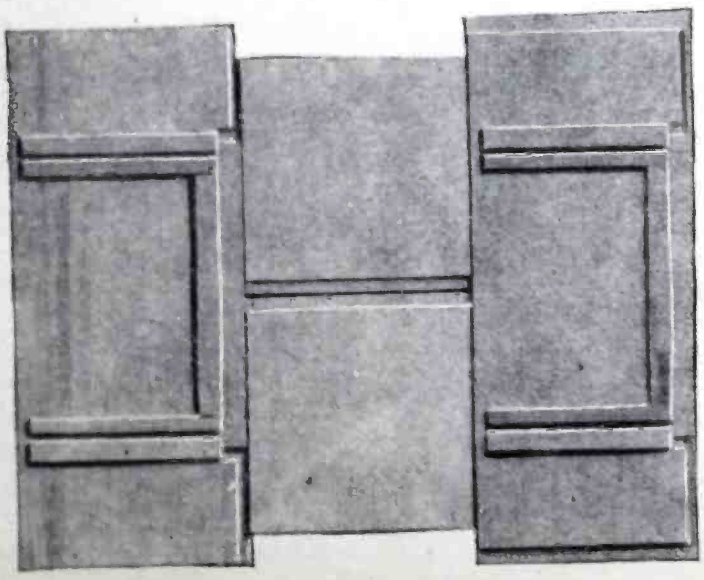
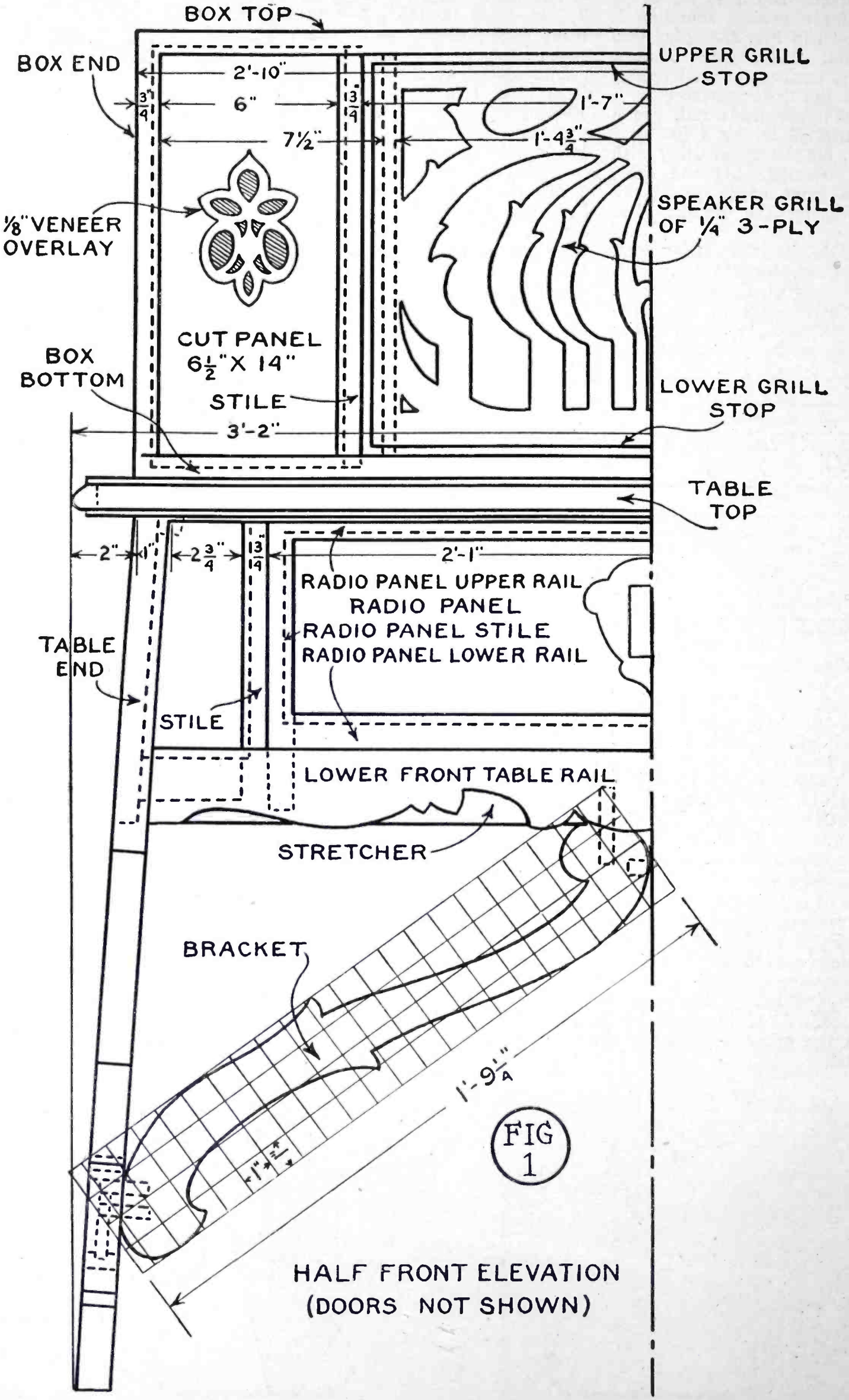


FIG. 10

The table assembly indicating all dimensions is shown above. At the left is a photo of the ends and bottom of the box.





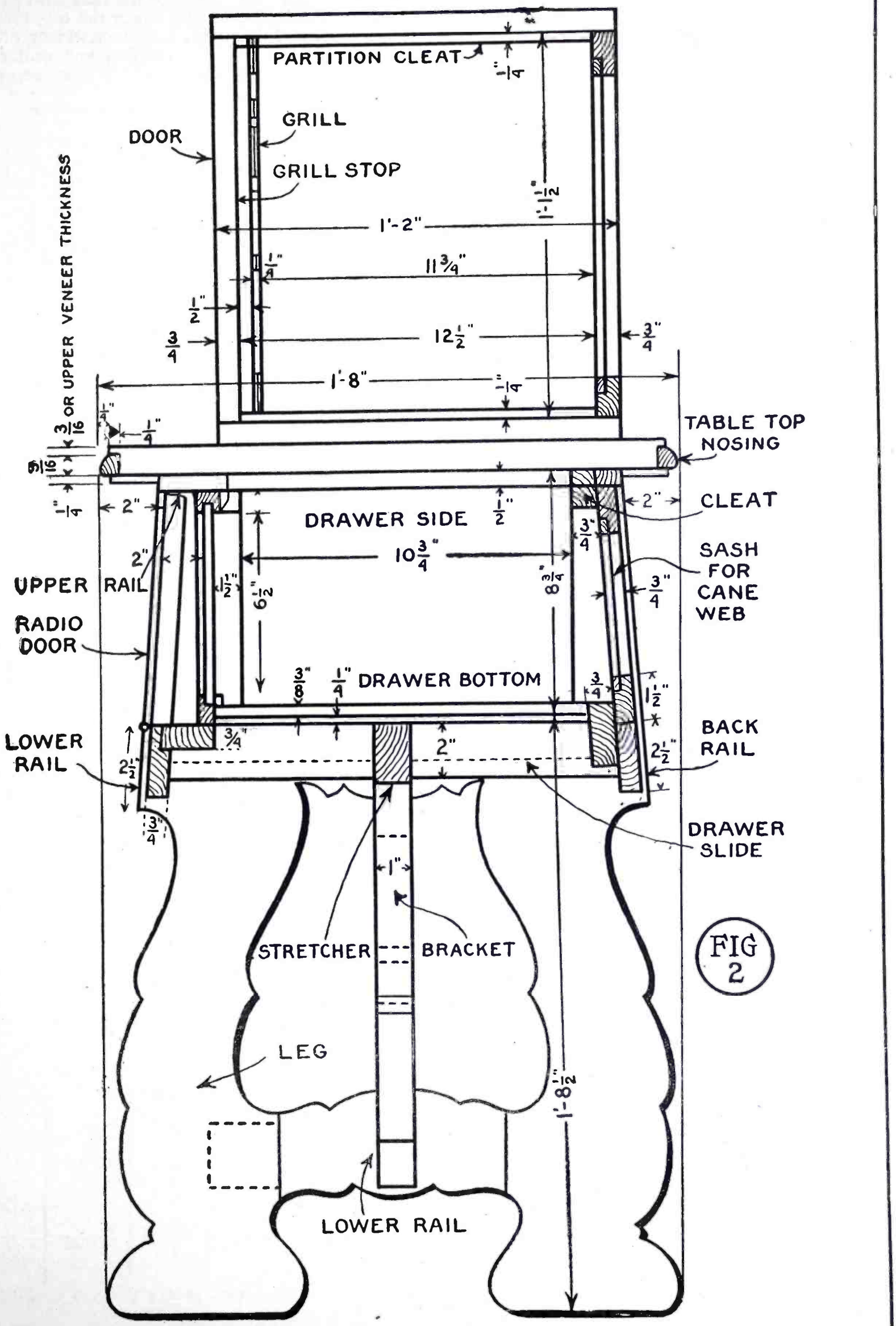


FIG 2

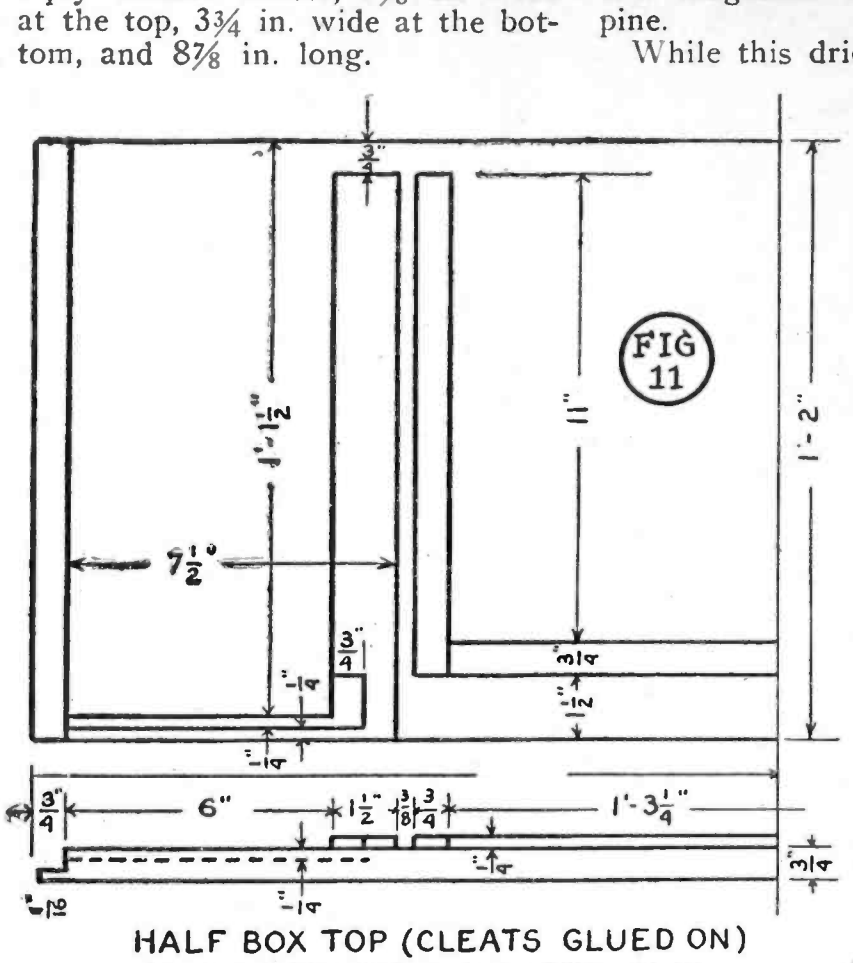
Size the ends of stiles, stretcher, rails, and slides, with thin glue.

The end panels are of ¼ in. 3-ply walnut veneer, 3⅛ in. wide at the top, 3¾ in. wide at the bottom, and 8⅞ in. long.

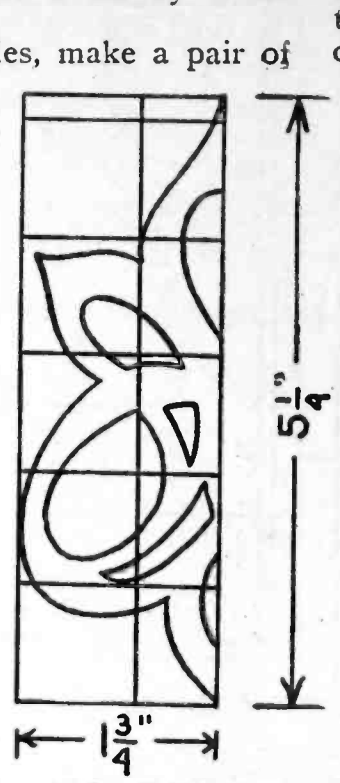
hold the piece square. Be sure that the ends slope equally. Fit the slides, glue in place, and put in the two diagonals of 1 in. by 2 in. pine.

While this dries, make a pair of brackets, as in Fig. 1, and attach them to the rails with ⅜ in. dowels.

To attach the top, lay it bottom-side up on papers or other protective padding and center the table on it, putting brass screws through



HALF BOX TOP (CLEATS GLUED ON)
5-PLY WALNUT, GOOD ONE SIDE



HALF PANEL OVERLAY (2 REQUIRED)

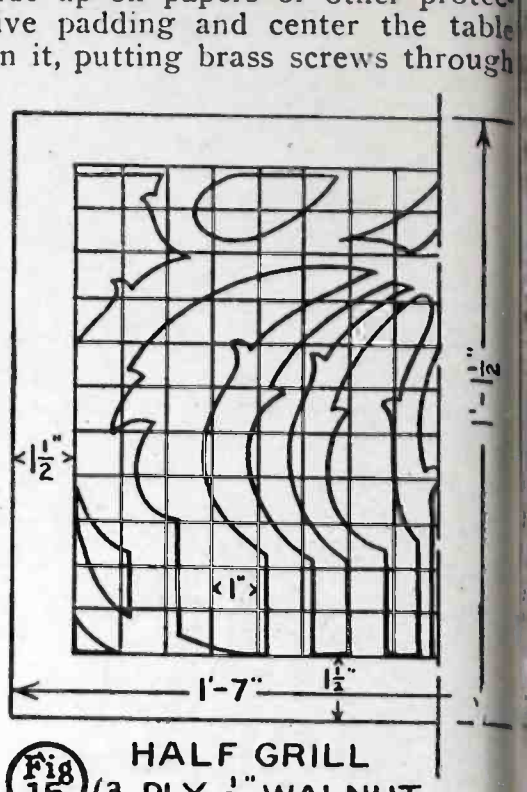
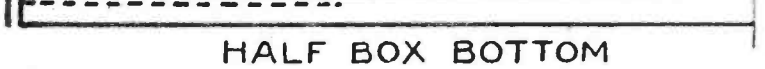


Fig 15 HALF GRILL (3 PLY ¼" WALNUT GOOD INSIDE)



HALF BOX BOTTOM
5-PLY PINE OR GLUED UP FROM SOLID STOCK.—DIMENTIONS SAME AS TOP.

Fig. 10 illustrates the table assembly. Assemble the frame, without the top, clamping as necessary to draw the joints tight. Tack strips diagonally across the top to

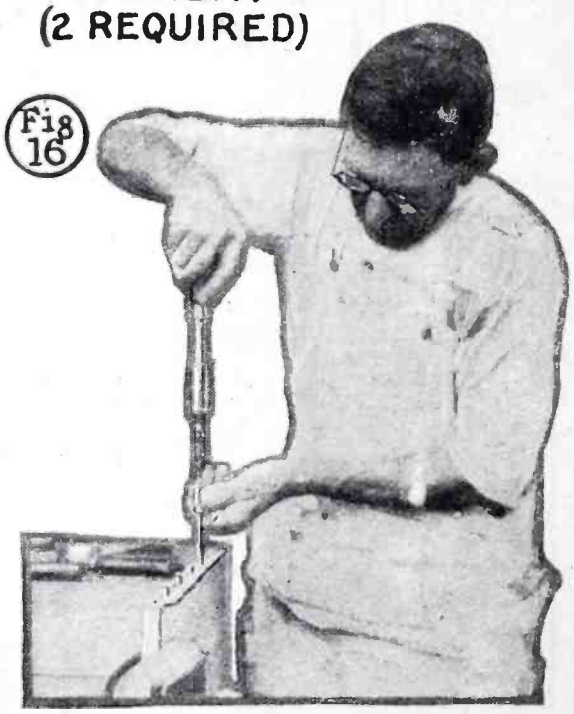
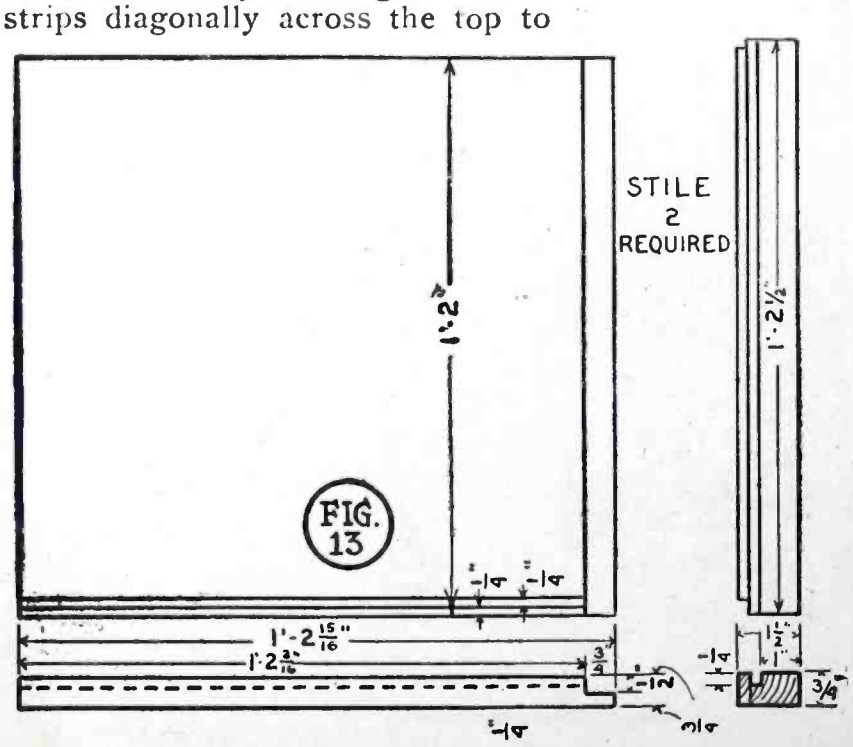
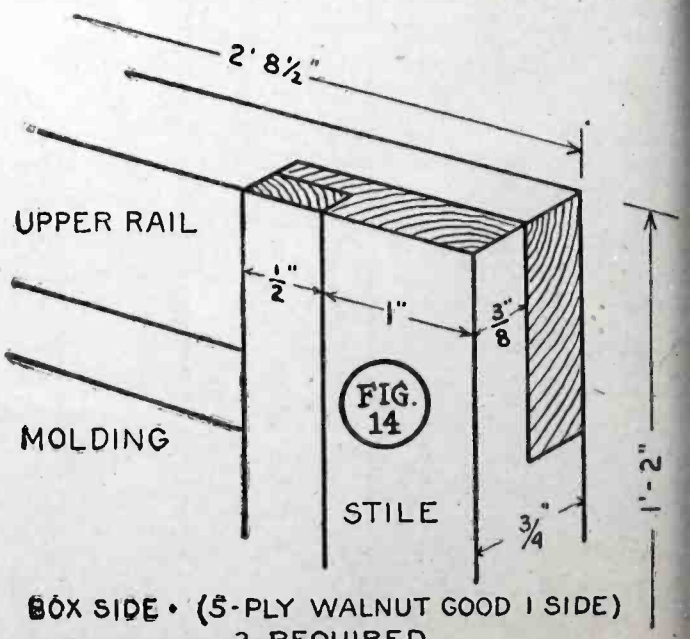


Fig 16 Screwing on a piano hinge.

the end cleats. Put two or three screws through the upper rail into the top, as well, and glue a ¼ in. by ¼ in. strip in the front of each front panel. Glue to the top a pair of ½ in by 1 in. cleats opposite the drawer slides to provide runs for the upper edges of the drawer sides.

Miter a ¼ in. strip of walnut around the top, the outer edges





BOX SIDE • (5-PLY WALNUT GOOD 1 SIDE) 2 REQUIRED

Details of stiles and method of making the half-lap joints. Get the exact length of the stiles and rails from the openings they are to fit.

ed with the upper edges of the

he box top is made from ¾ 5-ply walnut, good one side. a piece 1 ft. 2 in. wide by 3 2¼ in. long, joint the edges, lay out for end rabbets ¾ in. e, with the rabbets 32½ in. rt. Draw guide lines for ¼ in. ts 7½ in., and 7⅞ in. from h end. See Fig. 11. One-fourth from the front edge make a in. by 1¼ in. mortise 1 in. deep n. from each end, also cutting in. by ¼ in. grooves ¼ in. from front edges between the ends these mortises. Glue cleats in e, as shown. Deepen the end bets to the top veneer.

he bottom, detailed in Fig. 12, ke the top, except that the ends, ch fit ½ in. into rabbets in the ends, are square, and 6½ in. n the mortises. It is made er from solid pine stock or 5- material.

he box sides, Fig. 13, are 1 ft. n. by 1 ft. 2-15/16 in. Rabbet lower ends ½ in. by ¾ in., groove the inner faces ¼ in., ¼ in., ¼ in. from the front edges. wo stiles ¾ in. by 1½ in. by t. 2½ in. grooved ¼ in. by ¼ ¼ in. from the front edges, and ched ¼ in. by ¼ in. at the s, are made from walnut.

Make two partitions of ⅜ in. 3-ply e veneer 1 ft. 1½ in. by 11¾ and two panels of ¼ in. 3-ply walnut cut 6½ in. by 14 in.

Glue up the box, and when dry, re-enforce the lower corners with three ⅜ in. dowels put in through the bottom into each end. Glue triangular strips into the upper corners, as well.

Both the table and box backs are closed by sashes built from 1 in. by 2 in. stock covered with woven cane webbing, as in Fig. 14. The corners are half-lap joints. Get the exact length of the stiles and rails from the openings they are to fit. Rabbet the inner corners ½ in. by ½ in. Soak the cane in water, cut to size, and stretch as tightly as possible, holding it with ¼ in. by ½ in. molding. When dry, it will be as tight as a drumhead, and the sash can be fitted.

When the box is dry, do any necessary jointing on the front. To hide the plies, rip thin walnut strips

Rasping a bracket edge.

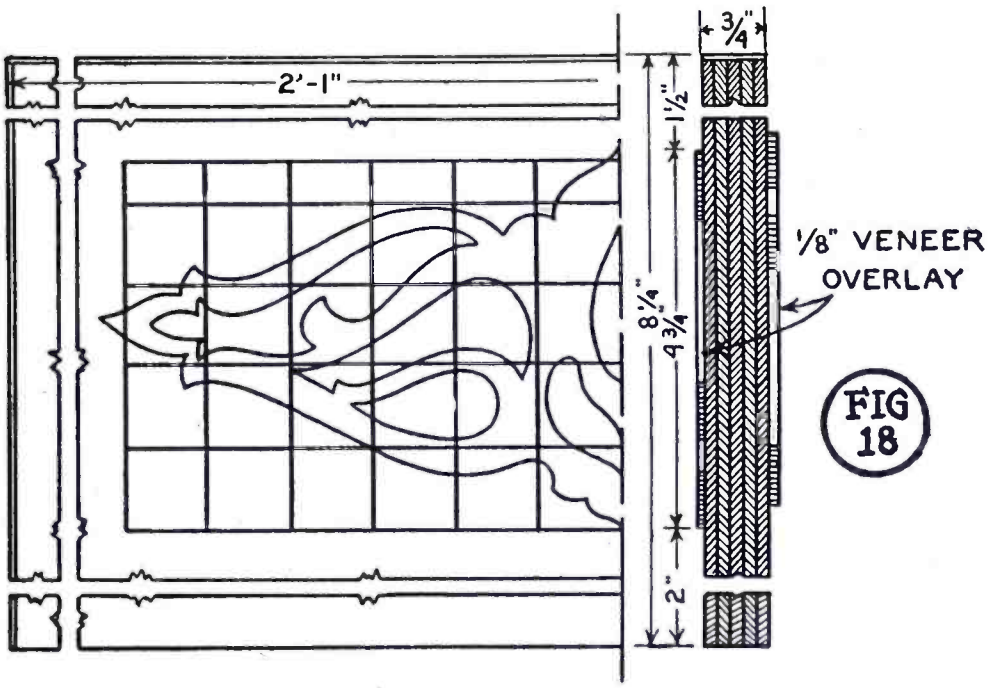


FIG 18

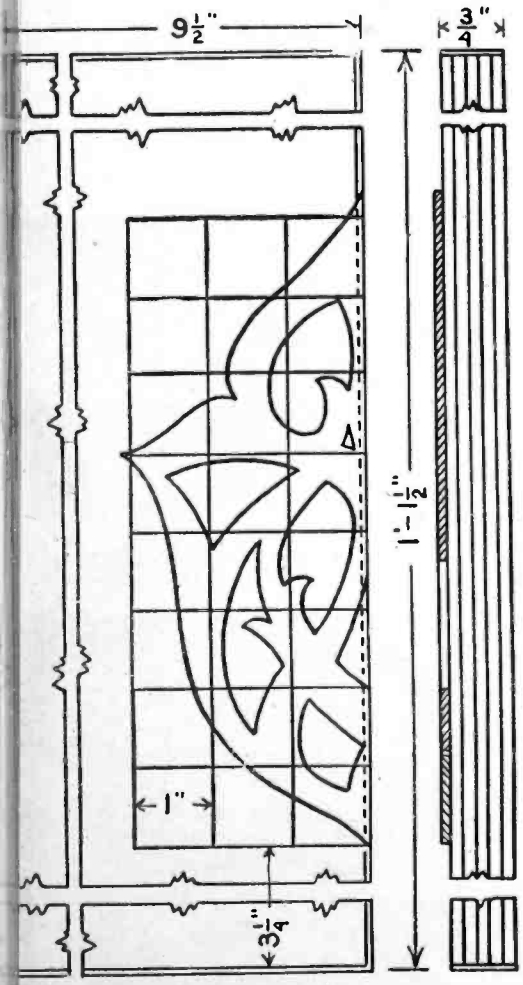


Fig 17 GRILL DOOR (2 REQUIRED)

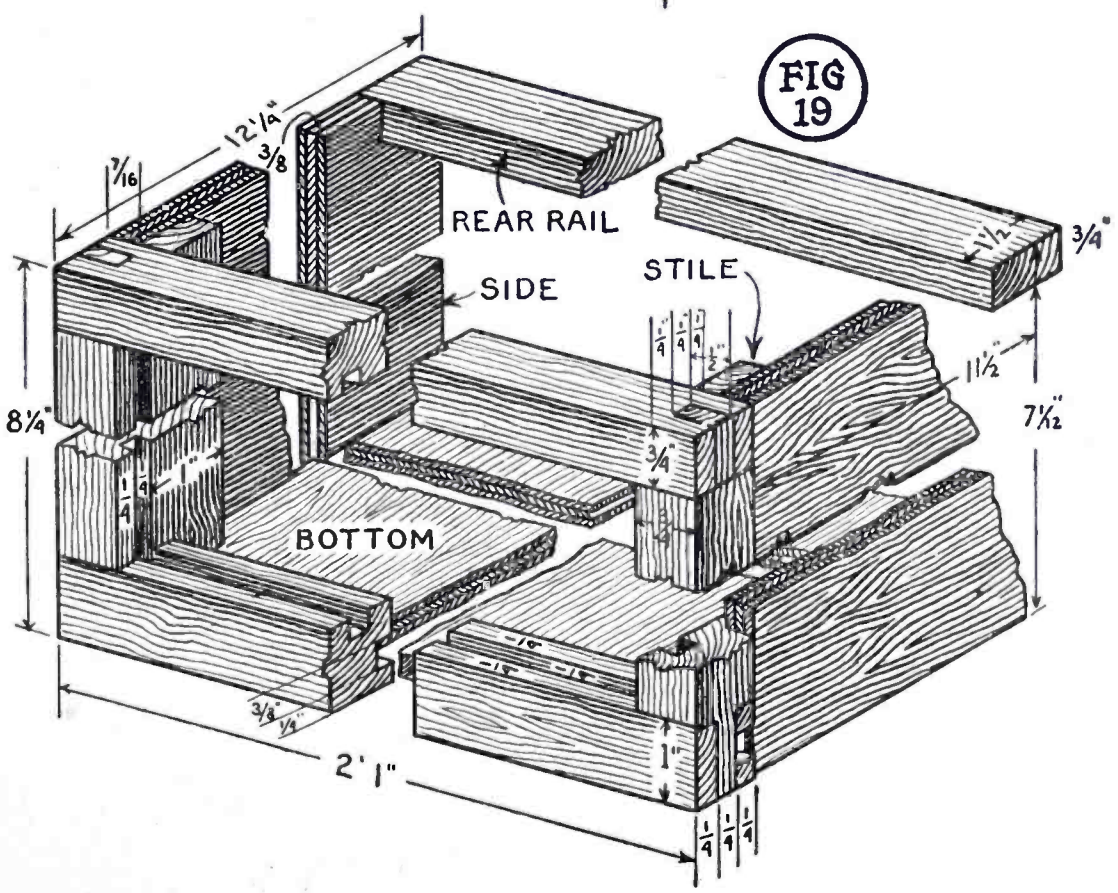
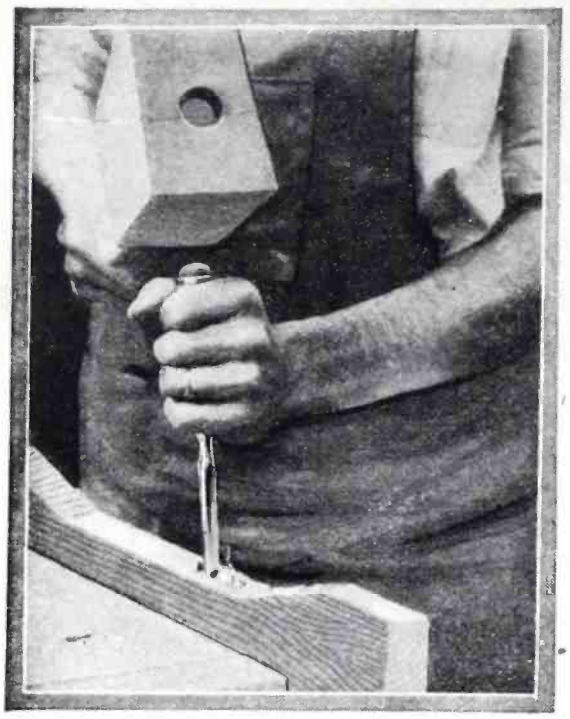


FIG 19

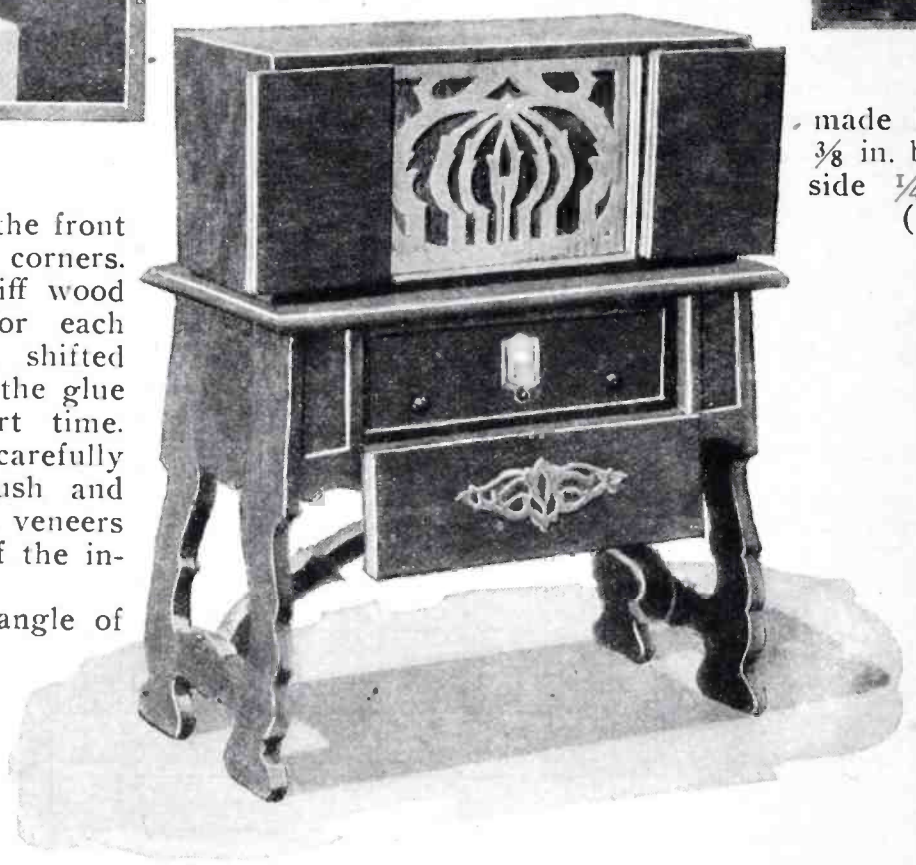
he lower edge of the ornament is 8¼ in. above the bottom of the door as seen in Fig. 17. Figs 18 and 19 show the veneer overlay of the radio door (one-half) and details of the radio drawer.



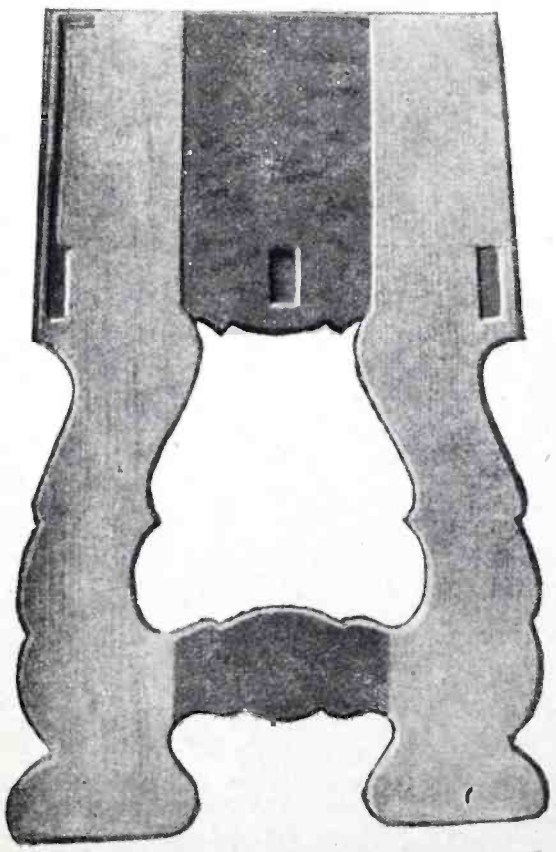
Cutting a mortise.

for veneer. Glue these on the front edges, mitering the outer corners. A pair of clamps and a stiff wood backing are necessary for each veneer, but they can be shifted from place to place when the glue has hardened for a short time. When the glue is solid, carefully trim the veneer edges flush and smooth the faces. Glue thin veneers around the panel reveals if the inside veneer is not walnut.

For the grill, cut a rectangle of ¼ in. walnut plywood 1 ft. 1½ in. by 1 ft. 7 in. The pattern should be worked out on paper and traced on the wood. Fit and fill the grill before applying the silk backing.



The completed Spanish radio cabinet with a set installed. At the lower left hand corner of the page is a photo of the assembled table end.



See Fig. 15. Install it with ¼ in. by ½ in. flat walnut molding tacked to the opening inside. This also serves as a stop for the doors.

Fig. 16 details the panel overlay pattern. Cut the ornaments from ⅛ in. walnut veneer and glue in place, centering on the panels 4 in. above the lower edges. The veneer stock can be ripped by hand from 1 in. walnut.

To close the tone chamber, two doors 1 ft. 1½ in. by 9½ in. are made of ¾ in. 5-ply walnut veneer good two sides. Fit these with 1/16 in. clearance all around, giving enough bevel to the front edges, and screw on each a length of piano hinge. When properly fitted, veneer the edges in the same way as the front edges of the box. The lower edge of the ornament is 3¼ in. above the bottom of the door. See Fig. 17.

The radio door is built as above, cut 8¼ in. by 25 in. It is hinged on the lower edge, dropping down to a vertical position when the radio is in use. So the inside, as well as the outside, is enriched with an overlay centered on the width 2 in. above the lower edge, as in Fig. 18.

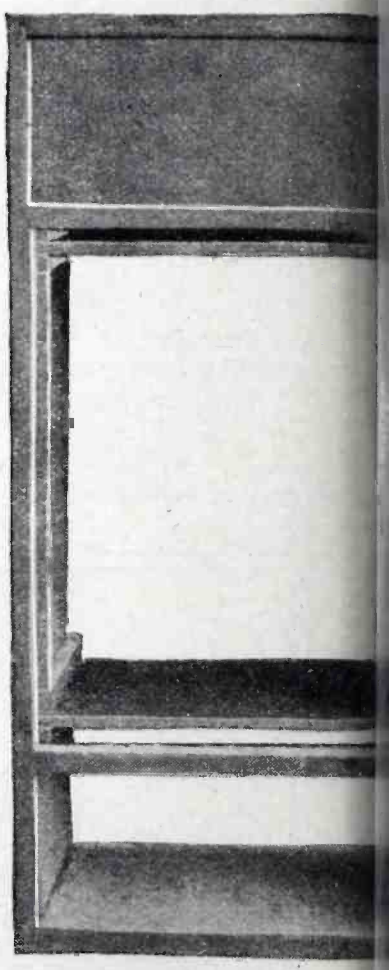
Fig. 19 details the radio drawer. The upper rail is of walnut, ¾ in. by ¾ in. by 2 ft. 1 in., notched at each end ¼ in. by ½ in. to receive the stile tenons. It is grooved ¼ in. deep ¼ in. from the face, to take the panel edge.

The lower rail is 1 in. wide,

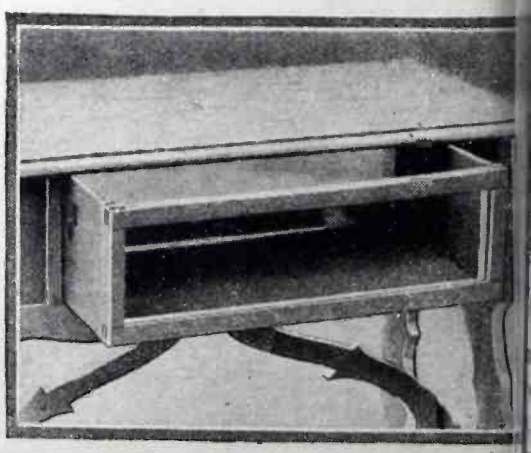
Ripping a tenon cheek.

made like the other, but with ⅜ in. by ¼ in. groove on the inside ¼ in. from the bottom

(*Continued on page* 163)



The box assembly. One panel is to show the compartment.



The drawer for the radio set.

A 210 Push-Pull Power Amplifier for Phonograph or Radio Reproduction

THE push-pull power amplifier shown in the accompanying oto and diagrams is a complete- self contained two stage audio plifier incorporating a 227 heater e A.C. tube in the first stage d two UX-210 power tubes in second, or output stage. The ment, plate, and grid current for th stages and the plate supply the balance of the receiver are furnished by the amplifier. The tubes are operated at full ca- ity, giving an undistorted power tput of well over 4,800 milli- tts, or more than 80 times the wer output of the standard 201A e of amplifying tube. Sufficient erve power is furnished to op- te any speaker at pleasing home ume without introducing tube tortion, and in addition to sup- plate current for the tubes of eivers having the heaviest drain. The construction of this am- fier is exceedingly simple, and no ficulty should be encountered in lowing the diagrams and photo- aph contained in this article. In signing this amplifier, the parts ve been arranged so as to per- t a minimum of inductive coup- g between the various circuits. erefore, it is suggested that the nstructor follow this physical ar- gement of parts as closely as ssible in order to prevent any ssible tendency toward an A.C. m.

The power supply transformer is signed for 110-115 volt, 50-60 cycle rrent only, and should not be ed with any other power source. ree secondary windings are pro- led as follows: Secondary No. 1 550 volts each side of center tap the rectifier supply; capacity of ndings, 120 milliamperes. Sec- dary No. 2—7½ volts at 2½ am- res, center tapped for the fila- ent supply of the two power bes. Secondary No. 3—same as condary No. 2, for the filament pply of the rectifier tubes.

This transformer is designed pri- arily for use with the 281 type ctifier tube. Two of these tubes e used, one being placed across ch side of the high voltage sup- y to provide full wave rectifica- tion with sufficient capacity for the operation of this amplifier.

The filter circuit consists of a double choke unit, and three 2-mfd. high voltage condensers contained in the condenser block. The choke unit contains two 30 henry chokes, each with a current carrying capacity of 130 milliamperes.

LIST OF PARTS

1	Thordarson Power Supply Transformer, T-2098 (T1)
1	Thordarson Double Choke Unit, T-2099 (CH)
1	Thordarson Filament Supply Transformer, T-3081 (T4)
1	Thordarson Audio Transformer, R-300 (T2)
1	Thordarson Push-Pull Input Transformer, T-2408 or T-2922 (T3)
1	Thordarson Push-Pull Output Choke, T-2408 (for high impedance speakers, or Output Transformer, T2629 (for dynamic speakers), (T5)
1	Thordarson Resistance Kit, R-2098, R1-750 ohms., R2-10,000 ohms. var., R3-10,000 ohms, R6-4,000 ohms., R7-4,000 ohms. var.
1	Flechtheim 1 mfd. by-pass condenser, type B100 (C1)
1	Flechtheim 210 condenser block, type FA10 (CB)
1	Carter 25 ohm center-tapped resistor (R8)
5	Benjamin UX Four-prong Tube Sockets
10	Eby Binding Posts.
1	Benjamin UY Five-prong Tube Socket
1	Electrad 0-2,000 ohm Resistor (variable) (R5)
1	Wood Baseboard, 12x18x1"
1	Piece Formica, 6x18x3/16"
1	Pkg. Corwico wire
1	Pkg. Kester rosin core solder
1	UX227 tube (V4)
2	UX281 Rectifier Tubes (V1, V2)
1	UX874 Voltage Regulator (V3)
2	UX210 Power Tubes (V5, V6)

The kit of resistances specified in the list of parts provides all the necessary resistances for the voltage divider circuit. The kit contains five individual resistors as follows: 1 fixed unit of 4,000 ohms, one variable unit of 4,000 ohms, one variable unit of 10,000 ohms, one fixed unit of 10,000 ohms, and one fixed unit of 750 ohms. The first four of these units serve to provide the necessary plate voltages for the tubes of the receiver and also the voltage to operate the field of a dynamic speaker if desired. The fifth unit of 750 ohms provides the grid bias for the two power tubes.

The voltage output of the filter circuit is in inverse proportion to the current load. Under average working conditions, the total current drain of the power tubes, the resistance units, the receiver plate supply and the voltage regulator tube will be approximately 100 milliamperes. At this load, with a primary voltage of 110 volts, the total filtered and rectified voltage is approximately 470 volts. With an output current of 60 milliamperes, this voltage is increased to approximately 565 volts.

The maximum output voltage of the filter system is applied directly to the power tubes. 435 volts, representing the drop between the high voltage side and the B-minus connection is applied to the plates. The balance of the output voltage, representing the drop of 35 volts across the 750 ohm resistor, is used as the grid bias for the power tubes.

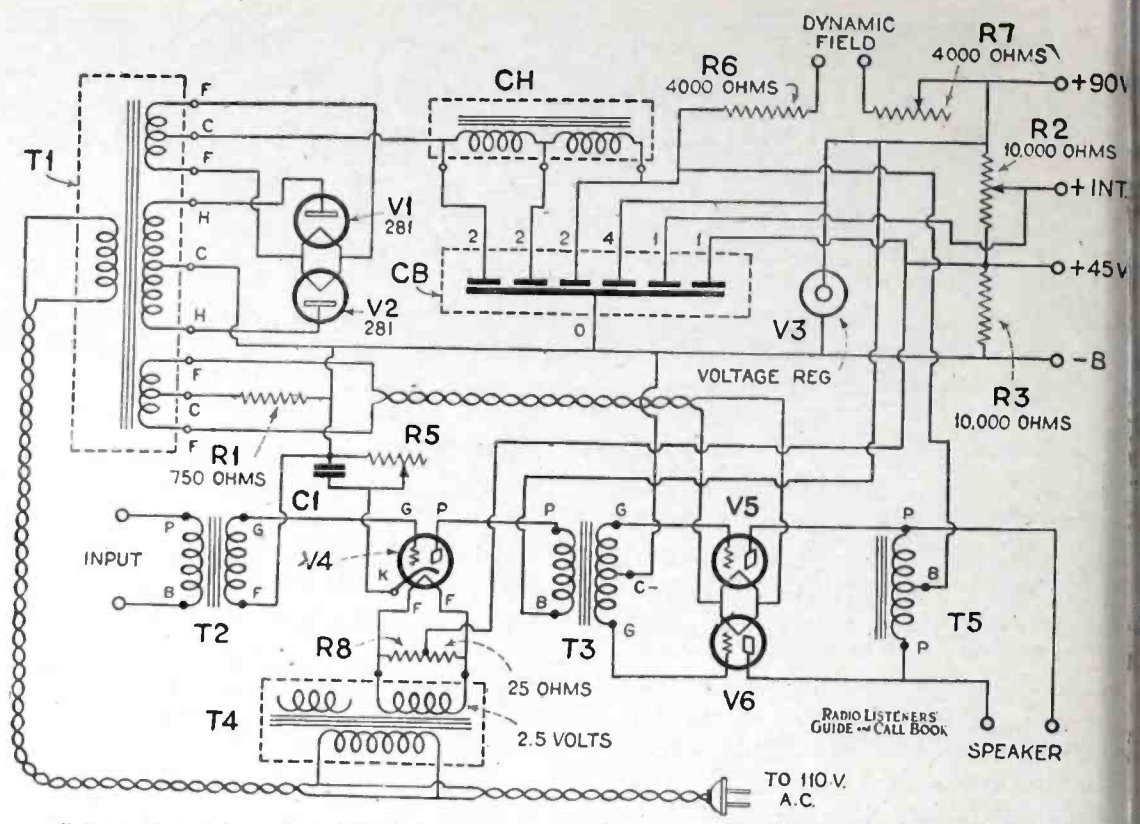
The circuit is designed to permit the operation of the field of a dynamic type speaker. To provide the necessary current the voltage divider circuit is opened between the two 4,000 ohm resistance units. The field winding is connected in series at this point, and the circuit is adjusted to allow 100 volts to act upon this winding. This is done by varying the 4,000 ohm resistor to the point just above that at which the voltage regulation tube glows steadily when the receiver is turned on. The ordinary high impedance speakers are used with this amplifier, the "Dynamic Field" binding posts are connected together.

The plate supply feature for the balance of the receiver provides voltages of 90, 45, and an intermediate variable voltage of from 45 to 90 volts. A voltage regulator tube of the 874 type is placed in the output circuit between the 90 volt and "B"-minus connections. This

tube serves as a ballast to keep the receiver plate voltages constant regardless of reasonable line fluctuations of variations in current drain. If there is need for a 22½ volt tap for "B" supply, it may be secured by transposing the two 10,000 ohm resistors so that the variable unit will be in the circuit between the "B"-minus and 45 volt taps. The variable center tap will then be used as the 22½ volt source.

The tubes required are as follows: 2 UX210 or CX310 power amplifying tubes; 1 UY227 or CY327 heater type A.C. tube; 2 UX281 or CX381 rectifying tubes; 1 UX874 or CX374 voltage regulator tube.

The filament supply for the 227 type tube in the first stage is secured from the filament supply transformer. This is a small unit with two secondaries, one of 2.25 volts at 3½ amperes, the other of 1.4 volts at 2 amperes. In this amplifier only the 2.25 volt winding is used. Connections are made from the two top terminals of the filament supply transformer. Placed directly across this winding is a 25 ohm center tapped resistor. This may be either of the fixed variety



Schematic wiring diagram of the 210 push-pull power amplifier and "B" supply unit.

or of the potentiometer type as desired; if of the fixed variety, the center tap should be as near to the exact electrical center as possible in order to secure quiet operation. The grid bias for the 227 tube is secured through the voltage drop across the 2,000 ohm variable resistor placed in the circuit between the "B"-minus terminal and the cathode of the tube.

This amplifier may be used with either a dynamic or an ordinary high impedance speaker such as the cone, exponential, airchrome or horn type. Care should be exer-

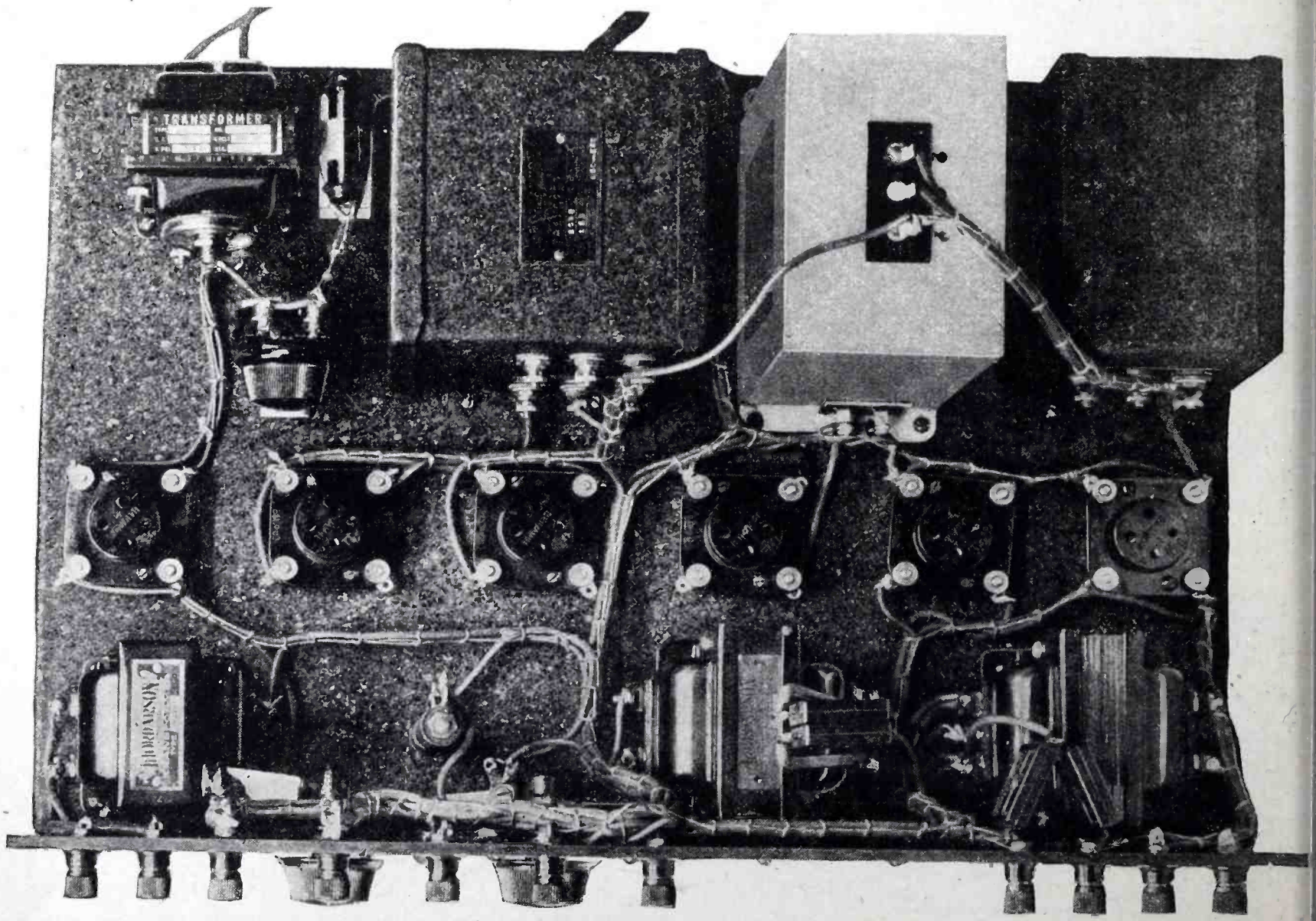


Photo showing the layout of parts. The baseboard used for this unit is metal and especially made to order. However, ordinary wood can b used as specified in the list of parts.

cised in selecting the proper speaker coupling transformer for this purpose. If a high impedance speaker such as the cone or horn type is used, the double choke unit should always be employed. If a dynamic type speaker is used a dynamic speaker type transformer should be substituted (see list of parts). This is an important feature and should be considered before purchasing the parts for this amplifier.

When using a dynamic speaker, the output of the dynamic speaker type transformer should be fed directly into the movable coil of the speaker. Most dynamic speakers are equipped with a speaker coupling transformer mounted directly in the base of the speaker. This transformer is not adaptable for the push-pull arrangement and should be disconnected from the circuit. In order to provide the required high frequency filter for the dynamic unit, a small condenser of from .0015 mfds. to .002 mfds. should be placed across each half of the primary of the transformer T5, from the two terminals marked P, to the center tap, marked B. The field winding of this speaker should be connected as indicated in the diagrams. Only dynamic speakers with a 100 volt field should be used with this circuit unless the field is excited from an external source.

When a high impedance speaker is used, the speaker leads should be connected directly to the terminals marked P and P on the push-pull output choke. No condensers should be connected across this choke unit as high impedance speakers do not as a rule require high frequency filters. The two "Dynamic Field" terminals of the amplifier should be connected together as previously described.

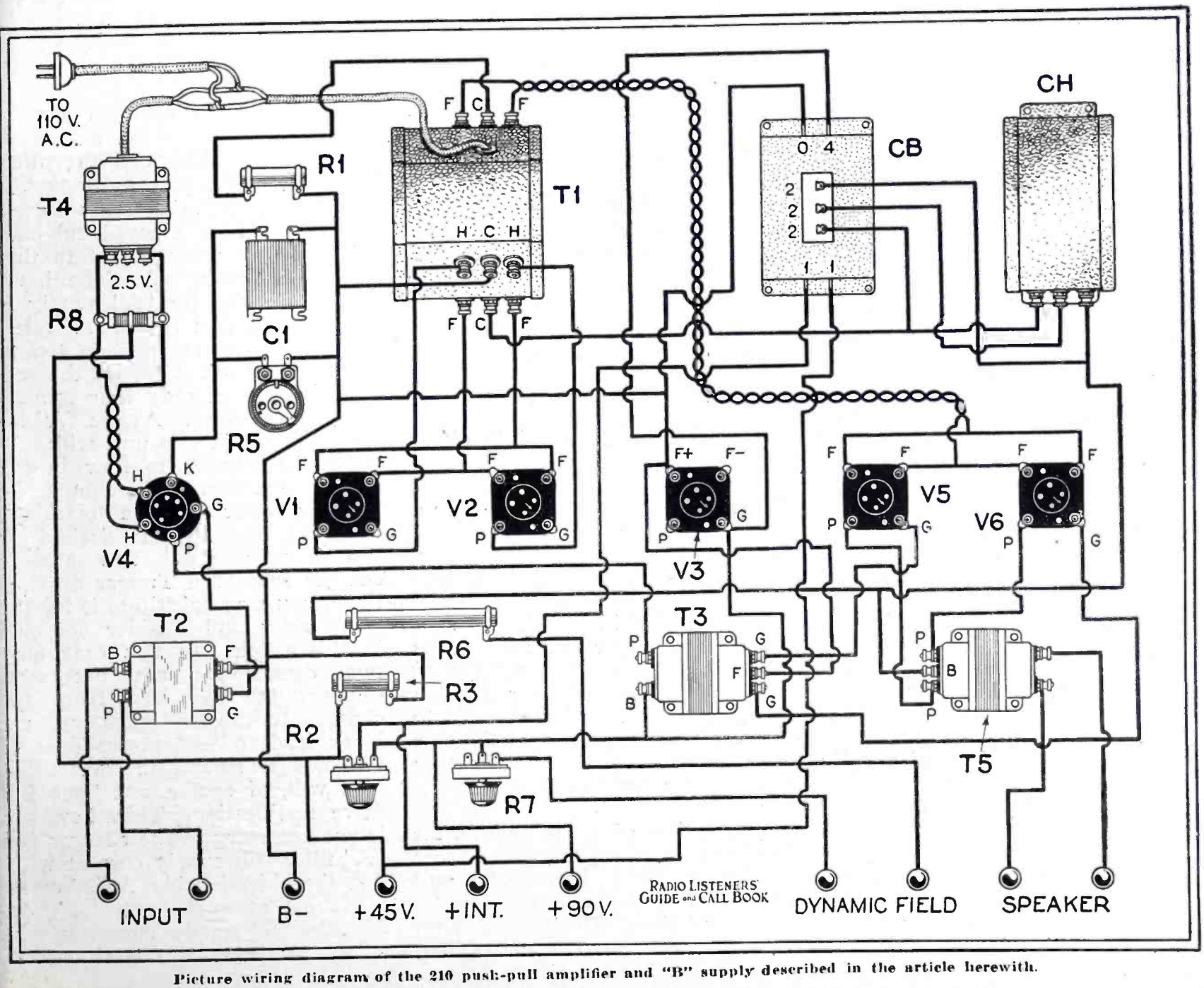
To couple the first audio stage into the stage of push-pull, either transformer of the types listed may be used.

To connect this amplifier to the receiver, connect one of the binding posts marked "input" to the plate connection of the detector socket and disconnect the old lead running from this plate terminal to the old first audio coupler. Connect the other "input" terminal to the 45 volt terminal on either the radio set or the amplifier. Connect the plate supply binding posts on the amplifier to the similarly marked terminals of the receiver, connect the speaker to the speaker terminals of the amplifier and the installation is completed.

When used with a radio receiver it is advisable to ground the "B"-minus terminal. If a ground connection is already provided in the receiver this will be unnecessary.

This assembly makes an excellent phonograph amplifier when used with a good electrical pick-up. The pick-up should be connected directly into the input of the amplifier. It may be necessary to ground one side of the input to reduce the tendency toward A.C. hum. It is good practice also to ground the "B"-minus terminal of the amplifier. If an electric motor operates the turntable, the case of the motor should be grounded.

A close adherence to the specifications and arrangement of apparatus shown in the diagrams will result in complete efficiency.



Picture wiring diagram of the 210 push-pull amplifier and "B" supply described in the article herewith.

A Compact A and B Power Supply For A. C. Operation

IN the rush of latest A.C. set developments it would seem that the millions of owners of battery operated receivers have become a "lost battalion," cut off and forgotten in the heat of battle. Fortunately, a few concerns have been proceeding in a quiet, orderly way to take care of the needs of these listeners and now the fruits of this research are available.

Visitors to the annual trade show in Chicago were impressed with the fact that the only marked development over last year were the A.C. operated receivers and dynamic speakers. Now, both of these were available in a limited way last year so that this year it merely means that they have come into more general use and are therefore more available in the public market.

This being the case it is obvious that electrically and mechanically the better class of battery operated receivers sold during the last two years are every bit as good as the new A.C. sets. The fan who wants to be relieved of the care of batteries is faced with junking his set or selling it for a song in order to get A.C. operation.

The "A" battery unit described and shown in the accompanying illustrations employs a first class condenser and choke filter system for A current. This unit combined with a good "B" unit gives the owner of the battery operated set complete dry A.C. operation with all the advantages of his present set added to it. The saving in money is considerable and there are many who feel that this operation is quite superior to any A.C. tube operation, these latter devices still having to meet much opposition.

This sort of a unit can be easily and quickly assembled and since buying the parts and assembling the unit saves considerable money, and the use of it is primarily an economical arrangement, we are giving the details of the building and construction of a combined "A" and "B" unit.

The accompanying diagrams show the parts and wiring of this supply unit. The upper part is the "A" end of the device and the lower the "B." Taking the "A" end we have a transformer which steps the incoming 110 volts A.C. down to 12 to 16 volts. This in turn is fed into a highly efficient metallic rectifier which converts it into direct current.

LIST OF PARTS

1 Tobe Tapped 50 watt transformer, (T1).
1 Tobe A Filter, (F).
1 Tobe 171 B Block, (CB).
1 Tobe Veritas 10,000 ohm, (R6).
1 Tobe Veritas 2,000 ohm, (R3).
1 Thordarson R-171 power compact, (T2).
1 Low range power Clarostat, (R1).
1 Power Clarostat 0 to 10 ohms, (R2).
1 Standard Clarostat, (R4).
1 Duplex Clarostat, (R5).
1 Raytheon B-H tube, (RT).
1 Elkon dry rectifier, (RU).
7 X-L or Eby binding posts and mounting strip.
50 ft. Corwico hook-up wire.

This current however, still has a ripple in it which would cause a loud hum in the set so it is filtered through a device consisting of a special condenser of 8,000 microfarads capacity and two large chokes which will permit the passage of the heavy current drawn for "A" work. The actual voltage to the set is controlled by a 10 ohm power clarostat. It is advisable to connect a voltmeter across this line in order to insure against putting too great a voltage into the receiver.

The action of a "B" eliminator has been described too many times to be repeated here. The unit shown is a particularly compact outfit and since the "A" eliminator is equally compact the whole affair is but little larger than several "B" batteries tied together.

Once this is completed and attached to your receiver battery troubles are over. Just turn the switch and your set will operate indefinitely, as long as the house current is connected. You have perfect A.C. operation and when you replace a tube in this set it costs from one-half to one-third as much as an A.C. tube replacement. The D.C. tubes have also been developed so many years that their life is long and uninterrupted service to the listener is assured.

To assemble and wire the compact A.C.-"A and B" power supply is quite simple as the major wiring is done in the "A" filter and the power compact.

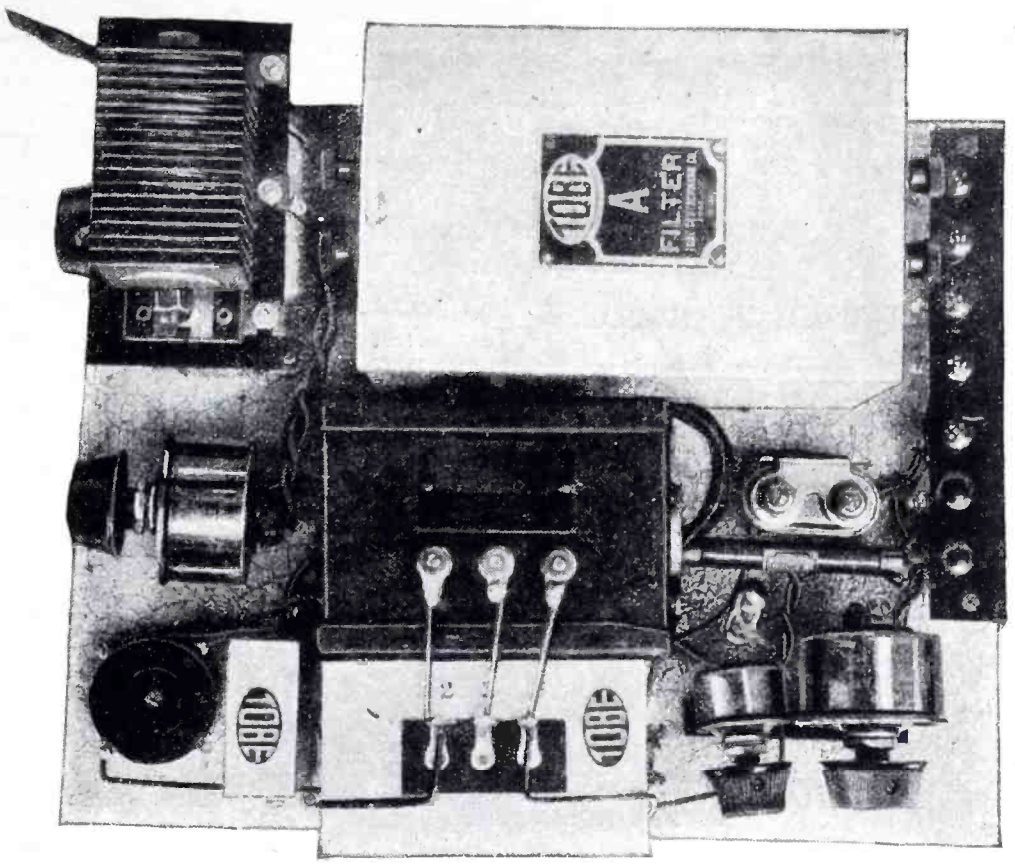
Two input transformers are required. One is to be associated with the "A" filter and the other is a part of the power compact.

The first operation is to mount all the parts on a wood sub-base using similar arrangement to that shown in photograph. The input transformer for the "A" supply is mounted adjacent to the "A" filter. Mount the dry rectifier on top of this transformer. Connect the rectifier as shown; only four connections are required. As the "A" filter employed in this unit will only allow the current to flow in the proper direction care should be taken to observe the markings when wiring. If it is desired or you have a good two ampere charger such as a Tungar or Rectigon, you may substitute it for the transformer and rectifier specified in this article. In this case only two connections are necessary. Connect the red lead from the charger to the "A" plus and the black lead to "A" minus post of the rectifier side of the "A" filter. You will, of course, not have full wave rectification. This, however, is not necessary as the charger and "A" filter will supply current without the objectionable A.C. hum.

Having completed the "A" supply, the "B" supply should now be wired. This is also very simple.

The circuit diagram shows all connection points. Points H-C-H are the high voltage side of the transformer and should be connected as shown. Points 1-C-2 are the connections to the chokes which are, of course, within one common case. Points F-C-H are the low voltage side of the transformer and are for lighting the filaments of the power tube in your set. Although the "A" filter will also supply this current a "C" battery would be necessary. With arrangement as shown no "C" battery is required. If your set is not wired for this arrangement you can do this very easily. Disconnect the wires on the filament lugs of your power tube socket and place some sort of insulation around the wires so they will not come in contact with any others. Connect these two lugs on the socket now vacant to two additional binding posts for easy connections to the corresponding posts on the "A" and "B" supply. If your set is not wired for a "C" battery no other changes are required. If it is wired for a "C" battery connect the "C" minus binding post to the "A" minus post of your set.

A Duplex Clarostat is used to divide and regulate the voltage for the "B" plus detector and "B" plus 90. Also a standard Clarostat is shown for those who require three "B" plus leads beside the "B" plus 180 volts. If this is not required in your set, you may omit this piece of apparatus and its associated wiring (two leads).

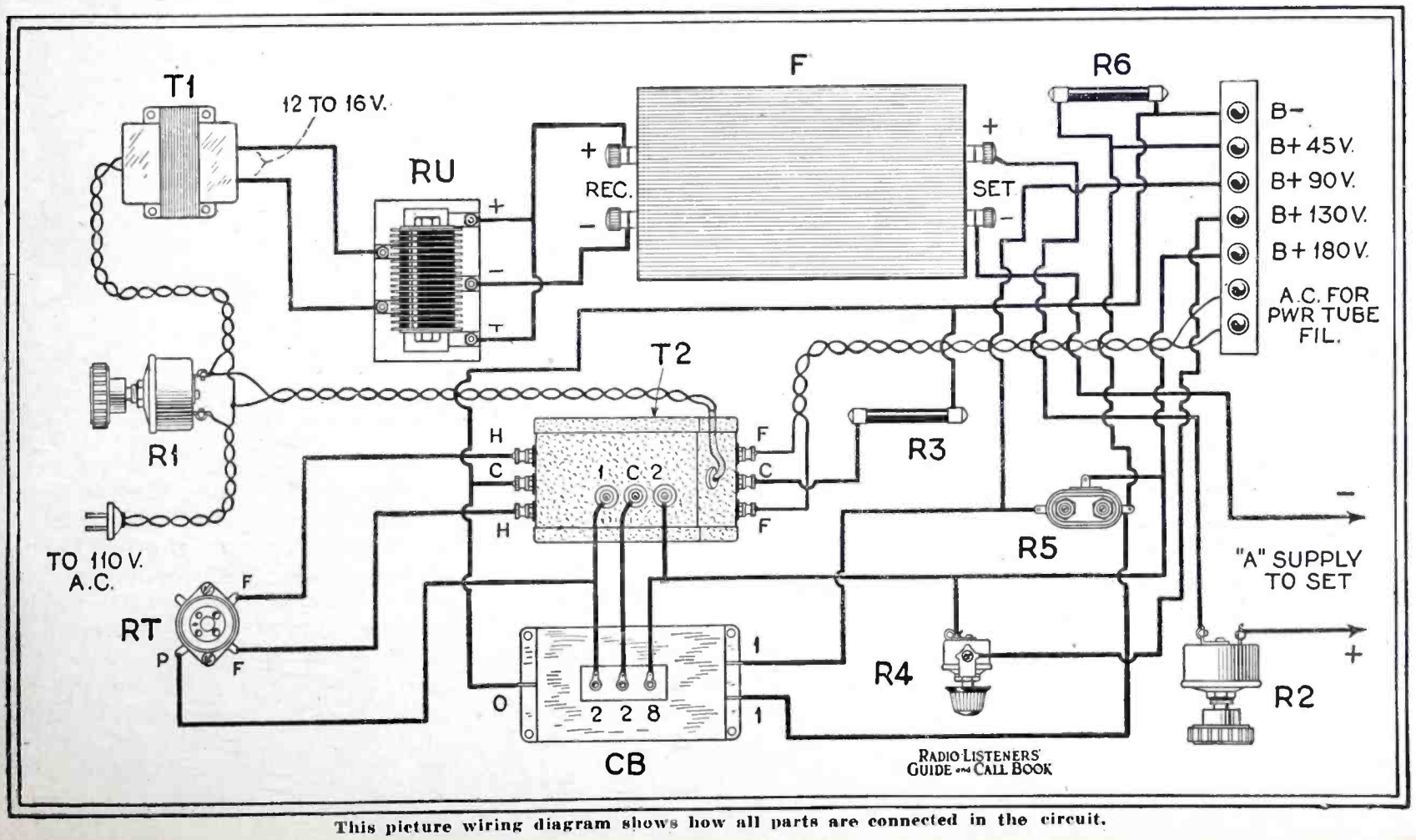


A top view photo of the A and B power supply unit showing the layout of parts.

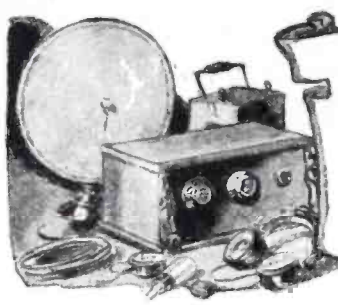
Two Power Clarostats are shown, one a low range, not more than 500 ohms being required, to regulate the 110 volts to the supply. By test in various cities it has been found that this incoming voltage may vary from 100 volts A.C. to 125 volts, depending upon the time of day the readings are taken and also local conditions. For this reason you should adjust the incoming voltage to as near 110 volts as possible. A good voltmeter, A.C. type, should be used for this purpose. If, however, you have a D.C. voltmeter you may regulate the A.C. supply by connecting your voltmeter on the D.C. side of your "A and B" supply and make adjustments to suit. If you are measuring between "B" minus and "B" plus 180, you can adjust until you are obtaining this voltage.

The 10 ohm power Clarostat is connected in the "A" plus lead to

(*Continued on page* 140)



This picture wiring diagram shows how all parts are connected in the circuit.

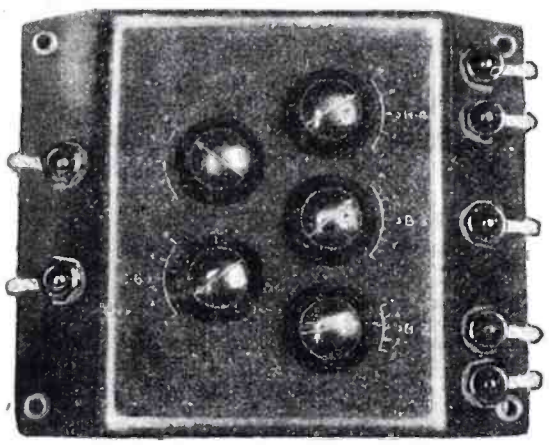


The Listeners' Accessory Guide

A Voltage-Divider for Power Supply Units

THE design of the voltage-divider of a "B" socket-power unit is one of the most difficult problems of the average radio constructor. In order to operate efficiently, radio receivers must be provided with the proper plate and grid potentials and, if the voltage-dividing resistor has not been properly designed, the voltages are likely to be far from the required values. This is one of the most frequent causes of trouble in home-constructed radio outfits.

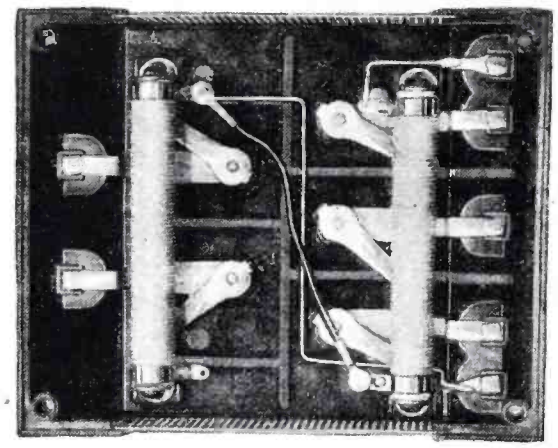
In order to provide the proper voltages, a fixed voltage-dividing resistor must be designed especially for the receiver and power unit with which it is to be used. For example, if a given power unit provides 90 volts from one tap of the voltage-dividing resistor when used in connection with a six-tube receiver, the same power unit will provide a much lower voltage from this tap if an eight-tube receiver is used. Also, the voltage would be higher if only four tubes were used.



Photos by courtesy Electrad, Inc.

The five knobs on the panel of the voltage divider are for adjusting the various plate and grid potentials.

Fortunately, there is a simple solution of the problem discussed in the preceding paragraph. It is entirely practical to have the total resistance of the voltage-dividing resistor the same for all sets, providing the power unit delivers an approximately constant output voltage; but the taps must be connected at different points on the resistor for each individual receiver. Therefore, a voltage-dividing resistor for use with any type of receiver may be made by providing the resistor with the necessary number of slider contacts instead of fixed points of contact. With this type of device each potential may be adjusted to the required value. A new factory-made voltage-dividing resistor of this type is shown in the photos herewith.



The five sliders shown in this interior view of the voltage divider make contact with wire-wound resistors and render it possible to obtain any five desired intermediate voltages.

From the photos it may be seen that the voltage-dividing unit under discussion has five knobs. Three of these are for adjusting the "B" voltages and the other two for the "C" bias potentials. The resistor consists of three resistor units (A, 8,000 ohms; B, 2,000 ohms, and C, 1,000 ohms—shown from right to left, respectively) connected in series. The free terminals of resistors A and C are connected to binding posts which connect with the output of the filter circuit, if the power unit is designed to supply 180 volts at the highest tap. (Where power units with a higher output are used, another resistor is inserted in the circuit to reduce the voltage across the resistor to 180 volts).

The voltage divider is 6¾ inches square by 1 inch high, and presents a very pleasing appearance. It is made of molded bakelite and is provided for vertical mounting in either of two positions. All resistors are of the wire-wound, high current type.

Electrodynamic Speakers for A.C. Operation

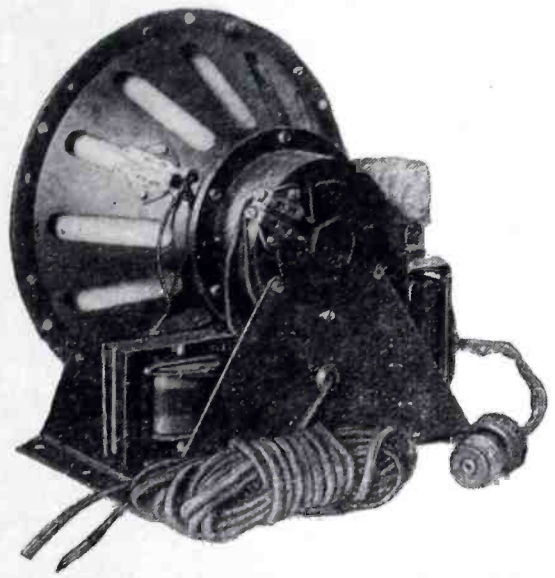
GREAT interest is being caused in radio circles at the moment by the electrodynamic speakers which are beginning to appear on the market in large numbers. Speakers of this type possess many features not found in the usual design, and are becoming very popular because of their ability to handle greater volume with less distortion. They are made in a number of different designs, and one of the latest designs presented is shown in an illustration on this page. The most interesting feature of this unit is that it may be operated directly from 110-volt A.C. without the necessity of an external source of direct current.

In the electrodynamic speaker a large electromagnet is used in place of the usual permanent magnet, and the field coil of this magnet must be supplied with a source of D.C. for its operation. Secondly, instead of employing the usual iron armature to produce sound vibrations, the electrodynamic speaker has in the field of the electromagnet a moving coil to which a small free-edge cone is attached directly. The output energy from the radio receiver is passed through the moving coil, causing the coil, and with it the free-edge cone, to vibrate with the signal. As the design of the magnets is such that there is nothing to limit the movement of the coil or cone within a wide range, the speaker is able to produce enormous volume without overloading and without appreciable distortion. Therefore this type of speaker is eminently satisfactory for use with the modern radio power pack which delivers sufficient energy to overload the average permanent-magnet type of speaker.

Photos by courtesy The Rola Co.

A front view of the electrodynamic speaker described herewith. The dry rectifier and step-down transformer can be seen on the side.

In the speaker described in this article, provision has been made for operating the field coil directly from a 110-volt A.C. supply. The speaker is equipped with a built-in step-down transformer and rectifier, which converts the A.C. into D.C. of the proper potential, and in this way avoids the necessity of operating the speaker with power supplied by the "A" or "B" socket-power unit. The rectifier used for the purpose is of the dry-electrolytic type, has a very long life and requires no attention whatsoever.



The step-down transformer and the rectifier on the side make possible the operation of this electrodynamic loud-speaker unit direct from the 110-volt light socket.

In the photos herewith the mechanical construction of the speaker is clearly shown. It will be noticed that the entire unit is mounted on a metal chassis, and that it is supplied with two outlet cords for connection to the 110-volt lamp socket and leads for the loud speaker binding posts of the set. The speaker will be available either as a separate unit or in an attractive cabinet.

Screen-Grid Booster Unit

THERE are thousands of old-style receivers in operation today which fall just short of the mark set by the modern broadcast listener for satisfactory reception under present conditions. In a majority of cases one of three complaints is made; the set lacks sufficient volume, it is not sensitive enough to receive distant stations, or it does not provide the selectivity required to separate local stations. Usually, the owner hesitates about discarding the receiver, as the results are otherwise quite satisfactory; and he is looking constantly for some method of modernization which may be applied to his circuit.

Recently, a number of R.F. booster units have been placed on the market, to satisfy the demand for a device which will bring up-to-date these old receivers. These units, usually, are designed for use ahead of the R.F. amplifier of the receiver and, when connected in this manner, they provide the advantage of an additional stage of R.F. amplification. A booster unit uses one tube and adds an extra tuning control to the receiver. It may be operated from the same batteries or the socket-power units which are used for the receiver.

The accompanying photo shows an R.F. booster of recent design. This device employs one of the new 222-type screen-grid tubes which provide an enormous amplification when used in R.F. circuits. As a result, when a booster unit of this type is connected ahead of a receiver, the effect is greater than it would be possible to obtain with an additional R.F. stage of standard design. The device when properly operated will increase the sensitivity, selectivity and volume of the receiver, or in other words, provide the extra "pep" which is needed.

In mechanical construction, the unit is very compact; it is housed in a metal cabinet 4½x6x7½ inches which serves also as a shield, and there are only two controls on the front panel, the tuning condenser and the battery switch. At the rear of the unit will be found the exit hole for a four-wire battery cable and the binding-post strip on which are mounted the two aerial posts and the output post.

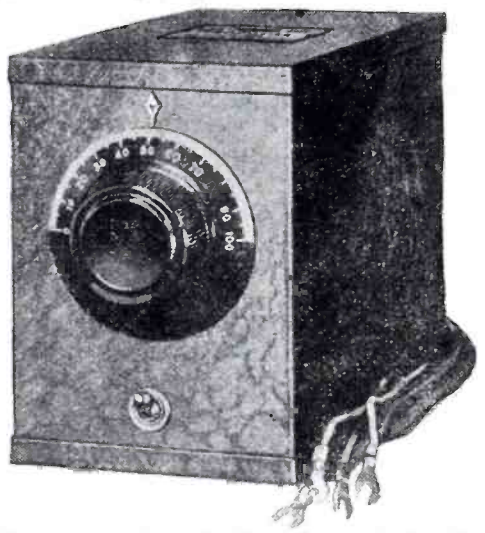


Photo by courtesy Sterling Manufacturing Co.

Above is the screen-grid booster unit which can be used in connection with practically any type of receiver.

It is a very simple matter to connect the booster unit to any receiver. Usually the unit is placed at the left of the receiver so that it is convenient to tune the dial, connect the battery cable to the power supply used by the receiver, and run a wire from the unit to the aerial post of the set. All original connections to the receiver are left as they were except the aerial lead-in, which is connected to the proper post of the booster unit; then a wire is run from the output post of the latter to the aerial post of the receiver. After this has been accomplished, a 222-type (screen-grid) tube is placed in the socket of the booster unit and the installation is ready for operation. However, it must be remembered that, in order to operate the set, it is necessary to turn on the switch in the booster unit as well as that on the front panel of the receiver.

An A.C. Adapter Harness for Battery Sets

THE accompanying photo shows a new adapter harness for the conversion of battery operated sets into A.C. This can easily be accomplished without rewiring even by the non-technical fan by the use of a standard step-down transformer, ordinary A.C. tubes, and an adapter harness.

Photo by courtesy Cornish Wire Co.

The A.C. tube adapters of this harness are made in different styles for use with different types of A.C. tubes.

For the person who has a set working with a "B" eliminator, such a conversion gives him an all-electric set. For the person who uses "A" and "B" batteries, the "A" battery is eliminated.

All important in the design of an adapter harness is its universality; that is, the ease and certainty with which it can be applied to all types and makes of receivers.

The harness pictured herewith is so designed that it may be used with practically all receivers, and will fit such sets mechanically and electrically.

Due to the difference in design and characteristics of different makes of tubes a harness is made for each type of tube. Ample provision is made for the "C" biasing and a volume control is supplied with all harnesses.

Amplifier Unit for Many Purposes

THE light-socket-operated power amplifier illustrated in the accompanying photo may be employed for many useful purposes. It differs from the usual devices of this type, inasmuch as it provides its

(*Continued on page* 142)

The RADIO SET MARKET

This department is conducted in the interest of our readers who either build sets for sale or desire to have sets built to order. Anyone desiring to communicate with setbuilders whose notices appear in these advertisements can do so by addressing correspondence to the key number of each setbuilder in care of RADIO LISTENERS' GUIDE AND CALL BOOK, *230 Fifth Avenue, New York City.*

All advertisements of custom set-builders appearing in the radio set market are published without cost or obligation. However, the publishers reserve the right to reject any advertisement which in their opinion appears illegitimate or cases where concerns merchandising parts would take advantage of this offer to custom set-builders. No more than fifty words to each advertisement and only one advertisement is allowed to each party or concern. Each request must be written on a separate sheet of paper to which must be attached the special coupon given in the notice appearing on another page preceding the feature articles in this issue.

MIDDLE ATLANTIC STATES
New York, New Jersey, Pennsylvania

No. 119—Buy a custom built radio set from a setbuilder in Brewerton, N. Y. All circuits built of national advertised parts. All work guaranteed whether rebuilt or new.

No. 221—Setbuilder in Bronx, N. Y., has custom built 3-tube radio set for sale. Only one dial and very compact. Uses small loop aerial which is contained in the set. Has excellent volume and tone quality with a hundred mile range.

No. 124—Radio Rex of Bronx, N. Y., will build any set to order. Specializes in Magnaformer 9-8. All inquiries answered promptly.

No. 372—Professional set designer and builder in Bronx, N. Y., has facilities for construction of all standard kits and sets for prompt delivery. Member Associate Institute Radio Engineers. No construction considered unless specified apparatus is used. Specializes in Erla reflex and Ultradyne Super-Heterodynes of all types.

No. 148—Custom setbuilder in Brooklyn, N. Y., will build latest circuits to order. Specializes in A.C. shield grid sets. Sets from 1 to 14 tubes built.

No. 175—Professional custom setbuilder of Brooklyn, N. Y., has facilities for construction of all high grade sets, irrespective of type. Specified equipment only considered in assembly. Specializes in Hammarlund-Roberts, Browning-Drake, Super-Hilodyne and Super-Heterodyne receivers.

No. 268—Setbuilder in Brooklyn, N. Y., has for sale the following. One Freshman Masterpiece, one three tube portable also an R.E.L. short wave receiver and some Ham parts and will build any short wave set or any type of set to order. All work guaranteed.

No. 253—Setbuilder in Brooklyn, N. Y., will build any make of set to order with standard parts and circuits used. Will rematch condensers which improve reception and selectivity on one-dial sets. Seven years experience.

No. 277—Setbuilder in Brooklyn, N. Y., will build to order any type of radio set for A.C. or battery operation.

No. 125—Setbuilder in Buffalo, N. Y., can build any set you wish at right prices. Fully equipped with accurate test instruments. Also maker of famous power antenna for more stations and distance.

No. 179—Custom setbuilder and radio consultant in Buffalo, N. Y., will build or design any circuit to order. Modernizing sets a specialty. 12 years' practical experience. Associate of Institute of Radio Engineers. Will build anything from a 1-tube receiver to broadcast station. All work guaranteed.

No. 151—Setbuilder in Buffalo, N. Y., can build any make of set to order. Victoreen Super-Heterodyne specialist.

No. 110—Custom setbuilder in Cohoes, N. Y., will construct any nationally known circuit at very reasonable prices.

No. 262—Setbuilder in Corona, L. I., N. Y., builds all popular late model sets, "B" eliminators and power amplifiers to order.

No. 118—Setbuilder in Elmira, N. Y., has one 8-tube Super-Heterodyne for sale—walnut case, Goldsmith circuit, A-1 condition. Will rewire, repair or build any type set or amplifier. Also repair "A" and "B" eliminators of any make. All work guaranteed.

No. 250—Custom setbuilder in Frankfort, N. Y., specializes in Silver-Marshall and all Screen Grid circuits of the day. Repairing done on all makes of sets.

No. 180—Custom setbuilder in Hastings-on-Hudson, N. Y., specializes in Silver-Marshall and Hammarlund-Roberts sets. All types of sets built, remodeled and repaired. All complete kits and accessories for sale.

No. 240—Radio expert and professional setbuilder in Jamestown, N. Y., will convert all sets for A.C. operation. Kits wired and sets tested. Antennas erected and sets installed.

No. 138—Cusrom setbuilder in Richmond Hill, L. I., N. Y., will build sets, "B" eliminators and power packs to fit your requirements. Will also electrify your old sets.

No. 132—Four or five-tube sets with cabinet made by setbuilder in New Rochelle, N. Y. Wonderful DX "go-getters."

No. 104—Setbuilder in New York, N. Y., builds "Everyman 4" complete, including tubes, "A" battery, "B" eliminator (180 volts), and cone speaker.

No. 109—Setbuilder in New York, N. Y., specializes in Hi-Q receivers. Can also build any set to individual specifications. Associate of Institute of Radio Engineers.

No. 133—Latest sets built and installed by a custom setbuilder in New York, N. Y. Sets repaired and rewired. Expert on S-M Shielded Grid Six, Tyrman Seven, Hammarlund-Roberts Hi-Q Six and all makes of power packs.

No. 134—Sets built to order by custom setbuilder in New York, N. Y. Old sets remodeled and brought up-to-date. Electrifying sets our specialty. Authorized service station for Atwater-Kent, Fada, Freshman, Sonora, Stewart-Warner and Grebe receivers.

No. 154—Setbuilder in New York, N. Y., specializes in custom-built A.C. and D.C. receivers and power packs. No order too large or too small. At your service.

No. 194—Certified radio-trician in New York, N. Y., with five years' experience, specializes in Shielded Grid circuits and Super-Heterodynes. Orders received for any circuit, eliminators and power packs. Complete kits and accessories for sale. Technical questions answered free of charge.

No. 219—Setbuilder in New York, N. Y., specializes in Acme, Victoreen and Silver-Marshall. Sets made to order. Repairing a specialty. Can also build a short-wave tuner—just plug it into your present set—the results are wonderful.

No. 237—Custom setbuilder in New York, N. Y., catering to musical instructors has a seven-tube receiver of his own design for sale. This radio set has a guaranteed range of 2,000 miles; remarkable tone fidelity and tremendous volume. Will duplicate to order and to external specifications only. Four weeks delivery on orders.

No. 272—Any set built by Super-Heterodyne expert in New York, N. Y., at lowest prices. Scott's World Record Supers; Tyrman 70; Silver-Marshall Shielded Grid; 180 and 450 volt eliminators; Dry "A" eliminators. Sets and eliminators brought up-to-date reasonably.

No. 312—Custom setbuilder in New York, N. Y., specializes in Silver-Marshall Screen Grid Six receiver. Finest material used and most any circuit built. High class "B" eliminators and power packs guaranteed not to motor-boat. Balsa, Cone, and Aeroplane speakers built to order.

No. 321—Setbuilder in New York, N. Y., will build, rewire or repair any type of set, speaker, eliminator or power amplifier. Long and short-wave sets a specialty. Inventor of Copeman Radioplane. Radio-teleautomatic expert. No order too large or small.

No. 326—Custom setbuilder in New York, N. Y., specializes in Hammarlund-Roberts Hi-Q, Browning-Drake, Screen-Grid, and Quadraformer. Will make any set A.C. operated. All types of power packs including 250 with dynamic output. Will repair any make radio set. All work guaranteed. Quick service. Deposit on all orders.

No. 332—Setbuilder in New York, N. Y., will build sets of supreme tone quality in cabinets of distinction. All-electric sets for direct current a specialty.

No. 304—Custom setbuilder in North Lawrence, N. Y., will build Super-Heterodynes to order. Expert repair work on all types of receivers. Browning-Drake sets a specialty, latest models for sale. Power amplifiers and reproducing equipment for home and auditorium use.

No. 113—Setbuilder in Patchogue, N. Y., will build any circuit to order. Specializes in Silver-Marshall sets.

No. 164—Setbuilder in Pittsford, N. Y., will build any kind of set you wish.

No. 249—Custom setbuilder in Plattsburgh, N. Y., specializes in Remler Best 115 Kilocycle 9-tube Super-Heterodyne. Any make set built to fit your pet piece of furniture, or in standard form.

No. 314—Setbuilder in Rochester, N. Y., will build sets to order. Only the best and specified parts used. Workmanship guaranteed, prices moderate. Have quantity of odds and ends of radio parts for sale. Member of A. R. R. L.

No. 367—Setbuilder in Rochester, N. Y., will build your custom radios at from 10 to 15% discount from list prices. All work guaranteed. Three years' experience. Work endorsed by National Radio Institute at Washington, D. C.

No. 207—Setbuilder in Rockaway Beach, N. Y., will build to order all latest types of radio circuits to meet your own ideas as to style and performance. Special consideration given to all orders for the Tyrman "70" using the new shielded-grid tubes. Above service to all points on Long Island only.

No. 115—Setbuilder in West New Brighton, S. I., N. Y., is specialist in custom built sets and Super-Heterodynes. Will repair or build any type of radio set or power pack. All work guaranteed.

No. 376—Setbuilder in Tuckahoe, N. Y., will build or repair any set. Complete laboratory equipment.

No. 350—Setbuilder in White Plains, N. Y., has dsigned sensational new 3-tube Ambassador circuit. Gives phenomenal distance, code and local reception. Will build same for you. Particulars upon request.

No. 197—Setbuilder in Barrington, N. J., will build any type of set to order. Battery sets converted to operate direct from house current. Expert service anywhere in southern New Jersey and Philadelphia. Tubes tested and rejuvenated free of charge.

No. 187—Authorized Silver-Marshall service man in Bayonne, N. J., has for sale one Silver-Marshall Laboratory Super-Heterodyne equipped with Silver-Marshall Reservoir A-B-C Eliminator and Temple Air Chrome Speaker. Satisfaction guaranteed.

No. 265—Setbuilder in Belleville, N. J., has greatest achievement known, using Hiler Impedance, 1500 volts, 210 tube output. Superior to any push-pull system using two 250's. Three-year unconditional guarantee. Old sets remodeled.

No. 417—Graduate radio-trician in Belleville, N. J., constructs sets, power packs, amplifiers and loud speakers, also adjustments and repairs. Local and school references on request.

No. 399—Setbuilder in Bloomsbury, N. J., will build any type of set desired. Specializes in Silver-Marshall sets. Sets delivered and installed within one hundred miles.

No. 103—Radio-technician in Camden, N. J., will build, repair and service radio receivers at reasonable prices. Authorized Hammarlund-Roberts and Silver-Marshall service station. Television apparatus, power packs, "B" eliminators and power amplifiers custom-built to your order. Complete laboratory testing equipment used. All work guaranteed.

No. 163—Setbuilder in Cliffside Park, N. J., specializes in Hammarlund-Roberts and Silver-Marshall receivers. Also short wave receivers and transmitters. Sets for special purposes designed and built. "B" eliminators repaired. Old sets rebuilt and repaired.

No. 203—Custom setbuilder in Dumont, N. J., has five and six tube radio frequency sets for sale. Specializes in this kind of set. Will build any kind of receiver to order. Prices reasonable.

No. 251—Setbuilder in Jersey City, N. J., has 4 and 5-tube Diamond of the Air and 2-3-4 tube reflex sets for sale. Can build or rebuild any make set to order.

No. 178—Setbuilder in Keyport, N. J., will build and repair all makes of radio sets. Specializes in Silver-Marshall Screen-Grid receivers.

No. 147—Setbuilder in Lakehurst, N. J., will build sets the way you want them. Push-pull amplifiers and shielded grid sets a specialty.

No. 276—Setbuilder in Linden, N. J., specializes in building the Magnaformer receiver and also other types of sets, "B" eliminators and power packs. Will repair any radio set. One year's service.

No. 116—Setbuilder in Newark, N. J., specializes in Hammarlund-Roberts Hi-Q 6 and Everyman 4 sets. Built to your specifications. Expert service on all sets. References and particulars on request.

No. 352—Custom setbuilder in Newark, N. J., has Hammarlund-Roberts Hi-Q 6 battery and electric sets for sale. Will build any set, eliminator or amplifier to order with specified parts at lowest prices.

No. 396—Setbuilder in Newark, N. J., has 3-tube Popular Mechanics Loop sets, one dial control, for sale. Also one Atwater Kent No. 20.

No. 375—Setbuilder in North Bergen, N. J., will build any circuit to order. Specializes in LC. 28 sets and short wave converters.

No. 172—Setbuilder in Passaic, N. J., specializes in A.C. sets, "B" eliminators, and special step-up or step-down transformers. All work guaranteed.

No. 156—Professional custom setbuilder in Phillipsburg, N. J., is Super-Heterodyne specialist. Specializes in World's Record Shielded Grid Nine, World's Record Super Ten and Silver-Marshall Laboratory Super. Workmanship unsurpassed. 72 hour service.

No. 281—Setbuilder in Allentown, Pa., specializes in the building of reflex, Browning-Drake and Hammarlund-Roberts circuits. Best quality parts used at the lowest consistent price, guaranteeing the greatest satisfaction.

No. 344—Certified radio-trician in Altoona, Pa., will build any make of set to order. 10% discount from list price on all sets. Guaranteed reception and full service for one year.

No. 297—Setbuilder in Bethlehem, Pa., builds the Magnaformer 9-8 Super-Heterodyne. Good selectivity and great volume.

No. 407—Setbuilder in Bethlehem, Pa., specializes in 5-tube radio frequency sets. Aero short wave set, 4-tube Browning-Drake and 3-tube sets for sale. Will also build A.B.C. eliminators and amplifiers. Repairing done on all kinds of sets.

No. 313—Setbuilder in Chester, Pa., can build any make of set to order. Specializes in kit sets.

No. 328—Custom setbuilder in Chester, Pa., builds receivers free for price of parts: H. F. L., Silver-Marshall, Tyrman, Hammarlund-Roberts, Magnaformer, Madison-Moore. Special audio stage switching arrangement optionally built for any set. Also A.C. and single dial, power packs and eliminators. Equipped to build any kind of radio apparatus. Repair service.

No. 217—Setbuilder in Crafton, Pa., has custom built Browning-Drake 4-tube sets for sale. Will also build any make of set to order.

No. 324—Custom setbuilder in Easton, Pa., has one Silver-Marshall Shielded Six (type 630) and one Aero Short Wave Converter (verification from England and France) for sale at a reasonable price. Specializes in Silver-Marshall and Aero sets, but can build all types. Authorized Silver-Marshall service station.

No. 144—Setbuilder in Irwin, Pa., specializes in Browning-Drake and Silver-Marshall 4-tube Shielded Grid sets. All types of sets custom built.

No. 290—Radio service men in Kittanning, Pa., who have been in the business for the past two years, will build any set to meet your requirements. Silver-Marshall sets a specialty.

No. 330—Setbuilder in Mill Hall, Pa., will design and construct radio equipment to meet the requirements of your locality. Constructor of super-fine custom built radio broadcast receivers. Repair department is at your service.

No. 365—Custom setbuilder in New Kensington, Pa., with eight years' experience, specializes in latest Silver-Marshall Screen-Grid Six and Laboratory Screen-Grid Super. Any set changed to A.C. All sets built to your order for price of parts. Prices reasonable and work guaranteed.

No. 101—Setbuilder in Philadelphia, Pa., has on demonstration the latest Browning-Drake receiver. Will also build any set to order. Best material, workmanship and results at lowest prices.

No. 106—Modern up-to-date sets constructed and serviced by a setbuilder in Philadelphia, Pa. Tuned Radio Frequency, Browning-Drake and Neutrodynes a specialty. Power Amplifiers.

No. 123—Setbuilder in Philadelphia, Pa., specializes in Hammarlund-Roberts Hi-Q sets.

No. 141—Setbuilder in Philadelphia, Pa., has 6-tube Hammarlund-Roberts and Aerodyne sets for sale. Can build any make of set to order.

No. 149—Setbuilder in Philadelphia, Pa., builds high-grade receivers and power packs. Specializes in Super-Hilodyne, Tyrman 70, Hammarlund Hi-Q, Continental, H.F.L. Model 28, World's Record Super, and sets using screen grid tubes.

No. 155—Setbuilder in Philadelphia, Pa., has six and seven-tube sets for sale. Specializes in Aero Seven and Harkness Counterfonic. Can build any make set or "B" supply unit to order.

No. 191—Setbuilder in Philadelphia, Pa., specializes in A.C. sets. Will build to order any type of set.

No. 264—Custom setbuilder in Philadelphia, Pa., has 5-tube, one-dial DX Shielded T.R.F. sets for sale with walnut cabinet. Specializes in this type of set. Can build any make of set to order, also socket power amplifiers and eliminators.

No. 360—Setbuilder in Philadelphia, Pa., specializing in Silver-Marshall circuits and high class Super-Heterodyne receivers, now has on display a beautful walnut floor console 5-tube all electric S-M DX circuit with built-in loud speaker. Any other circuit built to your order at moderate prices.

No. 394—Authorized radio-trician in Philadelphia, Pa., specializes in the Hammarlund-Roberts Hi-Q set. Any make set built to order. Also short wave sets built.

No. 152—Authorized radio-trician in Pittsburgh, Pa., has Hammarlund-Roberts Hi-Q 6 and Tyrman "70" radios for sale. Demonstration at your request. Sets built to your order.

No. 358—Authorized Hammarlund-Roberts radio-trician in Pittsburgh, Pa., has the Hi-Q 5 and Hi-Q 6 for sale. Four years' experience on the Hammarlund-Roberts sets. Any set built to order at reasonable cost.

No. 370—Custom radio setbuilder in Pittsburgh, Pa., will build any set or apparatus described in Radio Listeners' Guide and Call Book on satisfaction or money back basis. Specializes in modernizing obsolete model receivers. All kinds of indicating instruments repaired and recalibrated.

No. 395—Setbuilder in Pittsburgh, Pa., will repair all makes of radio sets. Old sets rebuilt and improved and new sets built to order. Prices reasonable. Ten years' experience.

No. 241—Setbuilder in Reading, Pa., has guaranteed custom-built radio receivers and short wave sets for sale.

No. 294—Setbuilder in Reading, Pa., has 9-tube Ultradyne and Silver-Marshall short wave sets for sale.

No. 205—Setbuilder in Scranton, Pa., has Tyrman "70" for sale. Write for our low prices on custom built sets. Repairing, designing and building any set on market.

No. 146—Setbuilder in Sharon Hill, Pa., is authorized Cardwell builder. My responsibility extends beyond ordinary guarantees and all designs are far in advance of commercial types.

NEW ENGLAND STATES
Connecticut, Maine, Massachusetts New Hampshire, Rhode Island

No. 129—Setbuilder in E. Norwalk, Conn., has on display and ready for demonstration the Silver-Marshall Shielded Grid Six and Hammarlund-Roberts Hi-Q Six. Old radios rewired, electrified and brought up-to-date.

No. 331—Professional radio set constructor in New Britain, Conn., specializes in Geo. H. Cooper's 9-tube All Wave Super-Heterodyne set. 7x18" front panel and 7x17" sub-panel. Straight line sequence. Studied radio technology through I. C. S. schools.

No. 232—Setbuilder in New Haven, Conn., has Ultradyne L2 for sale with or without AmerTran A. B. C. 2-stage power unit. Specializes in custom built sets.

No. 122—Setbuilder in New London, Conn., with years of experience in radio business, has custom made sets for sale. Can build any make of set to order. Prompt service.

No. 378—Setbuilder in Southington, Conn., will construct any set or power unit desired regardless of size. Old radios rewired, repaired and brought up-to-date.

No. 242—Authorized Hammarlund-Roberts radio-trician in Staffordville, Conn., will build and repair all makes of sets and convert any type battery set to A.C. electric sets. Also have for sale 5-tube sets, 5-tube kits and power units. All work guarteed.

No. 127—Custom made sets built to order by a setbuilder in West Haven, Conn. No set too small, none too large. Also repairing and remodeling of all kinds. Have your old set made up-to-date. Tyrman "70", all electric, for sale.

No. 377—Radio expert and custom setbuilder in Portland, Maine, will build any of the latest sets to order. Sets repaired and adjusted for the best results at reasonable prices. Old sets rewired for the new A.C. tubes. A trial is all I ask.

No. 303—Setbuilder in Boston, Mass., builds excellent, low priced short wave receivers. This circuit was used by Commodore Dyott for his Roosevelt Memorial Expedition to the River of Doubt, Brazil, for constant communication with the outside world. Will repair any type of set.

No. 320—Setbuilder in Cambridge, Mass., will build to order or service any radio set or power pack described in Radio Listeners' Guide and Call Book, for residents of Boston or vicinity. My laboratory is at your service.

No. 139—Setbuilder in Medford, Mass., has 5-tube Browning-Drake for sale. Sets built to order. Repairing and service work done at very reasonable prices.

No. 258—Setbuilder in Medford, Mass., will build any of the popular circuits to order. Power units and public address systems built and installed. Official parts used. Work guaranteed.

No. 114—Hammarlund-Roberts radiotrician in Natick, Mass., will inspect any set in trouble without cost. Will assemble any circuit. Hammarlund-Roberts specialty. Tubes, batteries and all other accessories for any radio for sale on order.

No. 107—Professional setbuilder and radio expert in Quincy, Mass., will build any make of set to order. Workmanship and results guaranteed, using materials as specified in Radio Listeners' Guide and Call Book.

No. 343—Professional setbuilder in Springfield, Mass., will build any set or circuit to order. Authorized Hammarlund-Roberts service station. Sets rewired for A.C. One year guarantee on any set. Graduate of N. R. I.

No. 195—Setbuilder in Worcester, Mass., has facilities to build on order any type set in sizes for homes or large halls. Factory built sets and accessories supplied where preferred. Builder and engineering graduate with seven years' experience. Personal service.

No. 243—Custom setbuilder in Chesham, N. H., has short wave adapters for sale; also Knickerbocker 4-tube sets. Will build any set or "B" power supply amplifier to order.

No. 263—Setbuilder in Pawtucket, R. I., has Everyman 4 sets for sale. Specializes in this kind of set. Can build any make of set to order.

No. 270—Radio technician in Woonsocket, R. I., will build sets to order. Super-Heterodyne expert.

CENTRAL STATES
Alabama, Arkansas, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Montana, North Dakota, New Mexico, North Carolina, Ohio, Oklahoma, South Dakota, Tennessee, Texas, Vermont, Virginia, Washington, D. C., West Virginia, Wisconsin.

No. 388—Radio setbuilder in Powerly, Ala., will build to order any radio receiver. Specializes in 3-tube Ambassador sets.

No. 229—Setbuilder in Eureka Springs, Ark., can build any make of set to order. Send schematic or preferably picture diagram for estimate. Workmanship guaranteed.

No. 126—Setbuilder in Bradentown, Fla., can save you money on a custom built radio set and build it to suit you and your furniture. Will guarantee good reception and great distance.

No. 112—Setbuilder in Daytona Beach, Fla., will build any type of the latest custom-made sets to order. Specializes in short wave receivers and transmitters. Service on all types of sets.

No. 283—Authorized Hammarlund-Roberts radio-trician in Ft. Pierce, Fla., can build to order any make of set, electric phonograph, or combination. Have you a fine old piece of furniture in which you would like to install a modern set?

No. 285—Setbuilder in Jacksonville, Fla., will build any type of set to suit your taste. Aero short wave sets and converters a specialty. Only the best parts on the market used.

No. 291—Radio-trician in Jacksonville, Fla., will build any set or power unit to order.

No. 305—Setbuilder in Manatee, Fla., has Hammarlund-Roberts Hi-Q 6 receiver ready to go in a cabinet for sale. Perfect reproduction and distance getter, fully tested and tuned.

No. 366—Setbuilder in Miami, Fla., will repair A.C. or battery operated sets. Will build any set you desire from reputable manufactured parts with a guarantee of satisfaction at reasonable prices.

No. 300—Setbuilder in Oneco, Fla., will wire to your specifications all standard kits or special hook-ups.

No. 140—Custom made radio receiving sets employing such circuits as Remler, Browning-Drake and other high grade receivers built by setbuilder in Champaign, Ill. Lowest prices for quality merchandise. For sale, 5-tube radio frequency receiver, coast to coast reception, complete with accessories.

No. 142—Any make radio built to order by a setbuilder in Chicago, Ill. Only well-known and advertised parts used. Specializes in the Quadjur Six, Silver Laboratory Super and the Quadraformer Five and Six.

No. 162—Setbuilder in Chicago, Ill., specializes in Bremer-Tully Counterphase, Hammarlund-Roberts Hi-Q, short wave sets, and can build any other make of set to order. "A" and "B" eliminators also built. Guaranteed radio service on repairing, remodeling and designing.

No. 167—Setbuilders in Chicago, Ill., takes second-hand sets in trade on their wonder set, the "King Kustombuilt 10," cheap. We are pioneers in the radio business, having started as wireless operators in 1907.

No. 204—Setbuilder in Chicago, Ill., will build the Tyrman 70, Hammarlund-Roberts, Nine-in-Line, Sliver-Marshall, Aero, or any high grade receiver to fit any style console or cabinet. All sets equipped with power amplification for battery or socket operation. Very selective—remarkable tone quality.

No. 248—Setbuilder in Chicago, Ill., will build Super-Heterodynes of all makes and styles, also Hammarlund-Roberts, Silver-Marshall, Karas, Scott and Browning-Drake sets. Any others made to order, including power packs. Workmanship guaranteed. Installations on work free.

No. 259—Setbuilders in Chicago, Ill., have for sale the following sets and amplifiers: Hammarlund-Roberts Hi-Q, Silver-Marshall, Madison-Moore, Remler, Victoreen, Camfield, and Karas A.C. Prices on application.

No. 288—Setbuilder in Chicago, Ill., will build any make of set to order. Specializes in Hammarlund-Roberts Hi-Q Six and Thorola-Do-Nut 5. Meets actual local conditions. Distortionless, perfect reproduction of broadcastings. DX. Safe delivery of set. Guaranteed master workmanship.

No. 306—Setbuilder in Chicago, Ill., will build to order the World's Record Super 10. Gets real distance, real selectivity and tone quality. A set you will be proud to own. Will also build other custom radios as well.

No. 308—Highest class of custom sets built to your order and specifications by setbuilder in Chicago, Ill. Power amplifiers built to order. Your favorite circuit can be built to suit any size and kind of cabinet. Specializes in Super-Heterodynes.

No. 310—Setbuilders in Chicago, Ill., will build Super-Heterodynes, power packs, short wave sets, etc. All types of radio service. We maintain one of the finest equipped laboratories in the West.

No. 334—Custom setbuilder in Chicago, Ill., will build sets to your order. Specializes in 5-tube sets embodying a tuned band pass filter. 50% deposit on all orders. Experimental sets made.

No. 338—Professional setbuilder in Chicago, Ill., with six years' experience, will build any circuit; best parts only. Specializes in H.F.L. Isotonic Ten and Scott's Shield Grid Super. One year guarantee and service anywhere in Cook County.

No. 341—Setbuilder in Chicago, Ill., will build to order any sets or power-packs. Assembling and wiring free of charge. Also servicing and repairing old sets.

No. 380—Setbuilder in Chicago, Ill., will build custom built sets of any design for A.C., battery or eliminator operation.

No. 383—Setbuilder in Chicago, Ill., is specialist in Super-Heterodyne receivers. Specializes in the Magnaformer receiver, and short wave receivers that get them all, regardless of distance. Any set built, rebuilt or repaired.

No. 387—Setbuilder in Chicago, Ill., will build to order and repair any Silver-Marshall set and power pack. All workmanship guaranteed. Authorizd Silver-Marshall service station.

No. 400—Custom setbuilder in Chicago, Ill., will build receivers from any kit using only specified parts. Specializes in Hammarlund-Roberts Hi-Q, Scott's World's Record Super, Aero Seven, Karas and short-wave sets. Workmanship and performance guaranteed. Prices reasonable.

No. 422—Professional set designer in Chicago, Ill., will rebuild old receivers in the modern way. Any make receiver built to suit any choice of cabinet. Special discounts to readers of this magazine. Power amplifiers, Scott's Shield Grid 9, and the Isotone a specialty. Demonstrations. Hear and be convinced.

No. 311—Setbuilder in Decatur, Ill., is in a position to build any kind of set desired. The famous Strobodyne in beautiful burled walnut cabinet built of all specified parts for sale. Guaranteed mechanically perfect and built by an expert who knows Super-Heterodynes.

No. 406—Setbuilder in Fiatt, Ill., has one 4-tube set with three UX201-A tubes and one UX171 tube for sale. Silver-Marshall Screen Grid Fours a specialty. Other types of sets also made to order.

No. 295—Setbuilder in Glenview, Ill., has for sale a Bremer-Tully 5-tube set complete with earphones and speaker. Plain hardwood cabinet. Fair distance. Also All-American 3-tube reflex. Will build any set to order.

No. 315—Setbuilder in Lena, Ill., can build any make of set to order. Has 5-tube tuned radio frequency sets with very good tone and excellent selectivity for sale.

No. 421—Custom setbuilder in Midlothian, Ill., will build, repair or remodel any radio set. Authorized Silver-Marshall service station. Everything in radio fully guaranteed. Best quality. Lowest prices.

No. 169—Setbuilder in Moline, Ill., will build to order any type set for the price of parts and cabinet. No charge for assembling and wiring. Set shipped to you as a finished product and guaranteed to be as represented. State if you wish set accessories also.

No. 412—Setbuilder in Ontarioville, Ill., will build any type of set to order and guarantee to please you. Can also build experimental television apparatus. Can repair any type of set. Also test and rejuvenate tubes.

No. 209—Setbuilder in Springfield, Ill., will build to order from practically all standard kits, both sets and power packs.

No. 137—Setbuilder in Stockton, Ill., has five, six and seven-tube sets that have the promised ten kilocycle sharpness with the new shielded grid tubes. Silver-Marshall Shielded Grid Six specialty. Can build any make of set to order. Last word in up-to-minute reproducers.

No. 335—Setbuilder in Wheaton, Ill., specializes in the Air Scout Four receiver as described in the Spring 1928 edition of Radio Listeners' Guide and Call Book. Will build any one, two, three, four or five tube set; also crystal sets and short-wave adaptors.

No. 362—Setbuilder in Albany, Ind., will build all makes of sets to order. Will also repair any make of set. All work and repairs guaranteed.

No. 145—Setbuilder in Elkhart, Ind., wants to build your next set for you. Madison-Moore and Diamond of the Air are specialties. Will guarantee you more for your money. Also expert repairing and rebuilding. Prices are very reasonable.

No. 143—Custom setbuilder and radio doctor in Emison, Ind., specializes in Karas Equamatic, Tyrman 70 and Scott Shielded Grid Nine sets. Will also build any type of reliable set desired. Satisfactory results guaranteed.

No. 181—Setbuilder in Indianapolis, Ind., is specialist on A.C. and shielded grid tube sets. Will build to your order a set from any nationally advertised kits with parts specified by designer of circuit. Guaranteed workmanship at reasonable prices.

No. 327—Eventually you will own a custom-built Super-Heterodyne. Buy this set from a Super-Heterodyne specialist in Indianapolis, Ind. Nine years' experience and personal service.

No. 371—Custom setbuilders in Indianapolis, Ind., will build and rebuild all A.C. and D.C. sets, amplifiers and eliminators. Will also install our style of antenna in our locality with a two-year guarantee. Prompt service.

No. 402—Custom setbuilder in Lapel, Ind., will build or rebuild any type of receiver. All A.C., battery or power pack installations. Any circuit and any number of tubes built from best grade parts. Neat factory-built appearance. Any type cabinet or console. Workmanship and performance guaranteed.

No. 413—Custom setbuilder in Linton, Ind., can build any type set or power pack to order. Specializes in Hammarlund-Roberts Hi-Q Six A.C. or D.C. Can change D.C. sets to A.C. operation.

No. 186—Setbuilder in Muncie, Ind., specializes in Silver-Marshall Six with the new shield-grid tubes and 210 power tube. Highest quality workmanship only.

No. 166—Setbuilder in Richmond, Ind., specializes in the complete Silver-Marshall line. Sets completely built, and sold for standard nationally advertised prices of kits alone. No construction charge. Each set tested and results sent with set. 24-page S-M catalog sent free.

No. 261—Setbuilder in Burlington, Iowa, will rebuild and make any set to order. Specializes in building four and five tube sets employing regeneration. Satisfaction guaranteed.

No. 369—Custom setbuilder in Cedar Rapids, Iowa, with three years of actual experienc will make to order or rebuild any kind of set. Specializes in Victoreen Super-Heterodyne—A.C. or D.C.

No. 208—Setbuilder in Council Bluffs, Iowa, has Bremer-Tully Power Six and World's Record Super 10 sets for sale with or without accessories. One to fourteen tube sets, any make, built to your order.

No. 269—Setbuilder in Des Moines, Iowa, will build any set described by the Radio Listeners' Guide and Call Book. Prompt and reliable service on any make of radio or eliminator.

No. 257—Setbuilder in Dubuque, Iowa, will build any type of set to order. Also has for sale the Single Control Browning-Drake set A.C. or D.C., the Hammarlund-Roberts Hi-Q Six A.C. or D.C., the Tyrman Shielded Grid Amplimax, the Four-Tube Roberts Electric, Scott Shield Grid Nine, and the Isotonic 10.

No. 317—Setbuilder in Greene, Iowa, will build any set to order. Power units and power amplifiers custom-built. Specializes in all standard circuits.

No. 273—Setbuilder in Iowa City, Iowa, will build to order the Diamond of the Air, four and five tubes, and the Air Scout 4-tube receiver.

No. 404—Setbuilder in Knoxville, Iowa, will build sets from any nationally advertised kit. Specializes in Silver-Marshall sets and phonograph-radio combinations. Beautiful consoles with built-in electric phonograph, electric pick-up and any make of radio receiver desired. All work guaranteed. Can furnish cabinets, consoles, tubes, batteries, eliminators, speakers, etc.

No. 233—Professional setbuilder in McGregor, Iowa, will build sets to your specifications, using any circuit, and to fit any console or cabinet. Hammarlund-Roberts Hi-Q Six a specialty.

No. 183—Setbuilder in Newton, Iowa, offers some 5-tube T.R.F. radio sets without cabinets, wired for power tube and "C" battery. These are real volume and distance getting sets and are priced at about one-half parts price alone. Also offer complete 5-tube kits comparitively low priced.

No. 117—Setbuilder in Red Oak, Iowa, builds all high grade receivers using standard make parts throughout. Will repair any make set, factory or custom built. Specializes in Bremer-Tully Power Six and R. C. A. III 2-tube portable weighing 28 lbs. complete.

No. 298—Setbuilder in Tama, Iowa, has Everyman 4-tube sets and Browning-Drake A.C. tuners with S-M Unipacs for sale. Specializes in these sets. Any set made to order and shipped anywhere C. O. D. Unconditionally guaranteed for one year.

No. 374—Setbuilder in Coffeyville, Kans., builds any type of receiver to order. Specializes in six tube and short-wave sets. Two on hand.

No. 252—Seven years' radio experience enables custom setbuilder in Kansas City, Kans., to offer custom built sets that will surprise you in their marvelous operation regardless of their low prices. We specialize in Shielded Grid receivers. We quote prices on any set.

No. 282—Custom setbuilder in Wellington, Kansas, will build any size set or power supply to your specifications. First class workmanship guaranteed. Victoreen Supers and power supplies our specialty. Can furnish parts if desired. Prices and references on request.

No. 381—Custom setbuilder in Middlesboro, Ky., will guarantee every part of complete set (except tubes) for one year on any circuit. Short-wave receivers and transmitters built and only the best parts used. Guarantee volume and tone. All sets tested. Experience since 1908 continually. All shipments C. O. D. Satisfaction or your money back.

No. 301—Custom setbuilder in New Orleans, La., will build any type radio set to order.

No. 128—Setbuilder in Shreveport, La., will build any set. Specializes in 5 and 6 tube circuits. Estimates given. We guarantee results.

No. 111—Custom setbuilder in Battle Creek, Mich., specializes in Hammarlund-Roberts and Silver-Marshall kits and circuits, but can build any other circuit desired. Hammarlund-Roberts Service Station.

No. 415—Setbuilder in Bridgeport, Mich., has Tyrman 70 sets for sale, and builds all makes of sets. You name it, we build it.

No. 184—Setbuilder in Detroit, Mich., has for sale a 9-tube Lincoln Super complete. Specializes in any Super. Guarantee satisfaction or money refunded. $200 in bank your protection.

No. 190—Setbuilder in Detroit, Mich., will build any set described in Radio Listeners' Guide and Call Book. Six years' experience. Specialist on Scott's World's Record Supers 8-9-10, Nine-in-Line, Shielded Grid Six and Hi-Q Six. All work guaranteed. Any set tailored to your order.

No. 244—Setbuilder in Detroit, Mich., has 6-tube Superphonic sets for sale. Complete line of tubes and accessories. Sets built to order. Sets repaired, altered and serviced. Prompt service.

No. 279—Setbuilder in Detroit, Mich., will make sets to order and install them in your Victrola or any antique furniture as writing desks, bookcases or cabinets.

No. 307—Designer and setbuilder in Detroit, Mich., specializes in short wave receivers. Will design or build to order any make of sets for any waveband.

No 348—Community setbuilder in Flint, Mich., builds any set to order. Utmost satisfaction assured. Day or night radio service. Many years experience.

No. 420—Setbuilder in Gladwin, Mich., will build any battery operated set to order. Can also furnish any manufactured A.C. or light socket operated set. Repairing done on all kinds of sets.

No. 296—Setbuilder in Jackson, Mich., specializes in such sets as Magnaformer, Harkness Counterfonic, Peridyne and S-M Shielded-Grid Six. Satisfaction guaranteed. Supplies and aerials installed.

No. 223—Setbuilder in Manton, Mich., specializes in Silver shielded grid sets. Can make any other kind of set to order.

No. 379—Setbuilder in Port Huron, Mich., will build any type of set desired. Specializes in Silver-Marshall, Remler and Browning-Drake. Technical laboratory service in remodeling or repairing any set. Fifteen years technical experience. Will also build any type of eliminator, power amplifier or power pack for any service.

No. 319—Setbuilder in Sault Ste. Marie, Mich., has Hammarlund-Roberts sets for sale. Also building and repairing of all other makes of sets. Seven years' experience. All work guaranteed.

No. 158—Setbuilder in Cloquet, Minn., specializes in Silver-Marshall sets, Tyrman 70 Shielded Grid Amplimax and other Super-Heterodynes. Reasonable prices. Can build any circuit desired. Also convert and service radios.

No. 189—Setbuilder in Minneapolis, Minn., specializes in Norden-Hauck Shielded Super 10 custom built receiver. Five type UX-222 screen grid tubes are used in this ultra-powerful broadcast receiver increasing the radio frequency amplification and sensitivity over 500 times. Installation on this receiver in any part of the country.

No. 121—Setbuilder in Stanchfield, Minn., has seven years' experience in custom setbuilding and will build your favorite set for you. Fast, modern assembly equipment used and price will please you.

No. 392—Practical certified radio-trician in Vicksburg, Miss., specializes in any standard circuit and especially those described in Radio Listeners' Guide and Call Book. Any type of receiver or eliminator built or repaired at a reasonable price.

No. 224—Setbuilder in Denton, Mo., will build Victoreen Super and any other sets to order.

No. 136—Setbuilder in Memphis, Mo., has three-tube coast-to-coast receivers for sale, and specializes in this type of set. Full loud speaker volume. Can build any type of set. My best reference is satisfied customers.

No. 339—Setbuilder in Pine Lawn, Mo., will build your favorite radio set to order. Also has Tyrman 70 for sale.

No. 230—Custom setbuilder in St. Louis, Mo., will gladly furnish estimate of cost of constructing any type radio of recognized merit, four to fourteen tubes; also power packs and short wave receivers. Workmanship unsurpassed. Have Victoreen 8-tube super for sale.

No. 267—Radio expert and custom setbuilder in St. Louis, Mo., will build any type set you desire. Get my price to make a Panathrope combination from your radio set and your phonograph. Can also change your D.C. battery type set to use the new A.C. type tubes. All work guaranteed.

No. 373—Authorized Silver-Marshall service station in St. Louis, Mo., has facilities for building or repairing Silver-Marshall sets, power units, amplifiers and other apparatus. Have S-M Shielded Six with 2 stage power amplifier, last stage push-pull 210's ready for installation—very powerful and marvelous. All work guaranteed for one year.

No. 271—Setbuilder in Thayer, Mo., has a custom built 3-tube Crosley set for sale. Will build sets on request such as Neutrodynes, Air Scout Four and tuned radio frequency receivers, from three to six tubes.

No. 341—Setbuilder in Geraldine, Mont., builds to order practically any type of set. Specializes in Browning-Drake sets. Material and workmanship guaranteed.

No. 405—Setbuilder in Melrose, N. Mex., will build any make of broadcast receiver or short-wave receiver and transmitter to order. Will also build eliminators and cone speakers. Specializes in power amplifiers.

No. 410—Setbuilder in Charlotte, N. C., specializes in Neutrodynes and other complicated circuits. All work guaranted for one year. We do this work cheaply to help promote the idea of custom made sets.

No. 393—Professional setbuilder in Ellenboro, N. C., makes a specialty on Silver-Marshall Shield Grid, Hammarlund-Roberts Hi-Q and World's Record Supers. Will assemble and wire any set for price of the parts and cabinet.

No. 182—Setbuilder in Minot, N. Dak., will build any popular circuit to fit your requirements. Variety as to appearance offered. Buy a custom set adapted to the locality.

No. 201—Setbuilder in Alliance, Ohio, with three years experience, will build any make of set to order. Specializes on Magnaformer 9-8 receivers.

No. 206—Custom setbuilder in Canton, Ohio, specializes in Aero-Dyne Six and Seven. Will construct any standard custom set. All work guaranteed.

No. 337—Setbuilder in Canton, Ohio, specializes on 5-tube Lynch-Hammarlund and Precision receivers. Also assemble 6-7-8 tube kits of single or dual control. Receivers only or all necessary equipment supplied at moderate price.

No. 289—Setbuilder in Charndon, Ohio, specializes in Silver-Marshall sets. Can also build or install any make of set desired and service sets too. All work guaranteed satisfactory or money back. Get estimate before buying. Courtesy and service of the kind that builds up good will.

No. 280—Setbuilder in Cincinnati, Ohio, will build to order all sets using the new shield grid tubes.

No. 363—Setbuilder in Cincinnati, Ohio, will build any popular high class set or power pack. Short wave sets a specialty. All work guaranteed.

No. 368—Latest sets built and installed from 1 to 14 tubes by a custom setbuilder in Cincinnati, Ohio. Any set rewired or repaired. Magnaformer 8-9, Hammarlund-Roberts Hi-Q 6, Tyrman 7 and Silver-Marshall sets at expert service. Estimates cheerfully given.

No. 153—Setbuilder in Cleveland, Ohio, will build to order and repair any Silver-Marshall Shielded Grid Super-Heterodyne and Shielded Grid Sixes.

No. 160—Setbuilder in Cleveland, Ohio, will build to order the new Browning-Drake sets. Specializes in completing the factory made kits. Satisfaction guaranteed. Moderate prices.

No. 211—Setbuilder in Cleveland, Ohio, has for sale 4, 5 and 6-tube sets for 1, 2 or 3-dial control. Can also build any set to order.

No. 318—Expert radio-trician in Cleveland, Ohio, will remodel and electrify any set. Radio sets built and repaired. Five-tube sets a specialty. Work is guaranteed and you get expert workmanship at a reasonable price.

No. 247—Custom setbuilder in Columbiana, Ohio, specializes in Super-Heterodynes, Browning-Drake, Hammarlund-Roberts, etc. Am capable of building any other set when ordered. I build custom built sets which give custom built results.

No. 170—Setbuilder in Columbus, Ohio, will build all latest circuits, Hi-Q Six, Hot-Spot, 14, Nine-in-Line, etc. Sets made A.C. or D.C.

No. 385—Custom setbuilder in Dayton, Ohio, will build any kind of radio set with a guarantee that counts.

No. 177—Custom setbuilder in Fostoria, Ohio, is authorized Hammarlund-Roberts radio-trician. The best in radio must be custom built. Write for literature or demonstration. Any receiver, in any furniture, built to your order.

No. 322—Setbuilder in Lancaster, Ohio, has Hammarlund-Roberts and Aero sets for sale. Any type of set built to order. All work guaranteed. Amplifier systems built for schools, churches, auditoriums. Also buildings wired for radio. Satisfaction guaranteed.

No. 105—Setbuilder in Malvern, Ohio, assembles, wires and constructs any make of set to order. Specializes in Silver-Marshall line. Thoroughly experienced.

No. 216—Custom setbuilder in Mansfield, Ohio, can build any set to order. Specializes in Silver-Marshall and Tyrman receivers. Have experimented with practically every type of circuit and speaker. Will also build any type power supply for radio sets. All work guaranteed. Reasonable charge for producing the best.

No. 302—Setbuilder in Massillon, Ohio, makes a specialty of receivers for hotels, restaurants, schools, boats, etc. In your choice of custom built sets, please expect from me choice parts and a complete set backed by experience and workmanship which has come from extensive training.

No. 255—Custom setbuilder in Steubenville, Ohio, builds any make of set to order, either battery or electric operated.

No. 293—Setbuilder in Toledo, Ohio, has 5-tube Browning-Drake sets for sale; also the famous Harkness Screen-Grid 5.

No. 403—Setbuilder in Shawnee, Okla., will build, rebuild or repair any type set desired. Special sets made to order. Ten years' practical experience. Charges reasonable.

No. 325—Radio expert and custom setbuilder in Stilwell, Okla., will build any set to order regardless of size. Electrifying and rebuilding old sets a specialty.

No. 346—Setbuilder in Sanator, S. Dak., has Silver-Marshall sets for sale. As authorized S-M Service Station, will build to your specifications.

No. 202—Custom setbuilder and radio trouble shooter in Yankton, S. Dak., will build S-M Shield-Grid Sixes or any type of set to order.

No. 168—Setbuilder in Chattanooga, Tenn., builds any kind of set or eliminator. Old sets rebuilt or brought up-to-date; adaptation from battery to light socket operation.

No. 275—Setbuilder in Chattanooga, Tenn., specializes in Hammarlund-Roberts receivers or will build to order any other make of set. All make of sets serviced.

No. 351—Setbuilder in Alice, Tex., has Counter-phase Power Six in scroll work cabinet hand made compartment for batteries, tubes, meter, etc. Will sell special horn for cash. Will build any kind of set with or without cabinet from 3 to 10 tubes.

No. 130—Any set described in popular radio magazines built to order by custom setbuilder in Baumont, Texas. Also power amplifiers. Local installation free.

No. 161—Setbuilder in Fort Worth, Texas, has 5-tube resistance coupled Radio Broadcast Universal receiving set for sale. Can build any make of set to order. Specialize in Browning-Drake receivers.

No. 292—Professional setbuilder in Harper, Tex., can build any make receiver from a one-tube set to a thirteen-tube Super-Heterodyne; the Rolls Royce of reception. Six years' experience.

No. 150—Short wave tuners and receivers built to order by a setbuilder in Houston, Texas. Specializes in Silver-Marshall Shielded Grid Six and Laboratory Super. Satisfaction guaranteed or no pay. Lowest possible prices consistent with good work.

No. 397—Setbuilder in McGregor, Tex., will build the Air Scout Four or Lynch-Hammarlund Five to order. Extra A-B-C unit to make either of these two sets all-electric. Both guaranteed.

No. 309—Setbuilder in Bethel, Vt., will build any set to order with or without cabinet, tubes and accessories. Will ship same within one week.

No. 361—Custom setbuilder in Norfolk, Va., with five years' experience, will construct any type set at a reasonable price and give written guarantee for satisfactory performance. Estimates gladly furnished.

No. 218—Setbuilder in Richmond, Va., offers exceptional service in designing and building special sets to suit individual needs. All types of sets serviced and repaired. Specialist on Super-Hets. Let's get together and build that DX set you've always wanted.

No. 286—Setbuilder in Richmond, Va., will build any set from three tubes to a World's Record Super 9 and 10 tubes. Estimates cheerfully given.

No. 157—Setbuilder in St. Charles, Va., has 6-tube Bremer-Tully Power Six receivers for sale. Will build any set from one to fourteen tubes on order. All work first-class and guaranteed. Six years' experience in building radio receivers.

No. 108—Setbuilder in Washington, D. C., will build all kinds of Super-Heterodynes and short-wave receivers. Will also assemble for you all parts on chassis, wire and can furnish any kit on the market at rock bottom prices. All work fully guaranteed. Prompt shipments. One trial brings steady customers.

No. 215—Setbuilder in Hollidays Cove, W. Va., has Hammarlund-Roberts Hi-Q Six receivers for sale. Will also build or repair any other make of set.

No. 414—Setbuilder in Huntington, W. Va., builds all kinds of sets, eliminators and audio amplifiers, etc., at reasoanble prices. Authorized Silver-Marshall service station. Have Melo-Heald Eleven equipped with Temple Senior drum speaker, Silver-Beauty "A" eliminator and Burns "B" eliminator on hand for sale.

No. 419—Setbuilder in Kingmont, W. Va., builds and repairs all kinds of sets. Also sets and speakers tested free for my customers. Short wave receivers a specialty. Old sets rebuilt or repaired at the lowest possible prices. All work guaranteed to give perfect satisfaction. Graduate of several radio courses.

No. 234—Setbuilder in Hustisford, Wis., specializes and has for sale A.C. or D.C. operated 6-tube one-dial radio frequency sets. Will build and repair any make of set.

No. 171—Setbuilders in Milwaukee, Wis., will build any set to suit individual taste. Specializing in Hammarlund-Roberts Hi-Q Six, Browning-Drake, Tyrman Amplimax 70, Nine-in-Line and radio cabinets and consoles. Satisfaction guaranteed.

No. 188—Setbuilder in Milwaukee, Wis., has 5-tube Karas Equamatic for sale. Will build any make of set (preferably of the neutrodyne type).

No. 222—Setbuilder in Milwaukee, Wis., will construct any set desired from one to fourteen tubes and build it into any cabinet, console or desk you wish. Speakers and amplifiers built. Satisfaction guaranteed or your money refunded.

No. 238—Custombuilt is invariably the reply when you ask what set have you that enables you to get such phenomenal results? Setbuilder in Milwaukee, Wis., will bring the world to your fireside with a custom built receiver placed in the type of cabinet or console you like best. Installation and service in and near Milwaukee.

No. 266—Setbuilder in Milwaukee, Wis., specializes in building Silver-Marshall sets and has same for sale. Any make of set built to order. Expert work in rebuilding and repairing custom built sets and also service work.

No. 349—Setbuilder in Milwaukee, Wis., will build any radio set to order. Graybar-Western Electric Headquarters.

No. 353—Custom built radio receivers of unexcelled quality, built by setbuilder in Milwaukee, Wis. Specializes in Hammarlund-Roberts Hi-Q, Tyrman 70 and Lynch-Hammarlund; shield grid tubes employed. Special amplifiers and power packs built and installed. What are your needs?

No. 135—Setbuilder in Monomonie, Wis., will build any set with 10% cash discount. Each set carries a guarantee for one year free service, express prepaid. Laboratory tested Super-Heterodynes our specialty.

No. 342—Setbuilder in Wamwatosa, Wis., will build any set to order for list price of parts. Specializes in four- and five-tube sets with one stage of radio frequency and regenerative detector.

PACIFIC STATES
Arizona, California, Colorado, Nebraska, Oregon, Utah, Washington

No. 212—Setbuilder in Ajo, Ariz., specializes in the new Silver-Marshall 720 Screen Grid Six. All sets rebuilt for A.C. References furnished. Express prepaid on all new sets. All work guaranteed.

No. 382—Setbuilder in Flagstaff, Ariz., will build and service any make of set from the biggest to the smallest. No charge made for building except the list cost of parts. Four years' real experience. Free consultation.

No. 260—Setbuilder in Phoenix, Ariz., has the following sets for sale or trade; three tuned radio frequency sets. one Browning-Drake set, one Marco-Dine set and one Aero short-wave set. These sets are built of first class material and in first class condition.

No. 256—Custom setbuilder in Glendale, Calif., specializes in Bremer-Tully, Silver-Marshall and Browning-Drake receivers. Official Arcturus service station. Inquiries gladly answered without cost or obligation. Let us help you with your problems.

No. 228—Setbuilder in Hollywood, Calif., has Silver-Marshall Shielded Grid Six sets for sale. I am equipped to balance and service any make of sets. Will also build to order any and all makes of sets.

No. 220—Setbuilder in Huntington Park, Calif., will build to order Hammarlund-Roberts Hi-Q Six, H. F. L. 9, Scott's New Super 9, Silver-Marshall New 720, Television and short-wave sets. Sets built for quality and distance.

No. 185—Professional setbuilder in Los Angeles, Calif., has 6-tube Silver-Marshall Shielded Six and Shielded Grid Six sets for sale. Specializing in this kind of set. Can build any kind of set to order. Can design cabinets or consoles to match.

No. 316—Setbuilders in Los Angeles, Calif., are specializing in Browning-Drakes, and in special sets for those who want individuality in design and appearance, together with the ultimate in performance. Such sets are engineered not "just built."

No. 418—All electric advanced type powerful Torgerson 7 tube distance receivers in walnut console cabinet for sale by setbuilder in Los Angeles, Calif. Positively unexcelled tone. Cuts through powerful locals. Fifteen hundred miles with volume. Stands voltage variations.

No. 210—Setbuilder in Oakland, Calif., will build any make of radio set, power pack and power equipment, all laboratory tested. Phonographs converted into electric Orthophonics. Television and short-wave receivers built. Specializes in the new S. M. Sargent-Rayment Seven with four stages of shield grid R.F.

No. 227—Setbuilder in Oildale, Calif., has Aerodyne Sixes for sale. Also make Magnaformer 9-8, and any other radio set you may wish. Mounted in any type cabinet you prefer.

No. 411—Factory trained expert designer and builder in Pomona, Calif., will design especially to suit your requirements any circuit you desire for A.C. or D.C. operation. All makes of sets rebuilt or repaired. Laboratory matching and calibrating service.

No. 198—Custom setbuilder in Roseville, Calif., will build to order any make of receiver described in Radio Listeners' Guide and Call Book at list price of parts used. Workmanship guaranteed. All work Jewell tested. Specializes in Scott's World Record Supers, Browning-Drake 4 and 5 tubes and Aero short-wave sets.

No. 329—Custom setbuilder in San Diego, Calif., can construct any set up to eight tubes. Aero-Dyne, Karas Equamatic and Knickerbocker Four a specialty. Sets complete if desired. All sets guaranteed.

No. 284—Expert radio-trician in San Francisco, Calif., is capable of building custom built radio receivers of real merit. All receivers are guaranteed for one year against any electrical and mechanical defects, except tubes. Endorsed by National Radio Institute, Washington, D. C. Authorized Hammarlund-Roberts radio-trician.

No. 359—Custom setbuilder in Santa Ana, Calif., is authorized Hammarlund-Roberts radio-trician. Will build the Hammarlund-Roberts Hi-Q or other good makes of sets. Will repair any make of radio receiver.

No. 389—Professional custom setbuilder in Tuolumne, Calif., has laboratory for building radio sets, eliminators and amplifiers. Sets converted to A.C. Hammarlund-Roberts service station. Short-wave sets, inductors and transmitters built.

No. 231—Custom setbuilder in Whittier, Calif., will build any make of broadcast set and short-wave receiver. Also repair or rebuild any make of set.

No. 384—Setbuilder in Denver, Colo., will build you a set to suit your own ideas using any circuit. Will make any size or shape to fit in desk, phonograph, wall space, etc. Power units to match any set. Will take your old set in on a trade or bring it up-to-date for a small fee. Victoreens a specialty.

No. 174—Setbuilder in Durango, Colo., specializes in short wave sets. Will build any type short wave set and any other type of sets.

No. 356—Setbuilder in Longmont, Colo., will build any make of set to order in cabinet or console models. I have Ultradyne and Browning-Drake receivers for sale. Repair service a specialty. All work guaranteed.

No. 409—Authorized Hammarlund-Roberts radio-trician in Pueblo, Colo., will demonstrate and build sets to your order for battery or A.C. operation. Also short-wave sets and adaptors.

No. 336—Setbuilder in Albion, Nebr., has selective 5-tube set with good tonal quality for sale. Specializes in rebuilding and repairing radio sets. Can build any make of set to order.

No. 278—Expert professional setbuilder in Exeter, Nebr., will build any radio receiver to order. Silver-Marshall sets a specialty. Prompt efficient service. Stocks, parts and accessories. Set repairing and tube testing. Service, equipment and installation.

No. 345—Setbuilder in Mt. Clare, Nebr., will build any make of set for list price of parts. All types of sets serviced and repaired at small cost. All work guaranteed. Five years' experience. Have five-tube home-built Neutrodyne and 18 inch cone speaker for sale.

No. 357—The set you have always wanted—the custom built Quadraformer, made by a setbuilder in Omaha, Nebr. Also kits and parts. Must be seen to be appreciated. Will also build any set to order, and "A" and "B" power units.

No. 173—Setbuilder in Upland, Nebr., will build any set and also repair sets of all kinds.

No. 274—Setbuilder in Medford, Ore., will build and repair all types of receivers. All work guaranteed.

No. 416—Experienced custom setbuilder in Ontario, Ore., will build any type of set to order. Repairing and service. Sets adapted for light socket operation.

No. 340—Custom setbuilder in Portland, Ore., builds any radio from simplest crystal set to largest super. Now specializing on the Silver-Marshall Shielded Grid Six and Silver-Marshall All Wave Tuner. Special sets our specialty.

Custom Setbuilders!

ARE you listed in this section? If not turn to page 67 and read the complete story of the strenuous efforts that this magazine is exerting in order to increase the sale of custom built radio sets. We know that a good custom built set is usually far superior to the manufactured set. We know that, as a rule, the material that is used in constructing custom built radio apparatus is of a higher standard than that used by the manufacturer who is generally swayed by price. We believe that there are many readers of our magazine contemplating the purchase of a radio set or, being dissatisfied with the results that they are getting from their manufactured set are looking around for a new one that will meet their requirements. And, we feel fairly certain that they will be able to get just what they are looking for from one of the custom setbuilders listed in these pages.

We have dedicated this section to the custom setbuilder and are listing his name FREE. Turn to page 67 and read the complete details of our generous offer.

Radio Listener's Guide and Call Book

No. 355—Setbuilder in Portland, Ore., will build any radio set to order. Satisfaction guaranteed. Specializes in Super-Heterodynes.

No. 398—Setbuilder in Portland, Ore., will build any make of radio set from one to ten tubes. Five years' experience.

No. 408—Setbuilder in Portland, Ore., specializes in Bremer-Tully and all kinds of Super-Heterodynes. Only high grade parts are used in sets and power amplifiers. Will build your set to fit your phonograph, bookcase, etc., and guarantee it to work. Eight years' experience.

No. 131—Setbuilder in Price, Utah, specializes on Infradyne and S-M Shielded Grid Six. Can build any make of set to order. Prices reasonable and all work fully guaranteed.

No. 214—Setbuilder in Salt Lake City, Utah, will build any make of broadcast receiver or amateur short-wave receivers and transmitters to order. Will also build eliminators, cone speakers, or cabinets.

No. 159—Setbuilder in Oak Harbor, Wash., will build custom radio sets free. My only charge is list price for parts. Any type of set built to your order. I also design and rebuild them for any need. No set too small or too large. Free consultation.

No. 196—Setbuilder in Seattle, Wash., builds practically any type of set. Workmanship guaranteed.

No. 200—Setbuilder in Seattle, Wash., has radio sets that bring in the stations you want. Up-to-date sets installed in your old cabinet or console.

No. 213—Setbuilder in So. Tacoma, Wash., has for sale all Silver-Marshall sets and power units. Any set built to order.

No. 287—Custom built sets, laboratory built and tested on the air by setbuilders in Tacoma, Wash. Any set preferred built and guaranteed. Delivery anywhere in Western Washington.

CANADA
Alberta, British Columbia, Manitoba, Ontario, Saskatchewan

No. 235—Setbuilder in New Dayton, Alta., Canada, has long distance, one, two, three, four, five, six and ten-tube sets for sale. Any make built to order. Dry or wet cell equipped. Sets installed and repaired. Work guaranteed.

No. 225—Setbuilder in Nanaimo, B. C., Canada, will build any type of receiver from complete kits. Expert work. Five years' experience. Satisfaction assured. Distance no obstacle. If you propose buying, write for information and unbiased advice on how you can have a better receiver for less money.

No. 165—Custom setbuilders in Hamilton, Canada, will build any of the popular kit sets at a very low cost. Best results guaranteed.

No. 199—Setbuilder in Winnipeg, Man., Canada, will build and repair all makes of sets. Special terms to the trade. Eight-tube Super for sale, electrified, built-in Silver-Marshall Unipac, UX-210 push-pull amplifier, complete with 3-ft. cone, built-in loop in beautiful walnut cabinet.

No. 347—Setbuilder in Montreal, Canada, features single control radio sets of five and six tubes of the most advanced design. Also Ferranti push-pull phonograph amplifiers. Any set built to order.

No. 401—Custom setbuilder in Fort Frances, Ont., Canada, builds any type of set in cabinet or phonograph. Specializes in Browning-Drake, Aero and reflexes. Will supply tubes, kits and accessories at lowest prices. Prompt service.

No. 323—Setbuilder in Port Arthur, Ont., Canada, builds sets that produce results. Specializes in Quadraformer and Mercury Super-Ten. Can build any make of set to order or rebuild the old one. Workmanship guaranteed.

No. 340—Community setbuilder in Ontario, Canada, will make any set to order. Satisfaction guaranteed.

No. 193—Setbuilder in Toronto, Ont., Canada, builds all popular circuits, more sensitive, selective, powerful and cheaper than equivalent circuit in manufactured set. Specializes in 5-tube receiver which has received verifications from Cuba, Mexico and Pacific Coast.

No. 333—Setbuilder in Toronto, Ont., Canada, is specialist in all Harkness circuits, including new Shield Grid Five and counterflex circuits. Will be glad to furnish any prices and information free on request.

No. 386—Certified radio-trician in Hirsch, Sask., Canada, specializes in Hi-Q Six and Silver-Marshall custom built sets, using either regular or screen grid tubes. Short-wave adaptors built to plug in your present set. Tubes rejuvenated. Any set made to your order. Estimates given and work guaranteed.

No. 176—Setbuilder in Regina, Sask., Canada, has for sale a 4-Tube Bremer-Tully receiver and 2-tube Bremer-Tully short wave receiver (12½-200). Specializes in Bremer-Tully and Silver-Marshall sets. Any make of set built to order.

No. 226—Setbuilder in Regina, Sask., Canada, specializes in 5 and 6 tube receivers, Super-Heterodynes, power suppliers and amplifiers. Estimates gladly given on the above to suit purse, taste and location.

No. 254—Setbuilder in Saskatoon, Sask., Canada, will build radio sets with any number of tubes to order. Prices reasonable showing great saving in cost to purchaser. Will install complete ready for operation anywhere within 100 miles of Saskatoon. Satisfaction guaranteed.

FOREIGN

No. 299—Custom setbuilder in Mayaguez, Porto Rico, has 5-tube flexible short-wave broadcast receiver for sale. Specializes in this kind of set. Can build any short-wave set to order.

No. 354—Buyer in Bucarest, Rumania, would like to buy American radio kits completely assembled and tested by a reliable custom setbuilder.

Even the Microscope Won't Tell You the Hidden Flaws

that cause costly condenser break-down!

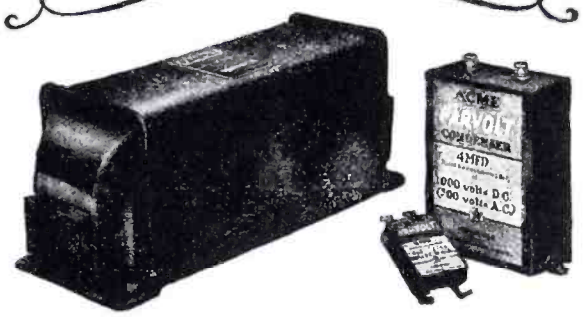
SO minute are the imperfections that cause condenser break-down that even a microscope cannot be relied upon to find them. With ACME PARVOLTS we employ scientific instruments to test the special papers and foils used in their construction.

It is only through eternal vigilance—through constantly testing and inspecting everything from raw materials to finished product that we are able to make condensers of such fine accuracy and dependability.

This is the reason why ACME PARVOLT Condensers enjoy the reputation they do today. Each one, whether By-Pass or Filter type, is a perfect unit. All ratings are guaranteed for accuracy and uniformity. All are tested to the standards of the R.M.A. and the N.E.M.A. and have our additional factor of safety as well.

When you realize that imperfectly made or inaccurately rated condensers break down under the sudden voltage surges common to electrified radio—when you realize that such break-downs can ruin many dollars worth of assembled parts—you must also appreciate why experts say "*Play safe with PARVOLTS*".

Made by THE ACME WIRE CO., New Haven, Conn., manufacturers of magnet and enameled wire, varnished insulations, coil windings, insulated tubing and radio cables.



ACME PARVOLT FILTER CONDENSERS

are supplied in all standard mfd. capacities for 200, 400, 600, 1000, and 1500 Volt D. C. requirements. Uniform height and width for easy stacking. Supplied singly or in complete housed blocks for the important power supply units such as Thordarson, Samson and others.

ACME PARVOLT BY-PASS CONDENSERS

are supplied in all standard mfd. capacities and for all required working voltages.

ACME PARVOLT CONDENSERS

Made by the Manufacturers of

ACME CELATSITE HOOK-UP WIRE

ENAMELED AERIAL WIRE

Enameled copper wire in both stranded and solid types. Also Acme Lead-ins, Battery Cables, Indoor and Loop Aerial Wire.

CELATSITE FLEXIBLE and SOLID

For all types of radio wiring. High insulation value; non-inflammable. 10 colors.

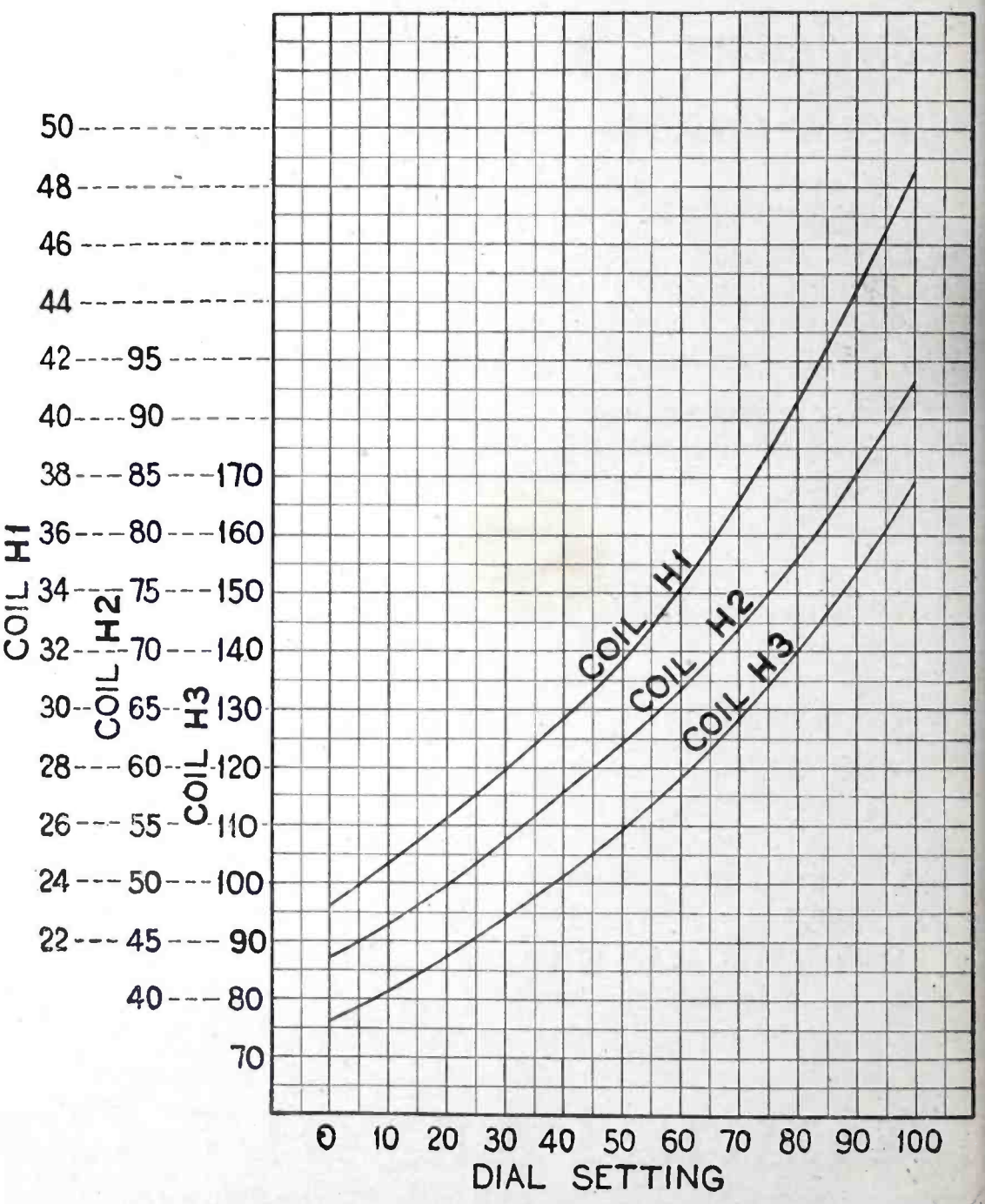
ACME SPAGHETTI

A superior cambric tubing for all practical radio and other electrical requirements. Supplied in 10 colors.

The Lacault Short-Wave Set

(*Continued from page* 91)

which send chain programs regularly are received consistenly and are in fact used more for the reception of broadcasting than the regular broadcast wavelengths because at the longer wavelengths the static in hot countries is really too bad to receive the other programs clearly and it is necessary to receive them on short waves in order to get them clear enough for reception on the loud speaker. For anyone wishing to own a short wave receiveer which is easy to operate we recommend this calibrated short wave set because the calibration makes it very easy to find the various stations on the dial, since after consulting the chart the tuning condenser may be set at exactly the right place for the station which is wanted. This is a great help because as anyone knows who has a short wave set, it is very difficult when one does not know the calibration of the dial to find the stations and easy to pass right over the setting without hearing the station at all. This happens very often especially in the hands of those who are not much familiar with short wave reception and this calibrated receiver should be of great interest to those who never owned one before.



Short wave calibration chart for Lacault's set.

The H.F.L. Model 10 Isotone Screen-Grid Receiver

(*Continued from page* 86)

circuit and inasmuch as it is non-critical in adjustment it will generally be found to be set in the correct position at the factory. This can be determined by adjusting the trimmer on a station broadcasting at about 300 meters. Do not make the mistake of tightening this trimmer condenser down too far as this will throw the antenna circuit into oscillation and throw the set out

Advanced construction ideas

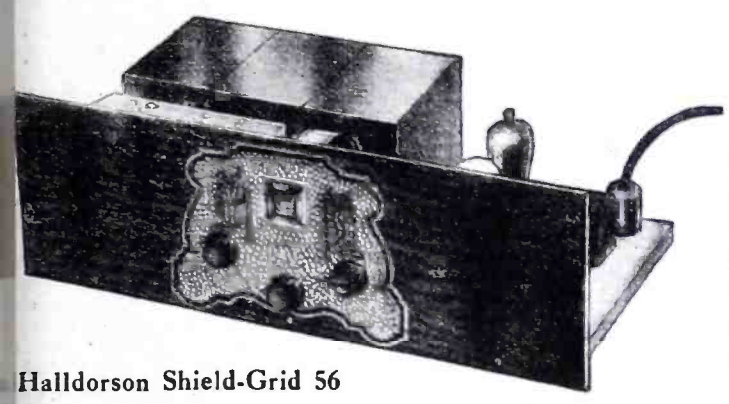
feature new Halldorson Shield-Grid Kit

PLAIN FACTS

Type—6-tube Shield-Grid t.r.f.
Selectivity—Guaranteed 5 to 8 K.C. separation of locals.
Sensitivity—On a 40-ft. antenna it will bring in distance stations with greater volume than most 9 or 10 tube receivers.
Volume—Shield-Grid first and Push-Pull second audio deliver tremendous power on weak input signals. Total gain over 6,400,000 times, several times that of any receiver not using a space charge Shield-Grid first audio tube.
Price—Compare the price with that of any other kit on the market. Never before has such value been offered.
Appearance—The keenest job you've ever seen.

All Steel Chassis

A beautiful bronze escutcheon plate



Halldorson Shield-Grid 56

carrying all controls may either be mounted upon the mahogany finished steel panel supplied or directly upon a wood panel such as is supplied with console cabinets. All parts are mounted upon a black crystal finished steel subbase and sockets are riveted in place at the factory. The remaining parts may easily be mounted in 15 minutes ready for the wiring.

Two stages of shield-grid R.F. amplification produce tremendous step up in signal strength. These two R.F. stages, as well as the detector stage, are totally shielded with highly buffed copper shields. This provides a finished receiver that is almost weird in its quiet and smooth operation. Distance and locals slip in one after another without any trace of background noises.

Shield-Grid First Audio Stage

The first stage of audio amplification is also a shield-grid tube. This type of tube was selected for this stage after many laboratory tests, because of its superior ability to amplify very week detector signals, while at the same time handling the large power demands made upon it, with ease and smoothness. This is one of the important improvements in the Halldorson 56 receiver, because it permits loud speaker operation of signals that are ordinarily too weak to satisfactorily swing the grids of the amplifier tubes.

Push-Pull Audio System Smooth and Powerful

The last amplifier stage consists of two 112 or 171 tubes in a push-pull circuit. To realize fully the advantages of push-pull amplification, one has only to remove one tube from the amplifier, allowing it to operate as a straight audio. The soft, smooth power of the push-pull amplifier is at once apparent.

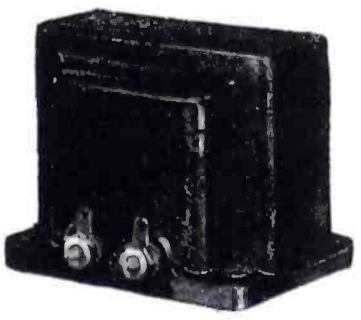
The power handling capacity of this stage is such that any of the present power dynamic speakers may be operated to its fullest extent direct from the receiver.

Phonograph or Radio Music

By an ingenious switch arrangement the amplifier stages may be used for either radio or phonograph music. Switching over takes but a few seconds. With the amplifiers on the phonograph the quality will compare with the finest electric Victrolas.

D.C. Kit complete .....Price **$59.85**
For A.C. operation .....Price 63.85
Power Supply Unit for A.C. Kit .....Price $37.50

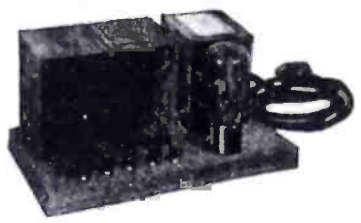
NOTE—*A.C. Kit uses 226 and 227 A.C. tubes.*



Halldorson Push-Pull Transformers

Halldorson Overtone Audio Transformers have been the standard among large set manufacturers for years. By a special design of laminations from a very high grade steel, the core is made more efficient than that of transformers with twice the amount of iron. Whether in the regular audio or the push-pull, the amplification of overtones thus made possible adds depth and brilliancy to music or speech such as seldom is heard in radio or phonograph instruments.

Shield-Grid Audio Coupler	$4.75
Overtone Audio	4.75
Overtone Output	4.75
Push Pull Input	5.75
Push Pull Output Choke	5.75



Halldorson Power Pack and A.B.C. Supply Units

Halldorson Power Packs and A. B. C. supply units are designed with a liberal margin of power capacity to insure smooth and quiet operation with receivers of as high as ten tubes. All have filament winding to supply any standard A.C. tube and are designed to prevent premature burnouts of tubes. Write today for prices on all Halldorson power items.

Ask your dealer for new Halldorson catalog including data on Shield-Grid Super 8. Interested in television? Get your name on our mailing list for future data on television.

Halldorson Radio Products

THE HALLDORSON COMPANY
4745 N. Western Ave., Chicago. Dept. G

☐ I would like my name placed on your mailing list to receive all future literature.

☐ I am interested in Halldorson Products. Please send catalog.

NAME .....

ADDRESS .....

of operation. This is the only control on the set that will throw the receiver into oscillation and if any persistent squealing is heard (on all stations) this condenser should be loosened up immediately.

The H. F. L. Isotone should be connected to a ground at all times, whether a loop or outside antenna is used, and this grounding connection can be made to any part of the metal chassis inasmuch as the entire set is totally grounded.

It will repay the operator to experiment with various lengths of antennas. An antenna about 50 feet in length will be found very satisfactory. Selectivity can naturally be increased by using a short antenna and inasmuch as the sensitivity of the instrument is much more than will ever be required there is no reason why the antenna cannot be shortened until the operator realizes the degree of selectivity which he desires.

A Compact A and B Power Supply For A. C. Operation

(*Continued from page* 129)

your set, to regulate the "A" voltage to not more than 6 volts, depending upon the number of tubes in your set. Another point worth mentioning is that the total current of your tubes should not exceed 2 amperes, for example, you can have 8¼ ampere tubes or less in your set. However, should you be using some of the very old types of tubes which draw 1 ampere or more of current, you must replace these tubes with ones which draw less current. You will also gain in the operation of your set with better signal strength and lower cost of operation.

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 quarterly at New York, N. Y., for October 1, 1928.

County of New York } ss.
State 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 Managers, None.

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, 245 Fifth Avenue.

3. That the known bondholders, mortagees, 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.

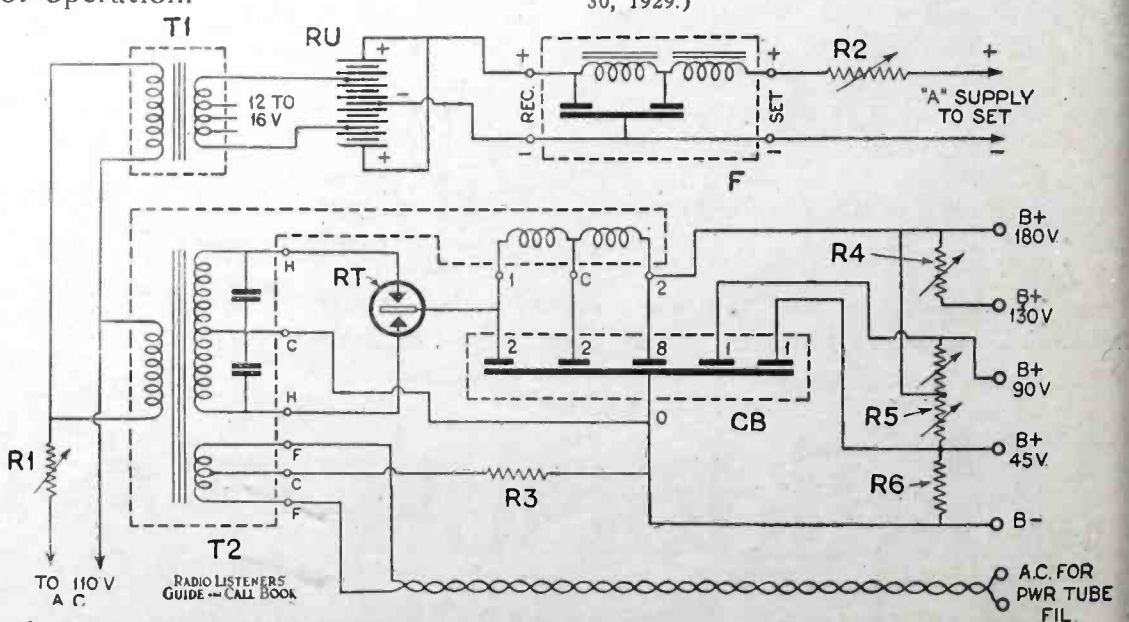
5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... (This information is required from daily publications only.)

S. GERNSBACK, Editor.

Sworn to and subscribed before me this 22nd day of September, 1928.

[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.)



Schematic wiring diagram of the A and B power supply unit. The legend of symbols correspond with the picture diagram and list of parts on pages 128 and 129.

The Listeners' Accessory Guide

(*Continued from page* 131)

own power but does not supply current for the operation of the receiver; and this is claimed as one of its most important features. The amplifier consists of an "A-B-C" power supply unit and a standard audio amplifier stage followed by one of push-pull amplification using 210-type tubes. The unit is very compact in size and uses four tubes.

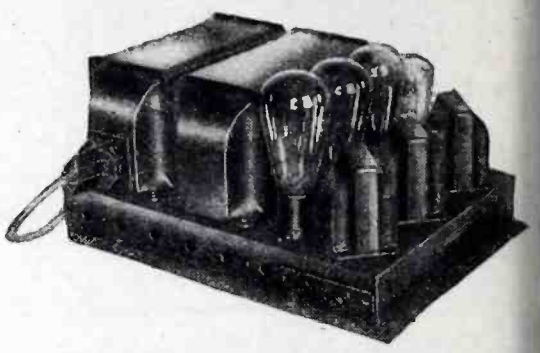


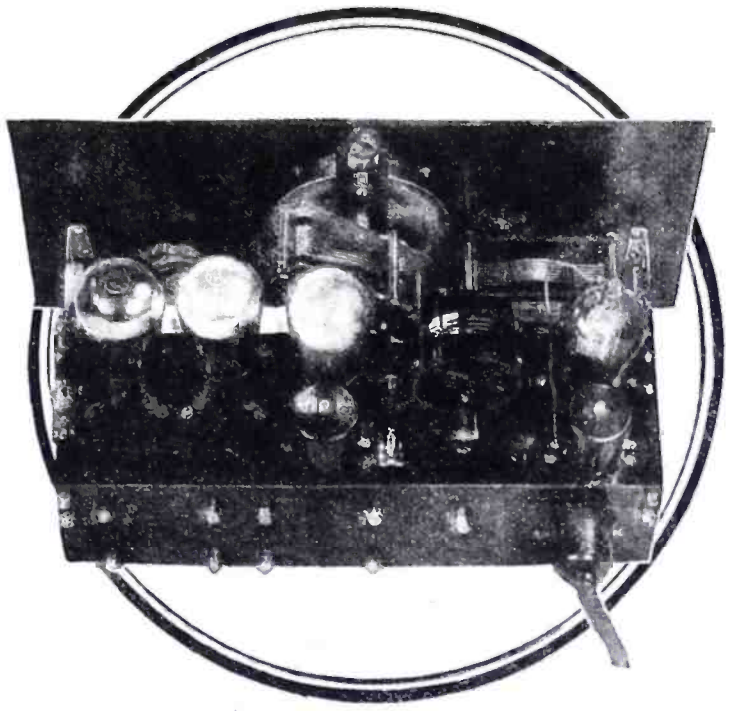
Photo by courtesy Samson Electric Co.

The A.C.-operated power amplifier shown above is entirely self-contained within a sealed metal chassis.

In the power amplifier under discussion, each part has been constructed to work with all other parts of the amplifier. This method of design has made possible many economies in construction; it has also made the circuit simpler and the unit much more compact. As the exact amount of current required is known, the power transformers and the filter choke coils and condensers are made without allowing as large an overload factor as otherwise would be necessary. Also, because all parts of the unit are constant, the potentials provided by the power circuit are the exact values needed.

The appearance of the power unit is clearly shown in the photo. It will be seen that all parts are mounted on a steel chassis which measures 11x15 inches, and that all wiring is concealed within the chassis. The power transformer and filter choke coil are housed in one unit which is mounted on the left edge of the chassis. The condensers of the filter circuit and the bypass condensers in the voltage-dividing circuit are in another unit. Other parts include a standard audio transformer, a push-pull (input) audio transformer, and a push-pull (output) audio transformer. One of the tubes is a rectifier tube of the 281 type and the other two large tubes are 210-type power tubes, while the small tube is a 227-type tube.

Now Receive Broadcast on Low Wave



The AERO INTERNATIONAL

Broadcast reception on short waves is remarkably clear and free from static. Programs are brought in from greater distances with the utmost simplicity of control.

You can easily assemble the Aero International. This remarkable set is built around the new Aero L.W.T. Coils—the acknowledged leaders in the short wave field. Newly designed parts are used throughout. The tuning condenser has no metal-to-metal bearing, so that noises caused by the variation in contact have been eliminated. The isolation of the antenna from the tuned stage means that the swinging of the antenna will have no effect on tuning and variations in antenna length have little effect on the operation of the set. The foundation unit comes with holes already drilled, assuring ease of construction and proper placement of all parts. As an aid to home builders, Aero Kits include large schematics and actual size pictorial wiring diagrams.

Ask your dealer for a complete Kit of all parts for the Aero International. If he can't supply you, write us, giving his name.

Convert Your Present Set

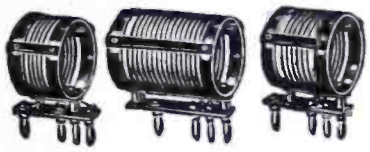
Build one of the Aero Short Wave Converters and receive short wave programs on your present set. The complete Kits include drilled Micarta panel and all parts. No extra tubes are needed when you use the single tube converters. Simply remove detector tube from your set and insert the plug attached to the Converter. Order Aro Kit No. 12 for D.C. Sets, and Kit No. 14 for A.C. Sets. If you want to build the International as a two tube converter for your D.C. set, order Kit No. 9, using one shield grid R.F. stage and regenerative detector.

AERO PRODUCTS INCORPORATED

Department 868 4611 Ravenswood Avenue Chicago, Illinois

AERO COIL KITS

The L.W.T. 10 Kit



If you wish to purchase only the Aero Coils for the Aero International, order the L. W. T. 10 Kit. The price is $10.50. These coils are designed to be used with our foundation unit.

The L.W.T. 11 Kit

If you prefer to furnish your own foundation unit for the Aero International, order the L. W. T. 11 Kit. The coils are the same as in the L. W. T. 10 Kit, but a mounting strip is provided. The price is $11.50.

The L.W.T. 12 Kit

Here are the newest Aero Coils. They are small in diameter, providing a much smaller external field, a better shape factor and improved efficiency. The Kit consists of three Aero Interchangeable coils and base mounting with Primary Coil. Price, $12.50.

The power unit is made in two different types which are identical in appearance, but which differs slightly in circuit design. Type A may be used with any standard type of loud speaker, and type B is for use only with an electrodynamic speaker having a 100-volt 50-milliampere field winding.

This power unit is very easily intalled. It is necessary only to connect a loud speaker to the posts marked "output," connect two wires from the radio receiver (detector or first A.F. stage) to the posts marked "input," insert four tubes in the sockets, and put the plug in a standard light socket.

Dynamic Speakers Give Fine Tone Quality

THE dynamic speakers illustrated in the photos herewith deliver tone quality so near to perfection that they can hardlly be compared with the older permanent-magnet type speakers.

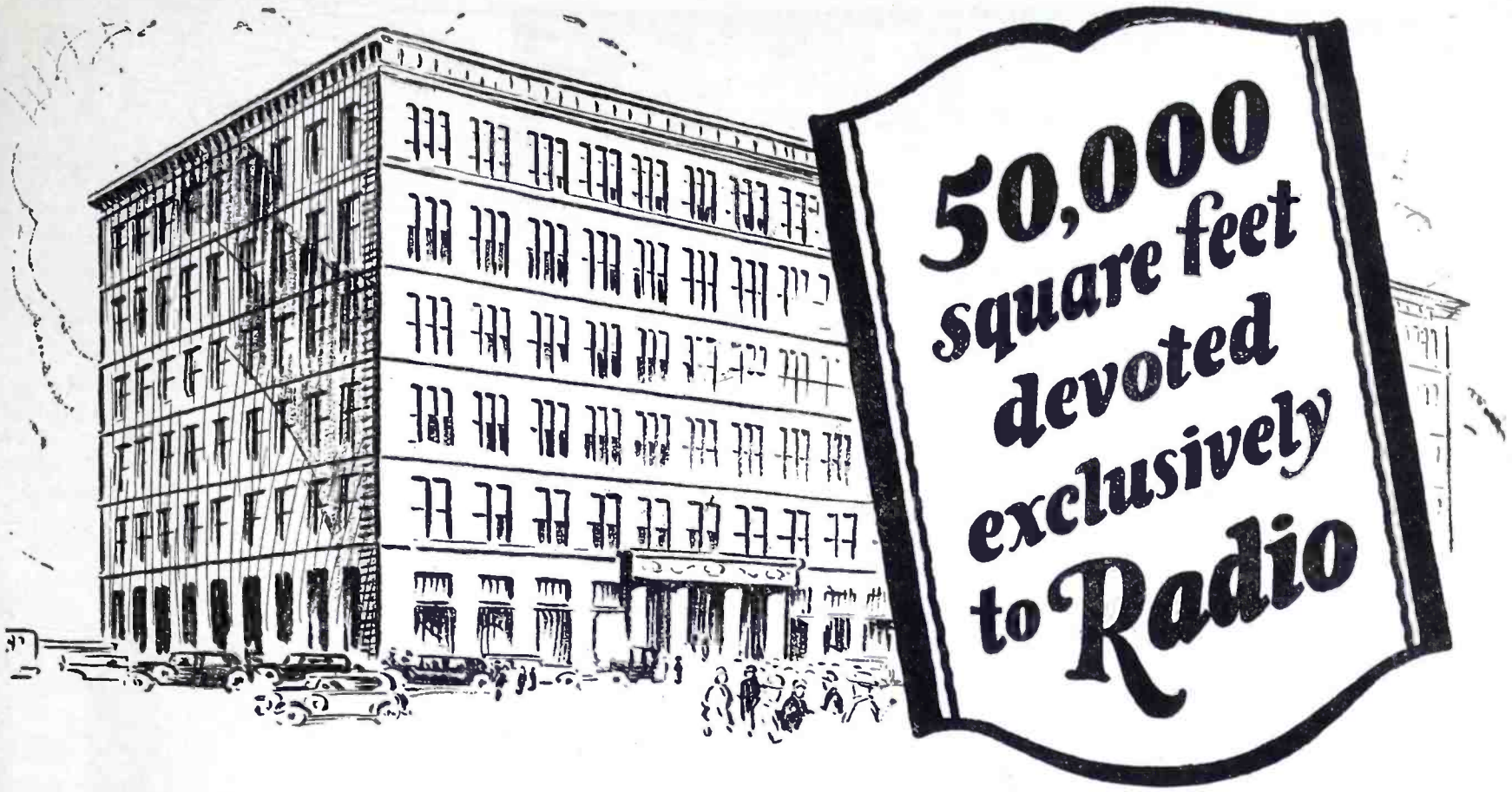
Photo by courtesy Sterling Mfg. Co.

The table model dynamic loud speaker.

Dynamic type speakers differ from others both in principle of operation and in construction. They possess valuable characteristics found only in this type of reproducer and lack many of the inherent faults of the permanent-magnet type speakers.

In speakers of the dynamic type there is a field winding which must be excited by an external source of direct current. In the magnetic field of this winding a separate moving coil is freely suspended, and the audio frequency currents are passed through this coil. The cone, which is of free-edge design, is attached directly to the moving coil. This construction gives great volume and purity of tone, due to a number of factors.

The field is of great strength and constancy, and in this field the moving coil is freely suspended. The forces on this coil, which produce the sound, are dependent only upon the current in the coil, and not upon its position in the field; and there is no iron in the armature, to be oversaturated. This results in almost



Setting a New Pace in Radio Service

Set Builders

Set Builders and experimenters will welcome an association here where tremendous stocks of practically all of the nationally advertised lines are carried—coupled with an organization trained to serve. Immediate shipments are assured. Silver-Marshall—Hammarlund-Roberts—Aero—Tyrman and practically all of the latest kits and parts are available. Your orders, large or small, will be handled with a promptness and dispatch that will prove a revelation to you in Radio Service.

Dealers

Dealers who line up with Allied Service will never disappoint their trade on deliveries. Our immense stocks in Sets, Parts, Kits and Accessories enable you to render real service to your trade. Immediate shipments in sure rapid turnover—eliminating the necessity of carrying large stocks on hand—and this along with lowest market prices will prove an ideal connection for the live dealer.

Allied Radio Corporation is composed of a large corps of trained men who have had years and years of experience in radio. They know how to get results. Their great fund of experience is now available for your benefit. They know the newest improvements, the up-to-the-minute demands of the trade and are ready to give you personal, helpful service.

50,000 FEET OF RADIO

50,000 square feet of floor space in a large modern building is devoted exclusively to radio. Floor after floor is filled with a tremendous stock of every variety that is exceptionally complete in kits, parts and sets of every description. Here are found the latest improved designs and styles in radio equipment.

NEW A.C. SETS AND KITS

New A.C. sets priced as low as $35.45. Also a wonderful array of beautiful Consoles ranging in prices from as low as $12 up to $200. A complete assortment of the famous Silver-Marshall parts and kits—in stock—ready for your call. Practically all of the nationally advertised lines in parts and kits are available here for immediate shipment. New A.C. Sets, Power Dynamic Speakers—all the latest and newest in Radio is here at prices that actually defy competition.

LOWEST WHOLESALE PRICES

Tremendous sales volume coupled with a rapid turnover to the thousands of radio dealers throughout the country who have come to depend on Allied Service enables us to go into the open market and buy for cash—at tremendous savings—and these savings are passed right on to you in the way of better merchandise and lower prices.

IMMEDIATE SHIPMENTS

The Allied organization is trained to service. Real team work from executives and department managers to stock clerks and office boys—all animated by a desire to serve—to make Allied service Radio's most dependable service.

Send for Large, Free, New, Illustrated Catalog "K"

Allied Radio CORPORATION

Wholesale Radio Distributors

711 West Lake Street Dept. "K" Chicago, Illinois

complete freedom from distortion common in the older permanent-magnet type of speakers.

The drive of the speaker is applied directly to the cone, eliminating the necessity for a connecting pin which might bend and vibrate. The inductance of the coil is extremely low and the speaker offers to the tube an almost pure resistance-load, resulting in a high power high-factor and an impedance which varies but slightly with the frequency. This makes for a remarkably flat response-curve. The motion of the coil is across the air gap, instead of along the gap, and as a consequence, the unit is free of the limitations imposed by the danger of hitting the pole-pieces. Chatter as a result is almost impossible.

The dynamic speaker in a console cabinet.

The freely-floating coil offers other advantages besides the ability to supply great volume without chattering. It is free to move an eighth of an inch at a mere touch, and is practically free from the definite resonances, which cause the characteristic pitch of other types of speakers. The impedance of the coil is practically constant for all frequencies and as a result the speaker is capable of giving full volume from 50 to 12,000 cycles. However, as broadcast stations do not transmit frequencies over 5,000 cycles, a filter cuts off reproduction above this frequency. Because the impedance of the moving coil is very much less than the output impedance of the power tubes used in radio reception, a step-down transformer also has been added to the speaker.

The dynamic speakers may be used in connection with radio re-

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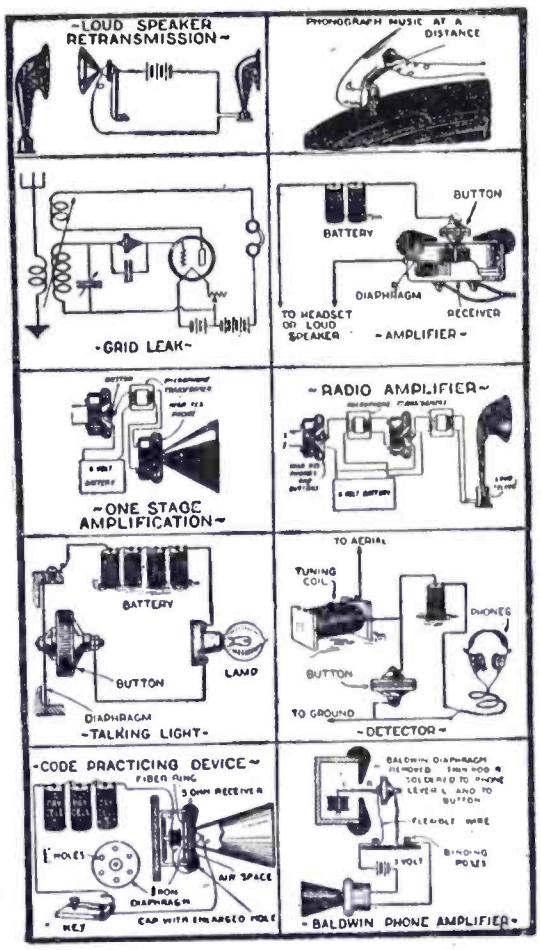

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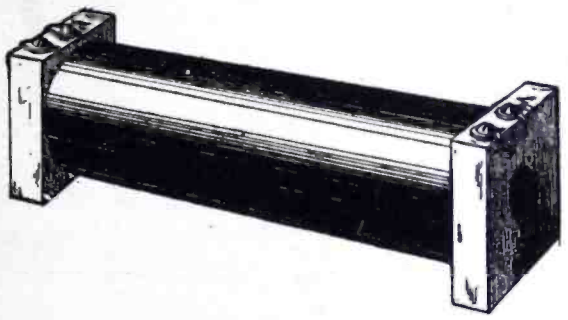

A microphone transformer (*modulation transformer*) specially designed for use with the Skinderviken Transmitter. These transformers are used for stepping up the low voltage high-frequency currents from the transmitter circuit, to a slightly higher voltage which will permit transmission over greater distances. The coils have many other uses for experimenters, such as for making small medical coils, etc. Primary resistance 1¼ ohms.

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ceivers of any type; but best results are obtained when a power tube such as the 210 is used in the output stage. The unit will not deteriorate with use or age like the permanent magnet type, as the magnetic lines of force are produced solely by the current passing through the field coil.

The speakers as illustrated herewith present a very handsome appearance in grained walnut cabinets with grills having hand-carved effect. The table model is 12½ inches high, 15 inches wide and 9 inches deep, while the flood console model is 38 inches high, 17¼ inches wide and 11⅝ inches deep. Both speakers are furnished for operation on six volts D.C., 110 volts A.C., 60 cycles; 110 volts A.C., 25 cycle and 110 volts D.C.

A Power Amplifier Built Along Modern Lines

THE power amplifier shown in the accompanying photo is designed according to the transmitting characteristics of present day broadcasting. That is, it has a flat frequency operating characteristic between 60 and 5,000 cycles with a power output of 1,500 milliwatts. This, of course, covers practically all frequencies ordinarily required and delivers power enough for dancing purposes in a large size hall when used in connection with one of the popular dynamic type loud speakers.

Photo by courtesy Eby Mfg. Co.

The power amplifier shown above employs one transformer coupled audio amplifier and push-pull amplifier.

This unit is completely operated on the 110-volt A.C. line and consists of two stages of transformer coupled amplification, i.e., a one-stage amplifier with a 226-type tube and push-pull amplifier with 171-type tubes. Rectification takes place by means of a 280-type full wave rectifier tube.

The unit presents a very fine appearance and can be easily mounted in the radio console or any other con-

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venient place. Practically all parts of the device are contained in two metal boxes as can be seen in the photo and the entire unit is finished in Egyptian lacquer. On one side will be found terminals for connecting the output from the receiver and on the other "B" battery terminals for the receiver. The unit is provided with a rubber covered cord and standard plug for connection to the 110-volt A.C. line. Another rubber covered lead is brought out of the unit with a switch for mounting on the panel of the receiver so that the device can be turned on or off from the set itself.

The Custom Built Set vs. The Factory Built Set

(*Continued on page* 71)

plates, equally spaced and firmly held. The parts are machined, not pressed, and are put together so that they will stay together. Parts that might rust or corrode are nickel plated or protected in some other way.

A cheap condenser has thin, flimsy plates. Sometimes the plates are loose, bent or unequally spaced. A set builder who uses cheap condensers probably uses cheap parts and materials throughout.

Where poor insulation is used on the tuning coils and transformer coils, the customer is likely to have trouble. Some of the best insulating materials are the cheapest, but in spite of that fact transformer trouble due to poor wiring has been very common.

A customer who has demanded a cheap set should not blame the maker for using cheap and poor parts, provided he has not misrepresented them. The community set builder who cannot induce his patron to pay for the best is compelled to use cheaper parts. The manufacturer is equally controlled by the customers' attitude. He does not know them individually, but he gets their opinions through the dealers. His only choice is between building models for the select few who can pay the highest prices, and producing models that will sell in larger and larger quantities as the price level is lowered.

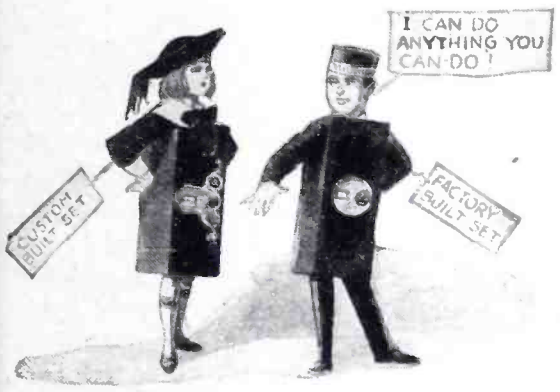
Most manufacturers produce the very best sets that they can at the prices charged. They are compelled to, for there are hundreds of manufacturers in the country and the competition is keen.

The patents held by radio manufacturers restrict community set builders less than they do other set manufacturers. The patentees always have been very lenient with in-

dividual set builders, whom they regard more as experimenters than as competitors. The custom set builders sometimes make their experience available to patentees and manufacturers and may save them some of the expense of experimenting.

Usually a community set builder is able to provide a customer with any type of set he may want, with the latest and best circuits and parts.

The human element undoubtedly has a great influence in the building of radio receivers. The division of labor in the factory speeds up production and reduces costs by keeping each employee working at high speed on one operation. Each is a part of the big machine and the human beings become almost as mechanical as the machinery.



The factory built set has advantages like those of a child raised in an institution while the custom built set is like a home-reared child.

The community set builder, assembling parts into a complete receiver, develops more interest and pride in the completed set than the average factory worker. He must understand the whole set for he often designs the circuit and he has to put it together and make it work.

A factory is obliged to employ inspectors to keep the work up to standard. If an operative slights his work, the inspectors discover the defective parts and the operative is not paid for them. Trying to get the work past the inspector with the least amount of effort and make the highest pay becomes quite a game with the workers. The deadly monotony of constantly repeated tasks has a tendency to lower the quality of the output.

The community set builder has the greater pleasure and satisfaction of performing many operations and finishing the job. He is stimulated by contact with his customers. His work develops him and fires his ambition to a much greater degree than factory work could. The harder he works and the better sets he produces, the better his chance for increased income.

The factory worker has a much harder time than the community set builder in trying to improve his conditions, because he is tied up with an impersonal corporation and system and, if he is a union man, with a large organization of workers whose combined efforts to secure larger wages or better working conditions do not succeed as quickly as individual effort and sometimes do not succeed at all.

The factory system places even the managers under certain disadvantages. Stockholders' demands for immediate dividends may interfere with the best development of a set that needs more time in the laboratory. As a famous inventor told the Institute of Radio Engineers in demonstrating a new device: "The main question in bringing out a new invention like this is: how rotten it can be and still get away with it?"

Summing the matter up, the best radio outfit is the one that best meets the requirements of the customer who buys it. The radio factory is in a better position to produce standardized receivers, of average efficiency, in large quantities, at a price that will appeal to a large number of purchasers.

The community set builder is in a better position to understand local conditions and the requirements of individual customers. He can start out with the idea of producing a set that will satisfy his customer, where the dealer who sells factory sets must work with the idea of making his customer buy what he has on hand.

The community set builder takes personal interest and pride in each receiver because each is his own creation. His prices need not be higher than those of the factory-built set, because he can take profits that, in the case of factory sets, go to jobbers, wholesalers, retailers and salesmen. He pays the manufacturers', jobbers' or wholesalers' profits on the parts and materials that he uses, and may not get as low prices on these as the factory, but the rest of the profits are his. He has no large organization to hold together at large expense through dull seasons. His investment, rentals and overhead are low as compared with those of a factory.

He can keep months ahead of the factory in bringing out new circuits and sets in which the newest ideas are used. He takes no chances on parts for he is free to select the best in the market and he does not have to contract for large quantities in which the quality may deteriorate before deliveries are completed. He can keep in touch with each set and customer, and change a circuit if the customer wants to try a new one without buying a new set.

The factory built set has advantages like those of a child raised in an institution and then sent out into the world to work among strangers. The custom built set has advantages like those of a child reared by his parents. It goes out to work in its own neighborhood, where papa can keep watch of it and help it if it gets into trouble.

The S-M 720 Screen Grid Six

(*Continued from page* 95)

and then further shielded by the metal cabinet of the set. The gang condenser for the second and third R.F. stages and the detector stage is very rugged, and is equipped with small "trimmers" or verniers to equalize tube and circuit capacities. In actual operation, the set tunes in local stations without having them cover more than three degrees on the dials. Distant stations often group two to a dial degree, and when 10 kilocycles apart, always separate cleanly.

The audio amplifier, which utilizes the new Clough system, shows some interesting amplification figures. With a 201A or 112A in the first stage and a 171A in the output position, the two-stage system shows an overall gain of about 500 times from 100 to 5,000 cycles. Two 3:1 transformers of standard construction, using the same tubes, show a gain of about 216 times, or less than half of that afforded by the 720 receiver. A measured frequency curve for both stages in operation together shows the same amplification at 65 cycles as at 1,000 cycles, with a rise around 100 cycles to compensate for the shortcomings of the average loud speaker, and a flat curve on up to 8,000 cycles. This is a fine characteristic for any two-stage amplifier, but the 720 amplifier has still another advantage not found in standard systems. This is the elimination of the distortion due to hysteresis effects, accomplished by keeping the direct plate current out of the transformer windings. (Measurements have shown this scheme eliminates distortion that is often of serious nature.) To the ear, a test of the 720 amplifier shows a depth and brilliance not usually obtained from other A.F. arrangements.

Through the use of a high voltage "B" supply unit (such as the S-M 675ABC), a 210 or preferably a 250 type power tube may be

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sed right in the set. The receiver ay be operated from a six-volt torage "A" battery, 180 volts of B" battery and 40 volts of "C" attery; better still, it may be op- rated from the light socket with six-volt "A" power unit and any ood "B" supply unit with dry C" battery. The ideal installa- ion would be completely light- ocket operated, with a 250 type ower tube, a six-volt "A" power nit and a S-M 675ABC unit, upplying "B" power to the entire et and "A," "B" and "C" power o the 250 tube through an daptor plug accompanying the ower unit. Such a combination without equal in the ready-made et field.

The assembly of the Screen Grid ix is very simple, and above all, ositive. The parts mount on the teel chassis as seen in the ac- ompanying illustrations, the wir- ng is put in place, and the set is eady for test. In preliminary ad- ustment the three trimmers on the ang condenser are set on a 300 to 50 meter station for the loudest ignals, and the set is finished. The chassis wiring is laced to- ether into a cable with waxed wine. The chassis is set on the abinet base moulding, the cabinet lropped down it, and the receiver s finished.

Scott's World's Record Shield Grid Nine

(*Continued from page* 101)

gram) under one of them; fully mesh the plates, tighten the rotor screws on the shaft and turn the dial to "100" before tightening it to the shaft. A similar procedure s followed with the other con- denser, except that its shaft is of insulating material (bakelite).

The work of laying out the other parts on the sub-panel is quickly done with the aid of the diagram; as the panel is already drilled in the proper places. The bottom leads of the intermediate-amplifier can are run through the corresponding holes and the can screwed to the panel, also with the lugs shown in the diagram. The binding posts and grid condenser are attached, with similar precautions; and the cable base is fastened in place, with the groove for the plug pin at the rear. The A.F. transformer is placed with its name plate fac- ing the front of the set; lugs are placed beneath each screw termi-

nal, and it is fastened—not too tightly, as the plates are of bakelite. The midget condenser, which controls regeneration, is then fastened to its bracket and the latter to the panel in the proper place, as indicated, thus completing the assembly.

The wire supplied with the kit is of the correct length; the accompanying diagram shows each lead, and with its aid they may be most easily connected.

First, however, the colored leads from the amplifier can should be soldered in place, as shown; the red, blue, black and yellow wires to their correct contacts on the plug base, the green wire to the 15-ohm rheostat which controls the shield-grid tubes, the slate-colored wire to the "—" post on the voltmeter, one white wire to the "P" terminal lug of the A.F. transformer, and the other white wire at the left end of the can to the socket contact "T1" (tickler-coil connection) of the R.F. coupler. The red wire at the left end is then soldered also to the lug marked "8A," which connects the grid leak and condenser to the first detector.

Before beginning on the other wires, solder the 2-ohm resistor, which controls the filament voltage of the first audio tube, to the "F—" socket terminal of that tube.

Follow the wiring directions carefully, with the diagram before you; check each connection as made with a heavy colored pencil.

Be painstaking with each soldered joint; be sure that a good metallic connection is made. No electrical circuit is stronger than its weakest point, and a poor connection when the solder does not make full contact with the metal, will introduce a loss that will take away much of the efficiency of the circuit. A good, hot soldering iron that will make the solder flow freely and cling to the wire and lug, and good rosin-core solder, are necessary if the job is to be done in a satisfactory manner. Test each joint and be sure that any soldering paste left on the joint is immediately wiped off. Be certain that every connection is properly made; everything else that could be done in advance has been properly done, and if your work has been done according to instructions.

It will be observed that caps have been provided to weight down the tubes of the amplifier. Three of these have clips at the top; these are to receive the brass-covered flexible leads from the shield-grid transformers in the amplifier. Clipping these leads in place connects

the grids of the shield-grid tubes, which lead through the tops of the bulbs, instead of through the sockets, as in ordinary tubes. The plain cap is slipped over the top of the second detector tube; and serves to prevent "microphonic" noises which might be caused by a vibration of the tubes.

Go over the wiring again with the diagram; check each lead again with a pencil of different color. You may test for an "A" battery short by putting a 6-volt lamp in series with one lead before connecting the battery. If it does not light, remove the lamp. Place tubes of a good make in each socket, according to the type for which its respective position calls. Connect the "A" battery to its proper wires in the cable, and turn the switch. Each tube should light. Turn the 25-ohm rheostat at the left of the panel up and down; the R.F. tube should respond by growing bright or dim. Turn the 15-ohm rheostat at the right up and down; the voltmeter should vary accordingly. Take off the "A+" terminal, touch it to the various "B+" posts; none of the tubes should light. If everything is all right, replace the "A+" lead and connect the "B" voltages; there is 45 volts on the plates of the oscillator and the first detector and on the shield-grids of the tubes in the amplifier, 90 volts on the R.F. tube and the second detector, 135 volts on the plates of the shield-grid tubes in the amplifier and of the audio stage; 4½ volts of negative "C" bias on the second detector, and 7½ volts "C—" on the audio amplifier.

You are now ready to tune in stations. It will be found that the receiver will squeal readily. The trick of operating at greatest efficiency is to keep the filament rheostats just below the point of squealing.

The midget condenser which balances the two tuning condensers at the left should be turned to minimum capacity on the shortest wavelengths; it should not be necessary to adjust it below about 280 meters. From there to the longest waves, it is gradually turned up by rotating the center knob.

The rheostat at the left also varies in its adjustment with the wavelength; on the shorter wavelengths, the R.F. tube is turned down more to prevent oscillation. This rheostat serves also as a volume control, when locals are tuned in, preventing overloading the following stages. The rheostat at the right adds to the control by reducing the voltage on the filaments of

the shield-grid tubes, which may be operated between 2.5 and 3.1 volts. In case an "A" power unit should be used, turn on this rheostat full and adjust the unit till the voltmeter shows 3.1 volts; the other tubes will then carry 4.75 volts.

Though complete in itself as described, the fullest serviceability of which the receiver is capable is secured by the addition of the power pack, which furnishes the required "B" voltages and the high "C" bias as well as the current for the operation of a 350-type power tube, equal to the utmost demand that may be made upon it, and for an electrodynamic speaker as well, if so desired.

So simple is the construction of this power unit and amplifier, which has been designed expressly for the Shield-Grid Nine, that no directions will be required other than the two wiring diagrams herewith. The question of obtaining the correct voltages for best operation has been taken care of in the engineering of this amplifier by the incorporation of a special voltage-divider with fixed taps for the different leads to the set. The appearance of this apparatus when completed is exceedingly neat rugged and compact. Its leads are short and the high "B" voltage is kept safely away from the set. This amplifier gives also tremendous volume from a phonograph pick-up; to connect which for alternate operation with the receiver is a simple task.

To connect any standard phonograph at will to the amplifier, it is necessary only to provide a connection between the white output lead of the Shield-Grid amplifier can and the "P" post of the audio transformer in the set. A single-pole double-throw switch, most conveniently installed in the phonograph cabinet, accomplishes the connection most quickly and satisfactorily.

A "SOFT" TUBE

The Halldorson Shield-Grid 56

(*Continued from page* 106)

obtained in a novel way, with a simplification of operation and of construction. The 5-volt tubes return to "A—" through the 1-1/3-ohm resistor, which reduces a battery's 6 volts to a maximum of 5. This adjustment is fixed.

The control-grids of the shield-grid tubes, however, need not return directly to the filament, but may be led to a tap on the 7-ohm resistor which, in series with the rheostat, protects the filaments. When this tap is fixed at 4 ohms from the grounded end of the resistor, it will put a bias on the grids of about 1-1/5 volts, compared with the negative point of the filament, or 3 as compared with its center. As the rheostat is turned into the circuit, the filament emission will be decreased, and at the same time the negative bias will be slightly increased. A slightly higher bias is given by the connection shown. The audio couplers are of the type especially required by the tube combination used. Their compactness, when first introduced by the manufacturer, seemed a departure from the trend of later years toward bigger apparatus; and aroused first criticism, and then adoption and imitation in the radio trade—as may be seen by examination of the newer high-grade manufactured sets.

The voltages required by the set, therefore, are 6 volts "A", from 22½ volts up on the space-charge (control-) grid of the first audio stage; 45 volts on the detector plate and the shield-grids of the two R. F. stages, 135 volts on the plates of the three shield-grid tubes (two R. F. and one A. F.) and 180 volts on the plates of the push-pull stages, with a corresponding 40½ volts on their grids, to secure best quality. The set draws but 1-1/7 amperes of "A" battery, and therefore can be readily operated economically in this method. The drain on the "B 22½" and "B 45" volt taps, also, is negligible. However, while this set may be operated from heavy-duty batteries, where suitable current is obtainable, the inexpensiveness and convenience fo a "B and C" power unit will make its inclusion at once desirable; and many users will desire also the addition of an "A" unit to make a complete, yet, all in all, extremely low-priced receiver of which con-

structor and user may alike be proud.

Tuning and adjustment should present few difficulties, as the single control quickly brings in a station. It is then brought up to the point of greatest distinctness with a slight variation of the trimmer condenser governed by the right-hand control knob. The rheostat at the left may usually be kept turned well down; for the enormous amplification and full power of the set will seldom be drawn upon, except for great distance. This reserve of energy serves to increase the satisfaction of operation, however, just as a high-powered automobile runs most smoothly at ordinary road speeds and gives the satisfaction of easy riding to its owners.

The "International" Short Wave Receiver

(*Continued from page* 111)

example in the cities of New York and Chicago, the "International" will give highly satisfactory results as a broadcast receiver with about ten feet of wire as an antenna, and it may even be found desirable to reduce the antenna length to five feet.

The operation of the receiver is very simple. With suitable tubes inserted in the sockets and the directed battery voltages in the circuit diagram applied one of the coils may be placed in the socket. With the regeneration condenser all the way out, the filament rheostat is turned up about halfway. As soon as the rheostat is removed from the off position, the shield grid tube should light to its proper brilliancy and remain that way unaffected by other variation of the rheostat which affects the detector tube alone. Then when the regeneration condenser is advanced part way, the detector tube should go into oscillation with a soft "thud" accompanied by a considerable increase in tube noises, and so on. Should the detector fail to oscillate with the regeneration condenser fully advanced, the filament rheostat should be turned up further. In the event that it should go into operation sharply or with disagreeable noises, it should be retarded to the point where oscillation is accomplished smoothly. After oscillation is obtained, the wave band covered by the coil may be swept with the tuning condenser, always simultaneously manipulating the regeneration control in such a way to

keep the tube just oscillating. Code signals will be received with the set in this condition and their pitch may be carried by slight adjustments of the tuning condenser. The signal of a broadcasting station will be indicated by a distinct heterodyne whistle, which instead of being broken up as in code signals, will be perhaps varied in pitch by the modulation, but after locating the heterodyne point of the broadcaster, retard the setting of the regeneration condenser until the tube is just out of oscillation. The setting of the tuning condenser should then be corrected for maximum signal strength and it will then be found that the regeneration control can be advanced slightly with some increase in signal strength up to the oscillating point of the tube.

Models of this receiver have been in operation for about six months and very excellent results have been secured. Only one "bug" has developed in the receiver during this time. If the B batteries are not in good condition, or if an eliminator is used in which the filter capacities are deficient, a persistent audio whistle may develop. This development, however, has been found to be non-existent when the outfit is used with an external power amplifier, using separate power supply, and in all cases it can be easily remedied in ordinary operation by the addition of the 4 mfd. condenser already mentioned and the insertion of a .0001 to .001 condenser across the secondary of the first or second audio transformer. This will not affect the quality in any way but will completely remove the whistle, which is caused by the tremendous amplification factor of the shield grid tube, causing any slight variations in the voltage of the B batteres to be amplified sufficiently to cause audio frequency amplification.

Transmission of Photo's by Radio

TRANSMISSION OF PHOTOGRAPHS BY RADIO—Various methods have been devised and are now in use for the transmission of photographs by radio. Among these may be mentioned the systems of *Belin* (q.v.), *Baird*, and *Jenkins*. The principles underlying the Jenkins system are explained under the heading of *Television*. Using the system developed by Capt. R. H. Ranger, photographs were transmitted by radio from Honolulu to New York, a distance of 5,136 miles. Recently commercial picture transmission service has been inaugurated between New York and London using the Ranger apparatus. Two distinct methods have been applied for analyzing the picture in the process of transmission. One a
producing an im
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and by means of a lamp, f
and reflecting prism, a na
of light is passed throug
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which is caused to be moved
and forward so that the bea
is concentrated in turn on all
the picture. A rotary motio
plied, as well as the transverse
the cylinder being given a slig
tion when it completes each tra
motion. The beam of light is
through a special photo-electric
This consists of a spherical
coated on the inside with potas
hydroxide, which is very sensitiv
light. The coating is connected to the grid of a vacuum tube, while an "electron collector" near the center of the tube is joined to the plate of the first amplifier. When no light is falling on the deposit on the inner surface of the globe, the grid acquires a negative charge, stopping the flow of electrons between filament and plate, and hence no current flows in the external circuit. The ray of light, however, causes an electron stream to flow between the coating and the collector, and since the coating is connected to the grid, the electron flow constitutes a discharged circuit, so that the grid becomes less negative. The first amplifying tube is a direct current potential amplifier, and is resistance coupled. The grid and plate connections of the amplifier are connected across a condenser which becomes discharged with the fall in the grid to plate resistance of the valve brought about by the grid potential fluctuations. A charging circuit is connected to the condenser and is controlled by a valve, the grid circuit of which operates by vari
of the potential across th
The charging curr
the plate cir
a rel

The recording mechanism of the receiver. Three electromagnets produce the magnetic field in which a moving coil controls the stylus.

are applied through its windings, operates a stylus while travelling across the surface of the paper. The stylus traverses the paper in perfect synchrony with the carriage of the transmitter, the paper being lifted each time the stylus completes a forward and backward movement across the paper. A small flashing neon lamp is used to indicate the correct speed adjustment of the driving motor.

TRANSMITTER—An apparatus for sending out electrical messages. As applied to radio telegraphy or radio telephony, the transmitter refers to the entire sending apparatus. The term transmitter is often used to refer to a *telephone transmitter* (q.v.). (See *tomatic Transmitter*, also *Wheat-ie Transmitter.*)

SMITTING AERIAL—A wire, or usually a group of wires, sus-d at a suitable height and con-l to a radio transmitting set. The e of the aerial is to facilitate diation of the electromagnetic enerated by the high frequency ig current which flows in the (See *Directional*, also *Receiv-l.*)

TING JIGGER—An *oscilla-ormer* (q.v.) having a vari-lary, permitting of various coupling, by adjustment, two circuits. (See *Jigger*)

NG KEY—A telegraph the sending of radio code is key must be of rather ction since it handles than those used in or-egraphy. Pressing the ircuit, and by holding a longer or a shorter nd dashes of the con-reproduced. (See *igh Speed.*)

TUBE, POWER eful power output tube is the power illating current in e output circuit. e tube, not count-heating the fila-f the plate sup-rage plate cur-on.

metallic blade mature The h a fixed con-

How to Construct a Spanish Radio Cabinet

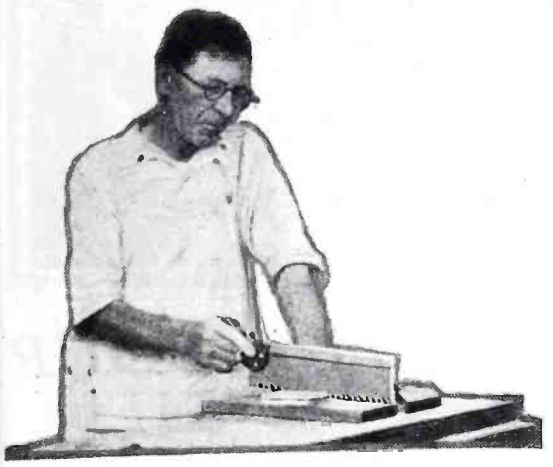
(*Continued from page* 124)

carry the front edge of the bottom.

The two stiles are ¾ in. by 1½ in. by 8¼ in., with tenons and notches at both ends to fit the rails. The outside faces are rabbeted 7/16 in. by ¾ in. for the ends of the sides.

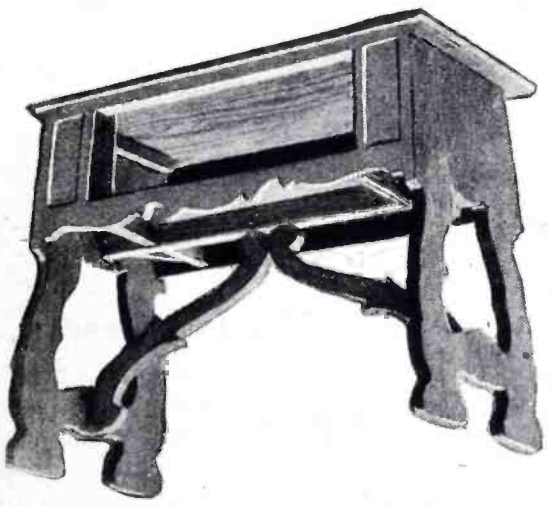
The sides are ⅜ in. 3-ply pine cut 7½ in. by 11½ in., grooved ⅜ in. by ⅛ in. from the lower edges. The bottom is 3-ply, 2 ft. ⅝ in. by 11½ in., notched to fit around the stiles.

In assembling, glue the lower rail to the stiles, sides, and bottom,



Sawing a tenon shoulder.

but leave the upper rail to be held by a brad tacked through each end from the top, to permit of inserting and removing the panel. A pine rail ¾ in. by 1½ in. notched into the upper rear corners of the sides holds them rigid.



An underside view of the table.

Since this drawer is seldom removed, fit the front closely. Glue a neat block to the upper rail to act as a door stop.

Put a Forg catch in the upper edge of each door.

Smooth the cabinet with No. ½ sandpaper. To raise the grain, sponge all over with a damp cloth, and sand again with No. 0. Brush

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* * * *

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on light oak filler cut with gasoline, rubbing it off across the grain with a cloth when it has dried dull. Pick the filler out of the corners with a sharpened stick. After drying for 24 hours, give a coat of shellac, and sand lightly. Finish with three coats of good varnish, lightly sanded between coats, and rub down the last with pumice stone and water, or, if a higher gloss is desired with rotten stone and water.

Varnish is a difficult medium for amateurs to handle. A most satisfactory finish, and one that is really artistic, is to fill the wood and rub over it every few weeks with a cloth moistened with boiled linseed oil. After a time a beautiful, mellow glow results. Wax may be used in the same way.

The Shield Grid Phantom

(*Continued from page* 116)

trolled by the 20 ohm rheostat (R10) placed in the negative side of the circuit and plate current from 20 to 120 volts is fed through clip at rear of receiver. This current is provided by the "B—C" supply and is controlled by knob marked "supply."

The .005 mfd. by pass condenser (C17) prevents the radio frequency currents from passing into the audio amplifier, thereby preventing a source of distortion common in the ordinary receiver.

The tube is provided with a 2 megohm grid leak (R11) and .00025 mfd. grid condenser (C16) connected as shown by diagram.

Another very valuable asset to the Shield-Grid Phantom is a voltmeter (M1) having a range from 0 to 8 and 0 to 200 volts, which when operated in conjunction with the 10 point switch (S-2) measures all voltages being used by the receiver. To enable the high plate voltage to be read on the 200 scale instrument, a multiplier (R18) is connected in series with the meter, so that this voltage as read on the meter must be multiplied by a constant to obtain the correct number of volts.

It is an agreed fact, that the greater amount of energy or power supplied to the speaker by the last audio or power stage, the more perfect will be the quality. To attain this result in the Screen-Grid Phantom we have adapted the push-pull system utilizing two 210 or two 250 tubes. This system is

superior to any other. This system results in improved reproduction of sustained notes, particularly of low frequency. Other advantages are elimination of hum when A.C. current is used for the filament supply and more equal power output.

To operate two tubes in the push-pull method, twice as much signal input voltage is required as with a single tube to obtain its maximum power output. This requires a voltage amplifier of high gain between the output of the detector tube and the grid of the two power tubes.

To secure ample signal input voltage in this set two stages of resistance coupled audio amplification are used, utilizing two Hi Mu tubes which have an amplification factor of 30 each, thereby gaining sufficient amplification with no distortion.

These resistance coupled stages are of the grid leak-condenser type using two plate resistors (R12, R13) of 100,000 ohms and two grid resistors R14 and R15, of 50,000 ohms resistance. The two fixed condensers are of the midget paper type, having a capacity of .01 mfd. and a working voltage of 750 volts D.C. The filaments of these two tubes are controlled by a fixed 2 ohm wire wound resistance R17 which gives a drop in potential from six to the proper working voltage of the tubes and also provides a 1-volt negative grid or "C" bias. A variable plate voltage from 90 to 150 volts is fed to these two tubes and is adjustable by control of the power pack.

The filaments of the last two power tubes are heated by 7½ volt A.C. current tapped directly from the "B-C" supply power transformer. This current is turned off and on by the switch on the "B-C" supply when using 210 or 250 tubes, and if 171 or 112 tubes and batteries should be necessary, the two flexible leads at rear of set should be connected to the 7th and 8th clips and after the jumper on the filament switch S3 is removed, this switch will cut the filaments of all nine tubes.

The input transformer (AT-1) and output transformer (AT-2) are of generous proportions and special design to stand the heavy plate current of the 210 tubes, without saturation of the cores or overheating of the windings and at the same time prevent excessive voltage drop in the plate circuit and protect the loud-speaker windings. As shown by the wiring diagram the output of the receiver comes directly from the output trans-

former (AT-2) to the speaker binding posts thereby making it possible to use either a cone type or dynamic speaker without any changes in wiring.

In constructing this receiver from the kit parts, all wires should be distributed according to the illustrations, as each has been carefully worked out and any deviation will result in difficulties.

The R.F. tube shelf as supplied, is all drilled, grained and engraved, and has the tube contacts, coil contacts, grid leak holders, and the series antenna switch, securely mounted in proper positions for wiring.

Using No. 18 stranded rubber covered wire, make all connections to tube contacts and coil contacts as shown in the diagrams, keeping wires short as possible and flat against the sub-panel. Only rosin core solder should be used in soldering and soldered parts should first be tinned separately and then soldered in place.

The four grid suppressors (R1, R2, R3, R4) are soldered across two coil contacts and each of the four shield grid filament resistors (R5, R6, R7, R8) has one end soldered direct to the "F"— of the first four tubes, while the other end is fastened to the bakelite shelf with a 6/32x½ inch screw, nut and lockwasher.

It should be noted that the middle coil contact of the first four tubes is used only as an anchor for the grid suppressors and the leads from the top of the shield grid tubes and does not enter into the circuit. The .0001 mfd. series antenna condenser (C-6) should be soldered across the two lugs of the knife switch (S1) and the .00025 grid condenser (C-16) and the .005 blocking condenser (C-17) be fastened in place as shown. After tinning all blank lugs remaining, the shelf is ready for assembly in the case.

The audio shelf is also supplied, drilled, grained and engraved with the tube contacts and grid leak holders tightly riveted in place. The filament circuit on this shelf can now be wired and the two .01 audio condensers (C-14, C-15) soldered in place as shown. Care must be taken not to apply the iron for any length of time on the paper midget condensers, when soldering, as they will be permanently damaged. This shelf is also now ready for the case.

The cabinet as supplied is built up of 16 Ga. sheet aluminum which has been given a mat silver finish inside and out and protected by

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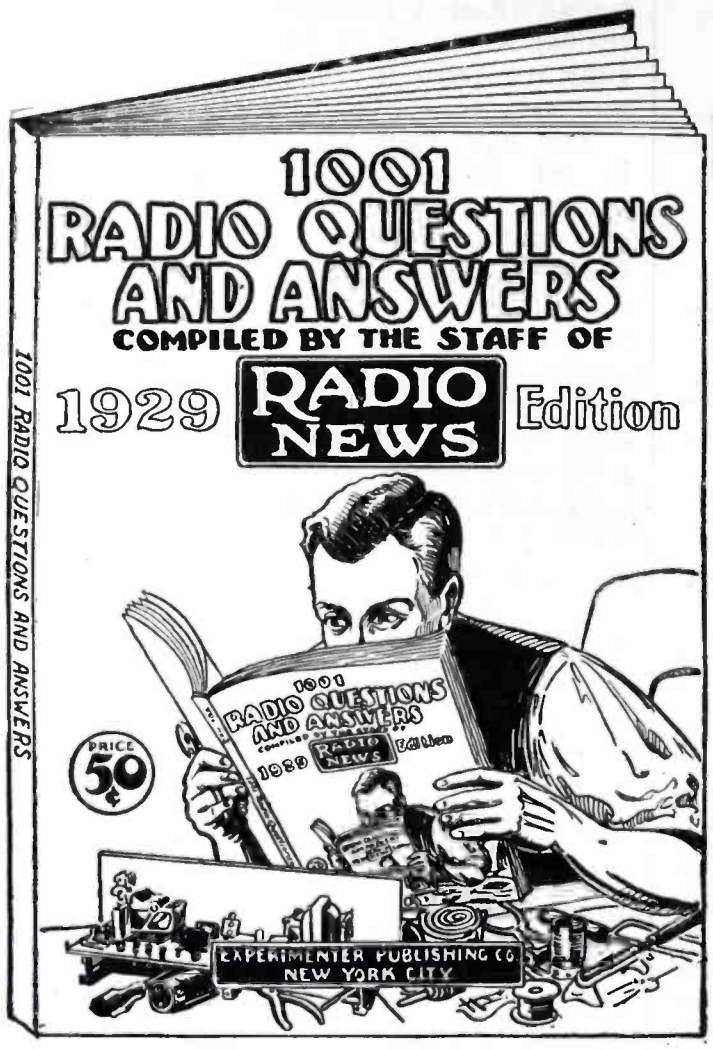

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two coats of clear Egyptian lacquer. The lid, front panel and bottom are removable and after these are taken off the set is ready for assembly. The assembly of the five tuning condensers, (C-1, C-2, C-3, C-4, V-5) is the first consideration and must be accomplished with the greatest of care and accuracy as this is a vital point in the future operation of the receiver. Special care must be taken not to bend or spring the panel out of shape as it will then be impossible to line the five condensers up without serious binding. The channel shaped reinforcing piece should be lined up with the screw holes and drum recesses in panel and held temporarily in position with a clamp at each end. Next slip each tuning drum on its condenser shaft, having the knurled edge nearest the condenser end plate, and lightly tighten the set screw to keep in place. Fasten the condenser on the extreme right in place first, using 8/32x7/16 inch oval head screws through the panel, reinforcing piece and condenser bracket and hold with a hex. brass nut and lock-washer. All four screws should be pulled up very lightly to allow lining the drum up with the slot in the panel. Now move the condenser assembly back and forth in the clearance screw holes until the edge of the tuning drum is parallel to the edge of the slot and as near central in the opening as possible. Then tighten up all four nuts only enough to prevent shifting. It might be well at this point to try the drum name plate over the drum to determine if the panel hole is properly hidden and if the nameplate is square with the panel when the drum rotates in the center of the name plate opening. In a like manner fasten the fourth condenser and drum in place on the panel, noticing this time that one end of the condenser shaft enters the universal joint fastened to the fifth drum. Make sure that these joints do not rub against the collar of the adjoining condenser. The first, second and third tuning condenser can now be assembled on the panel in the same way and in the order named, and the clamps holding the reinforcing strip removed. The five drum nameplates can now be clamped one at a time, in the proper position and drilled with No. 42 drill to take the special screws furnished, which cut their own thread. After all these nameplates are screwed on, make sure that none of the drums scrape and then go over all the condenser retaining screws and tighten down firmly taking care not to strip the

threads. When adjustsing indicating drums permanently, make sure that when the rotor is entirely meshed in the stator and the edges of each in the same plane, the indicating arrow on the drum nameplate should point exactly to the 100 graduation of the etched indicator scale. When testing condensers for alignment, stand panel on long edge as any other position tends to throw it into a curve.

The filament switch (S-3) and the three vernier condensers are ready for assembly directly upon the panel in the positions as indicated in the layout. Before adding the knobs to the verniers, slip the small spring washer furnished with each vernier over the shaft. Then with one finger on the rotor and the other on the knob, press together hard as possible and tighten down on the set screw in the knob. When fastening these knobs, adjust so that when the rotor is entirely meshed in the stator, the arrow on the face of the knob will be horizontal with head pointing to the right.

Both the R.F. rheostat and the detector rheostat must be insulated from the metal panel and to accomplish this condition, the four bakelite washers furnished with each rheostat must be carefully used in both the rheostats as well as in the nameplate holes and under the retaining nuts, so as not to make contact through the rheostat shaft.

The volume control is assembled in the same way and must be entirely insulated from the metal panel. The volume control and rheostat knobs must be so set that in the full on and off position, the arrow forms an equal angle each side of tse vertical center line. The voltmeter is attached last and then the completed panel should be screwed back in place on the cabinet.

Attach binding post strip on which the twenty special binding post clips are already assembled, to the rear of cabinet centering the soldering lugs in the punched clearance holes of the case. The semi-wired R.F. and audio shelves can now be fastened to the brackets inside of the case and the four 1 mfd. by-pass condenser C-10, C-11, C-12, C-13, should be fastened to the aluminum strip in the approximate positions as shown in the layout.

The receiver is now ready for the final wiring which should start with the front panel to tube shelf wires. Use 12 Ga. round bus wire covered with Acme insulated tub-

ing and distributed according to illustrations. The shield grid bias leads pass through the holes in the R.F. shelf and are soldered to the middle lug of the first four sets of coil contacts and likewise the two leads of the loop adapter are brought through the shelf and connected to clips as indicated in the diagram. The meter switch cable has one end of its eleven wires soldered to the meter switch (S-2) so that it is a simple matter to drop the assembly in place and solder other ends of the cable according to the diagram. At the same time the audio cable can have its four wire ends soldered to terminal lugs and the other ends soldered in place on the audio shelf. The 7½ volt A.C. filament current for the last two tubes is carried by the twisted pair of 14 Ga. wires which fasten to the seventh and eighth terminal clips. The filament voltage of the two Hi Mu audio tubes is kept at proper operating potential by the 2 ohm fixed resistance (R-17) connected as shown. This completes the audio shelf and input transformer (AT-1) and output transformer (AT-2) are ready for mounting on the partition, shielding audio stage, in the position shown. All leads from these two transformers are plainly marked and should be well protected with insulated tubing, especially the speaker and plate leads which require double tubing. The two leads from the volume control (R-16) can be flexible Acme celatsite wire.

The five "A" radio frequency transformers should now be inserted into their respective sockets and grid leaks fitted to the holders, as called for in the specifications.

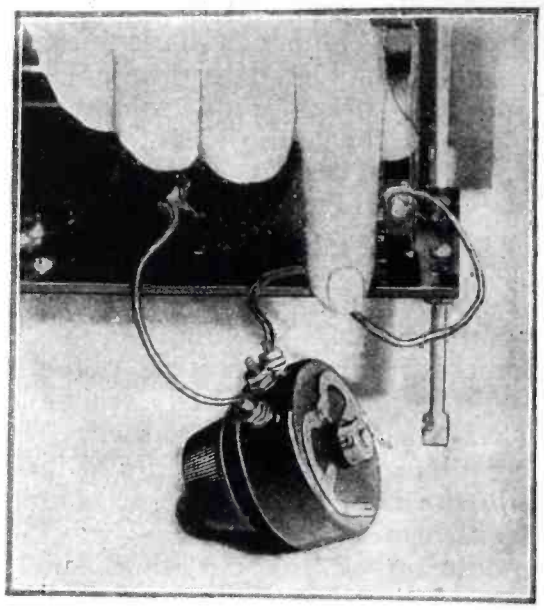
Complete details for assembling, wiring and testing this set with full size blue prints are furnished with the kit of parts, and the problem of building the set is quite easier than one might believe from the foregoing description.

Volume Control for A.C. Sets

THE advent of simple wiring harnesses which make possible the use of A. C. tubes in old-model radio receivers originally designed for direct-current bulbs has greatly increased the popularity of the A.C. tubes; but it has also created a new problem in the majority of these converted sets: namely, that of controlling the volume.

The most widely-used scheme for volume control in battery-operated sets involves a means of regulating

the filament current of the first R.F. tube, or of all the R.F. tubes. In a receiver which has just been converted to socket-power operation by the installation of a harness, this control naturally becomes useless, since the rheostat is no longer of the proper size. Even if it were of the correct resistance value, it would not be very satisfactory, because tubes of the A.C. type depend for their very success on the thermal lag of their filaments; that is, the latter are very slow in responding to changes in the current through them.



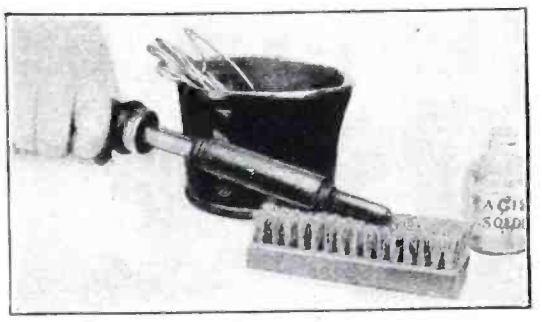
Connect the variable high resistor either directly in series with the aerial lead or shunt across the aerial and ground.

Thus, if a rheostat were used, an appreciable time would elapse between the instant the rheostat knob were turned and the instant a change in volume could be observed.

A highly satisfactory solution of this problem is to connect a high variable resistor (of the 0-1,000,000-ohm, universal type) either directly in series with the aerial wire, or across the aerial and ground posts, or across the secondary of the antenna coupler. All three connections should be tried and the best one made permanently. This resistor may be mounted in the same place formerly occupied by the filament rheostat.

Cleaning Brush for the Soldering Iron

A SMALL hand brush, about four inches long and two inches wide, which can be bought in the five and ten cent stores for a dime, makes an ideal cleaner for the electric soldering iron, and one should be found in the tool kit of every radio experimenter.



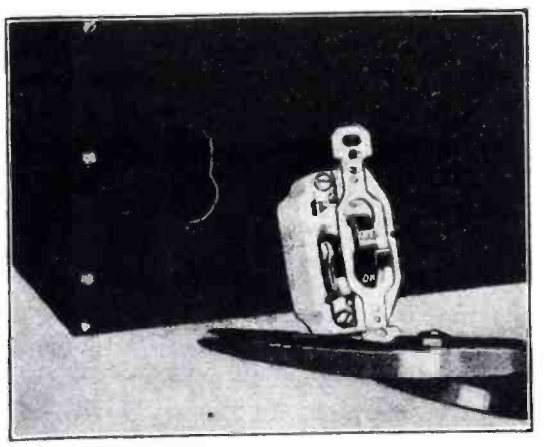
A cheap small brush can be used very effectively for cleaning the soldering iron.

The brush is simply laid flat on its back, and the point of the iron is drawn over its bristles. Such treatment quickly cleans the iron and leaves it ready for easy tinning.

A brush is much more effective for work of this kind than a rag, and is much cleaner to handle.

Installing Power Switch

TO protect yourself and others from shock caused by touching some of the exposed parts of a "B" socket-power unit, it is a good idea to enclose the whole instrument in a protecting case, preferably of sheet iron or steel. If this is done, a power control switch should be mounted on the case, so that the transformers can be controlled from the outside.

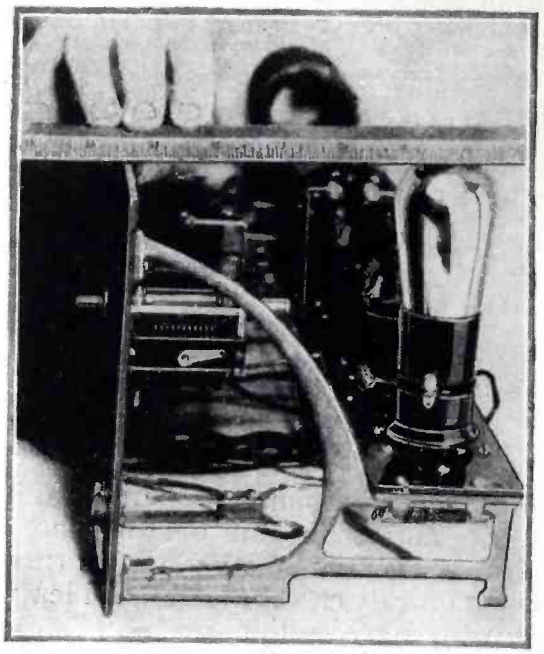


The hole in the metal case has been made to size with shears.

A standard 110-volt power switch of the toggle type requires an opening about three inches long and two inches wide. This may be made in the steel case by first drilling along a rectangle of these dimensions outlined on the metal, and by then cutting out the piece with a pair of tinners' snips.

Watch the Heights of the Tubes in A.C. Adapters

IN installing A.C. harnesses in sets, do not fail to take into consideration that fact that the socket adapters raise the tubes anywhere from a half inch to an inch above their previous levels. In some receivers this increase in height is likely to prevent the top of the cabinet from closing, or to prevent the use of the adapters altogether.

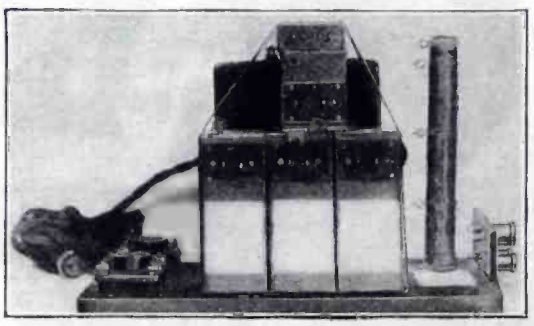


See that the tubes are not higher than the panel when placed in socket adapters.

Before considering or accepting a receiver for conversion to A.C. operation by means of these harnesses, measure the adapters and tubes carefully and then inspect the cabinet to make sure the tubes will fit.

A Resistor Hint

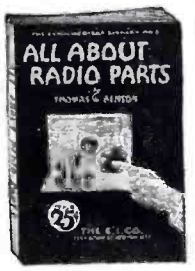
THE large fixed resistors which are used to supply the various output voltages of "B" socket-power devices develop a considerable amount of heat in normal operation. While their temperatures do not rise enough to cause any fear of fire, it is a good idea to mount them in such a position that the liberated heat rises upward. There should also be plenty of breathing room around them.



Mount the resistor upright on a small piece of asbestos.

As shown in the illustration, a good way to place such resistors is in an upright position, on top of a small piece of asbestos or other heat-protective material such as used for iron pads.

This Handy Book Should Go With Radio!



It is concerned with radio parts—their functions—where they are—and their names. It gives the symbols used in radio hook-ups, so that you will be able to read any diagram and understand it. It discusses air waves—the aerial—then takes you through every radio part—and finally the actual reproduction of sound.
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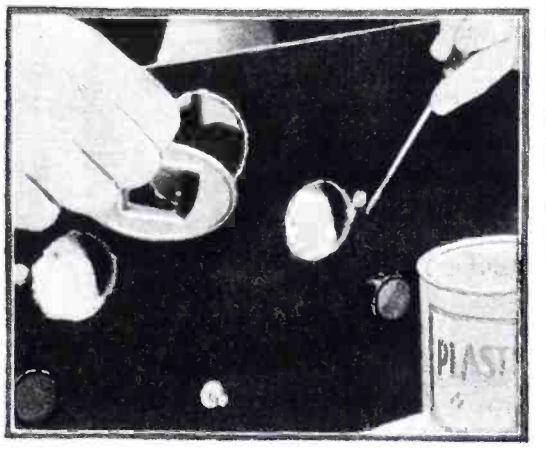
230 Fifth Avenue, New York, N. Y.

Concealing Misplaced Holes in Panels

NO matter how careful he is usually, every radio constructor manages to make a few occasional mistakes in the drilling of panels. It is not the cost of the spoiled panel that bothers him, as that is usually pretty low; it is the annoying fact that in nine cases out of ten the troublesome hole is one of the last he drilled.

A few years ago an occurrence of this kind would have left the set builder with two plans of action open: (1) he could dismount everything, but a new panel and drill it all over again; (2) he could drill a new hole in the proper place and leave the wrong one untouched, to ruin the appearance of the completed set for ever after. Nowadays,

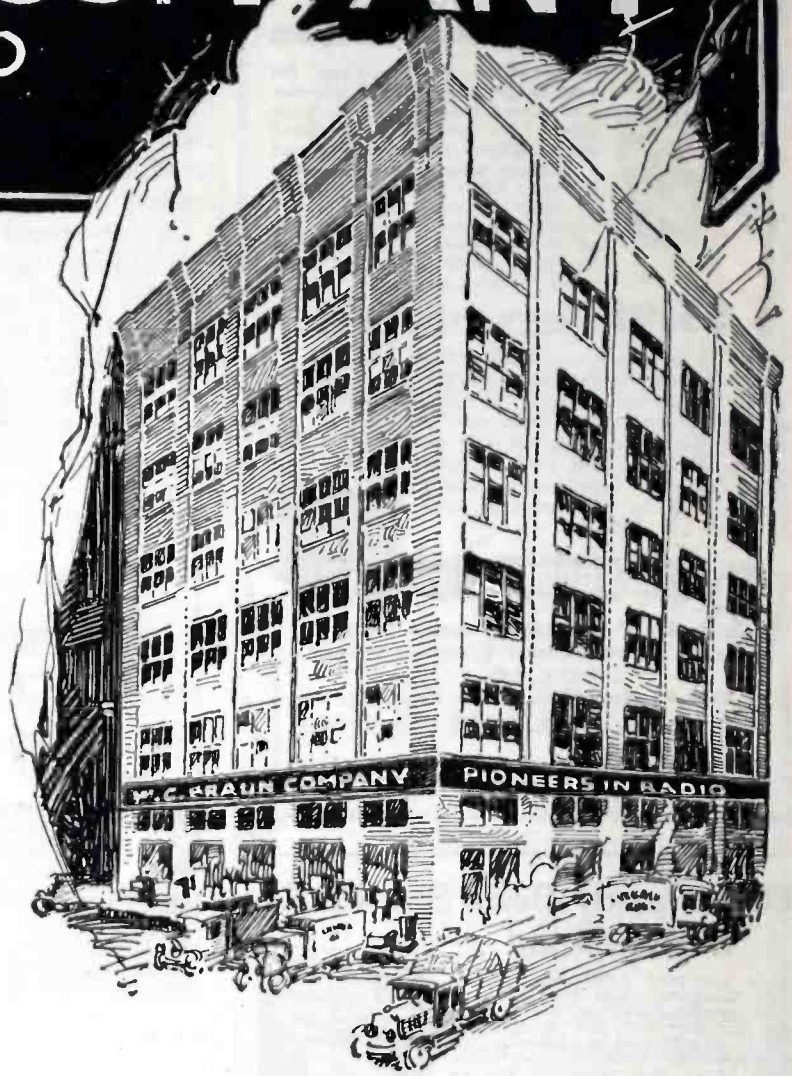


Filling in a misplaced hole with patent wood cement.

however, the constructor can save himself much labor, expense and possible mental anguish by making use of a patent substance known as "plastic wood."

This convenient preparation, in the can, looks something like putty and handles just like it. To repair a stupidly misplaced hole, either in a front panel or in a sub-panel, simply lift some of this plastic wood on the end of a small screwdriver and fill the opening with it. Wipe the exposed surface smooth, so that the plastic wood fills the hole to the top but does not smear over the panel itself. Leave the wood harden, and then merely paint it with a drop of black enamel or firm black paint.

W.C.BRAUN COMPANY
WHOLESALE RADIO HEADQUARTERS



WITH presidential and other elections holding the stage, the entire radio world is "all set" for the biggest year in history.

Radio Headquarters—W. C. Braun Co.—will be a mighty big help to you when you want the newest in sets, parts and supplies promptly, for here, all under one roof, is the distributing headquarters for almost everything that can be thought of in radio—the dependable products of the leading radio manufacurers.

Keeping up with the times, we have the newest A.C. sets, circuits and accessories—the latest dynamic, air column and other popular speakers, television supplies, short-wave and ham equipment, cabinets that fit any set, factory or home-built; in fact, everything from a screw to the most pretentious phonograph-radio combination.

Besides huge radio stocks, we have available other saleable merchandise in auto supplies, electrical and sporting goods, household utilities and a host of popular merchandise that has a ready sale.

Make this *your* headquarters as thousands of others are now doing. Get what you want when you want it. Dependable goods, fast service, big varieties—it's the kind of service you will appreciate.

Factory-Built Radio Sets

A complete line of high-grade factory-built radio sets—A.C. all-electric and battery-operated models. Big sellers—remarkable quality at moderate prices. The finest of engineering and construction. Everything from table models to deluxe highboys and super-consoles. Also a fine line of portable radio sets for camping, etc. Big discounts, big profits, fast sellers—beat all competition. No values approach ours.

Service to Professional Set Builders—Headquarters for All Circuits

We carry the largest stock of radio parts in the world—parts for all the leading radio A.C. and battery-operated circuits—Tyrman, Silver-Marshall, Hammarlund and Hi-Q, Karas, Aero, Scott's World Record, Magnaformer, Madison-Moore, LC29, all the new Grid Tube circuits: in fact, everything published in the way of circuits by the radio magazines and newspapers. Special combination offers that afford big profits to dealers and custom set builders.

Short Wave and "Ham" Section

Recent developments in short-wave equipment have popularized this fascinating study as never before. Thousands of "hams" are talking daily with the continents of the world—Australia, South America, Africa, Europe, etc. Every set builder and experimenter will find our Short-Wave Department a big help in keeping pace with the newest ideas in this most interesting and instructive radio art. We carry everything in short-wave equipment and are ready to serve you at all times.

Television Department

Nothing much of consequence in television has developed to date, but we have everything in this line that is to be had and will continue to add to this line as rapidly as it develops. Experimenters who want to delve into the mysteries of television will find here everything required to carry on their work.

Electrical Goods

Here is a line that is closely affiliated with radio: that will sell in any radio shop at all seasons. Complete assortment of wiring material, lighting fixtures, electric stoves, heaters, grilles, percolators, waffle irons, curling irons, motors, tools, household appliances, vacuum cleaners, etc.

Also Wholesale Headquarters for Auto Supplies

Lowest prices in history on guaranteed tires and tubes for all cars and trucks. The most complete line of auto supplies, including everything needed by the garage, auto dealer and auto supply shop. Standard quality seat covers, tools, tire gauges, pumps, jacks, luggage carriers, shock absorbers, springs, gaskets, replacement parts, special accessories and parts for all Ford models—in fact, everything that a motorist needs for city, country or camping.

Sporting Goods

You will be surprised at our complete line of sporting goods, including golf-clubs, bags, golf balls, and other golf equipment, tennis, basketball and football goods, outing equipment, etc.

Distributors of These Nationally Known Radio Lines

All-American	Micamold	Hammarlund-Roberts
Aero	Baldwin	Steinite
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Amsco	Trimm	De Jur
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Silver-Marshall	Thorola	Jensen
Raytheon	Carter	Temple
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Kingston	Pilot	R.F.I.
Belden	Cardwell	Potter
Cockaday	Mathieson	Peerless
Lynch	Chelton	Newcomb-Hawley
Bosch	McCullough	Superior
Scott	Aalco	Lund
Pioneer	Burgess	Pierson
Hammarlund	Bodine	Showers
Karas	Remler	Amplion
Daven	Hoyt	Pathe
Valley	Acme	Aerovox
Benjamin	Continental	Parvolt
Jefferson	Allen-Bradley	Amperite
Amertran	Victoreen	Arcturus
General	Signal	Cornish
Sangamo	Ultradyne	Utah
Dubilier	Stevens	United-Roberts
Eveready	Madison-Moore	Hyatt
Sterling	Precise	Dongan
Standard	Eagle	Ceco
Bruno	National	Abox
Sonatron	H.F.L.	Elkon
Magnaformer	Eby	Racon
Cunningham	Tyrman	Readrite
R.C.A. Tubes	X-L	B.M.S.
Monroe Sets	Cutler-Hammer	Cardwell
Elkay	Durham	R.E.L.
Kurz-Kasch	Yaxley	Ward-Leonard
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Centralab	Consrad	Goodell-Pratt
Marco	U.S.L.	And many others
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If you have received a Braun catalog before, you will get our new big catalog, without asking for it, as soon as it is off the press. If you have moved, be sure to send us change of address at once. If you haven't had the **Big Braun Book** before, send for it now. A request on your letterhead brings you a free copy.

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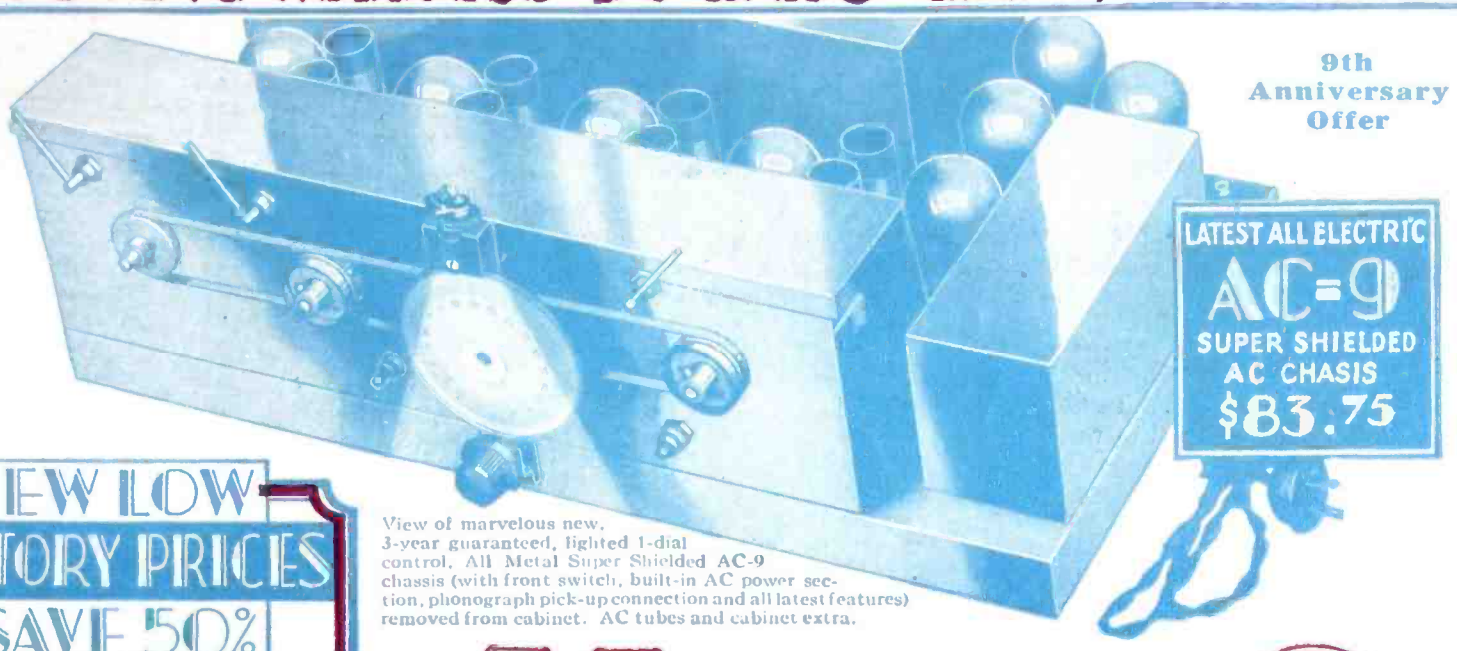


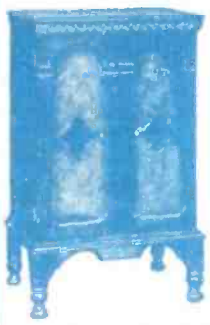
9th Anniversary Offer

View of marvelous new, 3-year guaranteed, lighted 1-dial control, All Metal Super Shielded AC-9 chassis (with front switch, built-in AC power section, phonograph pick-up connection and all latest features) removed from cabinet. AC tubes and cabinet extra.

NEW LOW FACTORY PRICES
SAVE 50%

Wide Selection of Beautiful Cabinets AC or Battery Sets,

30 DAYS HOME TRIAL



Richly designed, genuine walnut console of finest type. Electro-dynamic or magnetic power cone, or long air column speaker. Marvelous value.

A popular walnut Hi-Boy Console, with drop-leaf desk. Beautiful two-tone finish. Rare bargain!

Beautifully graceful Spinet console, genuine two-tone walnut. Choice of speakers. Also comes In Electric Phonograph-Radio Combination.

A new-type arm-chair console. Genuine walnut. Very pretty. Low priced. Electro-Dynamic or Magnetic-Power Speakers.

At right, a Lo-Boy console, walnut finish, that costs little. A gem!

Above, popular inexpensive combination. Set on Table Speaker (sold separately).

Metal or wood compact style cabinets. Wood cabinets in walnut or new shaded silver-chrome finishes. Cathedral Electro-Dynamic or Magnetic-Power Speaker to match!

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TRADE MARK REGISTERED

CATHEDRAL TONED, SUPER SELECTIVE, POWERFUL DISTANCE GETTERS

Celebrating its 9th successful year, America's big, old, reliable Radio Corporation springs a genuine sensation in high-grade sets. With its latest, Super-powered, 1-dial Miracos—the All Electric wholly self-contained, hum-free, AC-8 and AC-9, using AC tubes or the new 8-tube models for batteries or Eliminators—you are guaranteed values and savings unsurpassed in the fine set field.

Compare a Miraco with highest-priced radios, for 30 days in your home. Surprise and entertain your friends—get *their* opinions. Unless 100% delighted, *don't buy it!* Return everything—*the complete outfit*—at our expense. Your decision is final—absolutely!

Only exceptionally fine radios, of the very latest approved type, at rock-bottom prices, could possibly back up so liberally unconditional a guarantee. Send coupon now for *Amazing Special Factory Offer!*

BIG DISCOUNTS
Exclusive Territory to User-Agents on
BATTERY OR AC ELECTRIC OUTFITS

Don't Confuse with Cheap Radios

With its rich, clear Cathedral tone, hum-free operation, tremendous "kick" on distant stations and razor-edge selectivity—with its costly sturdy construction, latest features, including phonograph pick-up connection, ease of tuning, beauty, and economy—a Miraco will make you the envy of many whose radios cost 2 to 3 times as much!

Many thousands of Miracos—bought after 30 day home comparisons—are cutting through locals and getting coast to coast with the tone and power of costly sets. their delighted users report. Miracos are laboratory-built with finest parts, and embody 9 years' actual experience in constructing fine sets. Approved by Radio's highest authorities.

Deal Direct with Big Factory

Everything reaches you splendidly packed and rigidly tested to insure your instant enthusiasm. Enjoy the outfit 30 days—then decide. Liberal 3-year guarantee on each set. Play safe, save lots of money, and insure satisfaction by dealing direct with Radio's old, reliable builders of fine sets—9th successful year.

AC-8—$71.50

Unbeatable value in a 3-year guaranteed Super Shielded Metal Chassis (similar to AC-9 shown above).

Also New, More Powerful Battery Sets

The newest and latest in battery operated sets, designed with same advanced features used in electric sets! Same wide choice of cabinets. Highest quality, amazingly low priced!

8-tube Battery Super Shielded Metal Chassis $49.88

Tubes, batteries or eliminators and cabinets are extra. 30 days home trial on EVERYTHING!

IMPORTANT NOTICE!

"30 Day Free Trial" offers usually are money-back guarantees frequently only on the "set." Please understand that unless you are thoroughly pleased we pay return charges and refund the FULL purchase price on both the "set" and ALL equipment—tubes, cabinet, speaker, antenna (also on batteries or eliminators with ultra-8 sets). Could any offer be fairer?

MIDWEST RADIO CORP'N, 566-AD Miraco Bldg., Cincinnati, Ohio

BEAUTIFULLY ILLUSTRATED CATALOG, AMAZING SPECIAL FACTORY OFFER, TESTIMONY OF NEARBY USERS—All the proof you want—of our honesty, fairness, size, financial integrity, radio experience and the performance of our sets—including Amazing Factory Offer—sent with catalog.

Free!

MIDWEST RADIO CORPORATION
Pioneer Builders of Sets—9th Successful Year
566-AD Miraco Bldg., Cincinnati, Ohio

THIS COUPON IS NOT AN ORDER

WITHOUT OBLIGATION, send free catalog, Amazing Special Factory Offer, testimony of nearby users, etc. ☐ User ☐ Agent ☐ Dealer

☐ **Check here if interested in an EXCLUSIVE TERRITORY PROPOSITION**

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ONLY

$99 for this PACKARD SUPER 8—$250 A.C. ELECTRIC RADIO SET!

Direct From Our Factory

Today's greatest radio! A truly sensational offer! The Eight-tube PACKARD A. C. Electric Radio — a regular $250 set—shipped to any home in the U. S. at direct from factory price of only $99. And to prove our claims we will ship this set to your home on

$5000.00 CASH BOND to Back Our GUARANTEE

30 Days Free Trial

WORLD'S GREATEST RADIO

Genuine Walnut Console Cabinet

Eight powerful A. C. tubes and one genuine full-wave rectifying tube—nine tubes in all. Supreme quality throughout. Simple to operate. Connect the plug to electric socket and turn switch. Only one dial to tune. One hundred per cent electric. Handsome walnut cabinet—two-tone genuine DUCO finish. Metal trimming finished in old gold. Marvelous built-in, powerful speaker. Size of cabinet is 54 inches high, 27 inches wide.

Packard Radios are also made for BATTERY OPERATION PRICED AS LOW AS $53

The PACKARD Engineers

have invented this most unusual, powerful SUPER-Eight Tube Radio. Astonishing volume and tone quality. Remarkable selectivity and long-distance reception. Leading radio engineers unanimously agree that there is no better radio made — regardless of price.

Let us prove this by shipping a set to your home on 30 days' trial. Examine the set from A to Z. Let the most exacting critics pass on its merits. And if, after the 30 day trial period, you are convinced that the Packard Eight-tube Electric is fully the equal of any console radio set selling up to $250—then, and only then, need you decide to keep it at our factory price of only $99 —otherwise, return it.

This marvelous set combines every new scientific development in receiving sets—possessing beauty, refinement, durability. Gets everything on the air from coast to coast—from Mexico into Canada, loudly, clearly, and distinctly. Only one dial to tune in all stations.

You Save the Jobbers', Dealers' and Salesmen's Profits

The PACKARD Radio is shipped direct from our factory. All the in-between profits are deducted from the price of the set and instead of paying $250 you pay only $99. Quantity production, economy in selling, and only a small profit for the manufacturer makes this astounding offer possible.

MAIL COUPON NOW FOR *30 days' free trial offer*

Don't miss this opportunity. Mail coupon at once for complete information about the PACKARD A. C.—8 TUBE ELECTRIC RADIO and our liberal 30 days' free trial offer. No obligation on your part. Our $5,000.00 cash bond backs up our guarantee.

PACKARD RADIO CO.

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Packard Radio Company
2323 Milwaukee Ave., Dept. 370 Chicago, Ill.

I am interested in Packard Radios and your $5,000.00 Bonded 30 days' free trial offer and guarantee. Send full details.

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