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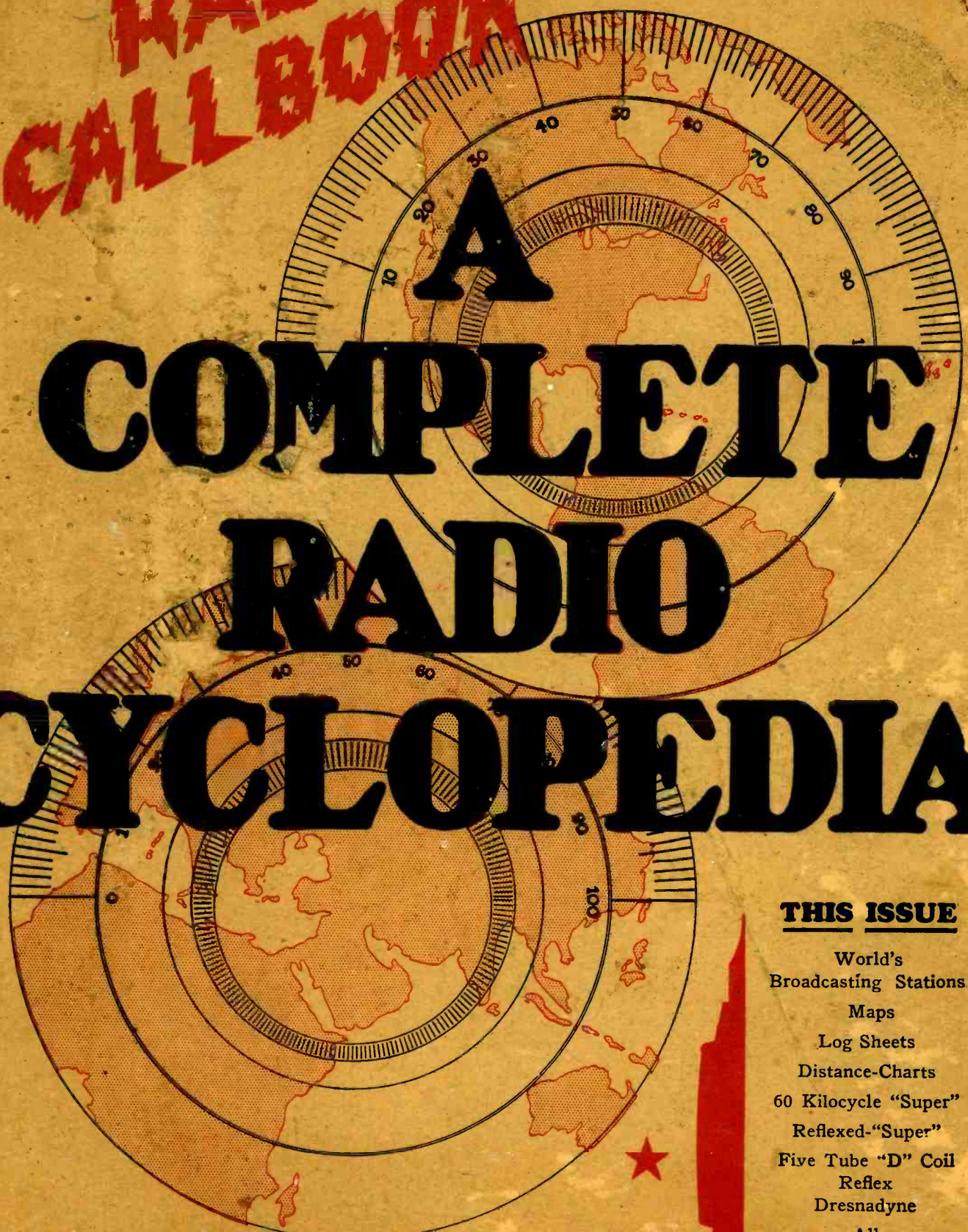

A COMPLETE RADIO CYCLOPEDIA

THIS ISSUE

World's
Broadcasting Stations
Maps
Log Sheets
Distance-Charts
60 Kilocycle "Super"
Reflexed-"Super"
Five Tube "D" Coil
Reflex
Dresnadyne
All
Latest "Hook Ups"
and
Operating Data

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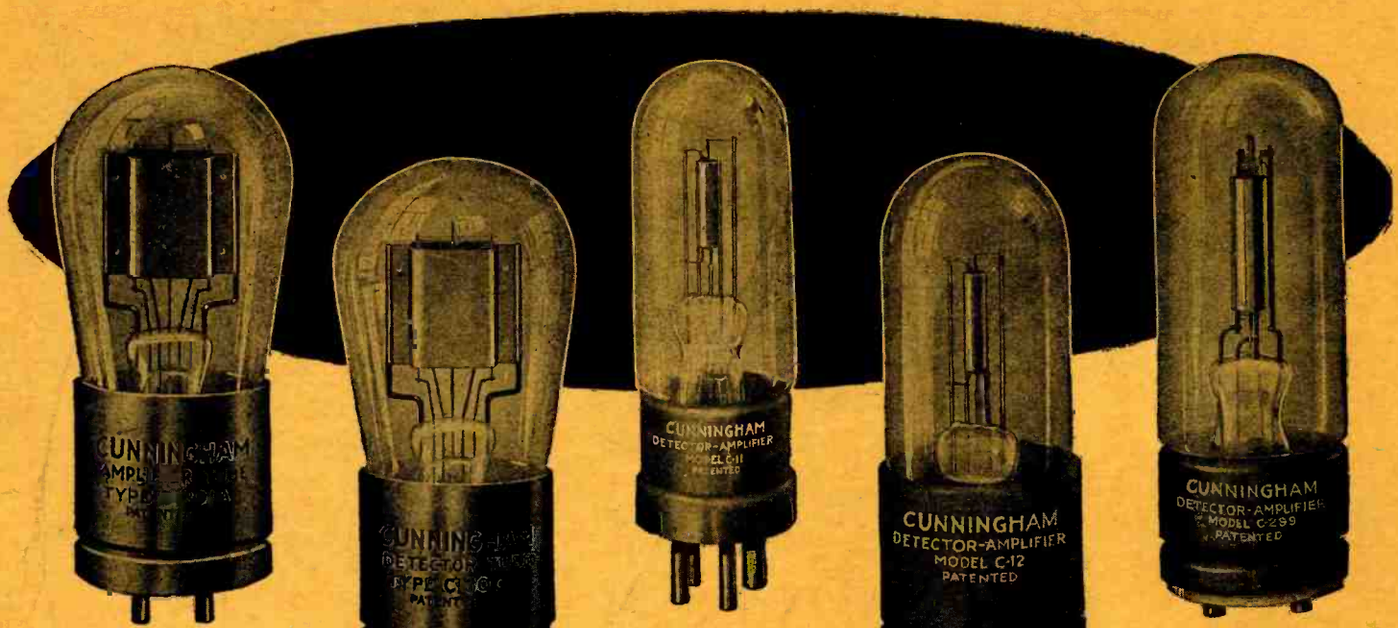
Printed in the United States of America

USED THE WORLD OVER



C-301A—6 Volts ¼ Amp. Amplifier

C-300—6 Volts Gas Content Detector

C-11—1.1 Volt .25 Amp. Dry Battery Det. and Amp. Special Base

C-12—Similar to C-11 with standard base

C-299—3 Volts .06 Amp. Dry Battery Det. and Amp.

Cunningham RADIO TUBES

SINCE 1915 STANDARD FOR ALL SETS

In the Orange and Blue Carton

Type C-301A, C-300, C-299, C-11, C-12

Three of these five tubes are designed to use dry batteries for filament lighting. C-299 is compact in design and highly efficient in operation as a radio frequency amplifier, a detector and as an audio-frequency amplifier. When used for the latter purpose, the output of two stages is sufficient for the operation of a small loud speaker.

The most remarkable feature of this tube is the new patented filament used which draws only .06 amperes at 3 volts.

C-11 is a dry battery tube with a special base for use in sets having special sockets. It is a good detector and audio-frequency amplifier. The filament is lighted from a single dry battery and draws .25 amperes.

C-12 is identical to C-11 in operating characteristics, but is mounted on a standard base to permit the use of a dry battery tube in sets equipped with standard sockets without the aid of special adaptors.

Whenever storage battery supply is available for filament lighting, the C-300 will be the best tube to use as a detector because it is the most senstive for the reception of distant and weak signals.

Under the same condition, C-301A will be the best tube for amplification at either radio or audio frequency, because it gives greater gain per stage than any other tube on the amateur market. The new patented filament used, similar to that in C-299, draws only .25 amperes at 6 volts, reducing the necessity of frequent storage battery charging.

Patent Notices

Cunningham tubes are covered by patents dated 2-18-08, 2-18-12, 12-30-13, 10-23-17, 10-23-17, and others issued and pending. Licensed for amateur, experimental and entertainment use in radio communication. Any other use will be an infringement.

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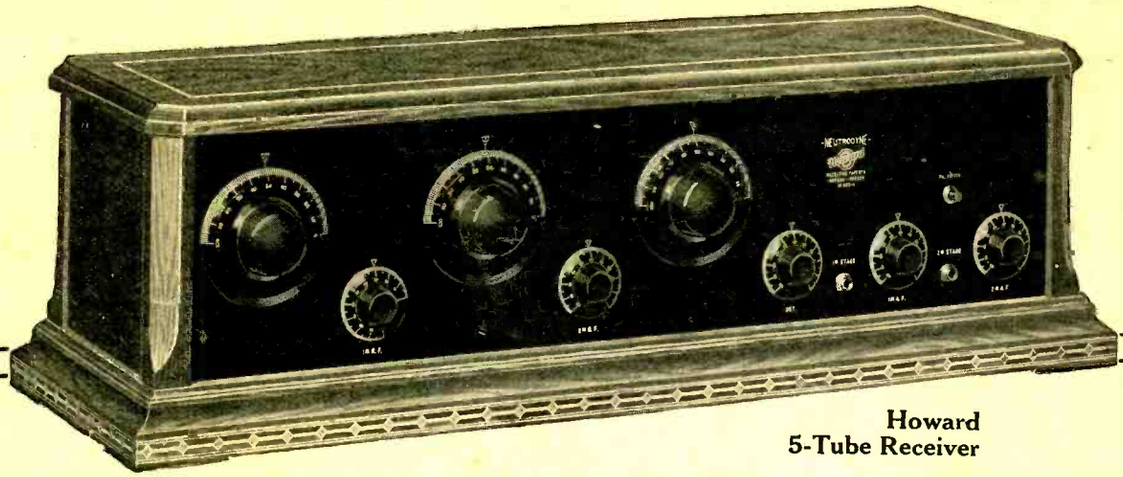
Branch New York



Howard
5-Tube Receiver

SELECTIVITY; distant reception range, volume and ease of operation are the most important things to consider when buying your radio receiver. To be sure that your selection will provide these essentials choose the Howard Five Tube Neutrodyne—it bears this label.

GUARANTEED Howard PRODUCTS

A Howard in your home will include practically all the United States and Canada as your neighborhood. To be content with less robs you of the satisfaction and realization of true radio reception.

Any Howard dealer will be pleased to give you a demonstration.

Howard Manufacturing Company

Dept. C 451-469 E. Ohio Street Chicago

Licensed by Independent Radio Manufacturers, Inc.
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Pat. March 27, 1923 and April 1, 1924
Hazeltine Pats. Nos. 1,450,080 and 1,489,228
Other Patents Pending

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"TRUE REPRODUCTION Musette OF VOICE AND MUSIC"

Popularly Priced

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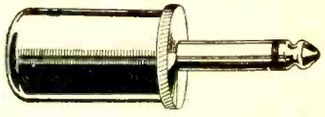
in black finish

$20

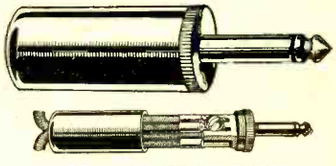
in silver or gold finishes

FROST-RADIO ACCESSORIES

No. 137 **FROST-RADIO** Cord Tip Plug, $1.25

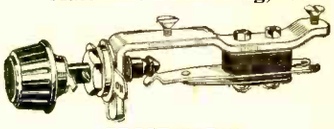


No. 139 **FROST-RADIO** Cord Tip Plug, 50c

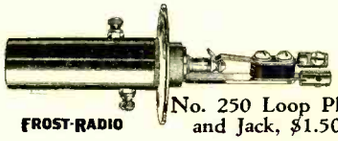


No. 140 **FROST-RADIO** 2-Fone Plug, 60c

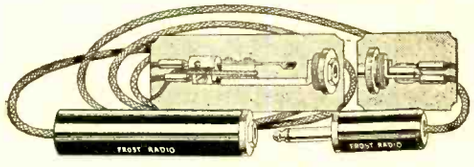
No. 141 **FROST-RADIO** Automatic 2-Fone Plug, 75c



FROST-RADIO Pan-Tab Jack Switches, $1.00 to $1.30



FROST-RADIO No. 250 Loop Plug and Jack, $1.50



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FROST-RADIO Pan-Tag Jacks 70c to $1.00

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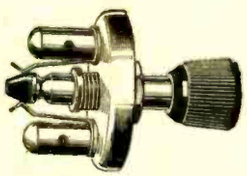

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No. 608 Push-Pull Battery Swith, single hole mounting, complete 30c

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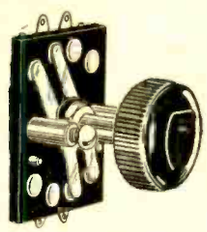
No. 603—Metal Frame Potentiometer, 0-400 ohms.....65c
No. 605—Metal Frame Potentiometer, 0-200 ohms.....65c



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No. 620, BAKELITE Potentiometer Cut - Out Switch 50c

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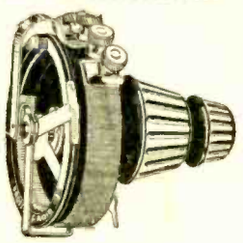
No. 651, BAKELITE Vernier Rheostat, 6 ohms.....$1.25
No. 653, BAKELITE Vernier Rheostat, 35 ohms $1.25
No. 657, BAKELITE Vernier Rheostat, 25 ohms $1.25



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No. 609, Same as No. 607, but with 25 ohm Rheostat and 400 ohm Potentiometer, ...$1.75

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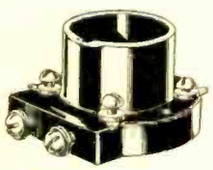

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No. 612, BAKELITE Socket for UV-199 C-299 Tubes, panel or table mounting 60c

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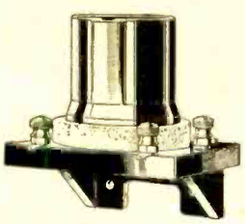
No. 619 BAKELITE Shock-absorber Socket, 3 - Gang Standard Base Type.....$3.25



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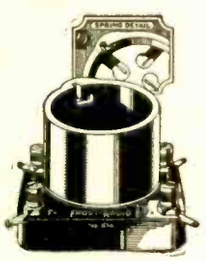
No. 618, BAKELITE Shock - Absorber Socket, Standard base type, for panel or table mounting.. .....$1.25



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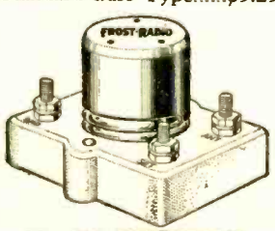
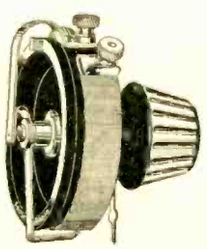
No. 614 BAKELITE Heavy Duty Socket....65c



No. 700 FROST-RADIO Protector, complete, $1.50



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QUALITY RADIO EXCLUSIVELY — EST. 1918

TELMACO

IN the home of TELMACO—the home of quality radio products—there is a steadfast belief that quality is necessary for continued business success.

To you as a dealer, quality is a road to steady and profitable growth, and to us, as a manufacturer and jobber, there is great satisfaction in the fullfillment of this obligation to you.

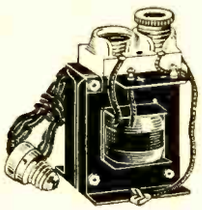
Of equal importance to dealers, is our service. Radio service, as we understand it is something more than careful filling of orders and prompt deliveries. TELMACO Service includes something better—a whole-hearted interest in development of more profitable merchandise by dealers together with constant effort to improve upon our own job as a manufacturer and distributor of radio products of quality.

We realize that the extent of our success is entirely contingent upon yours. Therefore we solicit a continuance of your valued patronage and we sincerely hope to merit it through consistent care and attention to every detail of all transactions.

We Are Jobbers for These Well Known Quality Products

Accuratune	Amsco	Carter	Filko	Henninger	Muter	Remler	Trimm
Acme	Branston	Chelten	Flewelling	Howard	Na-Ald	Saal	Thordarson
All-American	Bremer-Tully	Cunningham	Formica	Jewell	Pfanstiehl	Se-Ar-De	Vesta
Allen-Bradley	Balkite	Dubilier	Freshman	Karas	Philco	Signal	Walnart
Amer-Tran	Burgess	Electrad	Frost	King	Premier	Sodion	Weston
Amperite	Cardwell	Eby	Harkness	Music Master	Radiodyne	Sterling	Willard

and many others



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The lowest priced battery charger on the market. No vibrating parts to get out of order. Noiseless in operation.

Radiodyne WC-14

This is a five-tube set of exceptional high quality. Two stages tuned R. F. Detector and two stages A. F. Priced remarkably low.

Cunningham Tubes

Cunningham Tubes have been the choice of Radio users for many years. Why take chances with unknown makes?

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This horn enhances all the full natural tones and makes your reception a hundred per cent perfect. 14" or 21" mahogany finish.

—and Now! You Can Buy

The Famous

TELMACO P-1 RECEIVER

in Kit Form

In response to a mighty demand from the radio public, we now offer the TELMACO P-1 Receiver in kit form. The kit contains all parts, as built by us, including case, drilled and engraved panel, and complete illustrated instructions. The complete kit is now offered for only $80.00

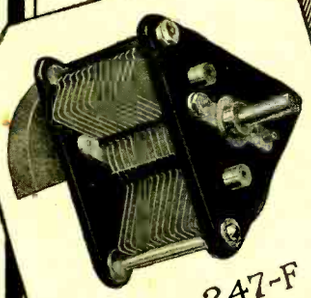
Ask your dealer or write us direct.

This is the famous Telmaco P-1 Receiver, the wonder portable radio set. Beautifully made for home use as well as outings. Four tubes do the work of seven. Coast to coast on self contained loud speaker. Complete with batteries and tubes $143.50

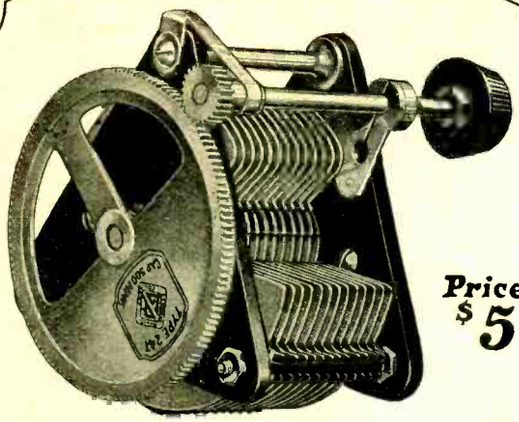
TELEPHONE MAINTENANCE CO.

20 So. Wells St. **Chicago, Ill.**

GENERAL RADIO Condensers



Type 247-F



Price $5

Type 247-H

Type 247-G

The Standards of Excellence Since 1915

THE *original low loss condenser* was introduced in 1915 by the General Radio Company.

This instrument heralded an era of rapid advancement in the science of radio.

Today the design and performance of the General Radio Type 247 Condensers merit their distinction as the standards of excellence.

Eight different models are now available for various radio requirements. All of these models incorporate the following features, which contribute to lower losses and greater efficiency:

Low resistance losses, because of soldered plates.

Straight line plates, which give a uniform wave-length variation.

Plates always in perfect alignment, being individually straightened before assembly in a jig, and firmly soldered while in position.

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Mechanically rugged design, which insures faithful performance over long periods of use.

Tight and smooth running spring bearings, adjusted to compensate for wear.

Popular prices, made possible by large-scale production and efficient methods.

Ask your dealer or write for instructive folder "Quality Condensers," containing complete information on all 8 models of General Radio Condensers.

The red cartons with the General Radio label are your unfailing assurance of satisfaction.

GENERAL RADIO Co
Cambridge, Mass.

CITIZENS RADIO CALL BOOK

A COMPLETE RADIO CYCLOPEDIA

Vol. 6 SPRING, 1925 No. 1

Contents This Issue

Published twice yearly by the

CITIZENS RADIO SERVICE BUREAU

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With the Editor

AGAIN the CITIZENS RADIO CALL BOOK brings to the novice as well as the expert radio fan all the latest developments, illustrated and described in an easily understood manner.

It is the sincere hope of the publishers that the material in this issue will be directly responsible for many happy hours spent with your favorite circuit.

As in the last issue, the Amateur Section has been left out of the main book. A complete book containing an up-to-date list of all the calls in the world is now available for 75c.

While this issue of the Call Book is the most complete ever published, the plans we are laying for the Fall issue bid well to out-do all past efforts.

Again let us repeat what we have always said since the Call Book's inception in the field: "Our entire organization is united in one effort—to produce the most complete, valuable, and accurate Radio Cyclopedia that money can buy."

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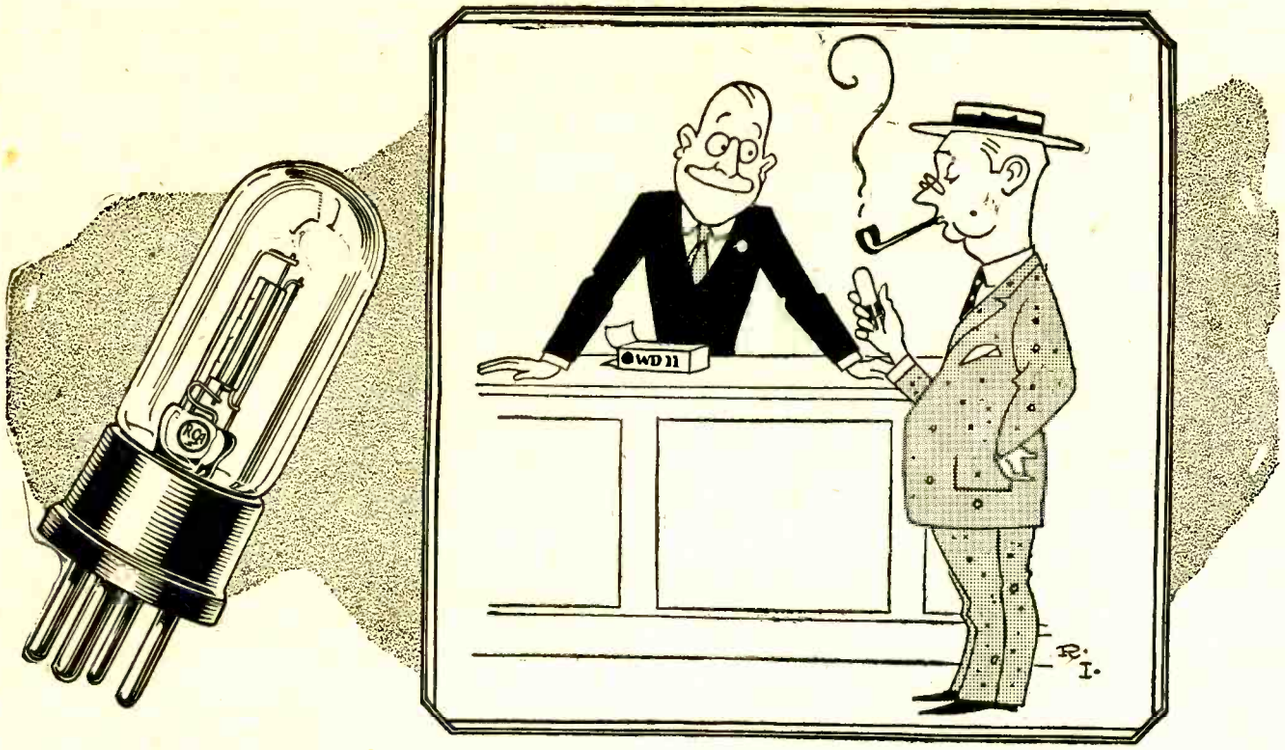

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This symbol of quality is your protection

It isn't a genuine WD-11 unless it's a Radiotron.

It isn't a genuine WD-12 unless it's a Radiotron.

It isn't a genuine UV-199 unless it's a Radiotron.

It isn't a genuine UV-200 unless it's a Radiotron.

It isn't a genuine UV-201-a unless it's a Radiotron.

If you go into a reliable store and ask for a vacuum tube, you will probably get a genuine Radiotron, because most reputable dealers carry nothing else. And most buyers mean "Radiotron" when they say "tube." But the wise man *says* "Radiotron." And he takes the precaution to look for the name, and the RCA mark. Those names have a history of invention, research and development back of them that has resulted in the production of the finest tubes possible today. And they have a history of *best performance* right within every fan's experience. That's why knowing fans buy by the name: Radiotron.

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Telephone Broadcasting Stations

For the United States

KDKA—Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. 309 meters. 970 kilocycles, class B. Daily ex Sun. 9:45 am. markets; 11:55 am. time signals; noon, weather; 3:30 pm, ex Sat. markets; 6:15 pm, concert; 7:15, stock reports; 7:30, children's hour. Mon, Wed & Fri, 8:15 pm, address; 8:30, concert; 9:55, time signals. Thurs, spec program, 8 pm. Tues & Thurs. 8:30 pm, concert; 9:55, time signals; 11 pm, concert. Tues. 10 pm, basket ball. Mon, Wed & Fri. 7-8 am, exercises. Sat, 1:30 & 6 pm, concert; 7:30 pm, children's hour; 8:30 pm, concert. Sun, 11 am, 2:30 pm & 4 pm, organ: 4:45 pm, vespers; 6:15 pm, concert; 7:45. church services. Slogan: "The Pioneer Broadcasting Station of the World." 1000 watts.

KDLR—Radio Elec. Co., Devils Lake, N. D. 231 meters, 1300 kilocycles, class A. 5 watts.

KDPM—Westinghouse Elec. & Mfg. Co., Cleveland, Ohio. 250 meters, 1200 kilocycles, class A. Schedule irregular, experimental station. 500 watts.

KDYL—Newhouse Hotel, Salt Lake City, Utah. 305 meters, 980 kilocycles, class B. Daily ex Sun 3-4 pm, & 6:30-8 pm. Standard Mountain time. 50 watts.

KDYM—The Savoy Theatre, San Diego, Calif. 280 meters, 1070 kilocycles, class A. 100 watts.

KDZB—Frank E. Siefert, 1402—20th St., Bakersfield, Calif. 240 meters, 1250 kilocycles, class A. 100 watts.

KDZE—Rhodes Dept. Store, Seattle, Wash. 270 meters, 1110 kilocycles, class A. 100 watts.

KFAB—Nebraska Buick Auto Co., Lincoln, Nebr. 240 meters, 1250 kilocycles, class A. Mon, Wed & Fri, 7:30-9:30 pm. Sun. 4-5 pm. church services. Central standard time. 500 watts.

KFAD—McArthur Bros. Merc. Co., Phoenix, Ariz. 360 meters, 844 kilocycles. 100 watts.

KFAE—The State College of Washington, Pullman, Wash. 329 meters, 910 kilocycles. class B. Mon. Wed & Fri, 7:30-9 pm. Pacific standard time. 500 watts.

KFAF—Western Radio Corp., Denver, Colo. 278 meters, 1080 kilocycles. class A. 500 watts.

KFAJ—University of Colorado, Boulder, Colo. 261 meters, 1150 kilocycles. class A. 100 watts.

KFAN—University of Idaho, Moscow, Idaho. 231 meters, 1300 kilocycles, class A. 50 watts.

KFAU—High School, Boise, Idaho. 275 meters, 1090 kilocycles. class A. Daily ex Sat & Sun, 4-4:45 pm, market, weather, health, music, etc. Mon, Wed & Fri, 8-9:30 pm. Mountain time. 500 watts.

KFAW—The Radio Den, 115 No. Broadway, Santa Ana, Calif. 280 meters, 1070 kilocycles. class A. Daily ex Sun. 4-4:30 pm, news. Mon, Wed & Fri, 8-10 pm, concert. Second and fourth Wed, each month, 11-12 pm. Pacific standard time. Slogan: "Where There is Always a Friend from Your Own Home Town". 10 watts.

KFBB—F. A. Buttrey & Co., Havre, Montana. 275 meters. 1090 kilocycles, class A. 50 watts.

KFBC—W. K. Azbill, 5038 Cliff Place, San Diego, Calif. 278 meters, 1080 kilocycles, class A. Thurs. 7-9 pm. Pacific coast time. 20 watts.

KFBG—First Presbyterian Church, Tacoma, Wash. 249 meters, 1200 kilocycles, class A. Sun, 11 am to 1 pm, 7:30-9:30 pm. Pacific standard time. 50 watts.

KFBK—Kimball Upson Co., 610 California St., Sacramento, Calif. 283 meters, 1060 kilocycles, class A. 100 watts.

KFBL—Leese Brothers, 2814 Rucker Ave., Everett, Wash. 224 meters, 1340 kilocycles, class A. 15 watts.

KFBU—The Cathedral, Laramie, Wyo. 270 meters, 1110 kilocycles, class A. Wed, 5:45-6 pm, Cathedral Chimes. Sun, 5 pm, vesper service; 7:30 pm, church services. Mountain time. Slogan: "The Top of the World". 50 watts.

KFCB—Nielsen Radio Supply Co., 311 No. Central Ave., Phoenix, Ariz. 238 meters, 1250 kilocycles, class A. Wed, & Fri, 7:30-8:30 pm. Studio program Mountain time. Slogan: "The Pioneer Sportcasters". 50 watts.

KFCC — First Congregational Church, Helena, Mont. 247 meters, 1280 kilocycles, class A. Sun, 11 am and 7:30 pm. Mountain time. 10 watts.

KFCF—Frank A. Moore, 707 Baker Bldg., Walla Walla, Wash. 256 meters, 1190 kilocycles, class A. Mon, 8-10 pm, studio. Thurs & Fri, 10-12 pm, concert. Pacific standard time. Slogan: "The Valley They Liked So Well They Named It Twice". 100 watts.

KFCL—Leslie E. Rice, Los Angeles Union Stock Yards, Los Angeles, Calif. 236 meters, 1270 kilocycles, class A. 500 watts.

KFCP—Ralph W. Flygare, 2421 Jefferson Ave., Ogden, Utah. 208 meters, 1440 kilocycles, class A. 10 watts.

KFCY—Western Union College, Le Mars, Iowa. 252 meters, 1190 kilocycles, class A. Schedule irregular. Fri. 9-10:30 pm, musical and educational. Central standard time. 50 watts.

KFCZ—Omaha Central High School, Omaha, Nebr. 258 meters, 1160 kilocycles, class A. 50 watts.

KFDD—St. Michaels Cathedral, Boise, Idaho. 275 meters, 1090 kilocycles, class A. 15 watts.

KFDH—University of Arizona, Tuscon, Arizona. 258 meters, 1150 kilocycles, class A. Schedule irregular, 7:30-8:30 Mountain time. Slogan: "Copper, Cattle, Cotton, Climate". 50 watts.

KFDJ—Oregon Agricultural College, Corvallis, Ore. 254 meters, 1180 kilocycles, class A. 100 watts.

KFDM—Magnolia Petroleum Co., Beaumont, Texas. 315 meters, 950 kilocycles, class B. Tues & Fri, 7 7:30 pm, children's half hour; 8-10 pm, program. Sun, 9 10 pm, sacred concert. Central standard time. Slogan: "KFDM Kall For Dependable Magnolene." 500 watts.

KFDX—First Baptist Church, Shreveport, La. 250 meters, 1200 kilocycles, class A. Sun, 11 am and 7:45 pm. Central standard time. 100 watts.

KFDY — South Dakota State College, Brookings, S. D. 273 meters, 1100 kilocycles, class A. Daily ex Sun, 12:15 pm, market and weather. Tues, 11 am, Thurs, 8-9 pm, music and lectures. 100 watts.

KFDZ—Harry O. Iverson, 2510 Thomas Ave. So., Minneapolis, Minn. 231 meters, 1300 kilocycles, class A. Sun, 6 pm, organ recital. Central Standard time. 10 watts.

KFEC—Meyer & Frank Co., Portland, Ore. 248 meters, 1210 kilocycles, class A. 50 watts.

KFEL—W. L. Winner Radio Shop, Denver, Colo. 254 meters, 1184 kilocycles, class A. Daily ex Sun, 11-11:45 am, 2-3 and 4-5 pm. Tues, Wed, Thurs & Fri, 10-11 pm. Sun, 3-4:30 pm. Mountain time. 50 watts.

KFEQ—Scroggin & Co., (Bank) Oak, Nebr. 268 meters. 1120 kilocycles, class A. 100 watts.

KFER—Auto Electric Service Co., Fort Dodge, Iowa. 231 meters, 1300 kilocycles, class A. Tues & Thurs, 9 pm, musical program. Sun, 9 pm, chapel services. Central standard time. 10 watts.

KFEX—Augsburg Seminary, Minneapolis, Minn. 261 meters, 1150 kilocycles, class A. 100 watts.

KFEY—Bunker Hill & Sullivan Mining & Concentrating Co., 834 McKinley Ave., Kellogg, Idaho. 234 meters, 1290 kilocycles. class A. Schedule irregular. Slogan: "The Voice of the Coeur d'Alenes". 10 watts.

KFFP—The First Baptist Church, Moberly, Mo. 266 meters, 1130 kilocycles, class A. Sun, 9:45 am and 11 am, 7:30 pm, services. Central standard time. Slogan: "The Gospel Messenger of the Air". 50 watts.

KFFR—Nevada State Journal, Sparks, Nevada. 226 meters, 1330 kilocycles, class A. 10 watts.

KFFV—Graceland College, Lamoni, Iowa. 250 meters, 1200 kilocycles. class A. Mon, 7:30-8:30 pm, musical program. Thurs, 7:30-8:30 pm, educational. First Sun each month, 7:45-9 pm. Second, third and fourth Sun each month, 11 am. Central standard time. Slogan: "The School With a Personal Touch". 100 watts.

KFFY—Louisiana College, Alexandria, La. 275 meters, 1090 kilocycles. class A. 50 watts.

KFGC—Louisiana State University, Baton Rouge, La. 268 meters, 1120 kilocycles, class A. Schedule irregular. 100 watts.

KFGD—Oklahoma College for Women, Chickasha, Okla. 252 meters, 1190 kilocycles, class A. Tues, Thurs & Sat, 8-9 pm. Wed. 10:05-10:45 am. Central standard time. 100 watts.

KFGH—Leland Stanford Junior University, Stanford University, Calif. 273 meters, 1100 kilocycles, class A. 500 watts.

KFGQ—The Crary Hardware Co., Boone, Ia. 226 meters, 1330 kilocycles, class A. Wed, 8-9 pm. Sun, 3-4 pm. Central standard time. Slogan: "The Daniel Boone Station". 10 watts.

KFGX — First Presbyterian Church, Orange, Texas. 250 meters, 1200 kilocycles, class A. 500 watts.

KFHA—Western State College of Colorado, Gunnison, Colorado. 252 meters, 1190 kilocycles, class A. Tues, 6:30 pm. bedtime stories; 7:30 pm, educational; 9 pm, conservatory music. Fri. 9 pm. Mountain standard time. Slogan: "Where the Sun Shines Every Day and the Fishing is Fine". 50 watts.

KFHJ—Fallon & Co., Santa Barbara, Calif. 360 meters, 833 kilocycles. 100 watts.

KFHL—Penn College, Oskaloosa, Iowa. 240 meters, 1250 kilocycles, class A. Tues. 8 pm. Sun, 4 pm. Central standard time. Slogan: "Keen for Higher Learning". 10 watts.

KFHR—Star Elec. & Radio Co., Seattle, Wash. 272 meters, 1070 kilocycles, class A. 100 watts.

KFI—Earle C. Anthony, Inc., Las Angeles, Calif. 469 meters, 642 kilocycles, class B. Daily ex Sun, 5-5:30 pm; News bulletins, 5:30-6 pm. Daily ex Mon, including Sun, 6:45-7 pm. Tues, Thurs & Sun, 7-8 pm. Wed, 7:30-8 pm, male quartet. Sat, 7-7:45, dance orchestra; 7:45-8 pm, the book shelf. Daily incl. Sun, 8-9 pm. 9-10 pm, 10-11 pm. studio program and special features. Sun, 10-10:45 am; 11 am to 12:30 pm; 4-5 pm, church services. Pacific standard time. 1500 watts.

KFIF — Benson Polytechnic Institute, Portland, Ore. 248 meters, 1210 kilocycles, class A. 100 watts.

KFIO—Radio Club of North Central High School, Spokane, Wash. 363 meters. 1130 kilocycles, class B. Fri, 8-10 pm. Sun, 7:30-9 pm, church services. Pacific standard time. 100 watts.

KFIQ—First Methodist Church, 332 Miller Bldg., Yakima, Wash. 256 meters, 1170 kilocycles, class A. Wed, 6:30 pm, Organ recital. Sun, 11 am and 7:30 pm. Pacific standard time. 100 watts.

KFIU—Alaska Electric Light & Power Co., Juneau, Alaska. 226 meters, 1330 kilocycles, class A. Mon, Wed & Fri, 7-8 pm. Alaska time (6 pm Alaska time is 7 pm Pacific coast time). Slogan: "A Voice from the Far North". 10 watts.

KFIZ—The Daily Commonwealth and the Seyfert Radio Corp., Fond du Lac, Wisc. 225 meters, 1320 kilocycles, class A. Daily ex Sun, 5 pm, markets, weather reports and news, sports. Central standard time. 100 watts.

KFJB—Marshall Elec. Co., 1603 W. Main St., Marshalltown, Ia. 248 meters, 1210 kilocycles, class A. Daily, ex Sun, market and weather. Sun, 10 am. Tues & Fri, 8:30 pm, music and educational program. Central standard time. Slogan: "Marshalltown —the Heart of Iowa". 10 watts.

KFJF—National Radio Mfg. Co., 406 N. Hudson, Oklahoma City, Okla. 261 meters. 1149 kilocycles, class A. Daily ex Sun, 9:40 am, markets. 12:15 (Sat, 12:30). Daily ex Sat, 3:15 pm, weather, markets, news. Daily ex Sun. 7pm. Tues & Fri, 8:30 pm, concert. Sun, 11 am and 7 pm, church services; 3 pm, concert. Central standard time. 225 watts.

KFJI—Liberty Theater and E. E. Marsh, Astoria, Oregon. 245 meters, 1220 kilocycles, class A. Wed & Fri, 10-11 pm. Sun, 10:30-11 pm. Pacific standard time. 10 watts.

KFJM—University of North Dakota, Grand Forks, N. D. 278 meters, 1080 kilocycles, class A. Daily ex Sat & Sun, 5 pm, grain and livestock markets, weather. Wed, 8:30 pm, story hour, news, music. Athletic events broadcast occasionally. Slogan: "Grand Forks the Educational Center of the World". 100 watts.

KFJR—Ashley Dixon & Son, Portland, Ore. 263 meters. 1140 kilocycles, class A. 100 watts.

KFJX—Iowa State Teachers College, Cedar Falls, Iowa. 258 meters, 1160 kilocycles, class A. Schedule irregular. 50 watts.

KFJY—Tunwall Radio Co., 13 No. 10th St., Fort Dodge, Iowa. 246 meters, 1220 kilocycles, class A. Tues, Wed, Thurs, Fri, 11:50 am. Chimes. Daily ex Wed & Sun, 5:45 pm, markets, news, weather. Wed. 9 pm, concert. Sun. 11:50 am, church services. Central standard time. 50 watts.

KFJZ—Texas National Guard, 112th Cav. Fort Worth, Texas. 254 meters, 1180 kilocycles, class A. 20 watts.

KFKA—Colorado State Teachers College, Greeley, Colo. 273 meters, 1100 kilocycles, class A. Wed. 10 am, Lectures, Concerts, athletics, broadcast at irregular occasions. Mountain standard time. 50 watts.

KFKB—Brinkley Jones Hospital Ass'n., Milford, Kansas. 273 meters, 1100 kilocycles, class A. Daily ex Fri & Sun, 6-7 and 10-11 pm. Fri, 7-12 pm. Sun, 8-10 pm. Slogan: "Kansas First Kansas Rest". Central standard time. 500 watts.

KFKQ—Conway Radio Laboratories, Box No. 360, Conway, Ark. 250 meters, 1200 kilocycles, class A. Tues & Fri, 8-10 pm. Central standard time. Slogan: "Known for Knowledge Quest". 100 watts.

KFKU—University of Kansas, Lawrence, Kans. 275 meters. 1099 kilocycles, class A. Mon & Thurs, 6:50 pm, announcements; 7 pm. music; 7:15 pm, 7:30 pm, 7:45 pm. lectures, elementary Spanish. Chemistry, etc. Central standard time. 500 watts.

KFKV—Frank F. Gray, 3200 Richardson St., Butte, Mont. 283 meters, 1060 kilocycles, class A. 50 watts.

KFKX—Westinghouse Elec. & Mfg. Co., Hastings, Neb. 288 meters, 1040 kilocycles, class B. Mon & Thurs. 9:30-10:30 pm. Central standard time. Daily 6:15-7:15 pm (Eastern time), relay from KDKA Pittsburgh Tues & Thurs, 11:30 pm to 1 am, (Eastern time), relay from KDKA. 1500 watts.

KFLA—Abner R. Willson, Box 1366, Butte, Mont. 254 meters, 1160 kilocycles, class A. Schedule irregular. 5 watts.

KFLB—Signal Elec. Mfg. Co., Box 75, Menominee, Mich. 248 meters, 1210 kilocycles, class A. Tues & Fri, 8-10 pm. No broadcasting during summer months. Slogan: "The Wave From Green Bay". 50 watts.

KFLE — National Educational Service, Inc., 939 So. University, Denver, Colo. 266 meters, 1130 kilocycles. class A. Daily 6:30-7 pm. Mountain standard time. Slogan: "The Station With the Good Modulation". 100 watts.

KFLP—Everette M. Foster, 1242 S. 6th St., Cedar Rapids, Ia. 256 meters. 1170 kilocycles, class A. 20 watts.

KFLR—Korber Wireless Station, the State University of New Mexico, Albuquerque, New Mexico. 254 meters, 1180 kilocycles, class A. Sat, 8-9:30 pm. Mountain time. Special programs as required. Slogan: "The Sunshine Center of America". 100 watts.

KFLU—San Benito Radio Club, San Benito, Texas. 236 meters, 1270 kilocycles. class A. Mon & Thurs, 8:30-10:30 pm. Sat. 8-11 pm. Central standard time. 15 watts.

KFLV—Swedish Evang. Miss. Church, Rockford, Ill. 229 meters, 1310 kilocycles, class A. 100 watts.

KFLX—George R. Clough, 1214—40th St., Galveston, Texas. 240 meters. 1250 kilocycles, class A. Tues & Fri, 8 pm. Sun, 4 pm. Central standard time. 10 watts.

KFLZ—Atlantic Automobile Co., 3rd & Poplar St., Atlantic Ia. 273 meters, 1100 kilocycles, class A. Wed, 6-7:30 pm, 9-11 pm. Sat. 9-11 pm. Sun, 4 pm, vespers. Central standard time. Slogan: "Where East Meets West". 100 watts.

KFMB—Christian Churches of Little Rock, Little Rock, Ark. 254 meters, 1180 kilocycles, class A.

KFMQ—University of Arkansas, Fayetteville, Ark. 299 meters. 1000 kilocycles, class B. Tues, 9 pm, music. Thurs, 7:30 pm, Radio extension courses. Special programs as announced. Central standard time. Slogan: "The Voice of the Ozarks". 500 watts.

KFMR—Morningside College, Sioux City, Ia. 261 meters, 1150 kilocycles, class A. Tues. Thurs & Sat, 8:55 am, 12:10 pm. Wed, 6-7 pm. Fri, 8:55 am. Central standard time. Slogan: "The College By the Sioux". 50 watts.

KFMT—Dr. Geo. W. Young, 2219 Bryant Ave. No., Minneapolis, Minn. 263 meters, 1140 kilocycles, class A. Mon, 7-8 pm. Thurs, 8-9 pm. Sun, 1:30-3:30 pm, Central standard time. Slogan: "See Young Again". 100 watts.

KFMW—M. G. Sateren, Houghton, Mich. 266 meters, 1130 kilocycles, class A. Sun, 3-4:30 pm. Central standard time. 50 watts.

KFMX — Carleton College, Northfield, Minn. 337 meters, 890 kilocycles. class B. Wed, concert with occasional lecture, 9 pm. Sun evening vesper service, 7 pm. Time signals daily ex Sun. Central standard time. 750 watts.

KFNF—Henry Field Seed Co., Shenandoah, Ia. 266 meters, 1130 kilocycles, class A. Daily ex Sun, 1235 pm. Daily ex Tues & Sun, 6:30 pm. Sun, 10:45 am, 3 pm and 6:30 pm. Central standard time. Slogans: "Keep Friendly Never Frown" also "Known for Neighborly Folks". 500 watts.

KFNG—Wooten's Radio & Elec. Co., Coldwater, Miss. 254 meters, 1180 kilocycles, class A. Sat, 9:30-10:30 pm, dance program. Sun, 4-5 pm, concert. Central standard time. Slogan: "The Most Powerful Ten Watt Station in the World". 10 watts.

KFNJ—Central Missouri State Teachers College, Warrensburg, Mo. 234 meters, 1280 kilocycles, class A. Tues, 8:15-9:15 pm. Sun, 3-4 pm, Organ. Central standard time. Slogan: "Education for Service'. 50 watts.

KFNL — Radio Broadcast Association, 1533 Vine St., Paso Robles, Calif. 240 meters, 1249 kilocycles, class A. Mon, 8-10 pm. Special programs as announced. Pacific standard time. 10 watts.

KFNV—L. A. Drake Battery & Radio Supply Shop, 505—3rd St., Santa Rosa, Calif. 234 meters, 1275 kilocycles, class A. Daily ex Sun, 2-3 pm, news, music, 6-6:30 pm, bedtime stories. Pacific coast time. Slogan: "The Home of Luther Burbank". 5 watts.

KFNY—V. Kemp Roberts, 40 Olive St., Helena, Mont. 248 meters, 1210 kilocycles, class A. 50 watts.

The GREBE SYNCHROPHASE

·TRADE MARK·

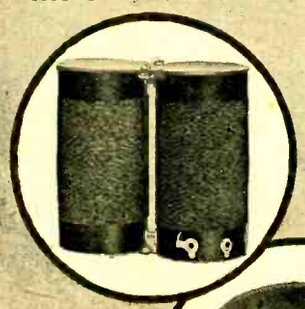
It is written:

"If there be no faith in our words, of what use are they?"

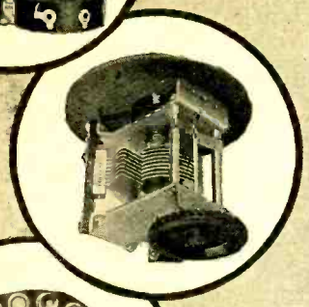
It is easy to prove the claims made for the Synchrophase.

Doctor Thy

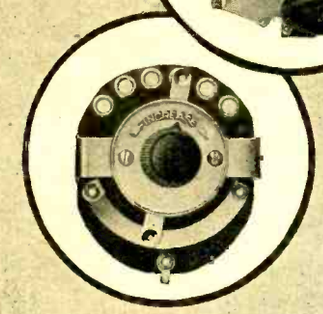
No other receiver has these features:



Binocular Coils



S-L-F Condensers



Volume Control

IF you have once operated a Synchrophase you will not be satisfied with any other type of receiver, because Grebe exclusive and fundamental features provide reception that is unsurpassed.

Binocular Coils, which keep the set balanced against local interference, provide greater selectivity and sensitivity.

S-L-F (straight line frequency) *Condensers* make tuning-in quick, easy and positive. All stations are spaced at equal intervals around the dials; short-wave stations are not crowded onto the lower numbers.

Grebe Volume Control gives six gradations of sound without detuning or reducing tube current; thus maintaining the true character and shading of every note.

In sets made up of assembled parts, the assembler has no control over their design and quality. Therefore, every detail of the Synchrophase is designed and built in the Grebe factory. Thus, all parts coordinate perfectly. This makes possible the perfect performance of the Synchrophase.

This perfection extends also to the Synchrophase cabinet. It is beautifully designed and built of solid mahogany, highly polished and with delicately embossed gold escutcheons.

Compare all sets before you buy, but be sure to have the Synchrophase demonstrated by your dealer.

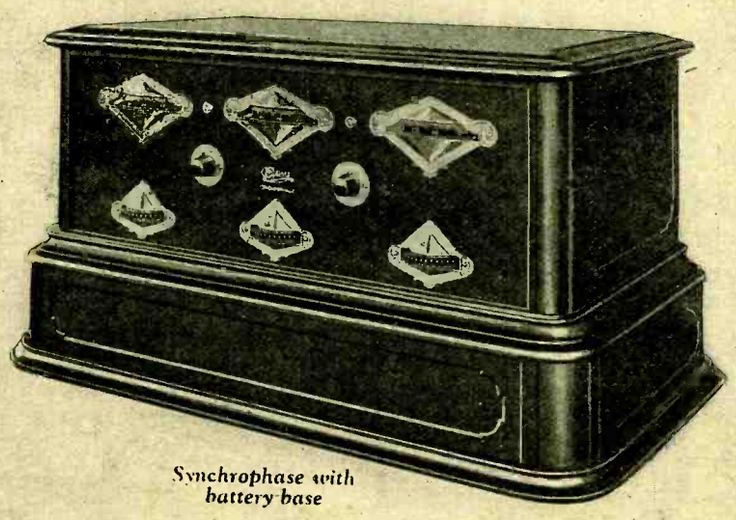
Ask your dealer or write us for full information

A. H. Grebe & Co., Inc.

Van Wyck Blvd., Richmond Hill, N. Y.

Western Branch: 443 So. San Pedro St., Los Angeles, Cal.

This company owns and operates station WAHG



Synchrophase with battery base

All Grebe apparatus is covered by patents granted and pending.

GREBE RADIO

TRADE MARK
REG. U.S. PAT. OFF.

KFNZ—Radio Sales Co., 1234 Burlingame Ave., Burlingame, Calif. 231 meters, 1304 kilocycles, class A. Daily ex Sun, 4-5 pm, news items. Mon, Wed, Fri & Sat, 7-8 pm, concert. Pacific standard time. 20 watts.

KFOA—Rhodes Dept. Store, 1321 Second Ave., Seattle, Wash. 450 meters, 660 kilocycles, class B. Tues, Wed & Fri, 12:30-1:30 pm. Daily ex Sun, 4-5:15 pm. Daily ex Thurs & Sun, 6:45-8:15 pm. Mon & Wed, 8-10 pm. Tues, Fri & Sat, 8-11 pm. Pacific standard time. Slogan: "Pacific Northwest Station". 500 watts.

KFOC—First Christian Church, Whittier, Calif. 236 meters, 1270 kilocycles, class A. 100 watts.

KFOD—The Radio Shop, Wallace, Ida. 224 meters, 1340 kilocycles, class A. 10 watts.

KFOJ—Moberly High School, Moberly, Mo., 246 meters, 1220 kilocycyles, class A. Schedule irregular. 5 watts.

KFOL—Leslie M. Schafbuch, Marengo, Ia. 234 meters, 1280 kilocycles, class A. 10 watts.

KFON—Echophone Radio Shop, Long Beach, Calif. 234 meters, 1280 kilocycles, class A. Mon, 7:30-11 pm. Tues, Wed, Fri & Sat, 2:30-4 pm, 6:30-11 pm. Sun, 11-12 am, 6:30-11 pm. Pacific standard time. Slogan: "Where Your Ship Comes In." 100 watts.

KFOO—Latter Day Saints University, Salt Lake City, Utah. 261 meters, 1150 kilocycles, class A. 5 watts.

KFOR—David City Tire & Elec. Co., David City, Nebr. 226 meters, 1330 kilocycles, class A. Wed. 9:30 pm. Sun, 7:30 pm. Slogan: "The Voice of David City". 20 watts.

KFOT—College Hill Radio Club, 1st & Erie Sts., Wichita, Kans., 231 meters, 1300 kilocycles, class A. Daily ex Sun, 9-10:30 pm, concert. Sun, 11-12:30 pm, 7:30-9 pm, church services. Central standard time. Slogan: "Kansas Grows the Best Wheat in the World". 50 watts.

KFOU—Hommel Mfg. Co., Richmond, Calif. 254 meters, 1180 kilocycyles, class A. 100 watts.

KFOX—Technical High School, Omaha, Nebr. 248 meters, 1210 kilocycles, class A. 100 watts.

KFOY—Beacon Radio Service, 375 Robert St., St. Paul, Minn. 252 meters, 1190 kilocycles, class A. 50 watts.

KFPG—Oliver S. Garretson, 5118 Maywood Ave., Los Angeles, Calif. 238 meters, 1260 kilocycles, class A. 10 watts.

KFPH—Harold C. Mailander, 992 Lake St., Salt Lake City, Utah. 242 meters, 1240 kilocycles, class A. 50 watts.

KFPL—C. C. Baxter, Dublin, Texas. 252 meters, 1190 kilocycles, class A. Mon & Thurs, 8 pm. Sat. 10 pm. Sun, 7 pm. Central standard time. 15 watts.

KFPM—New Furniture Co., Box 628, Greenville, Texas. 242 meters, 1240 kilocycles, class A. Tues, Wed & Fri, 7:45 pm, music. Thurs, 7:30 pm, latest Victor record releases. Sat, 10 pm, review. Sun, 11 am, church services; 7:15 pm, second and fourth Sundays each month. Central standard time. Slogan: "The Biggest Little Ten Watts in the Air'. 10 watts.

KFPR—Los Angeles Co. Forestry, Los Angeles, Calif. 231 meters, 1300 kilocycles, class A. 500 watts.

KFPT—Radio Service Corp. of Utah, Salt Lake City, Utah. 261 meters, 1150 kilocycles, class A. 500 watts.

KFPV—Heintz & Kohlmoos, 219 Natoma St., San Francisco, Calif. 236 meters, 1270 kilocycles, class A. 50 watts.

KFPW—St. Johns M. E. Church, Box 424, S. Carterville, Mo. 268 meters, 1120 kilocycles, class A. Tues, 9-11 pm. Fri, 8-10 pm. Sun, 1-3 pm, chapel service. Central standard time. Slogan: "Keeping Pace with Christ Means Progress." 20 watts.

KFPX—First Presbyterian Church, Pine Bluff, Ark. 242 meters, 1240 kilocycles, class A. Sun, 11 am to noon, 7:30-8:30 pm. Central standard time. 100 watts.

KFPY—Symons Investment Co., Spokane, Wash. 266 meters, 1130 kilocycles, class A. 100 watts.

KFQA—The Principia, 5539 Page Ave., St. Louis, Mo. 261 meters, 1150 kilocycles, class A. 50 watts.

KFQB—Searchlight Publishing Co., Fort Worth, Texas. 254 meters, 1180 kilocycles, class A. Daily ex Sun, 6 pm. Mon, Tues & Fri, 8:30 pm. Sun. 11 am. Central standard time. 100 watts.

KFQC—Kidd Bros. Radio Shop, Taft, Calif. 231 meters, 1300 kilocycles, class A. 100 watts.

KFQD—Chovin Supply Co., Anchorage, Alaska. 280 meters, 1070 kilocycles, class A. 100 watts.

KFQE—Dickenson-Henry Radio Laboratories, Colorado Springs, Colo. 224 meters, 1340 kilocycles, class A. 10 watts.

KFQG—Southern California Assn., Exposition Park, Los Angeles, Calif. 229 meters, 1310 kilocycles, class A. Mon, Thurs & Sat, 7-8 pm. Pacific standard time. 50 watts.

KFQH—Radio Service Co., Burlingame, Calif. 231 meters, 1300 kilocycles, class A. Schedule irregular. 50 watts.

KFQM—Texas Highway Bulletin, Austin, Texas. 268 meters, 1120 kilocycles, class A. 100 watts.

KFQN—Third Baptist Church, Portland, Ore. 283 meters, 1060 kilocycles, class A. 10 watts.

KFQO—Meier Radio Shop, Russell, Kansas. 261 meters, 1150 kilocycles, class A. Mon & Wed, 8-10:30 pm, musical concert. Fri, 7:30-9 pm, concert and late oil news. Sun, 1-2 pm, special concert. Central standard time. Slogan: "The Oil City". 10 watts.

KFQP—George S. Carsen, Jr., 906 College St., Iowa City, Ia. 224 meters, 1340 kilocycles, class A. Wed, 8-9 pm. Sun, 9-12 pm. Central standard time. 10 watts.

KFQR—Walter L. Ellis, 625 E. 6th St., Oklahoma City, Okla. 209 meters, 1430 kilocycles, class A. Daily 9:30 pm. Central standard time. 50 watts.

KFQT—Texas National Guard, 36th Signal Co., Denison, Texas. 252 meters, 1190 kilocycles, class A. Tues & Fri, 8-8:45 pm. Central standard time. 10 watts.

KFQU—Holy City Broadcasting Station, Holy City, (Alma, P.O.) Calif. 234 meters, 1280 kilocycles, class A. Daily ex Mon & Sun, 9-10 pm. Sun, 11-12 noon and 9-10 pm. Pacific coast time. 100 watts.

KFQW—Photo Radio & Electric Shop, North Bend, Wash. 215 meters, 1390 kilocycles, class A. Daily including Sun, 7:30-8:30 pm. Pacific standard time. Slogan: "At the Western Entrance of the Snoqualmie Pass". 50 watts.

KFQX—Alfred H. Hubbard, 310 Green Bldg., Seattle, Wash. 233 meters, 1290 kilocycles, class A. 500 watts.

KFQY—Farmers State Bank, Belden, Nebr. 273 meters, 1100 kilocycles, class A. Tues, 9 pm. Sun, 2 pm. 10 watts.

KFQZ—Taft Radio Co., Hollywood, Calif. 240 meters, 1250 kilocycles, class A. 250 watts.

KFRB—Hall Brothers (Rialto Theatre), Beeville, Texas. 248 meters, 1210 kilocycles, class A. Fri, 10 pm to 12 midnight. Central standard time. Slogan: "Boost Better Beeville". 250 watts.

KFRC—Radioart Corp., 347 Geary St., San Francisco, Calif. 270 meters, 1110 kilocycles. class A. Daily including Sun, 6:30-7:30. Tues, Wed & Thurs, 8-10 pm. Sun & Fri, 8-12 midnight. Wed, 11 pm to 1 am. Pacific standard time. Slogan: "Keep Forever Radiating Cheer." 50 watts.

KFRF—W. R. Brown, 222 Florence Ave., Alexandria, La. 242 meters, 1240 kilocycles, class A. 10 watts.

KFRH—The Radio Shop, 317 Hill Ave., Grafton, N. D. 268 meters, 1120 kilocycles, class A. 10 watts.

KFRJ—Guy Simmons, Jr., Conway, Ark. 250 meters, 1200 kilocycles, class A. 10 watts.

KFRL—First Presbyterian Church, Grand Forks, N. D. 240 meters, 1250 kilocycles, class A. Sun, 7:45 pm. Central standard time. 10 watts.

KFRM—Lieut. James P. Boland, Fort Sill, Okla. 263 meters, 1140 kilocycles, class A. Sun, 4:30 and 7:30 pm. Central standard time. Slogan: "Voice of the Prairie". 50 watts.

KFRN—M. Laurence Short, Hanford, Calif. 224 meters, 1340 kilocycles, class A. 5 watts.

KFRO—Curtis Printing Co., 1109 Eighth Ave., Ft. Worth, Tex. 246 meters, 1220 kilocycles, class A. Mon, 8-9 pm, lectures. Wed, 11-12 pm, concert. Thurs, 8:30-9:30 pm. lectures. Fri, 10:30-11:30 pm. concert. Sat, 6:30-7:30 pm, concert. Sun, 6-7 pm, Seventh Day Adventists Mass. Central standard time. Slogan: "Who Does Your Printing". 50 watts.

KFRP—Trinity Episcopal Church, Redlands, Calif. 206 meters, 1450 kilocycles, class A. 50 watts.

KFRQ—Radio Market Service Co., Portland, Ore. 213 meters, 1410 kilocycles, class A. 10 watts.

KFRU—Etherical Studios. Bristow, Okla. 296 meters, 1010 kilocycles, class B. Daily 12 noon to 1:30 pm; 3-4:30 pm. Mon, Wed, Sun & Fri evenings. Central standard time. 500 watts.

KFRW—United Churches, Olympia, Wash. 220 meters, 1360 kilocycles, class A. Thurs, 9-9:30, Bible study. Sunday, 11 am and 7:30 pm, church services. Pacific standard time. Slogan: "Make the World a Brotherhood." 100 watts.

KFRX—J. G. Klemgard, Route No. 2, Pullman, Wash. 217 meters, 1370 kilocycles, class A. Schedule irregular; daily, 9-12 pm. Pacific standard time. Slogan: "The Only Farmers' Radio Station in the World." 10 watts.

KFRY—New Mexico College of Agriculture, State College, N. Mex. 266 meters, 1130 kilocycles, class A. 50 watts.

KFRZ—The Electric Shop (P. M. Thies) Hartington, Neb. 222 meters, 1350 kilocycles, class A. Daily ex Sun, 11:45 am, 4:15-5:15 pm. Sun, 12 noon, 4:15 pm. Slogan: "Boosting for Light and Music." 15 watts.

KFSG—Echo Park Evangelistic Ass'n, 1100 Glendale Blvd., Los Angeles, Calif. 278 meters, 1080 kilocycles, class A. Tues, Thurs, Fri & Sat, 3:30-4:30 pm. Tues, 8:30-7:30 pm. Wed, 2:30-4:30, 6:30-7:30 pm. Thurs, Fri & Sat, 7:30-11 pm. Sun, 10:30 am to 12 noon, 2:30-4:30 and 7-9:30 pm. Pacific standard time. 500 watts.

KFSY—Van Blaricom Co., 20 So. Main, Helena, Mont. 248 meters, 1210 kilocycles, class A. Wed, 7:30 pm. Mountain time. 10 watts.

KFUJ—Hoppert Plumbing & Heating Co., Breckenridge, Minn. 242 meters, 1240 kilocycles, class A. Daily, 10:30 am, weather; 10:40 am, markets; 1:30 pm, markets; 5:40 pm, weather; 5:45 pm, markets. Mon & Wed, 8-9 pm, concert. Central standard time. Slogan: "Where the Red River of the North Finds Its Source." 50 watts.

KFUL—Thos. Goggan & Bro. Music Co., Galveston, Tex. 258 meters, 1160 kilocycles, class A. Schedule irregular. 10 watts.

KFUM—City of Colorado Springs, 226 Hagerman Bldg., Colorado Springs, Colo. 242 meters, 1240 kilocycles. class A. Tues & Sat, 8:30-10:30 pm, music. Sun, 7:45 pm, church services. Mountain time. Slogan: "City of Sunshine.' 100 watts.

KFUO—Concordia Theological Seminary, St. Louis, Mo. 549 meters, 546 kilocycles, class B. Wed & Sun, 9:15 pm. 500 watts.

KFUP—Fitzsimons Gen'l Hospital, Denver, Colo. 234 meters, 1280 kilocycles, class A. 50 watts.

KFUQ—Julius Brunton & Sons Co., San Francisco, Calif. 234 meters, 1280 kilocycles, class A. 5 watts.

KFUR—H. E. Peery & Glenn Garner, 420 25th St., Ogden, Utah. 224 meters, 1340 kilocycles, class A. Tues, Thurs & Sat, 9-12 midnight. Mountain time. 50 watts.

KFUS—Louis L. Sherman, Oakland, Calif. 233 meters, 1290 kilocycles, class A. 50 watts.

KFUT—University of Utah, Salt Lake City, Utah. 261 meters, 1150 kilocycles, class A. Tues & Thurs. 12 noon to 1 pm. Mountain time. 100 watts.

KFUU—Colburn Radio Laboratories, 448 Dowling Blvd., San Leandro, Calif. 224 meters, 1340 kilocycles, class A. Daily ex Sun, 10-11 am. Wed, 8-10 pm. Sun, 2-3 pm. Pacific Coast time. Slogan: "The Voice of the Cherry Valley." 100 watts.

KFUV—G. Pearson Ward, 236 W. State St., Springfield, Mo. 252 meters, 1190 kilocycles, class A. 10 watts.

KFUW—Earl W. Lewis, 417 E. Carpenter St., Moberly, Mo. 233 meters, 1290 kilocycles, class A. Schedule indefinite. 10 watts.

KFUY—Irvine H. Bouchard, 5 S. Excelsior Ave., Butte, Mont. 254 meters, 1180 kilocycles, class A. 5 watts.

KFUZ—Y. M. C. A. 510½ Chestnut St., Virginia, Minn. 248 meters, 1210 kilocycles, class A. 10 watts.

KFWB—Warner Bros. Pictures, Inc., 5842 Sunset Blvd., Hollywood, Calif. 252 meters, 1190 kilocycles, class A. 500 watts.

KFWC—L. E. Wall & C. S. Myers, Stoddard Canyon, Upland, Calif. 211 meters, 1420 kilocycles, class A. 10 watts.

KGB—Tacoma Ledger, Tacoma, Wash. 249 meters, 1198 kilocycles, class A. Mon, Wed & Fri, 7-9 pm. Pacific standard time. Slogan: "Tacoma, the Lumber Capital of America" and "The Gateway to Mt. Tacoma." 50 watts.

KGO—General Elec. Co., 5555 E. 14th St., Oakland, Calif. 300 meters, 1000 kilocycles, class B. Daily ex Sat & Sun, 11:30-1 pm, luncheon concert; 1:30 pm, stock market, weather (Sat 12:30 pm) and 6:45 pm. Mon, 9 am and 4-5:30 pm, orchestra; 5:30-6, children's half-hour. Mon & Thurs, 10:40 am. Mon, Wed & Fri, 3 pm. Tues, Wed, Thurs, Fri & Sat, 4-5:30 pm, concert. Fri, 5:30-6 pm. Mon, Tues, Thurs & Sat. 8-10 pm; 10 pm to 1 am. Sun. 11 am, 3:30-5 pm, 7:45 pm. Pacific standard time. 1000 watts.

KGU—Marion A. Mulrony, 236 S. King St., Honolulu, Hawaii. 360 meters, 834 kilocycles. Daily, 7:30-9 pm. 2½ hours later than Pacific standard time. 500 watts.

KGW—The Morning Oregonian, Portland, Ore. 492 meters. 610 kilocycles, class B. Mon. 11:30-11:35 am, 5-5:30, 7:15-8, 8-9, 10-12 pm. Tues, Wed. Thurs & Fri, 11:30-11:35 am, 12:30-1:30 pm, 5-5:30, 7:15-8 pm. Tues, 8-8:30, 8:30-9:30, 10 pm to 12 midnight. Wed, 8-9 pm, 10-12 midnight. Fri, 8-8:30, 10:30-12 midnight. Sat. 11:30-11:35 am, 10-12 pm. Sun, 10:30-12 am, 3-5, 6-7, 7-8 pm. Pacific standard time. Slogan: "Keep Growing Wiser.' 500 watts.

KGY—St. Martin's College, Lacey. Wash. 246 meters, 1220 kilocycles, class A. Tues, Fri & Sat, 8:30-9:30 pm. Pacific standard time. Slogan: "Out Where the Cedars Meet the Sea." 5 watts.

KHJ—Times-Mirror Co., Los Angeles, Calif. 404 meters, 742 kilocycles, class B. Daily ex Sun & Mon, 12:30-1:30 pm, 2:30-3:30 pm, 6-7:30 pm, 8-11:30 pm. Mon, 12:30-1:30 pm. Sun, 10 am to 12:30 pm, 6:30-7:30 and 8-10 pm. Pacific standard time. 500 watts.

KHQ—Louis Wasmer, Excelsior Motorcycle & Bicycle Co., Seattle, Wash. 273 meters, 1100 kilocycles, class A. 100 watts.

KJQ—Gould, the Light Man, 615 E. Main St., Stockton, Calif. 255 meters, 1180 kilocycles, class A. Wed & Sat, 9-11 pm, dance music. Pacific standard time. 5 watts.

KJR—Northwest Radio Service Co., 1328 Sixth Ave., Seattle, Wash. 399 meters. 720 kilocycles, class B. Daily ex Sun, 4:30-6 pm, Post-Intelligencer. Mon. Wed & Fri, 8:30-10 pm. Thurs, 7:30-10 pm, School for Boys. Sun, 10:30 am, church services; 4:30-5 pm, organ recital; 5 pm, vesper services. Pacific standard time. 1000 watts.

KJS—Bible Institute of Los Angeles. 536 S. Hope St., Los Angeles, Calif. 293 meters, 1020 kilocycles, class B. Tues & Thurs, 8 pm. Sun, 10:45 am to 12:30 pm, 6-6:45 and 7:15-9:30 pm. Pacific standard time. 750 watts.

KLDS—Reorganized Church of Jesus Christ of Latter Day Saints, Box 255, Independence, Mo. 268 meters, 1120 kilocycles, class A. Tues & Thurs. 9 pm. Sun, 11 am and 7:30 pm. Central standard time. Slogan: "Dedicated to Knowledge, Liberty, Divinity, and Service." 250 watts.

KLS—Warner Bros., 2201 Telegraph, Oakland, Calif. 248 meters, 1190 kilocycles, class A. Sun, 10-11 am. Pacific standard time. Slogan: "City of Golden Opportunity." 250 watts.

KLX—The Tribune, Oakland, Calif. 509 meters, 588 kilocycles, class B. Mon, 6-7, 7-7:30 pm, 8-11 pm. Tues, Wed, Fri, 3-5, 6-7, 7-7:30 pm. Wed, 8-10:15 pm. Fri, 8-12 midnight. Thurs & Sat, 3-5, 7-7:30 pm. Pacific standard time. Slogan: "Where Rail and Water Meet." 500 watts.

KLZ—Reynolds Radio Co., 1534 Glenarm St., Denver, Colo. 266 meters, 1150 kilocycles, class A. Tues & Thurs, 8:15-9:30 pm. Sun. 9-10. Mountain time. Slogan: "Tis a Privilege to Live in Colorado" (with canary bird whistle). 250 watts.

KMJ—San Joaquin Light & Power Corp., Fresno, Calif. 234 meters, 1280 kilocycles, class A. Wed, 9-9:30 am, educational. Fri, 8-9 pm, community program. Schedule irregular. Pacific standard time. Slogan: "Home of the Raisin." 50 watts.

KMO—Association Station (Love Elec. Co.), Tacoma, Wash. 250 meters, 1200 kilocycles, class A. Mon, Wed & Fri, 6-7 and 9-10 pm. Pacific standard time. 10 watts.

KNT—Walter Hemrich, Kukak Bay, Alaska (P. O. Box 511, Aberdeen, Wash.). 263 meters, 1140 kilocycles, class A. 100 watts.

KNX—Los Angeles Evening Express, Hollywood, Calif. 336 meters, 890 kilocycles, class B. Daily ex Sun, each hour from 8 am to 6 pm, 6-12 midnight, concert. Mon, silent 6-8 pm. Sun, 5-6 and 7-11 pm. Pacific standard time. Slogan: "In the Heart of Hollywood." 500 watts.

KOA—General Electric Co., 1370 Krameria St., Denver, Colo. 323 meters, 930 kilocycles, class B. Daily ex Sun, 12-12:30 pm, organ recital; 1-1:30 pm, stocks; 6-6:30 pm, stocks. Tues & Fri, 6:30-7 pm, stocks. Daily ex Sat & Sun, 8-10 pm, studio program. Sat, 9-12:30, dance music. Sun, 11 am and 7:30 pm, church services. Mountain time. Slogan: "Rocky Mountain Broadcasting Station." 1500 watts.

KOB—New Mexico College of Agriculture and Mechanic Arts, State College, New Mexico. 348 meters, 860 kilocycles, class B. Daily, 9:55-10 am, 11:55-12 noon, time signals; 10-10:02 pm, 12 noon to 12:02 pm, weather. Mon, Wed & Fri, 7:30-8:30 pm, concert, lectures, etc. Mountain time. Slogan: "The Sunshine State of America." 500 watts.

KOP—Detroit Police Headquarters, 1300 Beaubien St., Detroit, Mich. 277 meters, 1090 kilocycles. class A. Daily ex Sun & Holidays, 1 pm and 6:30 pm, police reports. Emergencies broadcast any time. Eastern standard time. Slogan: "Safety First." 500 watts.

KPO—Hale Bros., Inc., Market and Fifth Sts., San Francisco, Calif. 429 meters, 700 kilocycles, class B. Daily ex Sun & Mon, 7 am. Daily ex Sun, 10:30-10:45 am. Daily ex Fri & Sun, 1-2 pm. Mon, Tues & Thurs, 4:30-6:30 pm, 7-7:30, 8-11 pm. Wed, 2:30-3:30, 4:30-6:30, 7-7:30, 8-12 midnight. Fri, 12:45-2 pm, 4:30-5:30, 8-10 pm. Sat, 2:30-5:30, 8-12 midnight. Sun & Mon, 11 am. Sun, 8:30-10 pm. Pacific Coast time. Slogan: "City by the Golden Gate." 500 watts.

KPPC—Pasadena Presbyterian Church, Pasadena, Calif. 229 meters, 1310 kilocycles, class A. Wed, 7:45-9 pm. Sun, 10:30 am to 1 pm, 7-9 pm, services. One or two extra programs broadcast during the week. Pacific standard time. 50 watts.

KQP—Read's Radio Shop, Hood River, Ore. 270 meters, 1110 kilocycles, class A. Slogan: "Eat Hood River Apples." 10 watts.

KQV—Doubleday-Hill Electric Co., 719 Liberty Ave., Pittsburgh, Pa. 276 meters, 1090 kilocycles, class A. Daily ex Sun, 10:30 am. Daily ex Sat & Sun, 3 pm. Mon, Wed & Fri, 9 pm, concert. Eastern standard time. 500 watts.

KQW—Charles D. Herrold, San Jose. Calif. 240 meters, 1250 kilocycles, class A. Daily ex Sun, 1-1:30 pm. Wed, 8-9 pm. Pacific standard time. 50 watts.

KRE—Berkeley Daily Gazette, Berkeley, Calif. 275 meters, 1090 kilocycles, class A, 50 watts. Sun, 10 am, 8-9:30 pm, church services. Tues, 8-10 pm. Wed & Sat, 8-12 midnight. Thurs, 8-9:30 pm, concert. Pacific standard time, 50 watts.

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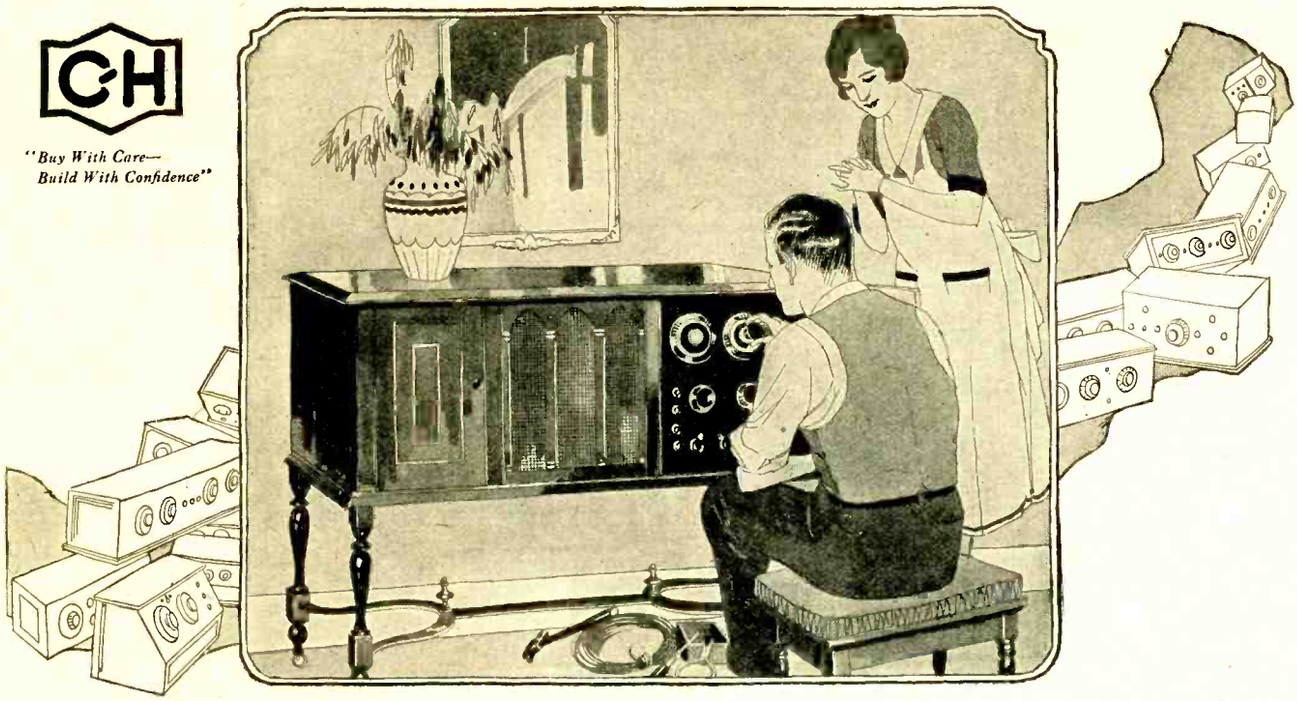
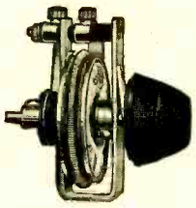


The Better You Build—*The More Carefully You Must Buy!*



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The new lock for your radio set. Protects tubes and batteries from meddling fingers and the children. Carry the key on your ring.

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

KSAC—Kansas State Agricultural College, Manhattan, Kans. 341 meters, 882 kilocycles, class B. Daily ex Sat & Sun, 9-9:30 am, 10-10:30 am, housewives' program; 12:30-1 pm, farmers noonday program; 7:20-8 pm, "College of the Air." Thurs, 8-9 pm, music. Sun, 8-9 pm, Sunday service. Central standard time. Slogan: "Knowledge, Science, and Culture." 500 watts.

KSD—St. Louis Post-Dispatch, 12th and Olive Sts., St. Louis, Mo. 549 meters, 546 kilocycles class B. Mon, 7 and 9 pm. Tues, 6 and 9 pm. Wed, 6:45 and 11 pm. Fri & Sat, 8 pm. Central standard time. 500 watts.

KTHS—New Arlington Hotel Co., Hot Springs, Ark. 374 meters, 800 kilocycles, class B. Daily ex Sun, 12:30-1:30 pm, markets, weather, orchestra; 8:30-10 pm, concert. Mon, Wed & Sat, 10-11 pm, dance music. Sun, 11 am, 8:30-10 and 10-11:30 pm. Central standard time. 500 watts.

KTW—First Presbyterian Church, Terminal St. Seattle, Wash. 455 meters, 658 kilocycles, class B. Sun, 11-12:30 pm, 3-4:30 and 7:15-9:30 pm. Pacific standard time. 1000 watts.

KUO—Examiner Printing Co., San Francisco, Calif. 246 meters, 1220 kilocycles, class A. 150 watts.

KWG—Portable Wireless Tel. Co., Stockton, Calif. 247 meters, 1210 kilocycles, class A. Daily ex Sun, 4-5 pm, news, markets. Tues & Fri, 8-9 pm. Sun, 2-3 pm, concert. Pacific standard time. 50 watts.

KWH—Los Angeles Examiner, Broadway at 11th St., Los Angeles, Calif. 360 meters, 833 kilocycles, class B. Schedule irregular. 250 watts.

KYQ—The Electric Shop, Fort and Beretania Sts., Honolulu, Hawaii. 270 meters, 1110 kilocycles, class A. 100 watts.

KYW—Westinghouse Elec. & Mfg. Co., 111 W. Washington St., Chicago, Ill. 536 meters, 560 kilocycles, class B. Daily ex Sun, latest news every half hour (ex from 7-12 pm). Tues & Thurs, 2:35-4 pm, 10 pm to 2:30 am. Fri & Sat, 9:30 pm to 2:30 am. Sun, 11 am, church service; 4-5 pm, concert; 7 pm, Sunday Evening Club service. Central standard time. 1500 watts.

KZKZ—Electrical Supply Co., 109 Plaza Moraga, Manila, P. I. 270 meters, 1110 kilocycles, class A. 100 watts.

KZM—Preston D. Allen, Hotel Oakland, Oakland, Calif. 241 meters. 1240 kilocycles, class A. Daily ex Sun, 6:30-7 pm, orchestra. Pacific standard time. 100 watts.

KZRQ—Far Eastern Radio, Inc., Manila Hotel, Manila, P. I. 222 meters, 1350 kilocycles, class A. 500 watts.

KZUY—F. Johnson Elser, Manila, P. I. 370 meters, 810 kilocycles, class B. 500 watts.

WAAB—Valdemar Jenson, 137 S. St. Patrick St., New Orleans, La. 268 meters, 1120 kilocycles, class A. 100 watts. Sun, 2-3 pm. Other programs as announced.

WAAC—Tulane University, New Orleans, La. 273 meters, 1090 kilocycles, class A. Fri, 7:30-9:30 pm, education and entertainment. Central standard time. 100 watts.

WAAD—Ohio Mechanics Institute, Cincinnati, Ohio. 258 meters, 1160 kilocycles, class A. Schedule irregular. Concerts and lectures as announced. 25 watts.

WAAF—Chicago Daily Drovers Journal, 836 Exchange Ave., Chicago, Ill. 278 meters, 1080 kilocycles, class A. Daily ex Sun & holidays, 8:40 am, markets; 10:30 am, weather; 10:45 am, markets; 12:30 pm, weather; 12:45 pm, markets; 3 pm, markets; 4:30 pm, Eastern meat trade conditions. Sat, final weather and markets, 12:30 pm. Central standard time. 200 watts.

WAAM—I. R. Nelson Co., Bond St., Newark, N. J. 264 meters, 1140 kilocycles, class A. Daily ex Sat & Sun, 11-12 noon. Mon, Fri & Sat, 6:15-11 pm. Tues & Wed, 7-11 pm. Eastern standard time. Slogan: "We Are American Manufacturers." 250 watts.

WAAN—University of Missouri, Columbia, Mo. 254 meters, 1180 kilocycles, class A. 50 watts.

WAAW—Omaha Grain Exchange, 19th and Harney St., Omaha, Neb. 278 meters, 1080 kilocycles, class A. Daily ex Sun, market reports. Thurs, 7:30-9 pm, educational night. Central standard time. Slogan: "Where Agriculture Accumulates Wealth." 500 watts.

WABA—Lake Forest College, Lake Forest, Ill. 227 meters, 1320 kilocycles, class A. Wed, 7 pm. Daily chapel at 10 am. Central standard time. 100 watts.

WABB—Harrisburg Sporting Goods Co., Harrisburg, Pa. 266 meters, 1130 kilocycles, class A. Tues & Fri, 8 pm. Sun, 9 pm, church services. Eastern standard time. 10 watts.

WABH—Lake Shore Tire Co., Sandusky, Ohio. 240 meters, 1250 kilocycles, class A. 10 watts.

WABI—Bangor Ry. & Elec. Co., Bangor, Maine. 240 meters, 1250 kilocycles, class A. Daily ex Sun, 5 pm, markets. Wed night, concert. Eastern standard time. 100 watts.

WABL — Connecticut Agricultural College, Storrs, Conn. 275 meters, 1090 kilocycles, class A. Mon, Wed & Fri, 7-9 pm. Eastern standard time. 100 watts.

WABM—F. E. Doherty Co., 901 E. Genesse St., Saginaw, Mich. 261 meters, 1150 kilocycles, class A. Daily ex Sun, 10:15 am, 2:30 and 6 pm. Mon, 8 pm, studio. Tues, Thurs & Fri, 6 pm, Hotel Bancroft. Wed, 9:15, dance program, 12:30 am, studio. Sat, 9:30, dance program; 12:30 am, midnight frolic. Sun, 12:30 pm, dinner program; 7:30 pm, church services. Central standard time. 300 watts.

WABN—Ben Ott, La Crosse, Wis. 244 meters, 1230 kilocycles, class A. Mon & Thurs, 9 pm to 12 midnight. Central standard time. Slogan: "The City Beautiful on the Banks of the Mississippi." 500 watts.

WABO — Lake Ave. Baptist Church, Rochester, N. Y. 277 meters, 1080 kilocycles, class A. Sun, 10:15 am to 12 noon, 7:15-9 pm. Eastern standard time. 100 watts.

WABQ—Haverford College Radio Club, Haverford, Pa. 261 meters, 1150 kilocycles, class A. Tues, 8-9 pm, educational; Thurs, 9-11 pm, music. Eastern standard time. 50 watts.

WABR—Scott High School, Toledo, Ohio. 263 meters, 1140 kilocycles, class A. Fri, 8:15-9 pm. Eastern standard time. 50 watts.

WABU—Victor Talking Mach. Co., Camden, N. J. 226 meters. 1330 kilocycles, class A. 50 watts.

WABW—College of Wooster, Wooster, Ohio. 206 meters, 1450 kilocycles, class A. 20 watts.

WABX—Henry B. Joy, 1830 Penobscot Bldg., Detroit, Mich. 254 meters, 1180 kilocycles, class A. 250 watts.

WABY—John Magaldi, Jr., 815 Kimball St., Philadelphia, Pa. 242 meters, 1240 kilocycles, class A. Sun, 9 pm. Eastern standard time. Slogan: "Quaker City Sleep Dodgers." 50 watts.

WABZ—Coliseum Place Baptist Church, Camp and Teopsichone Sts., New Orleans, La. 275 meters, 1090 kilocycles, class A. Wed, 9-10 pm. Sun, 11 am to 12 noon, 7:45-9 pm. Central standard time. Slogan: "The Station with a Message." 100 watts.

WAHG—A. H. Grebe & Co., Inc., Richmond Hill, L. I., New York. 315 meters. 950 kilocycles, class B. Mon, 7:30-11:45 and 12 midnight to 2 am. Wed & Fri, 12-1 pm, 7:30-12 midnight. Eastern standard time. Slogan: "Wait and Hear Grebe." 500 watts.

WAIT—A. H. Waite & Co., Inc., Taunton, Mass. 229 meters, 1326 kilocycles, class A. Fri 8-11 pm, music. Eastern standard time. 10 watts.

WBAA — Purdue University, Dept. of Electrical Engineering, W. Lafayette, Ind. 273 meters, 1100 kilocycles, class A. Daily ex Sun, 9:50 am, weather and Indianapolis markets. Mon & Fri, 7:15 pm, agricultural lecture. Central standard time. 250 watts.

WBAK—Pennsylvania State Police, Harrisburg, Pa. 400 meters, 749 kilocycles, class B. Daily ex Sun, 10:30 am, 1:30 pm, 5:45 pm, 12:30 am. Eastern standard time. 500 watts.

WBAN—Wireless Phone Corp., 193 Ellison St., Paterson, N. J. 244 meters, 1230 kilocycles, class A. Daily ex Sun, 9-11:30 am, 12:30-5:30 pm (ex Sat). Sun, 10 am to 12 noon, 2-5, and 7:30-10:30 pm. Eastern standard time. Slogan: "The Silk City of America." 100 watts.

WBAO—James Milliken University, Decatur, Ill. 275 meters, 1100 kilocycles, class A. Schedule irregular. 100 watts.

WBAP—The Star-Telegram, Fort Worth, Tex. 476 meters, 630 kilocycles, class B. Daily ex Sun, 10 am, 11 am, 12 noon, 1, 2, and 3 pm; 4 pm, Missing Men and Texas Sheriffs. Daily ex Sat & Sun, 12:05-12:30 pm, 7:30-8:30 pm, 9:30-10:45 pm. Sat 7 pm, Sun 11 am, church services; 4 pm, organ; 11 pm, popular concert. Central standard time. 1000 watts.

WBAV—Erner & Hopkins Co., 146 N. Third St., Columbus, Ohio. 293 meters, 1020 kilocycles, class A. Daily ex Sun, 12 noon to 1 pm. Mon & Fri, 8-10 pm. Eastern standard time. 500 watts.

WBAX—John H. Stenger, Jr., Box No. 104, Wilkes-Barre, Pa. 256 meters, 1170 kilocycles, class A. Tues, Wed, Thurs & Sat, 9:30 pm to 12 midnight. Sun, 6-9 pm, dance music, dinner concert, etc. Eastern standard time. Slogan: "In Wyoming Valley, Home of the Anthracite." 100 watts.

WBAY—A. T. & T. Co., New York, N. Y. 492 meters, 610 kilocycles, class B. 500 watts.

WBBA—Plymouth Congregational Church, Newark, Ohio. 225 meters, 1330 kilocycles. class A. Fri, 7:30 pm. music. Sun, 11 am, church services; 7:30 pm, church services. Eastern standard time, 20 watts.

WBBD—Barbey Battery Service, Fourth and Walnut Sts., Reading, Pa. 234 meters. 1280 kilocycles, class A. Wed & Sat. 10-11:30 pm. Eastern standard time. 50 watts.

WBBG — Irving Vermilya, Mattapoiset, Mass. 248 meters, 1210 kilocycles, class A. Mon, Wed & Fri, 8-10:30 pm, dance music, radio drama. Sat midnight, tests. Sun, 10:45 am, church services. Eastern standard time. Slogan: "The Voice from Cape Cod." 500 watts.

WBBH — J. Irving Bell, Port Huron, Mich. 205 meters, 1460 kilocycles, class A. 50 watts.

WBBJ—Neel Electric Co., West Palm Beach, Fla. 258 meters, 1170 kilocycles, class A. Tues, Thurs & Fri, 8-10 pm. Sun, 11 am to 12 noon, 7:30-9 pm. Eastern standard time. Slogan: "Where Summer Spends the Winter." 50 watts.

WBBL—Grace Covenant Church, Richmond, Va. 229 meters, 1310 kilocycles, class A. Tues, 8 pm, musical program. Sun, 11 am, church services; 7:45 pm, organ recital; 8 pm, service. Eastern standard time. Slogan: "The Gateway North and South." 50 watts.

WBBM—H. Leslie Atlass, 1554 Howard St., Chicago, Ill. 226 meters, 1330 kilocycles, class A. Tues. Thurs & Sat, 8 pm. Central standard time. Slogan: "We Broadcast Broadmore Music." 200 watts.

WBBP—Petoskey High School, Petoskey, Mich. 214 meters, 1400 kilocycles, class A. Wed. 8-9 pm. Central standard time. 100 watts.

WBBR—People's Pulpit Ass'n, 124 Columbus Heights, Brooklyn, N. Y. 273 meters. 1100 kilocycles, class A. Mon, Wed & Sat, 8-9 pm. Thurs & Sun, 9-10:30 pm, Eastern standard time. 500 watts.

WBBS—First Baptist Church, New Orleans, La. 252 meters, 1190 kilocycles, class A. Wed, 7:45-8:30 pm. Sun, 11 am to 12:30 pm. Central standard time. 50 watts.

WBBU—Jenks Motor Sales Co., Monmouth, Ill. 224 meters, 1340 kilocycles, class A. 10 watts.

WBBV — Johnstown Radio Co., Johnstown, Pa. 248 meters. 1210 kilocycles, class A. 5 watts.

WBBW — Ruffner Junior High School, Norfolk, Va. 222 meters, 1350 kilocycles, class A. Fri, 8 pm. Eastern standard time. Slogan: "The School You'd Like To Go To." 50 watts.

WBBY — Washington Light Infantry, Charleston, S. C. 268 meters, 1120 kilocycles, class A. 10 watts.

WBBZ—Noble B. Watson, 233 Iowa St., Indianapolis, Ind. 227 meters, 1320 kilocycles, class A. Varied programs, 8:30-10 pm. Sun, special programs 3-4 pm. Central standard time. Slogan: "Near the Center of Population of the United States." 50 watts.

WBCN — Southtown Economist Station, 730 W. 65th St., Chicago, Ill. 266 meters, 1130 kilocycles, class A. Daily ex Sun, 6-7 pm, juvenile. Tues, Thurs & Sat, 7-8 pm, classical concert; 8-12, popular concert, talks and stories; 12-1 am, Pirate Ship Club. Wed & Fri, 7-10, classical and popular concerts. Sun, 10:30 am to 12:15, church; 4-5, organ and vocal; 7-8 pm, concert; 8-10 pm, popular concert. Central standard time. Slogan: "World's Best Community Newspaper." 500 watts.

WBDC—The Baxter Laundry Co., 747 Fountain St. N. E., Grand Rapids, Mich. 256 meters, 1170 kilocycles, class A. Daily ex Sun, 5:30-6 pm. Mon, 7-9:30 pm. Daily ex Mon & Sun, 7-8 pm. Sun, 10-11:30 am. Slogan: "World Wide Baxter Dry Cleansing." 50 watts.

WBES—Bliss Electrical School, Takoma Park, Md. 222 meters, 1350 kilocycles, class A. 100 watts.

WBR—Pennsylvania State Police, Troop D, Butler, Pa. 258 meters, 1160 kilocycles, class A. Daily ex Sun, 9:30, 10, 10:30 am, 1, 1:30, 2, 5:30, 5:45, 6:15 pm., midnight, 12:30-1 am. Eastern standard time. 250 watts.

WBRE — Baltimore Radio Exchange, Wilkes-Barre, Pa. 231 meters, 1300 kilocycles, class A. Mon, Wed & Fri, 1:30-4 pm. Tues & Sat, 9 pm to 12 midnight. Alternating Sundays, 2-5 pm. Eastern standard time. 10 watts.

WBS—D. W. May, Inc., 325 Central Ave., Newark, N. J. 252 meters, 1190 kilocycles, class A. Mon, Thurs & Sat, 5:30-7 pm and 8:30-12 midnight. Tues, Wed & Fri, 7:8:30 pm. Fri, 12 pm to 1:15 am. Sun, 12 noon to 5:30 pm, and 7-9 pm. Eastern standard time. 100 watts.

WBT — Southern Radio Corp., Realty Bldg., Charlotte, N. C. 275 meters, 1090 kilocycles, class A. Daily ex Sun, 11 am, weather; 12:30-1:30 pm; 7 pm, concert; 7:15 pm, markets. Tues & Thurs, 9 pm. Mon, Wed & Sat, 10:45 pm. Sun, 11 am and 7:30 pm, church services. Eastern standard time. 250 watts. Slogan: "The Queen City of the South."

WBZ—Westinghouse Elec. & Mfg. Co., 82 Worthington St., Springfield, Mass. 333 meters, 900 kilocycles, class B. Daily ex Fri & Sun, 6-7 pm, dinner concert. Mon, Tues & Sat, 7-7:30 pm, children's period. Mon, 7:45-10:30 pm, music; 11:20-12 pm, dance program. Tues, Wed & Thurs, 7:30-8 pm, lecture; 8-10:30 pm, music. Fri, 7-7:15 pm, market and children's period. Sat, 7:30-10:30 pm, music. Sun, 10:45 am, church services; 3:25, symphony program; 7:30-10:30 pm, lecture and music. Eastern standard time. Slogan: "WBZ—New England." 1500 watts.

WCAD—St. Lawrence University, Canton, N. Y. 263 meters, 1140 kilocycles, class A. Daily ex Sun, 11 am, weather reports and educational bulletins. Wed, 8:30 pm, concert. Eastern standard time. Slogan: "The Voice of the North Country." 250 watts.

WCAE—The Pittsburgh Press and the Kaufman & Baer Co., Pittsburgh, Pa. 462 meters, 650 kilocycles, class B. Daily ex Sun, 12:30 pm, news; 4:30 pm, closing stock reports (ex Sat); 6:30 pm, dinner concert; 7:30 pm, Uncle Kaybee; 7:45-8:30 pm, special features; 8:30 pm, concert. Sat, 2:30 pm, Tea-Dansant music; 4:30, orchestra. Mon & Tues, 10:30 pm, late concert. Sun, 10:45 am, services; 3 pm, chapel services; 4 pm, piano recital; 6:30 pm, dinner concert. Eastern standard time. Slogan: "Pittsburgh—Where Prosperity Begins." 500 watts.

WCAG—Clyde R. Randall, 2813 Calhoun St., New Orleans, La. 268 meters. 1120 kilocycles, class A. Daily, 7:30-8 pm. Mon & Thurs, 8-9 pm. Central standard time. 50 watts.

WCAH—Entrekin Elec. Co., 321 W. 10th Ave., Columbus, Ohio. 266 meters, 1130 kilocycles, class A. Daily, 11:30-12:30 pm. Tues, 8-10:30 pm. Sun, 10-12:30 pm; 4 pm, vesper; 7:30-9 pm. Slogan: "The Heart of Ohio." 200 watts.

WCAJ—Nebraska Wesleyan University, University Place, Neb. 275 meters, 1100 kilocycles, class A. Daily ex Sun, 10:30 am, weather. Tues, 7 pm, children's hour. Fri, 9 pm, music, lectures. Central standard time. 500 watts.

WCAL — St. Olaf College, Northfield, Minn. 336 meters, 890 kilocycles, class B. Daily ex Sun & Wed, 9:45 am, chapel services. Thurs, 9 pm, musicale; Fri, 8:30 pm, book talk. Sat, 12, midnight, music. Sun, 8:30 pm, sacred. Central standard time. Slogan: "The College on the Hill." 500 watts.

WCAO—Sanders & Stayman Co., 319 N. Charles St., Baltimore, Md. 275 meters, 1090 kilocycles, class A. Daily ex Sun, 11:55 am, time signals; 12 noon, weather; 12:05 pm, studio program; 12:30 pm, dance music. Mon & Tues, 8 pm, studio concert. Wed, 9:30 pm, dance music; 11 pm, organ recital. Sun, 5 pm, vesper service. Eastern standard time. 50 watts.

WCAP—Chesapeake & Potomac Tel. Co., 725 13th St., N.W., Washington, D. C. 469 meters, 640 kilocycles, class B. Mon, Wed & Fri, 7:30-12 pm. Sun, 11 am, 4 pm and 7:20-10:20 pm. Eastern standard time. 500 watts.

WCAR—Southern Radio Corp. of Texas, 324 N. Navarro St., San Antonio, Tex. 263 meters, 1140 kilocycles, class A. Mon, Thurs & Sun, 8:30-9:30 pm. Mon & Thurs, 11 pm to 12 midnight. Central standard time. 100 watts.

WCAT—South Dakota State School of Mines, Rapid City, S. D. 240 meters, 1250 kilocycles, class A. Daily ex Sun, 9:30 am, weather; 12:30 pm, weather. Thurs, 7:30 pm. Mountain time. Slogan: "The Wild Cat of the Hill." 50 watts.

WCAU—Durham & Co., 1936 Market St., Philadelphia, Pa. 273 meters, 1060 kilocycles, class A. Tues & Thurs, 7:30-10 pm. Wed & Fri, 6:30-10 pm. Sun, 5-8 pm. Eastern standard time. 500 watts.

WCAV—J. C. Dice Elec. Co., Little Rock, Ark. 263 meters, 1140 kilocycles, class A. Wed & Fri, 8:30 pm. Central standard time. 10 watts.

WCAX—University of Vermont, Burlington, Vt. 252 meters, 1190 kilocycles, class A. Schedule irregular. Fri, 7-8 pm. Eastern standard time. 100 watts.

WCAY — Milwaukee Civic Broadcasting Association, Inc., Hotel Antlers, Milwaukee, Wis. 266 meters, 1130 kilocycles, class A. Mon, Wed & Fri, 10:15 am, 12:15 pm, 3-4 pm. Tues & Thurs, 9:15 pm. Wed, 6:30 pm. Sun, 9 am and 9 pm. Central standard time. Slogan: "We Can Accommodate You." 250 watts.

WCAZ—Carthage College, Carthage, Ill. 246 meters, 1220 kilocycles, class A. Wed, 9-10 pm. Central standard time. Slogan: "The College with an Ideal." 50 watts.

WCBA—Chas. W. Heimbach Camegraph Repair Shop, Allentown, Pa. 254 meters, 1180 kilocycles, class A. Wed, 8:15-11 pm. Fri, 6:45-7:45 pm, bedtime stories. Sun, 5-7 pm, church services. Eastern standard time, 10 watts.

WCBC — University of Michigan, Ann Arbor, Mich. 229 meters, 1310 kilocycles, class A. 200 watts.

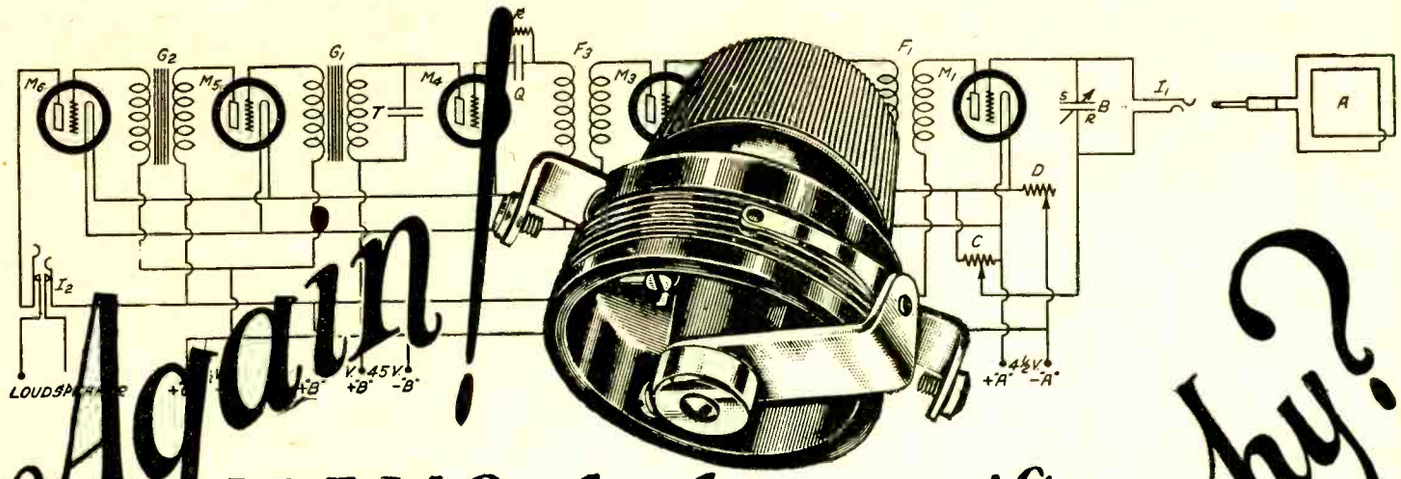
WCBD—Wilbur Glenn Voliva, Zion, Ill. 345 meters, 870 kilocycles, class B. Wed, 12:30-1 pm, organ concert. Thurs, 2:30-3:45 pm, service. Sun, 9-10:45 am, Bible school; 2:30-6 pm, service. Mon, Thurs & Sun, 8-10:30 pm. Central standard time. Slogan: "Where God Rules Man Prospers." 1500 watts.

WCBE—Uhalt Bros. Radio Co., New Orleans, La. 263 meters, 1140 kilocycles, class A. Mon & Thurs, 9-10 pm. Sun, 1-2 pm. Central standard time. 5 watts.

WCBG—Howard S. Williams (Portable), permanent address, Hattiesburg, Miss. 268 meters, 1120 kilocycles, class A. Daily ex Mon, 7:15-9:30 or 10 pm. Central standard time. Slogan: "Will Christ Be Glorified?" 10 watts.

WCBH—University of Mississippi (near) Oxford, Miss. 242 meters, 1240 kilocycles, class A. Mon & Fri, 8 pm. Central standard time. 10 watts.

WCBI—Nicoll, Duncan & Rush, Bemis, Tenn. 240 meters, 1250 kilocycles, class A. Sat, 8-9:30 pm. Central standard time. 150 watts.



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IN a recent issue of Popular Radio Mr. L. M. Cockaday specified the Unity Vernier Rheostat for use in the Popular Radio Portable Set. Previously he used it for the detector tube of his famous 4-circuit tuner. Why? And why is the Unity used by such well-known set manufacturers as Garod, Bristol, Amrad, Moon, and many others? And why does Station WGN (formerly WDAP) offer them repeatedly as prizes, giving away hundreds of them during the year? Ask anyone who has used the Unity on his set—or better still try it yourself and the answer will soon be forthcoming!

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WCBJ—J. C. Mans, Jennings, La. 244 meters, 1230 kilocycles, class A. Sun, 3-4 pm. Central standard time. 10 watts.

WCBK—E. Richard Hall, St. Petersburg, Fla. 266 meters, 1120 kilocycles, class A. Mon & Thurs, 7-8 pm. Tues, 8-8:15 pm. Sun, 8-10 pm. Eastern standard time. 500 watts.

WCBL—Northern Radio Mfg. Co., Houlton, Maine. 266 meters, 1130 kilocycles, class A. Wed, 7:30-10 pm. Sun, 10:30 am and 7:30 pm. Eastern standard time. 50 watts.

WCBM—Hotel Chateau, Baltimore, Md. 229 meters, 1310 kilocycles, class A. Tues & Thurs, 10 pm to 1 am, dance music. Sat, 9:30 pm to midnight, dance music. Sun, 9:45 to 11 pm, vocal concert. Eastern standard time. 50 watts.

WCBO—Radio Shop, Inc., Memphis, Tenn. 250 meters, 1200 kilocycles, class A. Sun & Wed, 8:30 pm. Central standard time. 20 watts.

WCBQ—First Baptist Church, Nashville, Tenn. 236 meters, 1270 kilocycles, class A. 100 watts.

WCBR—Chas. H. Messter, 42 Boyle, Providence, R. I. (portable). 205 meters. 1460 kilocycles, class A. 30 watts.

WCBT—Clark University, Worcester, Mass. 238 meters, 1260 kilocycles, class A. 250 watts.

WCBU—Arnold Wireless Supply Co., Arnold, Pa. 220 meters, 1360 kilocycles, class A. Wed & Sun, 9-10 pm. Sat, 10-11 pm. Eastern standard time. 50 watts.

WCBV—Tullahoma Radio Club, Tullahoma, Tenn. 252 meters, 1190 kilocycles, class A. 10 watts.

WCBW—Geo. P. Rankin, Jr. & Maitland Soloman, 300 College St., Macon, Ga. 226 meters, 1330 kilocycles, class A.

WCBX—The Radio Shop, Newark, N. J. 233 meters, 1280 kilocycles, class A. Tues, Wed & Fri, 6-6:30 pm, 7:30-10:30 pm. Eastern standard time. 100 watts.

WCBY—Forks Electrical Shop, Buck Hill Falls, Pa. 230 meters, 1300 kilocycles, class A. 10 watts.

WCBZ—Coppotelli Bros. Music House, 20 Illinois St., Chicago Heights, Ill. 248 meters, 1210 kilocycles, class A. Mon & Fri, 8:30 pm, musical program. Central standard time. Slogan: "Where the Lincoln and Dixie Highways Meet." 50 watts.

WCCO—Gold Medal Station. St. Paul-Minneapolis, Minn. 417 meters, 720 kilocycles, class B. Daily ex Sun, 9:40 am, 10 am, 10:30 am, 1:30 pm, 3 and 9 pm, market and weather reports. Daily ex Sun. 10:45 am, home service, Daily ex Sat & Sun 2 pm. Woman's hour; 4 pm, magazine hour; 5:30 pm, Children's hour, Mon, Wed & Fri, 2:30 pm, music. Wed & Fri, 6 pm, sport hour. Tues, Wed, Thurs, Fri, 6:30 pm. Wed, 7 pm, vesper. Fri, 7:30 pm, lecture. Mon & Sat, 8 pm, lecture; 8:30, music; 11 pm, dance program. Tues, 9 pm, weather. Wed, 9 pm, music; 11 pm, dance program. Fri, 8:30 pm, music. Thurs, 10 pm, concert. Sun, 10:20 am, 4:15 pm, 7:30, 9:15 pm. Central standard time. 500 watts.

WCDH—University of Mississippi, University, (P.O.) Miss. 242 meters, 1240 kilocycles, class A. Mon, Wed & Fri, 8 pm. Central standard time.

WCEE—Charles E. Erbstein, Elgin, Ill. 278 meters, 1100 kilocycles, class A. Daily ex Thurs & Sun, 7-8 pm. Mon, 10:30 pm to 12 midnight. Tues, Wed, Fri & Sat, 10 pm to 12 midnight. Central standard time. 500 watts.

WCK—Stix-Baer and Fuller, St. Louis, Mo. 273 meters, 1110 kilocycles, class A. Daily at noon and 3 pm. Mon, Tues, Wed, Fri & Sat, 8 pm. Mon & Fri, 11 pm. Wed, 11:30 pm. Sun, 7 pm. Central standard time. 100 watts.

WCM—University of Texas, Austin, Texas. 268 meters, 1120 kilocycles, class A. Daily ex Sun, 9:45 am, 11:45 am, 2:45 and 3:45 pm, markets. Central standard time. 250 watts.

WCTS—C. T. Sherer Co., Worcester, Mass. 268 meters, 1130 kilocycles, class A. 100 watts.

WCX—Detroit Free Press, Detroit, Mich. 516 meters, 580 kilocycles, class B. Daily ex Sun, 2 pm, news; 2:15 pm, markets; 2:50, weather; 4:15 and 6 pm, music. Daily ex Sat & Sun, 8:30-10 pm, alternate weeks. Tues, 10-12 midnight, "Red Apple Club." Sun, 10:30 am and 7:15 pm, church services. Eastern standard time. 500 watts.

WDAE—Tampa Times, Tampa, Florida. 273 meters, 1090 kilocycles, class A. Daily ex Sun, 5-5:30 pm, music. Daily ex Thurs & Sun, 7:30-7:45 pm, music, weather, news. Thurs, 8-10 pm, concert. Eastern standard time. 250 watts.

WDAF—The Kansas City Star, Kansas City, Mo. 365 meters, 824 kilocycles, class B. Daily ex Sun, 3:30-4:30 pm, 6-7 pm, 11:45 pm to 1 am. Mon & Tues, 5-5:30 pm. Mon, Wed & Fri, 8-9:30 pm. Sun, 4-5:45 pm. Central standard time. 500 watts.

WDAG—J. L. Martin, 605 E. 4th St., Amarillo, Texas. 263 meters, 1140 kilocycles, class A. Tues & Thurs, 8-9:30 pm. Central standard time. Slogan: "Where Dollars Always Grow." 100 watts.

WDAH—Trinity Methodist Church, El Paso, Texas. 268 meters, 1120 kilocycles, class A.. Sun, 11 am. Wed & Sun, 7:30 pm, services. Mountain time. 50 watts.

WDAY—Radio Equip. Corp, Fargo, N. Dak. 244 meters, 1230 kilocycles, class A. Daily ex Sun, 10 am, markets and news; 11 am, markets; 12:30-2 pm, music; 12:30 and 5 pm. Tues, Thurs & Sat. 7:30 pm, musicale. Sun, 10:30 am, church services, 4 pm, concert. Central standard time. Slogan: "Biggest Little City in the World." 50 watts.

WDBC—Kirk, Johnson & Co., Lancaster, Pa. 258 meters, 1160 kilocycles, class A. 50 watts.

WDBD—H. E. Burns, Martinsburg, W. Va. 254 meters, 1180 kilocycles, class A. Tues & Thurs, 8-10:30 pm. Eastern standard time. Slogan: "We Do Better Daily." 5 watts.

WDBE—Gilham-Schoen Elec. Co., 22 Luckie St., Atlanta, Ga. 278 meters, 1080 kilocycles, class A. Tues & Sat, 9-10 pm, music. Sun, 6-7 pm, music. Central standard time. Slogan: "We Distribute Better Equipment." 100 watts.

WDBF—Robert G. Phillips, Youngstown, Ohio. 222 meters, 1350 kilocycles, class A. 50 watts.

WDBI—Radio Specialty Co., St. Petersburg, Fla. 226 meters, 1330 kilocycles, class A. 20 watts.

WDBJ—Richardson-Wayland Elec. Corp., Roanoke, Va. 229 meters, 1310 kilocycles, class A. Daily ex Sun, 12-1 pm, 5:30-6:30 pm. Wed & Fri, 9-11 pm. Sun, 8-9 pm, church services. Eastern standard time. Slogan: "Roanoke Down in Old Virginia." 50 watts.

WDBO—Rollins College, Winter Park, Fla. 240 meters, 1250 kilocycles, class A. 50 watts.

WDBP—Superior State Normal School, Superior, Wis. 261 meters, 1150 kilocycles, class A. 50 watts.

WDBQ—The Morton Radio Supply Co., Salem, N. J. 234 meters, 1280 kilocycles, class A. Schedule irregular. Sun, 7:30 pm. Eastern standard time. 50 watts.

WDBR—Tremont Temple Baptist Church, Boston, Mass. 261 meters, 1150 kilocycles, class A. Fri, 7:30-9 pm. Sun, 10:30 am to 12 noon, 6:30-9 pm. Eastern standard time. 100 watts.

WDBS—The S. M. K. Radio Corp. 39 E. 3rd St., Dayton, Ohio. 275 meters, 1090 kilocycles, class A. Daily ex Sun, 12 noon to 1 pm, 6-8 pm, 8:05-11:30 pm. Sun, 10:45 am to noon, 12-1 pm, 7:30-9 pm. Central standard time. Slogan: "The Home of Aviation." 5 watts.

WDBT—Taylor's Book Store, Hattiesburg, Miss. 236 meters, 1270 kilocycles, class A. 10 watts.

WDBW—The Radio Den, 6th & Garden Sts., Columbia, Tenn. 268 meters, 1120 kilocycles, class A. Daily ex Sun, 12 noon, market and weather. Tues, Thurs & Sat, 8-9 pm. Sun, 11 am to 12:30 pm, 7:30-9 pm. Central standard time. Slogan: "The Dimple of the Universe." 125 watts.

WDBX—Otto Baur, 138 Dyckman St., New York N. Y. 233 meters, 1290 kilocycles, class A. 5 watts.

WDBY—North Shore Congregational Church, 1011 Wilson Ave., Chicago, Ill. 258 meters, 1160 kilocycles, class A. Wed, 7 pm, Bible class. Thurs, 7 pm, music. Sun, 11 am, church service; 3:30, studio; 7:45 pm, church service. Central standard time. 500 watts.

WDBZ—Ulster County Council Boy Scouts of America, Kingston, New York. 233 meters, 1290 kilocycles, class A. Thurs, 8-11 pm. Sun, 2:30 pm, services. Eastern standard time. Slogan: "Voice of the Catskills." 5 watts.

WDM—Church of the Covenant, Washington, D. C. 270 meters, 1110 kilocycles, class A. 50 watts.

WDWF—Dutee W. Flint, Cranston, R. I. 440 meters, 680 kilocycles, class B. 500 watts.

WDZ—James L. Bush, Tuscola, Ill. 278 meters. 1080 kilocycles, class A. Chgo. Board of Trade grain and live stock markets every 30 minutes from 9:30 am and 1:15 pm, each week day. Central standard time. 100 watts.

WEAA—Frank D. Fallain, 321—1st Ave., Flint, Mich. (Station Police Bldg.) 234 meters. 1280 kilocycles, class A. Daily ex Sun, 7 pm, police reports and music. Eastern standard time. Slogan: "The Vehicle City." 100 watts.

WEAF—American Telephone & Telegraph Co., 195 Broadway, New York City. 492 meters, 610 kilocycles, class B. Tues & Fri, 11-12 am. Mon & Sat, 4-5 pm. Mon & Tues, 6-11 pm. Wed, Thurs, Fri & Sat, 6-12 pm. Sun, 2-5:30 and 7:20-10:15 pm. Eastern standard time. 2000 watts.

WEAH—Wichita Board of Trade, Wichita, Kans. 268 meters, 1120 kilocycles, class A. Daily ex Sun, markets every hour until 2 pm; 5:30-7:30, Orchestra. Tues & Sat, program from Broadview Hotel. Central standard time. Slogan: "Kansas Grows the Best Wheat in the World." 50 watts.

WEAI—School of Electric Engineering, Cornell University, Ithaca, New York. 254 meters, 1180 kilocycles, class A. Schedules irregular. 500 watts.

WEAJ—University of South Dakota, Vermillion, S. Dak. 278 meters, 1080 kilocycles, class A. Wed, 8:30-9:30 pm and 10:15-11:30 pm. Central standard time. Athletic and sports, musical recitals, etc., also broadcast. Slogan: "South Dakota U. for South Dakotans." 100 watts.

WEAM—Borough of North Plainfield, North Plainfield, N. J. 261 meters, 1150 kilocycles, class A. 250 watts.

WEAN—Shepard Co., Providence, R. I. 270 meters, 1110 kilocycles, class A. 100 watts.

WEAO—Ohio State University, Columbus, Ohio. 293 meters, 1020 kilocycles. class B. Daily ex Sun, 9:45 am, markets, weather, agric, bulletins; 11 am, markets, weather; 1 pm, music; 1:15 markets, weather, Wed. 8 pm, concert. Lectures occasionaly at 9 am, 1:30 pm and 4 pm. Slogan: "Where Education Advances Ohio." 500 watts.

WEAP—Mobile Radio Co., Mobile, Ala. 263 meters, 1140 kilocycles, class A. Daily ex Sun, 4-5 pm. Tues, Thurs & Sat, 7:45-8:45 pm. Sun, 11 am to 12 noon. 7:30-9 pm. Central standard time. 100 watts.

WEAR—The Goodyear Tire & Rubber Co., 2023 Union Trust Bldg., Cleveland, Ohio. 364 meters, 823 kilocycles, class B. Daily ex Sun, 11:30-12 noon, (ex Sat) 3:30-4 pm, market review. Tues, 7:30-11 pm, music. Wed, Fri & Sat, 7-8 pm, dinner concert. Thurs, 7-11 pm. First Saturday each month 12 midnight, Nite-Caps concerts. Eastern standard time. 1000 watts.

WEAU—Davidson Bros. Co., Sioux City, Iowa. 275 meters, 1090 kilocycles, class A. Daily ex Sun, 9 am, (daylight saving time only) 10 am, 11 am, 12 noon, 1 pm, 1:30 and 5 pm. Tues, Thurs & Sat, 7:30-9:30 pm. Central standard time. Slogan: "The Heart of the Corn Belt." 100 watts.

WEAY—Iris Theater, Houston, Texas. 360 meters, 833 kilocycles, class C. Daily 11-11:20 am. Daily ex Sun, 12 noon to 1 pm, 2:30-3 pm, 6-7:15 pm. Tues, Wed & Fri, 8:30-9:30 pm. Sun, 11 am and 8 pm. Central standard time. Slogan: "We Entertain All Year." 500 watts.

WEBA—The Electric Shop, 131 Church St., New Brunswick, N. J. 233 meters, 1290 kilocycles, class A. Mon & Thurs, 8-10 pm. Eastern standard time. Slogan: "We Electrify by Appointment." 15 watts.

WEBC—Walter C. Bridges, 1225 Tower St., Superior, Wis. 242 meters, 1240 kilocycles, class A. 10 watts.

WEBD—Electrical Equip. & Service Co., 124 W Ninth St., Anderson, Ind. 246 meters, 1220 kilocycles, class A. Schedule irregular. 10 watts.

WEBE—Roy W. Waller, 319 Wall St., Cambridge, Ohio. 234 meters, 1280 kilocycles, class A. Fri, 7:30-9 pm, music, talks, markets. Sun, 2-3:30 pm, music. Slogan: "Wallers Evening Broadcast Entertainers." 10 watts.

WEBH—Edgewater Beach Hotel-Chicago Evening Post, 5300 Sheridan Road, Chicago, Ill. 370 meters, 810 kilocycles, class B. Daily ex Mon & Sun, 7-8 pm, 9-10 pm, 11-12 midnight. Sun, 5-6 pm, Twilight Musicale, 7-9 pm. Central standard time. Slogan: "Voice of the Great Lakes." 1000 watts.

WEBJ—Third Avenue Railway System, 130th St. & Third Ave., New York City, N. Y. 273 meters, 1100 kilocycles, class A. Tues & Fri, 7-9 pm. Eastern standard time. Slogan: "The Red Trolley Station." 500 watts.

WEBK—Grand Rapids Radio Co., Hotel Rowe, Grand Rapids, Mich. 242 meters. 1240 kilocycles, class A. Daily ex Sun, 7-8 pm. Wed, 8-9 pm. Sun, 7:15 pm, church services. Daily 10 am, weather; 20 minute piano program; household hints. Central standard time. 20 watts.

WEBL—Radio Corp of America, Woolworth Bldg., New York City, N. Y. (Portable). 226 meters, 1330 kilocycles, class A. 100 watts.

WEBM—Radio Corp. of America, Woolworth Bldg., New York City, N. Y. (Portable). 226 meters, 1330 kilocycles. class A. 100 watts.

WEBP—E. Budd Peddicord, Spanish Fort, New Orleans, La. 280 meters, 1070 kilocycles, class A. 50 watts.

WEBQ—Tate Radio Co., Harrisburg, Ill. 226 meters, 1330 kilocycles, class A. Daily ex Sun, 7:15 pm, news, weather, etc. Tues & Fri, 8-10 pm, concert. Sun, 3-4 pm. Central standard time. Slogan: "The Voice from Egypt." 10 watts.

WEBR—Howell Elec. Co., 54 Niagara St., Buffalo, N. Y. 244 meters, 1230 kilocycles, class A. Tues, Thurs & Sat, 8:30-11:30 pm. Sun, 12 noon to 3 pm. Eastern standard time. 50 watts.

WEBT—The Dayton Cooperative Industrial High School, Dayton, Ohio. 256 meters, 1170 kilocycles, class A. Schedule irregular. Slogan: "Worthy Effort Brings Triumph." 5 watts.

WEBW—Beloit College, Beloit, Wisc. 268 meters, 1119 kilocycles, class A. Tues, 8 pm, concert. Sun, 4:30 pm, vespers. Central standard time. 500 watts.

WEBX—John E. Cain Jr., Nashville, Tenn. 263 meters, 1140 kilocycles, class A. 50 watts.

WEBY—Hobart Radio Co., 570 Hyde Park Ave., Roslindale, Mass. 226 meters, 1330 kilocycles, class A. Daily schedule irregular. Sun, 2:15 pm. Eastern standard time. Slogan: "The First Station of Roslindale." 10 watts.

WEBZ—Savannah Radio Corp., Savannah, Ga. 234 meters, 1280 kilocycles, class A. 5 watts.

WEEI—Edison Electric Illuminating Co., Boston, Mass. 476 meters, 630 kilocycles, class B. Mon, & Fri, 1:30-10 pm. Tues, 2-11 pm. Wed, 2-10 pm. Thurs, 1-11 pm. Sun, 3:45-5:30, 7:20-10:30 pm. Eastern standard time. Slogan: "The Friendly Voice." 500 watts.

WEMC—Emanuel Missionary College, Berrien Springs, Mich. 286 meters, 1050 kilocycles, class B. Mon & Wed 8:15 pm, music, educational lectures, etc. Fri, 9 pm, Old Time and Sacred Music. Sun, 11 am. Chapel service, 8:15 pm, same. Central standard time. Slogan: "The Radio Lighthouse." 500 watts.

WEW—St. Louis University, University Station, St. Louis, Mo. 248 meters, 1210 kilocycles, class A. Daily ex Sun, 9 and 10 am, market and weather; 2 pm, closing market. Thurs, 7 pm, entertainment. Sun, 7 pm, lecture. Central standard time. 100 watts.

WFAA—Dallas News and Journal, Dallas, Texas. 475 meters, 630 kilocycles, class B. Daily 10:30-10:55 am, weather, markets; 12:30-1 pm, lectures; 2:30-3 stock, news, sports; 3:30-4, 4:30-5, news and sports; 5:30-6, Children's stories; 6:30-7:30, dinner concert; 8:30-9:30, concert, weather. Tues. Thurs & Sat, 11-12 midnight, concert. Wed, silent after 1 pm. Sun, 6-7 pm, Bible class, 9:30-11 pm, weather, concert. Central standard time. 500 watts.

WFAM—Times Publ. Co., St. Cloud, Minn. 273 meters, 1100 kilocycles, class A. 10 watts.

WFAV—Dept. of Elec. Engineering, University of Nebraska. Lincoln, Nebr. 275 meters, 1090 kilocycles, class A. Daily ex Sun, 10 am and 12:15 pm, weather, road, health, agr. bulletins. Thurs, 7 pm, music and lectures. Sat, 11 pm, music. Central standard time. Slogan: "The Home of the Cornhuskers." 500 watts.

WFBB—Eureka College, Eureka, Ill. 240 meters, 1250 kilocycles, class A. Mon & Thurs, 8-9 pm. Central standard time. 100 watts.

WFBC—First Baptist Church, Knoxville, Tenn. 250 meters, 1200 kilocycles, class A. Daily schedule irregular. Sun, 10:30 am and 7:30 pm, church services. 4-5 pm, sacred concert. Central standard time. 50 watts.

WFBD—Gethsemane Baptist Church, Philadelphia, Pa. 234 meters, 1280 kilocycles, class A. 5 watts.

WFBE—Van de Walle Music & Radio Co., 208 W. 2nd St., Seymour, Ind. 226 meters, 1330 kilocycles, class A. Mon, Wed & Fri, 9-10 pm. Central standard time. 20 watts.

WFBG—The Gable-Tribune Broadcast Station, Altoona, Pa. 277 meters. 1050 kilocycles, class A. Daily ex Sun. 11:45 am, 3:45 pm, 6:15 pm. Mon & Fri, 7:15 and 8:30 pm. Tues, Wed, Thurs, 8:30 pm. Tues, 10:30 pm. Fri, 11:15 pm. Sat, 9:15 pm. Sun, 10:30 am and 4 pm. Eastern standard time. Slogan: "Altoona, the Original Gateway to the West." 100 watts.

WFBH—Concourse Radio Corp., 72nd St. & Central Park W., New York City, N. Y. 272 meters, 1010 kilocycles, class A. Lectures, classical, popular concerts. Eastern standard time. Slogan: "Voice of Central Park." 500 watts.

WFBI—Calvin Radio Supply Co., 521 Market So., Camden, N. J. 236 meters, 1270 kilocycles. class A. Mon & Thurs, 9-12 midnight. Eastern standard time. Slogan: "The City Across the Bridge." 100 watts.

WFBJ—St. John's University, Collegeville, Minn. 236 meters, 1270 kilocycles, class A. 50 watts.

WFBK—Dartmouth College, Hanover, N. H. 256 meters, 1170 kilocycles, class A. 100 watts.

WFBL—The Onondaga Hotel, Syracuse, New York. 252 meters, 1190 kilocycles, class A. 100 watts.

WFBM—Merchants Heat & Light Co., Indianapolis, Ind. 268 meters, 1120 kilocycles, class A. 250 watts.

WFBN—Bridgewater Radio Sales & Service Co., 1 Broad St., Bridgewater, Mass. 226 meters, 1330 kilocycles, class A. Daily ex Sun, 5-6 pm, dinner concert. Fri, 8-10 pm. Sun, 1-3 pm. Eastern standard time. Slogan: "Bridgewater the Home of the K C Chocolates." 200 watts.

WFBQ—Wynne Radio Co., Raleigh, N. C. 252 meters, 1190 kilocycles, class A. 50 watts.

WFBR—Fifth Infantry, Maryland Nat'l. Guard, Baltimore, Md. 254 meters, 1180 kilocycles, class A. 100 watts.

WFBT—Gloucester Co. Civic League, Pitman, N. J. 231 meters, 1300 kilocycles, class A. 50 watts.

WFBY—U. S. Army, Signal Corps, Ft. Benj. Harrison, Ind. 258 meters, 1160 kilocycles, class A. Mon, Wed & Fri, 8:30-11:30 pm. Central standard time. 100 watts.

WFBZ—Knox College, Galesburg, Ill. 254 meters, 1180 kilocycles, class A. 10 watts.

WFI—Strawbridge & Clothier, 8th & Market Sts., Philadelphia, Pa. 395 meters, 760 kilocycles, class B. Daily ex Sun, 10:15 am, market and live stock, 1 pm, Orchestra; 1:50 pm, (ex Sat), 3 pm, concert; 6:30 pm, Orchestra; 7 pm, Sunny Jim—Kiddies Pal. Tues, 8-11:30 pm. Thurs, 8 pm, Boy Scouts; 8:30-10 pm. Sat, 10-11 pm. Sun, 10:30 am, church services; 4:30 pm, chapel services; 7:30 pm, church services. Eastern standard time. 500 watts.

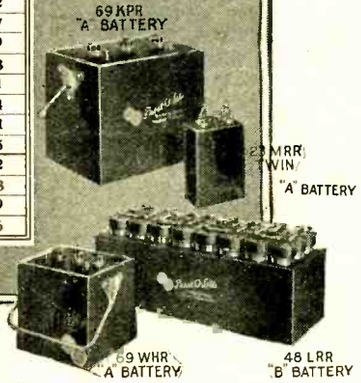
Prest-O-Lite

RADIO CHART

Voltage of Tubes	No. of Tubes	Type of Tubes (see foot-note)	Total Rated Ampere Drain	Recommended Prest-O-Lite "A" Batteries: Order by following Types	Recommended Prest-O-Lite "A" Batteries: Days between Chargings
5-Volt Tubes	1	UV-200	1	69 WHR	22
				OR 67 WHR	16
	2	UV-201A	½	67 WHR	33
	2	1 UV-200 1 UV-201A	1¼	611 WHR	22
				OR 69 WHR	17
	3	UV-201A	¾	69 WHR	29
				OR 67 WHR	22
	3	1 UV-200 2 UV-201A	1½	611 RHR	21
				OR 69 WHR	14
	4	UV-201A	1	69 WHR	22
				OR 67 WHR	16
	4	1 UV-200 3 UV-201A	1¾	613 RHR	22
				OR 611 WHR	15
	5	UV-201A	1¼	611 WHR	22
				OR 69 WHR	17
	5	1 UV-200 4 UV-201A	2	613 RHR	19
				OR 611 WHR	13
	6	UV-201A	1½	611 RHR	21
				OR 69 WHR	14
	8	UV-201A	2	69 KPR	21
				OR 67 KPR	15
	For sets using current at a rate higher than 2 amperes.		2¼	69 KRL	22
				OR 67 KPR	13
			2½	69 KRL	19
				OR 69 KPR	16

C-300 and UV-200 are interchangeable

C-301A, DV-2 and UV-201A are interchangeable



What size batteries will work best in your set?

SELECTING storage batteries of the right size and capacity is necessary, not only for the best reception, but also to arrange the time between chargings to suit your convenience.

The Prest-O-Lite Chart now makes this easy. Illustrated above is a section of the master chart showing Prest-O-Lite "A" Batteries for 5-volt tube sets. If your set has these tubes, you will find, in the fifth column, the Prest-O-Lite "A" Battery that fits it exactly. Two sizes are recommended, but the larger capacity battery will be found more desirable unless facilities for frequent and easy charging are provided. (The days between chargings are based on an average use of your set of three hours a day.)

Thousands of radio dealers have the complete chart, showing you also how to select Prest-O-Lite "B" Batteries, as well as Prest-O-Lite "A" Batteries for peanut tube sets.

You'll prefer Prest-O-Lite Storage Batteries because of their special features designed for better radio reception. Improved separators and plates insure steady, unvarying current and years of life. They're easy to recharge. Handsomely finished to go well with the finest sets. Prest-O-Lite Batteries offer you truly remarkable savings. Though standard in every respect, they are priced as low as $4.75 and up.

Let the Prest-O-Lite Chart guarantee you batteries scientifically correct for your set. It is endorsed by the world's largest electrochemical research laboratories. See it at your dealer's—or write for our interesting booklet, "How to fit a storage battery to your set—and how to charge it."

THE PREST-O-LITE CO., INC., INDIANAPOLIS, IND.
New York San Francisco
In Canada: Prest-O-Lite Company of Canada, Ltd., Toronto

Write today for this free booklet

Whether you have a one-tube set or most advanced multi-tube outfit, you'll find a fund of interesting information in our booklet, "How to fit a storage battery to your set—and how to charge it."

This booklet gives you the complete Prest-O-Lite Radio Chart—technically accurate recommendations covering both "A" and "B" storage batteries for every type of set.

In addition, there is much vitally important data on battery care and upkeep—information that any radio fan will find of real value in keeping his set at its maximum efficiency. Write for your copy right now

Prest-O-Lite

WGAL—Lancaster Elec. Sup. & Const. Co., Lancaster, Pa. 248 meters, 1210 kilocycles, class A. 10 watts.

WGAQ—W. G. Patterson, Shreveport, La. 263 meters, 1140 kilocycles, class A. Mon & Wed. 9-10:30 , music. Sat. 9-12 midnight, dance music. Sun, 9:30-10:30 am, Bible class, music and lecture. Central standard time. 150 watts.

WGAZ—South Bend Tribune, South Bend, Ind. 275 meters, 1090 kilocycles, class A. Mon, Wed & Fri 7-9 pm. Central standard time. Slogan: "Broadcasting From the Hoosier State." 250 watts.

WGBA—Jones Elec. & Radio Mfg. Co., Baltimore, Md. 254 meters, 1180 kilocycles, class A. 50 watts.

WGBB—Harry H. Carman, 217 Bedell St., Freeport, N. Y. 244 meters, 1240 kilocycles, class A. 100 watts.

WGBC—First Baptist Church, Memphis, Tenn. 266 meters, 1130 kilocycles, class A. 10 watts.

WGBF—The Finke Furniture Co., 307 So. 7th St., Evansville, Ind. 217 meters, 1380 kilocycles, class A. Daily ex Sun, 11:10 am, markets, weather, police reports. Tues & Fri, 8-10 pm, concert. Fri, 11 pm to 12:15 am, midnight frolic. Sun, 9:10 am, Bible class. Central standard time. Slogan: "We're Gon'a Be Friends." 50 watts.

WGBG—Breitenbach's Radio Shop, Thrifton, Va. 226 meters, 1330 kilocycles, class A. 100 watts.

WGHB—F. R. Herald Publ. Co., Fall River, Mass. (Portable). 210 meters, 1430 kilocycles, class A. 10 watts.

WGBI—Frank S. Megargee, Scranton, Pa. 240 meters, 1250 kilocycles, class A. 10 watts.

WGBK—Lawrence W. Campbell, Johnstown, Pa. 248 meters, 1210 kilocycles, class A. 5 watts.

WGBM—Theodore N. Saaty, 92 Dover St., Providence, R. I. 234 meters, 1280 kilocycles, class A. 5 watts.

WGBN—Hub Radio Shop, 728 First St., La Salle, Ill. 256 meters, 1170 kilocycles, class A. 10 watts.

WGBO—Dr. Roses Artan, 197 Ponce de Leon Ave., San Juan, Porto Rico. 275 meters, 1090 kilocycles, class A. 10 watts.

WGBP—M. L. Price Music Co., Tampa, Fla. 250 meters, 1200 kilocycles, class A. 50 watts.

WDGQ—Stout Institute, Menomonie, Wisc. 234 meters, 1280 kilocycles, class A. 20 watts.

WGBR—Marshfield Broadcasting Association, 114 Central Ave., Marshfield, Wisc. 229 meters, 1310 kilocycles, class A. 10 watts.

WGBS—Gimbel Brothers, Inc., 33d St. & Broadway, New York, N. Y. 316 meters, 950 kilocycles, class B. Daily ex Sun, 10-11 am, 1:30-2:30 pm, 3-4 pm. Mon, Wed & Fri, 6-7:30 pm. Tues and Sat, 6 pm to midnight. Thurs, 6 pm to 1 am. Sun, 2:30-5:30 pm, 9:30-11:30 pm. Eastern standard time. 1000 watts.

WGBT—Furman University, Greenville, S. C. 236 meters, 1270 kilocycles, class A. 15 watts.

WGBW—Valley Theater, 102 Erie St., Spring Valley, Ill. 212 meters, 1410 kilocycles, class A. 20 watts.

WGBX—University of Maine, Orono, Maine. 252 meters, 1190 kilocycles, class A. 10 watts.

WGBY—The Progress Sales Co., R. R. No. 2, New Lebanon, Ohio. 218 meters, 1370 kilocycles, class A. 30 watts.

WGI—American Radio & Research Corp., Medford Hillside, Mass. 261 meters, 1150 kilocycles, class A. Tues, Wed, Thurs & Fri, 7:30 pm, reports; 8 pm, concert. Sun, 6:45 pm, church service; 8 pm, sacred concert. Eastern standard time. Slogan: "Amrad The Voice of the Air—Where Broadcasting Began." 100 watts.

WGN—The Chicago Tribune—Drake Hotel, Chicago, Ill. 370 meters, 810 kilocycles. class B. Daily ex Sun, 9:31 am, time signals; 9:35 am, 10 am, 10:30 am, 11 am, 11:30 am, markets; 11:55 am, time signals; 12 noon, (ex Sat), 12:30 pm, markets; 12:35 pm and 1:05 pm, Tea room orchestra; 1 pm (ex Sat) 1:25 pm, markets; 1:35 pm, readings from Chicago Tribune; 1:45-2:30 pm, luncheon music; 2:30-3 pm (ex Sat) concert recital; 3-3:30 pm, fiction, humor, verse; 5 pm, stock exchange; 5:30-5:37 pm, Skeezix time for the Children; 5:57 pm, time signals. Daily ex Sun and Mon, 6-6:30 pm, Organ recital; 6:30-7 pm, dinner music; 8-9 pm, classic hour; 10-11 pm, the jazz scamper. Sat closing quotation and markets, 12:10 pm. Sun, 11-11:45 am, Uncle Walt; 11:45-12:45 pm, concert; 2-5 pm, recital; 9-10 pm, concert. Central standard time. 1000 watts.

WGR—Federal Telephone Mfg. Corp. Hotel Statler, Buffalo, N. Y. 319 meters, 940 kilocycles. class B. Daily ex Sun, 12-12:30 pm, Mon, Wed & Fri, 2:30-6:30 pm, Tues, Thurs & Sat, 2:30-6 pm. Daily ex Sat & Sun, 7:30-11 pm. Sun, 3-4 pm, 7:15-7:30 pm. Eastern standard time. Slogan: "Key City of Industry." 750 watts.

WGST—Georgia School of Technology, Atlanta, Ga. 270 meters, 1110 kilocycles, class A. Mon, 9-10 pm. Thurs, 7-8 pm. Central standard time. Slogan: "The Southern Technical School with a National Reputation." 500 watts.

WGY—General Electric Co., 1 River Road, Schenectady, New York, 380 meters, 790 kilocycles, class B. Daily ex Sun, 11:55 am, time signals; 12:30 pm, stock quotations; 12:50 pm, weather. Daily ex Sat & Sun, 12:40 pm, fruit and vegetable market; 6 pm, closing stock quotations; 6:10, produce market report; 6:15 pm, news bulletins. Mon, Tues, Thurs & Fri, 2 pm, music and talks to women, 7:45 pm. Mon, 6:30 pm, review of sports. Tues & Thurs, 6:30 pm, dinner music. Wed, 6:30 pm, adventure story. Fri, 6:30 Children's stories; 7 pm, Sunday school lesson; 7:45 pm, health talks; 10:30 pm, late program. Tues, 11:40 pm, Organ. Thurs, 7:45 pm, books; 11:20 pm, Organ. Sat, 9:30 pm, dance program. Second and last Mon each month, 7:15 pm, farm bureau talks. Sun, 10:30-11 am, Church; 3:35 and 5 pm, Organ; 7:30-8 pm, 9 pm, Orchestra. Eastern standard time. 1500 watts.

WHA—University of Wisconsin, Madison, Wisc. 535 meters, 560 kilocycles, class B. 500 watts.

WHAD—Marquette University, Milwaukee, Wisc. 275 meters, 1090 kilocycles, class A. Daily 11 am, weather. Wed, 7:30-8:30 pm, concert, health reports. Occasional lectures broadcast in afternoon. Central standard time. 500 watts.

WHAG—University of Cincinnati, Cincinnati, Ohio. 233 meters. 1290 kilocycles, class A. 100 watts.

WHAM—Eastman School of Music, Rochester, N. Y. 278 meters, 1080 kilocycles, class A. Daily ex Sun, 3:30-4 pm, Orchestra; 5-6 pm, Organ recital; 6:50 pm, market, weather; 7-7:30 pm, Orchestra. Tues, 6:15-6:45 pm, Organ recital. Sun, 3:15 pm, chapel service. Eastern standard time. 100 watts.

WHAR—Seaside Hotel, Atlantic City, N. J. 275 meters, 1090 kilocycles, class A. 100 watts.

WHAS—Courier-Journal and Louisville Times, Louisville, Ky. 400 meters, 750 kilocycles, class B. Mon, 4-5 pm. Daily ex Mon & Sun, 4-5 pm, 7:30-9 pm. Sun, 9:57-10:45 am, 4-5 pm. Central standard time. 500 watts.

WHAV—Wilmington Electric Specialty Co., Wilmington, Dela. 266 meters, 1130 kilocycles, class A. 100 watts.

WHAZ—Rensselaer Polytechnic Institute, Troy, N. Y. 385 meters, 778 kilocycles, class B. Every Mon, 9-11 pm. Second Mon each month, special trans-Atlantic and transcontinental test program 12 midnight to 1:30 am. Eastern standard time. 500 watts.

WHB—Sweeney Automotive & Electrical School, Kansas City, Mo. 411 meters, 730 kilocycles, class B. Daily ex Sun, 8:25 am, 9:25, 10:25, 11:25 am, 12:15 pm, 1:25 pm, live stock quotations, grain, weather, etc.; 2-3 pm, music; 3 pm, weather. Mon, Wed & Fri, 7-8 pm, music and educational program. Tues & Thurs, 8-10 pm, concert. Sun, 9:45-11 am, church; 12 midnight, concert. Central standard time. Slogan: "The Heart of America." 500 watts.

WHBA—Shaffer Music House, Oil City, Pa. 250 meters, 1200 kilocycles, class A. 20 watts.

WHBB—Hebal's Store, Stevens Point, Wisc. 240 meters, 1250 kilocycles, class A. 50 watts.

WHDI—Wm. Hood Dunwoody Industrial Institute, Minneapolis, Minn. 278 meters, 1080 kilocycles, class A. 100 watts.

WHK—The Radiovox Co., 1025 Boliver St., Cleveland, Ohio. 273 meters, 1100 kilocycles, class A. Daily ex Sun, 12:30-1:30 pm, 6-6:30 pm, 6:30-7:30, 7:30-8 pm. Thurs & Fri, 8:30-11:30 pm. Sat, 9 pm to 1 am. Sun, 10:30-12:30 pm, 4:30-5:30, 7:30-9, 9:15-11:30 pm. Eastern standard time. Slogan: "The Fifth Oldest Station in the U. S. Located in the Fifth City." 500 watts.

WHN—Geo. Schubel, 1540 Broadway, New York City, N. Y. 361 meters, 830 kilocycles, class B. Daily ex Sun, 12-1 pm, 2:15-3:15, 3:45-5:30 pm. Mon, Wed & Sat, 6-12 pm. Tues, Thurs & Fri, 6-7:30, 9:30-12 midnight. Sun 3-6 pm, 10-12 pm. Eastern standard time. Slogan: "The Voice of Great White Way." 500 watts.

WHO—Bankers Life Co., 1101 Liberty Bldg., Des Moines, Iowa. 522 meters, 574 kilocycles, class B. Daily ex Sun, 9:45 am, 10:15 am, 12 noon. Daily ex Sat & Sun, 2 pm. Mon, 7:30-9 pm, 11:15 pm to midnight. Wed, 6:30-9:45 pm. Fri, 7:30-9 pm. Every second week Thurs, 11 pm to midnight. Sun, 11 am, church and 4 pm, concert. Central standard time. Slogan: "We Help Others" 500 watts.

WHT—New high power 5 k.w. station under construction in Chicago to be operated by Radio Broadcasting Corporation of which William H. Thompson (W.H.T.) is President. Will be under way with tests in about 60 days, wave length not yet assigned. Will be class "B" station.

WIAD—Howard R. Miller, 6318 No. Park Ave., Philadelphia, Pa. 250 meters, 1200 kilocycles, class A. Tues & Thurs, 9 pm. Eastern standard time. Slogan: "The Voice From the Birthplace of Liberty." 100 watts.

WIAK—Journal-Stockman Co., Stock Yards, Omaha, Nebr. 278 meters, 1080 kilocycles, class A. Daily ex Sun, 7:45 am, 9:10 am, 10:20 am, 12 noon. Daily ex Sat & Sun, 1:35 and 3:50 pm. Central standard time. 250 watts.

WIAS—Home Elec. Co., Burlington, Iowa. 254 meters, 1180 kilocycles, class A. Tues, 8 pm, studio concert. Thurs, 7 pm, Organ. Sat, 10:30 pm, Organ. Sun, 10:30 am, church services. Central standard time. Slogan: "Burlington On the Mississippi." 100 watts.

WIK—K. & L. Elec. Co., McKeesport, Pa. 234 meters, 1280 kilocycles, class A. 100 watts.

WIL—Benson Radio Co., St. Louis, Mo. 273 meters, 1099 kilocycles, class A. Mon & Wed, 10-12 pm. Fri, 9-11 pm. Sat, 11 pm to 1 am. Central standard time. Slogan: "A Wave Length Ahead.' 100 watts.

WIP—Gimbel Bros., Philadelphia, Pa. 509 meters, 590 kilocycles, class B. Daily ex Sun, 1-1:30 pm, 1:30-3 pm, 3-4:30 pm, 6-7:30 pm. Tues, 8-10:30 pm. Thurs, 8-11 pm. Sat, 8-12 pm. Alternate Sundays, 10:30 am to noon, 4-5 pm, first Sunday. Second Sunday, 4-4:30 pm, 7:15-8, 9:30-10 pm. Eastern standard time. 500 watts.

WJAB—American Elec. Co., Lincoln, Nebr. 229 meters, 1310 kilocycles, class A. 100 watts.

WJAD—Jackson's Radio Eng. Laboratories, Waco, Texas. 352 meters, 850 kilocycles, class B. Mon & Fri, 9-10 pm. Sun, 11 am and 8 pm. Central standard time. 500 watts.

WJAG—The Norfolk Daily News, Norfolk, Nebr. 270 meters, 1110 kilocycles, class A. Daily ex Sun, 12:15 pm. Central standard time. 250 watts.

WJAK—Rev. Clifford L. White, Greentown, Ind. 254 meters, 1180 kilocycles, class A. Mon, Fri & Sat, 7:30-8:30 pm, music. Central standard time. Slogan: "The Radio Parson." 50 watts.

WJAM—D. M. Perham, 322—3rd Ave. West, Cedar Rapids, Iowa. 268 meters, 1120 kilocycles, class A. Daily ex Sun, 10 am, 11:30 am and 1:30 pm, market reports. Tues, Thurs & Sat, 6-10:30 musical program. Sun, 3:30 pm, vesper services. Central standard time. 100 watts.

WJAN—Peoria Star, Peoria, Ill. 273 meters, 1100 kilocycles, class A. 100 watts.

WJAR—The Outlet Company, Providence, R. I. 305 meters, 993 kilocycles. class B. Mon, Wed & Fri, 10 am. Daily ex Sun, 1:05 pm, studio. Fri, 11 am, Orchestra. Thurs, 7:30 pm, studio. Mon, Thurs & Fri, 8 pm. Tues, 8:30 pm, Gold Dust Twins. Mon, Tues, Wed & Thurs, 9 pm. Mon & Wed, 10 pm, Orchestra. Sat, 7:05 pm, studio. Sun, 7:20 pm, theater program; 9:15 Organ. Eastern standard time. Slogan: "The Southern Gateway of New England." 500 watts.

WJAS—Pittsburgh Radio Supply House, 963 Liberty Ave., Pittsburgh, Pa. 275 meters, 1090 kilocycles, class A. 500 watts.

WJAZ—Zenith Radio Corp., 332 So. Michigan Ave., Chicago, Ill. (Portable) 268 meters, 1120 kilocycles, class A. Schedule variable. Central standard time. Slogan: "The Most Powerful Portable Broadcasting Station in the World." 100 watts.

WJD—Denison University, Dept. of Physics, Granville, Ohio. 217 meters, 1380 kilocycles, class A. Schedule irregular. Educational, entertainment, athletic events broadcast. Slogan: "The College on the Hill." 50 watts.

WJJD—Loyal Order of Moose. Mooseheart, Ill. 302 meters, 990 kilocycles. class B. Daily ex Thurs & Sun, 3:30-4:30 pm, 6:30-8 pm, 10:30 pm to 1:30 am. Sun, 7:45-8:45 am, 9-9:40 am, 9:40-10:30 am. Central standard time. Slogan: "The Call of the Moose." 500 watts.

WJY—Radio Corporation of America, 33 West 42nd St., New York, N. Y. 405 meters, 740 kilocycles, class B. Tues, Thurs & Fri, 7:30-11:30 pm. Sun, 8:15-10:30 pm. Eastern standard time. 750 watts.

WJZ—Radio Corporation of America, 33 West 42nd St., New York, N. Y. 455 meters, 660 kilocycles. class B. Daily ex Sun, 10-11 am, 1-2 pm, 4-6 pm, 7-11:30 pm. Sun, 9-10 am, 11-1 pm, 2:30-5 pm, 7-10:30 pm. Eastern standard time. 500 watts.

WKAA—H. F. Paar, 1444 Second Ave., Cedar Rapids, Iowa. 278 meters, 1080 kilocycles, class A. Mon, Wed & Fri, 3:45-4:30 pm. Mon and Wed, 7:15-8, 9:30-11 pm. Fri, 8:30-11:30 pm. Sun, 11 am, church services; 5 pm, same. Central standard time. 50 watts.

WKAD—Chas. Looff, Crescent Park, East Providence, R. I. 240 meters, 1250 kilocycles, class A. 20 watts.

WKAN—United Battery Service Co., Montgomery, Ala. 226 meters, 1330 kilocycles, class A. 15 watts.

WKAP—Dutee W. Flint, Cranston, R. I. 234 meters, 1280 kilocycles, class A. 50 watts.

WKAQ—Radio Corp. of Porto Rico, San Juan, P. R. 340 meters, 880 kilocycles, class B. 500 watts.

WKAR—Michigan Agricultural College, East Lansing, Mich. 285 meters. 1050 kilocycles, class B. Daily ex Sun. 12 noon, weather and road bulletins. Mon & Fri, 7-8 pm, educational program. Wed, 8-9 pm. Sat, 12:30-1:30 am, dance program. Eastern standard time. 500 watts.

WKAV—Laconia Radio Club, Laconia, N. H. 254 meters, 1180 kilocycles, class A. 50 watts.

WKY—W K Y Radio Shop, Oklahoma City, Okla. 275 meters. 1090 kilocycles, class A. Daily 3-4 pm. Mon, Wed & Fri, 7-7:30 and 9-10:30 pm. Sun, 9:30 am to noon, 7:30-9 pm. Central standard time. 100 watts.

WLAL—First Christian Church, Tulsa, Okla. 250 meters, 1200 kilocycles, class A. Thurs, 8-9:30 pm, sacred concert. Fri, 8 pm, vocal and instrumental program. Sat, 8 pm, Bible school lesson. Sun 11 am and 7:30 pm, sermon. Slogan: "The Voice of the Church." Central standard time. 500 watts.

WLAP—W. Y. Jordon, 306 W. Breckenridge St., Louisville, Ky. 275 meters. 1090 kilocycles, class A. 20 watts.

WLAX—Greencastle Community Broadcasting Station, Greencastle, Ind. 231 meters, 1300 kilocycles, class A. 10 watts.

WLB—University of Minnesota, Minneapolis, Minn. 278 meters, 1080 kilocycles, class A. 5 watts.

WLBL—Wisconsin Dept. of Markets, Stevens Point, Wisc. 278 meters 1080 kilocycles, class A. Daily ex Sun. 8:45 am, markets. live stock; 9:45 am, weather, butter and egg markets; 10:45 am, weather; 11:45 am, weather, cheese market; 12:30 pm, weather, summary of markets, grain and feed quotations each Wed & Sat; 1:45 pm, weather, live poultry market. Tues, 8 pm, musical program. Sun, 12:01 am, "Enemies of Sleep." Central standard time. Slogan: "Wisconsin Land of Beautiful Lakes." 500 watts.

WLIT—Lit Bros., Philadelphia, Pa. 394 meters. 760 kilocycles, class B. Daily ex Sun. 11:45-12:55 pm, 2-3, 4:30-6, 7:30-8 pm. Mon & Wed, 8-10 pm, concert. Fri, 8-10:30 pm. Eastern standard time. 500 watts.

WLS—Sears, Roebuck and Co., 925 Homan Ave., Chicago, Ill. 345 meters, 870 kilocycles, class B. Daily ex Sun. 9-11 am. Daily ex Sat & Sun, 12-1 pm, 1:30 pm, 3:45-4:45 pm. Mon, 6 pm. Tues, 6 pm to 1 am. Wed & Fri, 6-11 pm. Thurs, 6-8 pm. Sat, 1:30 and 6:30 pm to 12:30 midnight. Sun, 6:30-8 pm. Central standard time. Slogan: "World's Largest Store." 500 watts.

WLW—Crosley Radio Corp., Cincinnati Ohio. 422 meters, 710 kilocycles, class B. 1500 watts.

WMAC—Clive B. Meredith, Cazenovia, N. Y. 275 meters, 1090 kilocycles, class A. 100 watts.

WMAF—Round Hills Radio Corp., Dartmouth, Mass. 348 meters, 860 kilocycles, class B. 500 watts.

WMAH—General Supply Co., Lincoln, Nebr. 254 meters. 1180 kilocycles, class A. 100 watts.

WMAK—Norton Laboratories, Lockport, New York. 266 meters, 1130 kilocycles, class A. Daily ex Sun, 11 am, weather. Mon, 7:45-9 pm. Thurs, 12 midnight. Sun, 10:25 am, church services. Eastern standard time. 500 watts.

WMAN—First Baptist Church, Columbus, Ohio. 278 meters, 1080 kilocycles, class A. Sun, 10:30-11:45 am, 7:30-8:45 pm. Eastern standard time. 50 watts.

WMAQ—The Chicago Daily News, 15 N. Wells St., Chicago, Ill. 448 meters, 670 kilocycles, class B. Daily ex Sun, 1-3 pm, 4-5 pm, 6-7 pm. Tues, Wed, Thurs, Fri & Sat, 8-10 pm. Central standard time. 500 watts.

WMAY—Kingshighway Presbyterian Church, St. Louis, Mo. 247 meters, 1215 kilocycles, class A. Sun, 11 am, services; 7 pm, musical program, 8 pm, services. Central standard time. Slogan: "May Every Byway Hear Kingshighway." 100 watts.

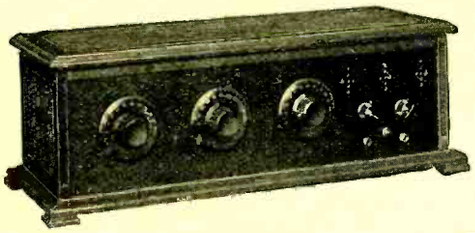
WMAZ—Mercer University, Macon, Ga. 261 meters, 1150 kilocycles, class A. Tues, Wed, Thurs, 10:20-10:50 am, Chapel. Mon, Tues & Thurs, 8-10 pm, music, radio classes. Wed, 11-12 pm. Fri, 8-12 pm, concert. Sat, tentative program, music and college stunts, 8:30-9:30 pm. Eastern standard time. Slogan: "Mercer—The South's Most Progressive University." 100 watts.

WMBF—Fleetwood Hotel, Miami Beach, Fla. 384 meters, 780 kilocycles, class B. 500 watts.

WMC—Commercial Appeal, Memphis, Tenn. 503 meters, 595 kilocycles, class B. Daily ex Sun, 9:45 am, weather and markets; 12 noon, music; 3 pm, closing market (ex Sat); 8 pm, bedtime story (ex Wed); 8:30 pm, music. Tues & Fri, 11 pm. Sun, 11 am, church services. Central standard time. Slogan: "Memphis, Down in Dixie." 500 watts.

WMH—The Ainsworth-Gates Radio Co., Cincinnati, Ohio. 326 and 424 meters, 920 and 690 kilocycles, class B. Mon & Thurs. 8-10 pm. Wed. 8-11 pm. Sat, 10-12 pm. Sun, 7-7:30 pm. Central standard time. Slogan: "The Station on the Hill." 750 watts.

WMU—Doubleday-Hill Elec. Co., 715—12th St. N. W., Washington, D. C. 261 meters, 1150 kilocycles, class A. 100 watts.



Style R-20

Solid Mahogany or Walnut

Panel size	Price
7x18 inches	$11.00
7x21 "	12.00
7x24 "	13.00
7x26 "	14.00
7x28 "	15.00
7x30 "	16.00

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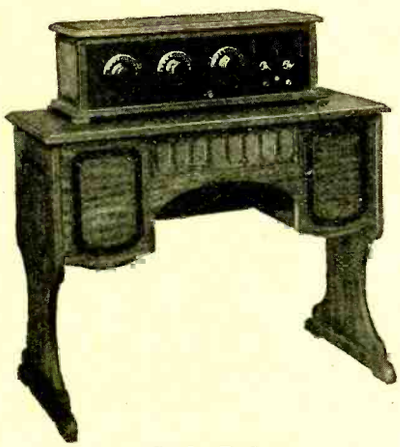
RADIO CABINETS

Represent the latest development in wall console cabinets. They combine years of experience in quality cabinet work with a thorough understanding of what radio fans are demanding in special cabinet features, conveniences and adaptability.

All Excello Cabinets have ample battery space. The filling pieces are adjustable to accommodate panels of varying sizes.

The sturdy construction and refinement of Excello Cabinets win them quick leadership with dealers and permanent satisfaction with users.

Style R-7
Price $57.00
Mahogany or Walnut
Panel Space—8x32 inches



Style R-9
Price $38.00
Mahogany or Walnut
Size 38x18x30 inches High

Style R-14
Price $60.00
Mahogany or Walnut
Panel Space—10x32 inches

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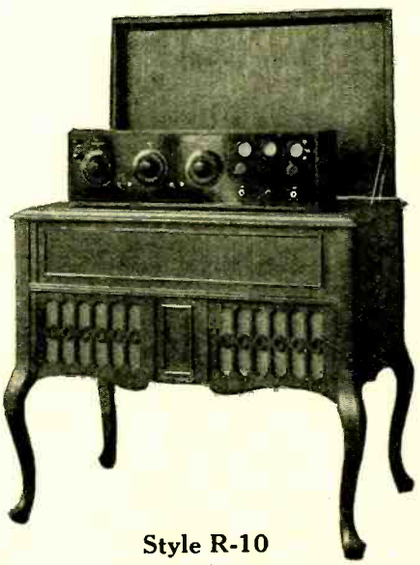
Find out about the complete Excello line and see why these cabinets excel all others in quality and attractiveness.

Prices quoted on this page are for Cabinets with Tone Chambers only and do not include other equipment.

Style R-8
Price $57.00
Mahogany or Walnut
Panel Space—10x24 inches



Style R-10
Price $73.00
Mahogany or Walnut
Receiver Space—32x12x10¼ inches High

Excello Products Corporation

4820-28 West 16th Street
Cicero, Ill.

WNAC—The Shepard Stores, Boston, Mass. 280 meters, 1070 kilocycles, class A. Daily ex Sat & Sun, 10:30 am to noon, 12:15-1 pm. Mon, 4-5:30 to 10 pm. Tues & Thurs, 3-5:30, 6:30-7:30 to 10 pm. Wed & Fri, 3-5:30, 8-10 pm. Sat, 10:30 am to noon, 1-3, 5:30-6:30, 8-11 pm. Sun, 10:45 am, 3:15-5:30, 6:45-8:30 pm. Eastern standard time. 500 watts.

WNAD—University of Oklahoma, Norman, Okla. 254 meters, 1180 kilocycles, class A. Daily including Sun, 9:15 pm, weather. Wed. 8:30-9:30 pm, concert. Central standard time. Slogan: "Oklahoma—The Voice of Sooner Land." 250 watts.

WNAL—Omaha Central High School, Omaha, Nebr. 258 meters, 1160 kilocycles, class A. 50 watts.

WNAP—Wittenberg College, Springfield, Ohio. 248 meters, 1210 kilocycles, class A. 100 watts.

WNAR—First Christian Church, Butler, Mo. 231 meters. 1300 kilocycles, class A. 20 watts.

WNAT—Lennig Bros. Co., Philadelphia, Pa. 250 meters, 1200 kilocycles, class A. 100 watts.

WNAX—Dakota Radio Apparatus Co., Yankton, S. Dak. 244 meters, 1230 kilocycles, class A. Daily ex Sun, 11:30 am, market reports; 5-6 pm, music. Central standard time. 100 watts.

WNJ—Radio Shop of Newark, 89 Lehigh Ave., Newark, N. J. 233 meters, 1290 kilocycles, class A. 150 watts.

WNYC—City of New York. New York City, N. Y. 526 meters, 570 kilocycles, class B. 1000 watts.

WOAC—Page Organ Co., Lima, Ohio. 266 meters, 1130 kilocycles, class A. 50 watts.

WOAF—Tyler Commercial College, Tyler, Texas. 360 meters, 833 kilocycles. 10 watts.

WOAI—Southern Equip. Co., San Antonio, Texas. 394 meters, 760 kilocycles, class B. Daily ex Sun, 10:30-10:50 am, 12:15-12:55 pm, 3-3:20, 6-6:20 and 7-7:20 pm. Tues & Thurs, 7:30-8:30, 9:30-10:30 pm. Sun, 11 am and 9:30-10:30 pm. Central standard time. 500 watts.

WOAN—James D. Vaughan, Lawrenceburg, Tenn. 282 meters, 1060 kilocycles, class B. Tues, Wed, Thurs, Fri, 11 am to 12 noon. Daily including Sun, 8:30-9:30 pm. Mon & Thurs, 11 pm to 12 midnight. Central standard time. Slogan: "Wake Up America." 500 watts.

WOAV—Penn. Nat'l Guard, 2nd Bat 112th Infantry, Erie, Pa. 242 meters, 1240 kilocycles, class A. 50 watts.

WOAW—Woodmen of the World Life Insurance Ass'n., Omaha, Nebr. 522 meters, 576 kilocycles, class B. Mon Fri, 6-7:30 pm, 9-11 pm. Tues & Thurs, 12:30-2 pm, 6-7:30 pm, 9-11 pm. Sat, 6-7:30, 9-10:30, 11 pm to 12 midnight. Sun, 9-10:45 am, 1:30-4 pm, 6-7:30, 9-11 pm. Slogan: "Omaha The City Surrounded by the United States." 1000 watts.

WOAX—Franklin J. Wolff, The Monument Pottery Co., Trenton, N. J. 240 meters, 1250 kilocycles, class A. Daily ex Sun, 12:15 pm, weather. Tues & Fri, 9-11 pm, concert. Eastern standard time. Slogan: "The Voice From Trenton." 500 watts.

WOC—Palmer School of Chirobractice, Davenport, Iowa, 483 meters, 620 kilocycles, class B. Daily 9 am, markets; 10 am, household hints; 11 am, weather, markets; 11:15 am (Sat only), closing markets; 12 noon chimes; 12:15 pm, weather; 1 pm, closing markets, (ex Sat), 5:45 pm, (Tues only), chimes; 6 pm (Tues only), weather and sports; 7 pm, sports, weather (ex Tues). Mon, Wed & Fri, 8 pm, music. Thurs & Sat. 9 pm, Orchestra. Mon, 10 pm, music. Central standard time. Slogan: "In the State Where the Tall Corn Grows." 500 watts.

WOCL—Hotel Jamestown, Jamestown, New York. 275 meters, 1090 kilocycles, class A. Wed, 8-12 pm, popular program. Sun, 10:45-12:15 am, church; 2-5 pm, classical; 7:45-9 pm, church services. Eastern standard time. Slogan: "We're on Chautauqua Lake." 30 watts.

WOI—Elec. Engineering Dept., Iowa State College, Ames, Iowa. 270 meters, 1110 kilocycles, class A. Daily 9:30 am, weather reports; 12:30 pm, market and crop reports; 9:30 pm, weather. Mon, 10 pm, dance program. Thurs, 8:15 pm, classical program. Sun, 10:45 am, chimes program. Central standard time. 500 watts.

WOO—John Wanamaker, Philadelphia, Pa. 509 meters, 590 kilocycles, class B. Daily ex Sun, 11 am, Organ, 11:30 am, weather; 11:55, Time signals; 12 noon, luncheon music; 4:45 pm, Organ; 5 pm, sport and police reports; 9:55, time signal; 10:02, weather. Mon, Wed & Fri, 7:30-11 pm. Sun, 10:45 am or 7:45 pm. Eastern standard time. 500 watts.

WOQ—Unity School of Christianity, Unity Bldg., Kansas City, Mo. 278 meters, 1080 kilocycles, class A. Tues & Sat, 8-9:30 pm. Thurs, 7:15-7:45 pm. Sat. 10-10:30 pm. Sun 11 am to 12:30 pm, 7-7:45 pm, 7:45-9:15 pm. Central standard time. 500 watts.

WOR—L. Bamberger & Co., Newark, N. J. 405 meters, 740 kilocycles, class B. 500 watts.

WORD—Peoples Pulpit Ass'n., Batavia, Ill. 278 meters, 1080 kilocycles, class A. 500 watts.

WOS—State Marketing Bureau, Board of Agriculture, Jefferson City, Mo. 440 meters, 680 kilocycles, class B. Daily ex Sun, 8-8:15 am, announcements; 9-9:15 am, hog market; 10-10:15 am, weather, hog and grain markets; 11-11:15 am, live stock, grain; 12 12:15 pm, live stock and grain; 1-1:15 pm, weather, poultry, butter, egg, markets; 2-2:15 pm, closing live stock, grain markets; 5:05-5:20 pm, music, address. Mon. Wed & Fri, 8-9:30 pm, concerts; lectures. Sun, 7:30-8:30 pm. religious services. Central standard time. Slogan: "Watch Our State." 500 watts.

WPAJ—Doolittle Radio Corp., 115 Crown St., New Haven, Conn. 268 meters, 1120 kilocycles, class A. 100 watts.

WPAK—North Dakota Agricultral College. Agricultural College, N. Dak. 275 meters, 1090 kilocycles, class A. 50 watts.

WPAU—Concordia College, Moorehead, Minn. 258 meters, 1160 kilocycles, class A. 10 watts.

WPAZ—Dr. John R. Koch, Charlestown, W. Va. 268 meters, 1120 kilocycles, class A. 10 watts.

WPG—Municipality of Atlantic City, Atlantic City, N. J. 299 meters, 1000 kilocycles, class B. 500 watts.

WPSC — Pennsylvania State College, State College, Pa. 261 meters, 1150 kilocycles, class A. Mon, 8-11 pm. Eastern standard time. 500 watts.

WQAA—Horace A. Beale, Jr., Parkesburg, Pa. 220 meters, 1360 kilocycles, class A. No schedule at present time. 500 watts.

WQAC—Gish Radio & Service, 108 E. 8th St., Amarillo, Texas. 234 meters, 1280 kilocycles, class A. No definite schedule. 100 watts.

WQAE—C. H. Moore Co. Inc., Litchfield St., Springfield, Vt. 246 meters, 1220 kilocycles, class A. Sat, 11 pm to 1 am. Sun, 8:30-9 pm. Eastern standard time. Slogan: "Among the Green Hills of Vermont." 50 watts.

WQAF—The Sandusky Register, Sandusky, Ohio. 240 meters, 1250 kilocycles, class A. Schedule irregular. 5 watts.

WQAM—Electrical Co., 42 N. W. 4th St., Miami, Fla. 268 meters, 1120 kilocycles, class A. Mon & Wed, 7:30-9 pm, Orchestra. Sun, 7:30-9 first Sunday each month. Sun 9-11 pm. Eastern standard time. Slogan: "Wonderful Qualities Advertise Miami." 100 watts.

WQAN—Scranton Times, 222 Spruce St., Scranton, Pa. 250 meters, 1200 kilocycles, class A. Daily ex Sun, 12:30-1 pm, 4:15-4:45 pm. Tues & Fri, 8-11 pm. Eastern standard time. Slogan: "The Voice of the Anthracite." 100 watts.

WQAO—Calvary Baptist Church, New York, N. Y. 360 meters, 833 kilocycles. 100 watts.

WQAS—Prince-Walter Co., Lowell, Mass. 252 meters, 1190 kilocycles, class A. Schedule irregular. Slogan: "The Voice of Merrimack Valley." 100 watts.

WQJ—Calumet Baking Powder and Rainbo Gardens Station, 4810 N. Clark St., Chicago, Ill. 448 meters, 670 kilocycles, class B. Daily ex Sun. 11-12 noon, 3-4 pm. Daily ex Sun & Mon, 7-8 pm and 10 pm to 2 am, Sun, 10:30 am and 8-10 pm. Central standard time. 500 watts.

WRAA—Rice Institute, Houston, Texas. 256 meters, 1170 kilocycles, class A. Sat, 3:30-5:30 pm, athletic events. Sun, 3:30-5:30 pm, lectures. Central standard time. 100 watts.

WRAF—The Radio Club, Inc., La Porte, Ind. 224 meters, 1340 kilocycles, class A. Mon, Thurs & Sat, 8:30 pm, musicale. Central standard time. Slogan: "The Voice of the Maple City." 15 watts.

WRAL—Northern States Power Co., St. Croix Falls, Wisc. 248 meters, 1210 kilocycles, class A. 100 watts.

WRAM — Lombard College. Galesburg, Ill. 244 meters, 1230 kilocycles, class A. Wed, 8 pm, music and educational talks. Central standard time. 100 watts.

WRAN—Blackhawk Elec. Co., Waterloo, Iowa. 236 meters, 1270 kilocycles, class A. 10 watts.

WRAO—St. Louis Radio Service Co., 1211 Hodiamont Ave., St. Louis, Mo. 227 meters, 1320 kilocycles, class A. 10 watts.

WRAV—Antioch College, Yellow Springs, Ohio. 263 meters, 1140 kilocycles, class A. Wed, 8-9 pm. Sun, 7-8 pm. 100 watts.

WRAW—Avenue Radio & Electric Shop, 450 Schuylkill Ave., Reading, Pa. 238 meters, 1260 kilocycles, class A. Thurs, 10 pm, music. Daily schedule irregular, local news and topics. Eastern standard time. Slogan: "The Schuylkill Valley Echo." 10 watts.

WRAX — Flexon's Garage, Gloucester City, N. J. 268 meters. 1120 kilocycles, class A. 100 watts.

WRBC — Immanuel Lutheran Church, Valparaiso, Ind. 278 meters. 1080 kilocycles, class A. Mon, musical and educational programs. Sun, 7:30 pm, church services. Central standard time. Slogan: "World Redeemed by Christ." 500 watts.

WRC—Radio Corporation of America, 3308—14th St. N. W., Washington, D. C. 469 meters, 640 kilocycles, class B. Mon, Wed & Fri, 4-6:30 pm. Tues, Thurs, 6:45-11:30 pm. Sat, 6:45 pm to 12 midnight. Eastern standard time. Slogan: "The Voice of the Capital." 500 watts.

WREO—Reo Motor Car Co., Lansing, Mich. 285 meters, 1050 kilocycles, class B. Daily ex Sun, 10 pm, weather. Tues & Thurs, 8:15-9:45 pm, concert. Sat, 9-12 midnight, Orchestra. Sun, 10 am, chimes; 10:30 am, services; 7 pm, services. Central standard time. 500 watts.

WRHF — Washington Radio Hospital Fund. 525—11th St. N. W., Washington, D. C. 256 meters, 1170 kilocycles, class A. Daily ex Sun, 12-1 pm. Eastern standard time. 50 watts.

WRK—Doron Bros. Elec. Co., Hamilton, Ohio. 270 meters, 1110 kilocycles, class A. 200 watts.

WRL—Union College, Schenectady, New York. 360 meters, 833 kilocycles, 500 watts.

WRM—University of Illinois, Urbana, Ill. 273 meters, 1100 kilocycles, class A. Football and basketball games. Relay carnivals and occasional experimental programs. Central standard time. 500 watts.

WRR—City of Dallas, Dallas, Texas. 261 meters, 1148 kilocycles, class A. Daily ex Sun. 12 noon, weather, 11:30 am-12:30 pm, 2:45-3.30 pm, 7 pm, police bulletin; 7:30-8:30 pm. Tues & Thurs, 8:30-9:30 pm. Sat. 12-2 am, the Dixie Nite Owls. Sun, 11 am, church services. Central standard time. Slogan: "Watch Radio Radiate." 350 watts.

WRW—Tarrytown Radio Research Laboratory, Tarrytown, N. Y. 273 meters, 1100 kilocycles, class A. Daily ex Thurs & Sun, 9-11:30 pm. Thurs & Sun, 8-9 and 10:30-11:30 pm. Eastern standard time. Slogan: "Everything in Radio." 500 watts.

WSAB—Southeast Mo. State Teachers College, Cape Girardeau, Mo. 273 meters, 1090 kilocycles, class A. 100 watts.

WSAC—Clemson Agricultural College, Clemson College, S. C. 336 meters, 890 kilocycles, class B. 500 watts.

WSAD—Foster-Jewelers, Dorrace & Weybosset Sts., Providence, R. I. 256 meters, 1170 kilocycles, class A. Daily ex Sun, 2:30-4 pm. Mon, Wed, Fri & Sat, 6-8 pm. Tues, 6-6:30 pm, Thurs, 8:30-11 pm. Eastern standard time. 100 watts.

WSAG—Gospel Tabernacle, St. Petersburg, Fla. 266 meters. 1130 kilocycles, class A. 500 watts.

WSAI—The United States Playing Card Co., Cincinnati, Ohio. 325 meters, 920 kilocycles, class B. Mon & Thurs, 10-12 pm. Tues, 7-10 pm. Sat, 8-10 pm, 12-2 am. Sun, 3-4 pm. Central standard time. 1500 watts.

WSAJ—Grove City College, Grove City, Pa. 229 meters, 1310 kilocycles, class A. Tues & Thurs, 9-10 pm, Orchestra, vocal and basketball games. Wed, 7:30-8:30 pm, vocal and piano. Fri & Sat, 8:15-9:30 pm, basketball game. Sun, 7:30-9:15 pm, church service. Eastern standard time. Slogan: "Grove City College—Wolf Pack." 250 watts.

WSAN—Allentown Call Publishing Co. Inc., Allentown, Pa. 229 meters, 1310 kilocycles, class A. Tues & Thurs, 8 pm. Special programs as announced. Eastern standard time. 50 watts.

WSAP—The City Temple, New York, N. Y. 263 meters, 1140 kilocycles, class A. 250 watts.

WSAR—Doughty & Welch Elec. Co., Fall River, Mass. 254 meters, 1180 kilocycles, class A. 100 watts.

WSAU—Camp Marienfeld, Chesham, N. H. 229 meters, 1310 kilocycles, class A. 10 watts.

WSAV—Clifford W. Vick Const. Co., Houston, Texas. 246 meters, 1220 kilocycles, class A. Mon, Wed & Fri. 8-9 pm. Sat, 10-12 midnight. Sun, 11 am to 12 noon. Central standard time. Slogan: "Top O' Texas." 100 watts.

WSAX—Zenith Radio Corp., 332 So. Michigan Ave., Chicago, Ill. 268 meters, 1120 kilocycles, class A. Schedule variable. Central standard time. 20 watts.

WSAZ—Chase Elec. Shop, Pomeroy, Ohio. 244 meters, 1230 kilocycles, class A. 50 watts.

WSB—Atlanta Journal, Atlanta, Ga. 429 meters, 700 kilocycles, class B. Daily ex Sun, 12-1 pm, entertainment; 2:30-2:45 pm, markets; 5-6 pm. Daily ex Wed & Sun, 8-9 pm, 10:45 pm to 12 midnight. Sun, 10:45 am to 12:15 pm, church services; 5-6 pm, studio program; 7:30-9:15 pm, church services. Central standard time. Slogan: "The Voice of the South." 750 watts.

WSL—J. & M. Elec. Co., Utica, N. Y. 273 meters, 1100 kilocycles, class A. 100 watts.

WSOE—School of Engineering of Milwaukee, 415 Marshall St., Milwaukee, Wis. 246 meters, 1219 kilocycles, class A. Daily ex Sat & Sun, 9-10 am, lecture; 1-3 pm. lecture; 5:30-6:30 pm, twilight concert. Sat, 5:30 pm. Sun, 9:30-11:30 am, services; 12:30-1:30 pm, concert. Mon & Fri, 9-12 pm, popular program. Tues, Thurs, Sat & Sun, 7:30-9 pm. Central standard time. Slogan: "In the Land of Sky Blue Waters." 500 watts.

WSRF—Harden Sales & Service, Broadlands, Ill. 233 meters, 1290 kilocycles, class A. 10 watts.

WSRO—Radio Company, 409 High St., Hamilton, Ohio. 252 meters, 1190 kilocycles, class A. Tues & Fri. 8-10 pm, talks, orchestra. Sun. 2-4 pm. Maple Leaf orchestra. Slogan: "We Sell Radio Only." 5 watts.

WSUI—State University of Iowa, Iowa City, Iowa. 484 meters. 620 kilocycles, class B. Wed, 9-9:30 am, High School Assembly program. Daily ex Sun, 12:30-1 pm, music and address. Tues, 8-9:30 pm, music. Wed. 4:30-5 pm, radio course lectures. Thurs & Sat, 7:30-9 pm, occasionally. Sun, 7-7:30 pm, children's hour; 9-9:30, familiar hymns. Central standard time. 500 watts.

WSY — Alabama Polytechnic Institute, Auburn, Ala. 250 meters, 1200 kilocycles, class A. Schedule irregular. 500 watts.

WTAB—Fall River Herald, Fall River, Mass. 266 meters, 1130 kilocycles, class A. Mon & Fri, 3:30 pm, sunshine hour. Tues & Thurs, 8 pm, music. Wed & Sat, 5 pm, children's hour. Eastern standard time. 100 watts.

WTAC — Penn Traffic Co., Washington St., Johnstown, Pa. 209 meters. 1430 kilocycles, class A. Tues & Thurs, 7:30-9:30 pm. Eastern standard time. 100 watts.

WTAF—Louis J. Gallo, New Orleans, La. 268 meters, 1120 kilocycles, class A. 10 watts.

WTAL—Toledo Radio & Elec Co., Toledo, Ohio. 252 meters, 1190 kilocycles, class A. 10 watts.

WTAM — Willard Storage Battery Co., 246 E. 131st St., Cleveland, Ohio. 390 meters, 768 kilocycles, class B. Daily ex Sun, 6-7 pm, dinner concert. Mon & Wed, 8-10:30 pm, studio concert. Wed, 10:30 pm to 1 am, dance program. Sat, 9 pm to 12 midnight, dance concert. Eastern standard time. Slogan: "The Voice from the Storage Battery." 1500 watts.

WTAP—Cambridge Radio & Elec. Co., Cambridge, Ill. 242 meters, 1240 kilocycles, class A. 50 watts.

WTAQ—S. H. Van Gordon & Son, Osseo, Wis. 254 meters, 1180 kilocycles, class A. 100 watts.

WTAR—Reliance Elec. Co., Inc., 526 Harrington Ave., Norfolk, Va. 261 meters, 1150 kilocycles, class A. Daily ex Sun, 6 pm, Tues, 8-10 pm. Eastern standard time. Slogan: "Down in Old Virginia." 100 watts.

WTAS — Villa Olivia Broadcasting Station, Elgin, Ill. 302 meters, 990 kilocycles, class B. Mon, Tues, Wed & Sat, 8-10 pm. Thurs & Fri, 12:30-1:30 pm, Sun, 7-12 pm. Central standard time. Slogan: "Willie Tommy Annie Sammy." 1000 watts.

WTAT—Edison Elec. Illuminating Co., Boston, Mass. (portable). 244 meters, 1230 kilocycles, class A. No definite schedule. 100 watts.

WTAU—Ruegg Battery & Elec. Co., Tecumseh, Neb. 242 meters, 1240 kilocycles, class A. 10 watts.

WTAW—Agricultural & Mechanical College of Texas, College Station, Texas. 270 meters, 1110 kilocycles, class A. 250 watts.

WTAX—Williams Hardware Co., Streator, Ill. 231 meters, 1300 kilocycles, class A. Mon, 9-11 pm. Central standard time. Slogan: "Tappa Keg O Nails." 50 watts.

WTAY—Oak Leaves Broadcasting Station, Inc., Oak Park Arms Hotel, Oak Park, Ill. 250 meters, 1060 kilocyclec, class A. Daily ex Sun & Mon, 6:15-7:30 pm. Wed, Fri & Sat, 9-10 pm. Wed & Sat, 12 midnight to 1:30 am. Central standard time. Slogan: "Programs for Everybody." 500 watts.

WTAZ—Thomas J. McGuire, Lambertville, N. J. 261 meters. 1150 kilocycles, class A. 15 watts.

WTG—Kansas State Agricultural College, Manhattan, Kans. 273 meters, 1100 kilocycles, class A. 50 watts.

WTIC—Travelers Insurance Co., Hartford, Conn. 348 meters, 860 kilocycles, class B. Tues & Fri, 8-10:30 pm. Eastern standard time. 500 watts.

WWAD—Wright and Wright, Inc., 2215 N. Broad St., Philadelphia, Pa. 250 meters, 1199 kilocycles, class A. Mon & Thurs, 7:45 pm to 1 am. First and fourth Sun of each month. Eastern standard time. Slogan: "Penn City Station." 100 watts.

WWAE—Lawrence J. Crowley, Joliet, Ill. 242 meters, 1240 kilocycles, class A. 500 watts.

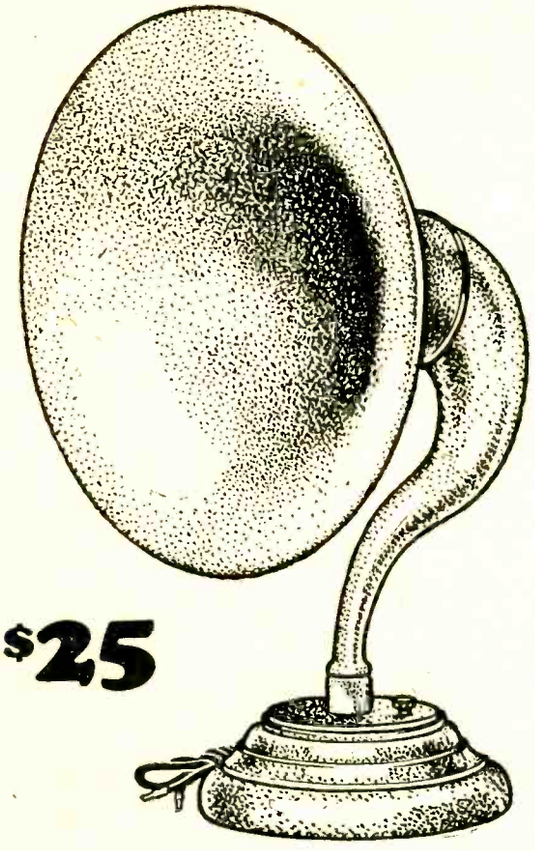
WWAO — Michigan College of Mines, Houghton, Mich. 244 meters. 1230 kilocycles, class A. Daily ex Sun. 12 noon to 12:35, music, market, weather. Tues & Thurs, 8-9:30 pm. Central standard time. Slogan: "Copper Country Station." 250 watts.

WWI—Ford Motor Co., Dearborn, Mich. 266 meters, 1130 kilocycles, class A. Wed, 8-9:30 pm. Eastern standard time. 500 watts.

WWJ—The Detroit News, Detroit, Mich. 352 meters, 850 kilocycles, class B. Daily ex Sun, 8-8:20 am, exercises; 9:30-9:45 am, dinner hints to housewives; 9:45-10:30 am, weather; 11:55-12, time signals and weather; 12-12:45 pm, concert; 3-3:50 pm, orchestra; 3:50-4 pm, weather and markets; 6-7 pm, dinner concert. Daily first and third weeks, including Sat, 7-8 pm, concert. Second and third weeks (ex Sat), 8:30-10 pm, concert. Sun, 11 am, church services; 2 pm, orchestra. Second and third Sundays, 5 pm, Orchestra; 7:30 pm, church services. Eastern standard time. 500 watts.

WWL—Loyola University, New Orleans, La. 275 meters, 1090 kilocycles, class A. Sat, 8-9 pm. Central standard time. 100 watts.

MEMBER RMA



$25

TRIMM CONCERT

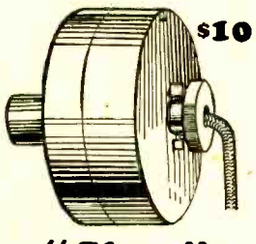
To Fit Every Need

Trimm Concert Speaker is the peer of all radio reproducers. The low pitched tones of cello, harp, organ and piano, so often lost in radio reception, are broadcast in all their original beauty through the Trimm Concert. Easily accessible adjustment provides control of volume. This speaker is recommended for high-powered, multi-stage amplifying sets.

There is a Trimm Reproducer to meet every requirement of the radio fan. Trimm Headsets are famed the world over for sensitivity and ability to get distant stations with great volume. Trimm Phonodapters are designed to fit every well-known make of talking machine.

TRIMM
Home Speaker
$10

Trimm Home Speaker is the biggest value in radio. Surprising volume, with headset distinctness and minimum distortion are the results obtained by every Home Speaker user

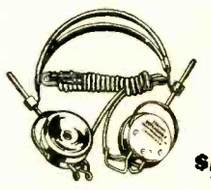


$10

"Giant" Phonodapter

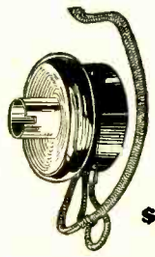
$7.50

Professional Headset



$5

Dependable Headset



$4.50

"Little Wonder" Phonodapter

TRIMM
RADIO MANUFACTURING COMPANY
24 So. Clinton St.
CHICAGO
U.S.A.

LOG SHEET

K

Call	1st Dial	2nd Dial	3rd Dial	Call	1st Dial	2nd Dial	3rd Dial	Call	1st Dial	2nd Dial	3rd Dial
KDKA				KFFV				KFNF			
KDPM				KFFY				KFNG			
KDPT				KFGC				KFNJ			
KDYL				KFGD				KFNL			
KDYM				KFGH				KFNV			
KDYQ				KFGQ				KFNY			
KDZB				KFGX				KFNZ			
KDZE				KFHA				KFOA			
KFAB				KFHJ				KFOC			
KFAD				KFHL				KFOD			
KFAE				KFHR				KFOJ			
KFAF				KFI				KFOL			
KFAJ				KFIF				KFON			
KFAN				KFIO				KFOO			
KFAR				KFIQ				KFOR			
KFAU				KFIU				KFOT			
KFAW				KFIZ				KFOU			
KFBB				KFJB				KFOX			
KFBC				KFJF				KFOY			
KFBG				KFJI				KFPG			
KFBK				KFJM				KFPH			
KFBL				KFJR				KFPL			
KFBU				KFJX				KFPM			
KFCB				KFJY				KFPP			
KFCC				KFJZ				KFPR			
KFCF				KFKA				KFPT			
KFCL				KFKB				KFPV			
KFCP				KFKQ				KFPW			
KFCY				KFKU				KFPX			
KFCZ				KFKV				KFPY			
KFDD				KFKX				KFQA			
KFDH				KFLA				KFQB			
KFDJ				KFLB				KFQC			
KFDL				KFLE				KFQD			
KFDM				KFLR				KFQE			
KFDX				KFLU				KFQG			
KFDY				KFLV				KFQH			
KFDZ				KFLX				KFQM			
KFEC				KFLZ				KFQN			
KFEL				KFMB				KFQP			
KFEQ				KFMQ				KFQR			
KFER				KFMR				KFQT			
KFEX				KFMT				KFQU			
KFFP				KFMW				KFQV			
KFFR				KFMX				KFQW			

LOG SHEET

Call	1st Dial	2nd Dial	3rd Dial
KFQX			
KFQY			
KFQZ			
KFRB			
KFRC			
KFRF			
KFRH			
KFRJ			
KFRL			
KFRM			
KFRN			
KFRO			
KFRP			
KFRQ			
KFRW			
KFRX			
KFRY			
KFRZ			
KFSG			
KFSY			
KFUJ			
KFUL			
KFUM			
KFUO			
KFUP			
KFUQ			
KFUR			
KFUS			
KFUT			
KFUU			
KFUV			
KFUW			
KGB			
KGO			
KGU			
KGW			
KGY			
KHJ			
KHQ			
KJQ			
KJR			
KJS			
KLDS			
KLS			
KLX			

Call	1st Dial	2nd Dial	3rd Dial
KLZ			
KMJ			
KMO			
KNT			
KNX			
KOA			
KOB			
KOP			
KPO			
KPPC			
KQV			
KQW			
KRE			
KSAC			
KSD			
KTHS			
KTW			
KUO			
KWG			
KWH			
KYQ			
KYW			
KZKZ			
KZM			
KZRQ			

W

Call	1st Dial	2nd Dial	3rd Dial
WAAB			
WAAC			
WAAD			
WAAF			
WAAM			
WAAN			
WAAW			
WABA			
WABB			
WABH			
WABI			
WABL			
WABM			
WABN			
WABO			
WABQ			
WABR			
WABU			
WABW			

Call	1st Dial	2nd Dial	3rd Dial
WABX			
WABY			
WABZ			
WAHG			
WBAA			
WBAN			
WBAO			
WBAP			
WBAV			
WBAX			
WBBA			
WBBD			
WBBG			
WBBH			
WBBL			
WBBM			
WBBP			
WBBR			
WBBS			
WBBU			
WBBV			
WBBW			
WBBY			
WBBZ			
WBCN			
WBDC			
WBRE			
WBS			
WBT			
WBZ			
WCAD			
WCAE			
WCAG			
WCAH			
WCAJ			
WCAL			
WCAO			
WCAP			
WCAR			
WCAS			
WCAT			
WCAU			
WCAV			
WCAX			
WCAY			

LOG SHEET

Call	1st Dial	2nd Dial	3rd Dial
WCAZ			
WCBA			
WCBC			
WCBD			
WCBE			
WCBG			
WCBH			
WCBI			
WCBJ			
WCBL			
WCBM			
WCBO			
WCBQ			
WCBR			
WCBT			
WCBU			
WCBV			
WCBW			
WCBY			
WCBZ			
WCCO			
WCEE			
WCK			
WCM			
WCX			
WDAE			
WDAF			
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WDBE			
WDBF			
WDBH			
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WDBO			
WDBP			
WDBQ			
WDBR			
WDBS			
WDBT			

Call	1st Dial	2nd Dial	3rd Dial
WDBW			
WDBX			
WDBY			
WDBZ			
WDM			
WDZ			
WEAA			
WEAF			
WEAH			
WEAI			
WEAJ			
WEAM			
WEAN			
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WEAP			
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WEBC			
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WEBQ			
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WEBW			
WEBX			
WEBY			
WEBZ			
WEEI			
WEMC			
WEW			
WFAA			
WFAM			
WFAV			
WFBB			
WFBC			
WFBD			

Call	1st Dial	2nd Dial	3rd Dial
WFBE			
WFBG			
WFBH			
WFBI			
WFBJ			
WFBK			
WFBL			
WFBM			
WFBN			
WFBQ			
WFBR			
WFBT			
WFBY			
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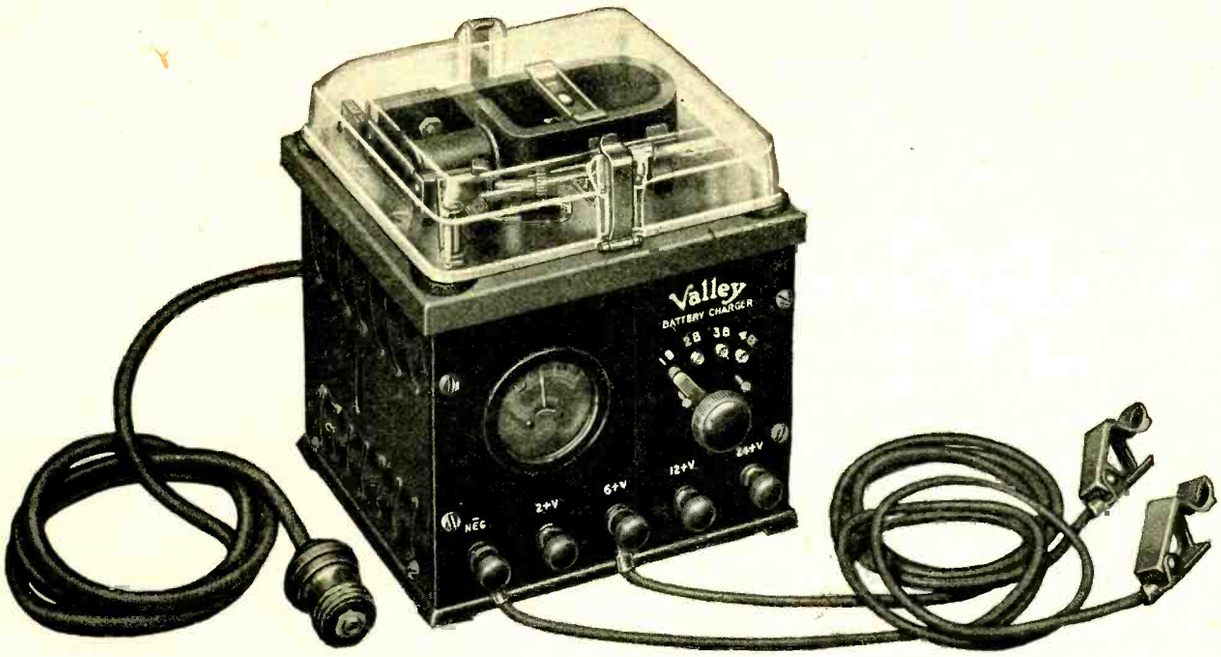
WHB			
WHK			
WHN			



Proven Principles Adapted to Radio

in the Valley Battery Chargers

Long before radio became one of the pleasures of the home, Valley Battery Chargers were in successful operation in telegraph, telephone, railway, and other signal work.

When radio came, our engineers adapted the proven principles of the Valley Battery Charger to Radio Battery service. The result is the Valley Type ABC Battery Charger—the radio member of an aristocratic family of battery chargers.

The Valley Type ABC Battery Charger is the only charger needed for all batteries; for 6-volt "A" batteries, for one, two, three, or four 24-volt "B" batteries, and for 2-volt batteries. Also for 6- and 12-volt automobile batteries.

It embodies all the essential characteristics of a battery charger for radio—and more. Just look at the ten points of superiority of the Valley Battery Charger. You'll not find another charger with ten years of research and development behind it and with all these superior features.

When you buy a charger, be sure to get the Valley You can't be satisfied with less.

Sold by radio dealers everywhere. If your dealer cannot supply you, write our nearest office.

Ten Points of Valley Superiority

1. Listed as standard by Underwriters' Laboratories.
2. No bulbs.
3. No liquids.
4. Quiet in operation.
5. Cannot harm your battery.
6. Efficient. Takes about a dime's worth of current for a full charge.
7. *Correct* 6-ampere charging rate enables you to recharge your battery overnight.
8. Ammeter mounted flush with panel shows if battery is receiving charge and if charging rate is correct.
9. Has only two wearing parts, the contacts, which can be replaced easily and cheaply. Average life of these contacts is about two years.
10. Built in handsome black case with grained and engraved Bakelite panel and clear glass top which shows simple, patented working parts. Harmonizes with the finest receiving set.

VALLEY ELECTRIC COMPANY,
3157 S. Kingshighway - - - - - St. Louis, Mo.

NEW YORK PHILADELPHIA CHICAGO INDIANAPOLIS
MINNEAPOLIS CLEVELAND KANSAS CITY SAN FRANCISCO

THE ONE CHARGER FOR ALL RADIO STORAGE BATTERIES

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

LOG SHEET

Call	1st Dial	2nd Dial	3rd Dial
WHO			
WIAD			
WIAK			
WIAS			
WIK			
WIP			
WJAB			
WJAD			
WJAG			
WJAK			
WJAM			
WJAN			
WJAR			
WJAS			
WJAZ			
WJD			
WJJD			
WJY			
WJZ	62	"	55
WKAA			
WKAD			
WKAN			
WKAP			
WKAQ			
WKAR			
WKAV			
WKBF			
WKY			
WLAP			
WLAX			
WLB			
WLBL			
WLS			
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WMAC			
WMAF			
WMAH			
WMAK			
WMAN			
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WMAZ			
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WMH			
WMU			
WNAC			
WNAD			
WNAL			
WNAP			
WNAR			
WNAT			
WNAX			
WNJ			
WNYC			
WOAC			
WOAF			
WOAI			
WOAN			
WOAR			
WOAV			
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WQAM			
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WQAO			
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WRAA			
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WRAL			
WRAM			
WRAN			
WRAO			
WRAV			
WRAW			
WRAX			
WRBC			
WRC			
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WRHF			
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WRL			
WRM			
WRR			
WRW			
WSAB			
WSAC			
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WSAG			
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WSAP			
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WSAX			
WSAZ			
WSB			
WSL			
WSOE			
WSRF			
WSRO			
WSY			
WTAB			
WTAC			
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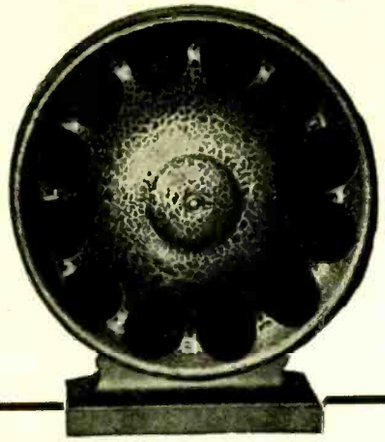
WTAW			
WTAX			
WTAY			
WTAZ			
WTG			
WTIC			
WWAD			
WWAE			
WWAO			
WWI			
WWJ			
WWL			

N & K Imported Phonograph Unit

Rigid brass, heavily nickeled. Generous length of cord. Fits Victrola and other standard phonographs without screws or special attachments. Price $7.50.



N & K Imported Loudspeaker

14 inches high. Three period designs to choose from, also dull black stippled in gold. Price $27.50. Descriptive folder free.

N & K Imported Phones

Handsomely nickeled casings of rigid metal, instead of flimsy aluminum. Generous six-foot cord. 4000 ohms capacity. Price $8.50. Descriptive folder free.

N&K TONE

TRADE MARK
Reg. U. S. Pat. Off.

So Clear!—So Rich!

ALL the delicate high notes, all the soft low ones, as well as all the lovely harmonies in between—in short you hear **the entire music clearly and naturally,** when you listen through N & K Speaker, Phones or Phonograph Unit.

Each of these radio reproducers is a master achievement of a group of European master scientists. Each embodies marked improvements over the usual reproducers of its class. For example, the

N & K Imported Loudspeaker

is entirely new in principle and appearance. It is built to **reflect and filter the sound,** giving greater mellowness and a freedom from the exaggerated megaphone falsity of commonplace horn speaker tone. A new scientific material, burtex, is used instead of resounding metal or wood. This material eliminates counter-vibrations, which are the cause of rasping, twanging, rattling speaker sounds. And instead of a disfiguring "smokestack" shape, you see a simple bowl-like form with artistic decoration in color schemes to harmonize with any type of home decoration.

N & K Imported Phones

are larger in size than ordinary phones. This makes them fit more comfortably, covering the ear completely and shutting out room sounds. The larger diaphragms and accurately designed sound chamber add to the beautiful clearness of their tone. And a sanitary covering of real leather on the head bands adds to beauty of appearance. Speaker owners can add many more stations to their logs by adding a set of N & K Phones to their radio equipment.

N & K Imported Phonograph Unit

makes your phonograph do double duty, and gives you the equivalent of a loud speaker of the highest type. Like N & K Phones the diaphragms and sound chamber are scientifically perfected for clear purity of tone. And the Unit slips onto Victrola or other standard phonograph instantly, without screws or attachment devices.

Your Money Back

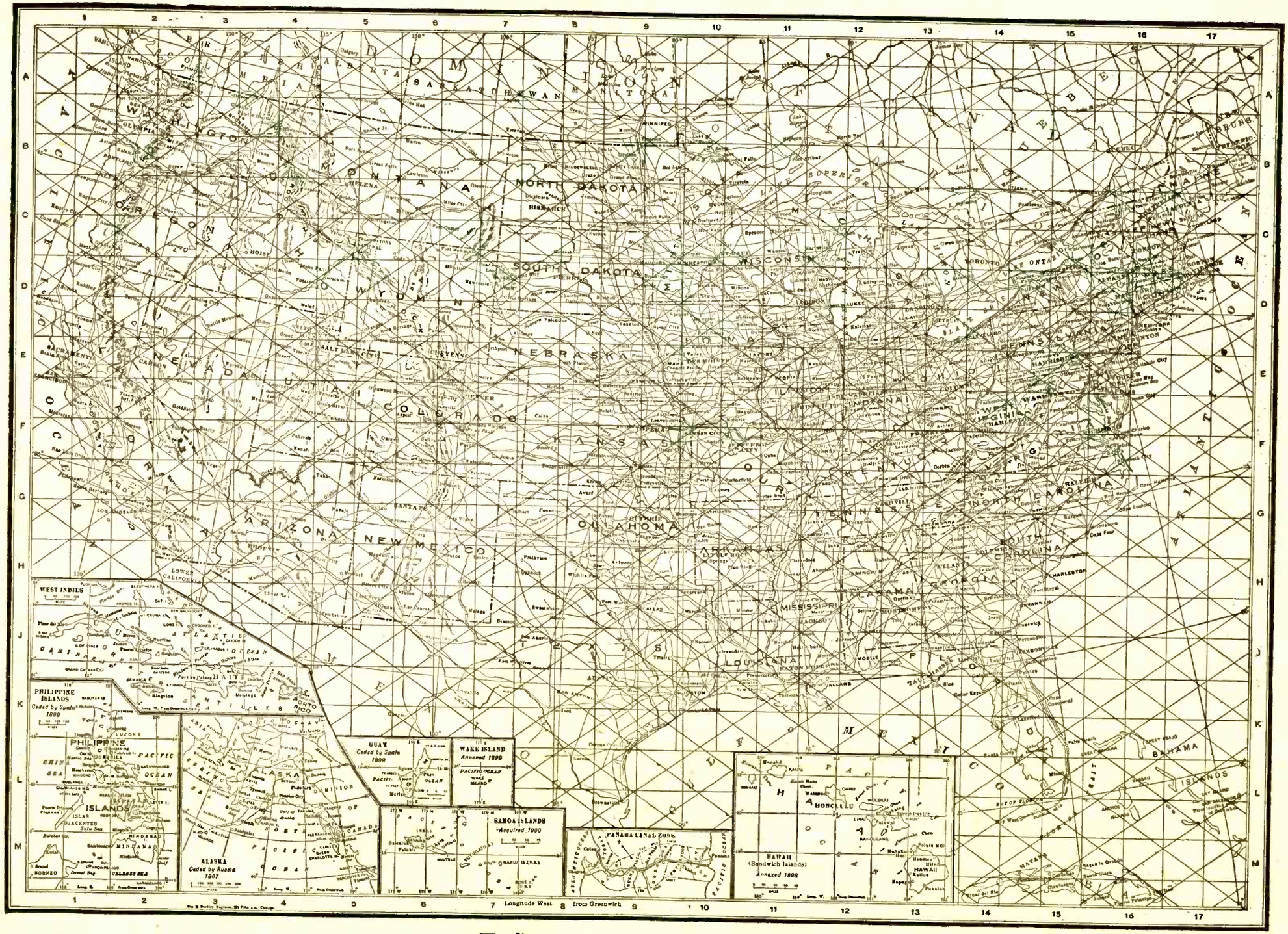
Every N & K product is sold with the clear understanding that your money will be promptly refunded if you are not wholly **delighted** with N & K clearness of tone.

If your dealer is not yet carrying the N & K line we will gladly see that you are supplied. Just write us.

Reg. U. S. Pat. Off.

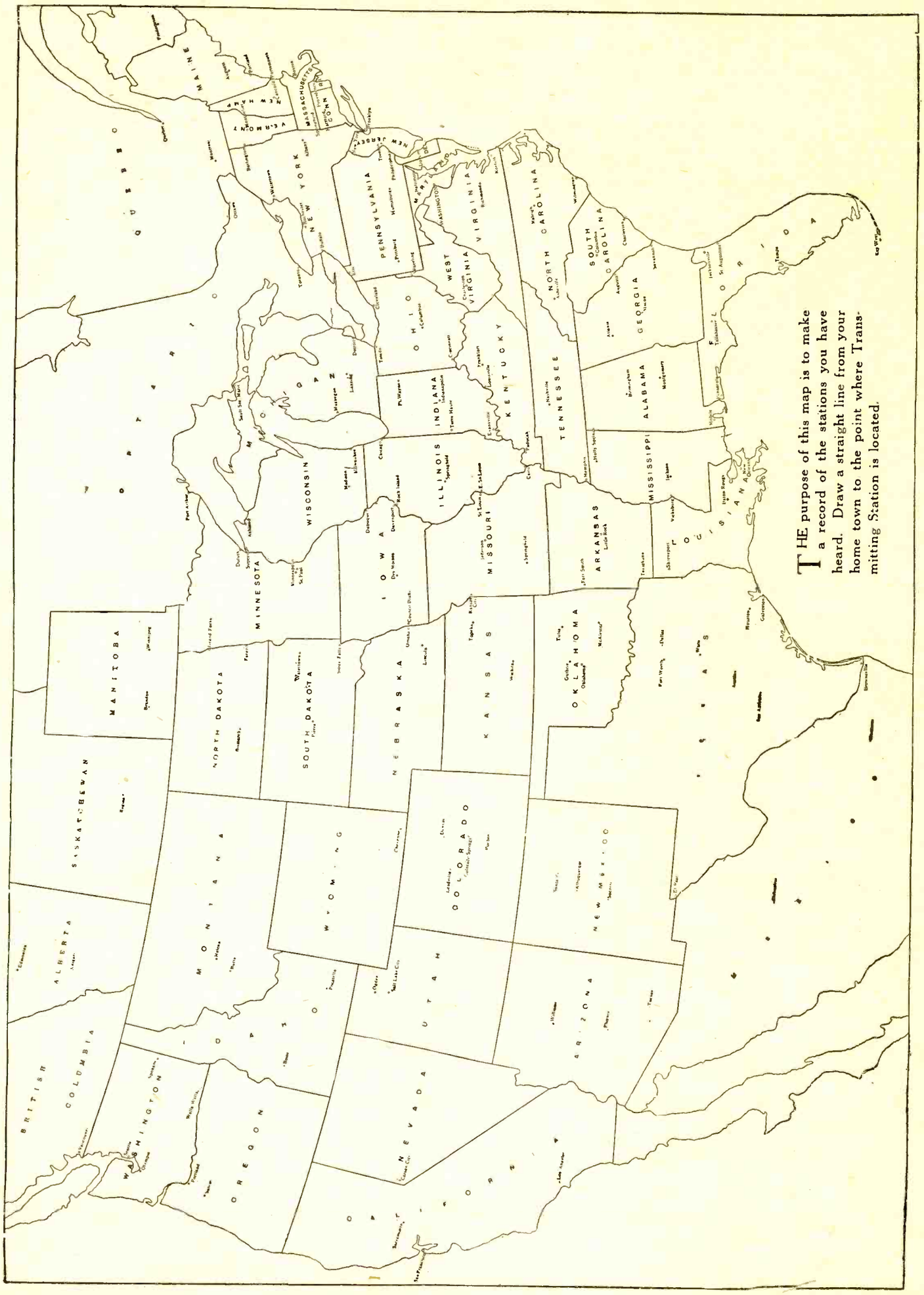
Th. Goldschmidt Corp., Dept. F3 **15 William Street** **New York**

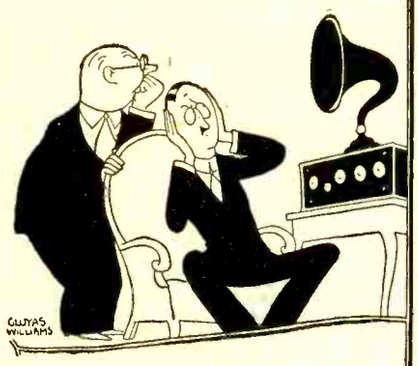
DISTANCE CHART



The lines on this map are drawn 100 miles apart

BLANK RECORDING MAP





Dear Jim:

So you've been bothered with battery noises.

When a battery leaks electricity between plates or across cell-tops it sure kicks up a row.

This unbalances the current in the set and you get the same spitting and cracking noises as with partly run down batteries.

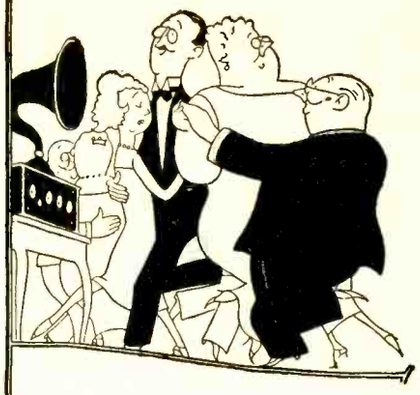
Willard Radio Batteries enable me to cut out these noises, and I can work on a full charge all the time, for Willards are *rechargeable*.

Their Threaded Rubber Insulation guards against leakage inside the battery, and their widely-spaced cells of glass with hard rubber tops say, "Halt," to current that tries to stray outside.

Willards are the only radio batteries insulated with Threaded Rubber. You'll find that they will make a tremendous difference in your set.

Your radio friend,

Sam.



WILLARD RADIO BATTERIES

Every radio fan should have WTAM's booklet, "Better Results from Radio." This booklet tells how to get better results, how to clear up battery noises, and gives many other interesting facts that you should know. Not a technical book. Written so everyone can understand.

Write to

WTAM

(The Voice of the Storage Battery)

for this booklet—

WTAM is the Radio Research Laboratory and Broadcasting Station of the Willard Storage Battery Company, Cleveland, Ohio.

Its function consists of research which is being done to improve the quality of radio reception and the broadcasting of radio programs for you entertainment.

Mail me to WTAM. I'll bring you "Better Results."

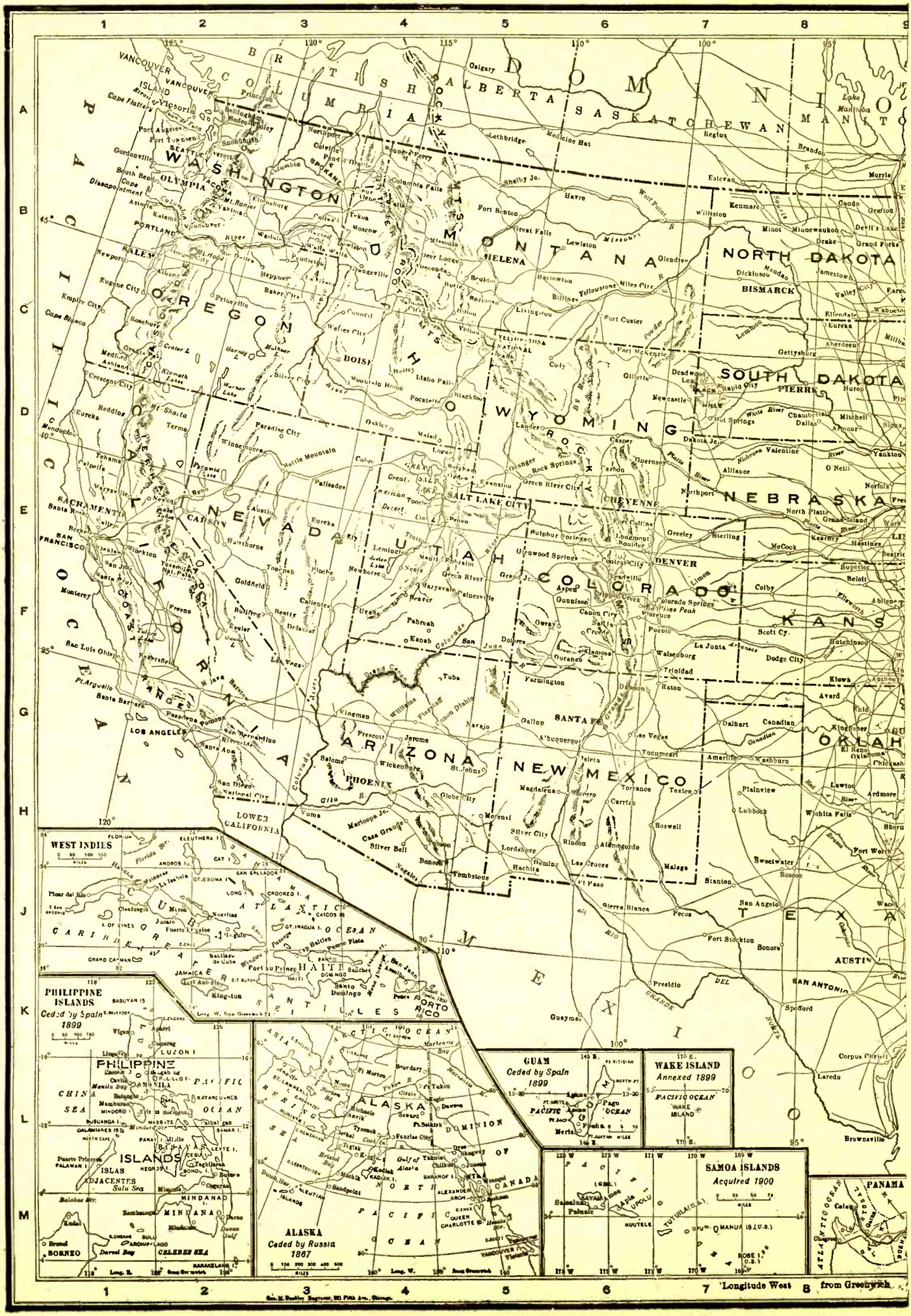
..... Name

..... City and State

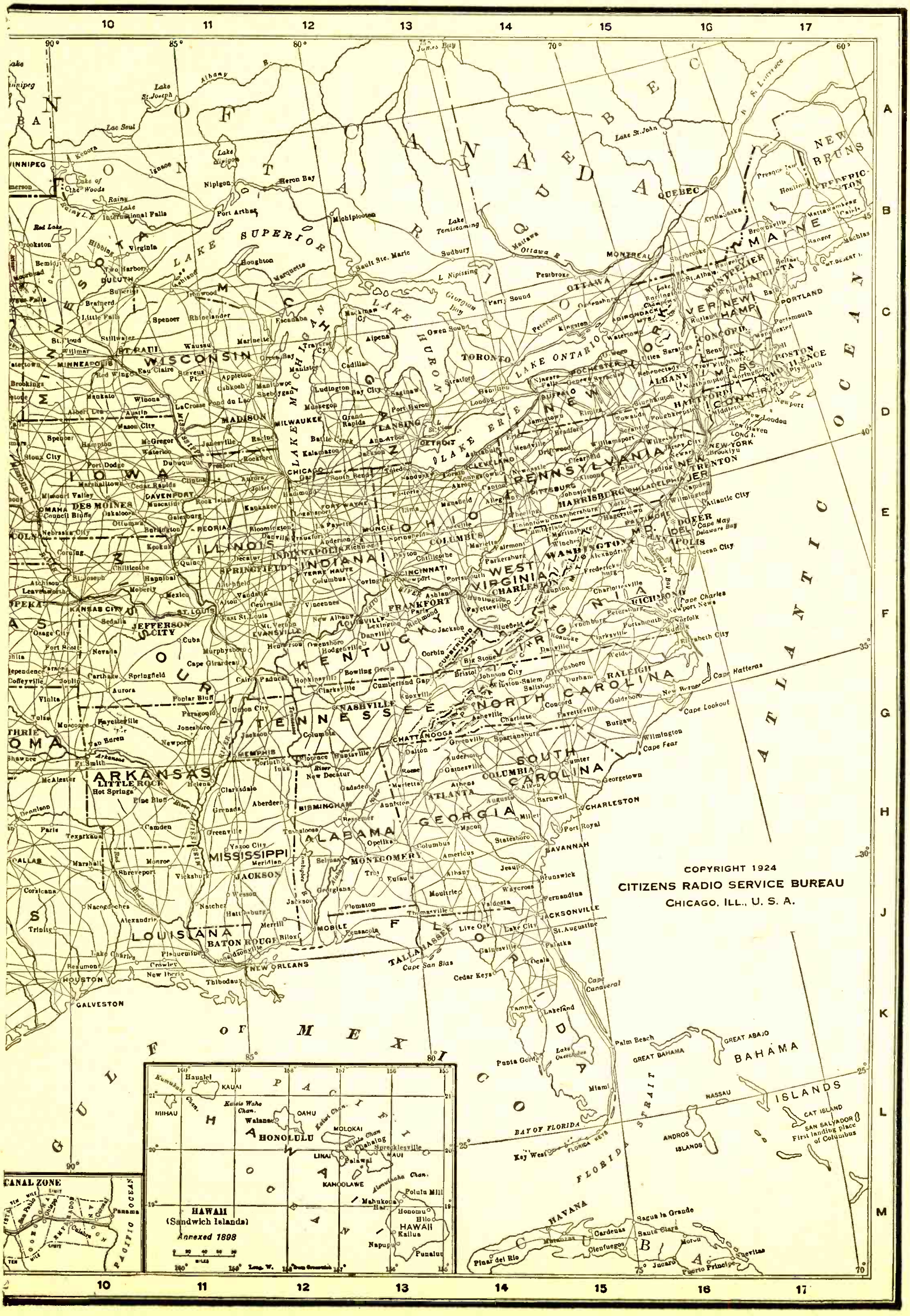
..... Street Address

C.B.-May

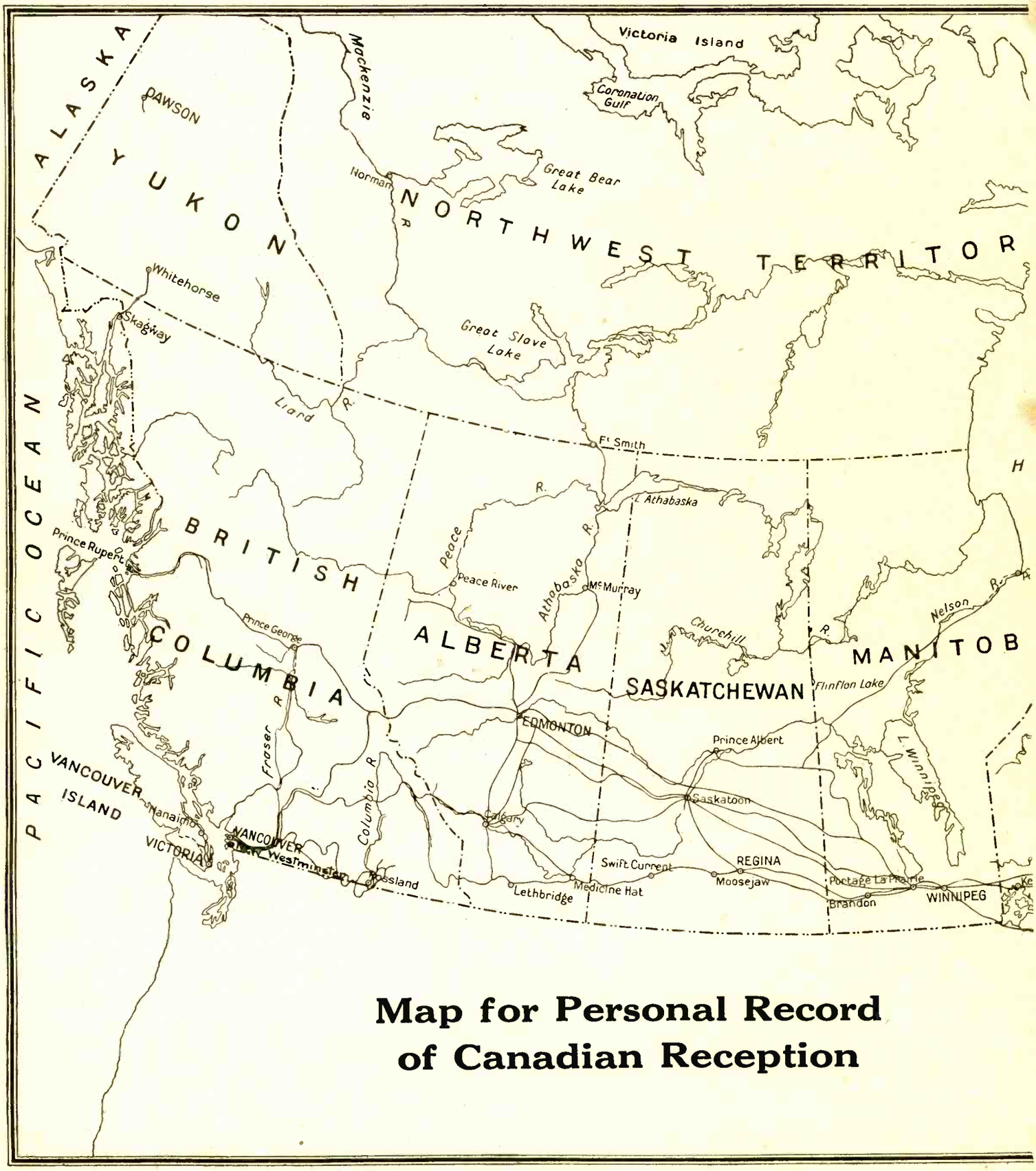
MAP OF THE



UNITED STATES

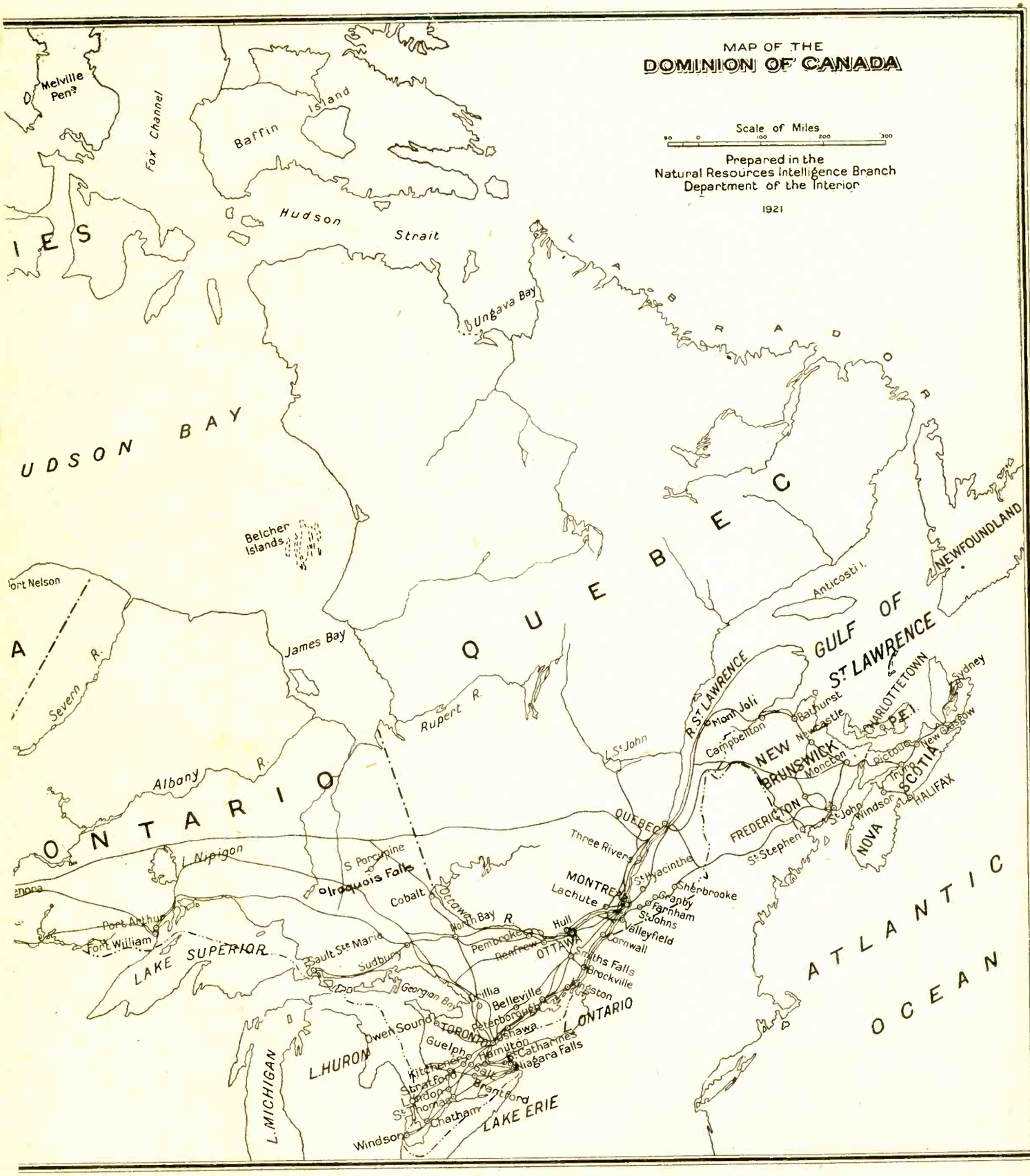


Map Of



Map for Personal Record of Canadian Reception

Canada



Canadian Broadcasting Stations

CFAC—The Calgary Herald, Calgary, Alberta. 430 meters, 697 kilocycles, 1000 watts. Daily except Sun 1 pm. market, news, 3:30-4:30 pm, music. Mon 10-12 midnight, dance program. Tues 7:45-8:45 pm, concert. Wed 7:15 pm, bedtime story, 7:45-8:45 pm, vocal. Thurs 9-11 pm, concert. Fri 7-8 pm, organ. Sun 11 am or 7:30 pm, church services. Mountain time.

CFCA—Star Publ. & Printing Co., 18 King St. W., Toronto, Ontario. 400 meters, 749 kilocycles, 2000 watts.

CFCF—Marconi Wireless Telegraph Co. of Canada, Ltd., Canada Cement Bldg., Phillips Square, Montreal, Quebec. 440 meters, 681 kilocycles, 2000 watts.

CFCH—Abitibi Power & Paper Co., Ltd., Iroquois Falls, Ontario. 400 meters, 749 kilocycles, 500 watts. Mon, Wed, Sat & Sun 8-10 pm. Tues, Thurs & Fri, 8-8:30 pm. Eastern Standard time. Slogan, "The Home of the World's Largest Newsprint Mill."

CFCK—Radio Supply Co., Ltd., 10229 101st St., Edmonton, Alberta. 410 meters, 731 kilocycles, 250 watts.

CFCL—Centennial Methodist Church, Victoria, British Columbia. 400 meters, 749 kilocycles, 500 watts.

CFCN—Wm. W. Grant, 605 24th Ave. West, Calgary, Alberta. 439 meters, 681 kilocycles, 1000 watts. Fri 9:30-11 pm, Sat 10-12 midnight, dance program. Sun 11 am and 7:30 pm, church services, 5:30-6:30, salon program. Mountain time. Slogan, "The Voice of the Prairie."

CFCQ—Radio Specialties, Ltd., 791 Dunsmuir Ave., Vancouver, B. C. 450 meters, 666 kilocycles, 40 watts. For testing only.

CFCR—Laurentide Air Service, Ltd., Nickle Range Hotel, Sudbury, Ontario. 410 meters, 731 kilocycles, 200 watts.

CFCT—Victoria City Temple, Fletcher Bros. Music House, 1110 Douglas St., Victoria, British Columbia. 410 meters, 750 kilocycles, 500 watts. Tues & Thurs 7-8 pm, Wed & Fri 8 pm, concert program. Pacific time.

CFCU—Jack V. Elliot, Ltd., 123 King St. W., Hamilton, Ontario. 485 meters, 620 kilocycles, 20 watts. Daily including Sun 5:15-6 pm, musical program. Mon, Wed & Fri 8:30-10 pm. Thurs 8-11 pm. Sat 9-12 pm. Central Standard time.

CFCW—London Radio Co., 314 Dundas St., London, Ontario. 430 meters, 697 kilocycles, 600 watts.

CFDC—Sparks Company, Wallace & Fitzwilliam Sts., Nanaimo, British Columbia. 430 meters, 697 kilocycles, 50 watts. Mon, Wed & Fri 7:30-8:30 pm. Sun 4-5 pm. Pacific Standard time.

CFHC—Henry Birks & Sons, Ltd., 708 Crescent Road, N. W., Calgary, Alberta. 440 meters, 681 kilocycles, 1000 watts.

CFKC—D. J. Fendell, Patricia Theatre Bldg., Thorold, Ontario. 295 meters, 1015 kilocycles, 150 watts.

CFLC—Chas. Guy Hunter, 551 Adelaide St., London, Ontario. 430 meters, 697 kilocycles, 100 watts.

CFQC—The Electric Shop, Ltd., 144 2nd Ave. N., Saskatoon, Sask. 400 meters, 749 kilocycles, 250 watts. Daily ex Sun 1:15-2 pm. Thurs 7:45-9 pm. Fri 9-11:30 pm, dance programs. Sun 11 am, church services. Mountain time. Slogan, "Hub City of the West."

CFRC—Queen's University (Dept. of Electrical Engineering), Fleming Hall, Kingston, Ontario. 450 meters, 666 kilocycles, 1500 watts.

CFXC—Westminster Trust Co., Columbia & Begbie Sts., New Westminster, British Columbia. 440 meters, 681 kilocycles, 50 watts.

CFYC—Victor Wentworth Odlum, Mercantile Bldg., 318 Homer St., Vancouver, British Columbia. 400 meters, 749 kilocycles, 20 watts.

CHBC—The Albertan Publishing Co., Ltd., 708 Crescent Road, N. W., Calgary, Alberta. 410 meters, 731 kilocycles, 1000 watts.

CHCE—Western Canada Radio Supply, Ltd., 919 Fort St., Victoria, British Columbia. 400 meters, 749 kilocycles, 20 watts.

CHCM—Riley & McCormick, Ltd., 133 8th Ave. East, Calgary, Alberta. 440 meters, 681 kilocycles, 1000 watts. Thurs 8-9. Special programs as announced. Mountain time. Slogan, "Western Canada's Leading Leather Goods Mail Order House."

CHCS—The Hamilton Spectator, Spectator Bldg., Hamilton, Ontario. 415 meters, 731 kilocycles, 2000 watts. Program irregular. Broadcast news, sport, speeches, lectures, etc., as announced.

CHIC—Northern Electric Co., Ltd., Toronto, Ontario. 350 meters, 857 kilocycles, 100 watts. Special programs as announced.

CHNC—Toronto Radio Research Society, 46 Lauder Ave., Toronto, Ontario. 350 meters, 857 kilocycles, 500 watts. Mon 8:30 pm. musical program. Sat 9-11 pm, dance music and specialties. Eastern Standard time.

CHUC—International Bible Students Association, Cor. Main & 2nd Sts., Saskatoon, Sask. 400 meters, 749 kilocycles, 200 watts.

CHXC—J. R. Booth, Jr., 28 Range Rd., Ottawa, Ontario. 435 meters, 689 kilocycles, 1200 watts.

CHYC—Northern Elec. Co., Ltd., 121 Shearer St., Montreal, Quebec. 341 meters, 880 kilocycles, 500 watts. Tues 8:45 pm. Wed 8:30 pm. Sun 7 pm. Eastern Standard time.

CJBC—Jarvis Street Baptist Church, Toronto, Ontario. 312 meters, 960 kilocycles, 4000 watts.

CJCA—The Edmonton Journal, Ltd., Journal Bldg., Edmonton, Alberta. 450 meters, 666 kilocycles, 500 watts. Daily ex Fri & Sunday 12:30 pm. Daily ex Fri 7:30 pm. Mon & Wed 8:30-9:30 pm. Thurs & Sat 9:15 pm to 12 midnight. Mountain time. Slogan, "The Sunniest Spot in Sunny Alberta."

CJCD—The T. Eaton Co., Ltd., Queen St. W., Toronto, Ontario. 410 meters, 731 kilocycles, 100 watts.

CJCE—Sprott Shaw Radio Co., Room 1604, Tower Bldg., Vancouver, British Columbia. 400 meters, 749 kilocycles, 150 watts.

CJCF—The News-Record, Limited, 39 S. Cameron St., Kitchener, Ontario. 295 meters, 1016 kilocycles, 300 watts. Daily concerts as announced. Sun 9-10 pm. Eastern Standard time.

CJCK—Radio Corp. of Calgary, Ltd., 223 2nd Ave., N. E., Calgary, Alberta. 316 meters, 955 kilocycles, 500 watts.

CJCM—Dr. J. L. P. Landry, Mont Joli, Quebec. 306 meters, 990 kilocycles, 250-500 watts. Daily 5-6 pm. Mon 8:30-10 pm, irregular. Sat 8:30-10 pm. Wed & Sun 8-10 pm. Tues 11 pm. Wed, Thurs, Fri, Sat & Sun 11 pm. Eastern Standard time.

CJCN—Simons, Agnew & Co., Toronto, Ontario. 410 meters, 731 kilocycles, 2000 watts.

CJGC—London Free Press Printing Co., 440 Richmond St., London, Ontario. 430 meters, 697 kilocycles, 200 watts.

CJSC—The Evening Telegram, 81 Bay St., Toronto, Ontario. 430 meters, 697 kilocycles, 2000 watts.

CKAC—La Presse, Montreal, Quebec. 425 meters, 710 kilocycles, 2000 watts. Mon, Wed & Fri 1:45 pm, 4 pm, 4:30 pm. Tues 4 pm, 7 pm, 7:30, 8:30 & 10:30 pm. First and third Wed each month, midnight frolic. Thurs 4 & 8:30 pm. Sat 7 pm, 7:30, 8:30 & 10:30 pm. Sun 4:30 pm. Eastern Standard time.

CKCD—The Daily Province, 142 Hastings St. W., Vancouver, British Columbia. 410 meters, 713 kilocycles, 2000 watts. Daily ex Sun 8:30-9:30 pm. Pacific Standard time.

CKCE—Canadian Independent Tel. Co., Wallace Ave. & Ward St., Toronto, Ontario. 450 meters, 666 kilocycles, 2000 watts.

CKCI—Le "Soleil," Limitee, C. W. Lindsay Bldg., Cor. St. John & St. Eustache St., Quebec, P. Quebec. 295 meters, 1025 kilocycles, 200 watts.

CKCK—Leader Publishing Co., Regina, Sask. 420 meters, 714 kilocycles, 2000 watts. Daily ex Sun 9:50-10:30 am, 12:30-1:15 pm, 7:30-8:10 pm. Sun 9-10 pm. Mountain time. Slogan, "Queen City of the West."

CKCO—Dr. G. M. Geldert for Ottawa Radio Association, 282 Somerset West, Ottawa, Ontario. 435 meters, 697 kilocycles, 100 watts. Tues 8-10 pm. Sun 7 pm, church service, 9 pm sacred concert. Eastern Standard time. Slogan, "The Community Voice of Canada's Capital" and "Ottawa's Radio Voice."

CKCX—P. Burns & Co., Limited, 708 Crescent Road, N. W., Calgary, Alberta. 440 meters, 681 kilocycles, 500 watts. Tues 9-10 pm, musical program and food talks. Mountain time.

CKFC—First Congregational Church, Vancouver, British Columbia. 385 meters, 788 kilocycles, 200 watts.

CKLC—Wilkinson Elec. Co., Ltd., 2119 7th Ave., N. W., Calgary, Alberta. 400 meters, 749 kilocycles, 100 watts. Mon 9-10 pm, concert. Fri 7:45-8:45 pm, concert. Sun 9:30-10:30 pm, sacred concert. Mountain time.

CKOC—Wentworth Radio Supply Co., 31 John St. N., Hamilton, Ontario. 410 meters, 731 kilocycles, 100 watts. Daily ex Sun 7:30-9:30 pm. Slogan, "In the Garden of Canada."

CKY—Manitoba Telephone System, Sherbrooke St., Winnipeg, Manitoba. 450 meters, 666 kilocycles, 2000 watts.

CNRA—Canadian National Railways, Moncton, New Brunswick. 313 meters, 960 kilocycles, 500 watts. Tues 8:30 pm. Fri 7:30 pm. Atlantic Standard time. Slogan, "Maritime Radio Station —Voice of the Maritimes."

CNRC—Canadian National Railways, Calgary, Alberta. 430 meters, 697 kilocycles, 1000 watts. Thurs 9 pm, bedtime stories & studio program. Mountain time.

CNRE—Canadian National Railways, Edmonton, Alberta. 450 meters, 666 kilocycles, 500 watts. Fri 6 pm orchestra, 7:30 pm children's bedtime stories, 8:30 pm orchestra. Mountain time.

CNRM—Canadian National Railways, Montreal, Quebec. 425 meters, 700 kilocycles, 2000 watts. Thurs 8:30 pm concert. Eastern Standard time.

CNRO—Canadian National Railways, Ottawa, Ontario. 435 meters, 688 kilocycles, 500 watts. Wed 7 pm market, 7:30 pm children's half hour, 8 pm studio program. Wed & Sat 7:30 pm, 8 pm dinner concert, 8:30 pm studio program, 10:45 pm dance program. Eastern Standard time.

CNRR—Canadian National Railways, Regina, Sask. 420 meters, 713 kilocycles, 2000 watts. Tues 8 pm. bedtime travel tales, orchestra. Mountain time.

CNRS—Canadian National Railways, Saskatoon, Sask. 400 meters, 749 kilocycles, 500 watts. Daily 2:30 pm, music and market reports. Mountain time.

CNRT—Canadian National Railways, Toronto, Ontario. 400 meters, 749 kilocycles, 2000 watts. Fri 6:30 pm concert, 8:30 pm studio program, 9 pm address, 10:30 pm orchestra. Eastern standard time. Slogan, "The Largest Railway System in the World."

CNRW—Canadian National Railways, Winnipeg, Manitoba. 450 meters, 666 kilocycles, 2000 watts. Thurs 8 pm market, 8:15 pm bedtime stories, 8:30 pm studio program. Central Standard time.

Brandes

Superior *Matched Tone* Headset $6
$7 in Canada

Table-Talker $10.
50¢ extra west of the Rockies
In Canada $12.50

Navy Type *Matched Tone* Headset $8
$9 in Canada

The name to know in Radio

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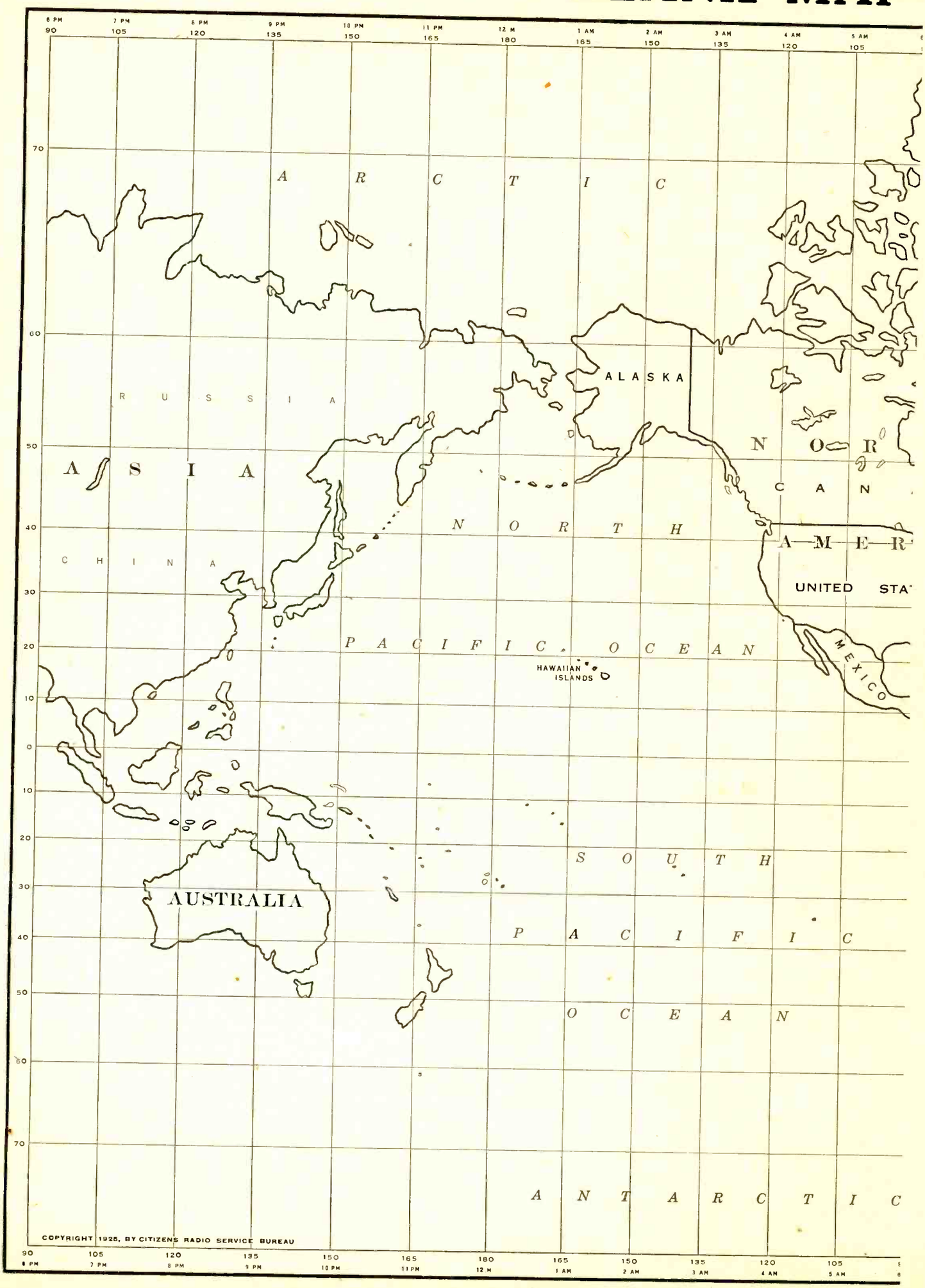
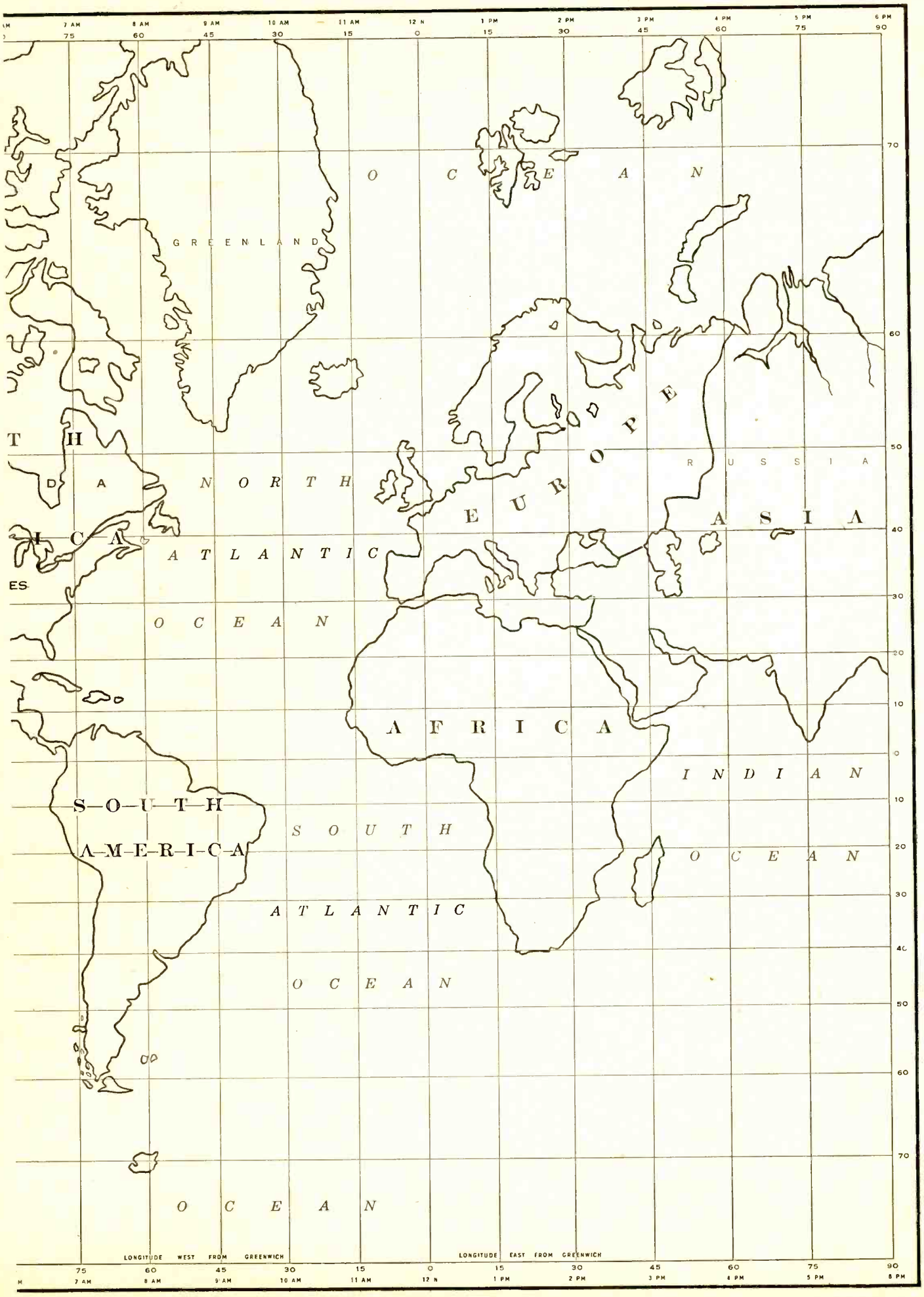


OF THE WORLD



Foreign Radio Broadcasting Stations

Location	Operated by	Call	Wave l'gth meters	Power watts
ALASKA				
Anchorage	Chovin Sup. Co.	KFQD	280	100
Juneau	Alaska Electric Light & Power Co.	KFIU	226	10
Kukak Bay	Walter Heinrich	KNT	263	100
ARGENTINA				
Buenos Aires	Radio Sud America	LOZ	375	500
	Also		384	.....
	Radio Cultura	LOX	375	.....
	Francisco J. Brusa	TCR	325	100*
	Also		300	.....
	Cia. Radio Argentina†	LOR	350	500
	Also		410	.....
	Ciara‡		400	500
	Francisco J. Brusa	LOV	.....	.....
	Francisco J. Brusa	B-1	.....	.....
	Grand Splendid Theater	LOW	.....	.....
	Radio Nacional	LOY	.....	.....
Tucuman			No data	
Rosario			No data	

*Now installing equipment for 1000 watts.
†Radio Cultura and Sociedad Radio Argentina also named as operators of this station.
‡Cia. Radio Argentina.

AUSTRALIA				
Sydney	Farmer & Co. (Ltd.)	2CF	1120	1000
	Broadcastings Sydney (Ltd.)	2BL	380	500
Melbourne	Associated Radio Co. (Ltd.)	2AB	480	250
Adelaide	So. Australia Broadcastings (Ltd.)		480	.....
Perth	West Australian Farmers (Ltd.)	6WF	1250	500
AUSTRIA				
Vienna	Technologische Gewerbmuseum	"Radio Wien"	700	100
	Radio Hekaphon	OHW	600	.....
BELGIUM				
Brussels	No data	SRB	405	.....
	No data	BAV	900	.....
	Also		1100	.....
	Radio Electrique		265	.....
BRAZIL				
Rio de Janeiro	Praia Vermelha	No data	.....	500
	Marconi (Radio Soeiedade do Rio de Janeiro)	No data	.....	6000
Sao Paulo	Radio Bondeirantes	No data	.....	10000
Belle Horizantes	National Telegraph Service	No data	.....	500
Bahia	Radio Sociedade do Bahia	(Projected station)		
CHILE				
Valparaiso	Senor Placi do Munoz Rojas		No data	
Santiago	Radio Corporation of Chile	CRC	400	.....
	Also		460	.....
Vina del Mar	Radio Corporation of Chile	ABC	400	.....
CHINA				
Hongkong	Hongkong Hotel Co.		.....	.....
	Radio Communication Co. (Orient), Ltd.		.....	.....
Shanghai	The Evening News		.....	.....
Macao	(Portuguese)		.....	.....
CUBA				
Habana	Cuban Telephone Co.	PWX	400	500
	Pedro Zayas	2DW	300	100
	Alberte S. Bustamente	2AB	240	20
	Mario Garcia Velez	2OK	360	100
	Frederick W. Borton	2DY	260	100
	Frederick W. Borton	2CX	320	10
	Westinghouse Electric Co.	2EV	220	50
	Roberto E. Ramirez	2TW	230	20
	Heraldo de Cuba	2HC	275	500
	Luis Casas	2LC	250	30
	E. Sanchez Fuentes	2KD	350	100
	Fausto Simon	2MN	270	300
	Manuel G. Salas	2MG	280	20
	Raul Perez Falcon	2JQ	150	10
	Alvaro Daza	2KP	200	10
	Julio Power	2HS	180	20
	Oscar Collado	2OL	290	15
	Amadeo Saenz	2WW	210	20
Colon	Leopoldo V. Figuerca	5EV	360	100
Tuinucu	Frank H. Jones	6KW	340	100
	Frank H. Jones	6KJ	275	100
Cienfuegos	Antonio T. Figuerca	6CX	170	20
	Eduardo Terry	6DW	225	10
	Jose Ganduxe	6BY	300	100
	Valentin Ullivarri	6AZ	200	10
Caibarien	Josefa Alvarez	6EV	225	20
Camaguey	Pedro Nogueros	7AZ	225	.....
	Salvador Rionda	7BY	350	.....
Santiago de Cuba	Alfredo Broocks	8AZ	240	20
	Alberto Ravelo	8BY	250	100
	Andres Vinnet	8FU	225	15
	Pedro C. Andus	8DW	275	50
	Eduardo Mateo	8EV	180	75
	Juan F. Chibas	8GT	260	.....
CZECHOSLOVAKIA				
Kbely	Radio Journal	None	1100	1000
Prague	No data	PRG	*1800	10000
Brunn	No data	OKB	1800	1000

*Also broadcasts on 4500 meters.

DENMARK				
Lyngby	Danish Government	OXE	2400	2500
FINLAND				
Tammerfors	Amateur Radio Society	3NB	300	20
Skatudden	Nuoren Voiman Liiton Radioyhdistys	"Radio Division"	450	75
FRANCE				
Paris	Eiffel Tower	FL	2600	4000
	Ecole Superieure des P. T. & T.	ESP	450	350
	Levallois (Radiola)	SFR	1780	2000
	No data	8AJ	1780	.....
Tours	French Government	YG	2500	500
LaDoua (Lyons)	French Government	YN	480	500
	Also		3100	.....
Nice	French Government	None	460	.....
Issy-sur-Moulineaux	French Government	None	1600	.....
Bourges	French Government	None	900	.....
Abbeville	French Governm't	None	900	.....
GERMANY				
Berlin	Konigswusterhausen	LP	2800	.....
	Vox Haus	None	450	1500
Leipzig	Mitteldeutsche Rundfunk AG	None	436	1000
	Also		.....	1500
Frankfurt	Sudwestdeutsche Rundfunkienst	None	460	.....
Hamburg	Nordischer Rundfunk AG	None	392	.....
Breslau	Schlesische Rundfunk AG	None	415	.....
Konigsburg	Ostmarken Rundfunk AG	None	460	.....
Stuttgart	Suddeutsche Rundfunkdienst AG	None	437	.....
Munich	Deutsche Stunde in Bayern	None	485	1500
Eberswalde	No data		2930	.....

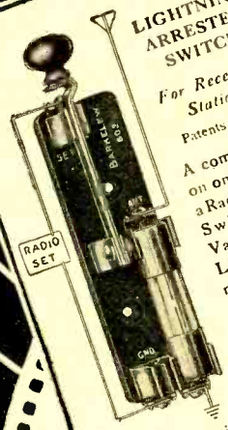
GREAT BRITAIN

The following stations are operated by the British Broadcasting Co., which holds an exclusive concession from the British Government:

Sheffield		None	303	.....
Plymouth		None	330	.....
Cardiff		5WA	350	1100
London		2LO	365	900
Manchester		2ZY	375	1000
Bournemouth		6BM	385	1100
Newcastle		5NO	400	1100
Glasgow		2SC	415	.....
Belfast		None	435	.....
Birmingham		5IT	475	500
Aberdeen		2BD	495	1100
Chelmsford		5XX	1600	.....
Croydon		GED	900	.....
Glasgow		5SC	420	1100
Leeds-Bradford		2LS	346	No data
	Also		310	.....
HAWAII				
Honolulu	Marion A. Mulrony	KGU	360	500
	The Electric Shop	KYQ	270	100
INDIA				
Calcutta	Radio Club (2BZ) operated by Marconi	5AFO	425	.....
ITALY				
Rome	No data	ICD	3200	.....
	Ing. Ranieri	None	350	.....
	Also		450	.....
Centocello	No data	None	2900	.....
JUGOSLAVIA				
Belgrade	No data		1625	.....
MARTINIQUE, French West Indies				
La p. des Carrieres	French Marine de Guerre	HYV	600	.....
	Also		2000	.....
MEXICO				
Mexico City	El Buen Tono	CYB	360	500
	El Universal	CYL	360	500
	El Excelsior (not now operating)			
Saltillo	Colegio Ateneo Fuente	None	450	135
Monterey	No data.			
NETHERLANDS				
The Hague	Velthuyzen	PCKK	1050	.....
	Nederlandsche Radio Industri	PCGG	1050	.....
	Laboratorium Heussen	PCUU	1050	.....
Ijmuiden	Middelraad	PCMM	1050	.....
Amsterdam	Smith and Hoog-hout	PA5	1050	.....
	Vas Diaz Press Office	PCFF	2000	.....
Hilversum	Dutch Radio Apparatus Factory	NSF	1050	.....
NEW ZEALAND				
Dunedin	Otago University	4XO	140	.....
	British Electrical & Engineering Co.	4YA	310	500
Auckland	Auckland Radio Service	1YA	260	200
	C. H. Pearson for Newcombe (Ltd.)	1YL	260	500
Wellington	Wellington Broadcasters (Ltd.)	2YB	275	15
	Dominion Radio Co.	2YK	275	15
Gisborne	Gisborne Radio Co.	2YM	335	500
PERU				
No data	Peruvian Broadcasting Co. (projected)			
PORTO RICO				
San Juan	Radio Corporation of Porto Rico	WKAQ	360	100
PORTUGAL				
Lisbon	Aero Lisboa	None	370	.....
	Also		400	.....
SOUTH AFRICA				
Johannesburg	Association of Scientific and Tech. Soc.	None	450	.....
Cape Town	No data		.....	.....
SPAIN				
Madrid	No data	EGC	2100	.....
	No data	PTT	400	.....
	Also		700	.....
	Radio Iberica		392	.....
Cartagena	No data	EBX	1200	.....
SWEDEN				
Stockholm	Royal Telegraph Radio Office	None	440	500
	Svenska Radioactiebolaget	None	470	300
Goteborg	Royal Telegraph Radio Office	SAB	700	200
	Ingenior Eliassons	SMZX	460	50
Boden	Royal Telegraph Radio Office	SAI	460	50
Gothenburg	Nya Varvet		700	.....
SWITZERLAND				
Lausanne	Champ de l'Air	HB2	1060	.....
Geneva	Station T. S. F. Cointrin	HB1	1100	.....

BARKELEW
RADIO ACCESSORIES

LIGHTNING ARRESTER SWITCH
For Receiving Stations
Patents Pending



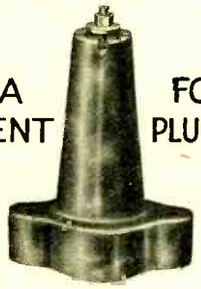
A combination on one base of a Radio Ground Switch and a Vacuum Tube Lightning Arrester.

A distinctive device for those who know and demand the best lightning protection.

Approved by the Underwriters Laboratories.

Catalog No. 602 Price $3.00

ANTENNA EQUIPMENT

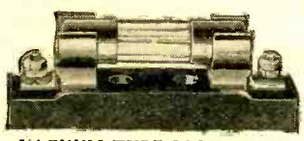


FOUR PHONE PLUGS AND POSTS

FOUR PHONE POST
For Radiola III and III-A
The prongs on this post fit through phone holes in the face of panel. It takes one to four head-sets in Series.
Catalog No. 624 Price $1.00

FOUR PHONE PLUG
Connects one to four head-sets in Series to any Radio set using telephone jacks.
Catalog No. 616
Price $1.00

PORCELAIN PEDESTAL
Brown Glaze
An insulator with a rigid clamp for the lead-in wire. A pedestal for spacing Ground Switches or other apparatus, 5" clear of the mounting surface.
Catalog No. 611 Price $0.40



VACUUM TUBE LIGHTNING ARRESTER
Required on the antena of every Receiving Station. Approved by the Underwriters Laboratories.
Catalog No. 606 Price $1.50

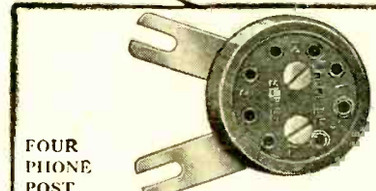
BARKELEW PRODUCTS
Have Merit and Reputation

THE keen buyer of radio material knows that some items can be purchased on their own merit, while others the reputation of the manufacturer is of first importance.

He is happy when he finds a fast moving, well advertised line with real merit and with a factory reputation backing it up.

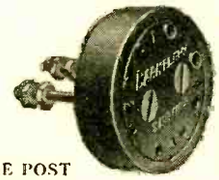
The articles shown here have several successful years behind them [they are old for radio] and our eighteen years in electrical manufacturing surely count for something.

For full description of each item, see our new Radio Catalog No. 32 at your dealer. If he hasn't his copy, we have one for him.



FOUR PHONE POST
For binding post mounting. Connects one to four headsets in series to the more common types of brass phone posts.
Catalog No. 628 Price $1.00

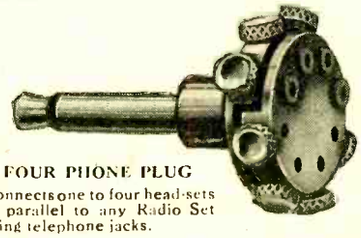
GROUND SWITCH
Required on all Transmitting Stations—Built of 60 Ampere Copper
Catalog No. 600. Price $2.50



FOUR PHONE POST
For Panel Mounting. Connects one to four head-sets in series.
Catalog No. 618 Price $0.75

GROUND SWITCH
Required on all transmitting Stations. Built of 100 Ampere Copper.
Catalog No. 601 Price $3.15

"LEAD-IN" INSULATOR
For Receiving Stations
Spaces the "Lead In" Wire 5" out from the wall.
Catalog No. 612 Price $0.50

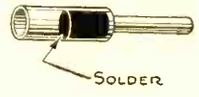


FOUR PHONE PLUG
Connects one to four head-sets in parallel to any Radio Set using telephone jacks.
Catalog No. 614 Price $1.50

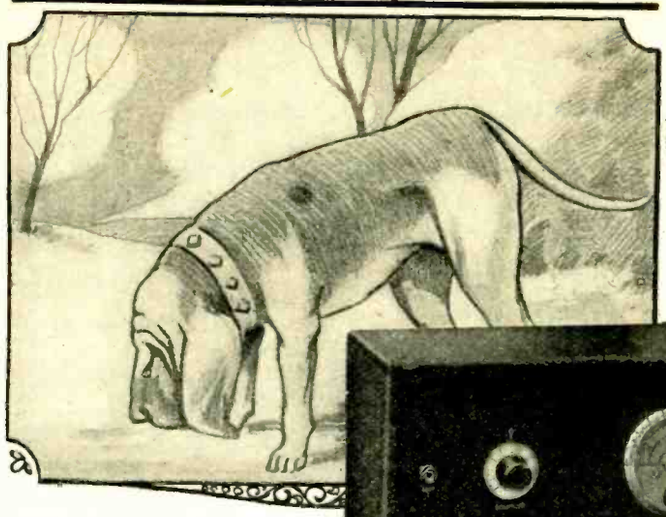
VACUUM ARRESTER TUBE
Used in 602 Switch and 606 Arrester. Sold separately for replacement purposes.
Catalog No. 622 Price $1.00

The Barkelew Electric Mfg. Co.
Middletown, Ohio U.S.A.

NEW YORK 157 Chambers St. | CHICAGO 15 Clinton St. | DETROIT McKerchey Bldg.
WASHINGTON, D. C. Mills Building | MINNEAPOLIS 1017 Lumber Exchange | SAN FRANCISCO 75 Fremont St.
LOS ANGELES 443 S. San Pedro St. | SEATTLE 1041 Sixth Ave., S. | DENVER Denham Bldg.



STANDARD CORD TIPS
If the wire is tinned they can be soldered on Phone Cord with a couple of matches.
Cat. No. 623 Price $0.05 ea.



The bloodhound, remarkable for the acuteness of its smell, can pick up a scent and follow a trail when all else fails.

Sensitivity

-never before thought possible!

With the extreme acuteness of the bloodhound's scent, the Model L-2 Ultradyne detects the faintest broadcast signals—signals that are "dead" to other receivers—regenerates and makes them audible on the loud speaker.

It's here, where the development of other super-radio receivers has halted; the Ultradyne forges ahead.

The unusual sensitivity of the Model L-2 Ultradyne is due to the successful application of regeneration, to the famous Modulation System of radio reception, recently perfected by R. E. Lacault, E.E., A.M.I.R.E., Chief Engineer of this Company and formerly Radio Research Engineer with the French Signal Corps Research Laboratories.

It's this development, an exclusive feature of the Model L-2 Ultradyne, that makes it possible to receive greater distance on the loud speaker.

In addition the Ultradyne is the most selective receiver known. Regardless of close similarity in wavelength, it selects any station within range —brings in broadcasting clearly, distinctly, faithfully.

Everything that the Model L-2 Ultradyne means in actual results and genuine satisfaction, you will appreciate the first evening you operate it.

THE ULTRADYNE KIT
Consists of 1 Low Loss Tuning Coil, 1 Special Low Loss Coupler, 1 Type "A" Ultraformer, 3 Type "B" Ultraformers, 4 Matched Fixed Condensers.
To protect the public, Mr. Lacault's personal monogram seal (R. E. L.) is placed on all genuine Ultraformers. All Ultraformers are guaranteed so long as this seal remains unbroken. **$30.00**

How to Build and Operate the ULTRADYNE
32 page illustrated book giving the latest authentic information on drilling, wiring, assembling and tuning the Model L-2 Ultradyne Receiver..... **50c**

Write for free descriptive folder.

ULTRADYNE
MODEL L-2

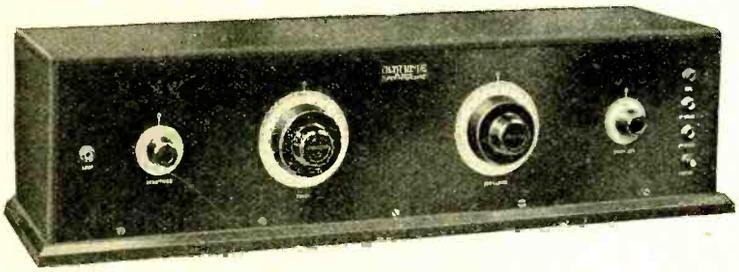
PHENIX RADIO CORPORATION
3-B Beekman Street, New York

The New Model L-2 Ultradyne

By HOGART S. SWEET

REGENERATION plus modulation is the keystone of the new Ultradyne Receiver designed by Robert E. Lacault, formerly Radio Research Engineer with the French Signal Corps. This combination is going to prove as valuable to the level minded radio fan as four wheel brakes and balloon tires have to the level minded autoists. There is a strong comparison here, for both the autoist and radio fan seek the same things, namely, smooth operation and reliable and instant control.

As any radio technician will tell you, it is easy enough to think up any number of combinations and draw them into an intelligible circuit, but to get the combination to work and work satisfactorily is another story and one that is not without its note of despair. Mr. Lacault has met with numerous difficulties in his attempts to make the combination of regeneration and modulation work to his complete satisfaction, but he was successful in the end.



Front View of Receiver

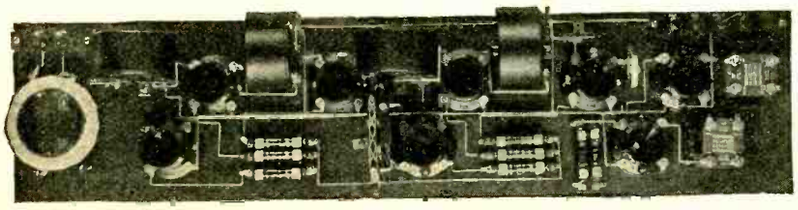
Specifications

But listen to the specifications of Mr. Lacault's new design, Model L-2 Ultradyne, before we cover the constructional details. There are no rheostats! The filaments of all the vacuum tubes are controlled by automatic filament regulating devices. Filament control jacks are employed for the stages of audio frequency amplifications so that it is not necessary to play around with one or a couple of rheostats every time you shift. If you are using both stages of audio and wish to shift to the detector, out comes the plug with your own hands and out go the two audio frequency amplifier tubes without saying boo. Likewise, one or both go on when the plug is inserted in one or the other jack.

All binding posts have been moved to the rear, where they rightfully belong, for there should be no wires in front or on the side of the receiver, but behind, where they are out of sight and out of the way. The two variable condensers, of the low loss type, are both of the same capacity, whereas before, one was twice the capacity of the other. Making them both of a capacity of .0005 M.F. provides a more even adjustment than was possible with the original type of Ultradyne.

Naturally, the old type single layer cylindrical coils have been replaced by coils of the low loss type. These are the basket weave form and are more compact than the single layer type and decidedly more efficient.

It will be noted from the photo of Fig. 1 that there is a radical change in the position of the controls. Both the tuning dials are situated in the center of panel, really the most convenient positions for them—right where your hands normally rest. The regeneration control and the potentiometer control are out to either side, being the less important adjusting mediums.

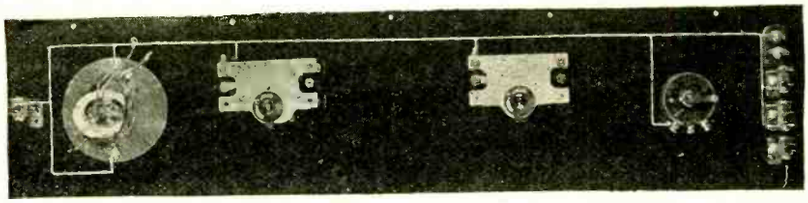


Looking Down on Receiver

The Layout

The layout is a work of art. Though the size of the panel is the same as in the former model, the instruments are not at all crowded and the leads from instrument to instrument are considerably shorter. It is a fact that it is much easier to wire this set than the old one or sets of similar design. A study of the accompanying photographs will assure you of this. The panel layout is shown in the photo of Fig. 1. The loop aerial jack is at the extreme left, followed by regeneration control knob, the tuner dial, the oscillator dial and the potentiometer control. The three phone jacks and the "A" battery switch are lined up on the extreme right of the panel.

A view of the layout from the rear of the panel is shown in Fig. 2, as well as that part of the wiring which is completed before the panel is attached to the baseboard. From left to right are: the phone jacks and "A" battery switch, the potentiometer, the 23 plate oscillator condenser, the 23 plate tuning condenser, the regeneration coupler and its copper shield and the loop aerial jack. Fig. 3 shows a view of the instruments mounted on the baseboard. The devices similar in appearance to grid leaks are the automatic filament regulators. The oscillator coupler is seen just to the right of the second rear tube socket. The tuning coil is situated to the extreme right of the baseboard. The Ultraformers are seen lined along the front portion of the baseboard, in the photo, though this is actually the rear. The "A," "B" and "C" battery binding posts are all mounted on a single strip of bakelite which is supported by two brass columns, and are at the extreme left of the baseboard, in the photo. The aerial and ground binding posts are mounted in the same manner and are seen to the extreme right.



Rear View of Receiver

The Parts Required

Below is given the complete list of parts required for the construction of the Model L-2:

1—7x30-inch cabinet with baseboard.
1—7x30-inch panel.
2—.0005 M.F. low loss variable condensers.
2—Vernier knobs and dials.
1—Low loss tuning coil.
1—Low loss oscillator coil.
1—Ultraformer, type A.
3—Ultraformer, type B.
1—Low loss 180 coupler with shield.
1—Dial for coupler.
8—Vacuum tube sockets.
1—Dial for potentiometer.
8—Amperites, type A.
2—Double circuit jacks.
1—Single circuit filament control jack.
1—Double circuit filament control jack.
1—"A" battery switch.
2—Audio frequency transformers.
1—Variable grid leak.
7—Binding posts.
2—Bakelite binding post mounting strips.

1—.0005 M.F. condenser with grid leak mounting.
4—.00025 M.F. fixed condensers.
2—.001 M.F. fixed condensers.
1—.005 M.F. fixed condensers.
No. 14 tinned copper bus bar wire.
Assortment of screws and nuts.
1—400 ohm potentiometer.

Above all means purchase the best of materials. The L-2 Ultradyne is worthy of the best and if full service is to be expected, do not use any inferior parts.

Assembling the Ultradyne

The first job to be done is the panel drilling and the mounting of the phone jacks, "A" battery switch, the two 23-plate variable condensers, the potentiometer and the coupler and shield. Layout the baseboard next, placing each instrument in its proper position as shown in the photo of Fig. 3. The complete circuit diagram is shown in Fig. 4. Wire the instruments mounted on the panel first, then the instruments on the baseboard. Be sure and solder all connections and take your time about it to insure a good job. Be sparing with the soldering flux and use a hot iron. After both the panel and baseboard instruments have been wired, attach the baseboard to the panel and complete the wiring between the instruments on each.

Be sure and check all the connections when you have completed the wiring and as a final check up, test each soldered joint with the battery and headphones to insure perfect electrical contact. As a precaution, before operating the set, connect your "A" battery to the "B" battery binding posts and with one tube test each and every socket to be positive that there is no short between the "B" and "A" battery connection. If the tube lights in any one or all of the sockets, it is proof that the set has either been incorrectly wired, or the "B" battery wires are touching the "A" battery wires at some point.

After all instruments and connections have been tested, insert the tubes in the socket, connect up the "A," "B" and "C" batteries to the proper binding posts, plug in the loop aerial or attach the aerial and ground and with the phones or loud speaker plugged in pull the filament switch.

Tuning In

The following is the correct procedure for tuning the Model L-2 Ultradyne: Turn the oscillator dial one degree at a time and for each setting of this dial turn the tuning dial slowly through its whole range. If nothing is heard at any setting, move the oscillator dial one degree more and repeat the process with the tuning dial. At some point one should hear a station, and it will be noticed that a slight hissing noise is heard when the station is transmitting, but no speaking or singing into the microphone. This slight hissing noise indicates the presence of a carrier wave and will help materially in tuning in the various broadcast stations. All this tuning should be done with the potentiometer adjusted to a point where no whistles are heard. If whistling noises are present, the potentiometer should be turned towards the positive side until the whistling stops, at which point the amplifier operates at its maximum sensitiveness. When tuning in distant stations, it may be necessary to readjust the potentiometer slightly. This should be done only after the station is heard faintly but clearly enough to increase the amplification. When tuning in very weak signals, the feed back or regenerative coupler should be turned slowly until a point is reached where a whistle is heard, then move back just below this point. A slight readjustment of the two condensers will then bring the signal to maximum audibility. When tuning in another station, turn the feed back coupler to zero (coils at right angle) and turn first with the two condensers, as explained above, then adjust the coupler once the station is tuned in.

Calibrating the Ultradyne

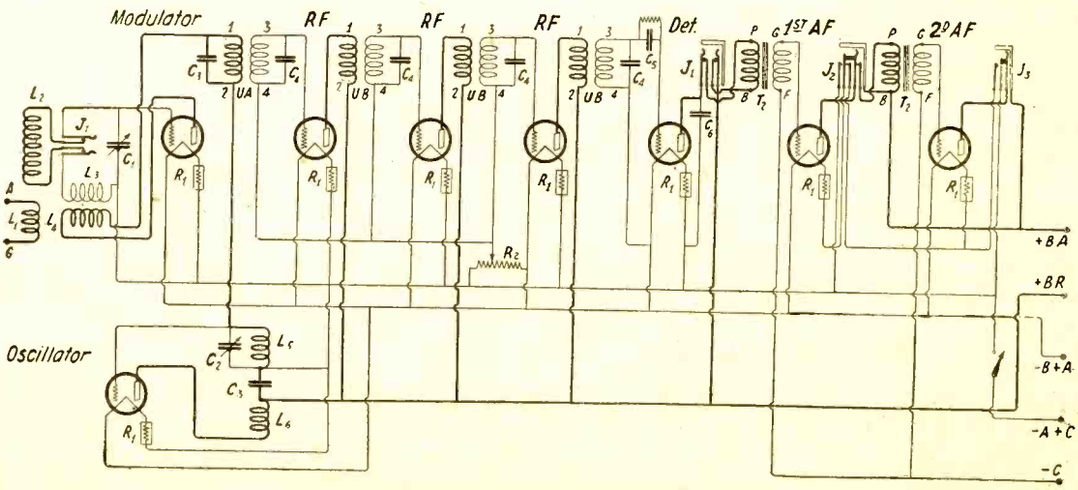
If the same antenna or loop is used at all times, the Ultradyne may be calibrated and a curve made giving the proper settings of the two condensers for any station. A somewhat similar procedure which will also prove useful is to keep a record of the two dial settings for each station heard. This permits the operator to tune any station which has already been heard by tuning the two condensers to the proper settings.

In Conclusion

It should be pointed out that the regeneration feature incorporated in the new Model L-2 Ultradyne is a form of radio frequency amplification and consequently plays its most important part when you are receiving a long distance station. Its use does not increase the volume of the signals received from the local stations to any appreciable extent, this not being the object. Greater volume can always be obtained by the addition of audio frequency amplification, but it does increase the volume of stations at a distance, for the reasons that the weak signals are boosted in amplitude before they pass through the long wave radio frequency amplifier. Since the object of the regeneration feature is to make the Ultradyne more sensitive to weak signals, it should be evident that it will not only increase the volume of signals from distant stations that could not be heard on an Ultradyne without regeneration.

As has been said, no great difference will be noticed in the volume of local stations, but it is surprising what the regenerative feature does in connection with the reception of long distant stations. Probably the most advantageous point is that it insures reliable and consistent reception from stations that heretofore faded or swung badly, and this is exactly what is desirable in a receiving set.

With the addition of regeneration, it will be found that the second stage of audio frequency amplification is of real use only when receiving from very distant stations. All the volume desired is had with one state of audio frequency amplification when receiving local or semi-local stations. The second stage of audio frequency amplification, however, is quite desirable for long distance work and may be likened to a high powered car when under normal conditions, the surplus power is not used, but is there for use in case of emergency. It is always nice to know that you have it to use when you wish.



Pictorial Diagram of Receiver

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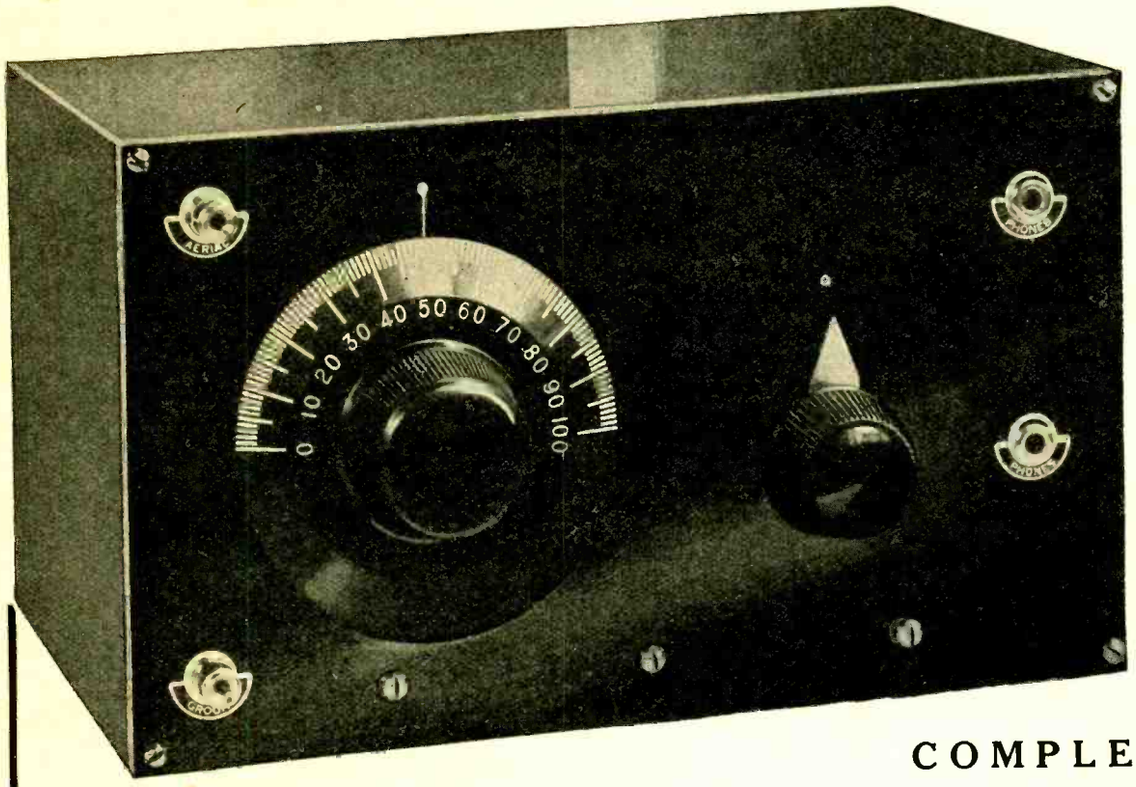

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—

Super Selective

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Pure Tone

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Bearcat Kit including cabinet, drilled panel, all parts, and clear, simple instructions for wiring and operating.

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WSAI	Cincinnati
WHB	Kansas City
KFI	Los Angeles
KSD	St. Louis
WOAW	Omaha
WMC	Memphis
WBAP	Ft. Worth
WTAS	Elgin, Ill.
WTAY	Oak Park, Ill.
WCBD	Zion, Ill.
WEBH	Post, Chicago
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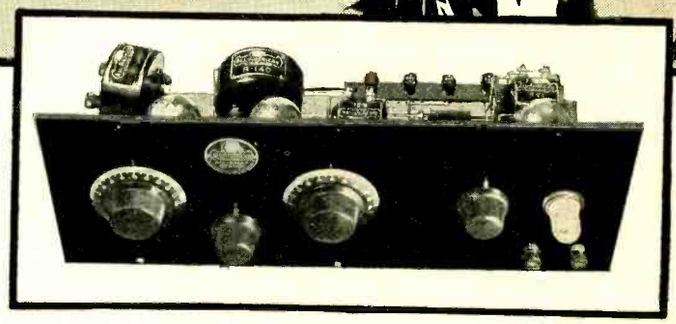
Wire Up in One Evening Your ALL-AMAX Set The ALL-AMERICAN Reflex



NO event of recent months has been as widely heralded as the appearance of the ALL-AMERICAN Reflex sets—embodying, as they do, two distinct advances in this type of reception; namely, ***high selectivity*** and ***wide wavelength range.***

ALL-AMAX Senior approaches the 1925 ***ideal*** of radio reception, for it has, in addition, great sensitiveness with only two controls, and that faithfulness of tone reproduction which can always be relied upon where ALL-AMERICAN Audio Transformers are used.

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Sharp tuning is here assured through the elimination of losses and accuracy of workmanship. Two are required in ALL-AMAX Senior.

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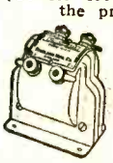
For use with 201-A tubes only.
Type R201-A..... $5.00
(Or for 199 tubes use Type R199; the price is the same.)



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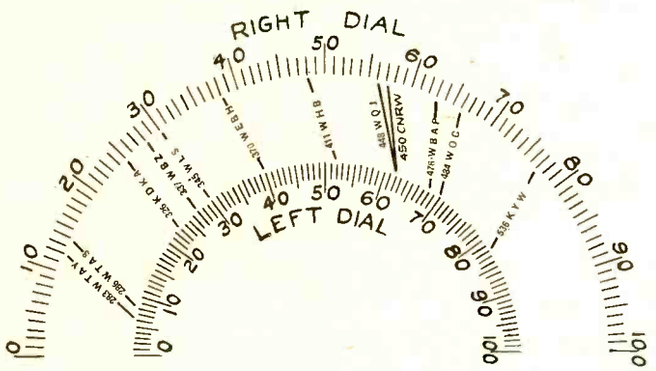
How to Build the New Three-Tube Ultra-Selective Reflex

By A. ELKINS, Technical Editor

THIS Receiver is the result of several years of study in our laboratory along the line of reflex hook-ups, which were undertaken in the belief that with proper development of suitable parts it would be possible to design a reflex set embodying to the fullest extent the theoretical advantages of the reflex principle, in such a way that these advantages would not be lost through various expedients frequently used for reducing the number of controls, stabilizing the tubes, etc.

That this expectation has been realized will be suggested by a mention of a few features of reception already accomplished with sets similar in every way to the one described here. No point in the United States is better adapted for a test of the selectivity of a radio receiver than Chicago. On a recent night, when one Chicago 500 watt station was broadcasting at 536 meters, another at 448 meters, another at 370 meters and another at 345 meters, a list of twenty stations outside the Chicago area were brought in on the loud speaker, including WBAP, Fort Worth, Texas; WBZ, Springfield, Mass.; WEAF, New York City, and CNRW, Winnipeg, Canada. These distances are, of course, not remarkable for a set of this quality. The above example is quoted simply as a demonstration of the sharpness of tuning which can be attained. It has been found possible, when local interference was not so pronounced, to tune in at will all the well-known stations along both the Atlantic and Pacific coasts. Another experimenter in Chicago, using as antenna a short stretch of wire from a porch roof to a tree, brought in on the speaker, in rapid succession, KFI, Los Angeles; KGW, Seattle, and KGO, Oakland.



Stations logged on one night, all on loud-speaker, by one Chicago listener. Note that, although several Chicago stations were operating, considerable distances were reached

Results of this character are expected nowadays from a good eight-tube heterodyne and from certain of the more highly developed five and six-tube radio frequency outfits. For a three-tube set, which can be built at a cost of around $40, we believe they set a new standard of efficiency.

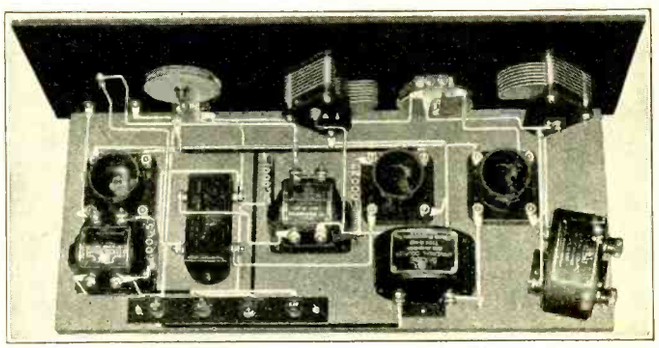
In order to make this hook-up available to the largest possible number of persons, it has been set forth in the photographs here given, so that the wiring can be done by anyone, whether he has any knowledge of electricity or not. There are thirty-one wiring operations necessary, and each one is clearly shown on one of the three progressive wiring photographs.

Many readers will be interested in a short explanation of the reflex principle; those who are not may skip the explanation and proceed directly to the following section, headed "Choosing and Assembling the Parts."

The Reflex Principle and How It Works

It has been known for many years that the same vacuum tube could be used simultaneously as a radio frequency and as an audio frequency amplifier. The chief advances in the reflex art have indeed been along the lines of refinements in the parts utilized.

In the set here described, the electrical impulses, set up in the antenna by a passing wave, flow through the primary winding of the coupler to ground. In so doing, however, a field is set up which links with a carefully designed secondary winding, and, if tuned to the frequency of the incoming waves, sets up a voltage across its terminals. A variable condenser forms the means of tuning the coupler, with a high selectivity due to the design of the coupler windings, in which losses have been reduced



This photograph of the completed set shows almost every wire clearly, and will give you a good idea of how the set should look It is important in reflex work to have all wires correctly placed, as well as correctly connected

to a minimum compatible with rugged construction, and to the unique arrangement of the windings, such that the coupling between them is almost entirely magnetic, with capacity effects a minimum.

The voltage thus set up is amplified by a "201-A" vacuum tube, at radio frequencies—that is, without being detected or rectified—and passed on to a tuned radio frequency transformer.

It is then further amplified in the second tube, coupled with a special self-tuned radio frequency transformer, which, being especially designed for a "201-A" tube, provides effective amplification over the entire range of broadcast wave lengths. The amplificated radio frequency voltage at the secondary terminals of the self-tuned transformer must now be changed to an audible frequency or "detected" before it can be heard.

The rectification is performed by a crystal detector, producing an audio current. This is reflexed to the first audio frequency transformer, which in turn impresses an amplified audio voltage on the grid of the second tube. The output is then passed, through a second audio transformer, to the grid of the third tube.

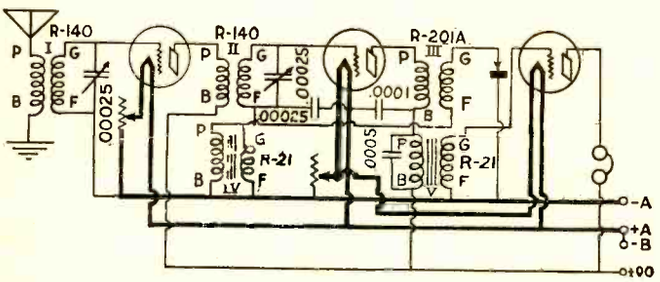
Thus three vacuum tubes are made to function as a two-stage radio frequency amplifier and as a two-stage audio frequency amplifier, giving a powerful signal in the phones or loudspeaker.

The qualities of the set are due in general to the following features: the use of a high grade low-loss coupler in the antenna circuit and in the tuned stage is chiefly responsible for the sharp tuning. The necessity for a third main control in order to cover the broadcast range is avoided through the use of the self-tuned radio frequency transformer—a recent type of instrument which has an unusually broad and flat resonance curve. Clearness of tone and faithfulness of reproduction are secured through a crystal detector, and through the use of high grade audio transformers with the proper fixed condensers to bypass radio frequency currents.

Choosing and Assembling the Parts

Parts required for building are as follows:

One panel 7x18 inches.
One base board 7x17 inches.
Two low-loss variable condensers .00025 mfd.
One rheostat 30 Ohms (R1 in photos).
One rheostat 6 Ohms (R2 in photos).
One crystal detector.
Two universal radio frequency couplers (T1 and T2).
One self-tuned radio frequency transformer (T3).
Two audio frequency transformers, ratio 5-1.
Three standard base tube sockets.
One .0001 fixed condensers.
One .00025 fixed condenser.
One .0005 fixed condenser.
Four battery binding posts on a small panel strip.
Two phone binding posts, or one single-circuit jack, as preferred.
Bus wire, about 20 feet.



Schematic diagram of the Selective Reflex set. The five couplers and transformers are designated by Roman numerals corresponding to T numbers on photographs. There is a tuned r.f. stage, a reflex stage, and a straight audio stage

Accessories required with the set are as follows:

3 Vacuum Tubes—UV-201-A or C-301-A.
2 45-volt "B" Batteries.
1 6-volt "A" Battery (storage battery).
Wire for antenna and ground connections and insulators.
Headphones, 1 or more pairs. (Optional).
Loudspeaker.

The parts above listed are all factory made. The set builder who has an aptitude for winding his own coils can, if he prefers, employ his own workmanship on the two radio frequency couplers. For each of these instruments he should have a short section of pasteboard tube 2¾ inches diameter, and should wind upon it about 60 turns of No. 26 D.S.C. wire for the secondary winding. The primary of the coupler should be made by winding 18 turns of No. 32 D.S.C. wire on a smaller piece of tube to fit inside the secondary. The usual precautions in the way of avoiding shellac and other high loss insulating materials must be rigidly employed, if selectivity is to be preserved, and some experimenting will be necessary in every case to determine exactly the proper number of turns, since hand methods of winding involve so much variation in dimensions that no exact specification can be relied upon. It may be said in general that modern methods of coil winding in the better factories have progressed to such a point that even with simple radio frequency coils the amateur builder must not expect from his own coils results equal to those of the product of a reliable factory.

Rheostats, condensers and audio transformers must be of the very highest quality for the best results. Tube sockets should be of a simple non-metallic type; avoid the old-fashioned sockets which rely on the locating pin of the tube to hold all four contact springs against the prongs on the tube base.

The crystal detector should preferably be one designed to be reasonably permanent in its adjustment. With any crystal detector, however, we find it advisable for best results to test the contact at intervals.

How To Wire the Set

When the parts are all mounted, simply follow this wiring order:

Wires shown on photo A.
1 + on V3 to + on V2 to + on V1.
2 B + on T3 to P on T5.
3 B BAT — to A BAT + to Wire 1 (Insulate with tubing).
4 Attach .0001 condenser from B + on T3 to Wire 1.
5 B + on T4 to F — on T4 (Solder lugs—no wires used here).

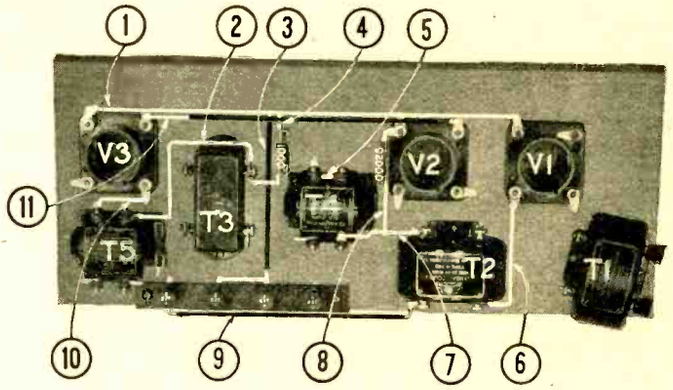


Photo A shows the wiring to be done on the baseboard before the panel is mounted. All wires are numbered right around the picture, in the best order for connecting them

6 P on V1 to P on T2.
7 F on T2 to G on T4.
8 Attach .00025 condenser from + on V2 to wire 7.
9 B + on T2 to B BAT + (Insulate with tubing).
10 G on T5 to G on V3.
11 on — V2 to — on V3 (Insulate with tubing except 1¼ inches at left end).

Now attach panel to baseboard with three wood screws.
Wires shown on photo B:

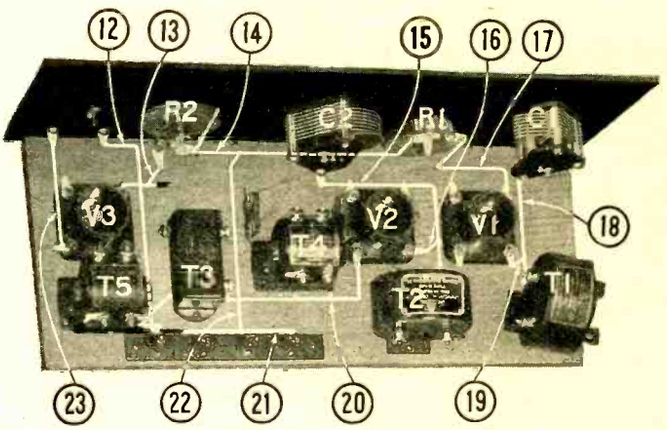


Photo B shows the next twelve wires to be put on; those already shown on Fig. A are not shown again, in order to simplify the picture

12 Right phone post to B BAT + to B + on T5, and leave 1 inch projecting end beyond B + on T5.
13 Arm on R2 to Wire 11.
14 Frame on R1 to frame on R2 and leave 2-inch end projecting upward at R2.
15 G on T2 to stationary plates on C2.
16 G on V2 to wire 15.
17 Arm on R1 to — on V1.
18 Stationary plates on C1 to G on T1, leaving a little slack for rotating adjustment of T1.
19 G on V1 to Wire 18.
20 P on V2 to P on T3.
21 A BAT — to F — on T5 (Insulate left half with tubing).
22 Wire 21 to Wire 14.
23 P on V3 to left phone post.
Wires shown on photo C:
24 B + on T4 to mineral mounting cup terminal of crystal detector.
25 Attach projecting end of Wire 14 to Wire 24 and cut off any excess length.
26 Rotating plates on C2 to Wire 7.

27 Rotating plates on C1 to frame on R1.

28 F on T1 to rotating plates on C1, leaving a little slack as on Wire 18.

29 F on T3 to P on T4.

30 "Catwhisker" terminal of crystal detector to G on T3.

31 Attach .0005 condenser from P on T5 to end of Wire 12 projecting at B + on T5.

It has been our experience that no form of solderless connection so far brought out is to be regarded as *permanent,* in the same sense as a well-soldered joint. Moreover, when right methods are used, soldering is not only the most perfect, but by far the *easiest,* method now known for connecting wires together electrically.

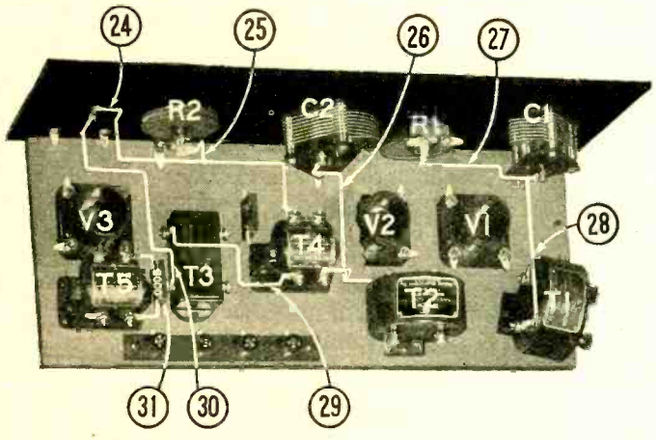


Photo C shows the eight wiring operations necessary to complete the set. Be sure that your fixed condensers are placed so that the capacity markings on them can be seen and checked for correctness

Wires should be soldered only to each other or to tinned terminals. Never solder a wire to the end of a binding post itself, and *never* reply upon a connection made by fastening stiff wire to a binding post without any terminal. We suggest that each wire be *penciled in with a colored lead* in the photograph after it has been put in place in the set.

How to Install the Set

An antenna about 50 ft. high and 50 to 75 ft. long is recommended. The lead-in wire from the antenna should be kept as far from the wall as possible; this will add to the sensitiveness of any radio set.

Where an outdoor aerial cannot be had, one can get splendid results with a length of insulated wire run around the room behind the picture moulding.

Before connecting the batteries permanently, the 6-volt storage battery should be connected across the posts marked B BAT, and both rheostats turned on. The tubes should be observel closely to see if they light. *If not,* then it is safe to connect the regular 90 volt "B" battery to these terminals, and the 6-volt battery to the posts marked "A Bat." Care should be taken in both cases that the + post is connected to the *positive* terminal of the battery.

Operating the Set

The first attempt to "tune in" should be made at a time when you are sure that some station is radiocasting within easy receiving range of the set.

The easiest and surest way to tune this receiver is to follow these directions exactly:

1. See that good contact is being made on the crystal detector.
2. Turn up both rheostats about half way.
3. Turn both dials slowly in unison—that is, turn both in the same direction and always keep them reading nearly alike. Listen carefully in the head phones and, when a signal is heard, turn each dial separately to exactly the point where the signal is loudest.
4. Adjust the two rheostats for loudest and clearest position for the signal being heard.
5. Adjust the contact on the crystal detector until you are sure it is on a point of maximum sensitiveness.
6. Turn the rheostats down, if necessary, to give the clearest possible tone.

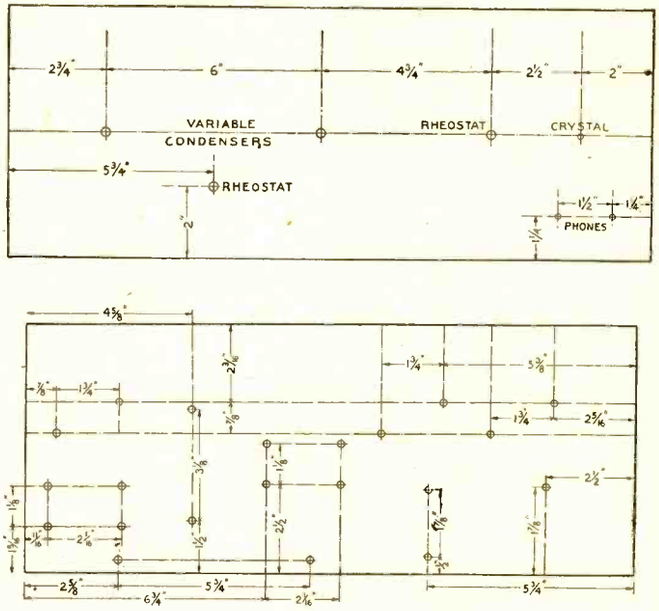
When the set is thus gotten into good working order, other stations may be tuned in by again rotating the two condenser dials, approximately in unison.

A very great increase in selectivity can be obtained by rotating the antenna coupler T1 to exactly the proper angle to eliminate coupling with the tuned radio frequency transformer T2. A correct adjustment cannot be obtained with accuracy until the set is fully wired, when the following process should be carefully carried out:

First, tune in some near-by station to maximum signal strength. Then, listening in the head phones, turn off entirely the first rheostat R1. The signal will probably continue to be heard, owing to coupling between the two universal couplers. To eliminate this, rotate the first coupler slightly. When a position is finally found where no signal is heard, fasten the first coupler permanently in this position and do not again disturb it.

To get the most out of your set, learn to control properly the temperature of the tubes by adjusting both rheostats, with great care, for best volume, sensitiveness, and selectivity, and for perfect clearness of tone. Always try interchanging your tubes in all possible combinations, for there is great variation between the electrical constants of different tubes, even of the best makes.

The value of the fixed condenser which should be connected across the primary of the last audio transformer, T5, depends on the tube. The condenser specified above—.0005 mfd.—will give the best results with most average tubes. If you happen to have a better tube than the average you may do better with a .00025

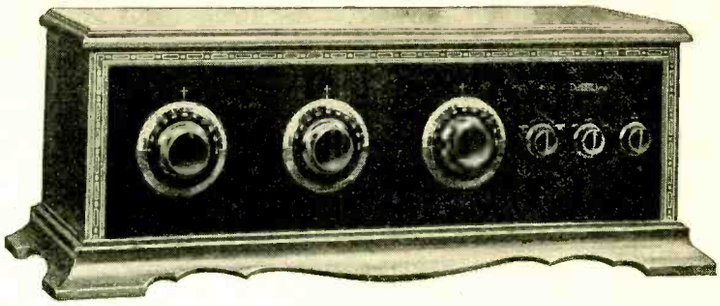


The panel and baseboard layouts are here seen, with the same edges at top and bottom, as in the photographs. Size of holes will vary, depending on instruments, etc.; be sure the instruments are in the same general position as in the photographs

here. If, on the other hand, you find that it is impossible after interchanging the three tubes in all possible positions, to adjust rheostat R2 so that beatnotes or "birdies" are heard when tuning, then the .0005 condenser is probably not of high enough capacity for the tubes and an .001 should be used.

The dial drawing shows approximately a log by one experimenter at Chicago. It must not of course be taken as applying to your own set since the values will vary somewhat with different antennas and different local conditions. However, if good parts have been used and wiring has been done as here described, this receiver will be found remarkably constant in its dial settings.

The author will be very glad to hear from builders, and will be especially glad to receive records of stations logged, and of any departure from the wiring diagrams which advance experimenters may find to give interesting results.



Features of Deresnadyne Performance—

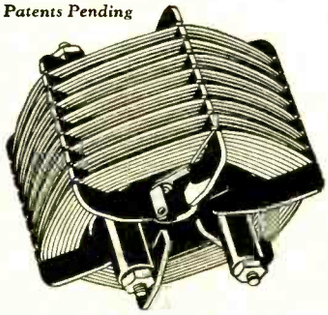
the Paddlewheel Inductance

Deresnadyne performance in the hands of its users during the past season has been a revelation. The Deresnadyne is selective. In the largest cities, no matter how many local stations are going, the Deresnadyne tunes them all out to bring in outside stations with amazing clarity and strength. During International week Deresnadyne Owners did not merely "get" Europe. They heard full programs, including the call letters of European stations, clearly and distinctly over the loud speaker.

The reasons for Deresnadyne performance lie in the basic merit of the Deresnadyne principle, which marks a new stage in radio development, and in the design and quality of the apparatus. For example, there's the exclusive Paddlewheel Inductance.

Buy a Deresnadyne at your dealer's today. If he cannot supply you, write to us. *New De Luxe model, $165, without accessories.*

Patents Pending



The Andrews Paddlewheel Inductance

The *Andrews Paddlewheel Inductance* is a radically new type of coil. It has a remarkably high ratio of inductance to resistance—the measure of coil efficiency. The small amount and placing of the insulating material by the unique paddlewheel construction has reduced absorption losses to a minimum. The compact spiral winding makes possible the use of large wire, without increasing distributed capacity, thus lowering resistance. The wire is held in place by slots, and each group of turns is space insulated from the rest, eliminating inefficient lacquer and insuring a moist-proof coil. The *Andrews Paddlewheel Inductance* effects a marked increase in both signal strength and selectivity.

Andrews Deresnadyne

DĒ-RĔS'-NÀ-DĪNE · PATENTS PENDING

Radio Receiving Set

ANDREWS RADIO COMPANY, 327 S. LA SALLE STREET, CHICAGO

A Tuned Radio Frequency Receiver With Deresonated Plate Circuit

Part I—Theory and Paddlewheel Inductances

By ARTHUR ELKINS

THE fundamental reason for self oscillation is just as much the amount of voltage across the plate circuit as it is the capacity between the plate and grid of the tube. The neutrodyne prevents it by counteracting the effect of the tube capacity. The Deresnadyne principle prevents it by allowing only the amount of energy to be generated in the plate circuit which can be used for undistorted amplification. Instead of building up more energy than can be used in the plate circuit and using the excess to stop oscillation, the Deresnadyne principle prevents this excess energy from ever being generated. Amplification is fully as great and oscillation is thus stopped at its source, in the simplest and most effective way. This result is accomplished by detuning, or deresonating, the plate circuit. The number of turns in the radio frequency transformers are reduced to such a point that maximum signal strength is obtained without oscillation. In this condition, the plate circuit is not resonant to the signal being received and to which the grid circuit is tuned.

Due to the increased tendency to oscillate at lower wave lengths, it is necessary to provide some means to prevent the voltage across the plate circuit from increasing as the set is tuned to receive the lower wave length station. There are several ways by which this can be accomplished. One of these is the use of the plate balance control to lower the plate voltage of the radio frequency tubes as lower wave length stations are tuned in. This method will be described later on. Although these methods are the subject of several patent applications their free use by the home builder is encouraged.

The Paddlewheel Inductances

The efficiency of the circuit as a whole depends to a very great extent upon the efficiency of the coupling coils used in the stages of tuned radio frequency amplification. Low loss condenser arguments are often absurd when the efficiency of inductance units are considered. This inductance is a radically new type of real low-loss inductance. In measuring coil efficiency, the highest possible ratio of inductance to resistance is essential. In a coil of this type the insulating material supporting the coil winding is so placed that absorption losses are almost eliminated. The high inductance value is proven by the fact that .00025 mfd variable condensers are used for tuning over the entire wavelength range. Figure 2 shows the Andrews Paddlewheel Inductance as used in the Deresnadyne Circuit shown in Figure 1. While the fan is encouraged to build his own set if he so desires, patent applications prevent the manufacture of it.

A little shielding between the variable condensers and the panel will do lots of good, so don't leave it out because it adds a little more work. Have you ever stopped to consider how many manufactured sets use shielding? The manufacturer wouldn't put it in if it wasn't worth while.

In buying fixed condensers, get good ones. Cheap condensers rarely are accurate in capacity value. If you were buying a tire for an automobile, would you buy one from a firm who guessed at the size and then let you try it out to see if it would fit the wheel? By-pass condensers must pass a specific current, changing the capacity may limit the functions they are intended for. In buying tube sockets, get the kind where the springs make good positive contact with the prongs on the base of the tubes. Poor contact between spring and prong, especially in the two radio frequency stages, will make more trouble than can be imagined.

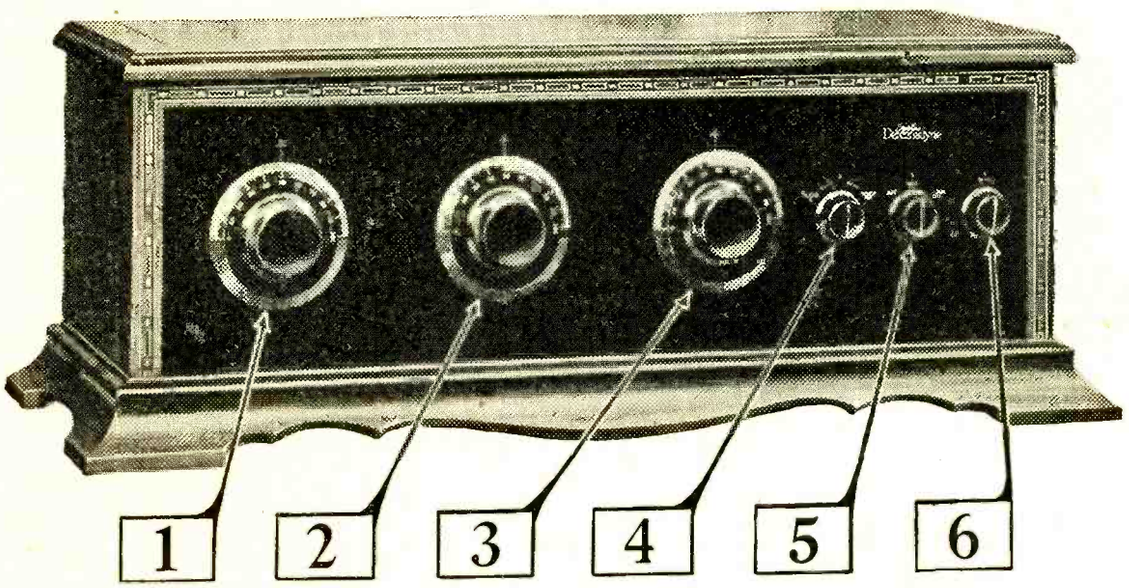


Fig. 8

The special resistance, variable from zero to 200,000 ohms, must be of the non-inductive type. A wire-wound type of this high value would not only be impractical but would have an inductance value that would affect tuning. The special switch not only acts as a battery switch, but also connects the loud speaker for one or two stages of audio frequency amplification as desired. If desired, the regular jack system and a battery switch can be substituted. No provision is made for plugging in headphones as they are unnecessary, all tuning in can be done with the loud speaker.

List of Parts

	1—Panel, 3/16 x 7 x 26.
	1—Battery Post Strip, 3/16 x 1¼ x 8.
	1—Ant & Gnd Post Strip, 3/16 x 1¼ x 2½.
	1—Selector Jack Strip, 3/16 x 1¼ x 2¾.
	1—Baseboard, ½ x 9 x 25¾.
	3—pcs Metal Shielding, 1/32 x 3¼ x 5¾.
	12—Metal Spacer Tubes, ⅛ I. D. x ¼ O. D. x 1¾.
J-1, 2, 3, 4	6—Midget Jacks.
P-1, 2	2—Midget Plugs.
	9—Binding Posts.

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Add Miles and Smiles with Branston Standard Radio Parts

It's Surprisingly Easy to Build a Super Heterodyne Using Branston's Super Kit No. R-199

A **reflexed** Super Heterodyne in which **seven** tubes do the work of **ten.** Blue prints and directions are so thorough and easy to follow that any amateur can easily make a receiving set that is the equal of "manufactured sets" costing twice as much. Many sets have been made with these kits that have coast-to-coast range, micrometer selectivity, "local" volume on all stations, and unsurpassed tonal quality. **You** can do the same in just a few hours' pleasurable "work."

The Branston Transformers contained in Kit No. R-199 were designed through years of diligent research. They are remarkable instruments and function properly as those of each set are perfectly matched and each is given an operation test.

Blue prints and complete layouts covering Super Heterodyne, Radio Frequency and Honeycomb Coil circuits, also complete catalog of Branston Quality Radio Products sent for 25c in coin or stamps. Take this first step today.

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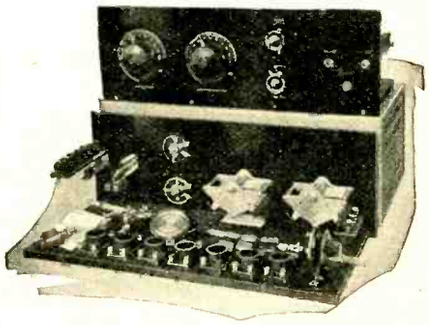
BRANSTON'S ACCESSORY KIT No. R-199-A

Contains Only Highest Grade Tested Parts Saves Time and Insures Success

$50.00



Partially Assembled, as Shown in Illustration Ready for Wiring

1 7x21 Drilled and Engraved Panel
2 23 Plate Straight Line Low Loss Condensers
1 60 Ohm Rheostat
1 25 Ohm Rheostat
1 Battery Switch
1 Single Circuit Jack
1 Two Circuit Jack
2 Branston Cam-Vernier Dials
2 Sub Panels and Ten Binding Posts, assembled
1 Baseboard 20"x9½"
7 Sockets
1 3 Plate Vernier Condenser and Mountings
2 .001 Tested Fixed Condensers
2 .005 Tested Fixed Condensers
1 .0001 Tested Fixed Condenser
1 .00025 Tested Fixed Condenser
2 Grid Leak Mountings
1 Variable Grid Leak
1 Fixed Grid Leak
Sufficient square bus bar, spaghetti, nuts, screws, terminals and rosin core solder to complete wiring of set.

Always state whether you intend using UV-199 or UV-201-A tubes

BRANSTON'S TRANSFORMER KIT No. R-199

Eight Matched Transformers

$35.00

Branston Super Transformers, Kit No. R-199 contains three-stage long wave R. F. Transformer No. R-200, Twin A. F. Transformers No. R-204, Long Wave Tuned R. F. Transformers No. R-201, Special Tuned Coupling Transformer No. R-203, Short Wave R. F. Transformer No. R-202.

Always state whether you intend using UV-199 or UV-201-A tubes

BRANSTON RADIO

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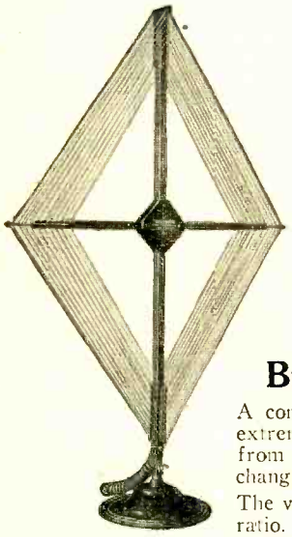

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Branston Regenerative Loop.....$13.50

Branston's Regenerative Loop No. R-210

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Specifications

Size: 38" high, 23" wide over all, including base.

Cross-Pieces: Made of selected hard wood with bakelite winding supports.

Wire: Special insulated stranded cordage made of 60 strands of No. 36 hard drawn copper wire and seven strands of phosphor bronze wire.

Base: An extremely attractive base of sufficient size and weight, making it almost impossible to upset the loop. Black crystal finish, diameter of base 8". Loop turns freely in base.

Wave Length: 200 to 600 meters.

Terminals: Three flexible leads 3 feet long are attached to the loop with terminal tips to connect to the loop posts on set.

Packing: Loop packed in substantial corrugated container.

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Branston Cam Vernier Dial No. R-55

A conventional 4" genuine bakelite dial capable of both coarse and extremely fine adjustment without the necessity of moving the hand from one knob to another, pushing in or pulling out on the knob or changing the mesh of gears.

The vernier movement covers any ten degrees on the dial at a 10 to 1 ratio. You can obtain vernier movement of the dial shaft instantly, at any point throughout the scale.

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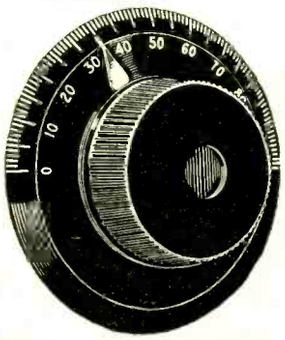
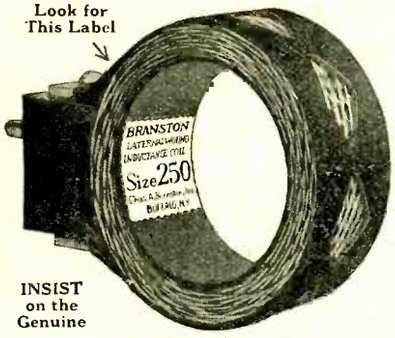
No. R-55 Branston Cam Vernier Dial **$1.75**



About One-Fourth Actual Size

No Gears No Lost Motion

Look for This Label



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PRICE LIST

No. Turns	Unm't'd	Price Mounted	Millhenries Inductance, Appx.	Appx. Wave Length with .001 Mfds. Condenser
DL- 25	$ .50	$1.25	.040	170- 375
DL- 35	.50	1.25	.075	200- 515
DL- 50	.55	1.30	.15	240- 730
DL- 75	.60	1.35	.3	330- 1030
DL- 100	.65	1.40	.6	450- 1460
DL- 150	.70	1.45	1.3	660- 2200
DL- 200	.80	1.55	2.3	860- 2850
DL- 250	.85	1.60	4.5	1120- 4000
DL- 300	.95	1.70	6.5	1340- 4800
DL- 400	1.15	1.90	11.	1860- 6300
DL- 500	1.30	2.10	20.	2340- 8500
DL- 600	1.45	2.25	40.	2940-12000
DL- 750	1.60	2.40	65.	3100-15000
DL-1000	1.90	2.80	100.	5700-19000
DL-1250	2.20	3.10	125.	5900-21000
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No. R-79 Coil Rack complete with full set of sixteen Coils.....$32.00

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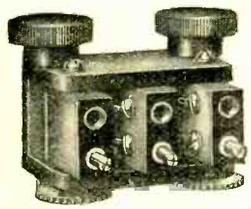
Genuine Bakelite. Front and Back geared types.



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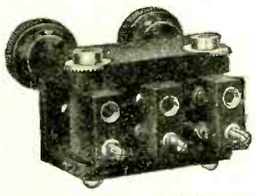

No. R-62. Three Coil Geared Type Back Panel Mounting. Bevel gears give smooth movement $6.00

No. R-64. Two Coil Geared Type Back Panel Mounting. Same as No. R-62.....$4.00

No. R-73. Regular Three Coil Mounting. Neatest and most efficient on the market..$4.50

No. R-71. Regular Two Coil Mounting. Same as No. R-73 .....$3.25

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Construction of Reflexed Super-Heterodyne

Incorporating Short Wave R. F., Regeneration, and Neutralization—Seven Tubes Give Results of Ten—An Inexpensive, Highly Efficient Super Circuit

By KENNETH SALISBURY,

DO you remember the early types of Super Heterodyne Receivers? Big cumbersome contraptions with control panels about four feet long covered with numerous dials, knobs and meters. What a contrast with the highly developed Super Heterodyne of today—neat, compact, efficient little receivers, mounted on extremely small panels, and with controls so simplified that a ten-year-old child can operate them successfully.

The Super Heterodyne described in this article is radically different from the conventional Super Heterodyne circuit. By incorporating the reflex principle in the radio frequency sides of the circuits, seven tubes are made to give results equal to the usual ten-tube circuit.

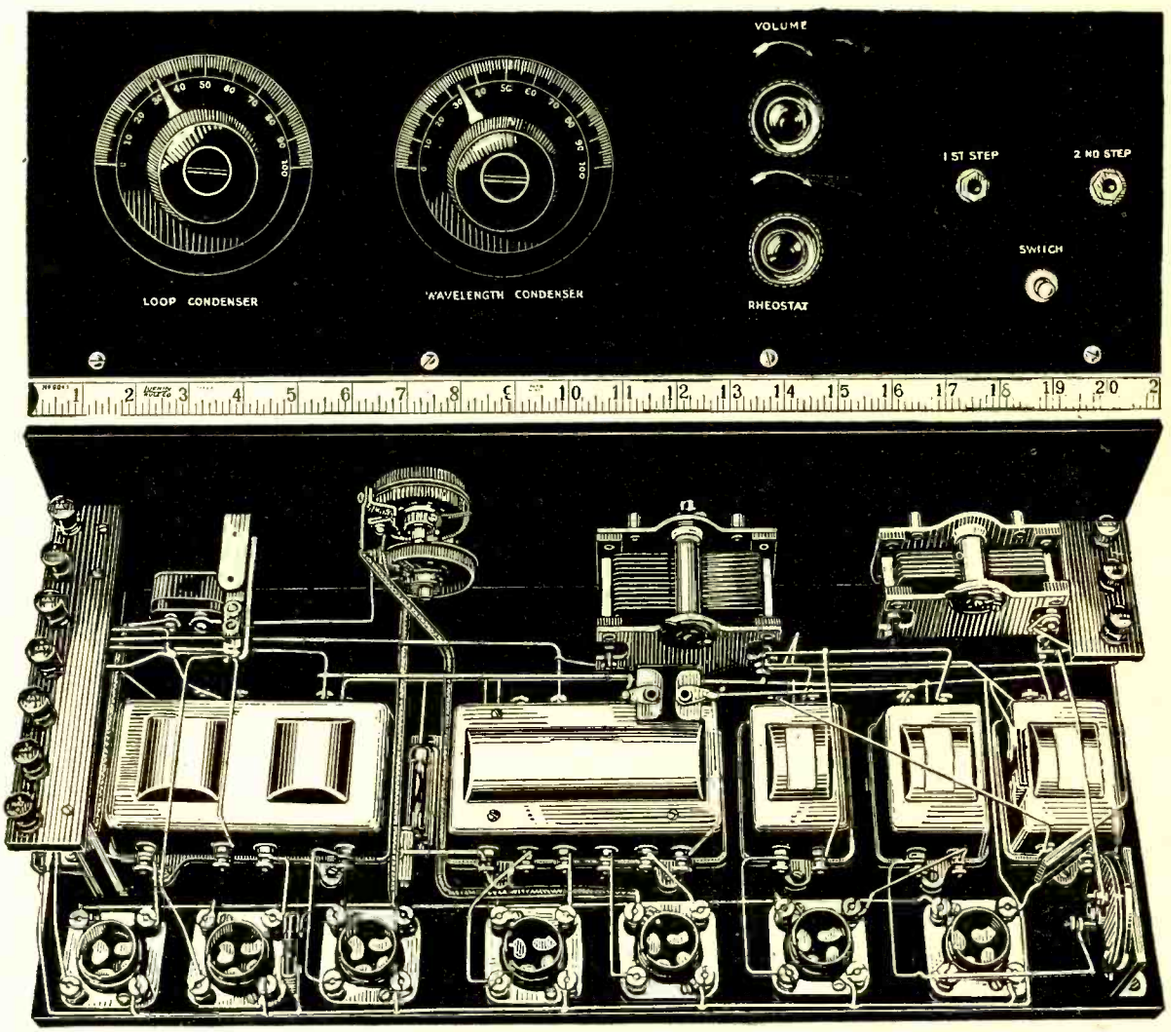

Fig. 1. Front Panel and Rear View of Complete Receiver

Does Not Radiate

One of the greatest faults of the Super Heterodyne has been overcome in this circuit—radiation is prevented by a stage of short-wave radio frequency which prevents the oscillations from going "on the air" and spoiling reception for everyone within a radius of many blocks.

Up to this time the great advantages gained by reflexing have not been incorporated into a Super Heterodyne circuit intended for home construction because of the difficulty encountered in the design and winding of the intermediate radio frequency transformers. In a reflexed Super circuit, it is necessary to bypass the radio frequency across certain windings where its presence is not desired by means of fixed bypass condensers. When a condenser of this type is placed across the primary or secondary winding of a transformer, it immediately raises the wave length of the coil across which it is placed. As it is most important that the intermediate frequency transformers have the same peak of amplification they must be specially wound in order to compensate for the effect of the condenser used across them. In order to successfully obtain the proper windings and values, it is necessary that very accurate laboratory equipment be used, and that the transformers be manufactured and tested with great care.

The selectivity of this Super Heterodyne circuit has been increased to the most efficient point for average home use. It is possible to design a transformer that will tune so sharply as to make it possible to eliminate a powerful local station and obtain reception from a distant station with a difference of but two or three meters in wave length. But should such a transformer be used it would not tune broad enough to include the "side bands" or side frequencies of the broadcast wave which carry the modulation of the voice or music, and a true tone could not be received. Therefore, this Super Heterodyne is designed

with a peak of amplification sufficiently broad to well cover the side bands of a broadcast wave, and narrow enough to perfectly separate stations of from one to seven meters difference in wave length between a local and a distant station, depending upon the distance you are from the local station.

Investigating the new circuit to see just how it operates and what takes place, we find that the first tube serves as a short wave radio frequency amplifier. This is a feature not usually incorporated in Super Heterodyne construction, and makes for very efficient long-distance reception. The grid of the first tube accepts the signal picked up by the loop or antenna, passes it to the short wave radio frequency transformer, where it is amplified and passed to the grid of the second tube. This tube serves as a rectifier and frequency changer, thereby doing double duty. There is no loss of efficiency in this arrangement and a saving of one tube is effected here. The output of the frequency changing tube has two frequencies, one of short wave, or high frequency, and one of long wave, or low frequency. The short wave high frequency is bypassed and used no more. However, the long wave we wish to preserve, and it is passed on to the first long wave transformer, usually called intermediate frequency transformer. Here it is amplified and passed to the grid of the first tube, and now the first tube is doing its second duty, that of amplifying at intermediate frequency.

The first tube now passes the intermediate frequency on to the primary coil of the second intermediate frequency transformer, and it is here amplified again through the remaining two stages of the intermediate frequency amplifier. It is now readily seen that the first tube has done two duties, that of amplification at short wave, and also amplification at long wave or intermediate frequency. The second tube has done the service of amplification and rectification at short wave, and also has created a third frequency as the long wave radio frequency or heterodyne action.

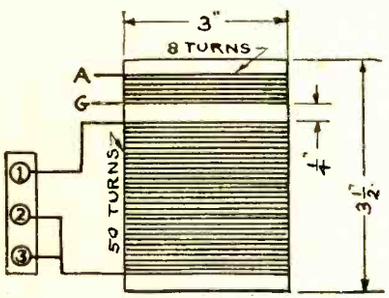

Fig. 4. Fixed Inductance Unit

From the last intermediate amplifier tube the signal is rectified in the detector tube and passed to the audio frequency tubes and transformers for amplification at audio frequencies.

Low "B" Battery Consumption

Heretofore it has been common super heterodyne practice to use a potentiometer to control oscillation, by returning the grid return lead of all radio frequency transformers to the center of the potentiometer. By adjusting the potentiometer toward the positive side of the A Battery, a positive potential is impressed upon the grids of the tubes, thus preventing oscillation. But in doing so, the B Battery current was raised far above the desired point, thus placing an unsually heavy drain on the B batteries and materially shortening their life. The remedy was to design a set of "neutralized" intermediate frequency transformers that would operate efficiently when the grid return leads of the tubes were brought to the negative side of the A battery instead of the positive side, or even carried further and run through a C battery. The use of the C battery in this manner greatly reduces the B battery current and greatly prolongs the life of the B batteries.

Whereas the usual Super Heterodyne set draws from 40 to 60 milliamperes, this Super operates with only a 10 milliampere B battery consumption. The use of the potentiometer control is completely eliminated, a special rheostat on the first immediate frequency amplifier tube acting as a volume control. The windings of the intermediate frequency transformers are so well neutralized that there is no tendency toward oscillation in the in termediate amplifier itself.

By the use of a regenerative loop, it is possible to greatly increase the strength of the received signal at the first tube. This is accomplished by a capacative coupling between the grid and plate of the first tube. The feedback is obtained by a small variable condenser to the center tap of the specially wound loop. This regenerative loop has two windings running in the same direction and parallel to one another, tapped in the center and brought out with flexible leads. The wire is composed of 60 strands of No. 36 hard drawn copper wire and 7 strands of phosphor bronze wire and is covered with two layers of insulation. The entire winding is supported on Bakelite strips, thoroughly insulating the winding from the frame of the loop.

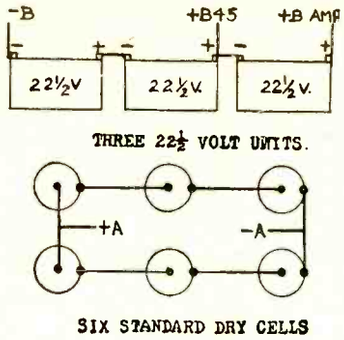

Fig. 2 Showing A and B Battery Connections

Another unusual feature of the set is the design of the transformer cases. All transformers are enclosed in drawn brass cases which completely shield the winding from outside disturbing noises, and prevent internal oscillation taking place. The entire winding are impregnated with a high grade insulating compound which prevents moisture absorption, and the possibility of damage through rough handling.

The first transformer used in the set is a specially designed long wave radio frequency transformer with a peak of amplification sufficiently sharp to permit close and accurate tuning without the diminution of the "side band" frequencies so necessary to true tonal reproduction. This transformer is peaked by the use of two condensers, a .0001 and a .001. It is not only adaptable for the heterodyne circuit but can be used for any long wave radio frequency amplifier.

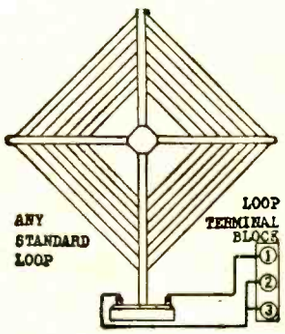

Fig. 3. Showing Loop Connections

The second transformer is a short wave radio frequency transformer and in it the convention design of short wave radio frequency transformers has been widely departed from. It has high amplification as low as 200 meters, and likewise amplifies efficiently as high as 600 meters. It is not only suitable for the circuit herein shown but can be used in many reflex circuits as well as for straight radio frequency amplification.

The special unit contains three long wave untuned radio frequency transformers, whose curve covers a wide band of frequencies. Not only is it very adaptable for super heterodyne circuits, but when used in conjunction with the first transformer would make an excellent long wave radio frequency amplifier.

The third is a two stage audio frequency unit, completely shielded and of as high amplification ratio as is consistent with good tone quality.

LIST OF APPARATUS

Following is a list of necessary material:
One Special Kit of reflexed Super Heterodyne Transformers.
One panel 7x21 inches.
One baseboard 9 inches to 10x20 inches.
Two straight line variable condensers .0005 M.F. each. These should be the best possible quality, without vernier attachments.
Two 4-inch dials, preferably of the Cam-Vernier type.
One 25 or 30 Ohm Rheostat, wire resistance type preferred.
One 60 Ohm Rheostat, wire resistance type preferred.
Ten binding posts.
One Single Circuit Jack with bracket for holding terminal binding post strip.
One Double Circuit Jack.
One Midget Condenser, maximum capacity of approx. .00001 M.F.
One Filament Switch.
One battery terminal strip, size, 1¾ inches wide by 5 to 7 inches long.
One loop terminal binding post strip, 1¾x3 inches.
Seven Sockets, best quality obtainable.
One Grid Leak (No. 1 in diagram) 2 to 7 Megohms.
One Leak (No. 2 in diagram) variable type, range 50,000 to 150,000 ohms.

Value of Fixed Condensers as shown in diagram

Fixed Condenser A—.001 M.F.
Fixed Condenser B—.001 M.F.
Fixed Condenser C—.0001 M.F. This condenser must be placed 2 inches from all other wires or transformers. If it is too close, coupling is liable to take place between plate and grid of first tube.
Fixed Condenser D—.00025 M.F.

Fixed Condenser E—.005 M.F.
Fixed Condenser F—.005 M.F.
Wire, Spaghetti, Screws, etc.

ASSEMBLY PRECAUTIONS

In constructing this Receiver, owing to the fact that there are very few instruments on the panel (two each of the jacks, rheostats and variable condensers, and a battery switch) it is advisable to mount and wire all the baseboard instruments before connecting the panel to the baseboard.

The photograph and wiring diagram show the transformers, sockets, and midget condenser in their proper positions. In order to eliminate unnecessary detail in construction and to simplify wiring the three intermediate frequency transformers have been embodied in one compact, shielded unit, and the two audio-transformers are also combined in a separate unit.

This arrangement, together with the layout of instruments shown in the illustration, permits the use of very short connecting leads and increases the efficiency of the completed set.

Looking at the baseboard from the front of the panel, the tube sockets are placed in a row along the back edge of the baseboard. It is extremely important that the transformers be placed in their correct positions.

The Midget Variable Condenser, which is used to control regeneration in the loop, is mounted to the left of the long-wave transformer. Space is provided between the intermediate and audio frequency transformers for the grid leak mounting.

FURTHER ASSEMBLY HINTS

The binding posts for the loop are mounted in the same manner and placed at the edge of the baseboard below the variable condenser.

Begin wiring, using the square tinned bus-bar by connecting the filament leads. The sockets are mounted in such a position that the filament terminals will be toward the rear edge of the baseboard. One terminal of each tube socket is connected to a single length of bus-wire which is connected to the correct binding post after panel and baseboard are assembled.

The remaining filament terminal of each socket (excepting the third from the antenna coupler) is connected to another piece of bus wire. This line is completed after the panel has been attached by connecting from the proper binding post to the "A" battery switch and then through the rheostat to the line connecting the six filament terminals.

The metal cases of the transformers are "grounded" by connecting them to the positive side of the "A" battery.

Work slowly and carefully and do not try to see how quickly you can wire the set. Check each connection on the diagram with a colored pencil, that is, when each connection has been made, mark off the proper line on the diagram with red or blue crayon. This will enable you to check the wiring against the diagram as the work progresses.

When the baseboard instruments have been completely wired fasten the panel to the baseboard and complete the wiring.

FINAL TESTING AND TUNING

After completing the wiring and checking connect only the "A" battery and insert tubes and test to see that all filaments light. Next remove all tubes and disconnect "A" battery. Then attach the leads of "B" battery to proper terminals. Also connect the "C" battery correctly. Secure a small piece of wire and short the filament terminals to see that there is no spark from "B" battery. Do this with all sockets at one time. If no spark is seen you are reasonably sure the wiring of the filament circuit is correct. The tubes can now be placed in their sockets and the loop connected, and you are ready to tune the set. Set the midget variable condenser at its lowest capacity and carefully turn the wave length condenser a few degrees at a time, moving the loop condenser slowly over the entire scale. After receiving signals and adjusting both condensers to maximum volume further adjust the midget condenser and again readjust the loop condenser. After the best results have been obtained, it is not necessary to make further adjustment of midget condenser.

If set appears inoperative place finger on plate terminal of first tube. If by doing so the set operates, this indicates that your midget condenser is too small, and a larger one should be substituted.

BATTERIES REQUIRED

Three standard dry cells should be used for A Batteries. Six can be used by connecting series parallel as shown in cut.

"B" Batteries—45 volts on the detector and 60 to 90 volts on the Radio Frequency Amplifier and Audio Frequency Amplifier. These voltages may be varied to obtain maximum results according to the tubes used.

"C" Battery—1½ to 4½ volts.

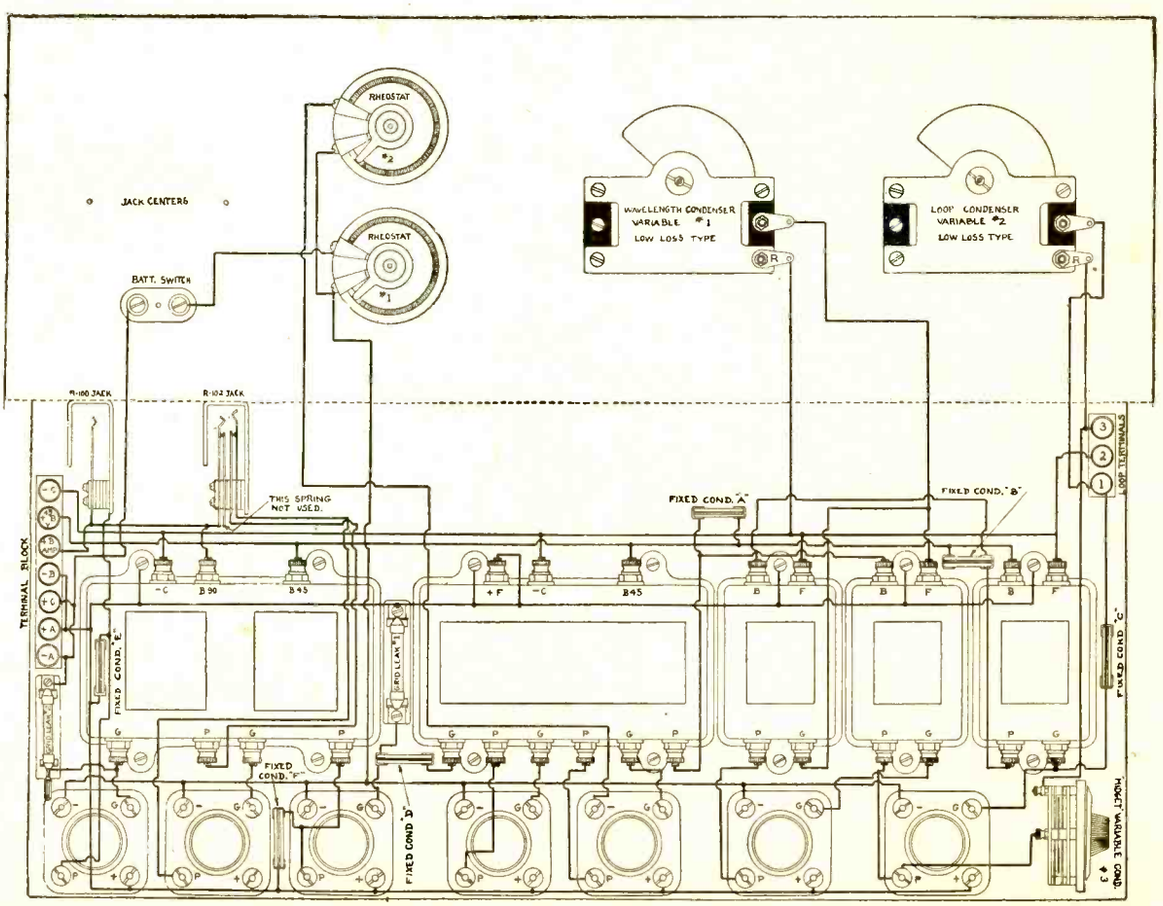

Fig. 5. Pictorial Diagram Showing Connections

The Secret of MUSIC MASTER Supremacy

MUSIC MASTER is built to insure faultless radio reception. By proper use of the proved principles of sound reproduction, long since thoroughly established, theories and guesses are eliminated.

The Unit in the base is made with watch-like precision, so delicately attuned that even the faintest radio impulses are reproduced distinctly. The Tone Chamber of heavy cast aluminum allows the sound waves to develop naturally, undistorted by over-vibrations. The amplifying horn is wood, because only wood has the resonance to completely recreate the original tone of voice or instrument.

The quality of these elements makes Music Master supremacy possible; their assembly into a well balanced musical instrument makes it a reality.

Music Master will improve your reception. Try one with your set and see.

Dealers Everywhere

Music Master Corporation

10th and Cherry Streets
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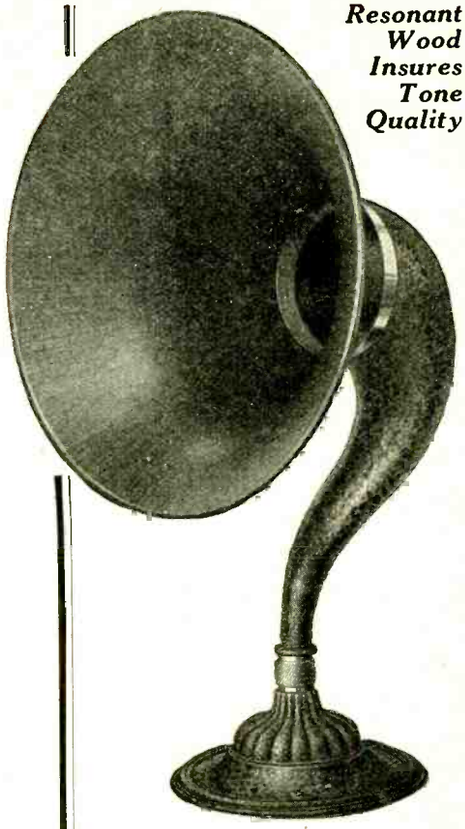
Music Master

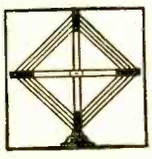
PROVEN RADIO PRODUCTS

Resonant Wood Insures Tone Quality



MODEL V, Metal Cabinet, Mahogany Finish $18
MODEL VI, 14 inch Wood Bell $30
MODEL VII, 21 inch Wood Bell $35
MODEL VIII, Mahogany Cabinet with "Full Floating" Wood Horn $35
MODEL IX, 14 inch Horn, hand painted.... $40
MODEL X, Pedestal Type $100

Connect Music Master in place of Head Phones. No batteries necessary. No adjustments.



Loop Aerial

Music Master Loop Aerial $10
Has calibrated dial, and covers entire band of broadcasting wavelengths. Mahogany frame. Art metal stand and leads.

Head Phones

Music Master Headset..... $10
Supersensitive. Greater distance with clearness. Covers entire range of audible frequencies.

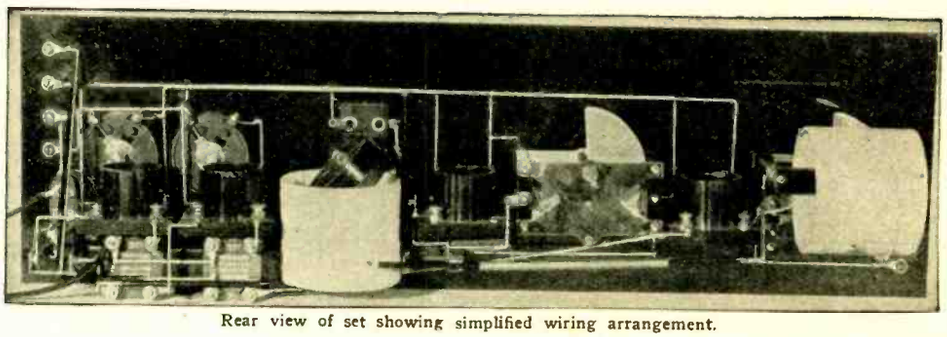
Phonograph Attachment

Music Master Phonograph Attachment, $8
Fits tone arms of leading phonographs, converting them into good loudspeakers.

The Four-Tube Knockout

Designed by McMurdo Silver, Assoc. I. R. E.

Does Everything on a Seventy Foot Antenna A Super Will do on a Loop



Can be Built By Anyone at Home with Three Tools in a Few Hours

Rear view of set showing simplified wiring arrangement.

Parts for the Knockout

These are the parts specified by Mr. Silver for use in the FOUR-TUBE KNOCKOUT, including the Low-Loss Inductances specially designed by him for use in this set. They give to the Knockout Set its remarkable power—they make it possible for SILVER-MARSHALL to stand behind every claim made for it with a guarantee of complete satisfaction. Every item is guaranteed electrically and mechanically perfect.

	Price, each
2—Silver .0005 Low Loss Condensers No. 301	$ 4.50
3—4-in. Moulded Dials—Tapered Knobs	1.00
Howard 6½ Ohm Rheostat	1.10
6—Insulated Top Binding Posts	.05
1—Carter 102A Jack	.80
1—Carter 101 Jack	.70
1—Silver Low Loss Coupler No. 105	5.00
1—Silver Low Loss Antenna Coil No. 205	2.50
4—Hoosick Falls Panel Mounting Sockets	.60
2—Thordarson 3½-1 Audio Transformers	4.00
1—On-off Switch	.60
1—.00025 Mica Condenser with Leak Clips	.45
1—.002 Mica Condenser	.40
1—.0075 Mica Condenser	.75
1—2 Meg Grid Leak	.50
1—7 x 24 x 3/16 Bakelite Panel, Drilled, Grained and Engraved	7.00
Bus-Bar, Spaghetti, Screws, Nuts, Solder, Lugs, Etc.	1.00

Type 105 Low-Loss Coupler

The coils are self-supporting, with minimum of dielectric material in their fields. Wave length range from 200 to 550 meters with .0005 Mfd. condenser.

Price each.....$5.00

Type 205 Low-Loss Antenna Coil

Windings are self-supporting, with air dielectric for minimum losses. Wave length range, from 200 to 550 meters with a .0005 Mfd. condenser.

Price each.....$2.50

Circulars on these parts will be sent upon request

S-M INDUCTANCES

Although the Silver-Marshall Low-Loss Inductances were designed originally for the Four-tube Knockout, they will increase the efficiency of any set 100%, whether tuned R.F., three-circuit, or any other demanding inductances of this type. They are fully described in "The Knockout Book."

THE KNOCKOUT BOOK

McMurdo Silver's new book on the FOUR-TUBE KNOCKOUT contains a complete account of this remarkable set, together with a valuable discussion of low-loss inductances. It will be indispensable to the man who builds the Knockout set. Price.....25c

Complete Parts for the FOUR-TUBE KNOCKOUT with Drilled and Engraved Panel. Price.....$43.50

THE SILVER SUPER

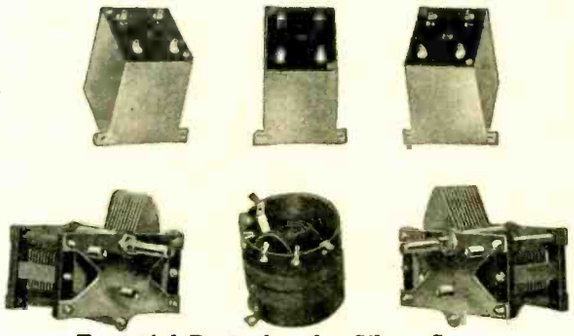
The "Why of Silver Supers"

It remained for SILVER-MARSHALL to produce long-wave Transformers so uniform that individual amplification curves could be supplied with each instrument. As the intermediate amplifier is the most important element in any super, it is of the utmost importance that your transformers be matched—and for your protection and guidance, it is imperative that you have positive assurance of their uniformity. Such uniformity and such assurance have never before been obtainable. But now, Silver-Marshall makes such laboratory measurements accessible.

The amplification curve of each TWO-TEN (inter-stage) and TWO-ELEVEN (filter) transformer is plotted in the S-M laboratory and recorded directly upon a tag tied to the instrument. It shows the peak of that particular transformer—side-bands passed—amplification to be expected in any circuit. It permits you to build your super, as an engineer builds a bridge—after a definite plan—with complete assurance of success.

Send for the "Why of Silver Supers"

The Seven-Tube Wonder Set



Essential Parts for the Silver Super

Write for Circulars on these parts and other S-M Radio Equipment

Parts for the Silver Super

The fact has been repeatedly brought out by engineers and technical editors who have built the SILVER SUPER that its high efficiency depends upon the use of those parts designed and specified by Mr. Silver. Every item is guaranteed to be electrically and mechanically perfect by SILVER MARSHALL, and all orders are subject to replacement or refund if you are dissatisfied. In addition, the S-M free technical information service is ever at your command to aid you with your troubles.

Interesting circulars have been prepared on all essential parts, including Type 101a Coupling Unit (oscillator)—Type 301a and 302a Low-Loss Silver Condensers—Type 601 Collapsible Loop with center tap—and the new TWO-TEN and TWO-ELEVEN Long-wave Transformers. Any of these circulars will be mailed upon request.

Mr. Silver's book on the Super-heterodyne has been enlarged and reprinted, owing to thousands of requests received for it. It will be promptly mailed on receipt of fifty cents.

Silver-Marshall, inc.

RADIO EQUIPMENT

110 South Wabash Ave. Dept. C CHICAGO

A Knockout Receiver

By CECIL W. PRESTON, Assoc. I. R. E.

IN this day of receivers boasting super-heterodyne results on one and two tubes, the man who wishes to build his own receiver, either for the pleasure to be derived from the work, or because of the financial saving that will result, is confused, and justly so— by the veritable legion of circuits, old and new, with which he is confronted. If this man is not swept away by extravagant claims, he will choose a circuit of known merit embodied in a receiver in which strict attention has been paid to each detail. He will not be influenced by phenomenal reports on but one receiver, but will rather consider the performance of many outfits under different and varied conditions—he will, if he is of an analytical turn of mind, select a receiver which has been proven to embody to a high degree the five prime receiver requisites: selectivity, sensitivity, ease of control, quality of reproduction and simplicity of assembly.

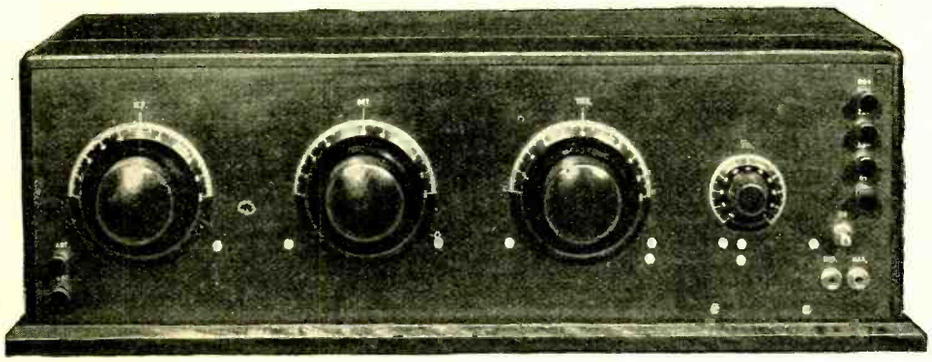


Fig. 1. Front View of the Four-Tube Receiver

Such a receiver, designed by McMurdo Silver, Assoc. I. R. E., is described in this paper. It presents no radical features, being only a careful application of sound engineering principles to the problem of producing a receiver possessing the requisites previously mentioned —an outfit low in cost, simple to assemble, and capable of giving super-heterodyne results on a small outdoor antenna.

Anyone at all familiar with circuit diagrams will realize upon an examination of Figure 4 that this set consists essentially of one stage of tuned radio frequency amplification of the neutralized type, a regenerative detector circuit, and two stages of audio frequency amplification, a total of four tubes being used. These tubes may be of either dry-cell or storage battery type, UV199 or UV201A tubes being recommended throughout. If we examine the design carefully, the following points will be evident, with respect to its efficiency.

Air-core inductances, tuned by low-loss variable condensers, are used and provide tuning circuits of as high efficiency as it is possible to build. Although low-loss condensers have been in use for some time, very little attention has been paid by the broadcast experimenter to low-loss coil design, yet a good condenser is of no value if used with a high-loss coil. These air-core coils are wound with no supporting tube whatsoever, their turns being held in position by an insulating compound, the composition of which is such that these inductances present substantially as low resistance as coils wound on air, which would have absolutely no mechanical means of holding them together. The impossibility of realizing this latter condition is apparent.

According to Dr. Pickard, probably the foremost inductance authority in this country, the single-layer winding used is the most efficient form that can be devised for broadcast reception, and the wire size, No. 20, is one of the sizes approved by Dr. Pickard, as well as the foremost testing laboratories of this country for broadcast work. The coils themselves are so placed in the set that adjacent metal parts affect them to a negligible extent. They are fitting companions for the variable condensers used, whose losses are so low as to be immeasurable.

The radio frequency amplifying tube is so arranged with its circuits that maximum selectivity and sensitivity will be obtained with practically any antenna system. It is rendered stable and free from undesirable oscillation by the use of a neutralizing condenser, which in addition to its other functions, so balances the radio frequency amplifier circuits that the detector tube, when oscillating, cannot feed energy back into the antenna system.

This is an extremely important point, for it permits the use of a regenerative detector, with all its resultant sensitivity to weak signals, yet without any tendency whatsoever to radiate. This non-radiating feature is of immense value, for it means that a person tuning this outfit would cause no interference with his neighbor's reception, no matter how he might operate his own receiver. In this respect this circuit conforms with the Golden Rule, for it will not disturb other nearby receivers.

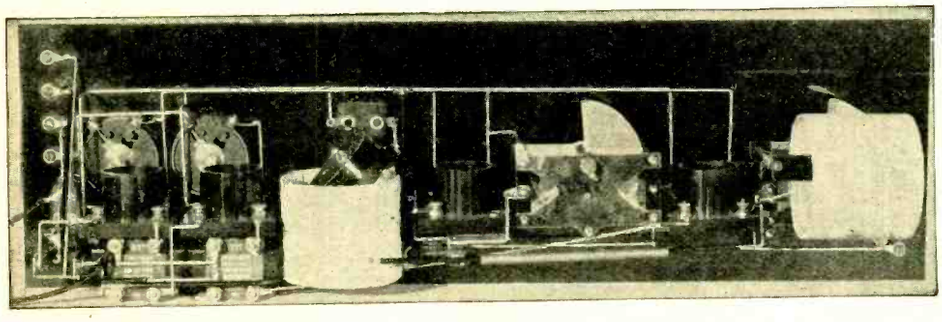


Fig. 2. Rear View of the Set, Showing Details of the Extremely Simple Wiring Arrangement.

The method of coupling the R. F. amplifier to the detector circuit, by means of a very small coil inside the lower end of the vario-coupled stator (outside) winding is in accord with the latest developments along this line, for it gives the greatest possible energy transfer with the minimum amount of capacity coupling, which means that the control of the R. F. amplifier and detector circuits will be independent of each other.

The tickler or rotor coil of the variocoupler is wound with as few turns as possible consistent with good regeneration control, and renders the tuning of the detector condenser almost entirely independent of the setting of the tickler coil. This, and the low capacity coupling between the R. F. stage and the detector, permit the two condenser dials to be logged accurately for any stations heard. (Stations may be tuned in whenever they are operating at exactly the same settings of the two condensers as were used the first time they were heard.)

The audio frequency amplifier employs two low-ratio amplifying transformers, selected for their exceptionally distortionless reproduction, and gives a surprising amount of amplification. Jacks are arranged so that one or two stages of audio amplification may be used at will.

The set itself is a very simple assembly proposition, for all parts are attached directly to the panel, or to the wiring, no sub base being used. The two left hand dials of Figure 1 are respectively the RF tuning condenser, and the detector condenser. The large right hand dial is the tickler, or regeneration control, while the small dial to its right controls the single rheostat, all that is necessary for the proper operation of the four tubes. The battery binding posts, jacks and on-off switch are on the right hand edge of the panel, and the antenna and ground posts at the left end. The panel itself is 7 in. x 24 in. x 3/16 in., of bakelite or formica.

Results

During the summer and fall quite a number of these receivers were built and operated in and around Chicago. In practically every case the extreme limit that had been set for them to come up to was achieved. This was reception on the four-tube set with a seventy-foot single wire outdoor antenna equal to that experienced with a seven-tube super-heterodyne operating on a twenty-inch loop. This in itself was a very stiff requirement, for few receivers, even on an outdoor antenna, will equal a really good super.

In one test, the super was used to log stations throughout the entire broadcasting wavelength range. Then the four-tube set went after the same stations. In nearly every case the volume was equal to the super, as well as the selectivity. In another test, a super and a four-tube set were put down between WQJ on 448 meters and WEBH on 360 meters, these stations being about three-quarters of a mile apart. The selectivity was in favor of the super, for neither station had but a single wave—anywhere from four to eight points being found between 550 and 200 meters for each station. KGO, in Oakland, California; WOR, in New York, and numerous other stations were brought through the locals, however, on both sets with equal volume—the four-tube set using an antenna and the super a loop.

Another test was run between a four-tube set and a standard five-tube neutrodyne, in Wilmette, a suburb of Chicago. Between the hours of 4 P. M. and 8 P. M., twenty-six stations were heard with loud-speaker volume on the four-tube set, more than could be gotten on the factory-built neutrodyne. Among these were stations in New York, Toronto, San Antonio, Texas, and many in other parts of the country, heard before darkness.

Similar tests could be quoted forever, but suffice it to say that in all cases the four-tube set out-performed standard five-tube neutrodyne sets on the counts of selectivity, ease of control, quality of reproduction, and volume. Yet the knockouts were in many cases built without instructions, except circuit diagrams, by inexperienced fans. They indicate that coast to coast reception may be expected with fair regularity under good conditions.

Construction

The material required to build the Knockout is given in the list below, with an accessory list further along. It is strongly recommended that the builder adhere strictly to this list, using parts made by reputable, nationally-known manufacturers. If, however, the experimenter desires to deviate, he should only do so where his knowledge is sufficient to effect the necessary design changes attendant upon the use of material other than that specified.

2 Low Loss Condensers, .0005 mfd.
3 4-in. Molded Dials—Tapered Knobs
1 6½ Ohm Rheostat
6 Insulated Top Binding Posts
1 Jack, 3 Spring
1 Jack, 1 Spring
1 Low Loss Coupler
1 Low Loss Antenna Coil
4 Panel Mounting Sockets, Standard Base
2 3½ :1 Audio Transformers
1 On-Off Switch
1 .00025 Mica Condenser with Leak Clips
1 .002 Mica Condenser
1 .0075 Mica Condenser
1 2 Meg Grid Leak
1 7 in. x 24 in. x 3/16 in. Bakelite Panel.
Bus-Bar, Spaghetti, Screws, Nuts, Solder, Lugs, Etc.

TOOLS REQUIRED: Screw driver, pliers, soldering iron, hand-drill with drills, and counter-sunk.

If a plain, undrilled panel is procured, it should be laid out in accordance with Figure 1. Holes should be drilled with the drill sizes indicated, and double-circled holes countersunk for a No. 6 flat-head screw. The panel may then be grained by rubbing in one direction only with fine sandpaper and oil until all traces of the original bright finish have been removed. Only the front of the panel should be grained, however. Indicating marks for the dials may be scratched with a scriber and square above the shaft holes for all dials, and filled with chinese white, or some other white compound.

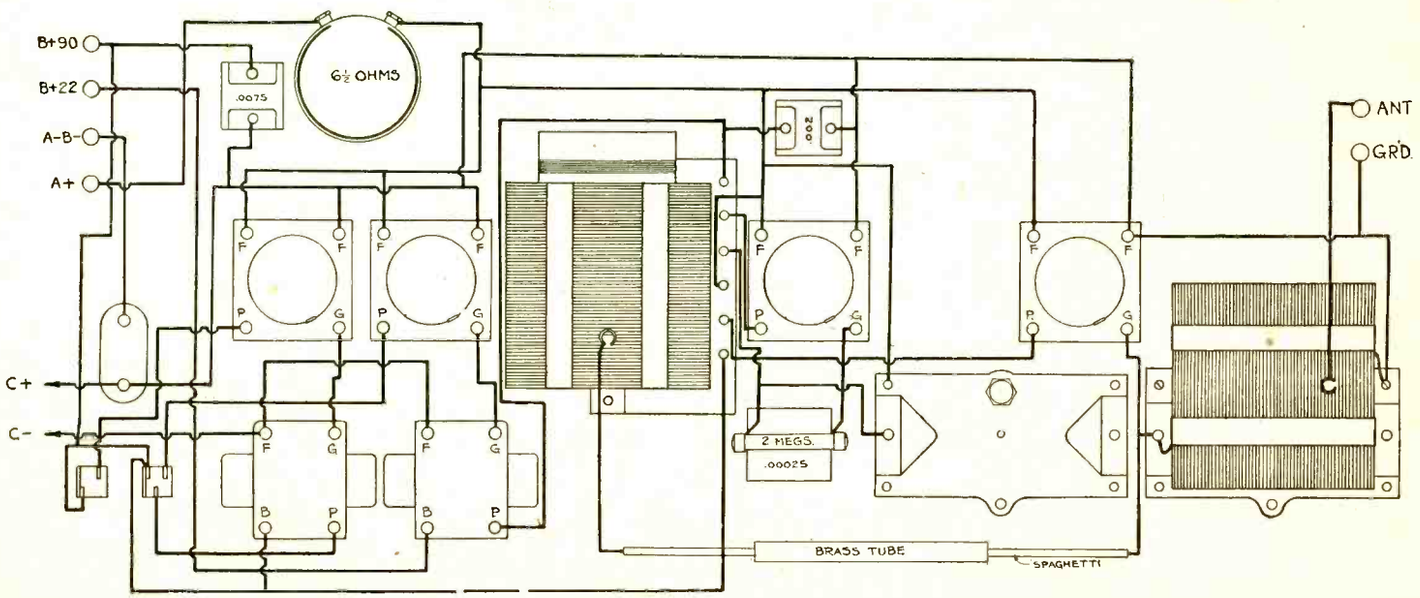


Fig. 3. Pictorial Circuit Diagram, Looking at Panel from Rear.
This, and Fig. 2 Should Be Carefully Studied Before the Wiring Is Started.

The antenna coil should now be attached to one of the variable condensers. The first step is to remove the two mounting screws on the rear end-plate of the condenser that are in a line with the bearing adjustment screw. Two round-head 1¼" No. 6/32 machine screws should be put through the holes in the bakelite mounting strip of the antenna coil, and two nuts screwed loosely on each screw. These screws should be screwed into the condenser holes from which the two original screws have been previously removed. They should be turned in as far as they will conveniently go. Care should be taken to see that the loop, or tap, on the coil comes near the right-hand end of the condenser, when viewed from the rear, and with the stator or fixed plate section of the condenser turned down, as in Figures 2 or 3. One nut on each screw should be tightened up against the condenser frame with a pair of pliers, and the other nut tightened against the bakelite coil-support strip. This will provide a firm mounting for the antenna coil on the back of the condenser.

All screws and nuts on condensers, transformers, sockets, etc., should be tightened up, and jacks and sockets carefully checked for proper contact and spring tension. Jack springs should make good contact with the phone plug, and socket springs should be bent up to make good contact with the tube-base pins. Soldering lugs should be put on the tube sockets, the filament lugs pointing toward the panel except in the case of two audio frequency sockets. The two lugs, one on either of these sockets, that will be adjacent when the sockets are on the panel, should be turned toward each other so that the wires to them can be put in without touching the rheostat.

Binding posts should be put on the panel, with lugs pointing straight in, under the screw head of each post. The nickeled collars, as well as the insulated tops, are tightened up on the front of the panel.

The binding posts now being on the panel, the four sockets, rheostat, jacks, on-off switch and audio transformers should be fastened on with screws and nuts. The audio transformers should be so arranged that their grid terminals come under the grid terminals of the audio frequency, or two left hand, tube sockets. The jacks should be turned so that two lines drawn along the panel from top to bottom would run through their frames horizontally. If it is found that the screws for fastening the sockets to the panel are too long, they should be filed down, as this trouble is sometimes encountered with Panel Mounting sockets.

Before starting the wiring, a well-tinned soldering iron should be heated, or an electric one used, and a quantity of rosin-core solder and a can of non-corrosive soldering paste produced. Each lug should be tinned by depositing a very small amount of paste on its end, followed by an application of the soldering iron and solder. To get a smooth coating it will be necessary to rub the iron on the lug slightly to transfer the heat. Above all things, the iron must be kept clean, and its tip tinned, or covered with solder. A good joint will not look rough—if properly made the solder will flow in around the lug and wire smoothly.

The rear view of the wired set, and the pictorial diagram should be carefully studied, and the wiring put in place progressively, starting with the filament circuit. The wiring for the audio amplifier is then done. The variocoupler is put on the panel next and wired in circuit, followed by the two condensers, the one holding the antenna coil going at the right end of the panel, seen from the rear. The fixed condensers are soldered directly to the wiring, and require no other support than this. The neutralizing condenser will be wired in later, it also being supported by the wiring. Care should be taken in scraping and soldering to the antenna coil tap and variocoupler neutralizing tap not to damage the coils themselves.

The 4" dials should be attached to the condenser and coupler shafts by means of the set screws provided. The dials should read 100 degrees on a line running down from the top of the panel to the shaft holes when the condenser plates are entirely interleaved and the coupler rotor is closest to the stator winding.

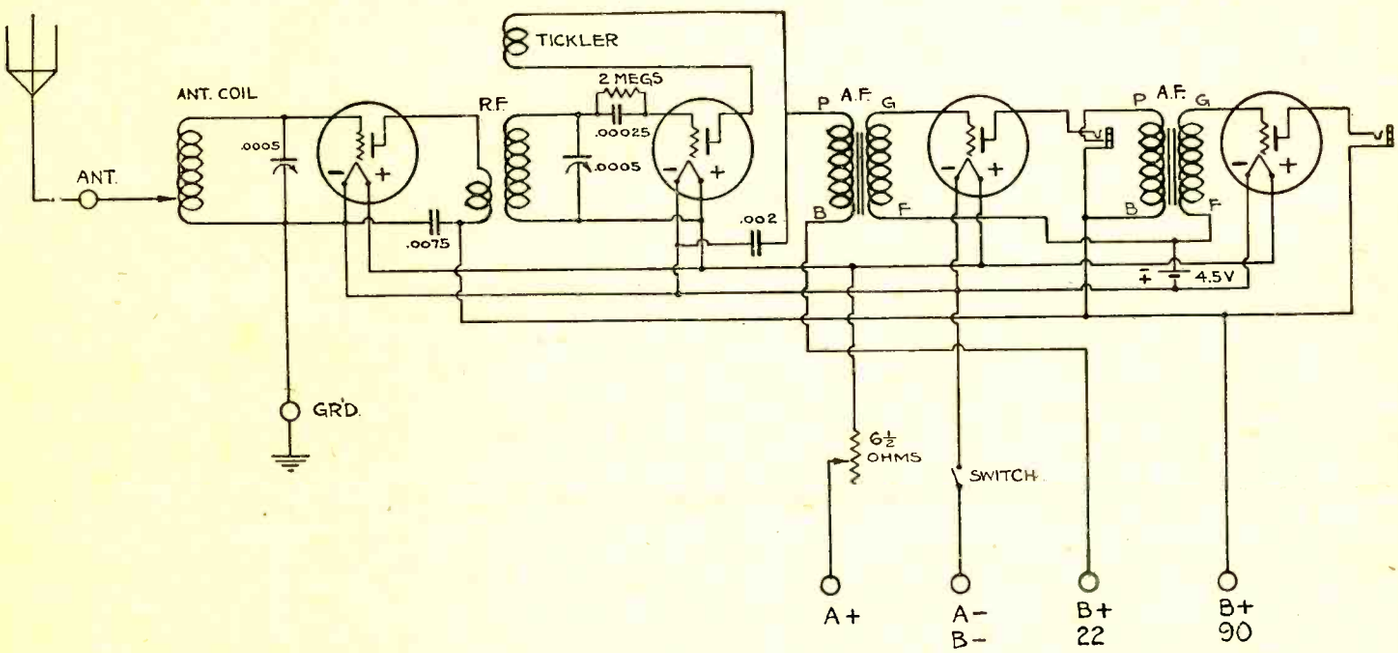


Fig. 4. Schematic Circuit. This Should Be Followed if Possible, as Doing so Will Insure a More Accurate Job than Following the Pictorial Diagram.

All wiring is now completed except the neutralizing condenser, and the set is ready for test. The following accessories will be required:

1—90 volt B battery (4 22½ volt or 2 45 volt batteries).
1—6 volt storage battery, if storage battery tubes are used, or three dry cells if UV199 tubes are used.
1—4½ volt C battery.
4—tubes (UV201A for storage battery recommended) or UV199 with adapters if dry cell. (The use of 199 sockets was not considered as there are no satisfactory panel-mounting 199 sockets, and adapters with standard sockets make a satisfactory electrical arrangment, and an excellent mechanical one).
1—pair of phones with phone plug, or loud-speaker with plug, or preferably both (any standard make).

A suitable antenna would consist of a 70 to 100 foot single wire run between two trees, or two buildings. The lead-in wire should not be over fifty feet long if possible. A good ground can be had by fastening a wire to a previously scraped water pipe with a ground-clamp.

The set should now be connected to the antenna and ground and to the A battery, but not to the B or C batteries. The tubes, upon insertion in their sockets, should light up if the on-off switch is pulled out and the rheostat turned on. If they do, disconnect the A+ battery lead and connect it first to the B 22 and then to the B 90 binding post. If the tubes then light, the

wiring is incorrect and should be checked. Assuming they do not, the A battery should be reconnected properly, and the B and C batteries connected. The C+ post connects to the flexible lead soldered to the on-off switch, and the C— post connects to the flexible lead attached to the F terminals of the audio transformers. The B batteries should be connected in series so that 22 volts will come between the AB— and the 22+ posts, and 67 volts between the 22+ and 90+ posts, or 90 volts between the AB— and 90+ posts.

Operation

The tickler dial should be turned to zero, and the tubes lighted up by turning the rheostat about three-quarters on for UV201A tubes or one-quarter on for UV199 tubes, and once set, it need not be varied, but should always be operated as low as is consistent with good signal strength. The first two condenser dials should be rotated, holding about the same settings, over their entire scales, with the phones in the three-contact, or first stage, jack. These two condenser dials will operate as the first two dials on a neutrodyne, keeping about the same relative separation in degrees over the entire wavelength range of the receiver. If there is any tendency for the RF amplifier to oscillate, it will be evidenced by clicking in the phones at certain dial settings on the lower, and possibly on the higher, waves. If stations are heard as a whistle, it means the amplifier is oscillating, and must be neutralized. Up to now the tickler has been left set at zero.

The neutralizing condenser should be connected in between the grid of the RF tube and the loop, or tap, on the varicoupled stator widening. It may best be hung on its own connecting wires, or one of its lugs may be soldered directly to the grid lug of the first tube, which will provide a substantial mounting. The condensers shown in the photos are nothing more than five-inch lengths of brass tube slipped over a length of spaghetti, which in turn is slipped over two pieces of bus bar of equal length soldered to the first grid lug and the coupler tap. The ends of these wires come within ¼" of touching in their spaghetti sleeve, but do not quite touch.

A station should now be turned in on other lower waves, or with little of either condenser in use. When the clicking or squealing is noticed, the neutralizing condenser should be adjusted in small steps until this clicking or whistling disappears. The set is then neutralized. This method is both simple and effective, although there are others that might be employed. If the set cannot be neutralized on an outdoor antenna, the two lower lugs on the vario-coupler should be reversed, and if this does not help, one or two turns may be pulled off the small winding connected to these lugs and fastened inside the vario-coupled stator coil.

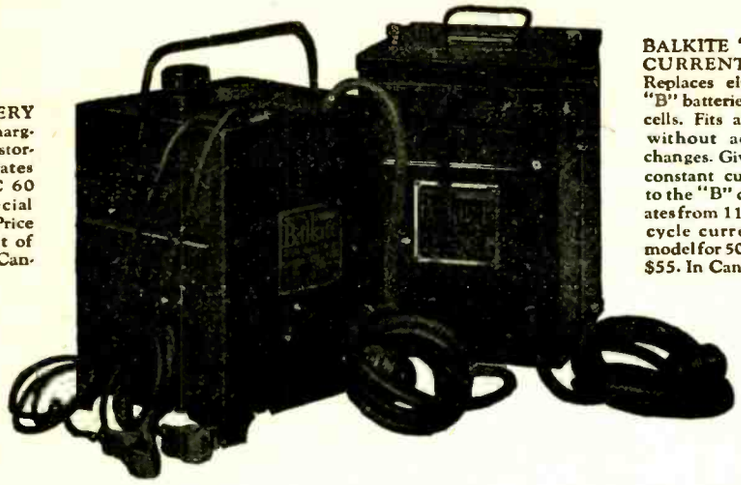
The set now operating, the tickler coil should be turned toward 100 on its dial until a plunk is heard, and stations come in again as a whistle. This is entirely correct, as the whistle can be cut out by reducing the tickler coupling. If the plunk cannot be heard, even using 45 volts on the detector instead of 22, the two top lugs on the variocoupler should be reversed. If the plunk is heard at different points as the tickler is turned up, and then down, stripping a few turns off the tickler coil will cause this point to be about the same whether going up or down on the scale.

In tuning the set either of two methods may be used. The first one is to tune in a station with the two condensers, leaving the tickler at zero, and then strengthening the signal with the tickler when heard. The second, and preferable, is to turn the tickler up until stations come in as a squeal, rotate the detector condenser until a squeal is heard, then vary the first condenser for maximum intensity, following this by turning the tickler back until the squeal disappears and the station modulation is heard. In either case final adjustments will have to be made on all dials when receiving weak signals.

If the receiver is broad in tuning, a small fixed condenser connected in series with the antenna lead-in will remedy matters. It should be either .0001, .00025 or .0005 MFD capacity, arranged so it can be short-circuited by a single-pole, single-throw knife switch when desired.

If an indoor antenna is to be used, it may be put up in an attic, and should consist of several wires run parallel to each other and connected together at both ends, or it may be as long a wire as is convenient run around a picture moulding. Some difficulty may be experienced in neutralizing the set on such indoor antennas, however. A loop could be used in place of the antenna coil, leaving off the antenna and ground connections, but the range of the set would be very materially reduced and this is not recommended.

BALKITE BATTERY CHARGER. For charging 6 volt radio "A" storage batteries. Operates from 110-120 AC 60 cycle current. Special model for 50 cycles. Price $19.50. $20 West of Rockies. $27.50 in Canada.



BALKITE "B" PLATE CURRENT SUPPLY. Replaces either storage "B" batteries or dry "B" cells. Fits any radio set without additions or changes. Gives unlimited constant current supply to the "B" circuit. Operates from 110-120 AC 60 cycle current. Special model for 50 cycles. Price $55. In Canada, $75.

Balkite Radio Power Units

solve the power problem for both "A" and "B" circuits

Balkite Radio Power Units—the Balkite Battery Charger and Balkite "B"—bring a convenient and unfailing power supply to both the "A" and "B" circuits. They bring to your set a constant uniform voltage, clearer tone, greater distance and greater volume. The Balkite Battery Charger keeps your "A" storage battery charged and working at maximum efficiency. Balkite "B"—one of the most important recent developments in radio—replaces "B" batteries entirely and supplies unlimited plate current from the electric lighting circuit.

Both the Balkite Battery Charger and Balkite "B" are entirely noiseless in operation. They do not create disturbances in either your set or your neighbor's. They have no moving parts, vibrators or bulbs, and nothing to adjust, break or get out of order. They cannot deteriorate through use or disuse. They require no attention other than the infrequent addition of distilled water. They are simple and unfailing in operation. Both can be put to use at any time by merely connecting to a light socket. Their current consumption is remarkably low. Both are guaranteed to give you satisfaction.

Both are sold by leading radio dealers everywhere

FANSTEEL

Balkite *Radio Power Units*

BALKITE BATTERY CHARGER— BALKITE "B" PLATE CURRENT SUPPLY

Manufactured by FANSTEEL PRODUCTS COMPANY, *Inc., North Chicago, Ill.*

MODEL S, $25.00

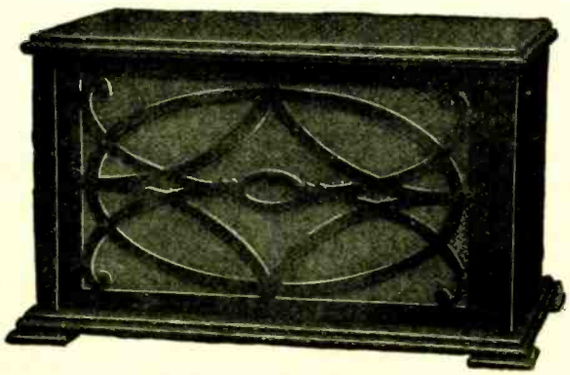
Rubber horn 14½" in diameter. Cast metal throat. Velvet mat finish or mottled bronze and gold.

Each Instrument in PERFECT TUNE

It makes all the difference in the world with the enjoyment you get out of radio whether the high notes of voice and orchestra are in tune or just a little "off."

A big point of the Bristol Audiophone is that each instrument, and each vocal note, comes in in the proper pitch. You will love your Audiophone for its pure harmony of reception.

There are four Bristol Audiophones, priced from $12.50 to $25.00, and a cabinet model at $30.00. If not at your dealer's, write for Bulletin.



CABINET MODEL, $30.00
Size 17x10x10¼. Beautifully finished mahogany. Full floating wooden horn, cast metal throat.

Model J
$20.00

Baby Grand
$15.00

Baby, $12.50

BRISTOL AUDIOPHONE Loud Speaker

The Bristol Company Waterbury, Connecticut

FOR 36 YEARS Ask Any Technical Engineer MAKERS OF
BRISTOL'S RECORDING INSTRUMENTS

LANGBEIN+KAUFMAN

High Grade "Low Loss" Tuning Devices

L+K A Guide to TECHNICAL ACCURACY

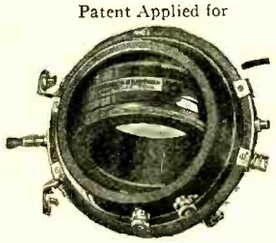
VARIABLE CLARIFYING SELECTOR

Big Improvement For Any Standard Circuit

This unusual tuning device is a real investment. Whether your set is a reflex, a straight R. F., one of the "dynes" or the old reliable Regenerator, you will find the Variable Clarifying Selector a very noticeable improvement.

In combination with a .0005 variable condenser, it will take the place of your fixed coupler, variocoupler, tapped coil, variometer, or other aerial tuner, with remarkable results.

Patent Applied for



It will separate and tune out conflicting stations like a born peace maker. Its selectivity is indescribably minute. And, signals which can't be coaxed beyond the muffled stage in most receivers can be cleared up to full brilliancy of tone.

The price is $7.00, the best seven dollar investment you've ever made in radio. If not at your dealer's, we'll ship to you.

This Instrument Makes Possible the Remarkable

L+K-PENETRATOR

Do You Have Trouble Getting Thru Local B. C.?

If so, and if you want to increase the selectivity of your present receiver without tearing it apart, use or build this little Penetrator. The way it enables you to cut through local stations will be a joy to your heart. When hooked on to the antenna or loop side of your set, no matter what it is, it lets in one station at a time. Type A will change your present regenerative set to a combination R. F. and regenerative receiver and will increase its selectivity to a surprising degree. Type L is especially arranged for loop sets and will greatly increase both selectivity and range.

However, don't confuse this instrument with the hundred and one so-called wave traps, which are usually no more than a coil and condenser and merely add losses to your set.

The L + K Penetrator is a tube unit taking one tube of the 201-A type. Price without tube for either type is $25.00; kit of parts, $17.50.

It will pay for itself in increased enjoyment each night you use your set.

READY NOW—THE NEW ELKAY SUPER-SELECTOR

(An L + K Product)

Here is the Super-Selector, the latest addition to the L + K line. It contains our standard tuning devices, the Variable Clarifying Selector and the VT-25, Variotransformer, and, as a result, give you "needlepoint" penetration, and extremely sweet tone quality and volume in any degree that pleases your ear. When you lift the cover and see that it contains but four tubes, you will wonder how it is done—and it becomes all the more wonderful when you discover that it is done entirely without reflexing. The price without tubes or accessories is $70.00. In kit form, $50.00.

Set Builders, Attention!

Are you handy at making sets? Do you want to make some extra money out of hours, supplying your friends and the local trade? If so, write us and we will start you in the set-building business. You can start on a very small capital. This is a fine opportunity to develop a profitable radio business. Special terms to manufacturers using large quantities of our parts.

Send for free diagram spread of L + K penetrator and Elkay Super-Selector set. We maintain a technical department which is ready, without charge, to discuss your problems at any time. Write us freely. Address

THE LANGBEIN-KAUFMAN RADIO CO.

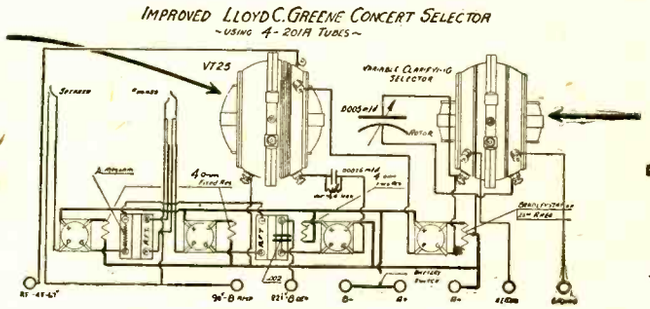
511 Chapel St., Dept. C., New Haven, Conn.

LANGBEIN+KAUFMAN

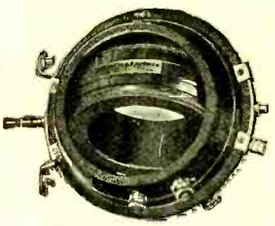
High Grade "Low Loss" Tuning Devices

L+K A Guide to TECHNICAL ACCURACY

VT-25 Variotransformer



Patent Applied for



Variable Clarifying Selector

The Heart and Soul of the IMPROVED

GREENE CONCERT SELECTOR

The new Lloyd C. Greene Concert Selector, which has just been perfected to use the large storage battery type of tube (VV-201A and C-301"), employs the two L+K low loss tuning devices illustrated above. These tuners are quite different from any others so far brought out and have the following remarkable characteristics:

"Needlepoint" Selectivity

The Variable Clarifying Selector

—tunes out local B. C.
—clears up muffled signals to full brilliance
—gives complete control of the antenna coupling
—eliminates tapped coils with their high losses
—displaces fixed couplers with their limited range
—works in any standard circuit with all tubes
—$7.00 at your dealer's.

Double Amplification

The Vt-25, Variotransformer

—an improved R. F. Transformer
—gives amplification of two ordinary R. F. Transformers over the entire B. C. range, 180 to 550 meters
—gives two-tube efficiency on one tube of any type
—supplants the ordinary tuned R. F. Transformer and works without variable condenser
—a satisfying addition to any tube set. Price, $8.50

Scientifically Correct Materials and Methods

These tuners are wound on highly polished, pure black hard rubber forms. Hard rubber has a dielectric constant of less than 2, as against 4 to 8 in the most widely known other materials.

The windings are of double silk-covered copper wire secured with a coating of pure Para rubber. No varnish or shellac is used. Every step of the work is done with the same care that is exercised by the makers of fine scientific instruments.

SEND FOR FREE DIAGRAM CHART

showing and explaining the new Greene Concert Selector circuit and other effective hook-ups. (Jobbers and Dealers, write for our proposition.)

THE LANGBEIN-KAUFMAN RADIO CO.

511 Chapel St., Dept. C., New Haven, Conn.

Build the Greene Concert Selector*

A Most Remarkable Radio Frequency Receiver Which Uses Any Type of Vacuum Tube, Has No Rheostats, and Gives Five-Tube Performance with Four-Tube Economy

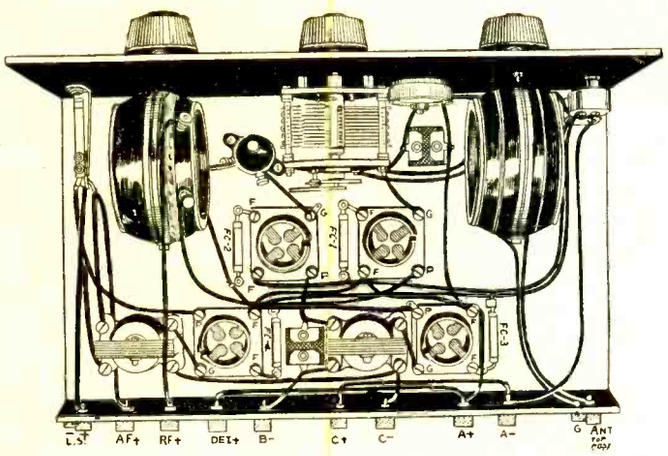
By LLOYD C. GREENE, Radio Editor of the Boston Globe

*Reg. U. S. Pat. Off.

BEFORE beginning the description of my Concert Selector I wish to take this opportunity to express sincere appreciation to the hundreds of radio experimenters and enthusiasm of those readers of the Citizens' Radio Call Book who have written from every state in the union and foreign countries to tell me of the gratifying success they have had with the radio receiver which I described in last issue.

Last fall I came to you, through this valued publication, a stranger. Yet, as time has since proven, there was a conviction borne to many of you in this first presentation which induced you to place confidence in my suggestion that you construct a Concert Selector. Now we are a little better acquainted with each other.

In New England, where my radio receivers are better known, more than 75,000 have been constructed by home experimenters in the last three years. During this time I have designed and described but two different sets. Radio receivers of good design cannot be "served out" with the speed of "hot dogs" at a quick lunch, at least this has been my observation.



Pictorial Diagram of Receiver

The Concert Selector already has gained great popularity. There has been sufficient demand for it to attract manufacturing interests which have recently placed on the market a factory-built model as well as a complete set of parts in kit form. This information is offered only as further evidence of the genuine merit of the receiver and as assurance to the prospective builder that, when properly constructed, the Concert Selector is an instrument well worthy of its costs in time and money.

As some of you will remember, the Concert Selector model which I previously described was designed especially for those fans who wanted an efficient and economical radio set in which small dry-cell vacuum tubes could be used. This receiver, with four UV-199 or C-299 tubes, is capable of receiving local and semi-distant broadcasts on a non-power type of loud speaker, is reasonably selective and could be operated satisfactorily from a few dry cells. Hundreds of letters which have come to me bear testimony to the fact that this receiver fulfilled a long-felt want on the part of many fans.

Following the success of this model, demand arose for a receiver of similar design in which larger tubes, such as UV-201-A, might be used. After some experimentation it was found that if a few changes were made in the original circuit and controls of the Concert Selector nearly any type of vacuum tube could be used. The tubes best to use when great volume, extreme distance and high selectivity are paramount demands of the new Selector are given in the order of merit, as follows: UV-201-A or C-301-A, DV-2 or DV-3, and C-299 and UV-199. With the first three types mentioned it is absolutely necessary to use a 6-volt storage battery of not less than 60-ampere-hour capacity for filament lighting. Dry cells in series-multiple connection which give a 6-volt source for the filament current of the last three types of tubes may be used for convenience, but dry cells will not prove as economical as would a storage battery.

Although any of the vacuum tubes named may be advantageously used in the new Concert Selector, the receiver has no rheostats. At first thought this condition of affairs may strike you as "impossible." But it is not, as I will explain. A special filament current control cartridge has been developed in two different forms to take care of filament current from a 6-volt source to any of the types of tubes above mentioned. One form of filament control cartridge is marked "UV-201-A" and this cartridge will properly regulate the filament current to tubes of the following types: UV-201-A, C-301-A and DV-2. The other form of filament control cartridge, marked "UV-199," will correctly govern the flow of filament current to tubes of the DV-3, C-299 and UV-199 types. So it becomes evident that the seemingly impossible can be accomplished with but two sets of cartridges. And these cartridges cost less than a good rheostat.

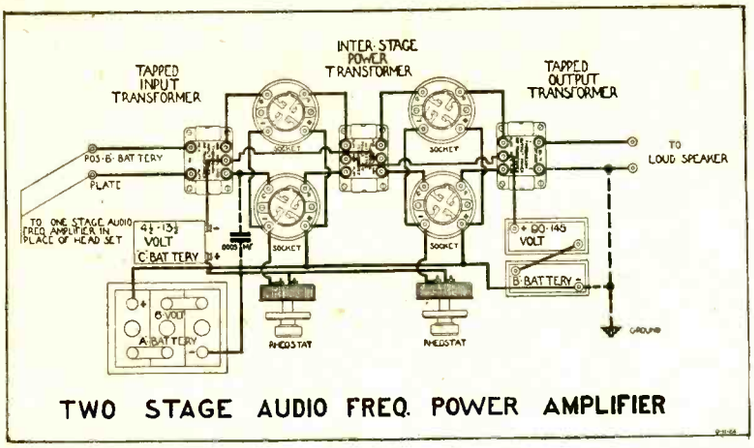
The advantages of the filament control system employed in the Concert Selector are many. Most important of these is the protection which they offer against burning the filaments of tubes too brightly. Any person who has had only a little experience in using UV-199 and similar low-temperature filament tubes will readily appreciate the value of a device which insures correct filament current. The old bugaboo question of "How brightly should the tubes be burned?" has been forever banished by this simple system of filament current control. Seventy-five per cent of the vacuum tubes which "go dead" prematurely do so because they have been subjected to excessive filament current. This cannot happen to tubes used in the new Selector.

After three or four years' experimenting with different types of radio sets many fans find they have a collection of miscellaneous vacuum tubes, perhaps one UV-199, a C-301-A, a DV-2 and a DV-3, for example. These four tubes, of but little or no value in any other type of multi-tube receiver, can be used not only to advantage in the Concert Selector but without the least difficulty with respect to filament lighting. This is due to the fact that none of these tubes require a voltage source greater than six volts, for which the special control cartridges have been designed.

If you desire to experiment with different types of vacuum tubes as radio frequency or audio frequency amplifiers, or detectors, it is only necessary to insert the proper form of filament cartridge in its receptacle beside the vacuum tube it is to control and forget about the filament adjustment. The cartridge will take care of it. So you see the system is extremely flexible and versatile.

Another advantage accruing to this system of filament current control is one which is a valuable protection to your storage battery. The storage battery should not, for best interests of the battery, be discharged to the point of exhaustion. Such practice rapidly shortens the useful life of the battery and always results in unsatisfactory operation of the radio set during the

ZENITH
KENNEDY
RADIODYNE
THERMIODYNE
ULTRADYNE
MURDOCK
OZARKA
Pfanstiehl
MICHIGAN
Deresnadyne
MALONE LEMON
MASTER RADIO
ROYAL
Howard
Pathé
HARMONY
AUDIOLA
GLOBE
EAGLE AND
MANY OTHERS



TWO STAGE AUDIO FREQ. POWER AMPLIFIER

When Better Transformers Can Be Bought— They Will Be Thordarsons!

Tone quality! Clear, natural reception! Even volume over the entire musical range! That is what the public demands today. And is getting in the finer sets—equipped with Thordarsons for musical amplification. Leading set makers continually test and compare transformers. They use more Thordarsons than all competitive makes combined—which answers the transformer question. If you want the best amplification, simply follow their lead: build or replace with Thordarsons! Unconditionally guaranteed.

They Use THORDARSON Super TRANSFORMERS

Standard on majority of quality sets

They say—

They Say of the New Super-Zenith:
"Greater clarity and volume. Amplification is always at a maximum in each stage for any wave-length. Three stages audio frequency amplification."
Zenith amplifies with Thordarsons!

They Say of the Kennedy:
"The Kennedy tone quality is superb; full-rounded, musically pure reproduction of any program within a good long range. No hollow tones or distortion. For the Kennedy is a musical instrument. A musician will enjoy its purity of tone."
Kennedy amplifies with Thordarsons!

They Say of the Murdock Neutrodyne:
"To hear the real voice of the nation full and clear—you want volume. . . . Volume that floods your room. . . . Distant stations can be tuned in with remarkable clearness and volume."
Murdock amplifies with Thordarsons!

They Say of the Andrews Deresnadyne:
"It secures the finest tone and high selectivity with increased volume and distance. It brings to the home—a reproduction of music really comparable to the original. In volume the Deresnadyne will give anything from a mute tone to a volume that fills a large hall."
Deresnadyne amplifies with Thordarsons!

They Say of the Ultradyne L-2:
"Selectivity is so high and amplification so strong that distant stations can be tuned in through local stations and put on the loud speaker."
Ultradyne amplifies with Thordarsons!

They Say of the Pfanstiehl Model 7:
"People now want trouble-proof service and purity of tone. The new Pfanstiehl . . . gives a clear, natural tone at any distance. . . . There is no distortion, however great the amplification. . . . It comes in like velvet. . . . Two stages of audio amplification—low ratio, of course, to give perfect quality, with all the volume desired."
Pfanstiehl amplifies with Thordarsons!

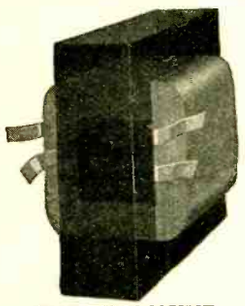
They Say of the Howard Neutrodyne:
"It brings in distant stations distinctly. It has natural tone qualities. It has remarkable volume."
Howard amplifies with Thordarsons!

They Say of the Radiodyne:
"When you own a Radiodyne you can hear singers' voices and orchestral harmonies faithfully reproduced thru the loud speaker . . . so clear and distinct that you lose nothing."
Radiodyne amplifies with Thordarsons!


Six floors, 100,000 square feet, devoted to making transformers.

All stores can now supply Thordarsons. Accept no substitutes. If your dealer is sold out, you may order from us by mentioning his name. Interesting bulletins on amplification mailed free. Write

THORDARSON ELECTRIC MANUFACTURING CO.
Transformer specialists since 1895
WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
Chicago, U.S.A.



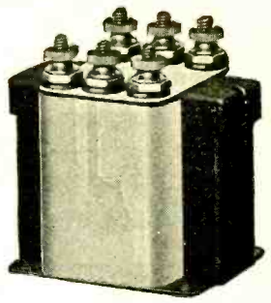
THE EXCLUSIVE THORDARSON SQUARE COIL

Leak-Proof Construction

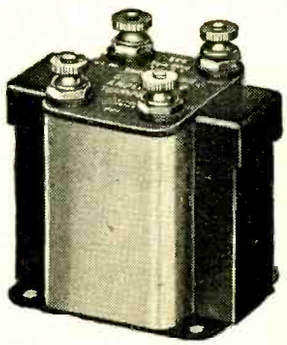
The Thordarson-made layer-wound SQUARE coil fits snugly around the square core. Coil can't turn—no open circuits due to layers slipping. No air spaces between coil and core (exclusive Thordarson feature)—no lost energy, no lost volume (especially on low notes), no leaks from primary to cause howls in set. (Thordarsons are quiet, even on the third stage.) Over-size core (¾ in. cross section) provides 50% larger magnetic circuit—minimizes core losses, prevents over-saturation. Broad ribbon leads locked in the coil give short, direct and more durable connections to the patented inner-locked terminal posts—no tangled or broken wires inside case (exclusive). Each Thordarson transformer comes completely protected, shielded and tightly clamped in a stout case. No rivets or screws through the special silicon steel core to cause short circuits or eddy current losses between the laminations (exclusive). Do you wonder that Thordarson leads the field in output and produces more transformers for more makers of quality sets than all competitors combined?

New!

The Thordarson INTERSTAGE Power Amplifying Transformer. Provides two stages of POWER amplification when inserted in circuit between Input and Output Power Amplifying transformers as per diagram at left. Four tubes are required, but the quality of the reception more than repays you. Only Thordarson builds a transformer of this type.


Thordarson INTER-STAGE Power Amplifying Transformer. Unconditionally guaranteed..... **$8**


Thordarson Power Amplifying Transformers. Give best results when preceded by two stages using 3½:1 Thordarson A.F. Transformers. May also be used as 4½:1 audio freq. transformers by disregarding center taps, or as a coupling transformer for loud speakers. Unconditionally guaranteed. Per pair..... **$13**


Thordarson "Super" Audio Frequency Transformers are the best at any price. Unconditionally guaranteed. Three ratios: 2-1, **$5**; 3½-1, **$4**; 6-1, **$4.50**.

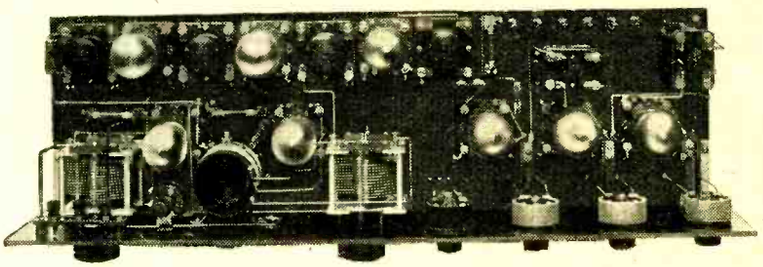
Super-Het Builders!
For the "Best" 45,000 Cycle Super-Heterodyne "RADIO" and other leading authorities recommend in highest terms the Thordarson 2:1 ratio transformers. Take no others!

Samson Helical

Showing SAMSON Helical Winding

found only in SAMSON Transformers, which insures much clearer reception from far greater distances due to its very much lower distributed capacity, resistance and leakage effect.

These lower losses are obtained by eliminating paper or other insulation between layers. Since adjacent parts of the winding are never more than 80 turns apart instead of the usual 800 to 1200, the voltage between them is correspondingly reduced. This makes layer insulation unnecessary, reduces the length of wire per turn, cutting down resistance, and also lowers the leakage between turns.



Make This Wonder Radio Set Yourself

Build the set described on page — of this issue of the Citizen's Radio Call Book.

Thousands have been built. The owners report remarkable results—distance, selectivity, volume and tone quality surpassing any set they ever heard or operated.

You cannot buy as good a set as this; you must build it yourself. And when you have it finished you can get "Entertainment from Everywhere."

People who have built this set say that it goes through powerful local stations and brings in what they go after if it is on the air.

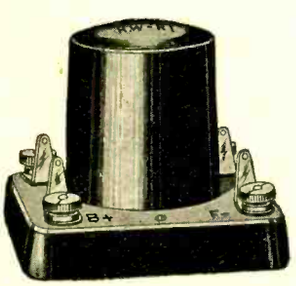
During Trans-Atlantic Test Week, a set like this was operated at an official Government Listening Post on Long Island, N. Y. In one evening it got Edinburgh and Glasgow, Scotland, and Birmingham, England, on the loud speaker using only **one** stage of audio amplification.

All along the Atlantic coast, owners of these sets say that they have no difficulty in getting Pacific coast stations.

SAMSON Helical Wound L. W. Transformers and the SAMSON Oscillator Coupler make this set possible. Price $4.50 each.

For your convenience, three matched SAMSON L. W. Transformers, one matched Filter Transformer and a SAMSON Oscillator Coupler are assembled in one package.

Your dealer has or can get SAMSON Helical Wound L. W. Transformers for you. If you have difficulty, write us.



SAMSON Radio Frequency Transformers

Type HW-RI

give higher amplification without detectable distortion, greater sensitivity and unusual compactness.

The amplification in intermediate frequency amplifiers the SAMSON Helical Winding makes possible is truly remarkable and, when SAMSON Audio Transformers are used in the same set, assures reception right down to the static level. No set can do more.

Even the first detector tube can be operated at its maximum efficiency in sets having two detectors if the SAMSON Filter Transformer is used.

RADIO DIVISION

SAMSON ELECTRIC COMPANY

Manufacturers Since 1882

Canton, Mass.

Direct factory representatives in 19 American cities and in foreign countries in all parts of the world.

Wound Transformers

SAMSON
Transformers Help Spell Success

Every day more and more experienced set builders are using SAMSON Helical Wound Transformers exclusively.

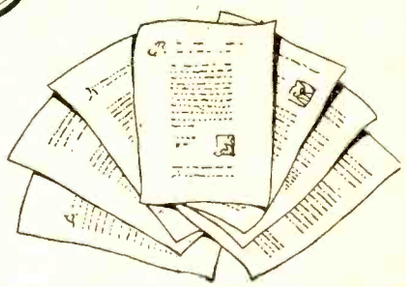
Radio engineers in all parts of the country have tested SAMSON H. W. Transformers on all kinds of circuits and hook-ups. Now, having proved that SAMSONS better any set, these engineers are recommending SAMSON Transformers to others as well as using them on their own sets. Manufacturers of the better type of receiving sets realize that the quality of the transformer affects the operation of their sets. Many are forgetting price and using SAMSONS although SAMSON Transformers cost them from one-third more to twice as much as the transformers they had been using.

You, too, will notice the difference the minute you use SAMSON Transformers. Musical notes come through clearly and distinctly—full, rounded, resonant—with a tonal quality which can be had only with SAMSON Helical Wound Transformers.

For forty-three years the Samson Electric Company has been manufacturing apparatus which had to meet the highly critical and scientific tests of engineers, architects and scientific investigators.

SAMSON Helical Wound Transformers are made for those in radio who are satisfied only with the finest apparatus and parts. Yet, at $5, SAMSONS cost no more than inferior transformers.

Your radio dealer has or can get SAMSON Transformers for you. Insist on SAMSONS if he tries to sell you some other kind. If he will not get SAMSON Transformers for you write us and we'll see that you are supplied.



Comments from Experts

"The Samson audio transformers were found superior to a number of various makes tested for this kind of work. An uncontrollable howl was always present when some of the other transformers were used."
—*Chicago Daily News.*

"The Samson transformer also has the advantage of the helical winding in which the distributed capacity effect is very materially reduced."
—*R. W. Cotton.*

Recommended by R. W. Bradley for the "DX Go-Getter" in December *Wireless Age.*

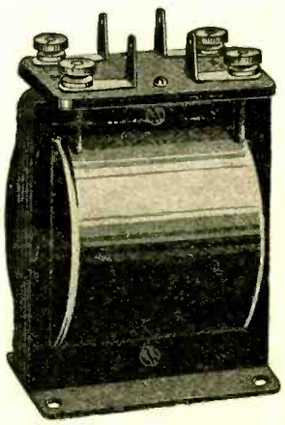
"The Samsons are practically free from distortion on any of the frequencies. * * * The amplification is far beyond that of the ordinary type transformer proving that volume does not have to suffer in the effort to obtain distortionless reception. * * * The Samson transformer does just about everything its manufacturers claim for it, as we have proven by actual tests in Everybody's Radio Weekly Experimental Laboratory."
—*Everybody's Radio Weekly.*

"The transformers (Samson) seem to be well made and certainly function beautifully as audio amplifiers."
—*J. C. Keogh, Chicago American.*

SAMSON Audio Frequency Transformers

HW-A2 in two ratios—6:1 and 3:1

bring in distant stations on loud speakers with the quality demanded by the most exacting music lovers.
You will be delighted with the absence of distortion—for the singer's tones come to you as though you sat in the distant concert hall. The speaker's voice is clear and vibrant. You get the ringing tone of the band instruments; the delicate notes of muted violin strings.
You will be astonished with the far greater amplification obtained which places the offerings of a nation at one's fingertips.



RADIO DIVISION

SAMSON ELECTRIC COMPANY

Manufacturers Since 1882

Canton, Mass.

Direct factory representatives in 19 American cities and in foreign countries in all parts of the world.

Construction Data on Super-Heterodyne Receivers

1. Position in Field

AMONG all the means which have been provided by the mind of man and the ingenuity of the skillful craftsmen for the reception of wireless signals, the Super-Heterodyne stands out clearly as the most sensitive, selective and satisfactory equipment for the reception of Radio Telephony.

This universal acknowledgment of the supremacy of the Super-Heterodyne, on the other hand, does not depreciate the usefulness of the smaller sets any more than the ranking of the Eagle as the King of Birds lessens the beauty or usefulness of bird life in general. But for those who want, in a single instrument, the ultimate in sensitivity, in selectivity, in volume, in tone quality—in short, the most satisfactory Radio reception—nothing in the field today will equal the Super-Heterodyne.

II. Principle of Operation

The fundamental principle of the Super-Heterodyne is the efficient amplification of Radio frequency currents before they are rectified and become audible.

The amplification of low wave length Radio Frequency currents at their very high signal frequencies is an exceedingly difficult thing to control. High frequency currents will jump from one wire to another at the slightest opportunity, and the extremely weak currents received are often dissipated before they can be used. This tendency increases with the frequency, and the lower the wave length, the higher the frequency.

In order to avoid this difficulty and to avoid these losses, instead of attempting to amplify the low wave length at their high frequencies, the Super-Heterodyne converts the incoming waves to a higher wave, which means lower frequencies, and amplifies them at this intermediate frequency before passing the signal along to be rectified by the detector and amplified at audio frequencies as in other receivers.

In order to understand the operation of a Super-Heterodyne, it is necessary to understand its component parts. They are briefly as follows:

The Oscillator Circuit

This comprises the third section of the set, and is composed of an oscillator coupler, vacuum tube with its grid leak and condenser, rheostat and tuning condenser. This circuit sets up the independent high wave length signal at low wave length and delivers it to the frequency changing equipment as noted above.

The Intermediate Frequency Amplifying Units

These consist of a filter and three long wave Radio transformers with three vacuum tubes and rheostat. Their sole duty is that of amplification of the new long wave signal (at low frequencies) received from the Frequency Changing Equipment, which is delivered enormously amplified to the rectifying or

Detector Unit

This consists of a vacuum tube, grid leak and grid condenser and its rheostat. The purpose of this unit is to convert the amplified long wave into audible frequency so that it can be heard by the human ear and deliver it to the detector jack or to the

Audio Amplification Section

This consists of two Audio amplifying transformers, two vacuum tubes with associated jacks and phone bypass condenser. This is used to further amplify the signal at audio frequency and deliver the increased volume to the loud speaker.

III. Data on Construction

Three photographs and the wiring diagram of an 8-tube 60 kilocycle Super-Heterodyne are shown in the illustrations accompanying this article. The parts necessary to construct this receiver are not so many nor as expensive as is generally believed, as they list at about $75, including the panels, and amateurs and experimenters will find their efforts will be amply repaid by its construction. One thing, however, should be kept uppermost in mind by the constructor—use only the best parts, for "the best is the cheapest in the long run."

Loop

The specifications of the loop which is suited to this receiver are as follows:

Front View of Receiver

Length of long sides, 25 inches; length of short sides, 12½ inches; distance across the top of the loop, 18 inches; total height of the loop, 33 inches.

The wire on the loop is wound on 5/16-inch centers and is composed of 12 turns of No. 18 insulated braid with a tap taken off at the exact center of the wire. The pieces of wood which support the wire are 4x¼-inch thickness by 1½-inches wide and notches are cut in one side of these, which are ⅛-inch deep and 5/16-inch on centers to accommodate the wire. The loop frame should be made of any good dry 1-inch square wood.

There is a great deal of question on the average experimenter's mind as to the relative merits of Litz wire as against that of ordinary stranded wire. If the constructor is building his own loop, the advantages of having Litz wire is probably not worth the extra amount of money which the use of Litz would involve.

There are a great many people who desire to use an antenna and ground with any receiver they may use. If it is desired to use an antenna with this set, all that is necessary is to connect the antenna wire to the ground wire by means of approximately 4 or 5 feet of stranded insulated wire. This wire may be turned once around the outside of the loop.

Panels

In selecting panels both for the front and base of this set, the constructor is given considerable latitude in that he may use hard rubber, bakelite or many of the composition panel materials available on the market. If hard rubber is used, the panel should be ¼-inch in thickness; otherwise, 3/16-inch will be satisfactory.

The front panel is 28x7 inches and the base panel 27x8 inches.

It is recommended that the base panel be of this material or similar, rather than of wood—whereas good dry wood or wood impregnated with paraffin is an exceptionally good insulating

material; in a good many cases it has been found that wood which has not been seasoned has caused a great deal of trouble when used for baseboards—particularly if bare wires are led through the board and come in contact with the wood.

Variable Condensers

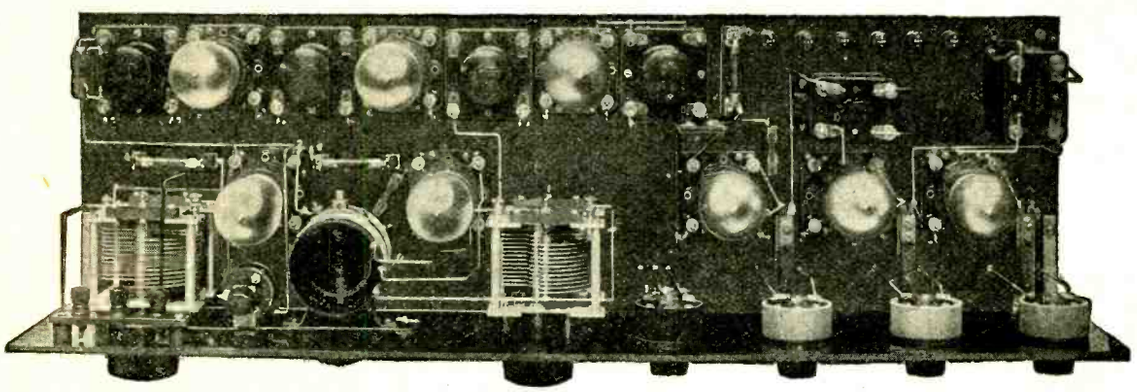
In choosing variable condensers for this set, it is well to purchase one of the so-called "low loss" type, with a grounded rotor. There are many of these on the market which are very good.

Be sure in buying this that the minimum capacity is low—at least not more than .00002 mfd., this reading to be taken when the rotor plates are entirely removed from those of the stator.

There are two variable condensers of .0005 mfd. maximum capacity required for this set and one small variable feed back condenser of approximately .000045 mfd. maximum capacity to control regeneration used in the first detector.

Oscillator Coupler

The oscillator coupler is rather a departure in design from the ordinary coupler. On account of this fact the following data are set down to explain the reason for its design:



Looking Down on Receiver

This coupler has been designed to give the necessary variation in frequency over the range of the 5,000 meter intermediate frequency transformers. This means that it will not be found that part of the time the heterodyning will be done by the harmonics and part of the time by the fundamental. For the proper operation of the 5,000 meter transformers, the oscillator must range in wave-length from about 215 meters to about 600 meters. This variation can be obtained within the scale of the ordinary .0005 mfd. condenser dial.

In order to accomplish this wide variation in wave-length, it is necessary that the winding of the plate coil on the coupler shall not be of wire of too small a cross section, for as the cross section becomes smaller, the winding is more compact with the attendant increase in self capacitance, which tends to make the lowest frequency obtainable with the coil in the oscillator circuit higher than it would be were this capacitance not present, and this apparent capacitance adds to that of the variable condenser.

Another fact which cannot be overlooked is that in order for the oscillator coil and condenser to "oscillate," the energy necessary must come from the tube, or more properly, from the "B" battery through the relay action of the tube. In order for this to happen, the coupling between the oscillator coil and the grid coil must be right. In an oscillator designed for use for the Super-Heterodyne, frequency variation from one extreme to the other must be obtained by a single uniform adjustment for convenience. This means that there can be but one coil and but one condenser.

For any given frequency, there is one best relationship for the oscillator coil, the grid coil and the condenser. In the oscillator of the Super-Heterodyne, a compromise must be made. Above all else, the compromise must not effect the ability of the oscillator.

In the coupler which is used here, an extra tap is taken off the oscillator coil for the plate lead, which increases the stability at the high frequency end, and allows at the same time sufficient coupling between the plate and grid coils to insure operation with vigor over the entire scale of the condenser.

Intermediate Frequency Amplifying Transformers and the Intermediate Frequency Filter

The Intermediate Frequency Amplifying Transformers have been said to be the heart of the Super-Heterodyne circuit, and this statement is without question true, as the difference between a good Super-Heterodyne and an average Super-Heterodyne lies in the material used in this particular part of the set.

There has been a great deal of discussion as to which wave length is best, and each wave length from 2,000 to 10,000 meters will find its particular supporter, but the 5,000 meter band seems to offer the advantages of both the higher and lower without some of their disadvantages.

There has also been a large amount of discussion as to the relative advantages of iron core transformers versus air core transformers. In the design of the transformers used in this set, it is believed that a happy medium has been struck, as the transformers are primarily of the air core type with a very small amount of iron in them.

This iron is introduced only in a quantity sufficient to broaden the peak of the transformer. These transformers are sufficiently sharp so that great amplification is obtained, and yet they are not so sharp that they will not work properly together or so that the side bands are cut.

The Input or Filter Transformer is of the air core type, and brought to a sharp peak by the use of a .001 mfd. fixed condenser across its primary winding. This Input Transformer is sufficiently sharp to eliminate interference and cause sharp tuning, but its peak is broad enough so that none of the side bands are prohibited from passing through it—thus insuring good quality of reception. By its use the first detector tube acts as a by-pass for the frequency of the incoming wave.

Rheostats and Potentiometers

There are three rheostats required in this Super-Heterodyne—one controlling the first and second detector tubes of 15 ohms resistance; the second one controlling the oscillator, and the three intermediate frequency tubes of 5 ohms resistance, and one controlling the two audio tubes of 15 ohms resistance.

A Potentiometer of 200 ohms resistance is used.

Sockets

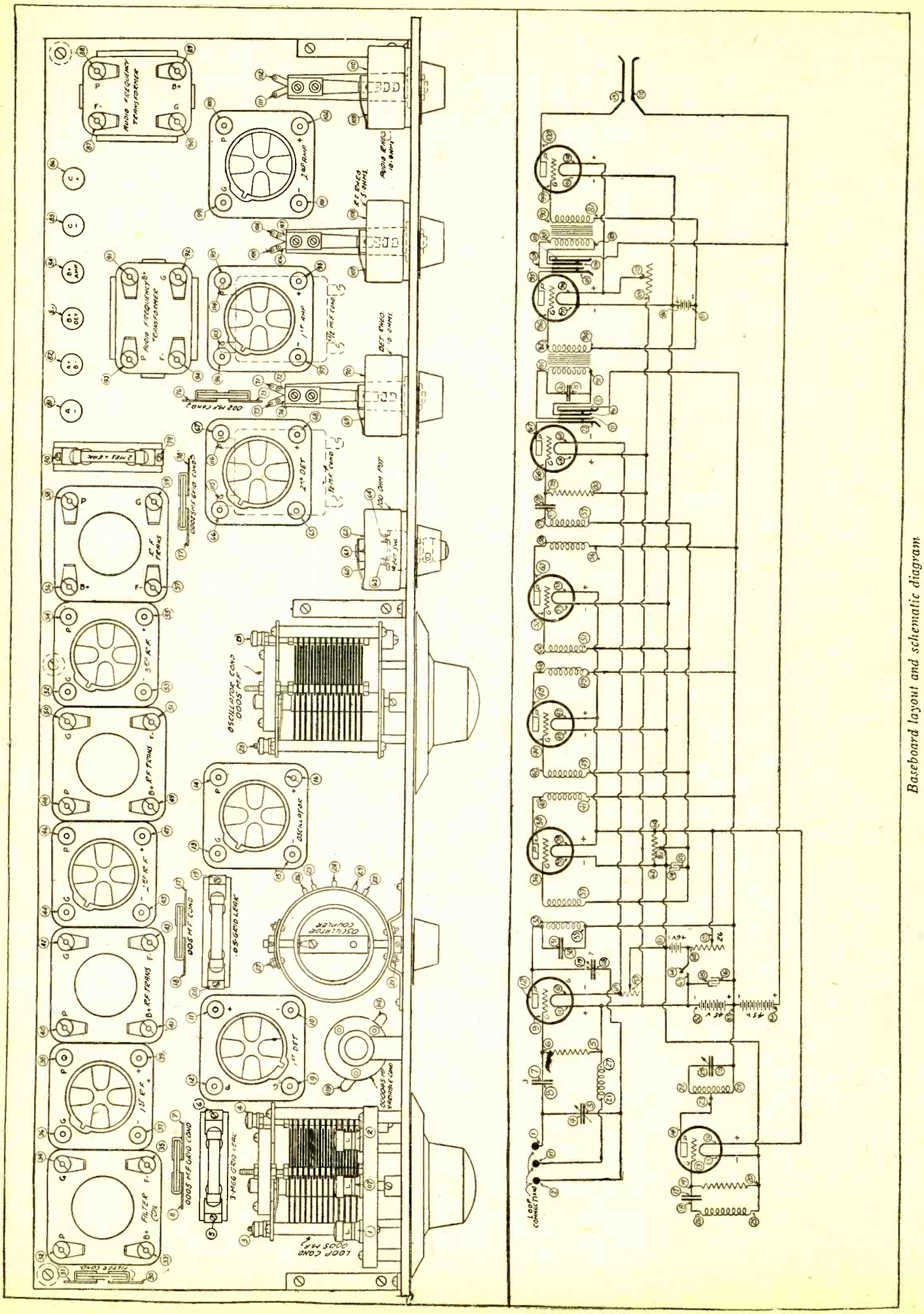
There are eight sockets required for this set. A high grade socket should be used, preferably of the non-metallic type, such as those made of Pyrex, Porcelain or all Bakelite. In fact, any good socket may be used, but it is highly desirable that a socket, either spring-cushioned or with an under mounting of sponge rubber, be chosen to avoid the microphonic action of the tubes from becoming audible.

Grid Leaks and Fixed Condensers

It will be noted that the grid condensers of the first and second detectors are in the usual position, and that the grid leaks are connected from the grids to the positive ends of the filament.

With the grid leaks connected in this manner, it makes no difference to which side of the filament the grid return is connected, since there is no direct current in the grid return, owing to the presence of the grid condenser.

In the oscillator circuit, there are also a grid leak and grid oscillator. This is essential for satisfactory operation of the



Baseboard layout and schematic diagram

oscillator over the entire range. With the grid leak and condenser, a large amount of energy is lost and the grid circuit when the oscillator is in operation, since for a part of the time during each cycle the grid is quite positive.

A UV201A tube will operate best as an oscillator with a grid leak of about 30,000 ohms, although this value is not critical. A grid leak of 50,000 ohms or .05 meg-ohms will work very satisfactorily.

The grid oscillator condenser only acts as a by-pass for the alternating current and need only be large enough to serve this purpose. For the oscillator in question, a value of about .005 mfd. will be good, although a .004 mfd. or a .006 mfd. will do as well.

It is important, particularly in the filter transformer, that fixed condensers which are of the capacity marked on them be used. These condensers should be of the mica type with the exception of the large by-pass condensers, which may be of waxed paper and tin foil construction. All condensers must be sufficiently well constructed to withstand a high plate voltage.

On the Filter Transformer it is suggested that the purchaser ask to have a .001 mfd. condenser tested on a capacity meter to insure its being the correct capacity. The capacities used are as follows:

1 Oscillator tube grid condenser	.005	mfd.
1 First detector tube grid condenser	.0005	"
1 Filter tuning condenser	.001	"
1 Second detector tube grid condenser	.0005	"
1 Phone by-pass condenser	.001	"
2 "A" and "B" battery by-pass condensers	1.	"

Audio Transformers

Any good Audio Transformers may be used. It will be found that one having as low a distributed capacity as possible will give the clearest tone, and at the same time largest volume per stage. A six to one ratio is recommended for the first stage, provided one having a low capacity effect is used. A three to one ratio should be used on the second stage.

Jacks and Switches

It is recommended that high grade jacks be used, as it is not advisable to use a jack which would show leakage across its terminals. A switch to break the "A" battery circuit should be used. The potentiometer is directly across the "A" battery, and although the consumption of current is small, it is there nevertheless, unless the "A" battery circuit is broken.

Batteries

Any good "B" batteries may be used on this set. There are 90 volts used in all—45 on the radio frequency and detector tubes and 90 on the audio amplifier tubes.

Although the first cost is greater, storage "B" Batteries are recommended for any set of this character, as in the long run they are by far the cheaper, as the life of dry "B" Batteries on a set of this character is not high, due to the current consumption, which is normally from 25 to 30 miliamps.

Any good 6-volt 100 amp. hour storage battery or larger is recommended for the filament current, using C301A or similar tubes.

Dials

To obtain the best results with the Super-Heterodyne, Vernier Dials are a necessity.

Wire and Solder

Small tinned copper wire or insulated wire is the very best material to use in the construction of this set. Wire smaller than No. 14 is not recommended for use in the filament circuit, but smaller wire may be used elsewhere in the set.

Rosin core solder should be used, or plain solder with a mixture of rosin and alcohol as a flux. Never use paste or acid core solder, as this has a tendency to create trouble later on.

Wiring

It is rather needless to go into a long description as to how to wire this set.

A few general ideas, however, may be helpful.

The first thing to do is to fasten the instruments to the base panel and to the front panel. Do not, however, put these panels together. Wire all that can be done on the front panel, and then wire all that can be accomplished on the base panel.

When these are finished, attach the front panel to that of the base panel by brackets and finish the wiring from panel to base. Make all the joints rigid enough so that it is possible to slide the set on your table by the joint which has just been made. This will save you the trouble of broken connections at some later date.

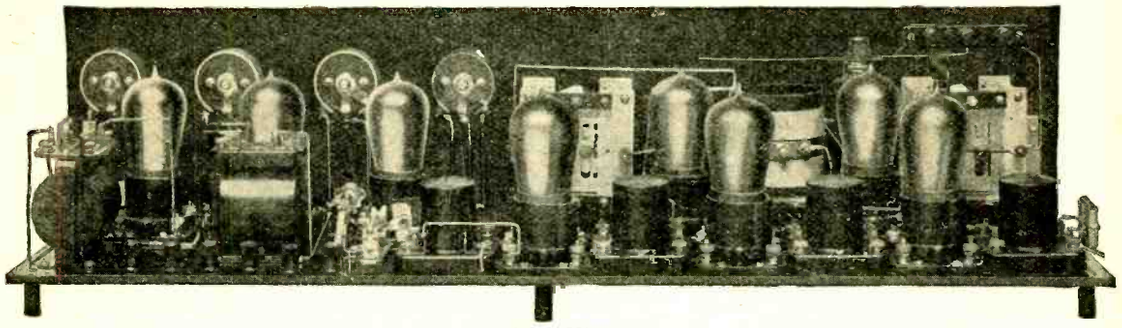
The best way to proceed is to do all of the filament wiring first. Then follow with the wiring of the"B" battery connections; this, in turn, may be followed with wiring of the loop tuning circuit and the oscillator circuit.

Testing and Preparing for Operation

The first thing to do is to be sure that the wiring is correct so that the tubes will not be burned out; connect your "A" battery to the "A" battery binding posts, taking one tube and inserting it in each successive socket with the filament switch on and rheostat controlling the particular tube socket which you have the tube in, about half way on. If the tube lights in each place controlled by the rheostat corresponding to the socket in which the tube is inserted, you may be reasonably certain that the filament wiring is correct.

Then connect the "A" battery to the detector "B" battery terminals, taking one tube and inserting it in each socket as before. If the tube does not light, this wiring is correct. Do the same thing with the "A" battery connected to the amplifying "B" terminals.

Next connect the "B" battery to the "B" battery binding posts and insert the telephone plug in the detector jack. This should give you a click, showing that the "B" battery circuit is correct. Now insert one tube in each socket successively with the filament current on, and if nothing happens, the "B" battery connections are not shorted with that of the "A" battery. Now put all tubes in their respective sockets and connect the three tap loop to the three binding posts. The center tap of the loop must by all means be connected to the center binding post.



Rear View

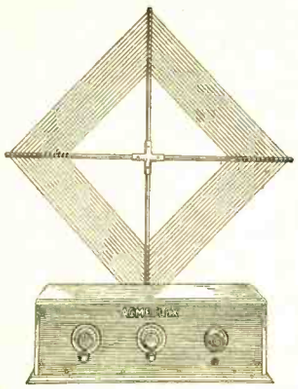
Turn on the detector tubes to approximately normal brilliancy, which will be about three-quarters of the rheostat. Follow this by turning on the intermediate frequency amplifiers and the oscillator by means of the rheostat, which controls them, to their normal brilliancy. Be sure that the small variable condenser is at its minimum capacity. When listening to a low wave-length station, 1,000 or more miles away, move this condenser up to the point where the greatest signal strength is obtained without distortion. In some cases it may be possible to throw the first detector tube into oscillation by means of this small condenser, and, of course, it would be set just beneath this point. Now that this condenser is set, it will not have to be varied.

On a station of at least 1,000 miles away, make the adjustment of the oscillator rotor to the minimum coupling position that it is possible to attain without decreasing signal strength. This may be accompanied by a small change in the oscillator condenser dial. Now that this adjustment is fixed, it need not be changed, except when a new oscillator tube may be inserted in the oscillator tube.

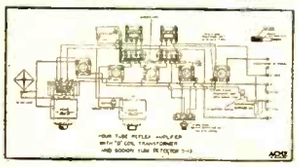
You can save about $60.00 on your radio if you will put a Model "S" Acmeflex Kitset together

Like earning $60.00 cash for a few hours' fun

The wonderful new Model "S" Acmeflex Kitset would cost you if assembled complete in our factory, $150.00. But it costs you only $80.00 (plus a small cost for a cabinet) if you put it together yourself. You can easily do it. We give complete directions. You save about $60.00.

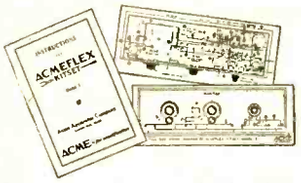


A set anyone can put together



Wiring diagram new Model "S" Acmeflex Kitset

The radio fan will especially notice the use in the new Model "S" of the D-Coil radio frequency tuning unit and the vacuum tube detector, which together wonderfully improve distance, reception, and selectivity.



Directions given so simply that anyone can follow them

Above are illustrated the circular of printed instructions and the life-size diagrams of the wiring, which are packed with each Model "S" Kitset. Step by step the making of the set is described in clear, simple language—just simple operations which anyone can easily follow.

Only two tools required — a screwdriver and pliers—and they are included in the Kit.

Enthusiastic praise from Model "S" users

From New York City:

"Well, I believe we had every jerkwater station in the U. S. Stations I never heard of before. At 11:45 P. M. I pulled in KFI (Los Angeles, Calif.) on the loudspeaker. At 12:15 A. M. KGO (Oakland, Calif.). I went back and picked up KFI three times. My home is located in what is considered one of the worst sections for radio. The skyline of New York is directly opposite me. I am on the harbor, a mile from the Navy Yard, and have three bridges with electric trains to bother me, but with it all I got the coast."

THE perfection by Acme engineers of the new model "S" Acmeflex Kitset not only makes it possible for you to get a $150 worth of radio for only $80 (plus a cabinet), but it also places in your home the famous Acme 4-tube Reflex (trade mark) now wonderfully improved through the combined use of a D-Coil radio frequency tuning unit and a Sodion S-13 Detector Tube. You get greater distance, greater selectivity and better reception. We could make it for less than $80, but it would not give results.

Contents of Kitset is complete

ALL the parts necessary for making the complete set are included in the Kitset. Even the loop is included. There is no antenna to erect. Each part is packed carefully in its own carton and not thrown in a jumbled heap. Each part is fresh, bright, new and well made. Screws, nuts and bolts are in a box of their own. Everything is included; nothing forgotten. The only accessories to get are the tubes, batteries, loud speaker and cabinet. We have put everything in the kit but the fun.

No technical knowledge or workshop necessary

You do not have to be a radio engineer in order to put this set together. Anybody can do it. Many have done it easily in three hours—had the set complete and working all in one evening. Only two tools are needed, a screwdriver and a pair of special Acme pliers and they are included in the kit. Good tools which you can use afterwards for other things. The panel is all drilled for you, and no soldering is necessary. If you do not want to assemble the set yourself, there are plenty of amateurs and dealers glad to do it for you at a nominal charge, still saving you a lot of money.

Note these features of Model "S" Acmeflex Kitset

- Complete directions given for putting set together.
- No antenna to erect.
- No technical knowledge of workshop required.
- Only two tools and they are in the Kit.
- No soldering to do.
- Only one tuning dial.
- Excellent reproduction.
- Greater distance, sensitivity and selectivity.
- Non-radiating — won't bother your neighbor.
- Saves you about $60.00.

Complete printed directions and diagrams

WITH each Kitset are included complete printed directions, telling you just how to put the set together, step by step; just simple operations that anyone can easily follow and have a good time doing it. In addition to these printed directoins are two life-size printed diagrams, one giving the wiring diagram for the set both from the baseboard view and the panel view, and the other showing, in actual size, exactly how every wire in the set is bent and connected.

More, tube for tube than any other set

THE finished Model "S" Acmeflex Kitset, a Reflex (trade mark) set, gives two stages of radio frequency amplification, two stages of audio frequency amplification plus a D-Coil radio frequency tuning unit and detector, with only five tubes.

The new Model "S" Acmeflex Kitset will pull in more stations, louder and clearer, on a loop and loud speaker, than any other set using the same number of tubes (five), and more than many sets using from six to eight tubes. It is easy to tune. There is only one tuning dial.

Everything on loudspeaker

The selectivity, range and volume of this set make it remarkable for loud, clear reception of stations near and far. The pleasure and the joy of it can be yours at a price only a little more than half what it would cost you to buy the set complete. Anyone can now sit down and put together a set that will perform on a plane with the highest-priced factory-made receivers.

Send coupon now and start putting this wonderful set together

Just tear out the coupon below; write your name and address on it plainly, mail it to us, and we will send you by return mail a special circular completely describing this set in every detail. Send coupon today.

ACME APPARATUS COMPANY

Transformer and Radio Engineers and Manufacturers

Dept. O1 **Cambridge, Mass.**

ACME ~for amplification

Send this coupon

ACME APPARATUS CO.,
Dept. O1, Cambridge, Mass.

Send complete information about the new Model "S" Acmeflex Kitset to:

Name.....

Street.....

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

A Description of the New Five Tube "Reflex" Set Using the "D' Coil Transformer and Sodion Tube Detector

By G. E. M. BERTRAM

WHEN anyone contemplates getting a radio set there are two questions which always present themselves; first, how much can I afford to invest, and, second, how can I get the best set that my money will buy? If he turns for information to the advertisements in newspapers and some magazines he will immediately see that nothing is impossible. That almost every set will give "coast to coast" reception at any time and do twice as much as every other set, and if he looks at circuit diagrams he will meet a maze of supers and dynes which may or may not mean anything to him.

But in spite of the thousands of circuits which have been printed and exploited, there are only six basic radio reception systems of which all the circuits are merely adaptations. These systems are as follows:

1. Crystal Detector.
2. Vacuum Tube Detector.
3. Regeneration.
4. Heterodyne.
5. Radio Frequency Amplification.
6. Audio Frequency Amplification.

The radio frequency amplification may be attained by means of tuned R. F. or fixed transformer R. F. Until recently, however, tuned R. F. amplification has been objectionable on account of multiplicity of adjustments and the necessity of using some means of stabilizing or preventing oscillation, most of which are not efficient over the whole broadcast range and accomplish the results with considerable loss of energy.

Every radio receiving set uses either one of these systems or a combination of two or more and until some new fundamentals are discovered the only improvement will be in styles and efficiency of the apparatus and circuits.

The most efficient circuit in use at present and one which is rapidly gaining popularity among set builders, because of the excellent results it produces, is "Reflex" (trade mark) and particularly Reflex (trade mark) with tuned radio frequency amplification.

What Reflex Is and How It Works

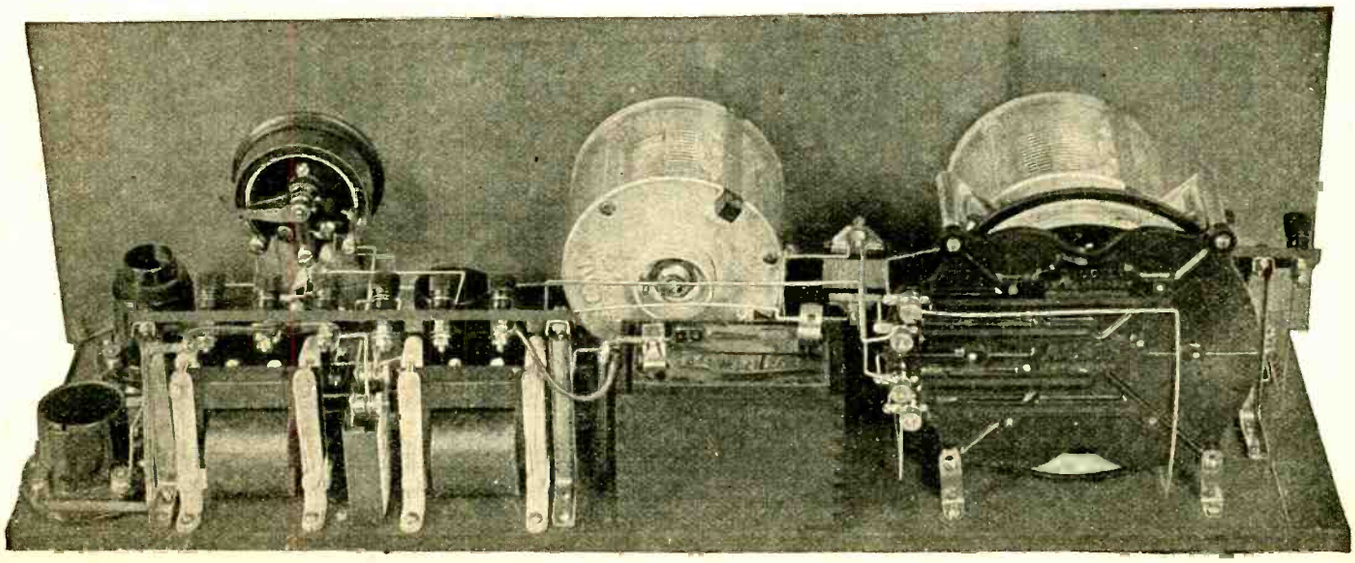
A Reflex circuit is essentially one in which one or more of the vacuum tubes are used for both radio and audio frequency amplification, the advantage being in reducing the amount of apparatus used and at the same time getting better results than if more apparatus were used. Better because with the same amount of amplification the smaller amount of apparatus causes lower losses and less distortion, also lower initial and operating costs and fewer controls, some of the tubes doing double duty.

The fact that a loop can be used with this "Reflex" circuit is a measure of its sensitivity. The loop is sufficient to pick up stations a long distance away directly on a loud speaker without the bother of using head phones for tuning in. Only a really sensitive set can use a loop effectively, but those that do have a big advantage, as interference is reduced to a minimum and selectivity is obtained by the low losses in the loop and the ability to turn it in the direction of the station for best results.

The Reflex set shown in the accompanying pictures is designed especially to work with an indoor loop antenna, although in locations where interference from radiating receivers, etc., is not a factor an outdoor aerial may be coupled to the loop in order to increase the volume on very distant stations.

The loop connects at the left of the set as shown, and with the condenser at that side forms the complete tuning circuit. By turning this condenser knob this circuit is brought to resonance for the particular wavelength desired.

Mounted on the same shaft with this condenser and directly in back of it is a variable radio frequency transformer. This is a piece of apparatus quite new in design and very efficient in operation. It consists of a flat plate rotor and stator, each of which carry two low loss coils shaped like the letter "D." These four coils are connected in parallel so that when the windings of the rotor and stator coils, which are opposite each other, are in the same direction, the inductance of the circuit is maximum, and when the shaft is turned through 180 degrees the windings of the rotor and stator coils opposite each other are in opposite directions the inductance of the circuit is minimum. The constants of the coils being properly arranged, the variation of inductance from minimum to maximum corresponds to a difference in wavelength of 200 to 560 meters, which more than covers the broadcast range. By mounting the rotor of this transformer on the shaft of the tuning condenser all of the tuning for the set is easily



Rear View of Receiver

there are no oscillators or noisy detector tubes, only clear music or speech will be heard in the speaker.

Selectivity, which is the ability to cut out one station and bring in another, is accomplished to a very high degree by the use of a directional loop antenna, and by tuning at radio frequency.

The tuned radio frequency amplification and the controllable sensitivity of the sodion tube are also chiefly responsible for the remarkable distance getting qualities of this set, and reliable reception over a range of 1,000 to 2,000 miles under average conditions is not at all uncommon.

Easy to Construct

It is all very well to read about or have someone tell you how simple it is to build a real good radio set, but did you ever try it? If you have, you know that it is usually the little construction details that cause so much trouble. Placing the parts correctly, getting neat holes drilled in the right places, using the proper screws, nuts and bolts and above all running wires so as to eliminate coupling between leads in the set.

In the set described in this article all of the engineering has been done in the most satisfactory manner. Every little detail is taken care of. It is marketed in the form of a kit, which is 100 per cent complete. The parts included in the kit are as follows and may be purchased separately if so desired:

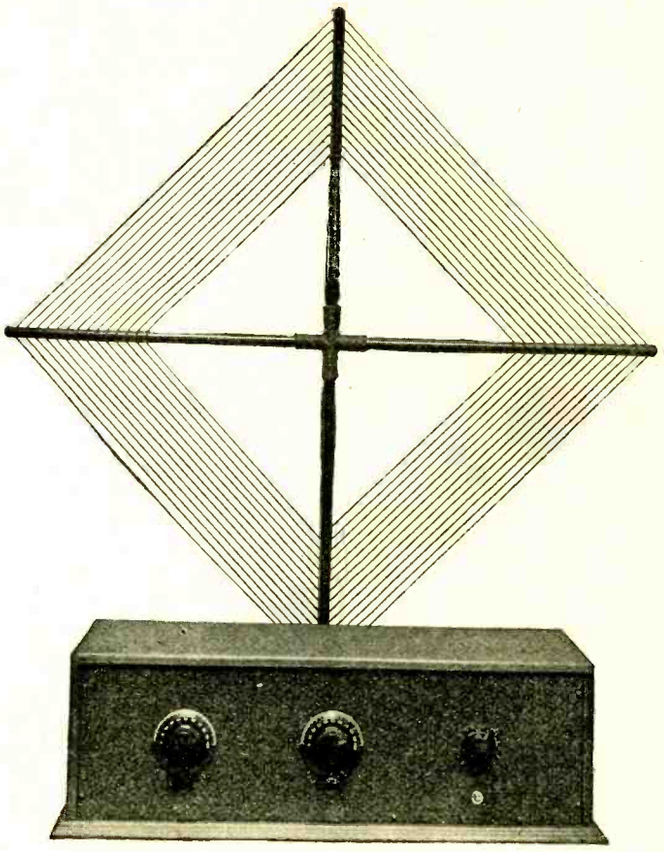
List of Parts

2 Audio frequency transformers, 4¼ to 1 ratio.
1 Radio frequency transformer for second stage.
1 Radio frequency transformer for third stage.
1 .0005 mf. Var. condenser with screws.
1 Pot-rheo, 6 ohm rheo, 100 ohm potentiometer.
5 Sockets (with screws).
1 "D" coil unit complete with screws.
1 .0004 mf. fixed condenser.
1 By-pass condenser, 1 mf.
8 Engraved binding posts.
2 Three-inch condenser knobs and dials.
1 Drilled front panel.
1 Drilled baseboard.
1 Pair pliers.
1 Screw driver.
1 Set of prints.
1 Instruction book.
1 Fifteen-inch rule.
20 Pieces No. 14 tinned wire 24-inch long.
1 Box with all necessary screws containing:
- 4 No. 6-32 binding post tops.
- 4 No. 6-32 binding post bottoms.
- 4 6 32 R.H. Mach. screws, 9/16-inch long.
- 1 ohm fixed resistance on red fibre.
- 1 5 ohm fixed resistance on black fibre.
- 1 Package soldering lugs.
- 1 Filament switch.
- 1 Insulating bushing for pot-rheo.
- 1 Pair storage battery clips.
- 30 No. 6 R. H. wood screws, ½-inch long.
- 6 6-32 R. H. machine screws, ½-inch long.
- 30 6-32 Hex. nuts.
- 30 ⅜-inch brass washers.
- 6 6-32 H. R. machine screws, ⅜-inch long.
- 2 ⅝-inch F. H. No. 6 wood screws.
- 1 Forked connector.

3 Terminal panel brackets.
2 Terminal panels.
1 D battery box.
2 Shielded leads.
1 Sodion tube adapter.

For Loop

4 Arms.
1 Center metal piece.
1 Base metal piece.
2 Base wood legs.
2 Plain binding posts.
2 ⅜-inch brass washers for 6-32 machine screws.
1 10 32 round head machine screws, ½-inch long.
1 ¾-inch brass washer for 10-32 machine screws.
100 Ft. Litzendraht loop wire.

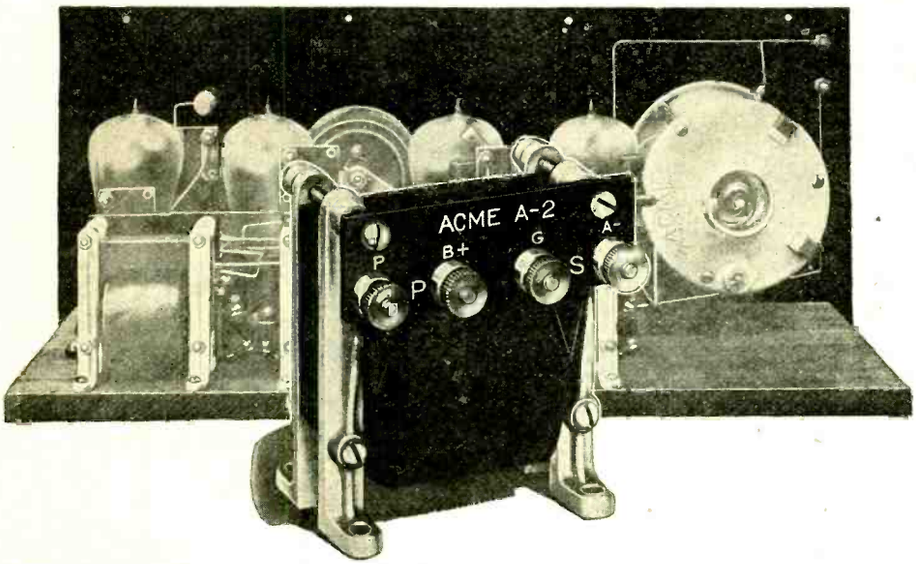


Front View of Receiver

In describing receivers for Radio fans to buy or build, the editorial staff of the Citizens Radio Call Book has been untiring in their efforts to give you a complete description of the best that money can buy, consistent with results.

We know that you will find the circuit section an accurate guide in building your favorite hookup. Send your inquiries direct to the manufacturer.

You can give your set this big advantage—



Amplification without Distortion

How to make sure of getting everything loud and clear

The Amplifying Transformer is the Magnifying Glass of Radio

YOU can make your set so that it will reproduce clearly and distinctly without distortion. The real pleasure in radio comes when you can understand and enjoy what you hear—voices that are natural—music that is clear in tone. In order to hear clearly and distinctly you want to be sure that you are using amplifying transformers that amplify the sound without distorting it.

Give your set this big advantage—Amplification without Distortion. Whether you have a neutrodyne, superheterodyne, regenerative or reflex the addition of the Acme A-2 Audio Amplifying Transformer will make it better.

The Acme A-2 has become famous among radio owners for increasing the volume of sound without distorting. It has improved thousands of radio sets. If you are bothered by distortion, try an Acme A-2 and note the difference.

Each transformer is tested and carries a guarantee tag. If you want Amplification without Distortion use Acme Transformers in the set you build and insist on them in the set you buy. (That's one of the big reasons why the Acmeflex Kit-set gives such good results—it uses Acme Transformers.) Send for our 40-page booklet which explains how to get the best results by proper amplification and also contains a number of valuable wiring diagrams. It will help you build a set. Mail the coupon with 10 cents.

ACME APPARATUS COMPANY, Dept. O2, Cambridge, Mass.

Transformer and Radio Engineers and Manufacturers

Have the fun of making your own radio set

ACME

~ for amplification

ACME APPARATUS COMPANY,
Dept. 02, Cambridge, Mass.

Gentlemen:

I am enclosing 10 cents (U. S. stamps or coin) for a copy of your book, "Amplification without Distortion."

Name .....

Street .....

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

ERLA SUPEREFLEX CIR-KITS

More Power, Tube for Tube—The Economical Way to Finest Radio

Circuits of matchless efficiency, plus apparatus equally advanced, plus ingenious facilities that make child's play of assembly—these stamp Erla CIR-KIT knock-down receivers the most far reaching contribution yet made to radio reception.

Founded upon the exclusive principle of Supereflex amplification that enables tubes to do triple duty as simultaneous amplifiers of received radio, reflexed radio and reflexed audio currents, each of these receivers provides, tube for tube, materially greater range and volume than any other types.

Tone quality, likewise, is notably superior, with a richness and exquisite purity of reproduction that has earned the acclaim of foremost musical authorities.

Ease of control and selectivity are similarly outstanding. But two major dials are used for tuning in even the five-tube types, with ability to separate cleanly stations only ten meters apart, and to bring them in always with the same dial setting.

Ranging from one to five tubes, in loop and antenna models, a type and size is provided to meet every requirement, from metropolitan apartment to isolated ranch. And each model is guaranteed to deliver highest attainable efficiency per number of tubes employed.

The one-tube circuit, for example, incorporating three stages, one radio, detector and one audio, operates a loud speaker at full volume on local stations, with headphone range from coast to coast, while the five-tube antenna model provides volume sufficient for the largest concert auditorium, when operated at full capacity.

For portable use, small apartments, or remote regions where charging facilities are not readily available, a special 199-tube loop circuit has been developed that in range and volume compares most favorably with conventional loop circuits employing amplifying tubes of larger size. In fact, through special transformers, the efficiency of the larger tubes is approached within 10% to 25%.

The relative ability of the various types, together with their salient characteristics, are catalogued as follows, enabling intelligent choice between them, according to the requirements of the user.

One-Tube Antenna—Three stages, one radio, detector and one audio. Operates loud speaker on local stations at full volume. Headphone range coast to coast.

Two-Tube Antenna—Two stages of radio amplification, detector and one audio. Loud speaker range under favorable conditions, 1,000 miles.

Three-Tube Antenna—Two stages radio, detector, and two audio. Coast to coast loud speaker range.

Four-Tube Antenna—Three-tube circuit with one stage of audio added. Volume on long distance stations exceeding five and six-tube conventional designs.

Five-Tube Antenna—Three-tube circuit with stage of push-pull amplification added. Tremendous volume, ample for concerts or outdoor gatherings.

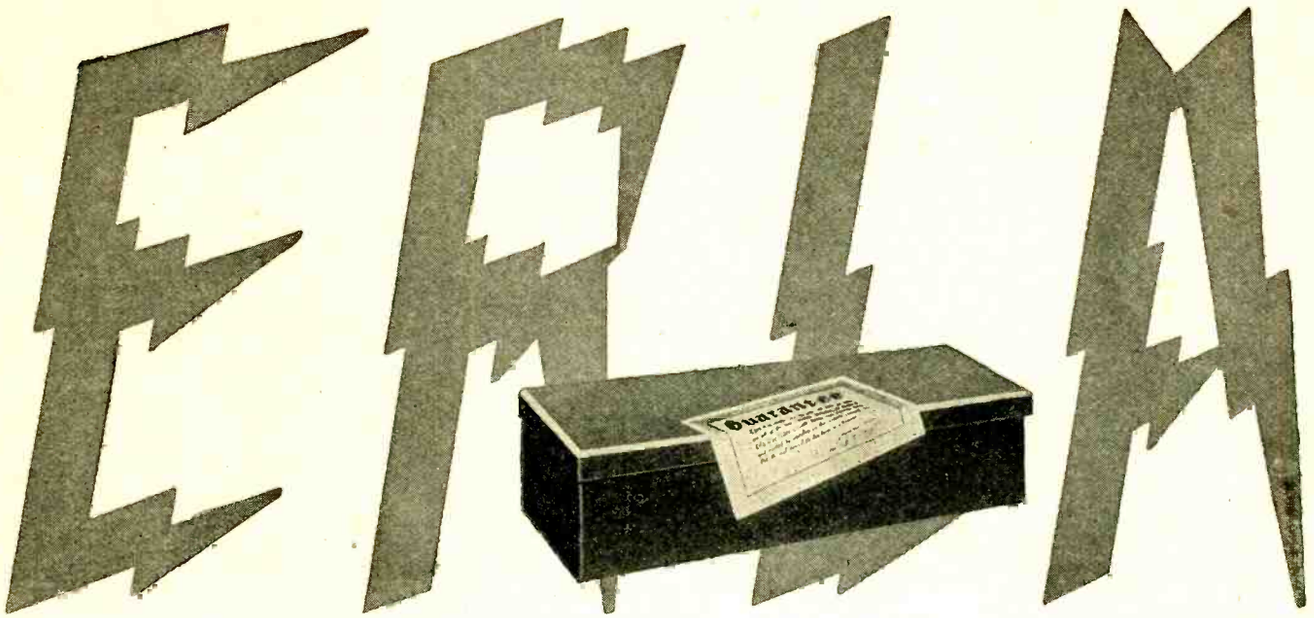
Five-Tube Loop 199—Three stages radio, detector and three audio, providing range and volume equal to three-tube antenna design using large tubes.

Construction of each of these CIR-KIT models is surrounded with every safeguard for success. Every needed part, to the last screw, nut and wire, is provided. Synchronizing radio and audio transformers, balanced crystals, tested capacity condensers—these and other units manufactured to Erla standards of highest efficiency insure maximum performance, while correct construction is made certain through a drilled and lettered panel, stenciled baseboard and full-size blue-prints giving the exact location of every unit and connection.

Even soldering, bugaboo of the beginner, is eliminated through Erla solderless connectors. The most inexperienced individual, therefore, can easily build Erla CIR-KIT receivers to professional standards with no tools other than a screwdriver and a pair of pliers, and in a few hours' time.

Erla Supereflex CIR-KIT is the quickest, easiest, surest way to most efficient radio reception, at minimum effort and cost.

ELECTRICAL RESEARCH LABORATORIES, Chicago



SUPEREFLEX *means* MORE POWER *per tube*

Erla Floor Console

Erla Table Console

Erla Table Cabinet

Erla Radio Instruments, in a complete series of styles, embody improvements which qualify radio as true musical art.

Erla Supereflex makes tubes do triple duty. One tube actually does the work of three that would be needed otherwise. Three tubes do the work of five, unquestionably! That is why simple, compact, inexpensive Erla Supereflex receivers equal or surpass the performance of costliest, temperamental multi-stage radio sets.

More power, tube for tube, is basic in Erla Supereflex. Nothing else can "make up for it." Greatest power in Erla Supereflex just simply means finest radio. And you can now afford it.

For you yourself can confidently build these matchless Erla circuits with Erla Supereflex *CIR-KIT*.

CIR-KIT is a complete assortment of Erla Scientific Precision Apparatus, especially created to make Supereflex possible. *CIR-KIT* provides clear, simple instructions for perfect assembly. Blueprints are full size. The panel is pre-drilled for you. The baseboard is marked to locate every unit accurately. The famous Erla Solderless Connectors do away with soldering entirely.

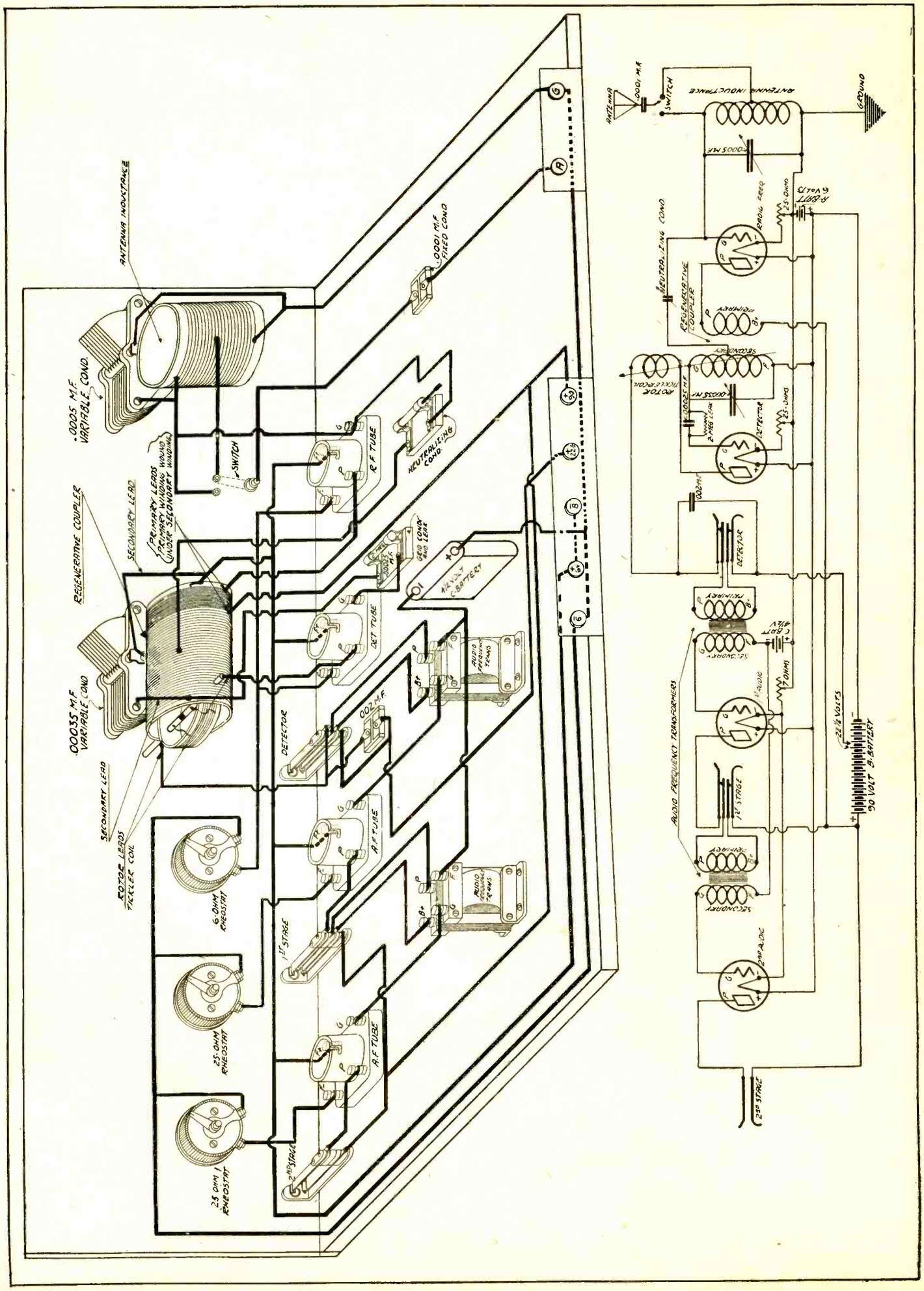
With screwdriver, pliers and *CIR-KIT* you are sure of a set that will make you proud, both for appearance and performance. The cost is very moderate. Yet the range, volume, selectivity AND TONE PURITY are rarely equaled at any price, because Supereflex does give you most power, tube for tube.

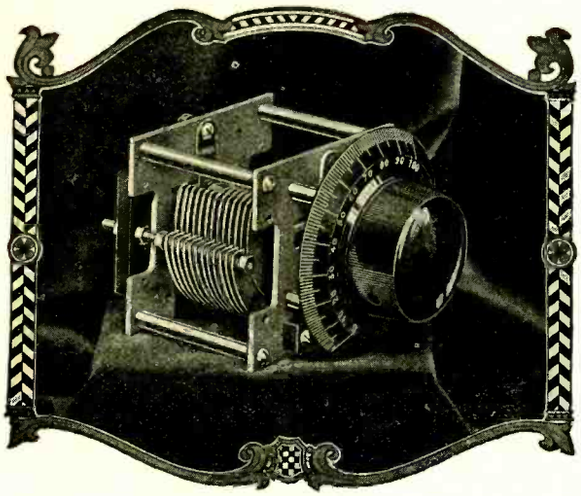
Electrical Research Laboratories
Department L, 2500 Cottage Grove Avenue, Chicago

CIR-KIT

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

BROWNING DRAKE RECEIVER





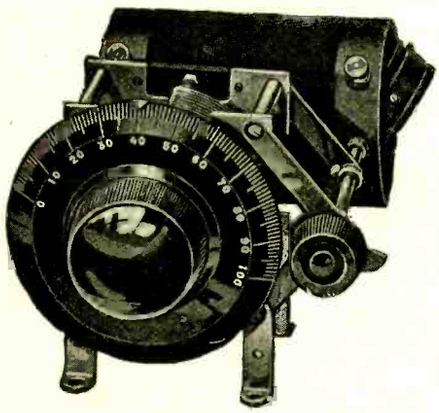
National Condensers

Make a wonderful difference in the home built set.

Tested and approved by all prominent Radio authorities.

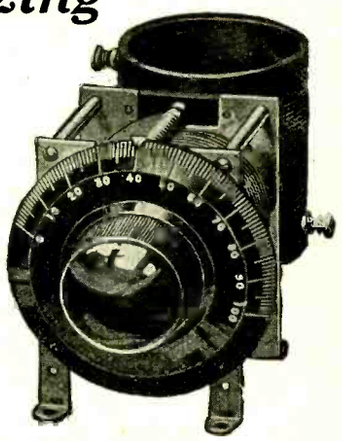
Capacity, Max., MF.....	.001	.0005	.00035	.00025
Price without dial	$6.00	$5.00	$4.75	$4.50
Complete with Velvet Vernier, 3⅜"	7.25	6.25	6.00	5.75
Bakelite Dial, 4".....	7.50	6.50	6.25	6.00

"—results are simply amazing"



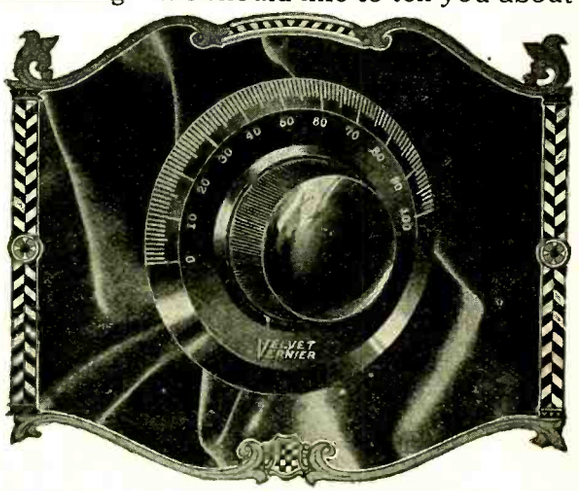
National Velvet Vernier Dials driving National Condensers upon which are mounted the newest National Radio Products.

Write for Bulletin 105RC



The National Ragenaformer and Antenna Inductance

The National Ragenaformer is a tuned radio frequency transformer of highest efficiency. When used with a Browning-Drake receiver, the results are amazing. We should like to tell you about this highly efficient radio device. It has won the enthusiastic approval of the radio editors of five Boston newspapers.



The NATIONAL VELVET VERNIER DIAL

A touch of velvet smoothness, no back lash and no lost motion after a test covering 1,000,000 revolutions.

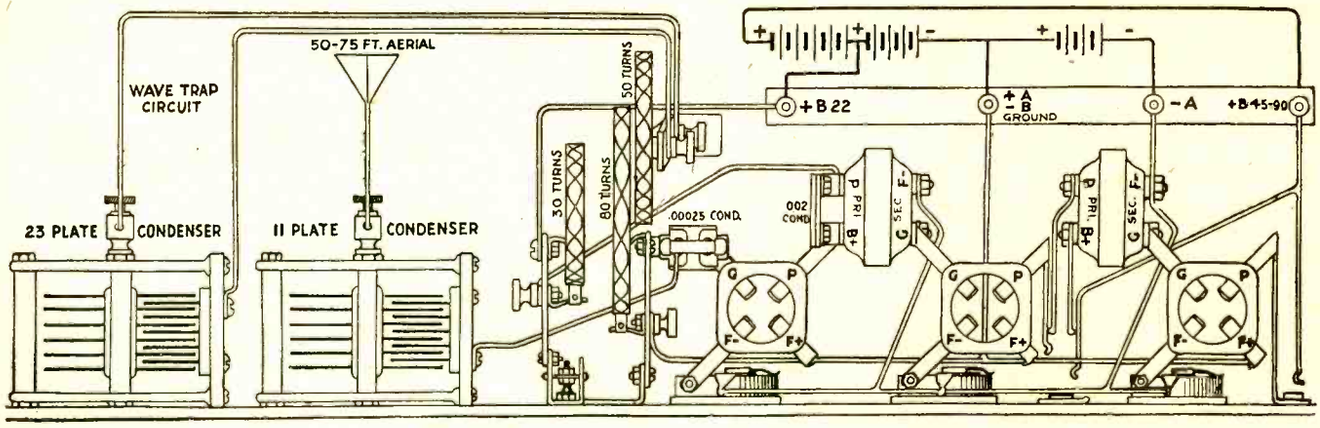
4" Bakelite.....$2.50
3⅜" Bakelite..... 2.25

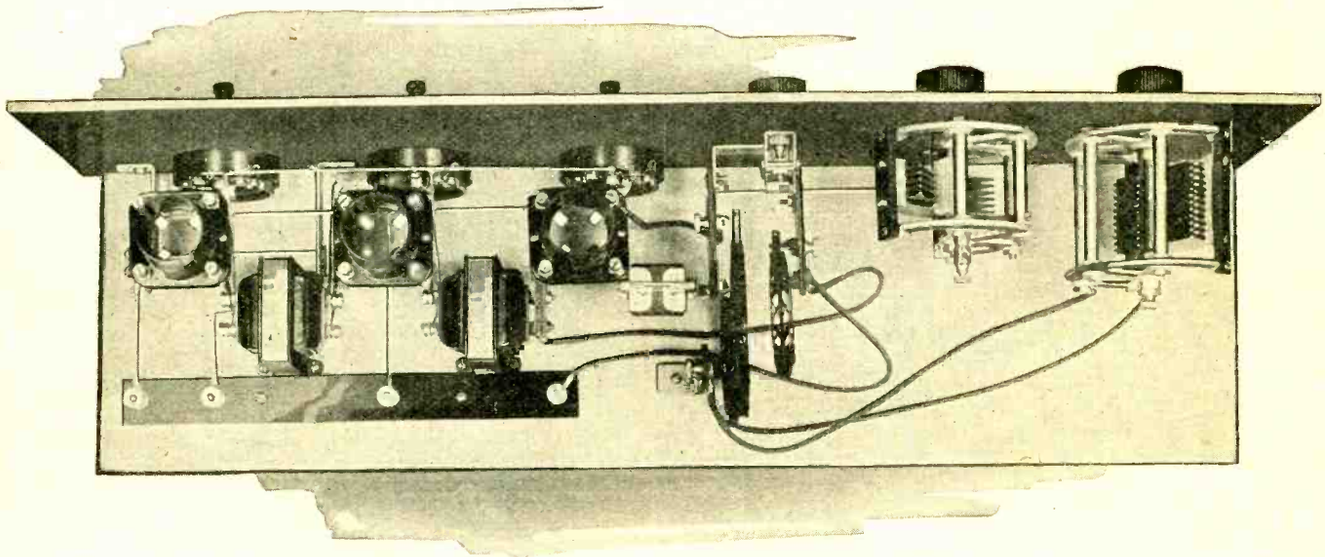
NATIONAL COMPANY, Inc.

110 Brookline Street, Cambridge, Mass.

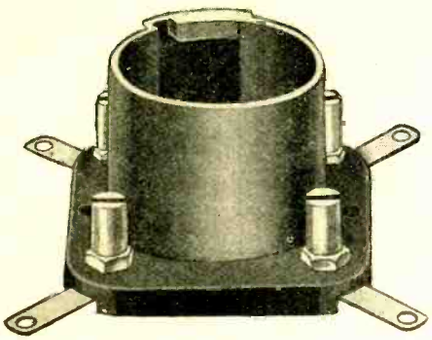
Engineers and Manufacturers. Established 1914

Flewelling Single Circuit Receiver Wiring Diagram

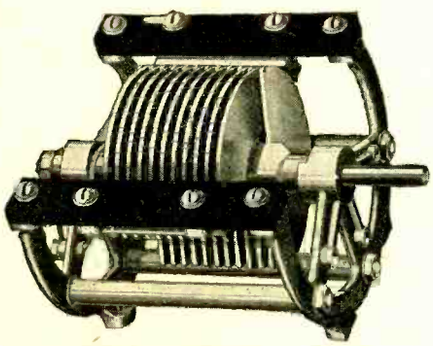




Top View of Receiver

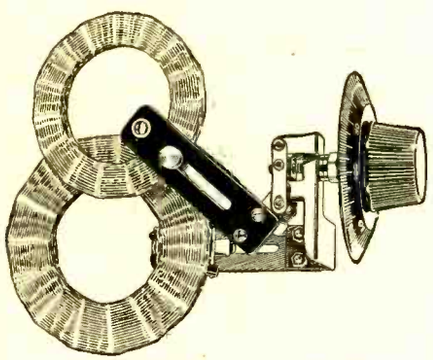


Standard Socket . . . **75c**
No. 199 Socket **75c**



.0005 mfd. Condenser . **$7.00**
.00025 mfd. Condenser . **6.00**
[Vernier Included]

Audio or Radio Uniformer . **$5.00**



Tuner Complete . **$7.25**
Coils Less Than 50 Turns . **1.00**
Coils 50 to 100 Turns . . **1.25**
Single Coil Mounts . . . **.75**

BUELL E. J. Flewelling

RADIO APPARATUS DE LUXE

The Flewelling Socket by a departure from the usual method of making contact, secures an extra firm contact on the brass of the tube terminals instead of the lead end. It locks tight with a sure contact grip and requires no downward pressure on tube.

Extra wide spacing of contacts make it a true "Low-Loss" socket. Extension terminals for direct connection insure greatest efficiency. It costs no more to have the best. Insist on Flewelling Sockets at your dealer's.

Flewelling Condenser is of mechanical superiority that can be appreciated at a glance. Its rugged construction assures long life. Its extra heavy 1-16 inch plates will not warp out of alignment. They are die cast using S. A. E. specification bearing metal. Extra large ball bearings insure free action of rotor plates. Bearing plates and "drag" on rotor are all adjustable independent of each other.

The condenser is the most important element in your set. In its selection you may save a few cents, but never without the sacrifice of the important features you desire. Buy a Flewelling Condenser and you know you have the best.

Flewelling Uniformers are designed to eliminate all unneccessary and detrimental wiring in set construction such as tuned radio-frequency, untuned radio-frequency loop sets—in fact any type of set from the simple one-tube to the various types of Super-Heterodyne. The advantage of wiring elimination is readily and most aptly appreciated in the latter type.

The Uniformer case is of polished hard rubber—a material of the lowest loss as a dielectric. It is recessed and terminals are so spaced that the Flewelling Socket assembles readily in unit construction with a true "factory made" appearance. A six-tube assembly measures but 19 inches in length and 3 1-2 inches in width. This enables you to construct a neat compact set in a phonograph cabinet or any small cabinet. Ask your dealer for Flewelling Uniformers.

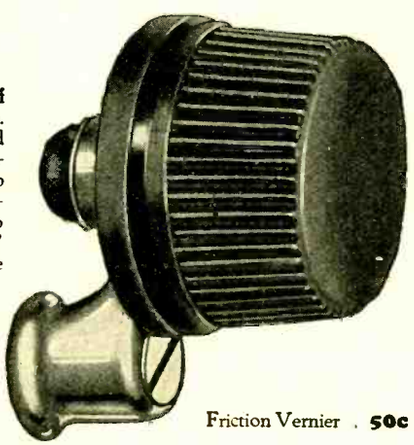
The Flewelling Type S Tuner is of basket weave design having exceptionally low distributed capacity. With 80 and 30 turn coils, as it is regularly supplied, when connected in series with a .0005 mfd Flewelling Condenser in a single circuit "hook-up" will cover a range of 220 to 550 meters with very sharp tuning. [This is without the use of taps and providing the aerial is of correct capacity.]

The Flewelling Type S Tuner with two stages of audio will bring distant stations up to loud speaker volume. Coils are interchangable, however a wide range can be covered without change. This tuner must be seen to be appreciated to the utmost. Ask your dealer to show it to you.

BUELL MANUFACTURING COMPANY

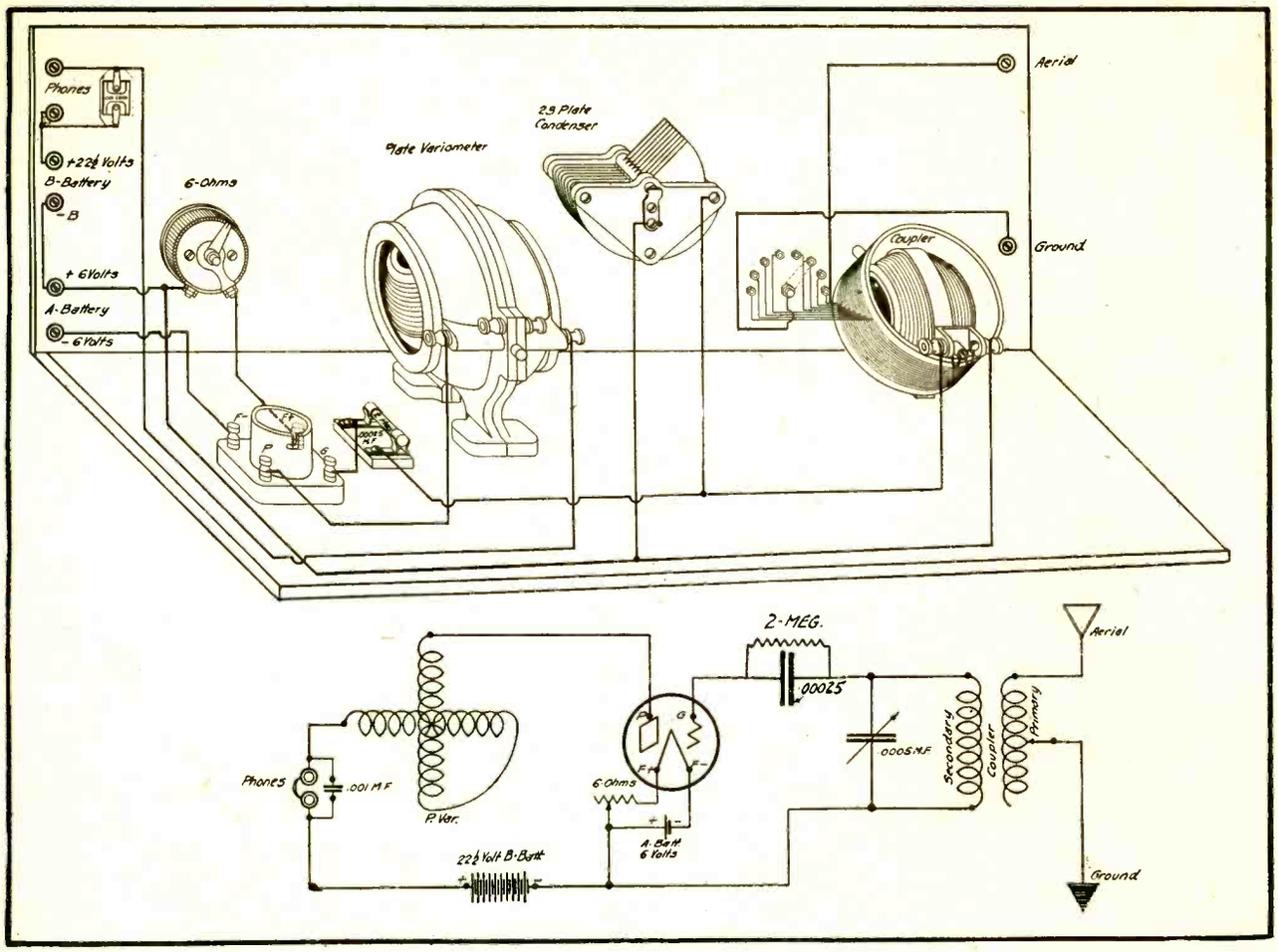
2975-77 Cottage Grove Avenue
CHICAGO

The Flewelling Vernier is of our own "heavy duty" type design. Gives a ratio of 20 to 1 when used on a 4 inch dial. It is highly recommended to those desiring fine, sharp tuning. The friction disc is of especially prepared gum rubber. The knob is of correct size to have a real "feel." Rugged construction throughout. See it at your dealer's.

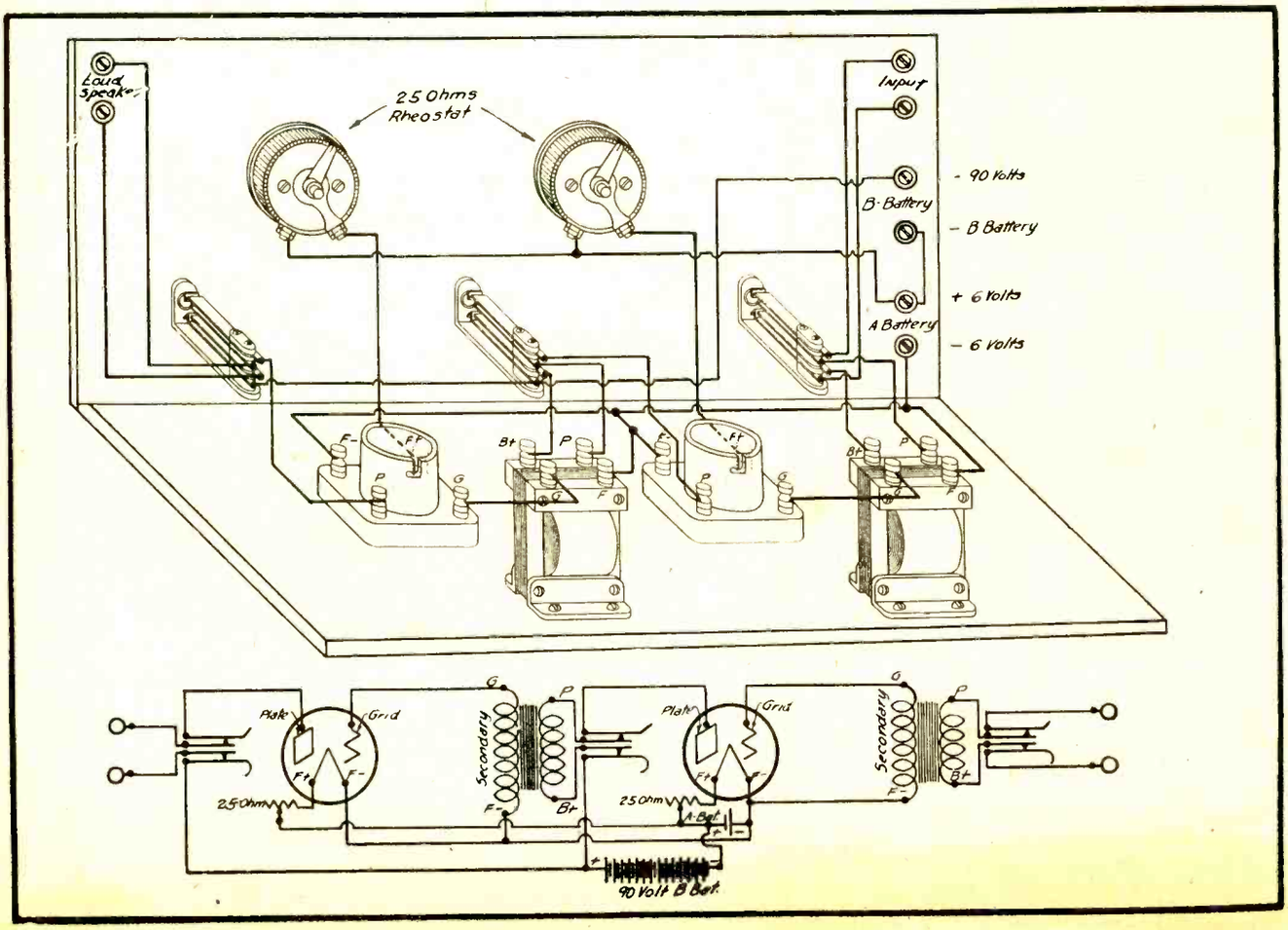


Friction Vernier . **50c**

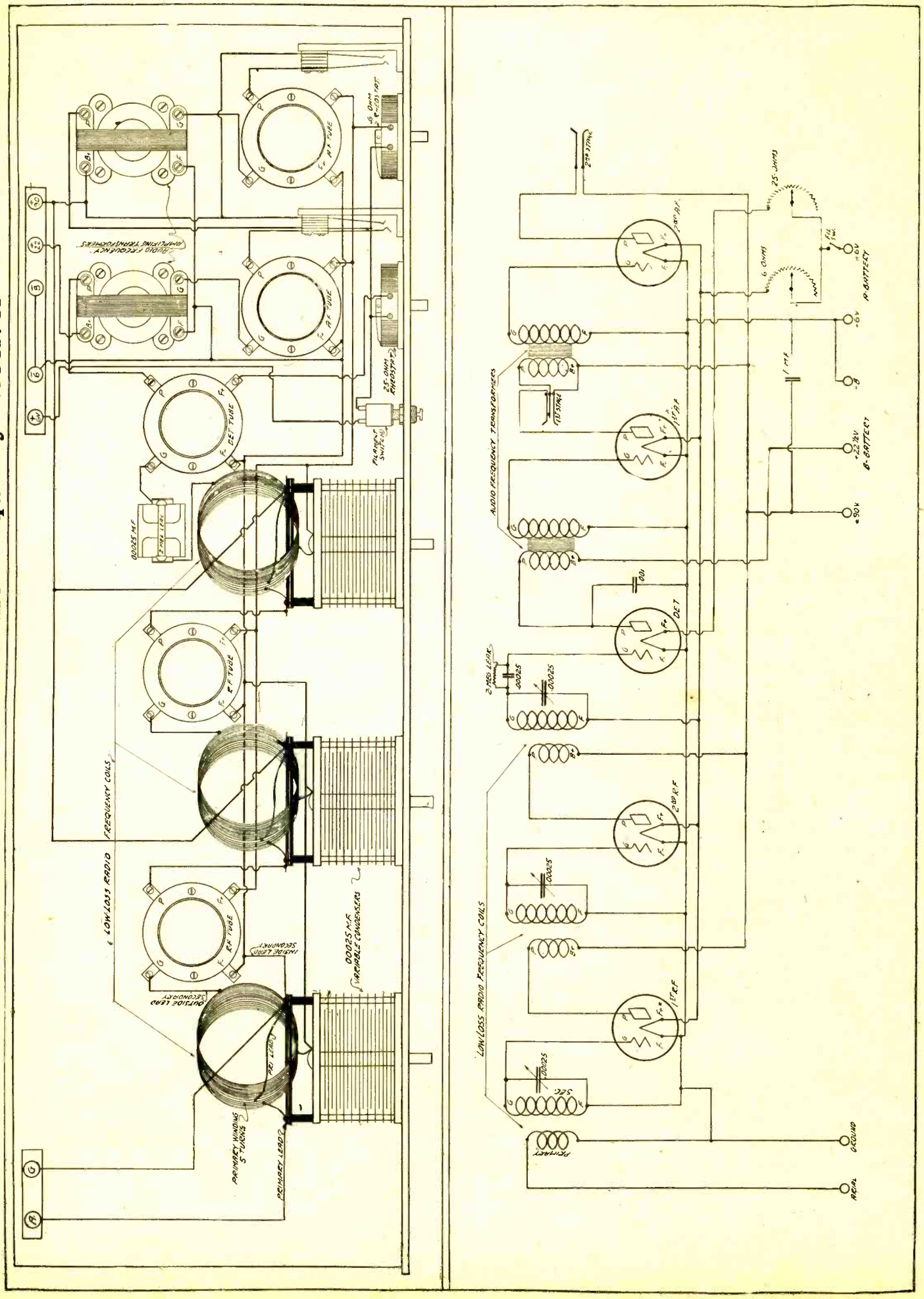
Tuned Plate Receiver

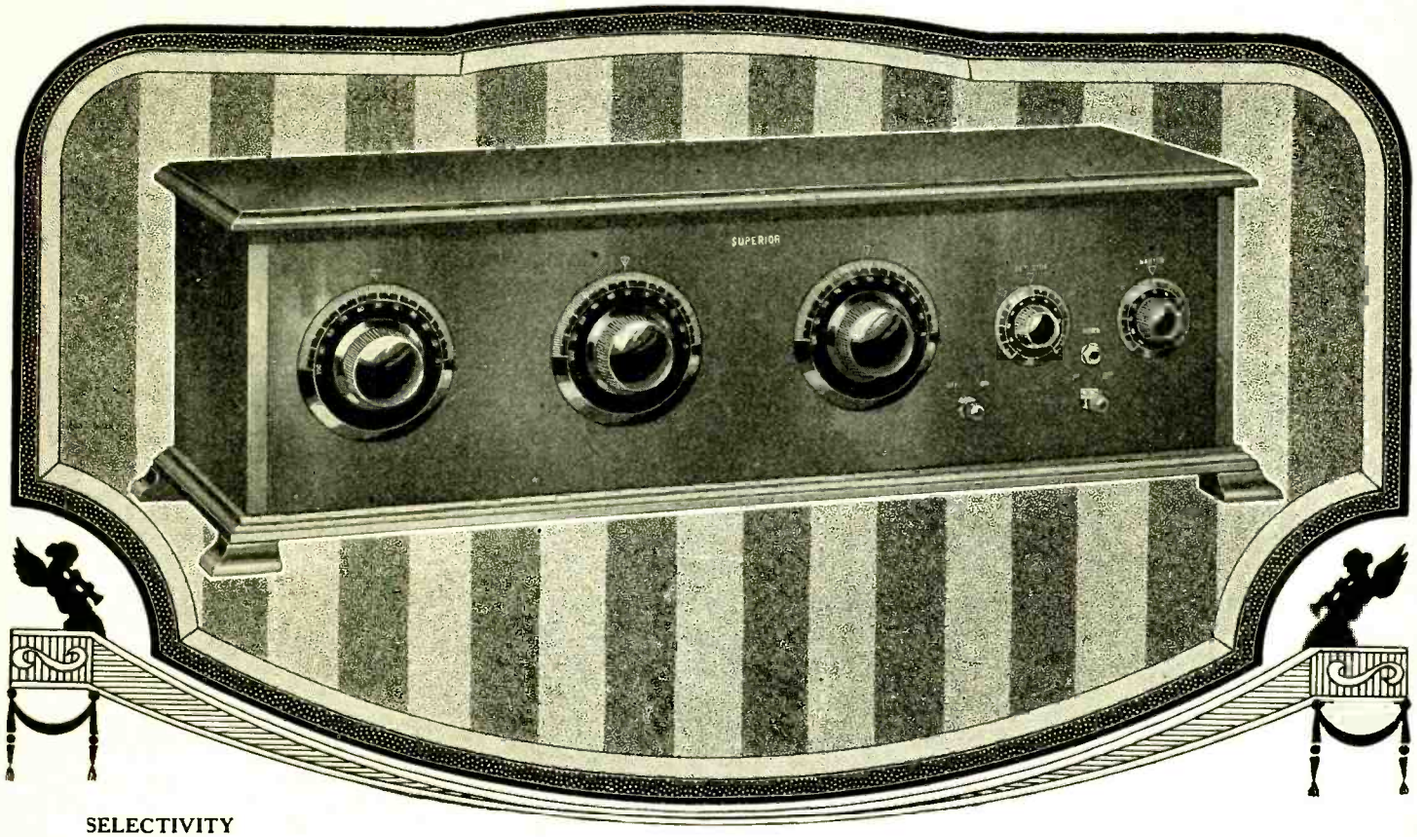


Two Step Audio Frequency Amplifier

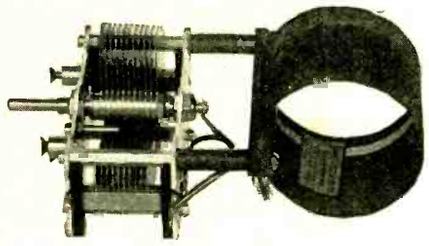


Self Neutralized Tuned Ra dio Frequency Receiver





SELECTIVITY
DISTANCE
CLARITY
VOLUME



The Secret of Superior's Success

Here is the exceptionally designed and constructed Low Loss Coil found only in the SUPERIOR. It has a very low degree of distributive capacity with a consequent high degree of inductance, obtained through the self-supporting method of mounting.

Your Assurance of Perfect Reception

In the "Superior" Receiver you will find only materials of the finest quality together with absolute precision of construction. It is an exceptional receiving set designed and built to give the utmost in radio entertainment.

As you get better acquainted with the "Superior," you will find in it finer tone qualities, more faithful reproduction, greater range and more selectivity than you ever dreamed was possible on any five-tube set. It is the result of years of careful study and experiment and comes to you, a product of unusually fine quality. Unusually attractive in design, easy to tune, simple to operate.

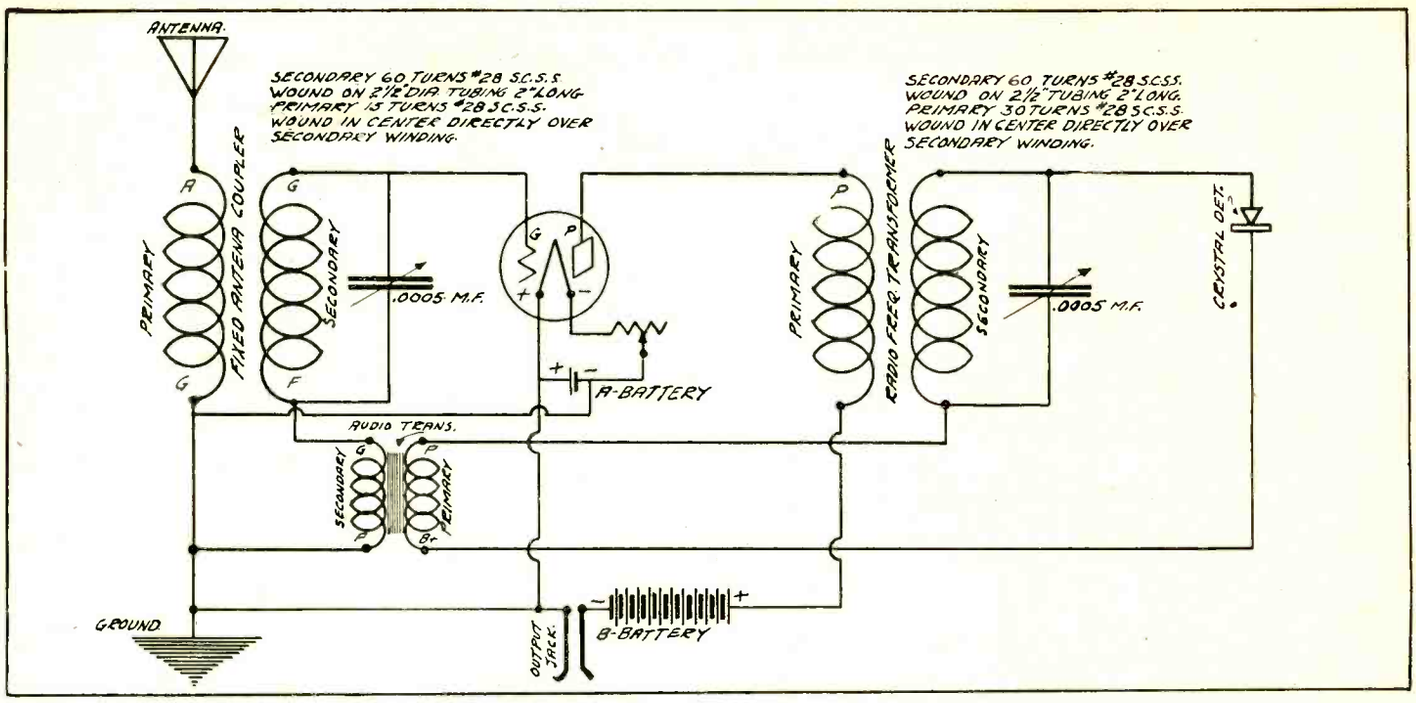
Have your dealer demonstrate the SUPERIOR to you today. You will readily appreciate the fine qualities of this set. If your dealer does not handle the SUPERIOR, write us direct for complete data.

UNITED ELECTRIC CO. of CHICAGO

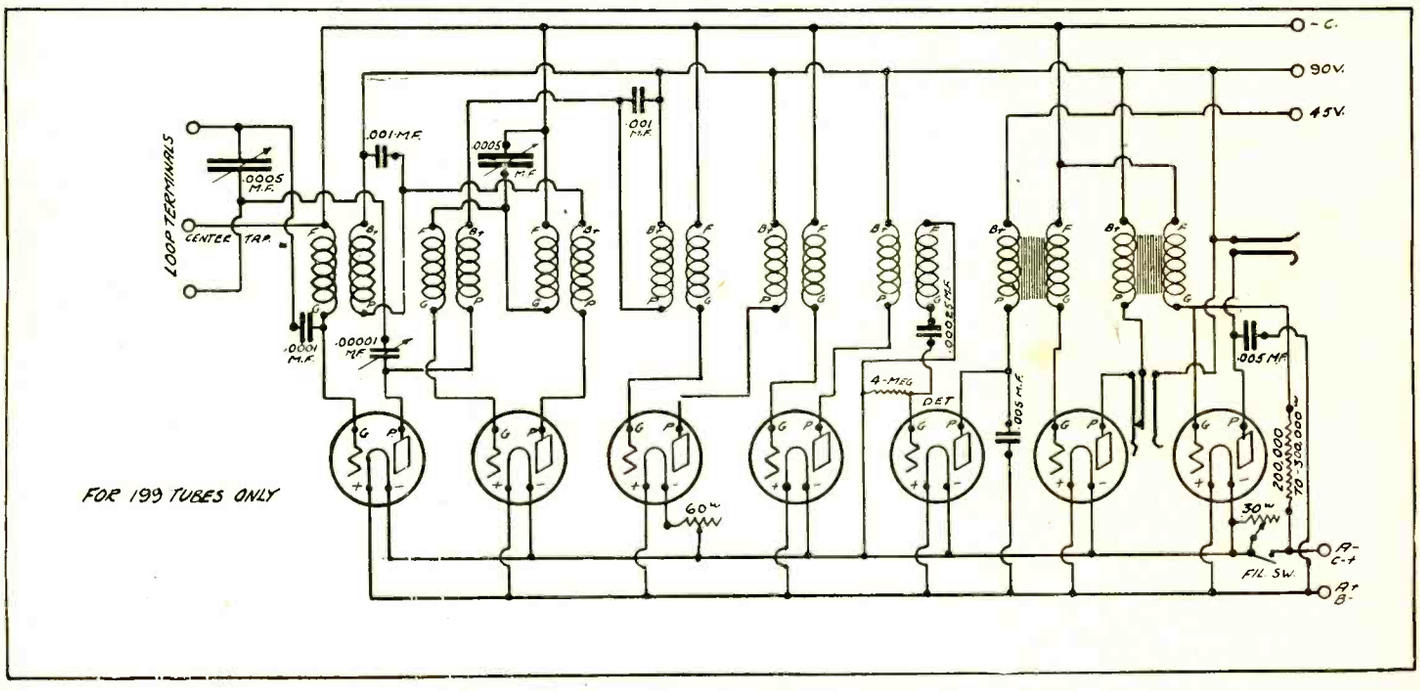
9030 Commercial Avenue

CHICAGO

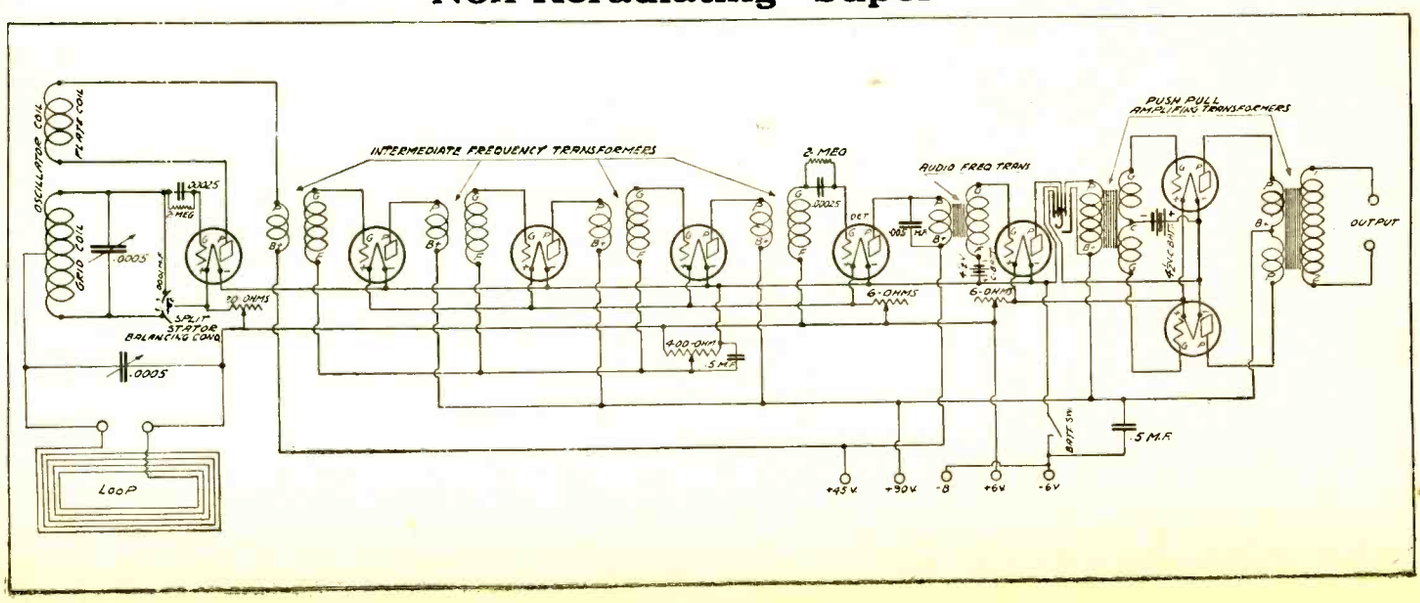
Harkness Reflex



Superheterodyne Reflexed



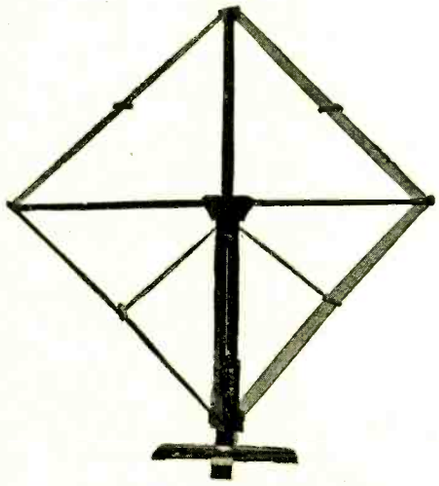
Non Reradiating "Super"



THE AMPLIFEX LOOP

A Revelation and a Revolution in Loop Construction

Open

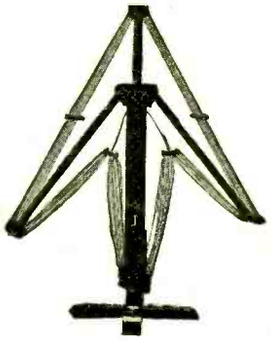


TRADE MARK REG.

AMPLIFEX

PATENT PENDING

Partly Closed



THE AMPLIFEX LOOP collapses by simply turning a thumb nut in the center.

WOUND with 40 strands No. 38 double silk-covered Litzendraht wire. Has a COMPASS in the base for directional adjustment.

THE AMPLIFEX LOOP by a series of six numbered binding posts can be tapped for seven combinations giving 3, 4, 6, 7, 9, 10 and 13 turns with a wave length range of 88 meters to 1,000 meters WITHOUT ANY DEAD-END LOSSES. THE MOST IMPORTANT AND REVOLUTIONARY FACTOR IN LOOP CONSTRUCTION.

When extended the Loop is 43″ high and 39″ wide. Beautifully finished in mahogany with all metal parts nickel-plated. Packed in individual cartons.

The Amplifex Loop Is Center Tapped—Portable—Directional—Efficient

Approved by COCKADAY, RADIO NEWS, POPULAR RADIO, RADIO IN THE HOME and many leading Radio Publications all over the country.

MR. HENRY M. NEELY, Publisher of RADIO IN THE HOME, says: "VERY FINE WORKMANSHIP . . . EXTREMELY CLEVER . . . ITS EFFICIENCY HAS SURPRISED ME."

IF YOU WANT A LOOP THAT WILL SOLVE YOUR NOISE TROUBLES AND GIVE YOU REAL VOLUME AND SELECTIVITY, WRITE US TO DEPT. RC FOR CIRCULAR AND CHART.

ESPECIALLY RECOMMENDED FOR THE RADIOLA SUPERHETRODYNE, FOUR AND FIVE TUBE REFLEXES, GRIMES INVERSE DUPLEX, ETC.

DEALERS: *Our Jobbers listed below are working in close co-operation with us in the proper distribution of our products. Dealers who are interested in selling the finest product of its kind on the market, should write us for details.*

DISTRIBUTED BY

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For Dealers Only

Amplifex Radio Corp.,
Arlington, Mass.

Enclosed find Check—Money Order for $7.50 (Regular list $15.00). Send me one Ampliflex Loop.

Name.....

Street.....

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

WE CONTRACT TO MANUFACTURE LOOPS TO ANY SPECIFICATIONS

Write to DEPT. RC for descriptive circular and chart.

Formerly $18.50—Now $15.00

MANUFACTURED BY

Amplifex Radio Corporation
Arlington, Massachusetts

For Citizens Radio Call Book Readers

Amplifex Radio Corp.,
Arlington, Mass.

Enclosed find Check—Money Order for $10.00 (Regular list price $15.00). Send me one Ampliflex Loop.

Name.....

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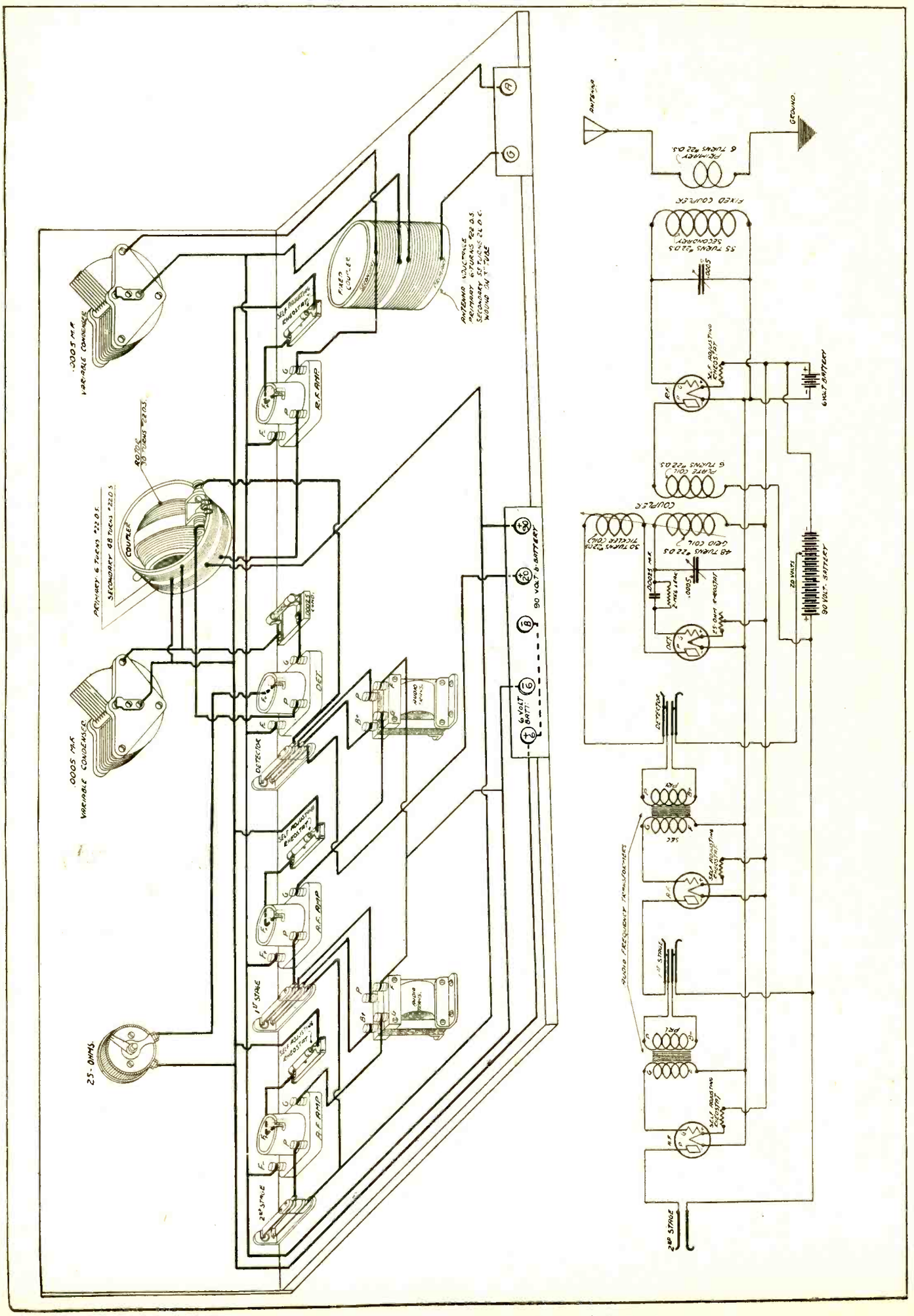
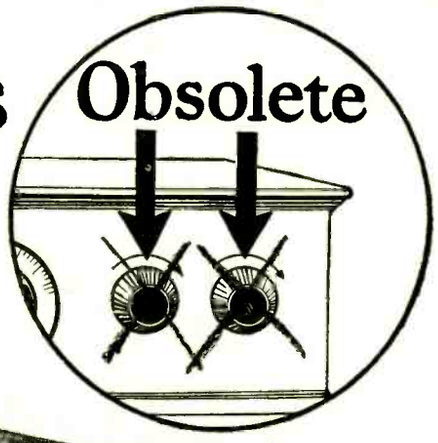
City.....State.....

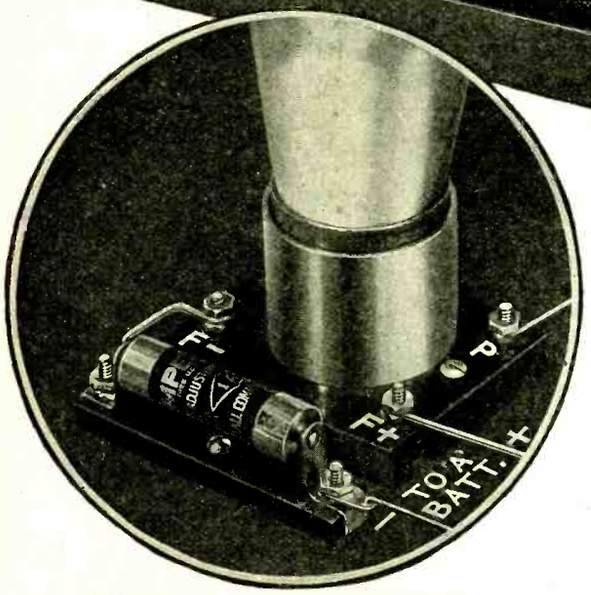
Non-Reradiating Regenerative Receiver



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

8 improvements at ONE stroke





PRICE $1.10 EVERYWHERE

Write for

FREE

Hook-Ups

The Self-Adjusting Rheostat

1. Eliminates hand rheostats—thereby simplifying control and giving compactness.
2. Greatly simplifies set wiring, therefore makes for greater efficiency.
3. Prolongs life of tubes from 2 to 3 times.
4. No moving parts—therefore no grinding noises.
5. Permits use of any type of tubes or any combination of tubes.
6. No filament meters necessary.
7. Brings the most out of each individual tube—automatically—no guessing.
8. Makes perfect tube operation absolutely fool-proof.

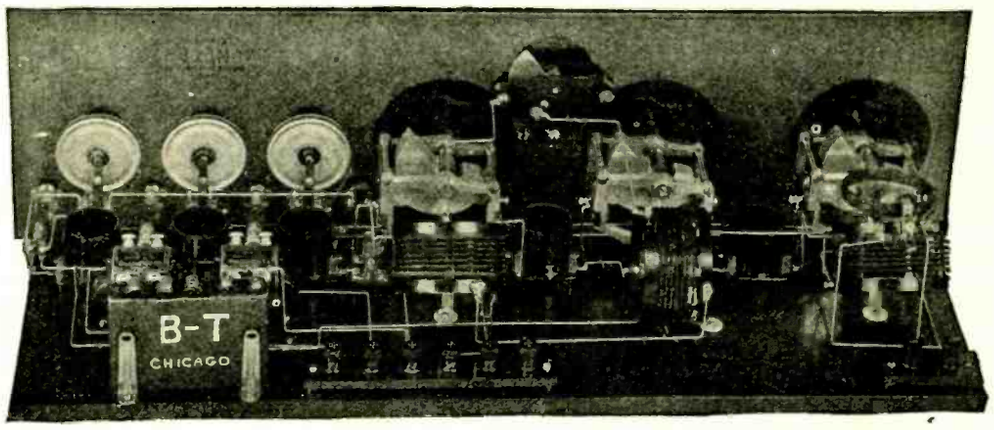
AMPERITE operates on the thermo-electric principle. Contains a specially treated filament hermetically sealed in a glass tube and surrounded by an inert gas. This filament has the unique property of automatically changing in resistance as the "A" battery voltage changes—so that a practically constant current is maintained in the tube filament. Consequently the tubes are constantly operated at maximum efficiency. No knob to turn. Nothing to get out of order. **AMPERITE** mounts conveniently inside the set. Really takes the place of a good hand rheostat, a delicate meter and an expert operator. Thoroughly approved by every prominent laboratory. Used as standard equipment in such sets as **Somerset, Ultradyne, Marshall, Pfanstiehl, Kilbourne & Clark, Ambassador, Cockaday** and numerous others. Perfect for every circuit. Fully guaranteed.

RADIALL COMPANY
Dept. C.B.-1, 50 Franklin St., New York

AMPERITE

REG. U.S. PAT. OFF.

"means right amperes"



The B-T Low Loss Nameless

Ever since the fall of 1923, when the official organ of the American Radio Relay League, QST, published an article dealing with the reduction of losses in radio receivers we have been hearing almost continually of "low loss" coils and condensers. Despite anything that may have been said to the contrary, this trend is certainly in the right direction, and has been instrumental in greatly improving the standard of design of radio parts, with a resultant increase in sensitivity, selectivity and volume of receivers.

It is logical therefore that the tremendous success of the Nameless should be still further increased by the introduction of essential parts possessing the good qualities properly attributed to real "low loss" parts.

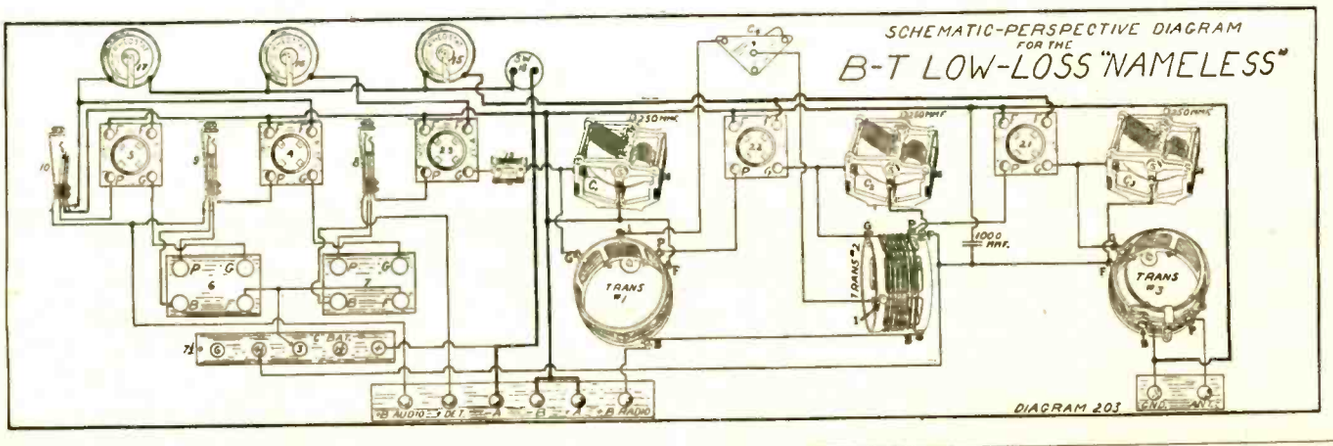
The Nameless circuit comprises two stages of tuned radio frequency amplification, a tuned rectifier and two audio amplifiers. The system of oscillation control is entirely peculiar to this circuit.

Those who understand regenerative sets know that the greatest volume and selectivity are obtained by keeping the set at all times just below the point of oscillation. The same condition is true of an R.F. amplifier—just below oscillation is the best point of operation. As this cannot be a permanent adjustment, as no means have as yet been discovered to keep regeneration constant over the entire broadcast range, the tremendous advantage of the panel control system used in the Nameless is immediately apparent. As you will note in the schematic wiring diagram, the small control condenser links circuits No. 1 and No. 2, thereby causing or preventing oscillation at will, as compared with other R. F. circuits where so-called neutralization is used at one particular frequency. Or where large losses are introduced to prevent any approach to oscillation at any wave length.

Another valuable improvement in this circuit is the adjustable antenna coupling on the first stage of radio. This adjustment in Transformer No. 3 permits you to adapt your set to long or short aerial and corrects for extreme local interference conditions.

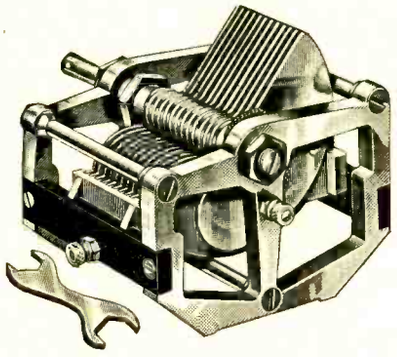
Other important and recently developed features are incorporated in the set. For instance, a "C" battery on both radio and audio frequency stages allows greater selectivity and keeps "B" battery consumption down to a minimum. Due to this, a set of batteries will last two or three times as long as usual.

As for results; under any reasonable conditions the Nameless will step all over the country, getting plenty of volume on even lower power stations. Its ability to tune out locals is a most decided pleasure to those located near any of the larger stations.



BREMER-TULLY

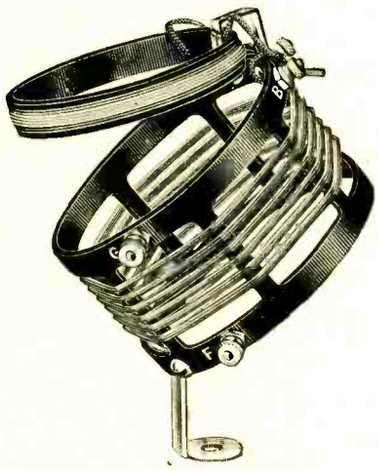
"Pioneers of Better Tuning"



B-T Laboratory Type Low Loss Condenser

One glance at the rigid die cast construction of the new B-T Low Loss Condenser will convince you that it is the finest made. Special plate shape spaces the stations uniformly over the dials, eliminating crowding on the lower waves. Lifetime Bearing can be adjusted for wear or friction without changing capacity. Soldered, pigtail connection. Grounded rotor. Made in the following sizes:

Type	Capacity	Price
L-7	125 M.M.F.	$4.25
L-11	250 M.M.F.	4.50
L-23	500 M.M.F.	5.00
L-35	750 M.M.F.	6.50



B-T Air Core Transformers

The most efficient transformer for use in tuned radio frequency circuits. Skeleton coil form reduces the amount of insulation in the field of the coil to a minimum. Special series banks windings give additional selectivity and sensitivity. Type AC-3, as illustrated, has adjustable untuned primary. Type AC-1 has fixed primary. Ranges given below covered with an L-11, Laboratory Condenser.

Type AC-3.....(200 to 565 meters).....$3.50
Type AC-1.....(200 to 565 meters)..... 2.50

MERIT of design and workmanship established B-T parts in a position of commanding superiority three years ago. Since that time B-T has kept up, and in some instances led, in the development of radio practice. It is worthy of note, that notwithstanding the radical changes that the past two years have brought, that every B-T part that we have ever put out is still successfully fulfilling the purpose for which it was designed.

Proof of the pudding is in the eating! As proof of the worth of B-T parts we offer the following unsolicited testimonials. We receive hundreds of letters, like the ones reprinted, in every mail. They are the rule—not the exception.

Clifford, N. D., Dec. 26, 1924

Old or new all B-T sets work splendidly. It's impossible for me to keep one for my own use, as some one wants it as soon as I get it hooked up.
B-T only for Radio.

(Rev.) K. K.

New York, N. Y., Dec. 30, 1924.

One isn't likely to praise a good article with the same enthusiasm he displays in condemning a poor one—but too much can not be said in favor of the B-T Tuner. Upon the earnest recommendation of R. A. Bradley, Technical Editor of Wireless Age, I purchased a B-T Tuner, and it surpassed all expectations, logging 33 stations the first night from Montreal to Jacksonville and New York to Texas. The Tuner is satisfactory in every way and I am only too glad to pass the good word along.
(R. C. A. Operator S, S.) C. L. J.

Pittsburgh, Pa., Dec. 12, 1924.

I meant to write you that I tuned in KFI and KHJ (California) twice recently with your B-T No. 2, using your new Tuner and Condenser. You should be proud of that. Have received Montreal, Winnipeg, Ottawa, Dallas, Fort Worth, Atlanta and so on all season.

Mrs. E. L. N.

P. S.—Last evening I tuned in PWX, Havana, through two local stations, for forty-five minutes.

Chicago, Dec. 10, 1924

I purchased one of your Low Loss Condensers recently and it is the finest piece of work I ever saw outside of my 23-jewel watch.

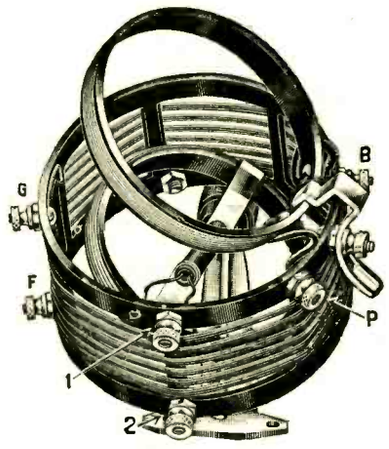
F. J. N.

Chicago, Nov. 26, 1924

Just a note to tell you that last night using B-T No. 1, at 10:35 I tuned in 5NO, Newcastle, England on 400 meters and listened to two numbers, a piano solo and a mandolin. At 10:50 I tuned in 2BD, Aberdeen, Scotland on 495 meters for two numbers. Both stations came in clear.

Get a Copy of This Book

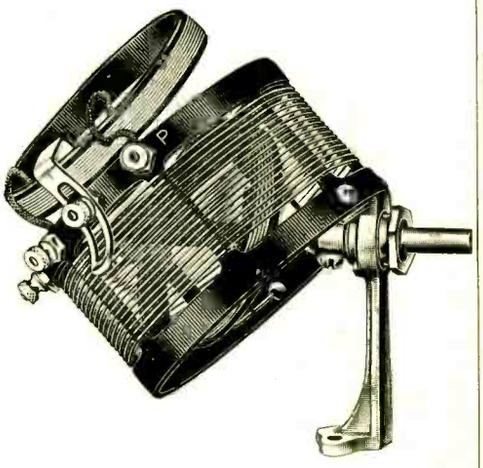
Don't start on another set until you read "Better Tuning." 48 pages of diagrams, hook-ups, construction and tuning information. From your dealer or sent postpaid for 10c.



B-T Broadcast Type Low Loss Tuner

"Without question the finest regenerative type tuner that the radio industry has ever seen", is the comment of many experts. Employs the famous B-T skeleton coil form and "series-banks" windings. The adjustable untuned primary may be locked in the best position to meet any requirements of circuit or location. Broadcast listeners in congested districts will find this instrument a great aid in bringing in distance through local stuff. Ranges covered with an L-11, Laboratory Type Condenser.

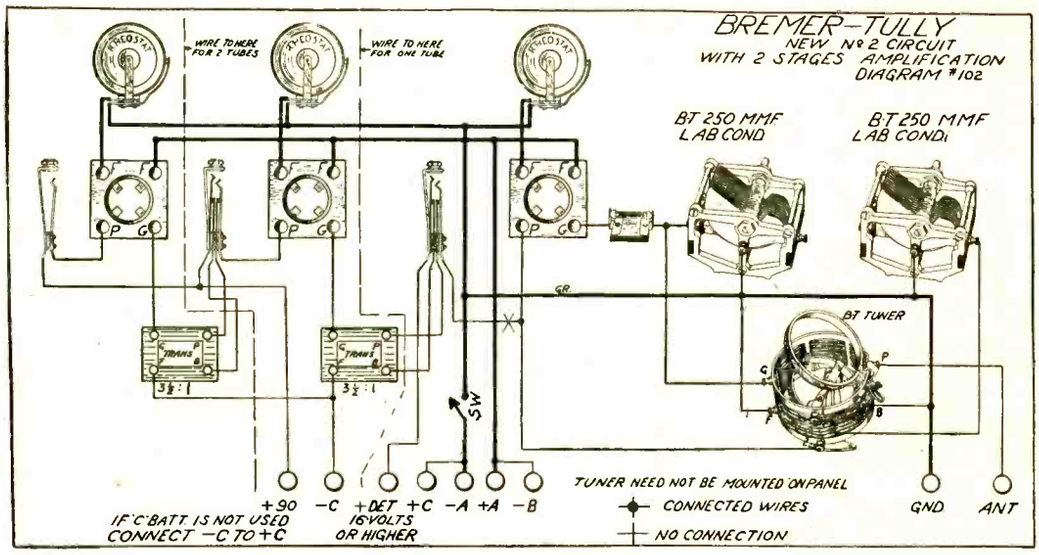
Type B.....200 to 565 Meters.....$5.00



B-T Short Wave Type Low Loss Tuner

Similar in construction to the Broadcast Type except that it is designed for low wave lengths, either amateur or broadcast. Praised by A.R.R.L. members everywhere. Covers 50 to 150 meters with type L-11, Laboratory Condenser and 49 to 110 with type L-7, Laboratory Condenser. Type SW.....$5.00

BREMER-TULLY MFG. CO., 532 S. CANAL STREET CHICAGO, ILLINOIS



Two Dependable Circuits for Low Loss Parts

A rather general survey of the radio field, including discussions with dealers and perusal of various magazines and newspaper sections would seem to indicate that for one, two, three or four tube sets some form of feed-back type of circuit is the most popular.

Just as the highest standard of automobile today consists of a refinement of the first sound principles developed in that industry, so it is that the fundamental efficiency of the feed-back circuit furnishes the mainstay on which to fall back when in search of dependability.

Due to the ease with which variations may be effected, this type of circuit has appeared, and still appears under countless modifications and if not too widely divergent from original principles most of them give satisfactory results, provided efficient parts are used in their construction. In other words, the proper choice of well-designed parts is a most important factor and the safest procedure is to follow the experience and judgment of a manufacturer whose products have been known for their merit. Unless one is looking for experience only he will do better to allow the laboratory expert to weed out the impractical and inefficient from the mass of suggestions continually in evidence.

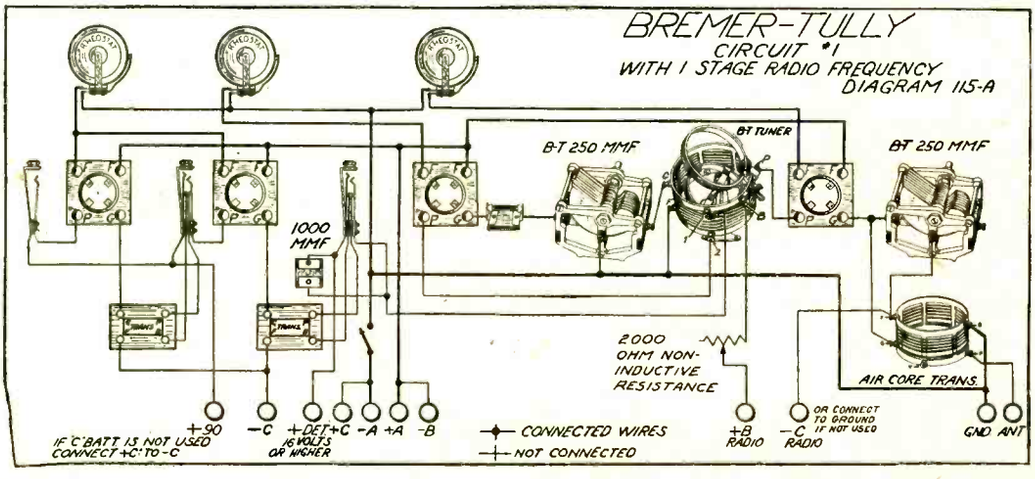
The circuits shown herewith are chosen because of their record of consistent dependability under the most difficult conditions.

The three tube hook-up is a modified shunt feed-back that is not surpassed by any set of an equal number of tubes. Regeneration is controlled by variation of capacities, in a smoother and less critical way than other methods used in feed-back circuits, and the feed-back does not affect tuning appreciably, which simplifies operation without sacrificing essentials.

Progressive construction may readily be followed without waste of parts by anyone wishing to begin with one tube, and he is assured that with each stage added he has all possible with an equal amount of equipment.

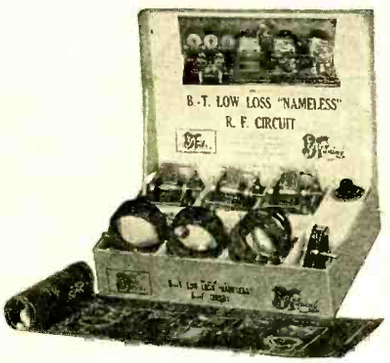
The 4-tube hook-up includes a stage of radio frequency, making a very practical set that will cut through heavy local interference—which is most necessary in or near all broadcasting centers, and is becoming more important as super-power stations increase in number. The adjustable primary of the tuner, and of the transformer also, if desired, furnishes the greatest possible assistance in this respect. This set may be made so selective that close vernier tuning is necessary even on local stations, and it is of the type where attention to proper tuning will bring amazing results.

The inductances as shown require condensers of only 250 M.M.F. to cover 200 to 565 meters, this being an important consideration not only from a standpoint of tuning but also of being prepared to receive all stations as new allotments are made on the lower lengths.



BREMER-TULLY

"Pioneers of Better Tuning"



B-T Nameless Kit No. 3

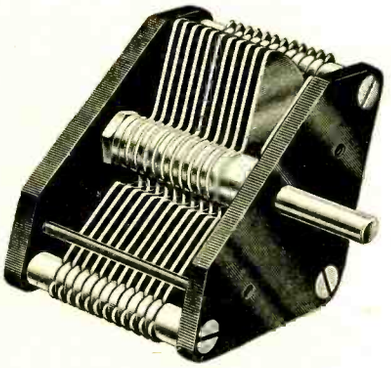
Contains three 3-Circuit Transformers, three 250 M.M.F., L-11, Laboratory Condensers, one 40 M.M.F. Control Condenser with 2-in. Dial, and a complete, full size set of Blue Prints, and Instructions.....$26.50

B-T Nameless Kit No. 1

Contains three 3-Circuit Transformers only. Blue Prints for building the Nameless must be purchased separately.....$10.50

B-T Nameless Blue Prints

Full size Panel Template, Baseboard Template, Straight Schematic and Pictorial Schematic Blue Prints. Also complete Instructions for building and testing with list of all parts needed.....$1.00



B-T Plain Condensers

For every day use where micrometer adjustments are not required B-T Plain Condensers fill the bill admirably at an extremely fair price. Made in a wide variety of capacities to meet every need.

Type	Price
P-3	$1.50
P-5	1.90
P-11	2.40
P-23	3.00
P-43	3.50

FOR real satisfaction there is not a set on the market that equals the B-T Low Loss Nameless. Since this circuit was brought out in 1924 a year of constant research has brought a distinct improvement in the circuit as well as in the parts employed. We consider the 1925 Low Loss Nameless the climax of our achievements.

Read the letters below. They will give you some idea of what you may expect if you build a Nameless.

San Antonio, Texas, Dec. 29, 1924

In each instance where I did not use B-T parts I regretted it. I think they are the best obtainable. My reception with the Nameless is nation wide at all times, and twice as loud as any other five tube set. As for selectivity I bring in Toronto through our local stations without any interference at all.

J. B. Y.

Tito Schipa, the world's greatest lyric tenor, praises the Nameless set installed in his apartment in the Congress Hotel, Chicago. Part of his letter follows:

"After having used several other well known makes of receivers and discarding same, to say that I am pleased with your set is putting it mildly. The volume, selectivity, quality of tone and ease with which distant stations were tuned in whilst other Chicago stations were radiocasting, is simply marvelous and almost beyond understanding. I suppose that you will hardly believe me when I tell you that I tuned in 42 stations my first night."

Atlanta, Ga., Dec. 2. 1924

Pleased to report verified reception of PTT, Madrid, Spain, evening of 27th, by W. D. Alexander Jr., using the Five-Tube Nameless.

Alexander Seewald Company

Chicago, Ill., Dec. 16, 1924

As I believe in credit where credit is due I am submitting a list of 30 stations, received last night on the Nameless, and covering coast to coast. This is not my record, but what I get regularly on Monday nights, and am quite successful in getting DX during the week. Thank you for your efforts in putting on the market A-No. 1 radio equipment.

E. G. S.

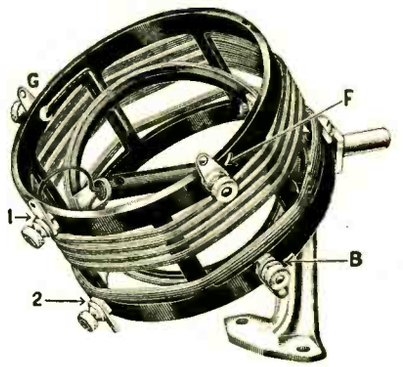
Chicago, Dec. 15, 1924

I have been testing my new Nameless for two weeks using your new Low Loss Condensers and Coils, and it is without question the best radio set it has ever been my pleasure to tune. On Monday night, December 1st, I logged 40 stations, listening to one to four numbers from each station. I live about four miles from WEBH and succeed in bringing in WGY, with WEBH operating—this is a difference of ten meters. I can now get many distant stations each night regardless of who is operating in and around Chicago.

L. S. W.

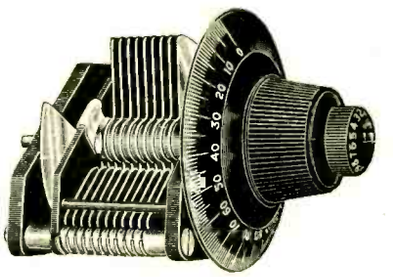
Get Your Copy of This Folder

Our circular "RF-32" contains more details of the B-T Low Loss Nameless. A postcard will bring it to you.



B-T Oscillator Coupler

Built with B-T "series-banks" windings on B-T skeleton coil form, suitable for use in any circuit that requires an Oscillator Coupler. The low capacity winding requires only a 500 M.M.F., L-11, Laboratory Condenser to tune a band of 205 to 725 meters. The high ratio of inductance to capacity insure stability and uniformity of power. Pickup rotor coil may be locked in position.....$4.00



B-T Vernier Condensers

The B-T was the first and is still the most perfect vernier condenser on the market. Users delight in its positive vernier action. Losses and minimum capacity are lower than most of the so-called "low loss" condensers. For anyone desiring highly sensitive vernier control no better product can be found than the B-T Vernier Condensers. Vernier Condensers are furnished with a 3-inch Dial.

Type	Price
V-16	$4.50
V-23	5.00
V-43	6.00

BREMER-TULLY MFG. CO., 532 S. CANAL STREET CHICAGO, ILLINOIS

Air Core Radio Frequency Transformers

ORIGINALLY radio frequency transformers were of air core construction. These air core transformers amplified very efficiently, but only over a rather narrow band of wavelengths; for instance, a transformer designed to work at 200 meters might amplify excellently from 150 to 250 meters, and fairly well from 100 to 300 meters, but outside this range they would be practically worthless. With the growth of broadcasting stations, therefore, and the spreading out of the necessary wavelength range, it became evident that in order to cover this band, it would be necessary to design an iron core with as little loss as possible, as the loss would be partly compensated for by the increased efficiency over a wider range.

Short wave radio frequency sets now use either tuned air core transformers, giving maximum amplification and sharp tuning, or untuned iron core transformers, which permit the discarding of one or two tuning dials, but which tend to be rather broad in tuning.

In the super-heterodyne circuit the amplification system is designed to work at one certain wavelength, all signals being what might be termed "transposed" by the oscillating system, and introduced into the amplifying tubes at this predetermined frequency. In a set of this type, then, we can use air core transformers confident that, providing they are carefully matched, we will obtain the utmost in quality and volume and a degree of sharpness. If a condenser is connected across a transformer secondary, a very sharp peak is produced which will distort the music or speech, and the usual practice in a system of iron core intermediate frequency amplification is to tune the secondary of the filter coil by means of a small fixed condenser. This sharp peak is necessary because the intermediate transformers cannot be depended upon to eliminate hardly any of the undesired frequencies.

As each air core transformer acts as a fairly broad filter, the true filter transformer does not require a sharply tuned secondary, and the difference in quality is quite noticeable. The main advantage, or the reason for the use of iron core transformers, lies in the ease with which they may be manufactured. If the wavelength of each transformer is slightly different, the addition of an iron core smooths out the amplification curve and eliminates the necessity of testing each one to determine its true wavelength. Manufacturers of air core intermediates must find the exact wavelength of each transformer and sell them in complete sets in order to insure satisfaction to the builder.

Very often, due to a flaw in the insulation, twenty-five or thirty turns may be shorted in a coil. On a test board used in some factories to determine the wavelength of the transformer, a shorted coil can be detected instantly, although the wavelength may be exactly the same as that of a transformer having fewer turns than the average, and a careful manufacturer desiring to maintain his reputation, will reject these faulty ones because the shorted turns form a very undesirable absorption coil, affecting the operation of the set considerably, whereas a transformer with a few turns less than normal can be matched with others in the same condition, and will work exactly the same as transformers of slightly higher wavelength. If no wavelength test is made, as is the case with iron core transformers, such a condition would never be disclosed and the result would be unsatisfactory reception, especially in the case of weak signals, where every bit of energy is necessary.

The proper frequency to select for the operation of the amplifying system of a super-heterodyne is still largely a matter of opinion; but a wavelength of twenty-two hundred meters is very satisfactory. A lower wavelength, about fifteen hundred meters, will give slightly greater selectivity with a loss in amplification, and vice-versa, three thousand meters will give some additional amplification, but the loss in selectivity seems to overbalance this gain. Twenty-two hundred meters, or approximately one hundred thirty kilocycles, will be found to be a very good balance of these two desirable features.

The coils used in the construction of intermediate frequency transformers may be either random wound, usually on wood or bakelite spools, or they may be of self-supporting construction. In the case of random wound coils, a wood spool is usually used, the wire being wound haphazardly in order to separate the turns as much as possible, and so cut down the distributed capacity between turns. Any insulating material in close proximity to coils adds a certain amount of resistance to the circuit, resulting in a slight loss and broader tuning, so, although the loss may be very little and largely theoretical, it would seem that if it can be dispensed with it would be wise to do so. Then, too, the distributed capacity will always be greater in coils of this type than in stagger wound or honeycomb inductances.

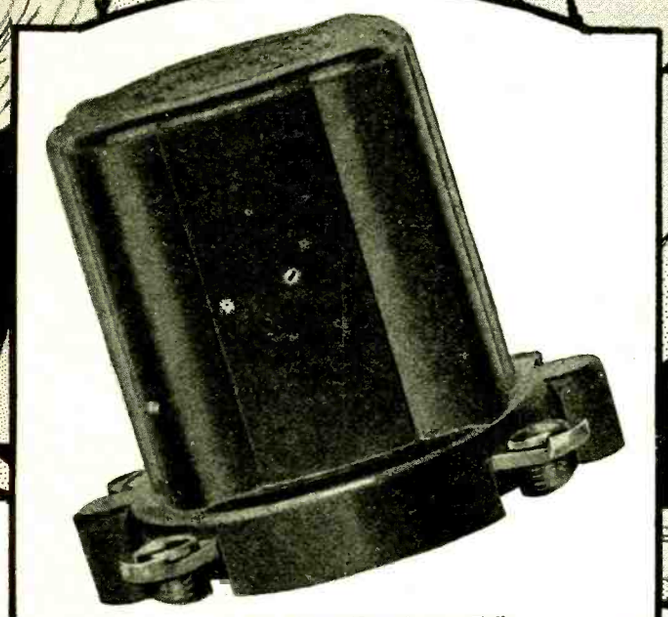
The advantage of random wound coils seems to be entirely with the manufacturer. They can be wound much faster and on less expensive machines. The only disadvantage is that the wavelength varies considerably with each transformer, as the tension of wire and the number of turns, as well as the way the wire happens to be wound, are all factors governing the wavelength of the completed coil, and are likely to vary with each one. Even if the number of turns is kept constant, twelve hundred turns on one spool will give a different wavelength than twelve hundred on another, because the position of the wire in the coils will be different, this difference resulting in a variation of both inductance and distributed capacity. Consequently, if the manufacturer is really careful to match up his transformers, he will find a wider variation than would be the case if self-supporting coils were used.

It is considered poor practice to impregnate coils, as the distributed capacity is increased enormously in this manner. Silk covered wire is less likely to absorb moisture from the air than is cotton covered wire, so unless the transformer is absolutely air tight, which is seldom the case, silk covered wire, although somewhat more expensive to use, is undoubtedly more desirable. Silk covered wire makes a smaller, more compact and a neater looking coil than cotton covered wire, and allows a smaller transformer shell to be used if the wavelength is kept up to the desired standard.

Transformers, whether of the random or "stagger" wound type, may or may not use a split secondary. Some transformers on the market use a wood spool with two grooves each five-sixteenths of an inch wide and separated about a sixteenth of an inch. The diameter is about three-eighths of an inch. On one side is wound at random approximately twelve hundred turns of wire. This is the secondary, the outside turn being the grid terminal and the inside going to the filament circuit. The primary coil consists of about nine hundred fifty turns in the other half of the spool, the outside turn going to the plate and the inside lead to the B battery supply.

Some random wound transformers use a spool about three or four inches in diameter, with three grooves for wire, the center one being used as a primary and the two outside coils joined together in series to act as a secondary. Such a practice seems to produce a more satisfactory transfer of energy from the primary to the secondary circuit and is to be preferred to the first type mentioned. The size of this transformer renders it cumbersome and obsolete, however, the newer ones taking up no more room than a tube socket. One of these late ones may be described, as it seems to incorporate most, if not all, of the desirable features. In this three coils, twelve hundred turns each of the "stagger" wound construction, and of single silk covered wire, are wound on a quarter-inch diameter. The coils are separated about one-quarter of an inch, the inside coil being the primary and the two outside coils connected together to form the secondary. A central stem of bakelite is used to support the three coils, so the resistance due to insulation in the vicinity of the coils is cut down to a minimum. The complete transformer is small and neat and gives excellent amplification.

KLENTZ TRANSFORMERS



Cut Shows Transformer Full Size. Notice Short Connection to Socket

A Super-Heterodyne for Quality, Amplification, Distance

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Salient Features

Quality of tone—Selectivity—Perfect matching—Stagger windings—Non-Impregnated — Bakelite construction throughout — Easily assembled on account of Bottom Connection—Moderately priced. One filter and three intermediate frequency matched transformers for only **$20.00.** Universal Oscillator for above, **$3.50.**

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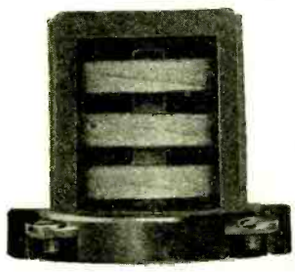
No. 1. This sheet shows full size panel layout giving dimensions and can be used as a template. Very handy when laying out apparatus that is mounted on front panel.

No. 2. Shows full baseboard layout so that you can lay out evenly apparatus to be mounted on baseboard. Gives exact dimensions of distance between each instrument.

No. 3. This shows a complete schematic diagram with all electrical connections plainly marked so that receiver will work when it is hooked up.

Complete set of three prints 50c postpaid

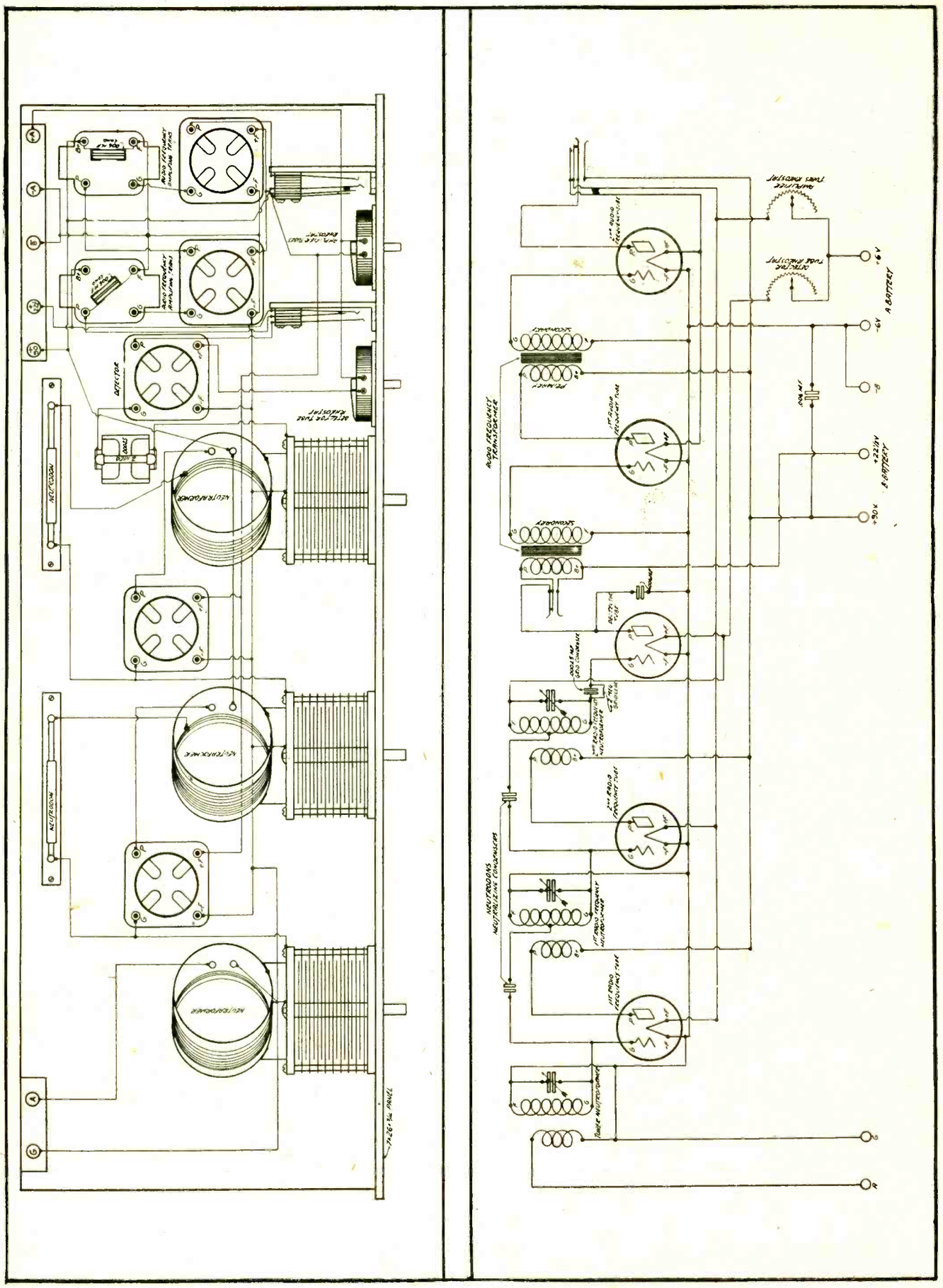


This "cut-away" view of the Klentz Transformer shows the Stagger windings which assure its perfect performance at all times.

Klentz Radio Co., Not Inc.

2324 No. Sawyer Ave., Chicago

Neutrodyne-Receiver



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CHUM
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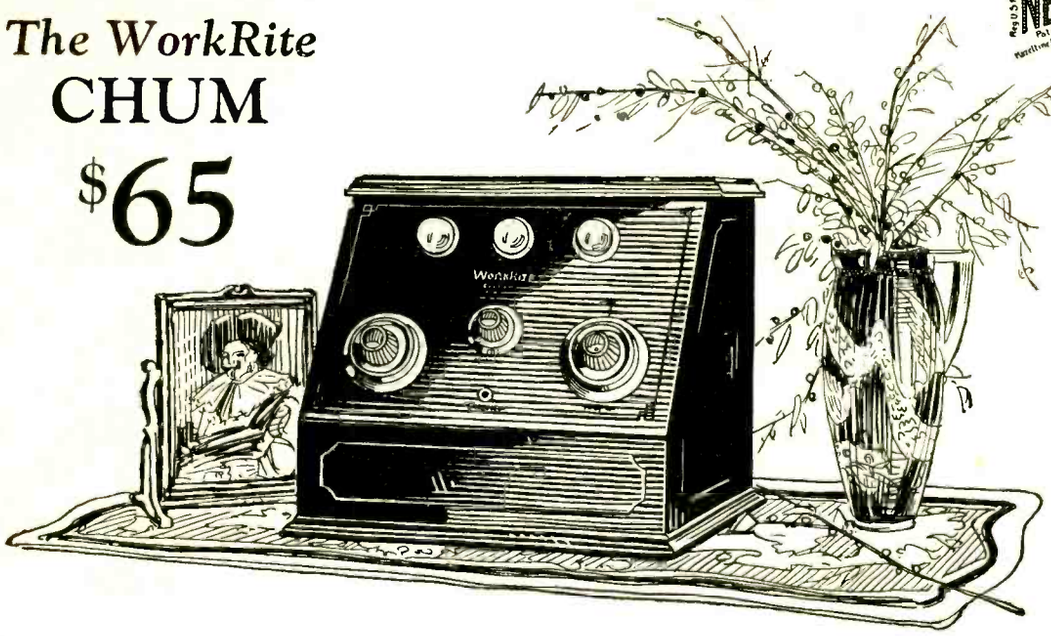

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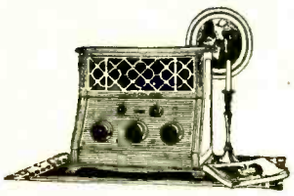

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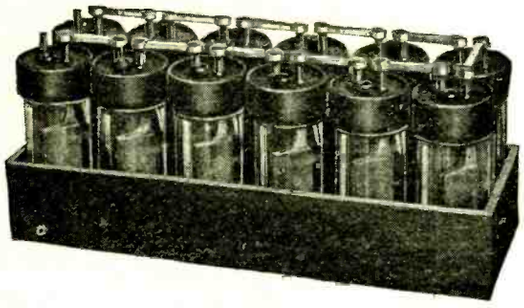

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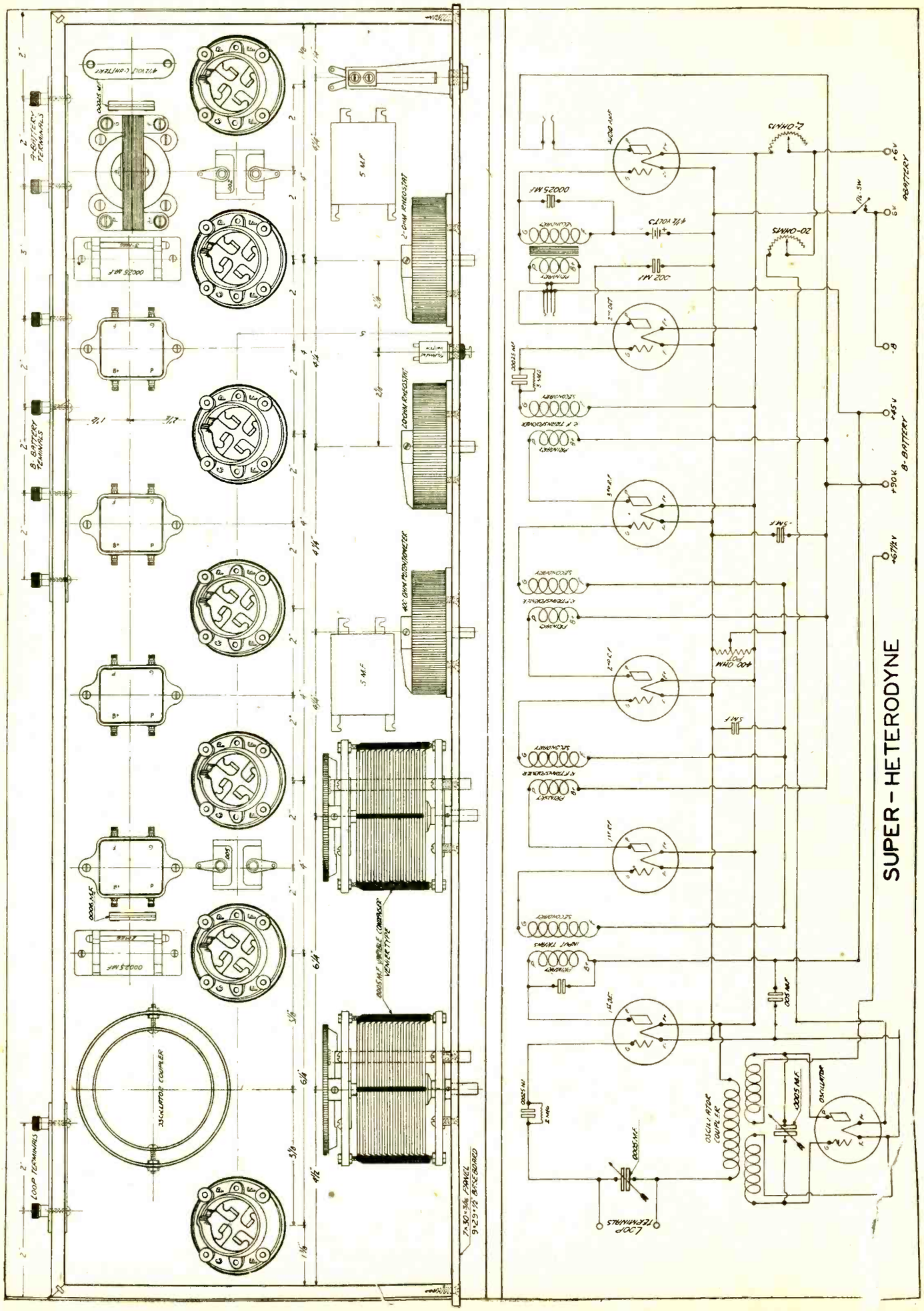

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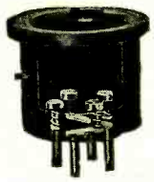

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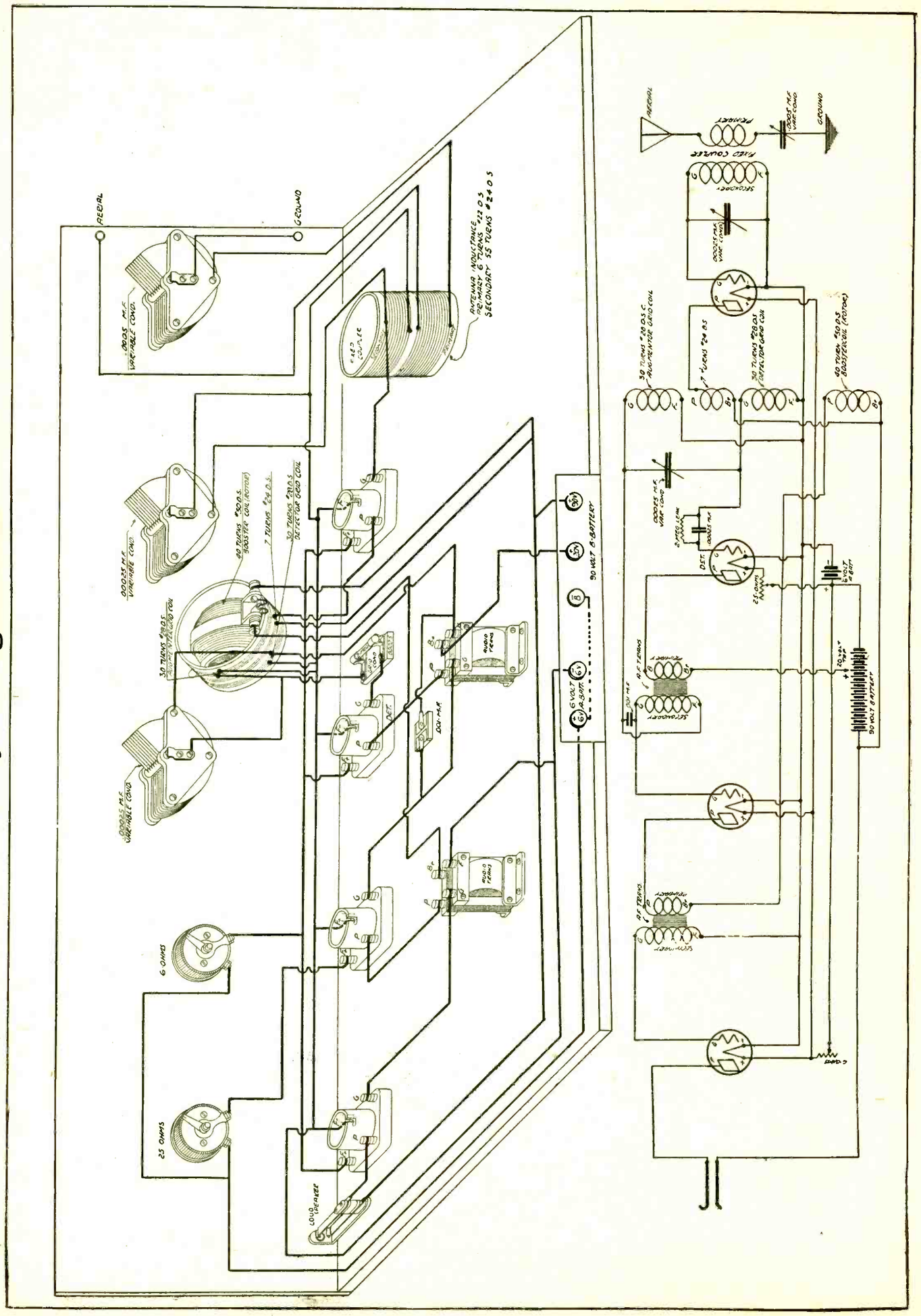

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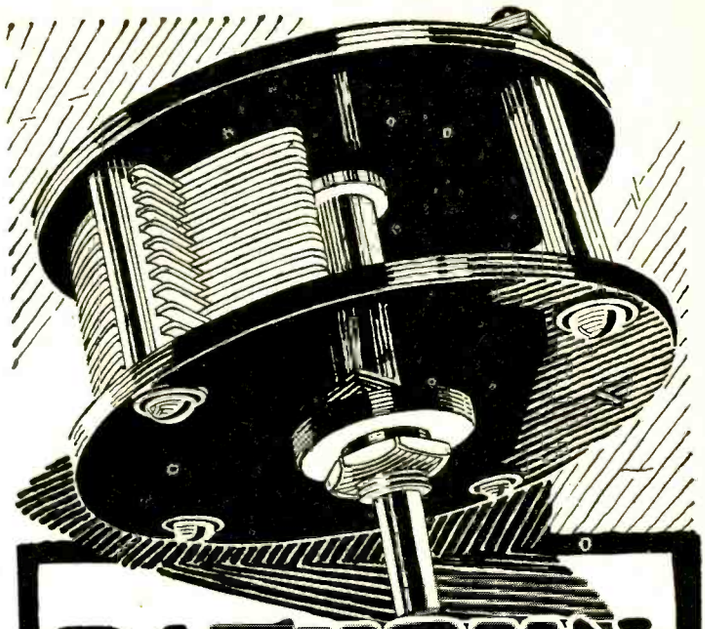

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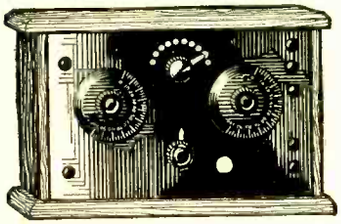

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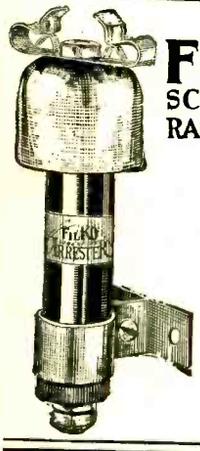

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This policy will double your sales, too

Now, I will show you what I mean by following the path of least resistance. How I apply this old law in a new way.

You, better than many, fully appreciate the great fundamental wrong in the radio field today. Too many folks are trying to get rich overnight. What is the result? The market is flooded. Just as it was in the old days when talking machines first appeared. But what happened to this industry will happen to radio also. Without question, many products now clamoring for favorable attention will entirely disappear. And out of the multitude of names a certain definite few will stand aloft and secure.

The reason for this is plain. Some radio products today are inherently sound. They are made of the best that money can buy. They are the result of the greatest scientific and engineering ability in the country. These two factors alone insure the success of such products. But there is still another—the greatest factor of all: *National advertising.*

Hudson-Ross distribute only nationally advertised goods

I anticipated the development of nationally advertised radio products several years ago. So I tied up only with national leaders. That is why I am enjoying such a large business today. That is what I mean by *following the path of least resistance.* In other words, give people the products they know about and ask for. Give them products identified with the greatest manufacturers in the business. Give them *nationally* advertised merchandise.

A FEW OF OUR WELL KNOWN LINES

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Ekko
Electrahot
Erla
Eveready
Freshman
Frost
General Instrument
Haynes-Griffin
Hilco
Howard
International
Jewell
Karas
King
Martin-Copeland
Melco
Music Master
Muter
Na-Ald
Philco
Precision
Pyrex
Rathbun
Remler
Signal
Thompson
Thordarson
Thorola
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Univernier
Western Electric
Weston
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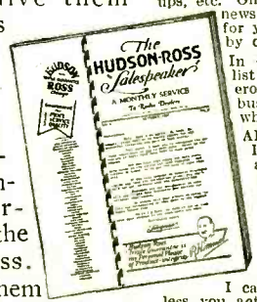

Glance at the list of products we distribute. You know them all. So does the radio public—your customers. They are all leaders in their line. They are nationally advertised. They are here to stay. They are bringing in big profits for our dealers every week. For we can let them go at very liberal discounts.

FREE

Write at once for your personal copy of my "Salespeaker." It is the livest dealer radio bulletin published today. It contains actual photographs of the leading nationally advertised sets, speakers, parts, hookups, etc. One entire page is devoted to the latest radio news from all parts of the country. New ideas for your window. Successful selling stunts used by other dealers.

In each issue, along with the merchandise, I list the retail price and cost to you. My generous discounts will appeal to your sense of business. You will enjoy the neat tabulation which shows how large your profits are.

All this is entirely free. Yet I do even more. I will turn over to you all inquiries from your neighborhood sent to us in response to our advertising. I will send you one of our full-color seals for your window which will identify you as the Hudson-Ross neighborhood dealer. But I can do nothing for you unless you act right away. Unless you write your name and address on the handy coupon below. We are receiving so many requests for the "Salespeaker" that we urge you to write at once. Fill in and mail the coupon now while it's in your mind.

Hudson-Ross, Inc., 123 W. Madison St., Chicago

HUDSON-ROSS, INC., 101
123 W. Madison St., Chicago, Ill.

Gentlemen:

Please mail me free and prepaid your "Salespeaker" and one of your full-color seals for my store window.

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HUDSON-ROSS

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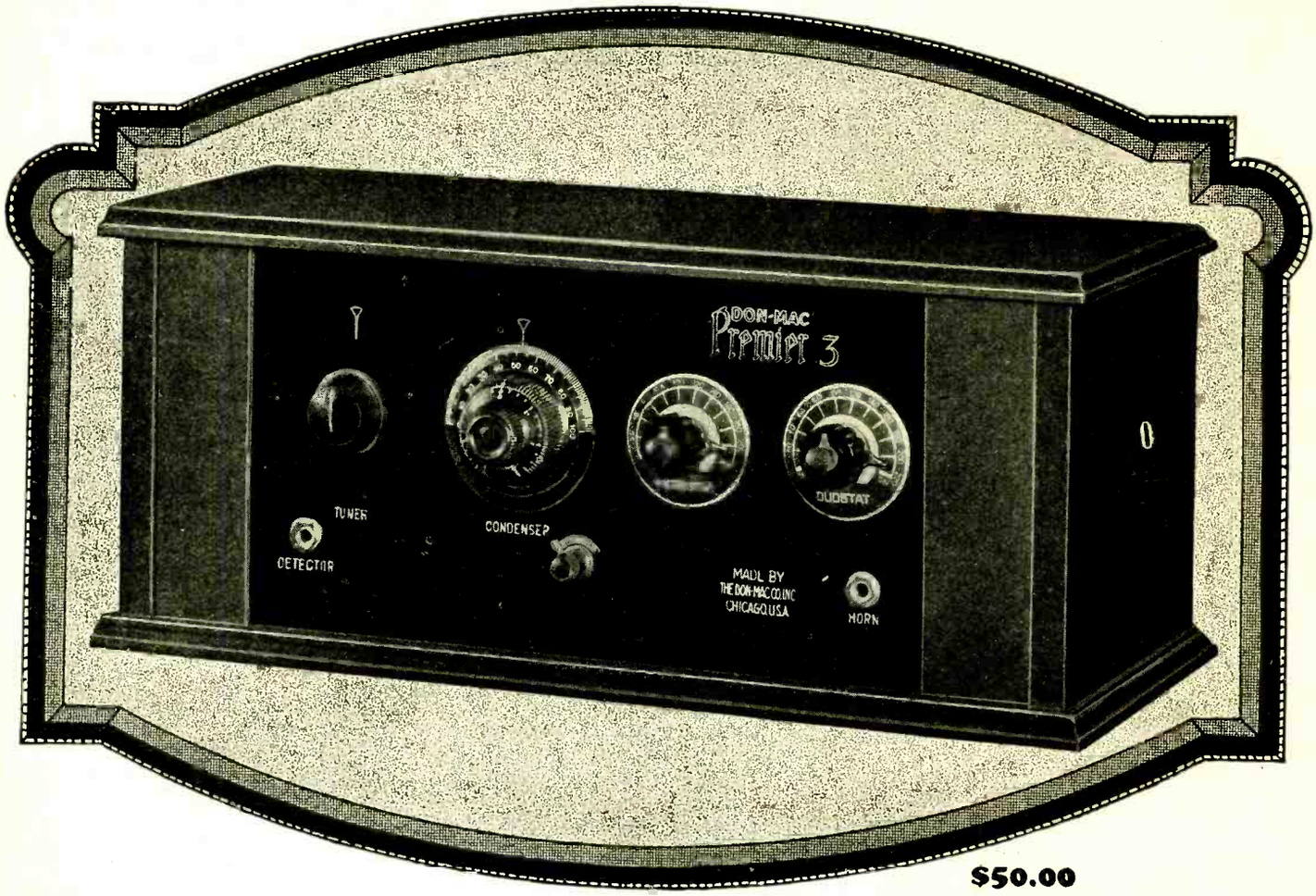


$50.00

The Outstanding Radio Value of 1925

THE DON-MAC PREMIER 3 offers to radio fans the best of everything in radio. Constructed throughout with standard parts furnished by reputable manufacturers such as Premier Electric Company, Bremer-Tully, and others whose products are made under the stamp of QUALITY.

Strict adherence to quality, many years experience and study and a desire to produce only a genuinely valuable product, have made the DON-MAC PREMIER 3 the outstanding value of 1925.

Have your dealer demonstrate the DON-MAC PREMIER 3 to you. You will immediately appreciate its fine tone quality and simplicity of operation.

The PREMIER 3 is a three tube 100% low loss, triple feed back set. Range and selectivity are remarkable with it. Coast to coast stations are easily brought in even through powerful local stations. Operates on loop aerial and reproduces clearly on loud speaker.

We have some interesting and valuable information for dealers who want a quality product at a popular price. Let us send you our proposition today.

Consumer—if your dealer does not handle the PREMIER 3 write us direct, giving his name.

SPECIFICATIONS

Premier Crowfoot Condenser	Premier Lo-Loss Sockets
Premier Duo-Stat	Bakelite Panel
Premier Microstat	Bakelite Baseboard (Specially built)
Premier Hegehog Transformers	Birch Mahogany Cabinet, 20"x8"x8".
Bremer-Tully Tuner	

Every minute detail of the parts entering into THE DON-MAC PREMIER 3 was selected on quality and performance alone.

DON-MAC CO., Inc.

29 SO. DESPLAINES ST.
CHICAGO - - ILLINOIS

A QUALITY SET—UNCONDITIONALLY GUARANTEED

Glossary of Circuits

The "How" and "Why" of Push-Pull Amplification

(See Page 94 for Diagram)

THE principal advantages of "Push-pull" amplification are as follows:

1—The signal current from the amplifier to which the "Push-pull" unit is attached is divided between two tubes. Thus, the tubes are not overloaded by strong signals from local stations.

2—In ordinary transformers there is a magnetic flux at all times in one direction, due to the "steady plate current" from the tube. In the push-pull circuit the steady component is "balanced out," leaving no flux except that due to audio-frequency variations in plate current. This gives a very nearly ideal condition in the transformer core.

3—The fact that we have two tubes in parallel in "Push-pull" amplification enables us to use a specially designed transformer in the output circuit, having very low resistance. This results in a maximum of current delivered to the loud speaker.

4—The *characteristics of any amplifying tubes*, particularly at audio frequencies, always produce a certain amount of undesirable harmonics ("kinks") which may, or may not be, noticeable to the ear. In "Push-pull' amplification, these harmonics are balanced out, resulting in a decided improvement in tone quality.

There are other advanatages of using "Push-pull" amplification in the last stage, but these additional points are somewhat too technical to discuss in a brief article of this kind. Having gained some knowledge of the principal advantages of "Push-pull" amplification, we shall now consider the operation of this unit.

For a "Push-pull" circuit, the output of an ordinary one or two stage audio frequency amplifier is connected directly to the primary winding of a special input transformer, which has two windings on the *secondary*.

It will be observed that both of the secondary windings are connected to a common terminal. It is evident that if one of the "G" terminals is at any instant positive with respect to the center terminal the other will at that instant be negative. Since the two "G" terminals of the double secondary windings are connected to the grid terminals of two tubes a positive potential is impressed on the grid of one tube, while simultaneously a negative potential is impressed on the grid of the other tube. This means that we have *divided the secondary voltage* of the input transformer equally between the two tubes of our "Push-pull" unit. The result is a corresponding increase and decrease in the plate currents of these two tubes, since this plate current is governed by the potential of the grid.

Having followed the circuit from the input terminals of the power unit, through the input transformer and thence to the grids of the two tubes, we will now consider the plate circuits of these two tubes and their relation to the output transformer.

In actual operation there is, at a moment of silence, a steady plate current flowing in both primary windings, but in opposite directions from the common terminal. Since these currents oppose each other —one "pushing" and the other "pulling"—their magnetizing effect on the iron core of the transformer is neutralized as stated above, and *there is no flux present*. But when a voltage appears on the grids, its effect is to *increase* one of these opposing plate currents and *decrease* the other, so that while one "increases its push," the other "relaxes its pull." Consequently, both windings *combine their effect* to produce a powerful sound current in the secondary. As a matter of fact, one stage of "Push-pull" amplification gives more volume than one stage of ordinary audio amplification, but somewhat less than two stages.

The principal value of "Push-pull" power amplification is its action in dividing the voltage delivered by the previous stage equally between the grids of the two tubes. From your studies of vacuum tubes you may remember that the output, that is to say the variations of plate current, is seldom, if ever, exactly in proportion to the signal impressed on the grid. This gives rise to "harmonics" which are balanced out in the "Push-pull" style of amplification, this being a further reason why we recommend a stage of "Push-pull" instead of a third stage of ordinary audio amplification. All radio engineers recognize the fact that even though it were possible to produce a transformer ideally perfect in every detail, yet with plate currents as high as those in an ordinary third stage, the *tube characteristics* alone would result in introduction of undesirable harmonics, and consequently would impair tone quality. This is exactly what the "Push-pull" circuit avoids.

In the following paragraph we list a number of suggestions which the builder will be wise in following when constructing his "Push-pull" power unit. We want to emphasize particularly the point regarding use of tubes of the same type in the power stage. That is, the tubes in parallel between the input and output transformers should be of exactly the same type; for instance, *both* tubes should be UV-201A or similar type tubes such as C-301A, or else both should be of any other type which you find gives good results.

We wish also to mention the advisability of constructing your stage of "Push-pull" amplification as a separate unit electrically. It can, of course, be incorporated mechanically as a fixed part of your set, but when wired as a separate unit, with its own plug and jack, it can be plugged in on either the first or second stage of audio frequency amplification.

Suggestions

1. Follow layout of apparatus as shown in the diagram. Make connections from transformers to circuit exactly as indicated on transformer plate. Grid and plate leads or wiring should be as *short as possible* to eliminate local feedback effects. These important leads may be shortened by raising the sockets an inch or two from the base board.

2. We recommend the use of UV-201-A or C-301-A tubes throughout the amplifier. *Be sure that you use tubes of like characteristics* in the power stage. *This is essential* to obtain the balancing effect: it is not so important in the other stages.

3. Ordinarily 90 volts will be found sufficient for the plate potential; however, when using power tubes, such as UV-202, greater voltages will be required, depending upon their specifications.

4. It is *essential* that the "C" or biasing battery be used. When using the 201-A type tubes, six volts will be sufficient; however, we suggest that you experiment with voltages ranging from three to nine and choose the value that gives the best tone. Ordinary flashlight cells will be found satisfactory, if cell-to-cell connections are well soldered.

5. We suggest the grounding of the transformer casing to the negative "A" battery or ground.

6. *Do not use soldering paste*—even so-called non-corrosive—in making joints in your wiring. Use only rosin-core solder.

7. Remember that a Push-pull amplifier depends absolutely, as does no other type, on perfect *balancing* of the two transformers; unless both are designed and made in a factory accustomed to *precision workmanship*, the neutralizing of distortion described above can by no means be depended on.

Non-Reradiating Superheterodyne

(See Page 98 for diagram)

This circuit has many desirable features, namely: Non-reradiation, strong signals on a loop, selectivity, quality of tone, simplicity, and compactness.

It will operate satisfactorily using 6 volt "A" tubes which draw only ¼ of an ampere apiece.

WD-12 tubes are used with a 6-volt "A" battery as the filaments are connected in series. The last two tubes are "A" tubes and are operated in parallel, using a 6-ohm rheostat.

This receiver will "get" all stations in the band of wavelengths used by radiocast stations and is equipped with a switching device for reception on the higher wavelengths.

In selecting parts use the best. Vernier condensers are essential when tuning this circuit.

The Browning-Drake Receiver

(See Page 90 for Diagram)

To Glen H. Browning and Frederick H. Drake, of Harvard University, belongs the honor of designing this remarkable receiver which has proved so efficient that over 90% of the value of amplification calculated by mathetmatics was actually produced when subjected to laboratory tests. The Browning-Drake Circuit has essentially two tubes—a radio frequency amplifier and detector to which two stages

of audio amplification may be added making a four-tube set for loud-speaker reception.

Mr. L. D. Yont, of Brighton, Mass., received 35 stations in one evening on this set, among which were: KGO, Oakland, California; KSD, St. Louis, Missouri, and PWX, Cuba. Dr. D. B. Cheetham, located in Worcester, Mass., says: "This set is a wonder—had Dallas, Atlanta and Kansas City the first night, before 9 P. M. on the loud speaker. Marvelous clarity and wonderful volume. Can't use push-pull on stations under 1500 miles; has too much volume."

List of Parts

The necessary apparatus for construction is given below:

1—panel, 7-24 inches.
1—baseboard, 8½x23½ inches.
1—Regenaformer kit, which consists of 1 .0005 mf. condenser, 1 .00035 mf. condenser, 1 antenna coil and 1 regenaformer.
1—balancing condenser.
4—standard tube sockets or one UV-199 tube stocket with three standard sockets.
2—audio transformers.
2—rheostats (1 of 10 ohms and 1 of 30 ohms resistance).
1—25-ohm fixed resistance.
1—volt-meter.
1—.0001 mf. fixed condenser.
1—.001 mf. or .002 mf. fixed condenser.
1—.00025 mf. fixed grid condenser.
1—variable grid leak.
1—double circuit jack.
1—single open circuit filament control jack.
1—filament switch.
1—1. mf. by-pass condenser (this is optional).
9—binding posts.
20—feet of wire for connecting parts.
4—tubes.
1—"A" battery.

Cockaday Four Circuit Tuner

(See Page 124 for Diagram)

Going a little beyond the three circuit tuner, Laurence M. Cockaday has designed a receiver in which four circuits are employed, insuring absolute elimination of interference, unlimited range and ease of tuning.

The primary circuit consists of a single turn of tinned copper bus wire 1/16 inch square, the secondary winding consisting of 65 turns of No. 18 DCC wire, stabilizer 34 turns of No. 18 DCC wire and the antenna tuning coil 40 turns of No. 18 DCC wire double bank wound.

No variations of coupling are necessary in a set of this type, therefore eliminating coupler, variometer and feed back coil, thus allowing a fixed regeneration feature that will stay put over the entire wave length's range.

It will be noted from the diagram that the primary inductance consists of only a single turn of wire, this being inductively coupled to the secondary. The wave length of the primary current is controlled by the bank wound inductive coil. As the inductive effect of this coil is used for adjusting the wave length, care should be taken in locating it in the set so that it will not have any inductive effect on the other coils.

The other three coils are all in inductive relation to each other. The antenna tuning is done by varying the primary coil by use of the switch lever. Regeneration and all secondary units are controlled by the use of the two (11 plate) variable condensers.

When tuning the receiver, one will at first find difficulties; but after a little practice and when more familiar with the set, it will seem very easy.

Tuned Plate Receiver

(See Page 94 for Diagram)

The tuned plate receiver is similar to the three circuit regenerative set, except that in place of a grid variometer for tuning the secondary and grid circuit, a 23 plate condenser is shunted across the secondary of the coupler. This makes the set tune sharper.

Superdyne Receiver

(See Page 112 for Diagram)

This is one of the very recent circuits which have appeared to be most successful in the many attempts to combine regeneration and radio frequency amplification.

The circuit differs from the usual radio frequency circuit in the use of the tickler coil. It is found in all tuned radio frequency circuits, that when all the circuits are tuned alike oscillations begin. Various methods have been tried to neutralize this tendency. In the superdyne, it is accomplished by use of the tickler coil, which may be adjusted so as to bring enough energy from the plate circuit to the grid circuit in the reverse direction.

When all connections are properly made, there should be no popping or squealing. If this occurs, try reversing the leads to the rotor of the coupler.

Choosing Your Receiver

In choosing a receiver that will give you the most satisfaction take into consideration the quality of tone consistent with volume. The set must bring in stations you want to hear and keep out the stations that you do not want to hear. Efficient performance day after day is an important item and this is more easily obtained from a receiver whose construction is simple.

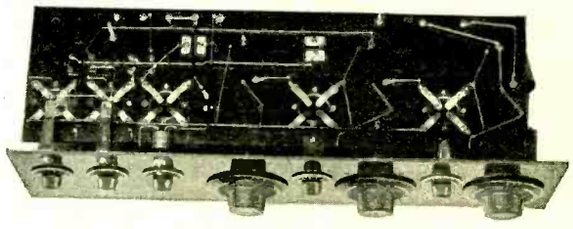
First of all your receiver is no better than the parts used. Each part has a distinct duty to perform and pains should be taken to see that each section of your receiver is operating at its maximum efficiency. You should request parts that have been thoroughly tested.

Each tube should be controlled by separate rheostats although the average set controls more than one tube with one rheostat. Such practice is at the expense of good reception, because tubes in use are known to develop peculiarities.

If you buy a receiver completely assembled, pick out one that is the simplest constructed. Do not pay for frills or complicated, mysterious equipment.

A well designed receiver will be so arranged that a minimum amount of wire will be used, and the connections must be perfect.

We understand that manufacturers of parts for this circuit have prepared a complete book describing the circuit, and it is suggested that you write to them for full particulars. You will find these parts advertised in another part of this book.



Here is an example of neat assembling and exceptionally careful wiring. Power losses are slight in this set because the interior wiring has been cut down to only 14 feet of wire where the average five-tube set uses 50 feet

The Hoyt Augmentor

(See Page 114 for Diagram)

To enable the builder to properly construct this circuit the dimensions of the coils are shown in another part of this book. The coils have a combination winding including an aperiodic primary.

It is important that the aperiodic primary be NOT used directly on the antenna when the receiver is in the city. This is to be used only with the stage of tuned radio frequency as shown in the diagram. With high powered stations operating only ten kilocycles apart, the day of the aperiodic primary is past where extreme selectivity is desired.

The antenna tuning coil should be very loosely coupled to the secondary; this is from two and a half to three inches, or it can even be at right angles. This position can be fixed, once it is determined. Tune out the most persistent interference and leave the coil in that position.

In constructing this receiver the best parts throughout should be used. Only the best grade of fixed mica condensers and low loss variable condensers should be employed. Standard 3½ to 1 audio frequency transformers give the best results.

Regarding tubes, it is recommended that 201-A or 301-A types be used, although the detector tube may be a 200 type if desired. But, as the rheostat setting is not at all critical in this circuit, the hard tubes may be used to advantage, and one rheostat for all of the tubes will then be sufficient. This of course is optional.

Be very careful when you construct the augmentor coil. The illustration gives the number of turns and size of wire to be used. The augmentor coupler has been designed around standard dimension

tubing, and there are on the market one or two makes of vario-couplers which can be purchased and rewound for this circuit.

Non-Reradiating Regenerative Receiver

(See Page 100 for Diagram)

With the constantly increasing number of radio listeners, the problem of radiation from the regenerative sets has become acute and any circuit that reduces or eliminates this feature will be welcomed by all radio fans.

In the first place due to the untuned antenna, the set tunes independent of antenna length, which is a decided advantage. The tuning is exceptionally sharp and for that reason micrometer dials must be used on condensers.

Under certain conditions of wiring the feed backs between some of the wires may render it advisable to run the lead from the fixed coupler to a potentiometer instead of directly to negative "A" but this is not ordinarily necessary. A variable grid leak is strongly recommended because of the variation of operating characteristics of the tubes available on the market.

This set has given remarkable results, as it will tune out local stations on less than one-half degree on the dial and for distant stations requires exceptionally careful tuning even with a micrometer dial control.

The circuit operates very well with hard tubes but a soft detector tube may be used in which case the proper "B" battery voltage must of course be used. Audio amplification can be added in the usual way.

For the advanced amateur who is interested in rather startling results, some very remarkable effects will be secured by placing ar. 11 plate condenser across the tickler coil, but it is not recommended to any one that is not possessed of a great deal of patience.

Care should be used in connecting the condenser with the rotary plates to the lowest possible potential in all cases and as the set is somewhat sensitive to body capacity, shielding is advisable, although when operating properly the body capacity effect is hardly noticeable.

The selectivity and success of this circuit depends upon the use of the best parts obtainable and inefficient parts will ruin operation of circuit both as to distance and selectivity.

45 Kilocycle "Super" Using UV 199 Tubes

(See Page 126 for Diagram)

Forty-five kilocycles is a very good frequency to use when the person constructing the set wishes to employ UV-199 tubes.

Efficient results depend a great deal on the intermediate frequency amplification employed. At relatively long wavelengths this is simple, but at the short broadcast wavelengths there is a tendency toward oscillation due to internal capacity and circuit coupling. This is overcome in this circuit by eliminating the "stabilizer" or potentiometer.

Another advantage of this set is that it employs dry battery tubes. The filament current is less than ½ ampere for the entire eight tubes. By using three "C" batteries the plate current drain on the "B" batteries is only 10 to 12 milliamperes.

A loop having three taps is used which gives a regenerative effect on the loop itself.

Maintaining Your Neutrodyne

(See Page 108 for Diagram)

The Antenna System

The best antenna for a Neutrodyne set is one consisting of a single wire of about 100 to 125 feet long, strung between supports that are as high as possible from the ground. The antenna must be insulated at each end by insulators of the highest quality. Whereas the antenna itself may be either of bare or insulated wire, it is extremely important that in no case it touch any structures such as chimneys, trees, neighboring buildings, etc., and that it should be at least several feet from any obstructions.

The antenna lead-in should in all cases be part of the antenna itself. By this is meant that the antenna wire stretched between the two supporting points is continued directly down from one end to connect to the receiving set. It is not necessary to cut the wire and then connect the lead-in to the antenna. This latter practice requires careful scraping of the antenna wires and secure soldering to insure good electrical contact and maximum efficiency. Making the antenna and lead-in all in one obviates the necessity of soldering. It is also important that the lead-in should be kept away from buildings, trees, and other obstructions.

The antenna lead-in, as it comes to the set, should be kept away from the set. It is poor policy to bring the antenna back along the length of the receiver, so that the electric field around it affects the receiver. This usually results in trouble and makes the receiver inoperative. It may be necessary at times to insert the antenna lead-in within a shield. This shield can best be of flexible copper braid or a copper tube, which should be connected to ground.

It is a very great advantage in installing an outdoor antenna or an indoor antenna, for that matter, to have the antenna directional. By directional it is meant that the antenna system will receive signals with greater efficiency from one direction than from another. The simplest method of erecting a directional antenna is: always connect the lead-in to the end of the antenna pointing toward the station from which it is desired to receive the signals.

An indoor antenna differs from an outdoor antenna only in that it is placed entirely indoors and therefore must be shorter and lower than the outdoor antenna. As a result the reception and intensity of the received signals must be considerably weaker than the corresponding signals as obtained from an outdoor antenna.

An indoor antenna may be made of ordinary insulated wire such as an annunciator or bell wire and concealed about the room by placing it behind picture moulding, etc.

The Ground Connection

The ground connection is one of the most important factors for the proper operation of any receiving set. In the city, especially in congested districts, the ground is exteremely important. The cold water pipe system of the house is usually the best ground connection The pipe or connection to which the ground is made must be very carefully scraped and cleaned so that the metal shows bright. A ground clamp will be of great aid in making a good connection, and can be installed in a few moments. The ground wire from the receiving set to the clamp must be securely attached to the clamp, and preferably soldered. It has been proven time and time again that reception has been increased from very poor to astounding results merely be removing the ground clamp, cleaning the insulating paint, dirt, etc., between the clamp and ground proper, and cleaning and soldering all connections.

Vacuum Tubes

The low filament battery consumption of filament tubes, namely, the types UV-201-A and C-301-A, or "hard" tubes, as they are called, has made their use almost universal, supplanting almost entirely the earlier UV-201 and C-301 types. However, the types UV-199, C-299 and WD-11, which are dry battery tubes, are fairly popular. The "UV" type tubes are known as Radiotrons and the "C" type tubes are known as Cunninghams. These tubes are made from identical specifications, and can be used interchangeably in any receiver.

UV-201-A or C-301-A tubes are recommended because of their greater amplification. However, when these tubes, or others, are used in a Neutrodyne receiver, there are times when the receiver does not seem to function properly. Among the various causes that may render the receiver inoperative is the fact that the tubes themselves are defective. By interchanging the tubes among themselves one may arrive at a combination which gives best results. Some tubes act better as radio frequency amplifiers and some better as audio frequency amplifying tubes. There is no way of telling beforehand; trial alone will tell.

One of the chief causes for tubes becoming inoperative after being used for some time is the excessive filament current to which they are sometimes subjected. Rheostats are put into the receiver to regulate the filament current of the vacuum tubes and should be adjusted so that the maximum signals are obtained with a minimum amount of filament current. It is a well established fact that when the filament such as the "UV" and "C" type tube is adjusted to a certain filament current, the maximum signal strength is obtained. Any further increase in the filament current *will not* and *should not* increase the signal strength.

The 2 ohm power rheostat previously furnished with some Neutrodyne receivers to control the amplifier tubes is so designed that when using UV-201-A or C-301-A tubes, one need but turn the rheostat knob until the contact lever just makes contact with the resistance strip. This will give the proper signal strength. Further decreasing the resistance by turning the rheostat knob further to the right will not increase the intensity of the signals. It will only diminish the life of the tubes and render them inoperative in a short period of

time. If it is necessary to cut out all the resistance to obtain the loudest signals, either the filament battery is discharged or one or more of the tubes are defective.

"Bootleg" tubes are very inferior to the genuine product and therefore must be scrupulously avoided.

Detector Tubes: The choice of a detector tube is dependent upon the type of service the broadcast listener desires. If he is content with consistent results from broadcasting stations at medium distances, no better tube can be used as a detector than either the UV-201-A or the C-301A. Should he desire to listen to broadcasting stations at great distances, in other words to try for "DX" reception, the "soft" tube type UV-200 or C-300 should be used.

The "hard" tube requires no adjustment of its filament current beyond the initial adjustment to obtain signals. Thereafter the filament rheostat need not be adjusted every time the receiver is used. Local powerful broadcasting signals will not swamp or overload "hard" detector tube but on the contrary such signals will be more efficiently rectified. Signals obtained when using a "hard" tube as a detector in this case will be several times as loud as those obtained with a "soft" detector tube. The relative lack of sensitivity of a "hard" tube for weak signals renders the receiver in which it is used, seemingly more highly selective than when a "soft" detector tube is used. The "soft" tube of the UV-200 or C-300 type is very sensitive to weak signals. It is therefore an excellent tube to be used for the reception of long distance signals. A "soft" tube contains a slight amount of gas, and due to partial ionization, or the breaking down because of electronic bombardment of the gas, it becomes extremely sensitive. It therefore requires very careful adjustment of its filament current and its plate potential, in order that the most sensitive point be obtained. This makes the tube a rather critical device, and requires some experience to obtain the maximum results. Due to the gaseous ionization, a "soft" tube is somewhat noisy in operation, and therefore a compromise must be made between the tube noise and the strength of the signal desired.

Signals of various intensity will require different adjustments of the filament current of a "soft" tube. For fairly strong signals from nearby stations it is not necessary to adjust the filament current of the tube to the maximum sensitive point. For weak signals, it is abolutely necessary to obtain the most critical point of operation. Thus, the filament current required for strong signals is less than that required for weak signals. In tuning in for any particular station, it is best to reduce the filament current of the detector tube until the signals obtained are fairly weak. Then turn the dials of the receiver until maximum signals are obtained. The signal then obtained should not be very strong. Now the filament current of the detector tube is increased until maximum response is obtained. If this procedure is followed the receiver will be tuned exactly to the incoming wave length of the broadcast signals. Following this method the operator will not be confused by the seemingly broad tuning obtained when listening to strong signals and with his detector tube adjusted for extreme sensitivity.

The plate voltage required for a "soft" detector tube is usually between 16 and 25 volts. This voltage is best determined by listening to the "hiss" which is very charactertistic of the "soft" detector tube when it is adjusted to its critical point of operation. The best plate voltage is that voltage at which a reasonable adjustment of the filament is necessary to obtain this "hiss" point. If the plate potential is low, more filament current will be required to obtain the hiss point, than if the plate potential is higher. If, after adjusting the plate voltage throughout the entire possible range, this point is not obtained, either the filament battery is low and insufficient filament current is obtained, or the particular detector tube is defective, and should be replaced.

New Radio Chart

The Radio Chart Bureau of Fresno, Calif., has perfected a new radio chart that is so designed that the operator can find the desired station in the minimum amount of time.

If the directions printed on this Radio Chart and the Call-Letters Tabulator are followed closely, the operator of any kind of receiving set can keep constantly up-to-date, regardless of the continuous wavelength changes and new stations coming on the air.

In re-locating, for instance, a station previously indexed for which either the Call-Letters or Wavelength is known, the operator can conveniently eliminate all unwanted Call-Letters or Meters by looking only in the particular column for the desired information.

When a new station is received which has not yet been logged on the chart and for which the Call-Letters cannot be distinctly understood, the approximate wavelength can be quickly determined by following the directions printed on the Call-Letters Tabulator. Here again the operator can conveniently eliminate the many hundreds of unwanted Call-Letters until the correct Call-Letters for the new station are definitely determined beyond doubt. There are sufficient blank spaces provided on the Call-Letters Tabulator so that the operator can constantly insert any meter changes or new stations coming on the air as announced in radio publications, an advantage which has not been provided for in the many publications giving printed information of Call-Letters, Wavelengths, etc.

Audio Frequency Amplification

During the past few years vacuum tubes have practically displaced all other forms of audio-frequency amplifiers, because of the great volume and fidelity of reproduction obtainable with the tubes. Their use always requires some sort of coupling device, and the most effective is the transformer. An amplifier tube, together with the transformer which supplies the input current to its grid, make up what is called one *stage* of amplification.

We shall not attempt to describe in detail the amplifying action of the vacuum; we shall simply say that a vacuum tube of any of the common types, used without the grid condenser and leak, has primarily a "valve" action, by which we mean that an alternating voltage delivered to the grid of the tube "stops off" and "releases" the flow of plate current so as to mould it very closely to the wave form of the grid voltage itself. Hence the voltage we get from the detector tube need only be high enough to "work the valve" on the grid of the amplifier tube. However, we cannot connect the detector output directly to the amplifier grid, since we must have there only the *variations* of the plate voltage, and not the full continuous "plus" voltage necessary on the detector plate. So we use, as by far the best means of getting these variations of voltage delivered to the amplifier grid, an "audio-frequency transformer."

To the radio-wise, we could define a transformer as simply a very close inductive coupler—but for such readers no definition would be necessary at all. So instead, we have on this page a picture which symbolizes the parts of a transformer so that their functions can be better understood. Any iron-core transformer is, in its operation, simply a chain of three "links": two coils of wire, each interlinking with the iron core or "magnetic link." According to the principle of electromagnetic induction, when an alternating electric current is sent through one of the coils, it causes magnetism to appear in the iron core, and all changes and reversals of the current are accompanied by corresponding changes and reversals of magnetism. All the changes of magnetism are at the same time causing voltages in the other or secondary coil, proportional to the rapidity with which the magnetism is changing, and therefore proportional to the rapidity with which the primary coil current is changing.

The kind of current which flows from the detector to the audio frequency amplifier is a "direct current," since it flows always in one direction, but it is a "pulsating direct current," because its strength is not uniform, but varies according to the form of the sound wave it is transmitting. This is the current which we send through the primary coil of our transformer, and variations in it cause continual variations in the magnetism of the core. Imagine one of these "peaks" of current coming from the detector; as the current grows, it causes a voltage to appear in the secondary. Then, as the primary current stops growing and reaches its maximum, the secondary voltage vanishes; as the primary voltage now begins to decrease, voltage appears again in the secondary, but in the reverse direction.

All these changes of secondary voltage are transmitted to the grid of the amplifying tube, reflecting each little "kink" in the primary (detector) current. The *voltage* of this secondary current depends on the number of turns in the secondary coil as compared with the primary; thus, by winding five times as many turns on the secondary as on the primary, we have a "5 to 1 ratio" transformer, and can send out to the amplifier grid a voltage almost five times as high as we get from the detector plate. This "stepping up" of voltage increases the amplifying action.

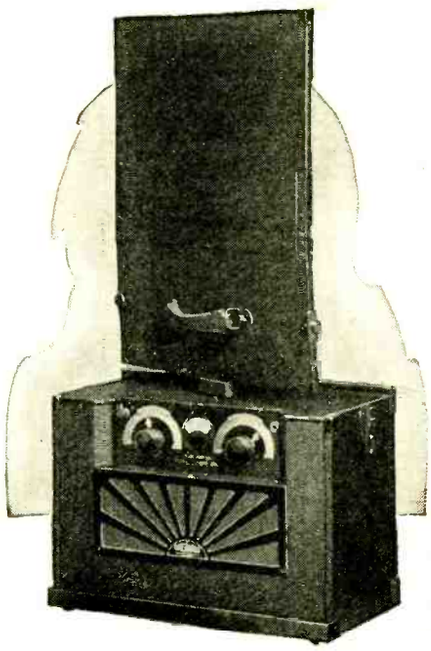
Now—more than ever *the* Right Set to Buy

The self-contained set is the radio receiver of the future—and the only satisfactory type for summer use

There are a host of people who will get fully as much pleasure out of radio this summer as they have all winter. They are the thousands of owners of the 1925 Operadio. Whether they stay at home or travel, splendid radio reception is always available. For with this complete, self-contained set they may listen in anywhere. Its extra large battery supply, six tubes, large loop in the removable cover, and efficient loud speaker—all enclosed in the compact carrying case—assure powerful distance performance. Think of it! No outside wires or connections, no accessories, nothing but a smart-looking case, opened and easily tuned in less than a minute. The 1925 Operadio is not to be confused with the ordinary so-called "portable" set. It has far longer battery life because three years of concentrated effort by nationally known radio engineers has resulted in extreme compactness, allowing space for six "A" batteries and four of the largest "B's." It has greater range and selectivity, greater ease of tuning, and much finer tonal qualities than any set of this type ever designed, and its performance is comparable with that of any set on the market. Before you buy any set, judge it by the standard established by the Operadio. Get the convenience and added enjoyment of a set that can be enjoyed anywhere. If your dealer is not yet handling Operadio, write us and mention his name.

THE OPERADIO CORPORATION
8 South Dearborn Street CHICAGO, ILL.

OPERADIO
The Original Self-Contained Radio Set

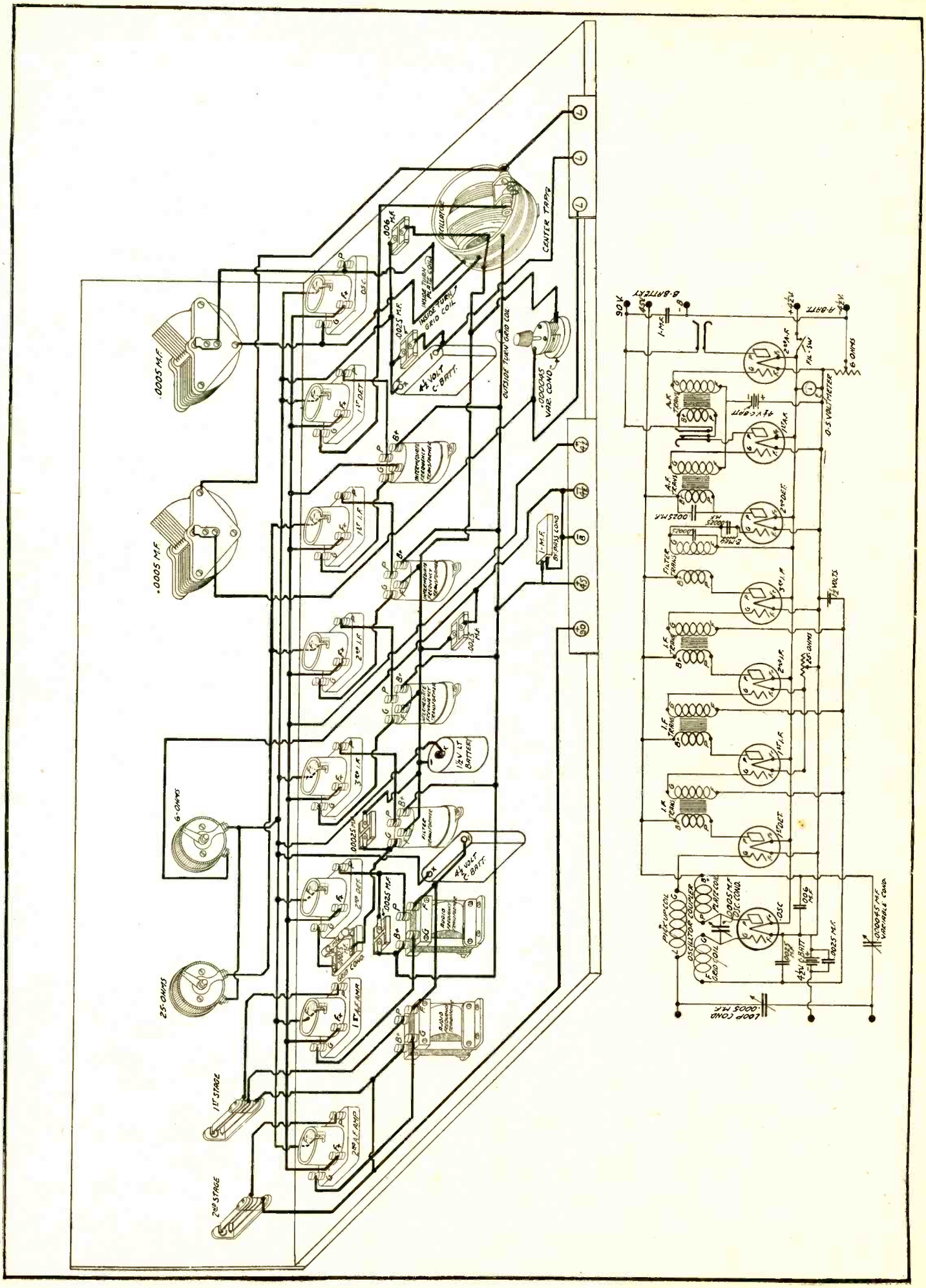


The Operadio is entirely complete in its smart leatherette carrying case. An attractive De Luxe Walnut Cabinet has also been designed for those desiring a furniture model in which the case may be placed.

Price Complete
With Tubes and Batteries
(Portable Type Only)
$189.00

Close it up
Take it with you
Use it anywhere

45 Kilocycle "Super" Using UV199 Tubes



BROADCASTING

the *SilverVoice* Story to Your Customers and Prospects in 1925

This smashing full page in Collier's, The National Weekly, will bring business to every dealer

Write Now for the SilverVoice "S-A-L-E-S Broadcast"

Both together we can do *volume selling*, and you will sell more loud speakers than any other dealer in your locality. Your profits start when you "tune in". Do it now! Every dealer should write at once.

Distributors: A few Jobbing Territories still open. Write or Wire.

RADIOTIVE CORPORATION

21st AVENUE & 53rd STREET BROOKLYN, N. Y.

Advertising

WE will run a series of nine advertisements in Collier's, *The National Weekly*, beginning with a striking full-page in the February 7th issue.

Collier's million families are just the type of people who are now coming into your store. Collier's has a special Radio Department which interests radio fans, and it is read by the kind of men and women who can afford good radio speakers.

We also are running newspaper advertising in large cities. This advertising has wide influence beyond the cities themselves; being read in outlying small towns and suburbs. Moreover, large cities read one another's papers. You can buy New York papers in Boston and Boston papers in New York. Thus, by merely concentrating on the richest markets — where you are — we can further make the SilverVoice name nationally known.

Dealer Cooperation

Half the power in this drive is the individual effort of our dealers. Through *you* we will apply pressure on your townfolks *where the sales are actually made.* You will find that our advertising makes sales easy if you tie up to it.

By advertising and by local display at your store we *send them in* and you *bring them in* — to your profit.

Write Now!

For the Silvervoice S-A-L-E-S Broadcast

Buy Where WESTON Radio Instruments are sold—*You'll find a Quality Stock*

Radio Plug

The smooth and instantaneous action of this Radio Plug, the positive grip, the beauty of design and finish, mark it as a typical Weston product. The large popular demand has made this plug one of radio's outstanding sale successes.

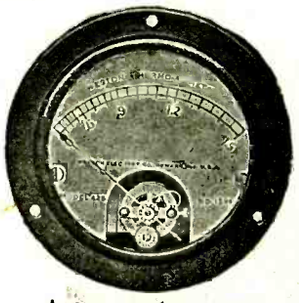
Radio Table Voltmeter

This model 489 Double Range Radio Table Voltmeter with ranges of 150-75 volts was especially designed by the Weston Corporation for the radio enthusiast. It is a high resistance instrument, beautifully made with a strong Bakelite case. Its portable form, accuracy, dependability and range combination make it an ideal all purpose voltmeter around the radio set, for checking filament and grid voltages, locating troubles such as loose or broken connections, testing new hook-ups, for improving reception and for materially increasing the useful life of the tubes through close regulation of filament voltage.

Filament Voltmeter

A Filament Voltmeter is no longer a luxury. It is now recognized as an essential of every good radio set, because close regulation of filament voltage improves reception and materially lengthens the life of the tubes.

As the ammeter on the dash of the automobile is the telltale of the battery, so is the filament voltmeter the tell tale of the radio set.



Antennae Ammeter

This Weston thermo-couple type Ammeter solves perfectly the problem of measuring high frequency currents, such as are imparted to the antennae. It also measures accurately and with equal facility, alternating currents of low frequency. It is also accurate on direct current service and is a remarkable contribution to the art of electrical measurement.

Thermo Galvanometer

A sensitive Thermo-milliammeter of low resistance, designed especially for use in a wave meter circuit for the measurement of wave length and decrement; and for the measurement of high frequency resistances by the resistance and reactance variation methods. It has a large overload capacity, a resistance of 4.5 ohms and requires only 115 milliamperes for full scale deflection.

FOR over 36 years Weston Electrical Indicating Instruments for Power Switchboards, Commercial Testing, Standardizing Laboratories, Research Work, etc., have been recognized as the world standards.

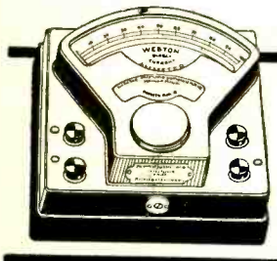
Weston Radio products embody the same forethought and preciseness of design and workmanship to be found in the larger instruments so long used in the electrical measuring field. These instruments have won for Weston its well-known international reputation.

These radio instruments are accurate, dependable, and will render a lifetime of service if used with reasonable care. Furthermore, the interest of the Weston Corporation does not cease at the time of the making of a sale. It wants to be assured that every purchaser of a Weston Instrument actually receives the service he has a right to expect. Any information regarding individual experiences with these instruments will always be welcomed.

WESTON ELECTRICAL INSTRUMENT CORPORATION

1 Weston Avenue - Newark, N. J.

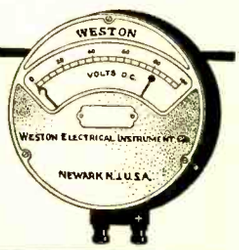
OFFICES IN ALL PRINCIPAL CITIES



STANDARD THE WORLD OVER

WESTON

Pioneers since 1888



Simple or Complex Tuning —Which do you Want?

Simple tuning, to be sure! Then why not use the only single plate vernier condenser that can be tuned and definitely logged on neutrodyne or radio frequency circuits without a preliminary operation of setting the vernier. Why not use the condenser with a single plate vernier that will give you the complete wave range of your coil without an extra operation. The Proudfoot Low Loss One Knob Vernier Condenser is built for modern hook-ups.

Assemblage

Two rods, instead of three, completely and efficiently support stator plates.

Tuning Plates

Stator and rotor plates are made of No. 18-B. & S. Gauge (.040-in.) aluminum with .026-in. clearance.

Vernier Plate

Vernier plate lining up and operating as one of the rotor plates in making rough adjustment, insures quick tuning and extreme range of capacity. In making vernier adjustment, it turns a complete 360 degrees.

End Plates

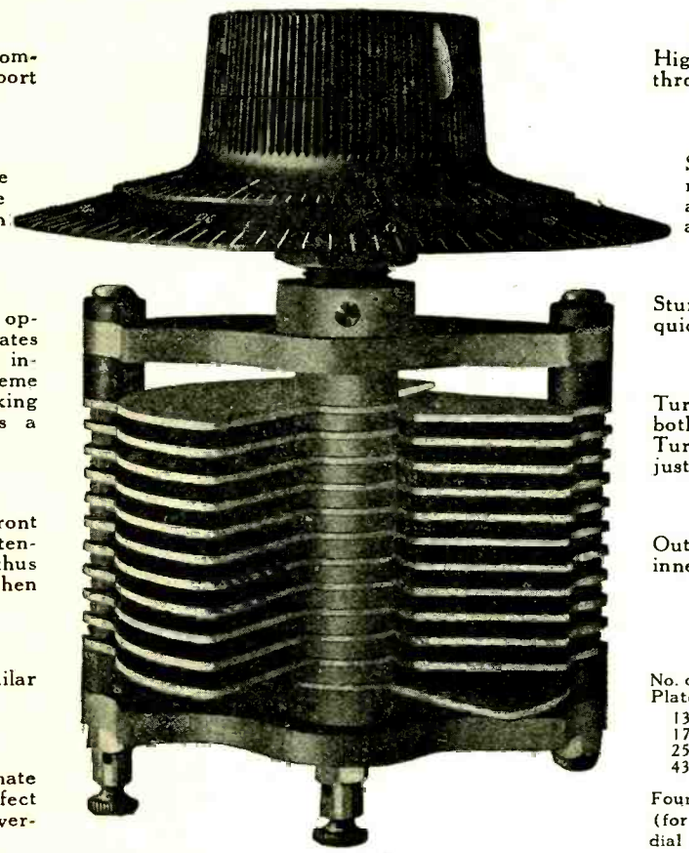
Made of ⅛-in. aluminum. Front end plate is at the same potential as the rotor plates, thus eliminating body capacity when grounded.

Bearings

Bronze bearings with dissimilar metals at wearing points.

Contacts

Three positive contacts eliminate the pigtail and provide perfect electrical connection of the vernier.



Insulation

High grade hard rubber is used throughout for insulation.

Mounting

Single hole in panel and single nut firmly lock the condenser at the most efficient working angle.

Connections

Sturdy binding posts permit quick, positive wiring.

Adjustment

Turning complete knob adjusts both group and vernier plate. Turning outer half of knob adjusts only the vernier plate.

Logging

Outer scale logs group plates and inner scale logs vernier plate.

Prices

No. of Plates	M.F.C.	With Vernier Dial and Knob	Without Vernier Dial and Knob
13	.00025	$3.75	$3.25
17	.00035	4.40	3.90
25	.0005	4.50	4.00
43	.001	5.75	5.25

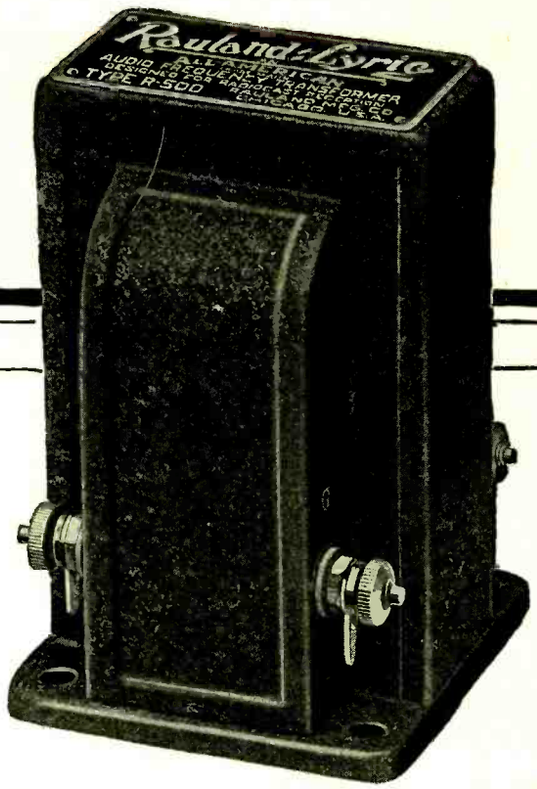
Four-inch polished bakelite two piece (for group and vernier readings) dial $1.00

See the Proudfoot at your dealer's. Note the sturdy construction—that explains why it is such a serviceable unit. It is used as standard equipment in many popular nationally-used sets. And it's priced right, too! Get one today. If your dealer cannot supply you, write us sending us his name and we will see that you are promptly supplied.

Cruver Manufacturing Company

2456 Jackson Boulevard, Chicago, Ill.

PROUDFOOT Low Loss One Knob Vernier Condenser



Tonal Beauty Lies Deeper than the Varnish

DEEPER even than the circuit diagram—chiefly, indeed, in the *audio transformer.*

All-American engineers, builders tor years of the *largest selling transformers in the world,* have achieved another triumph, in the *world's finest transformer* at any price. *Rauland-Lyric amplification,* with an ordinary tuner and loudspeaker, has received the plaudits of musical authorities hitherto skeptical of all radio reproduction.

Perfect amplification makes of a radio a joy unending. Who shall say that such a benefit is not worth the slight additional cost?

There is romance in the story of Rauland-Lyric. A request will bring it to you complete — from the laboratory studies to the auditions with world-famous music critics. All-American Radio Corporation, 2678 Coyne Street, Chicago.

The price is nine dollars

Rauland-Lyric

AN

ALL-AMERICAN

TRADE MARK

TRANSFORMER

The Choice of Noted Music Critics

For further details on All-American Reflex Sets, see pages 48-51

Another Famous TOWER

Tower's Scientific LOUD SPEAKER

$8.50

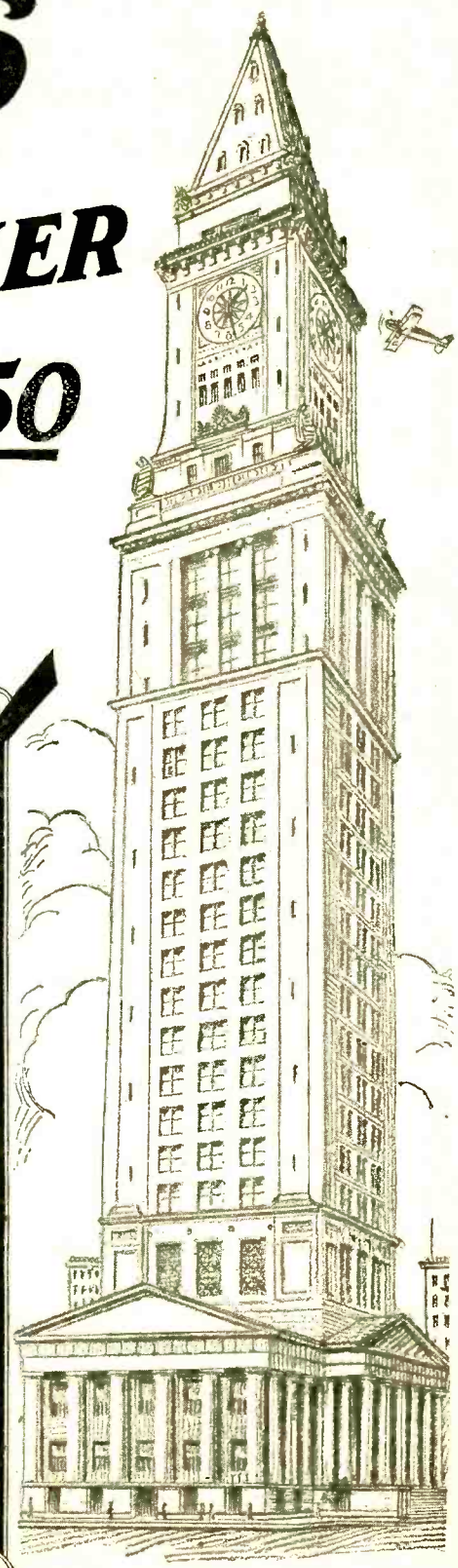
It had to be the BEST

We could have manufactured a loud speaker two years ago, but we wouldn't! We have waited—studying, planning, continually striving for perfection and now at last! WE HAVE IT—In the new TOWER'S LOUD SPEAKER. Surely a Wonderful TOWER Triumph.

The many features include, magnets that lift 2 lbs. 10 oz. diaphragm of specially constructed material, perfect non-vibrating horn, 10" bell.

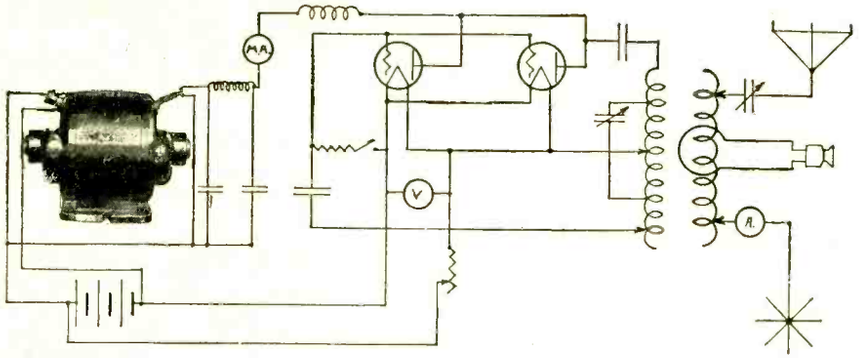
TOWER'S phones are tested by Government Licensed Radio Operators. Weight only 8¼ oz. On sale at all good dealers from coast to coast.

THE TOWER MFG. CORPORATION
98 BROOKLINE AVE. Dept. F BOSTON, MASS.



The U. S. Custom House Tower at Boston is 500 feet high and is situated in the business district overlooking Boston Harbor. It is the tallest Government building in America.

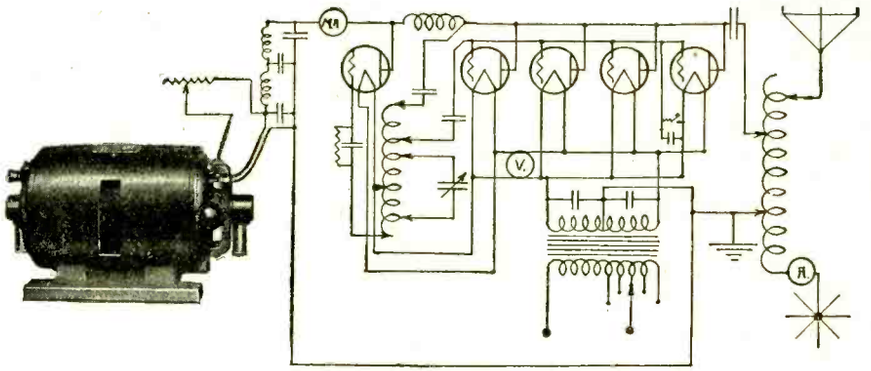
Worlds Greatest Loud Speaker Value



A SMALL PORTABLE SET FOR THE AUTO, BOAT OR HUNTING LODGE.
KEEP IN TOUCH WITH BUSINESS AND THE FOLKS AT HOME.

Item No. 68 6-12 volt primary, 500 volts, 40 watt secondary.

This little ten watt set can easily be constructed for less than $100.
Requires a minimum of technical knowledge to effectively operate.



Item No. 8 Type M. G. 113 500 volts 150 watts when used with one five watter as a master oscillator and four as amplifiers, will make a set of which the owner may be justly proud. A real DX getter.

This is but two of the many combinations built by "ESCO" and designed to give a **"pure wave,"** and the **maximum miles per watt.**

Don't forget—the maximum miles per watt equals the maximum miles per dollar.

TRADE **"ESCO"** MARK

MOTORS - DYNAMOTORS - GENERATORS - MOTOR-GENERATORS

Used by more than 150 Universities—Colleges—Research Labs., etc. Many Federal—State—County and Municipal Depts.
Write for Bulletins 237B and 242A Listing over 200 combinations

Send us your problems—we'll help you solve them

ELECTRIC SPECIALTY COMPANY

267 South Street, Stamford, Conn., U. S. A.

Pioneers in Developing and Perfecting High Voltage Wireless Apparatus

STORAD RADIO BATTERIES

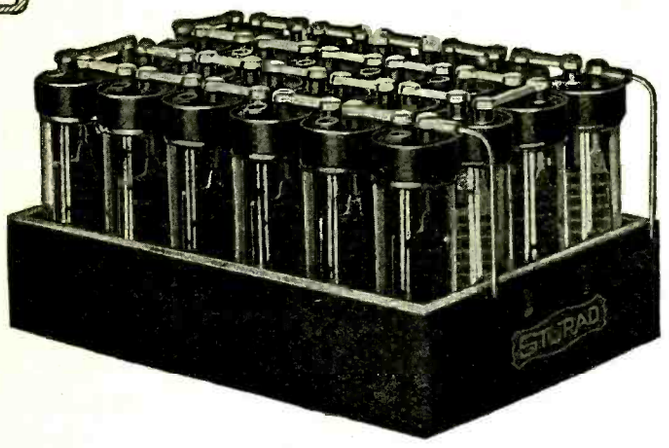
STORAD Leads the Way

STORAD Storage "B" Batteries are designed and manufactured by Storage Battery Engineers who know radio and its battery requirements.

STORAD is a pioneer in the Storage "B" Battery field. The following points emphasize its superiority:

STORAD has especially designed combination perforated rubber and treated wood separators.

STORAD has a special patented top combining the advantages of the soft and hard rubber tops.



STORAD has heavy glass jars made up according to exact specifications especially for this purpose.

STORAD has heavy plates 5/16" thick. These are necessary for high capacity, long life and constant voltage.

STORAD has a capacity of 4½ amp. hrs. It's a heavy duty battery.

STORAD has welded on cable terminals which eliminate the use of expensive, troublesome and corrosive clips which more often than realized are the cause of noisy and poor reception.

STORAD is compact.

STORAD gives the right kind of power because it is not connected with any outside power lines.

With static, local interference due to power lines, street cars, other receiving sets, etc., it is necessary to reduce radio power interference to a minimum if satisfactory reception is to be accomplished.

STORAD is noiseless in operation and will aid in obtaining satisfactory reception. The U. S. Bureau of Standards tests show that "B" Batteries are absolutely quiet and noiseless during the entire life of the battery.

STORAD supplies power of a steady, even voltage in pure direct current. This assures an even volume of sound because it is not subject to fluctuation of voltage like the ordinary house lighting circuit.

That's why we say that for "B" circuit power STORAD "B" Batteries will give ideal results.

The STORAD Storage "B" Battery is built in two sizes—24 and 48 volt units. Capacity for both sizes, 4½ ampere hr. (4500 M. A. H.)

Get STORAD from your dealer. Ask for them by numbers.

STORAD No. 4548—48 volt.
STORAD No. 4524—24 volt.

STORAD "B" Battery Charger

A chemical rectifier that will charge 48 volts of "B" Batteries at a time. Inexpensive to operate. Complete instructions with each charger. Ask for part No. 4R.

Insist That Your Dealer Supply You with Storad Battery Products

STORAD "A" Battery

A heavy duty Storage Battery for radio work. Has full 100 amp. hr. capacity. Handy carrying handle. Ask for STORAD "A" Battery No. R. A. 100.

STORAD "C" Battery

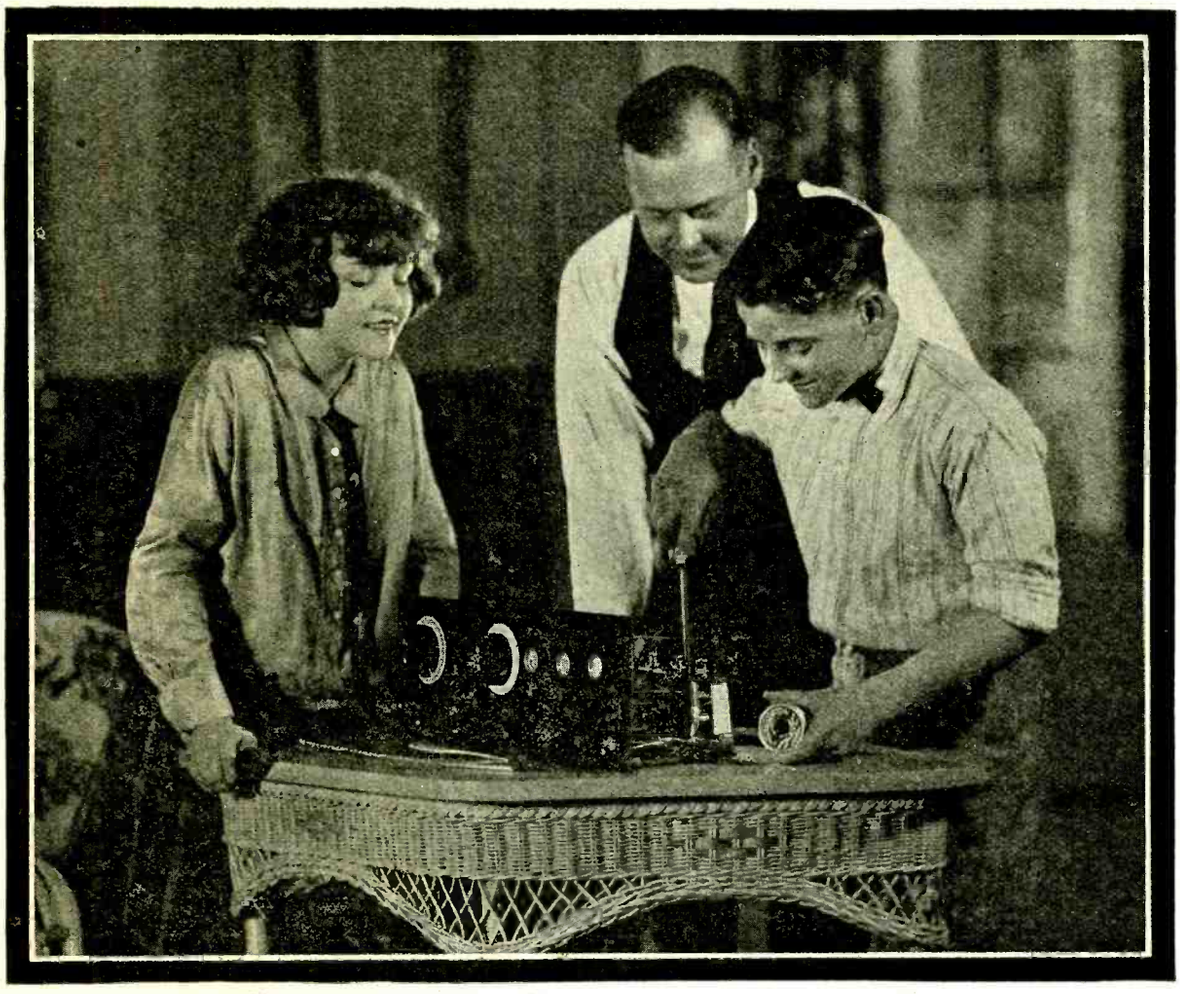
Every radio set needs a "C" Battery for best reception. STORAD "C" Batteries are rechargeable. Made in 4 volt units. May be used as additional "B" Battery if needed. No. 2-C.

THE CLEVELAND ENGINEERING LABORATORIES CO.

2427 Superior Viaduct, N. W. **Cleveland, Ohio**

KESTER *Radio* SOLDER

(Rosin Core)



Oh boy! It Sure is Safe and Simple

"Requires Only Heat"

Approved by Radio Engineers

IF YOUR DEALER CANNOT SUPPLY YOU

Chicago Solder Company
4226 Wrightwood Ave., Chicago, Ill.

Gentlemen: Send me one can Kester Radio Solder, for which I enclose 25c in stamps.
(Postpaid anywhere in U. S. A.)

Name .....
Address .....
City ..... State .....
Dealer .....

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

As world pioneers in the art of sound reproduction and amplification, Magnavox has brought radio to its highest point of MUSICAL expression.

YEARS AGO, when the Radio meant little more than listening through a set of headphones to a phonograph record played a few miles away, Magnavox developed the now famous electro-dynamic Reproducer.

This instantly opened the door to that astonishingly vast fund of free musical entertainment, lectures, and feature programs which Radio offers the world today.

The name Magnavox now stands for a great organization pledged to the highest manufacturing standards, initiative in research, and policies insuring unequalled value to the purchaser of any Magnavox instrument.

Especially important to the new radio user (and also those who desire to replace their old equipment with the latest and best apparatus obtainable) are the remarkable cabinet receivers and storage battery tubes now exhibited by Magnavox dealers everywhere.

Magnavox Radio Products

Broadcast Receivers—A 5-tube tuned radio frequency circuit with Unit Tuner and Volume Control, in handsomely carved cabinets with built-in or external Magnavox Reproducer . . . **$125.00, $150.00**

Vacuum Tubes—Amplifier and Detector Tubes designed on new principles making them far superior to ordinary storage battery tubes for all standard sets . **$5.00**

Reproducers—Instruments of the electro-dynamic type with Volume Control, and of the semi-dynamic type requiring no external battery, for all vacuum tube receiving sets . . . . . **$25.00 to $50.00**

Phonograph Attachment—The semi-dynamic Magnavox Reproducer mechanism in a unit readily attached to any standard phonograph **$15.00**

Registered Magnavox Dealers in every community are prepared to demonstrate Magnavox Radio equipment. Catalog on request.

THE MAGNAVOX COMPANY

OAKLAND, CALIFORNIA

NEW YORK: 350 W. 31st St. CHICAGO: 162 N. State St.

Canadian Distributors:

Perkins Electric Limited, Toronto, Montreal, Winnipeg

Earn $50 to $200 a Week *in* RADIO

You can! Hundreds of ambitious men are already earning thousands of dollars in this wonderful new industry—you, too, can get your share. Mail coupon below for Free Book which describes fully the amazing money-making opportunities in Radio and tells how YOU can earn from $5,000 to over $10,000 a year.

The astounding growth of Radio has created thousands of big money opportunities. Millions of dollars were spent during the past year on Radio, and thousands of young men are needed right now to meet the ever-increasing demand of work.

Men are needed to build, sell and install Radio sets—to design, test, repair—as Radio engineers and executives—as operators at land stations and on ships traveling the world over—as operators at the hundreds of broadcasting stations. And these are just a few of the wonderful opportunities.

Easy to Learn Radio at Home in Spare Time

No matter if you know *nothing* about Radio now, you can quickly become a Radio expert, by our marvelous new method of practical instruction—instruction which includes all the material for building the latest up-to-date radio apparatus.

PAY INCREASES OVER $100 A MONTH

I am averaging anywhere from $75 to $150 a month more than I was making before enrolling with you. I would not consider $10,000 too much for the course.

(Signed) A. N. Long,
Greensburg, Pa.

DOUBLES SALARY

I can very easily make double the amount of money now than before I enrolled with you. Your course has benefited me approximately $3000 over and above what I would have earned had I not taken it.

T. Winder,
Grand Junction, Colo.

FROM $15 to $80 A WEEK

Before I enrolled with you I was making $15 a week on a farm. Now I earn from $2080 to $4420 a year, and the work is a hundred times easier than before. Since graduating a little over a year ago, I have earned almost $4000 and I believe the course will be worth at least $100,000 to me.

(Signed) Geo. A. Adams,
Tamaqua, Pa.

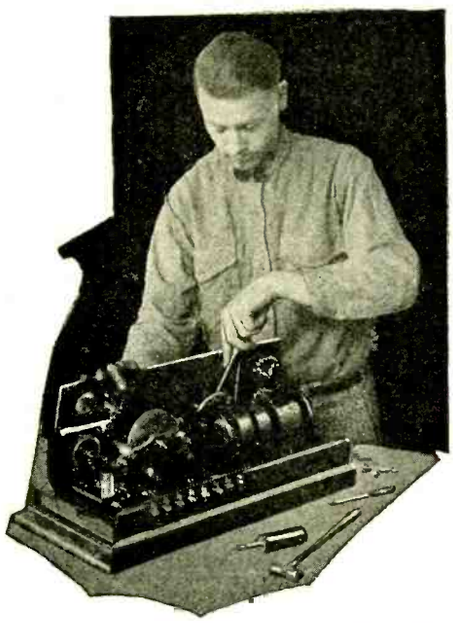
Scores of young men who have taken our course are already earning from $75 to $200 a week. Merle Wetzel of Chicago Heights, Ill., advanced from lineman to Radio Engineer, increasing his salary 100% *even while taking our course!* Emmett Welch, right after finishing his training, started earning $300 a month and expenses. Another graduate is now an operator of a broadcasting station—PWX of Havana, Cuba, and earns $250 a month. Still another graduate, only 16 years, is averaging $70 a week in a radio store.

Wonderful Opportunities

Hardly a week goes by without our receiving urgent calls for our graduates. "We need the services of a competent Radio Engineer." "We want men with executive ability in addition to radio knowledge to become our local managers." "We require the services of several resident demonstrators"—These are just a few small indications of the great variety of opportunities open to our graduates.

Take advantage of our practical training and the unusual conditions in Radio to step into a big paying position in this wonderful new field. Radio offers you more money than you probably ever dreamed possible—fascinating easy work—a chance to travel and see the world if you care to or to take any one of the many radio positions all around you at home. And Radio offers you a glorious future!

The National Radio Institute is America's Pioneer Radio School—established in 1914. Our course is the absolutely complete one now being offered which qualifies for a government first-class commercial license. It gets you the *bigger* paying jobs in Radio.



Send for FREE RADIO BOOK

Learn more about this tremendous new field and its remarkable opportunities. Learn how you can quickly become a radio expert and make big money in radio.

We have just prepared a new 32-page booklet which gives a thorough outline of the field of Radio—and describes our amazing practical training in detail. This Free Book, "Rich Rewards in Radio," will be sent to you without the slightest obligation. Mail coupon for it *now!*

For a short time we are offering a reduced rate to those who enroll at once. Act promptly and save money.

National Radio Institute
Dept. 85EB
Washington, D. C.

NATIONAL RADIO INSTITUTE
Dept. 85EB, Washington, D. C.

Please send me without the slightest obligation your Free Book, "Rich Rewards in Radio," and full details of your special offer of Free Employment Service. Please write plainly.

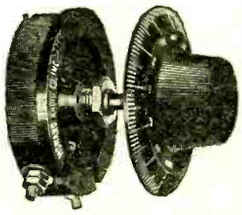
Name..... Age.....

Address .....

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

HOWARD RADIO COMPANY—CHICAGO

HOWARD STANDARD RHEOSTAT WITH DIAL CONTROL. Note the simplicity of this rheostat and the convenience of drilling only one hole in the panel for mounting.



HOWARD Rheostats are guaranteed to give uniform service, perfect filament control and maintain constant resistance under continuous duty. HOWARD Rheostats meet every radio requirement. Workmanship and materials are of the highest quality. The bases are of special heat resisting materials, preserving shape and finish under all operating conditions. Slide contacts are phosphor bronze, insuring perfect electrical connections and resistance elements constructed of special non-corrosive resistance wire, accurately spaced by precision machines and wound under tension on a seasoned fibre strip so that the turns cannot come loose. Carrying capacity 1.5 amperes. Its operation is controlled by a beautiful 2½-inch dial with 100 point marking covering full sweep of contact arm. Diameter of base 2 5/32 inches. Made in resistance of 6½, 25, 40 and 60 Ohms.

Each $1.10

HOWARD MICROMETER RHEOSTAT WITH DIAL. ONE CONTROL. The HOWARD Micrometer Rheostat gives instantly that extremely fine and hair line adjustment so necessary for the successful operation of all gas content tubes, known as soft tubes. The micrometer adjustment does not have a separate control but is automatically carried along with the main contact arm and brought into play instantly when desired. Made in resistances of 6½, 25 and 40 Ohms. The micrometer attachment can be purchased separately and will fit any standard HOWARD Rheostat.

Dial Rheostat with Micrometer Attachment. Each..... $1.50
Micrometer Attachment separate. Each..... .50

POTENTIOMETERS WITH DIAL. HOWARD Potentiometers are noted for that extremely close control of the potential in the plate and grid circuits so necessary to increase selectivity and obtain satisfactory results. The potential is kept under positive control at all times.

The HOWARD Potentiometer is the same size and matches the HOWARD Standard Rheostats. Furnished in resistance of 200 and 400 Ohms.

200 Ohms. Each..... $1.50
400 Ohms. Each..... 2.00

MIDGET RHEOSTATS. The HOWARD MIDGET RHEOSTAT was designed to meet the long-felt want for a high grade rheostat small enough to be used in portable sets where space is limited and a smaller instrument is desired. The same materials and workmanship will be found in this Rheostat as in the standard HOWARD Rheostats, the only difference being in the size, the base being 1⅝ inches as compared with 2 5/32 inches on the standard Rheostat. This Rheostat is not furnished with micrometer attachment. Made in resistances of 6½, 25, 40 and 60 Ohms.

Each $1.10

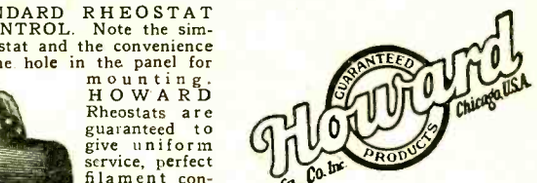
(Cut is ⅔ actual size)

Front view of HOWARD Dial. These dials are sold separately and may be placed on any HOWARD Rheostat or Potentiometer. Size, 2⅜ inches in diameter.

Each $0.25

Rear view of HOWARD Dial showing 3/16-inch shaft permanently anchored in dial. The length of this shaft is 1⅜ inches.

Each $0.25



451-469 E. Ohio St.

The superiority of the HOWARD Socket lies in the "Sure Contact" which is made to the side of the tube pins and not to the ends. The contact arms have more than twice the spring value found in the average socket, as well as a full ¼-inch contact surface applied to the side of the pins. These contact arms cannot lose their spring tension and can be relied upon to make a permanent, perfect contact. The base of the Howard Socket is moulded from the highest grade bakelite.

Each $1.25

Upper Cut shows the Howard Socket and Lower Cut shows the construction of the "Sure Contact" springs.

THE HOWARD MULTI-TERMINAL PHONE PLUG is the most simple and efficient on the market. The patented feature provides instantly a positive connection for phones or loud speaker and will accommodate from one to six pairs of phones, all connected in at the same time, with maximum electrical efficiency. Slip in another pair of phones instantly without interfering with connections previously made. Merely insert the tips in the holes provided in the plug for that purpose.

Each $2.00

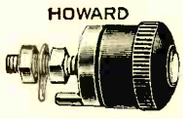
FIXED CONDENSERS. Nearly every radio set in existence makes use of small fixed condensers. They perform a very important part in the successful operation of the set. Defective or inaccurate condensers cause no end of trouble. When a circuit calls for a condenser of a "fixed" rated capacity, install a "HOWARD" for accuracy and permanency. Only the best grade of Indian Ruby Mica is used to separate the copper and brass conductors. No paraffin or similar substances form any part of the dielectric. They are all hand made, each tested on a capacity bridge and guaranteed to be noiseless and accurate. Made in capacities of .00025, .0005, .001 and .002.

Each $0.60

HOWARD INDUCTANCE SWITCH LEVER. This switch lever is made in two sizes, with small and large knob and having a blade radius of 1 inch and 1 9/32 inches respectively. The highly nickel plated phosphor bronze contact blade is securely keyed to the knob and will not turn or come loose under any condition.

Each $0.50

HOWARD BINDING POST. The special feature of this binding post is the holding device which positively prevents the binding post from turning after it has been mounted. The top is made of the same high-grade insulating material as used in the manufacture of other Howard products.



Each $0.20

21-22 — Large and small indicating pointers. .020 inch thick, 8-32 thread, 1 1/16 inch radius and 13/16 inch radius respectively. Highly nickel plated.

Each $0.08

23-24-25—Soldering Lugs with standard 6-32 hole, nickel plated.

Per dozen $0.10

26-27—Switch points and switch stops, highly nickel plated, 6-32 thread and equipped with nut.

Each $0.03

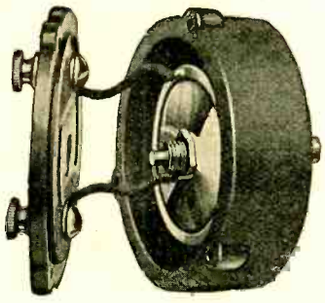
All Howard Products are sold with a Guarantee of "Satisfactory Performance or Money Back"

Ask your dealer to show you the Howard line of parts. If he cannot supply your wants, send his name to us with your order.

SUPERADIO

REG. U.S. PAT. OFF.

A New Combination of exclusive features



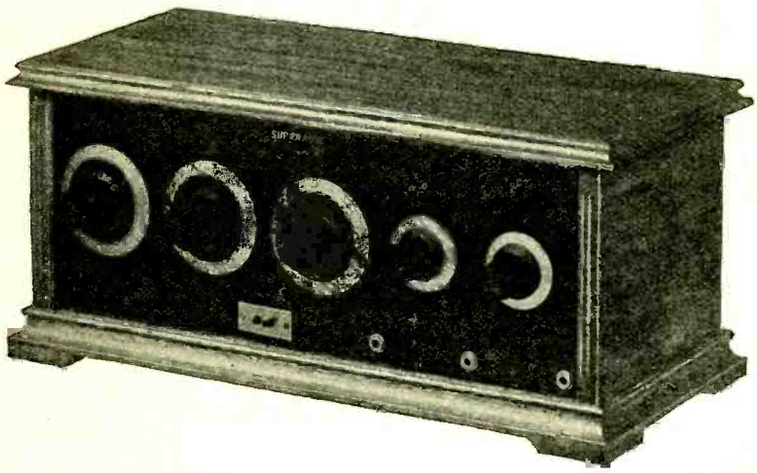
Open

Something Different

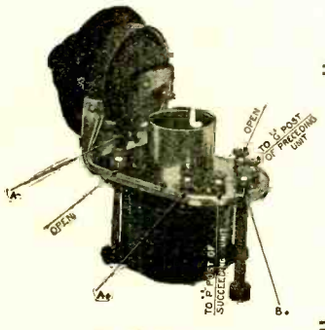
A low loss straight capacity curve condenser made of mica-mercury built on a new principle. Extremely compact, requiring only two and one-fourth inches on the panel. Made in two capacities—.00025 M. F. D. and .0005 M. F. D. List Price, $3.00.

Closed

The new Superadio Type 103, 5-tube, non-oscillating Tuned Radio Frequency Receiver, in which are incorporated the new Type X Transformer and the new Superadio compact variable Condenser; List Price, $90.



This set can be supplied in Kit form which consists of three Radio Frequency Amplifier Units and two Audio Amplifier Units, drilled panel; Dials, three jacks, Switch Terminal board, and Wires all numbered and bent to shape, with complete layout of wiring and can be set up by anyone in one hour. This complete Knock-down 5 tube set, excepting Cabinet, $50.00.

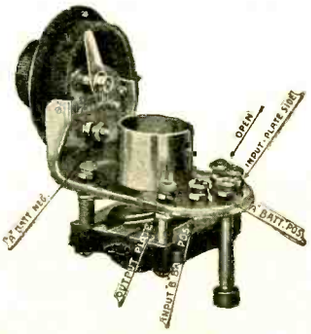


R. F. Unit

One complete stage of tuned Radio Frequency Amplification in one unit. Supplied in groups of three units. 2 Type, 1, $8.50 each. 1 Type, 2, $9.00.

One complete stage of Audio Amplification in one unit.

List Price, $7.00.



A. F. Unit

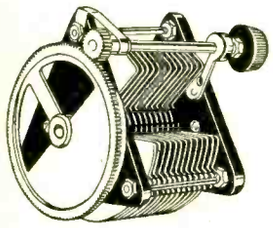
De WITT-LaFRANCE Company, Inc.

54 Washburn Avenue-Cambridge, Mass.

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

CHI-RAD

OLDEST EXCLUSIVE RADIO JOBBER IN THE MIDDLE WEST



Type 247 Condensers

The type 247 General Radio condenser is a universal favorite because of its high electrical efficiency. Plates of Rotor and Stator Groups soldered together thus insuring perfect electrical contact. Vernier adjustment is by balanced metal gear operated by fibroil pinion. End plates of hard rubber.

Price .....**$3.25 to $7.25**

Type 231-A Amplifying Transformer

The core is of closed, shell type construction and of a carefully selected grade of steel.

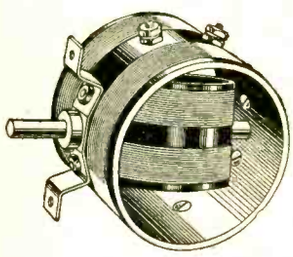
The windings of the coil are of proper ratio to insure maximum results with respect to quality volume of singles.

Binding posts and mounting brackets are easily accessible. The 231-A has an unusually high and flat amplification curve which indicates that it is best for all stages. **Price..$5.00**

Type 271 Medium Frequency Transformer

The type 271 transformer has been specially designed for use in long ware reception (10,000 meters-30 kilocycles) and in the superheterodyne circuit. The core, and coil windings are completely enclosed in a metal shell. Shielded both electrostatically and eleotromagnetically. Very compact and rugged.

Price **$5.00**



Type 268 Vario Coupler

Very compact and rugged—ideal for the portable set. Stator coil has but a single tap which simplifies installation, operation, and reduces losses. Bearings very smooth running. Forms of genuine moulded bakelite wound with green silk covered wire. **Price**.....**$3.50**

If you want quality radio merchandise—
If you want radio apparatus that will make friends out of customers—
If you want prompt, intelligent attention to all your orders—big or small—
If you want courteous, friendly cooperation—

Make Chi-Rad your jobbing headquarters for Radio in 1925 and every year thereafter!

Jobbers for the following:

General Radio Co.
Complete Line
Adams-Morgan Co.
Paragon Receivers
Benjamin Electric Mfg. Co.
Sockets
Allen D. Cardwell Mfg. Co.
Condensers
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Cunningham Tubes
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French Battery & Carbon Co.
Ray-O-Vac Batteries
Jewell Instrument Co.
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Jones Multiplug
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Sockets, Fixed Condensers
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Dials
Lopez Low-Loss Tuners
Mica Insulate Co.
Tubing
Mu-Rad Laboratories
Receivers
National Co.
Condensers, Coils, Dials, Regenaformer Kits
Fansteel Products Co.
Balkite Chargers and "B" Current Supply
Radio Units Co.
Radium Loops
Remler Mfg. Co.
Condensers, Transformers
Reichmann Co.
Thorola Talkers
Thordarson Transformers
Vesta Storage Batteries
Western Electric Co.
Loud Talkers, Tubes
Weston Electric Inst. Corp.
Meters, Plugs

DEALERS ***Write for New Catalog***

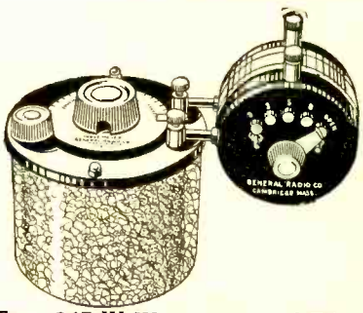
Every radio dealer should have a copy of our handy loose-leaf catalog—a perpetually up-to-date Radio Catalog. Free to dealers only.

Write for FREE BULLETIN on new General Radio Company Type 285 Audio Transformer

Chicago Radio Apparatus Co.

Radio Jobbers Exclusively

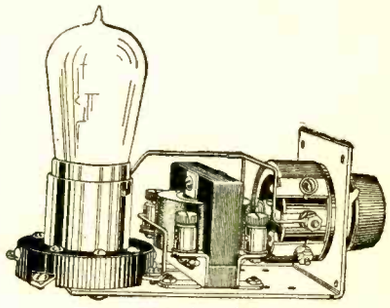
415 South Dearborn Street, Chicago, U. S. A.



Type 247-W Wavemeter and Filter

The type 247-W wavemeter and filter increases the selectivity of a receiver by tuning out interference from various sources. Composed of a special type condenser with filter coil attached. Filter coil with range of 150 to 500 meters is of moulded bakelite wound with silk cover wire. **Price**.....**$10.00**

Extra interchangeable filter coils for shorter or longer wavelengths furnished for.....**$3.00**

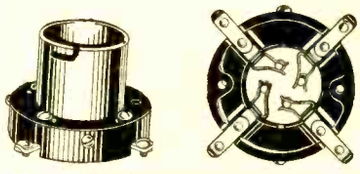


Type 300 Amplifier Unit

Self contained except for tubes and batteries. It is ready for use with either crystal or vacuum tube detector. The parts used are standard General Radio instruments described in these pages. The complete unit is particularly convenient for persons building their own sets, since the bother of assembling and wiring the parts is eliminated. Panel or table mounting.

Type 300-D for Standard tubes (UV-201) **$8.00**

Type 300-C for dry cell tubes (UV-199) **7.75**



Type 156 Standard Tube Socket

The type 156 socket holds the tube securely so as to prevent vibration and to make firm electrical contact. The contact springs are of bronze, nickel finished. The tube is of heavy brass with highly polished nickel-finish. For mounting standard tubes such as UV-200, UV-201A, and other similar tubes having the standard base. **Price** **$1.00**

Type 301 Rheostat and Potentiometer

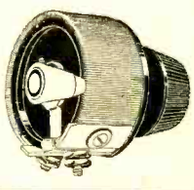
The type 301 rheostat maintains positive contact at all times. There is no momentary opening of the circuit to cause a bothersome click in the ear-phones.

The resistance units are tightly wound on specially treated fibre strips.

The base and tapered knob are of genuine moulded bakelite. Pointer on knob indicates the position of the contact arm. Furnished with resistance units of 10, or 30 ohms.

Price **$1.25**

Potentiometer similar in construction but with 200 ohm resistance unit. **Price** **$1.25**



A COMPLETE LINE OF GENERAL RADIO CO. PARTS

The QUALITY LINE

Do not be misled. There is only one thing to consider *first* in selecting the parts for a radio receiving set—that is *quality*. You can have quality without paying an exorbitant price. Premier Radio Parts are first of all a quality line. But Premier prices are most reasonable. They offer the extreme in value for every dollar invested.

Every part in the line shown here has demonstrated its quality. Each has passed the test of the experimental laboratory and the far more exacting test of use in thousands of home-built receiving sets. Each is advanced in design, presenting radically different features contributing to its efficiency.

It will pay you to read carefully the description of the parts shown on this page. It will be even better to get the bulletin offered elsewhere on this page and read the complete descriptions. It will pay you most of all, when building your set, to make it a quality set throughout and specify

PREMIER
Quality Radio Parts

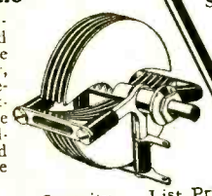
Volume Without Distortion

"HEGEHOG" is the smallest audio transformer made—just half the size of others—which makes its great volume and pure, natural tone all the more remarkable. 100% self-shielded. Mounts anywhere. Just the thing for portables. Ideal for neat and compact wiring.

Ratios 1 to 3, 1 to 4, and 1 to 5, $3.50
Ratio 1 to 10, $4.50

"CROFOOT" Condenser

1 to 74 Tuning Ratio



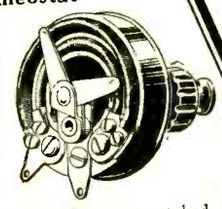
"CROFOOT" has the lowest minimum capacity yet attained — and the greatest tuning ratio. Made entirely of brass and hard rubber, giving remarkably low skin resistance and low insulation leakage. Semi-straight line plate construction. All plates soldered, look for the "red stripe." Mounts with one hole.

Capacity	List Price	Capacity	List Price
.0001 M.F.	$2.75	.00035 M.F.	$3.50
.00025 M.F.	3.25	.0005 M.F.	3.75

Vernier type with "E Z TOON" dial, 75 cents extra

"MICROSTAT"

Noiseless Vernier Rheostat



Premier "MICROSTAT" stands alone in its fineness of adjustment and minute control. New principle provides two resistor units—one six ohms and one forty ohms — connected in parallel. Vernier adjustment on high resistor. Noiseless in operation. Insures perfect freedom from sputtering and scratching. Capacity 3 amperes. Bakelite moulded. Silver etched dial. Price $2.50.

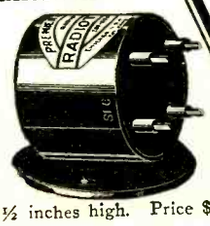
Prevent Battery Waste

and tube blowout danger with the Premier "Double Disconnect Potentiometer." The last word in plate current control. Its special feature, a double break switch, automatically disconnects "A" and "B" batteries when lever is off. Stays put. Contact circuits are riveted. One hole mounting. Similar in appearance to "Microstat." Price $2.50.

Fits Any Plug—Any Panel

Premier "UNIVERSAL" Radio Jacks have been designed to make a quick and flexible method of connection. Have several exclusive advantages such as spring mounting adjustable for all lengths of plugs. Spring combinations are interchangeable on frame and may be purchased separately if desired. Adjustable Thimble or Bushing permits mounting on any thickness of panel from ⅛" to 7/16" jacks. Phosphor bronze springs. All metal parts brass, nickel-plated. Prices range from 65c to $1.10.

A Quality R. F. Transformer



PREMIER "RADIOTRAN" is an "AIR CORE," non-interfering (non-metallic case) radio frequency transformer, correctly designed to satisfy the experienced radio engineer and the super-critical amateur. In volume, non-distortion and long range it is unsurpassed. Efficient in all circuits. Mounts anywhere. Small in size—only 1½ inches high. Price $1.50.

"LO LOSS" Tube Socket

For Greatest Speaker Volume

Use Premier "LO LOSS" Tube Sockets throughout. This radically different tube socket has lowest insulation leakage, lowest capacity. Contacts always visible. Contact springs automatically clean tube prongs. New cam-action tube lock makes insertion of tubes easy and contact certain. Maximum spring deflection without set. Both sizes 90c.

Send for FREE Bulletin 94

Whether you plan to build or to buy a receiving set, you should know something about the "insides" of radio. This booklet gives you the "inside dope" on some of the recent inventions embodying the latest ideas of radio engineers. In this bulletin is full information about all the Premier Parts shown on this page and others included in the full line.

FREE "HOOKUPS"

For those desiring to make their own receiving sets, we have ready for distribution individual diagrams of each of the most popular "Hookups," including Harkness Reflex, Neutrodyne, Super-Heterodyne, Tuned Radio Frequency, Regenerative, etc. THEY ARE FREE FOR THE ASKING.

Ask your dealer to supply you with a set of these diagrams. If he does not have them on hand write to us and you will receive complete assortment by return mail.

Premier Electric Company
3805 Ravenswood Avenue, Chicago

HEATHRADIANT

Non-Dielectric Condensers Used in the

A-C DAYTON XL5

THE A. C. Electrical Co., in designing their Polydyne Receiver, looked for the make of condenser which could stand up under all sorts of usage without lessening its efficiency one particle. That their choice was the HEATH RADIANT Condenser, bears out the HEATH claim of permanent efficiency.

The adjoining panel explains the principal reason for this extraordinary durability. You yourself, can see the other reasons, once you've set eyes on a HEATH RADIANT Condenser. Everything about it impresses you with its scrupulous workmanship.

You want to make your new set the best yet — then learn about these "better condensers."

—

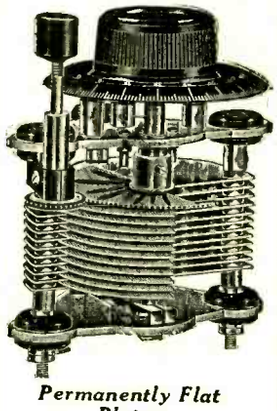
PRICES FOR VERNIER CONDENSERS

	With Dial	Without Dial
No. 12AV 12 Plate	$5.00	$4.35
No. 24AV 24 Plate	5.50	4.85
No. 44AV 44 Plate	6.50	5.85

Non-Vernier types in all capacities

Heath Sockets with the Exclusive Shock Absorber Feature. Price 75c. Heath Genuine Bakelite Dials in 2, 3 and 4 inch sizes. See the Heath Condenser at your dealer's.

Grounded Metal End Plates

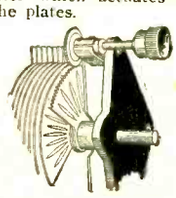


Permanently Flat Plates

Stamped under huge presses to absolute flatness, tempered to prevent warping.

Micrometer Geared Vernier

Ordinary adjustments reduced by separate geared adjustment to hairbreadth distinction. We guarantee the Heath Vernier Condenser to be more highly selective than any condenser employing a vernier which actuates ALL of the plates.



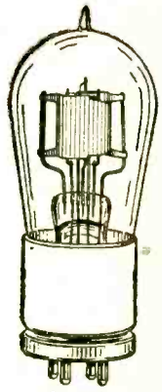
Write for Literature

HEATH RADIO & Electric Mfg. Co.
202 First Street
Newark, N. J.

Canadian Distributors: Marconi Wireless Telegraph Co. of Canada, Ltd., Montreal, St. Johns, Vancouver, Winnipeg, Halifax and Toronto

SAVE $2.25 ON COST OF NEW TUBES

By Having Your Old Tubes Rebuilt at $1.75 Each



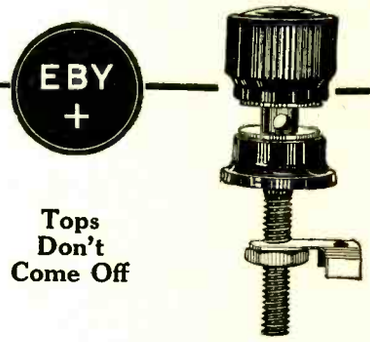
$1.75

Guaranteed equal to new. Send us your tubes by parcel post (not necessary to insure package or guard against breakage). We return rebuilt tubes by parcel post, C.O.D. and try to maintain 24 hour service.

□□

HARVARD RADIO LABORATORIES

300 Old Colony Ave., So. Boston, Mass.



Tops Don't Come Off

25 Different Markings

Eby Binding Posts

Standard Equipment on over one hundred Manufacturer's Sets

This fact alone indicates what we mean when we say that EBYS are binding posts PLUS.

Superiority is built into them.

They can be furnished either plain or engraved in twenty-five different markings. **And the Tops Don't Come Off.**

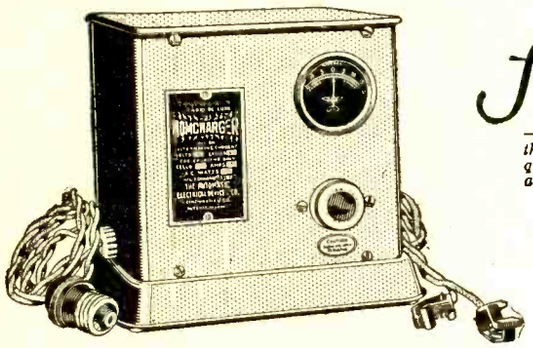
If your dealer doesn't stock them— write us.

H. H. EBY MFG. COMPANY

Philadelphia, Pa.

Handsome - Safe - Fast

GOLD SEAL HOMCHARGER



fast!

—charges in one-third the time required by 2 or 3 ampere chargers.

Radio's most popular Battery Charger!

OVER 250,000 Radio fans have found the big capacity 5 ampere GOLD SEAL HOMCHARGER ideal for keeping their Radio batteries fully charged and operating at top efficiency. Connects to any lamp socket and charges all Radio "A" and "B" and Auto Storage Batteries over night for a nickel.

Simple, reliable, fool-proof. Can be operated by any one. Contains no bulbs, acids or fast wearing carbon contacts. Only one moving part, replaceable for $1.00 after thousands of hours' use.

Absolutely safe — no danger of shock or fire. Approved by Insurance Underwriters everywhere. Beautifully finished in mahogany and gold. May be used right in the finest living room. Price, $18.50 complete for all currents.

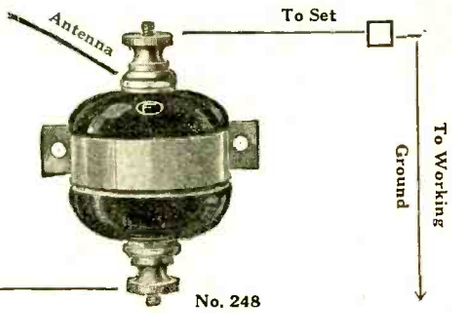
Sold by all good Radio dealers, or shipped charges prepaid upon receipt of purchase price.

THE AUTOMATIC
ELECTRICAL DEVICES CO.
179 W. Third St., Cincinnati, Ohio

Largest Manufacturers' vibrating rectifiers in the world

Free Write for booklet, "The Secret of Distance and Volume in Radio," containing information on this subject and fully describing the GOLD SEAL HOMCHARGER. *Free*

The "LITTLE JOE" Lightning Arrester



No. 248

Card No. E—5841

Jan. 5, 1923, Underwriters Approval

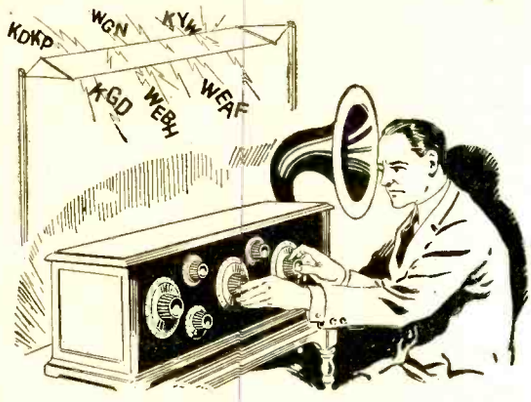
Especially Designed for Radio Work

Made of Porcelain, small, neat, rugged and serviceable. Can be suspended on antenna or fastened to wall.

Ask your dealer or write for further information

CIRCLE F MFG. CO.

TRENTON, NEW JERSEY



Unlock the Scrambled Wave Lengths

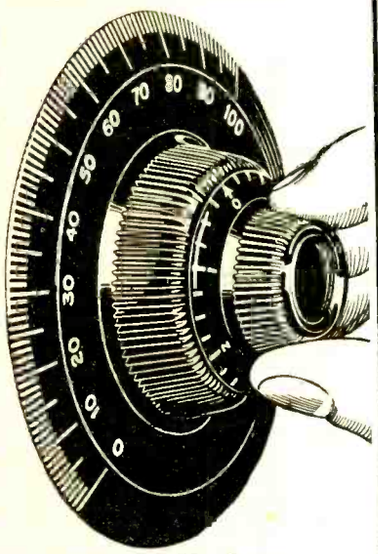
with

E-Z-TOON

(EASY TUNE)

RADIO DIALS

The Key to Simplified Tuning



E-Z-TOON Radio Dials are the key which will unlock the scramble of wavelengths that has been bothering you for so long. They are two dials in one, the smaller dial having a ratio of 80 to 1 to the larger dial. E-Z-TOON dials give a fine smooth vernier adjustment. Place a set of them on your set and you will marvel at its selectivity.

No cogs, gears, backlash or lost motion.

3" Dials, Black, **$2.00**; Mahogany.....**$2.20**
4" Dials, Black, **$2.25**; Mahogany.....**$2.45**
2" Non-Vernier Dials, Black, 40c; Mahogany.....45c each

All Vernier Dials are made with Zero mark on either right or left side.

Mr. Barry, White Plains, N. Y., Says:

"Tuesday night, November 25th I heard station 2LO London, England with a 3 tube single circuit type receiving set, built by myself and equipped with an E-Z-TOON 4" dial on aerial tuning condenser."

"My whole success I contribute to the exceptional close tuning of the variable condenser, with vernier type dial, this condenser was not in itself a vernier type, but became one and better with the addition of your dial."

JOHN F. BARRY,
103 Main St., White Plains, N. Y.

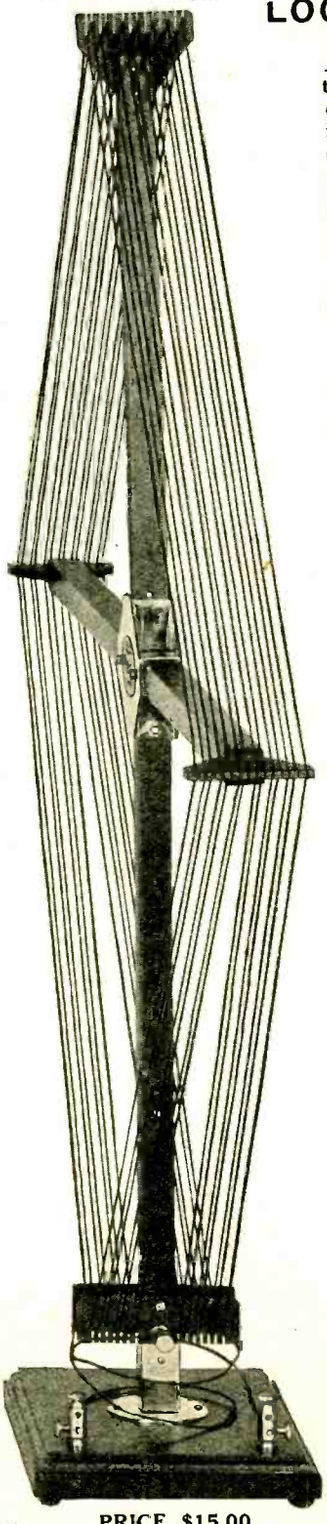
Easy to Install

Only a small screw driver is required to install. There are no changes necessary in the shaft—no redrilling of panel. E-Z-TOON Dials are arranged to accommodate so-called single hole mounting condensers. Simply take off old dials slip on E-Z-TOON and tighten set screw.

If your dealer cannot supply, write us.

E-Z-Toon Radio Company
3236 W. Washington St. Indianapolis, Ind.

THE BANK FIAT WOUND LOOP



A Novel, Collapsible, Directional Loop Embodying Numerous New Features resulting in relatively small size, (18" on a side although more efficient than loops twice as large) unusual sensitivity, low dielectric losses, low radio frequency resistance, convenient size when folded and pleasing symmetry in the arrangement of the turns.

The Fiat Loop is a quality product throughout, painstakingly constructed to insure accurate, well fitting parts. It is attractive in appearance and will harmonize with other furnishings in the home. Woodwork is of either solid walnut or mahogany, hand rubbed, with metal parts of brass, heavily nickeled.

Folded, The Fiat occupies very little space and may be readily carried in a hand bag or a small compartment in a portable set. The unique manner in which it folds prevents tangled wires and does not require the removal of any parts. It is easily opened without the use of tools. The construction is such that the wires are always taut and repeated opening and folding will not spring the parts out of alignment or cause the turns to sag.

In The Fiat Loop you have a device which is the equal of the best radio receivers or parts available. When you invest in the FIAT, there is the assurance of utmost performance and complete, lasting satisfaction.

Laboratory Test

Self Inductance....0.00021 Henries
Distributed capacity.....33 M.M.F.
Natural wave length....156 Meters
Resistance at 1,000,000 cycles.....12 Ohms
Wave band covered when shunted by .0005 M.F. condenser.....156-630 Meters

PRICE $15.00
Solid Mahogany or Walnut

Designed and Manufactured by

RADIO APPLIANCE LABORATORY
4884-90 North Clark Street, Chicago, U. S. A.

Needlephone

$10.00
complete with cord

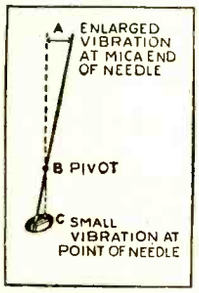
MAGNIFIED Reproduction

Music as clear and melodious as the tinkle of silvered temple bells of Mandalay—that's what you'll get on your radio when you use the Needlephone with your phonograph. Nothing else will give the same mellow notes—the same wonderful discrimination of tone values—the same perfect reproduction, because no other loudspeaker takes advantage of the principles of "magnified reproduction" and the correct principles of acoustics (the laws of sound) as embodied in the phonograph reproducer.

Rhamstine*

NEEDLEPHONE

The Needlephone picks up the delicate impulses of high pitched notes—often lost on other types of loudspeakers—and through the vibrations of the flexible reed *enlarges them and transmits them* through the needle of the phonograph to the mica diaphragm, where they are transformed into sound.



"Magnified Reproduction" Principle
The delicate vibrations of the reed at "C" are transmitted through the pivoted needle and magnified at "A," where it is attached to the mica diaphragm.

This "magnified reproduction" principle also brings in distant stations more clearly than is possible with the ordinary loudspeaker that has a stiff metal diaphragm.

Send No Money. Take No Risk

Send the coupon today, pay on delivery, and try the Needlephone with your own set and your own phonograph. Try it with a soft needle for local broadcasting—or a loud needle for distant stations—and see what wonderful results await you. Then if you are not more than satisfied—if you cannot say you get far greater volume—if you do not get fuller, sweeter music and better reproduction, Rhamstine* does not want you to keep it. Return it and we will gladly refund your money in full.

J. Thos. Rhamstine*

J. THOS. RHAMSTINE*
510 E. Woodbridge, Detroit, Mich.

Send me the Needlephone. I'll pay the postman $10 upon its arrival. It is distinctly understood I may return it if I desire, within 5 days, and receive a refund in full.

Name .....

Address .....

Western New York Representatives

for Leading Makes

of

Radio Sets and Parts

"Wireless Since 1910"

Also

— Thos. E. Wilson Line —

SPORTING GOODS

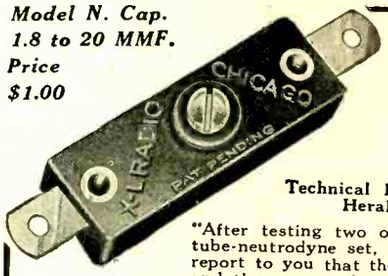
Rudolph Schmidt & Co.

New Location

43 South Ave. - - Rochester, N. Y.

Est. 1882

Model N. Cap. 1.8 to 20 MMF. Price $1.00



For positive balance in Neutrodyne and all other tuned radio frequency sets.

FRANK D. PEARNE
Technical Radio Editor of the Chicago Herald and Examiner, says:

"After testing two of your condensers in a five-tube-neutrodyne set, I am very glad to be able to report to you that they are all you claim for them and then some. I wish to congratulate you upon having produced a first-class article which should prove to be of great value to the vast army of neutrodyne users."

For Greater Distance Volume and Clarity Use

X-L VARIO DENSERS

X-L Radio Laboratories

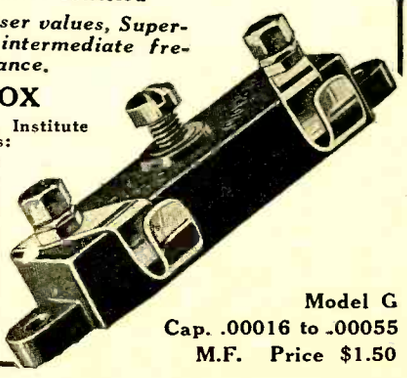
2424-26 Lincoln Ave., Chicago

If your dealer cannot supply you write direct. Dealers solicited

For correct grid condenser values, Superheterodyne filter and intermediate frequency and reflex balance.

G. M. WILCOX
Prof. of Physics, Armour Institute of Technology, says:

"The range of adjustment of these condensers is sufficient to allow the value of grid capacity best suited for a particular tube or circuit to be obtained easily. These condensers are compact and well made and are a desirable accessory for high grade radio equipment."



Model G
Cap. .00016 to .00055
M.F. Price $1.50

The ekko Broadcasting Station Stamp Album

Begin collecting ekko stamps today!

Here's just what you have wanted for a long time—a convenient, permanent and authentic means of recording all the stations you have heard over your set.

Verified Reception

The Ekko Broadcasting Station Stamp Album contains spaces for the beautifully engraved stamp of each of all the recognized stations in the United States and Canada—more than 550 in all. With the album are furnished PROOF OF RECEPTION CARDS. You send these cards to the station, together with facts that prove you have heard their broadcasting and 10 cents to cover the cost of verification and mailing. The station then sends you its Ekko Stamp as verified proof of reception. You then paste the stamp in your album. From the Ekko Album and the stamps pasted in it you can tell at a glance what stations you have heard.

Beautiful Stamps and Album

The stamps are beautifully engraved in different colors. Each station has its own stamp showing call letters. The album is 9½x11 inches, handsomely bound in a two color cover. It contains 96 pages with spaces for stamps of all recognized stations in the United States and Canada, arranged alphabetically by states and call letters. Contains also a convenient log and an alphabetical list of official names and other interesting features of call stations.

A Fascinating Hobby

Think of how much fun you can have showing your friends your album and proving to them at once how many stations you have heard. And think of how much more fun you'll have collecting the stamps themselves. Most of the important broadcasting stations in America are already furnishing Ekko Stamps to their hearers. Although the game is still new, radio fans throughout the country are already enjoying this fascinating hobby. Many Ekko Album Owners already have more than 100 stamps pasted in their books.

Begin Today!

You too can join this new radio game that is sweeping the country. Buy your copy of the Ekko Album and begin collecting Ekko Stamps today.

For sale by radio dealers and bookstores everywhere. If your dealer cannot supply you, sent direct, postpaid, on receipt of price. Money back if not satisfied.

Price $1.75

$2.50 in Canada

THE EKKO COMPANY

111 West Monroe Street Chicago, Illinois

For a Limited Time Only

You can purchase for $3.50 a 12 cell 24 volt RABAT SENIOR battery. Saving $6.10 through direct buying. The Jobber and Dealers profit now is yours. 24 cell 48 volt size $7.00.

Rabat Senior Storage "B" Batteries

are neat, powerful, noiseless and will harmonize with any Radio Set. Separate cells and patented rubber cork prevent current leakage and clear glass tubes give vision of the condition of battery. Heavy duty plates 3-16" x 1" x 2½" with staggered ribbed grid form the backbone of this sturdy battery. Shipped completely charged ready for instant use. And you can save $6.10 by ordering now.

Rabat Super-Charger $3.00 c. o. d.

Is specially designed to satisfactorily recharge any make of storage "B" battery. Shipped complete ready to use, including lamp socket, attachment plug and cord. You save $1.80 by ordering direct.

SEND NO MONEY

But write us today, advising quantity and type wanted. After examining and approving these wonderful batteries then pay the Expressman the small C.O.D. charges.

The Rabat guarantee is back of all our products. DON'T WAIT, ORDER TODAY and save the middleman's profit.

The Radio Rabat Company

1763 St. Clair Avenue. Cleveland, Ohio

Mail this Coupon, today!

THE RADIO RABAT COMPANY,
1763 St. Clair Ave., Cleveland, O.

Send me at once C.O.D. subject to examination and approval:

..... 12 cell 24 volt Rabat Seniors at $3.50 each .....
..... 24 cell 48 volt Rabat Seniors at $7.00 each .....
..... Rabat Super-Chargers ..... at $3.00 each .....

Total.....

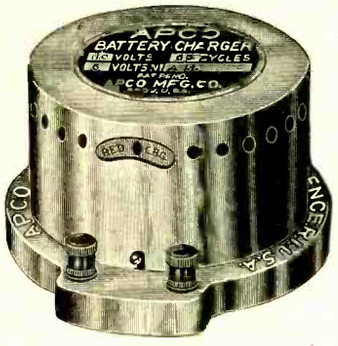
Name .....

Street .....

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

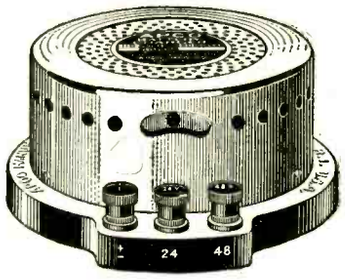
APCO-RADIO

"A Charged Battery Requires No Apology!"



You can charge them over-night—without disconnecting a wire, with

APCO BATTERY CHARGERS



APCO "A" CHARGER is extremely quiet in operation. Has high charging rate of 7½ amperes and taper charge for safety. It is neat, compact, sturdy—an ornament to your living room table. Fully charges radio "A" batteries over-night at a few cents' cost.....**Price $18.50**

APCO "B" CHARGER is the first thoroughly dependable charger for 24 or 48 volt "B" storage batteries (or 90 volts in multiple). Rate varies from ¼ to ½ ampere according to size of the cell. Does its work in ten hours for less than a dime.

Price $10.00

APCO Radio Switch

The toggle arm type. Positive in action. No springs to wear. Only one panel hole to drill. Will last a lifetime. The terminal connections are very accessible, making installations quick and easy. Heavily nickeled on brass. **Price, 50c**

APCO Resistance Units

Permanent in their values, of constant, specific resistance for all practical changes in temperature, and rigid in construction. Current uniformly distributed throughout the whole cross section, giving maximum carrying capacity with minimum size. **Price, 50c**

APCO Radio Transformer

Permanent Installation Type

Any Ratio from 2 to 1 to 10 to 1

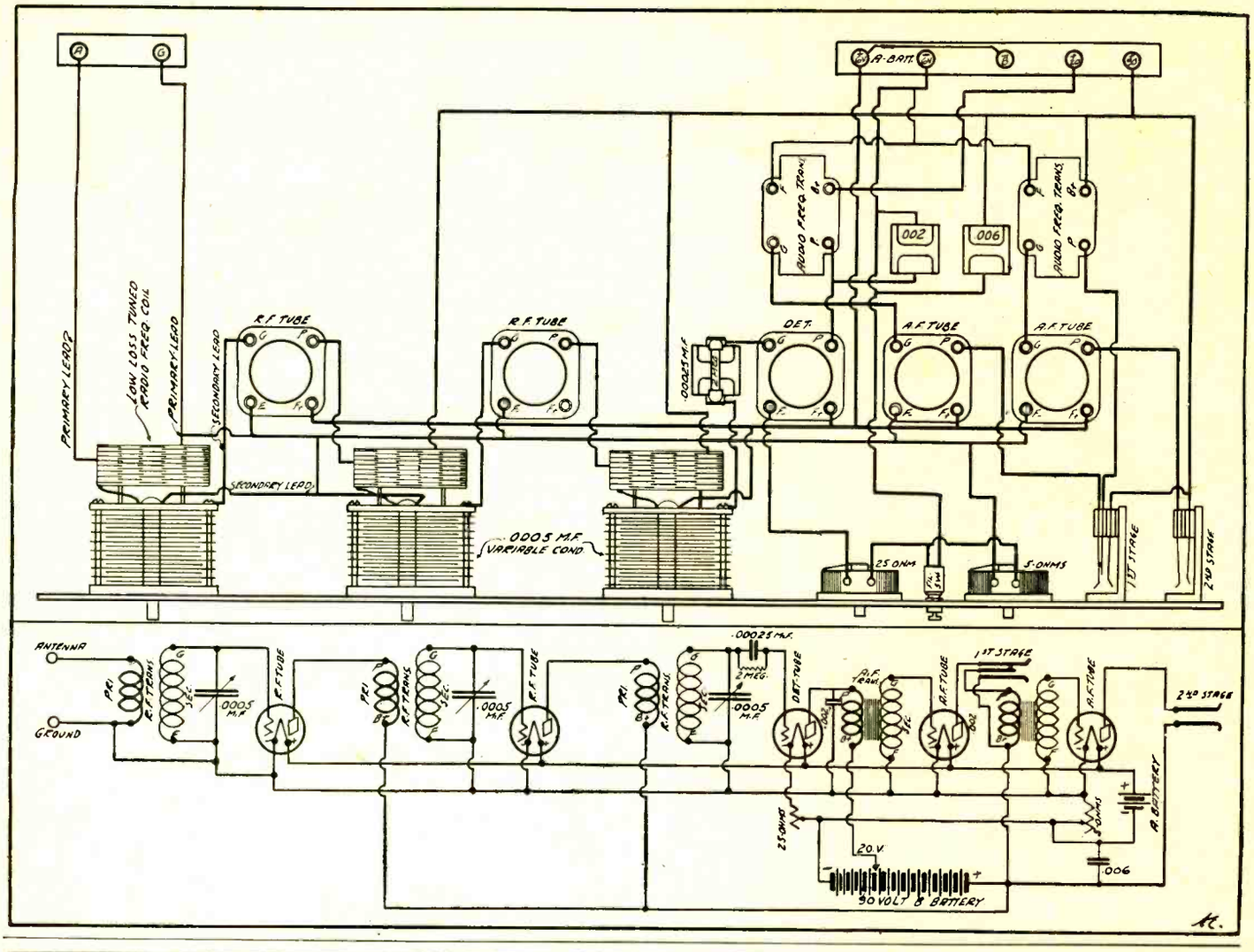
Price $5.00

Has all the characteristics of the interchangeable tube base type in quality and construction, but is made to sell at a lower price to meet the demand for a high-grade popular priced transformer for permanent installation. APCO Transformers are built for the discriminating radio owner who realizes the advantages in reception from transformers of highest possible quality.

At Your Dealer's—or Write Us

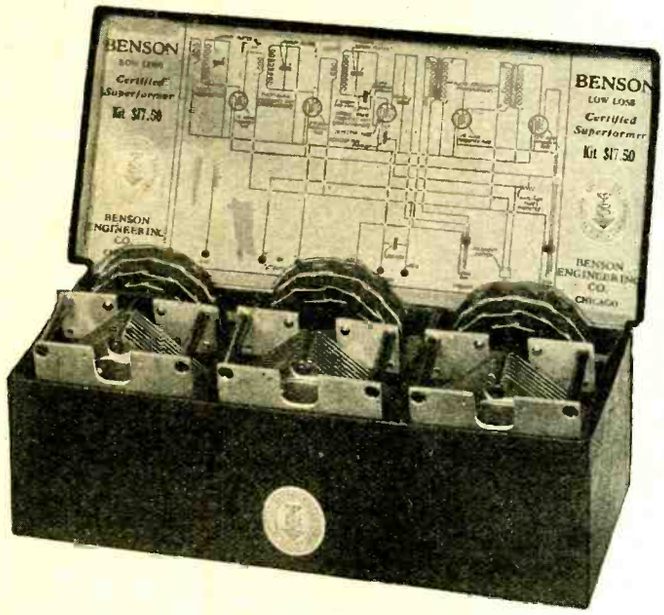
APCO Manufacturing Co. - Providence, R. I.

Low Loss Tuned Radio Frequency Receiver



BENSON ENGINEERING CO.
MANUFACTURERS DISTRIBUTORS

An Outstanding Radio Value of Unusual Merit



Build the Benson Certified Superformer Receiver

The Benson Superformer Kit shown here is indeed an outstanding value. It assures perfect reception. Has lowest dialectic loss. (Actual tests prove this). It is simple to hook up from the diagram furnished on each box.

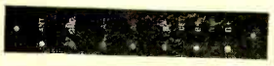
During International Radio Week foreign stations were picked up by the Benson Superformer Receiver. This is proof enough of its wonderful performance.

Have your dealer show you the kit today. If he does not handle them write us direct, giving his name.

Benson Engineering Company
2125-27 No. Halsted St. Chicago, Ill.

Insuline Frieze Finish

Insuline Ear Phone Cushions. Soft rubber. Prevents outside noises, eliminates pressure of head phone. 75 cts. per pair.



Insuline Binding Post Panels. Drilled and Engraved, 1¼" x 7" black or mahogany, 20 cents.

Insuline Tubing. We cut tubing to order any length desired. Wall thickness ⅛". Polished Tan or Black Colors.

INSULINE PANELS AND PARTS

Insuline fills the demand for a perfect insulating material specially made for radio purposes, beautiful in appearance, tough enough to stand the hardest usage, yet workable with ordinary tools. Being the largest panel house in the world equipped with cutting, engraving and drilling machinery, we are fully prepared to take care of your panel requirements for any circuit shown in this magazine or any other special circuit.

PRICES ON PANELS FOR 9 POPULAR CIRCUITS

	Fada 5 Tube Neutrodyne, 7"x26" x3/16"	Fada 3 Tube Neutrodyne, 7"x24" x3/16"	Ambassador 3 Tube, 7"x18" x3/16"	Journal 3 Tube Filter Tuner, 7"x21" x3/16"	Journal 1 Tube Filter Tuner, 7"x12" x3/16"	Freshman Masterpiece, 5 Tube 7"x18" x3/16"	Rasla Reflex 3 Tube, 7"x18" x3/16"	Gennwin Low Loss 3 Tube, 7"x18" x3/16"	Transcontinental Low Loss 3 Tube, 7"x18" x3/16"	Roberts Knockout 4 Tube, 7"x21" x3/16"
Black	$5.00	$4.80	$3.50	$4.00	$2.50	$3.50	$3.50	$3.50	$3.50	$4.50
Mahogany	6.00	5.70	4.00	4.50	2.90	4.00	4.00	4.00	4.00	5.50
Frieze Finish	6.00	5.70	4.00	4.50	2.90	4.00	4.00	4.00	4.00	5.50

Send your specifications. Write for descriptive literature.

RADIO PANEL & PARTS CORP.

(Insulating Co. of America)
Insuline Building—59 Warren St., New York, N. Y.

Western Division:
Insulating Co. of America, Madison, Wis.
538 So. Dearborn St., Chicago, Ill.

Michigan and Ohio Representative:
F. A. Krue, Jr.,
333 State St., Detroit, Mich.

Insuline Sure Grip Dial. Beautiful design, ¼-inch shaft, brass bushing and screws. 0° to 100° graduations 4 inch. In individual boxes. Black, 75 cents; mahogany, $1.00.

Insuline Aerial Insulators. Heat resisting. Strain resistance 1,000 pounds. 10 cents.

Insuline Low Loss Tube Sockets. Skeleton barrel, direct connection, table mounting. 75 cts.

King Quality Radio Five Tube Neutrodyne Kit

THIS kit contains all the parts necessary for building a Five-Tube Neutrodyne Receiver of highest quality.

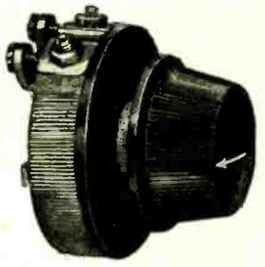
By means of telephone switchboard type of cable, all wiring goes into the set as a unit. Listening jacks are soldered in place. All bus wires are cut to length and bent to shape. Tube sockets are supported by metal brackets. The coils, of liberal proportions and wound with heavy wire, are attached to Cardwell Low Loss Condensers. Neutroformers are adjustable on condensers. Neutrodon is operated by a michrometer screw so receiver can be perfectly neutralized. The Bakelite Panel is properly drilled and engraved. Templates and full instructions for assembling furnished with kit.

R-1400—Storage Battery Type
R-1500—Dry Cell Type

King Quality All-Bakelite Dials

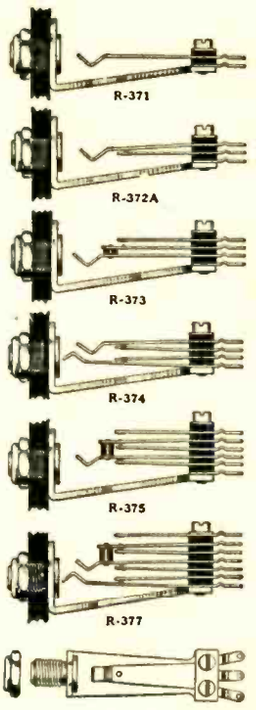
R-300—4" dial
R-301—3" dial
R-303—2¼" Rheostat dial
R-410—Rheostat knob

A one-piece, all-Bakelite dial with a specially designed knob which gives a perfect grip. Supplied in either black or mahogany Bakelite.



King Quality Rheostats with tapered fine knurl arrow knobs

R-640, 6.5 ohms
R-641, 6.5 ohms, Vernier
R-642, 15 ohms
R-643, 25 ohms
R-644, 40 ohms



Diagrammatic Top View

King Quality Jacks

A new and greatly improved type of jack. Terminals staggered to insure easy soldering, overall length much shorter than old style straight frame. Soldering flux cannot run into space insulators.

King Quality Vacuum Tube Sockets

Standard Tube Sockets

R-730, Black Bakelite.
R-731, Mahogany Bakelite.

UV-199 or C-299 Sockets

R-732, Black or Mahogany Bakelite.

King Quality Cardwell Condensers

Type No.	Plates	Max. Cap. MF.	Min. Cap. MMF.
R-190	11	.00025	10.0
R-191	15	.00032	12.0
R-192	17	.00035	9.0
R-193	21	.0005	18.0
R-194	41	.001	20.0

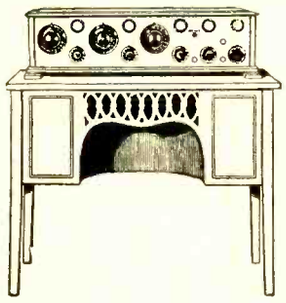
Write for copy of 1925 Radio Parts Catalog

KING QUALITY PRODUCTS, INC.
Buffalo, N. Y.

Branches: **Bridgeburg, Ont.** **Chicago, Ill.** **Kansas City, Mo.**

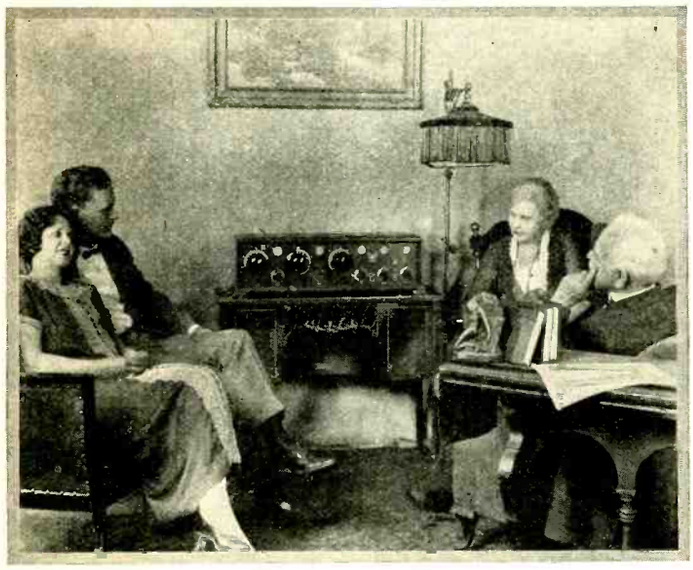
KING QUALITY RADIO

RADIO WITHOUT THE HORN!



Goodbye to the Old-Fashioned Horn Speaker!

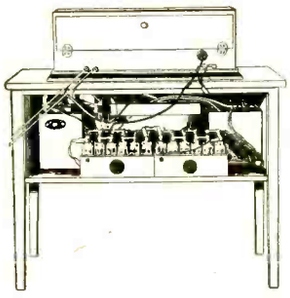
A Vastly Better Reproduction With This New Radio Console!



"Our old horn speaker never gave tones like this! An artistic addition to the living room—everything in its place—it's a joy!"

New Console Has Its Own Perfect Loudspeaker!

Ample Space for All the Rest of Your Outfit!



HERE is something that enables you to enjoy radio in the home without the clutter of unsightly apparatus that plays havoc in the decorative scheme of your living room! The horn speaker is out of date and out of place in radio for the home. This console, with its in-built loudspeaker, is scientific and sightly.

A Truly Wonderful Tone

It does a good job of reproducing, for it has a good unit and its sound-box is of resonant wood instead of metal, fibre, or composition.

The appearance of a Windsor loudspeaker console is a delight. Its convenience is a joy. A piece of real living room furniture of pleasing lines and finish—and it accommodates all the miscellany of equipment which hitherto had no place except on table tops, shelves or floor. Ample space on top for any set, with plenty of elbow room in front. Nothing in sight but the console and receiving set. Everything else goes inside—from behind—in spaces cleverly designed to hold the largest batteries and outfit for home use—besides the self-contained loudspeaker—all unseen and protected from dust or disturbance.

Dealers!

The sale of these consoles has already reached extraordinary figures. They are selling in surprising quantities in even smallest stores where there is one in the window or on the floor. It is a convenience and a value not to be duplicated.

Write us for discounts and particulars.

You Need This Console Whatever Your Present Outfit Is

It makes no difference what kind of radio outfit you have—this console was designed for your use. The graceful exterior of this console gives no hint of its inner utility, for it is a simple and effective piece of furniture in every line. But a glance at the interior reveals a most ingenious arrangement of the in-built loudspeaker with space either side and in back. These spaces are ample for the largest A battery, and the largest wet B batteries and the largest charging outfit for home use. It is 38 in. long, 18 in. deep, and 29 in. high. Notice the artistic grill that conceals sound-box, and the provision for the "knee-room" beneath. Made in mahogany or walnut finish, **and the price is only $40.00!** (West of the Rockies, $42.50.)

INVESTIGATE!

Dealers everywhere are now showing the Windsor loudspeaker console, and have them for immediate delivery to your home. If you haven't already seen this remarkable contribution to radio enjoyment and convenience, write us now for the name of a nearby store where you may view it. We will also send you complete information. Remember, this console gives you not alone a reproducing unit and a sound-box, but an altogether new beauty and utility in the provision for your entire radio outfit. Mail coupon or postal.

If you wish to use your own favorite unit, a deduction will be made for omission of unit.

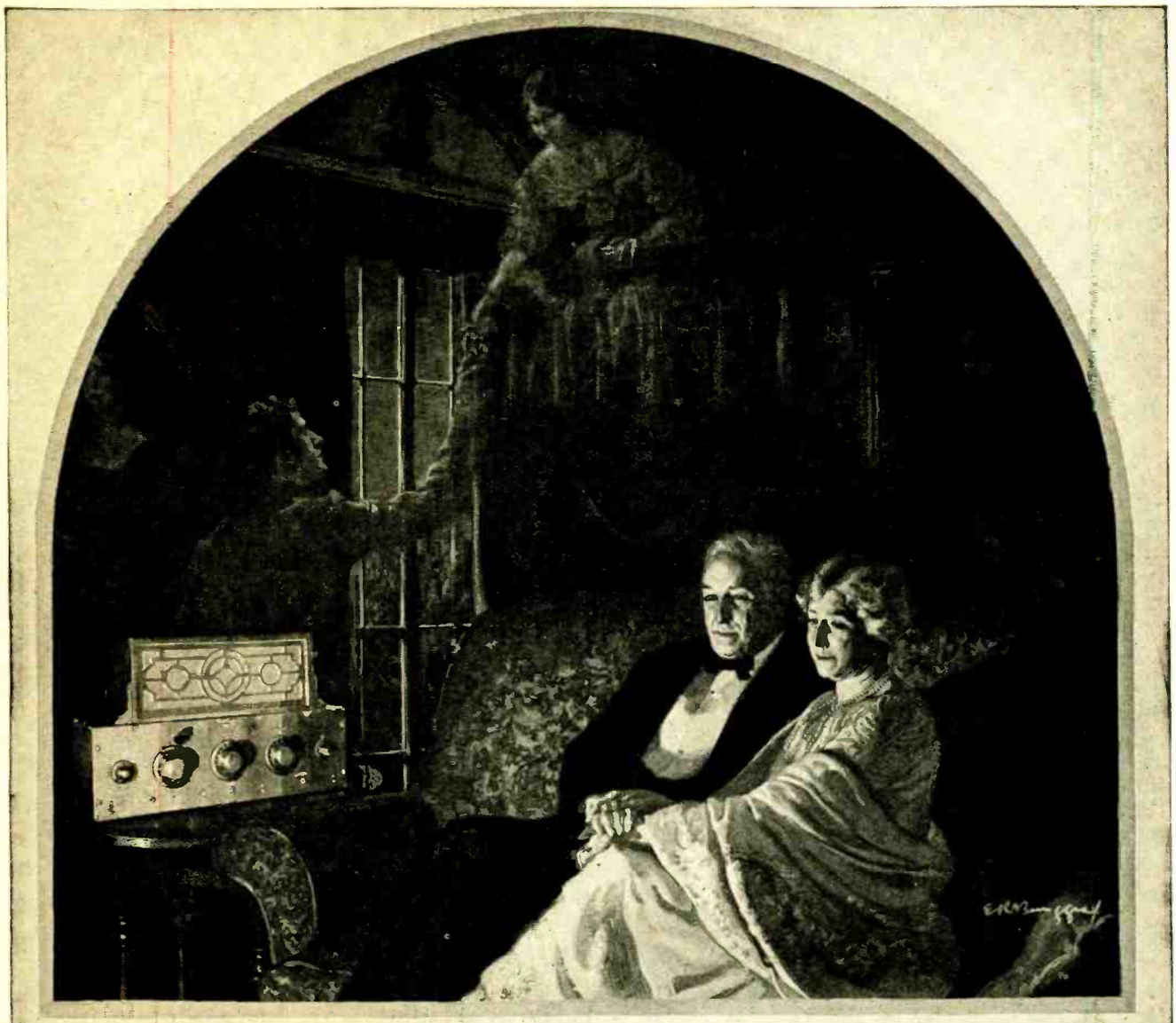
WINDSOR FURNITURE COMPANY C.R.C.B.

1422 Carroll Ave., Chicago.

Please furnish pictures and full details, also name of nearest dealer who has the new Windsor loudspeaker console.

Name.....

Address.....



Distance Lends Enchantment

WITH THE FREED-EISEMANN RADIO RECEIVER—each day is a new anticipation—each night—a new surprise!

In the American home it is constantly cheering the silence, refreshing the hopes, and lifting the spirits of millions.

Ask any radio dealer to demonstrate the FREED-EISEMANN—*the finest Receiver in the world*... Learn with what perfect realism, clarity and ease it performs .... Each set is individually built by men who are masters of their craft, and each is subjected to seventeen tests before leaving the great plant.

When you buy *yours*, you take with it our guarantee of complete dependability and lasting satisfaction.

* * *

We have prepared a booklet to help you. It is called "Buying a Radio".... It is interesting, enlightening and non-technical. Free—address Dept. A

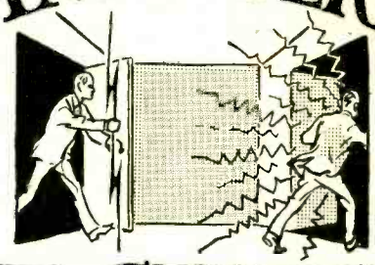
NEUTRODYNE

FREED-EISEMANN RADIO CORPORATION
MANHATTAN BRIDGE PLAZA, BROOKLYN, N. Y.

Reliable dealers sell the genuine Freed-Eisemann Receivers at listed prices. Beware of imitations offered at cut rates.

FREED-EISEMANN
RADIO RECEIVERS

EXIT INTERFERENCE



WELCOME SELECTIVITY

LITERALLY thousands of people have come to know the joys of perfect radio reception through the Ferbend Wave Trap. Testimonials from all parts of the world continue to pour in, unsolicited, from those who have equipped their set with this marvelous instrument.

You, too, will find it the shortest, easiest, and—best of all—the least expensive route to clear, undistorted reception—*without interference.* Never reduces, but nearly always increases volume. You can make your set selective to the point of perfection by simply adding a Ferbend Wave Trap. *It will absolutely cut out any interfering station, no matter how loud, how close by or how troublesome.* So why pay $50.00 to $200.00 extra for increased selectivity when you can buy it for $8.50?

Guaranteed to tune out any interfering station. The Ferbend Wave Trap is designed and manufactured complete by us after years of careful experimenting. It is not to be confused with imitations, hastily assembled from ordinary parts. The price is $8.50. Shipment is made Parcel Post C. O. D., plus a few cents postage. If you prefer, you can send cash in full with order, and we will ship postage prepaid. Clip and mail the COUPON today!

FERBEND ELECTRIC CO.

26 E. South Water Street CHICAGO, ILL.

FERBEND Wave Trap REG US PAT OFF

Always look for this Trade Mark. It is your protection against misleading imitations and those who infringe on the registered name "Wave Trap" and its reputation. "If it isn't a FERBEND, it isn't a WAVE TRAP."

Read the evidence

Dunbar, West Va.
Ferbend Electric Co.

Gentlemen: I bought your Wave Trap to see if I could not cut out the awful noise of telegraph stations which ruined most of our programs. Since we installed it in our five-tube Fada Neutrodyne set we have not heard any more telegraphers—*we let 'em in sometimes to show our friends how easy it is to kick 'em out with the Wave Trap.* I would not have a set without a Ferbend Wave Trap.

(*Signed*) H. E Atherton.

Farragut, Iowa.
Ferbend Electric Co.

Dear Sirs: I set my radio where Havana, Cuba, should come in but received only a jumble of K. F. N. F., W.O.R. and W.L.A.G. I then tuned in with the Trap and had Havana for two hours. I have several times taken a jumble like this and separated five and six stations. I find it a great help in cleaning up stations that can not be brought in distinct. I am using a Crosley X.J.

(*Signed*) W. T. Cox.

Towson, Md.
Ferbend Electric Co.

Gentlemen: Well to say I am pleased with the Trap is putting it mildly. It is simply a wonderful instrument. I have have had more or less trouble in getting K.D.K.A., W.B.Z., W.D.R. and W.L.W. with my Freed-Eisemann Set as they are only a few degrees apart on my dials. Your Trap lets me through with the clearest possible reception. In my candid opinion there is no Radio Receiving Set complete without the addition of the Ferbend Wave Trap.

(*Signed*) E. W. Stevenson.

FERBEND ELECTRIC CO.
26 E. South Water St.. Chicago, Ill.

Gentlemen: Please send me:

☐ WAVE TRAP. Send postpaid. I am enclosing (check, M. O.. etc.) for $8.50.

☐ WAVE TRAP. Send C. O. D. I will pay Postman $8.50, plus few cents postage when it arrives.

☐ FREE BOOKLET on Interference.

Name .....

Address .....

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

CARDWELL CONDENSERS

VARIABLE AIR TYPE

Bulletin No. 43 Published by The Allen D. Cardwell Mfg. Corporation Brooklyn, N. Y. **March, 1925**

THE Allen D. Cardwell Manufacturing Corporation was the first to adopt the now standard method of condenser construction:—the use of metal end-plates and grounded rotors, and the supporting of the stator by means of small insulation strips instead of bushings. The Cardwell company produced the first "low loss" condenser over a year-and-a-half before the efficiencies which the Cardwell design afforded were sufficiently understood by others to suggest their following the same general design.

By this original construction, which was characterized by engineers as "low loss" to distinguish the Cardwell from ordinary varieties, the Cardwell Company was able to offer the public a laboratory type condenser at a low price.

The general ideals of good condenser design are now fairly well understood by the advanced radio experimenters, but a brief review may not be amiss in pointing out the more refined details of construction.

A condenser is a piece of machinery. It must be able to withstand rough usage, retain its rating under varied temperature conditions, give a permanent alignment of plates, have a proper bearing which will afford smooth, firm action, etc. Any condenser which can be set out of shape by pressure of panel screws so that the plates touch or which will become loosened or jammed by casual blows will never prove satisfactory.

In examining a condenser, therefore, see that it cannot be pressed at the opposite corners so that the shaft or plates will yield perceptibly. It should be possible to press the shaft in or pull outward on it without the condenser changing its calibration or "log."

The Cardwell condenser is so strong mechanically that it will not suffer from rough usage. The bearings are accurately set and adjusted so that they will remain serviceable after years of constant use. The frame is so built that it takes a severe blow to make the slightest change in the alignment of the plates. The spacing of the plates is so arranged that they cannot become wide or narrow on one side due to the heat of the vacuum tubes inside the cabinet.

From an electrical point of view the Cardwell condenser has many unusual points which have revolutionized the standards of good condenser design.

The low losses in the Cardwell are due to the arrangement of the insulation material as a support for the stator. The plates of the stator, it will be noted, are swedged into brass blocks used as a spacing device and support. These brass blocks are held by screws which run through the rubber strips and are attached to the upper and lower end plates.

By this arrangement the electrostatic field is reduced to a minimum between the end plates (which are part of the rotor) and the screws which hold the stator. The distance from the end plate screw to the stator screw is ample to maintain a high resistance to any stray current in the regions across these points. The area of contact at each supporting point is also small. Contrary to the general idea, the screw posts from the stator do not fit against the hard rubber except where the ends are locked. At each end there is a small circular seat. The area of this on one side and the washer on the other end, when added together, give only .05 square inches of surface contact with the rubber. This means that very little of the insulation is in the condenser circuit and the hysterisis losses are accordingly low.

It will be noted also that the rubber is placed out at the edge of the end plates so that there is a relatively weak field between the end plates and the stator plates at the points where the rubber is supported and an even weaker field where the stator strip is held directly to the hard rubber. Thus the insulation is held almost entirely outside of the electro-static field where induced capacity effects will not cause losses in the rubber.

The arrangement of the insulation in the weakest part of the electro-static field and the restriction of the surface area used in contact between the insulation and the stator screws are the most important elements of the Cardwell design. The blocks supporting the stator, being continuous and extending beyond the points of support, shield the insulation from all stray field. In this respect no type of construction has been found since which can secure lower losses or better engineering than in the Cardwell.

Thus far we have dealt only with the broader considerations of good condenser design. In the succeeding paragraphs, we would point out a number of specific features of the Cardwell condenser which are not appreciated by many builders but which have no small importance in the satisfactory operation of a receiver.

The end bearing consists of a steel ball bearing which is set in a cup at the end of the rotor shaft and also set in a cup on the end adjusting-screw, which fixes the center of the shaft in perfect alignment and affords a smooth turning action. The shaft is of case-hardened steel and the end adjustment-screw is also of case-hardened steel. The bearing is practically immune from wear, as the case-hardened ball bearing revolves in a thin film of oil and is constantly keeping a constant distance and a fixed center.

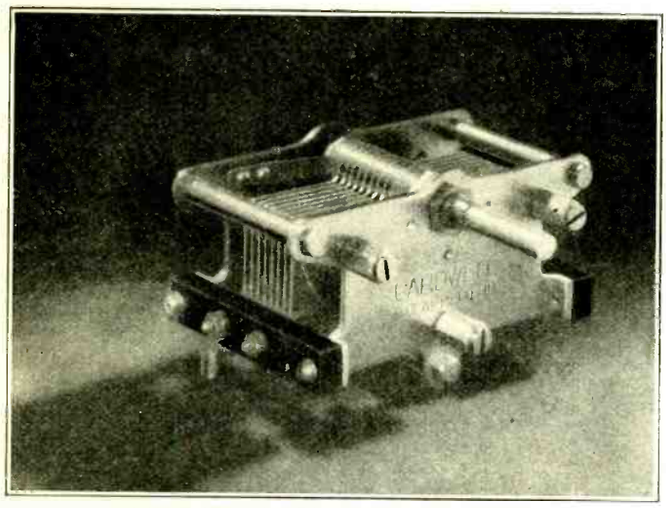
The shaft is tightened at the other end by a broad hexagonal brass nut locked to the end plate. A steel washer rests against the hexagonal nut and thus two dissimilar metals afford a fine bearing which is not subject to wear or play.

The end plate lock nut has a projecting split collar which gives firm, even pressure against the shaft, thereby insuring a good contact from rotor to shaft, but also avoiding any tendency of the rotor to turn due to its weight.

The condenser employs a special type of friction contact at the end bearing which fits snug against the under end of the lock washer and presents a broad surface for positive contact. This special friction contact is not entirely needed but doubly assures absolutely noiseless operation and is only added as a special precaution. It also avoids the necessity of using end stops where a "pig-tail" is used.

The stator plates are swedged into grooves by a permanent jambing process which insures unvarying pressure and avoids any risk of conductivity losses. The brass grooves are of sufficient depth to afford a rigid alignment to the stator plates.

The rotor plates are spaced by machined brass washers which are very accurately finished. The surfaces are broad and afford ample area to maintain the rotor plates flat and in perfect parallel with the stator plates. The pressure on the rotor plates and washers is very great, one end being locked against the steel collar washer which rides on the shaft and the other end being washer locked by a thread on the shaft and a hexagon lock washer which is tightened by a heavy wrench. As the diameter across the washers is a half inch it is practically impossible to get any of the rotor plates to turn on the shaft.



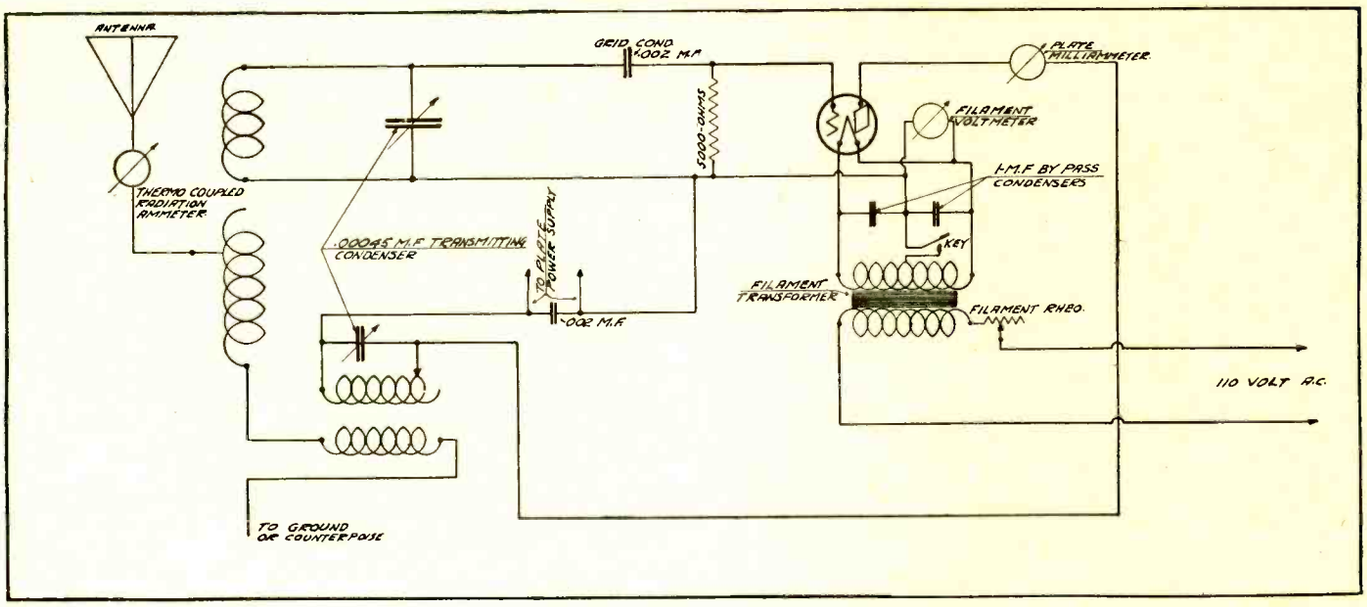
SOME STANDARD SIZES AND TYPES

Type Number	List Price	Number Plates	Minimum Capacity Micro-Micro-Farads	Maximum Capacity Micro-Micro-Farads	Price with Vernier	Vernier* Type No.
159-B	$ 4.00	5	2	50	$ 5.50	159-BV
154-B	4.00	7	3	100	5.50	154-BV
141-B	4.25	11	12	250	5.75	141-BV
153-B	4.50	15	18	300	6.00	153-BV
152-B	4.75	17	20	350	6.25	152-BV
123-B	5.00	21	22	500	6.50	123-BV
137-B	6.00	41	25	1000	7.50	137-BV
155-B†	4.00	7	3	43		
147-B‡	15.00	43	27	450	16.50	147-BV‡
157-B‡‡	16.50	21	15	200	18.00	157-BV‡‡
164-B‡	10.00	21	18	250	11.50	164-BV‡
200-B°	7.25	11	7	250	8.75	200-BV°
201-B°	7.50	15	8	300	9.00	201-BV°
202-B°	8.00	17	9	350	9.50	202-BV°
203-B°	8.50	21	15	500	10.00	203-BV°

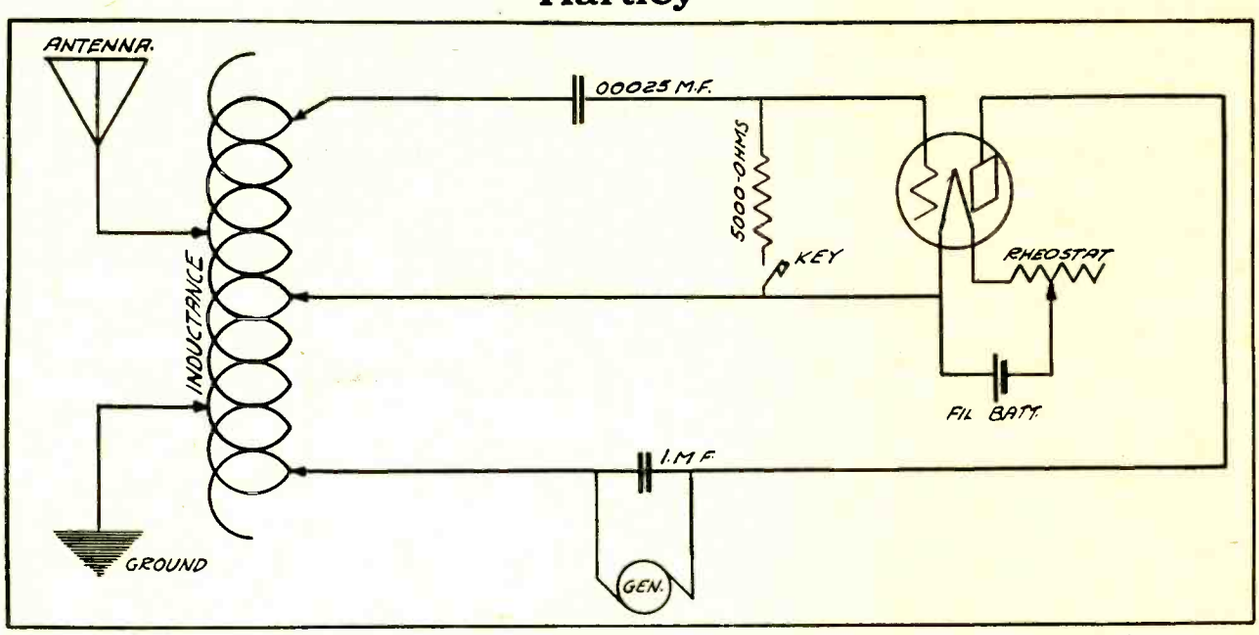
*With either right or left hand verniers. †Double stator for balancing circuits. ‡Transmitting condensers. °Double stator, "over-all" end plates, with separate insulator strips, for balancing circuits.

Transmitters

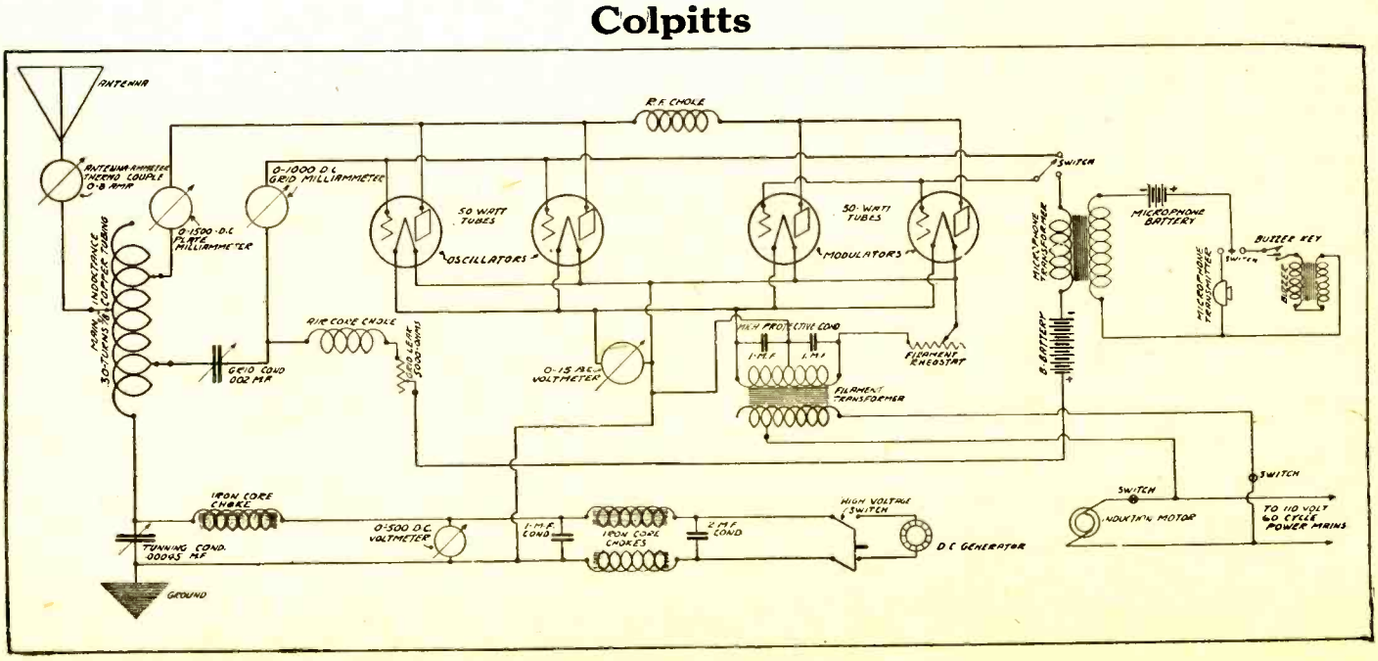
Meissner



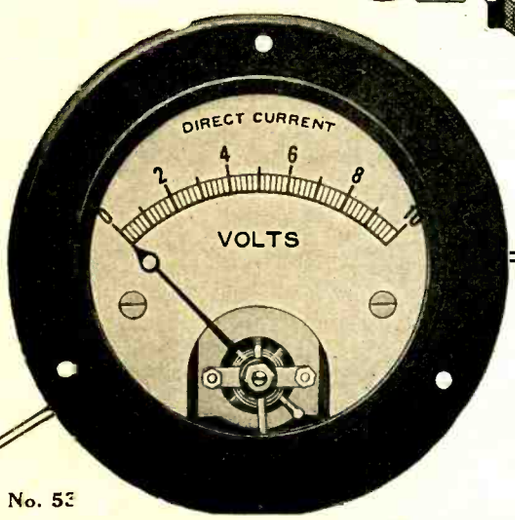
Hartley



Colpitts



JEWELL



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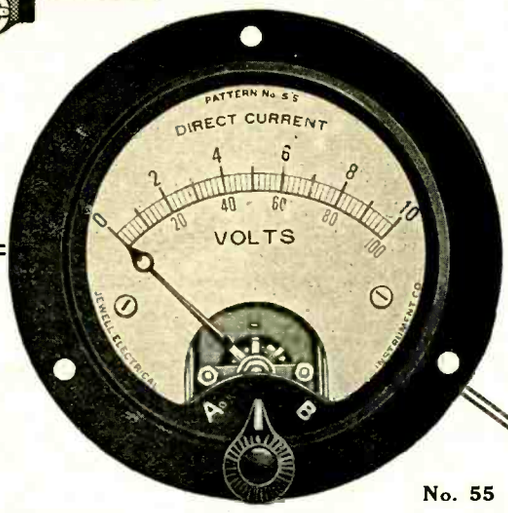


No. 55

CONTROL
FILAMENT *and* BATTERIES

During the past five years we have designed more new types of instruments for radio work than all other manufacturers combined. Not only have we studied the instrument needs of radio men, but we have built accuracy and quality into every instrument that leaves our plant. (Every radio enthusiast should have a copy of our 15-A radio catalog.)

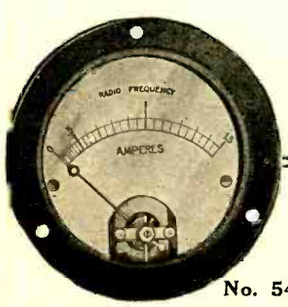
Don't paralyze your tubes—Control their filaments by using a Jewell No. 53 voltmeter. This is very important with owners of Neutrodyne, Superheterodyne and multiple tube sets.

Your batteries—they must be watched if you would have good reception. Use a Jewell No. 55 on panel of your set, and you will always know the condition of your batteries.

Send for Jewell 15A Radio Catalog

ORDER FROM YOUR DEALER OR JOBBER

JEWELL ELECTRICAL INSTRUMENT CO.
1650 Walnut Street **Chicago**



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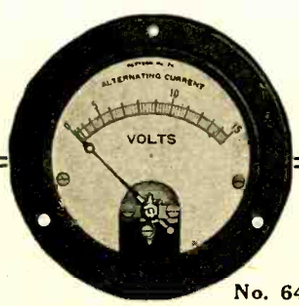

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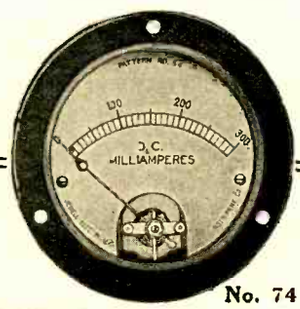
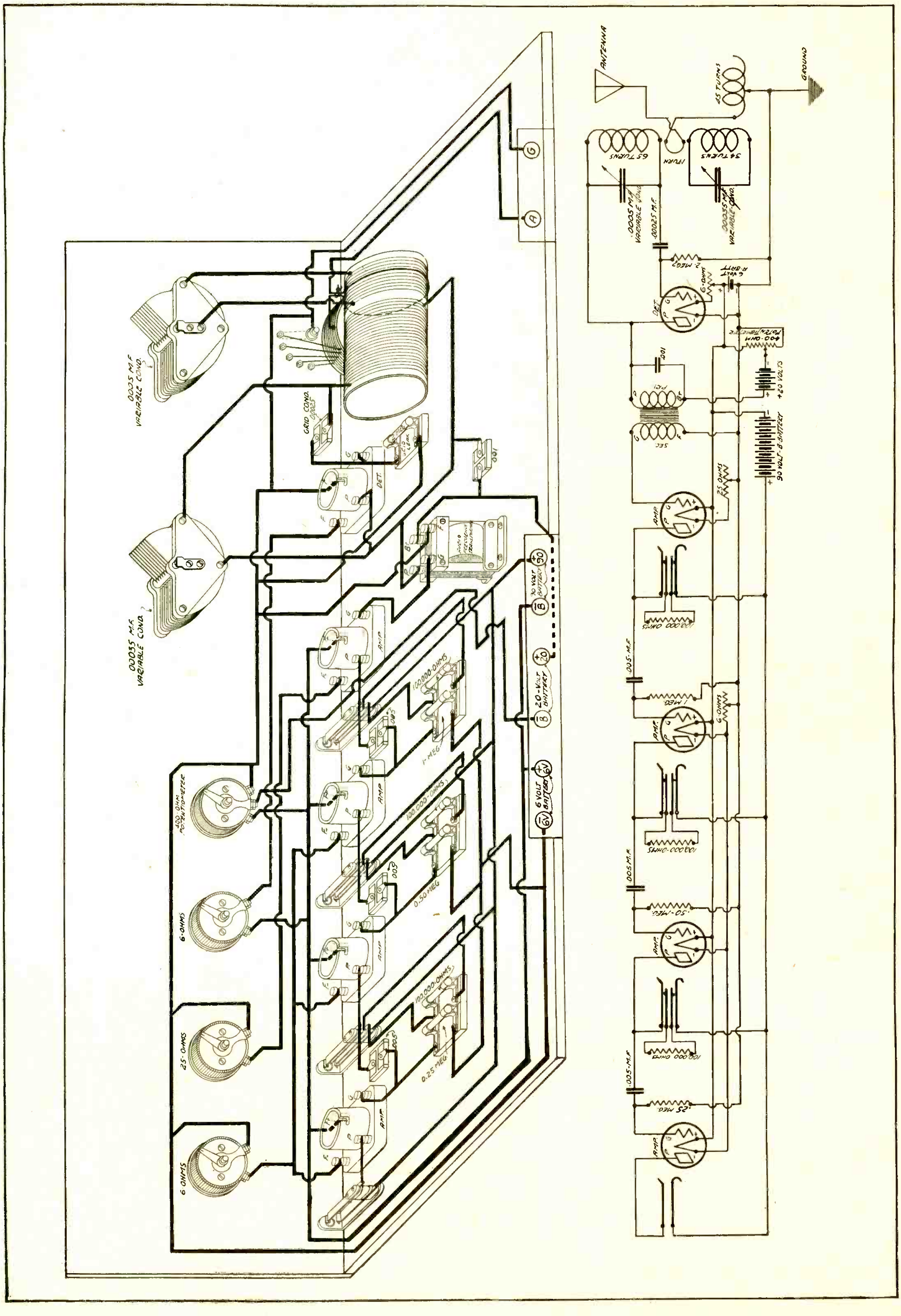
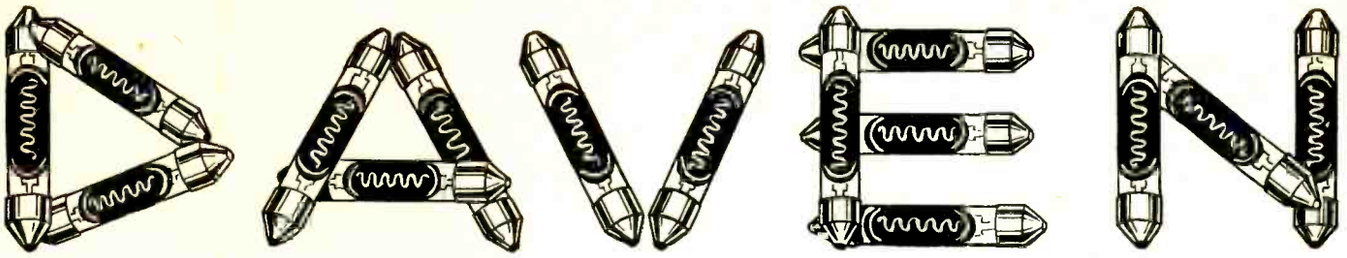


No. 74

THE JEWELL TRIO
"Famous Among Amateurs"

Four Circuit Tuner Using One Stage Transformer Coupled and Three Stages of Resistance Coupled Amplification



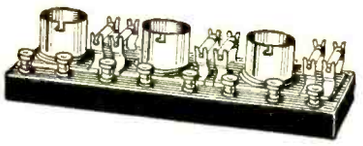


DAVEN is the real word for dependability when connected with Resistance Coupled Amplification. Daven engineers designed and built the first Resistance Coupled Amplifier offered the Broadcast fan—they were the pioneers and their devices have blazed the way for others to follow.

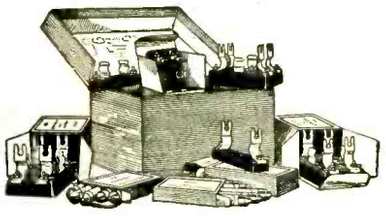
The Daven Resistance Coupled Amplifier Kits are highly perfected—their assembly is very simple—their output perfect. By adding this amplifier to your favorite tuner, you will have a worthy combination, hard to beat, and amplification that is perfect.

With Resistance Coupling the volume is adequate for all purposes, while the tone quality is overwhelmingly superior to any other form of amplification. The name Daven is the "Sine of Merit" and your safeguard when you go out to buy.

The Daven Super Amplifier Unit is laboratory tested and comes ready to install. The base is of molded Bakelite and small enough to fit within any cabinet. All wiring is hidden beneath the base.



The Daven Kits are supplied for either three or four stages—sockets and mica fixed condensers are not included, but instructions are furnished giving complete information and diagrams.



You can buy the Daven Products at any good Radio Store.

TRADE MARK

DAVEN RADIO

"The Sine of Merit"

CORPORATION

Resistor Specialists

Newark, New Jersey

Obtain from your dealer the RESISTOR MANUAL, our complete handbook on Resistance Coupled Amplification, 25c. If your dealer cannot supply you, we will send you one direct, postpaid, for 35c.

RADIO LOG BOOKS

This book together with 100 log sheets only

$2.00

No Station Is Complete Without One

By special arrangement, the Citizens Radio Call Book is now prepared to furnish at cost to all radio fans, a Genuine Art Leather 6x9½ in. LOG BOOK together with specially designed log sheets.

The illustration below shows the exceptional design of the log sheets which makes possible the proper recording of all adjustments on your receiver.

You should have one of these books. You will find it a wonderful help in the operation of your set.

RADIO STATION LOG

Date	Station	Time	Q S S	Q R N	Char	Tone	Remarks

Sample of Log Sheet

CITIZENS RADIO SERVICE BUREAU

508 So. Dearborn St. ~ Chicago.

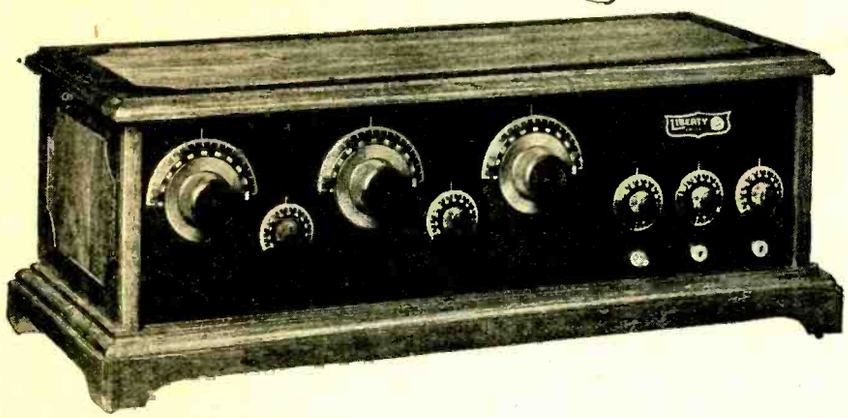
Tell 'Em You Saw It in the Citizens Radio Call Book

Index to Advertisers

LIBERTY

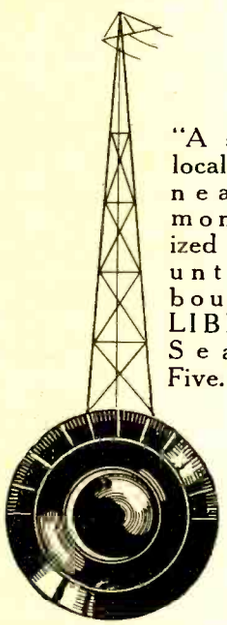
Sealed Five

Delivered Sealed



"My wife said all radio sets sounded 'mechanical' until she heard the LIBERTY. That's why we bought one."

All five tubes are kept "matched" because each tube is controlled by a **separate** rheostat. That gives pure tone.



"A strong local station near us monopolized the air until we bought a LIBERTY Sealed Five."

LIBERTY is extremely selective. You need no verniers on these large dials.

Owners of the LIBERTY Sealed Five are never without excellent entertainment.

LIBERTY is built for the Future

"I installed one of your Liberty Five radios in my home last week and the first three nights I operated this machine I pulled in the following stations:

KFI, Los Angeles	WCAP, Washington	WHN, New York
PWX, Havana	WCAE, Pittsburgh	WCBD, Zion
KHJ, Los Angeles	WJZ, New York City	KDKA, E. Pittsburgh
WBZ, Springfield, Mass.	WMAQ, Chicago	WLW, Cincinnati
WKAQ, San Juan, P. R.	WOS, Jefferson City	WSAI, Cincinnati
WFAA, Dallas	WSB, Atlanta	WMH, Cincinnati
KYW, Chicago	WHB, Kansas City	WTAS, Elgin, Ill.
WWJ, Detroit	WDAF, Kansas City	WTAY, Oak Park, Ill.
WCX, Detroit	WOR, Newark, N. J.	WEBH, Chicago
WOO, Philadelphia	WHAS, Louisville	WQJ, Chicago
WIP, Philadelphia	WTAM, Cleveland	WLS, Chicago
WEAF, New York City	WJAX, Cleveland	2XBJ, New York City
WOC, Davenport	WGY, Schenectady	WREO, Lansing, Mich.
WHAA, Iowa City	WGN, Chicago	WLBL, Stevens Point
WBAP, Ft. Worth	WCAL, Northfield, Minn.	8XG, Willard Test
WRC, Washington		

"I think the above test is remarkable inasmuch as I was not familiar with the operation of the set. Might also state that my residence is not located in a very desirable spot for reception, but nevertheless the above stations were received in a very clear tone and with plenty of volume on the Loud Speaker.

"I wish you all the success you deserve with this wonderful set."

"Yours very truly,
(Signed) M. E. Mogg, President,
Linton Consolidated Collieries Company, Indianapolis.

INVEST IN A LIBERTY SEALED FIVE

$100.00

less accessories for this 5-tube tuned Radio Frequency Receiver in beautiful two-tone solid walnut cabinet.

Manufactured by

LIBERTY TRANSFORMER CO., Inc.

555 North Parkside Ave., Chicago

MURDOCK NEUTRODYNE

$100
with
built-in
Loudspeaker

Same set with adjustable loud speaker unit
$110
Without loud speaker
$92.50

THE Murdock Five Tube Neutrodyne is the outstanding 1925 model receiving set. You will be impressed by the beautiful tone quality and the rich cabinet design. There is space in the cabinet for "B" batteries and the only accessories necessary are batteries and tubes. A "Murdock" set is backed by our 20 years of successful experience in making radio apparatus.

WM. J. MURDOCK COMPANY

Dept. D1, Washington Ave., Chelsea, Mass.

Branch Offices: New York Washington Chicago Los Angeles San Francisco Seattle

MURDOCK RADIO PRODUCTS

Standard since 1904

Use Any Tube

UV-200 or C-300

Volts—5
Amps.—1
Grid Leak
0.5—2
Megohms
Condenser
.00025
-.0005 M-f.

UV-201A or C-301A

Volts—5
Amps.—.25
Grid Leak
2—9
Megohms
Condenser
.00025 M-f.

WD-12 or C-12

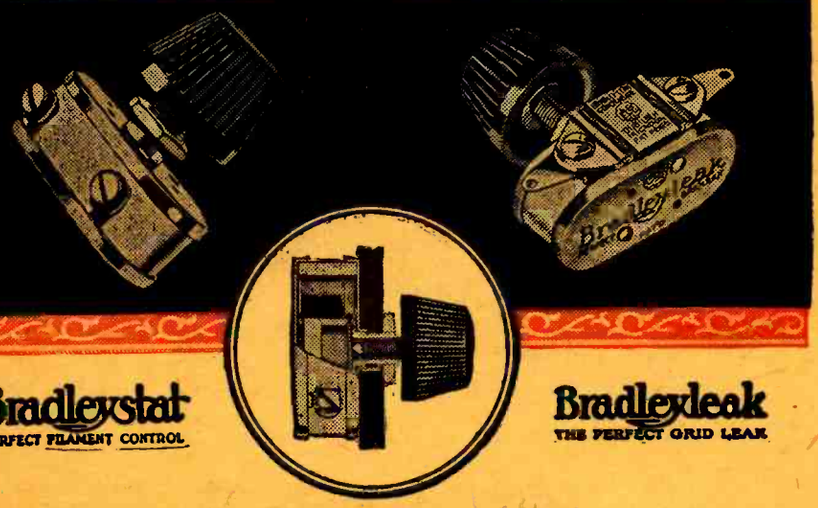
Volts—1.1
Amps.—.25
Grid Leak
2—3
Megohms
Condenser
.00025 M-f.

WD-11 or C-11

Volts—1.1
Amps.—.25
Grid Leak
2—3
Megohms
Condenser
.00025 M-f.

UV-199 or C-299

Volts—3
Amps.—.06
Grid Leak
2—9
Megohms
Condenser
.00025 M-f.



Bradleystat
PERFECT FILAMENT CONTROL

Bradleyleak
THE PERFECT GRID LEAK

Do You Know—

that any tube can be used in your set without changing rheostats or grid leaks?

IT SOUNDS unbelievable, but it's true. The perplexing problem of selecting the correct rheostat or grid leak is solved by using the Bradleystat and the Bradleyleak. They offer the most marvelous range without steps or noise, and such smooth precision of control that no other rheostat or grid leak can approach them in performance.

The Bradleystat has a resistance range from approximately ¼ to 100 ohms, by merely turning the adjusting knob that varies the pressure on the graphite discs. It will handle *all tubes* without change of connections, and provide ample control in every case.

The Bradleyleak, with a range from ¼ to 10 megohms, can be adjusted instantly for any tube, indicated in the adjoining table of tube ratings, by turning the adjusting knob.

Be ready to use any tube in your radio set. Install Allen-Bradley Radio Devices, throughout.

Have you used the Bradleyswitch? It saves batteries and tubes.

Allen-Bradley Co.

ELECTRIC CONTROLLING APPARATUS

Sales Offices:
Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Denver, Knoxville, Los Angeles, New York, Philadelphia, Pittsburgh, Saint Louis, Saint Paul, San Francisco, Seattle

General Offices and Factory: 488 Clinton Street Milwaukee, Wis.

Manufacturers of Graphite Disc Rheostats for Over Twenty Years

BURGESS
RADIO BATTERIES

Burgess 'C' Batteries improve reception economically.

One of several sizes of Vertical 'B' Batteries.

Quality at *Every* Price

Cabinet or table space many times determine the size and type of radio batteries selected by the user.

Burgess manufactures a battery for every radio circuit and tube. Your choice of any one of many types involves no sacrifice of economy or service hours. The value and quality of Burgess Radio Batteries are constant—your satisfaction assured.

Ask Any Radio Engineer

Write to 323 Burgess Engineering Building, Madison, Wisconsin, for the Burgess Radio Compass. It is amusing, unusual and useful.

BURGESS BATTERY COMPANY
Engineers DRY BATTERIES *Manufacturers*
Flashlight · Radio · Ignition · Telephone
General Sales Office: Harris Trust Bldg., Chicago
Laboratories and Works: Madison, Wisconsin
In Canada: Niagara Falls and Winnipeg

Standard Burgess Radio No. 6 'A' Battery "Over Twice the Life."

Burgess block shape 'B' Batteries are made in numerous types and voltages.