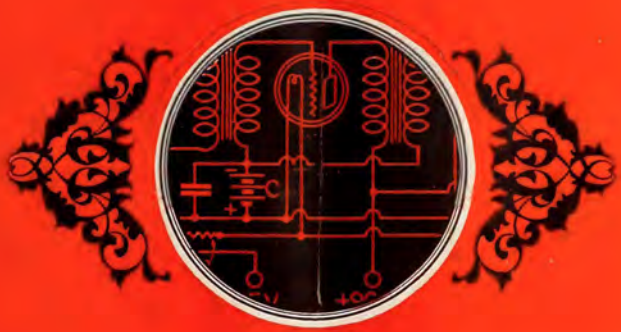
RADIO AGE



In This Issue

Quadrode Superheterodyne (With Blueprints)
Radio Age Short Wave Receiver
1928 "Nine-in-Line"
Aero-Seven
Camfield Super-Ten

November
1927

Complete List
of
Broadcasting Stations

25¢

All Electric Radio

The Randolph

7 Tubes-*Single Control*

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

30 DAYS FREE TRIAL

6 Tube $55 Retail Price

Biggest Discounts To Agents

Beautiful Ampliphonic Console

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

Genuine Walnut Cabinets

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

6-Tube Radio

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

All Sets Guaranteed

Biggest Discounts to Agents

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

RANDOLPH RADIO CORPORATION
711 West Lake Street Dept. 236 Chicago, Ill.

USE THIS COUPON TODAY!

Randolph Radio Corporation
711 West Lake Street, Dept. 236
Chicago, Illinois

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

Name.....

Address.....

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

Mark here ☐ if interested in Agent's proposition.

Now! A great Radio Training made greater!

If you want to get into the Radio Profession, or if you're in it and want to get ahead—

Read This Announcement!

J. E. SMITH, President

Here's a message of importance to every man who hopes to better himself along the lines of Radio. Never before has there been a Radio training course that could be made to fit the needs of all—both experienced men who wish to better themselves and inexperienced men who wish to start from the beginning. There is one now. I am prepared to help the beginner start in Radio from the very beginning. And I am prepared to help the radio dealer, the experienced Radio operator, the Radio service man, the college engineering student, the graduate engineer, the Radio fan, the "ham," the factory or broadcast man who wants to get a more responsible job.

An old, established system of Radio home-study training has now been developed, improved, tested, and enlarged in scope so that now it not only will help anyone who wants to get into the Radio profession, but more, can be adapted to help almost any man now engaged in Radio (Radio engineers of experience and standing excepted).

If you want to get into Radio, or if you're already in it and want to add to your knowledge and get ahead, let me send you my free 64-page book of information about this new and greater Radio training system.

The Good Jobs Pay $50, $75, up to $200 a Week—Some Pay More

If you're earning a penny less than $50 a week, you're not earning what you should be able to get out of Radio. Thoroughly-trained Radio men—men whose knowledge of Radio is practical and completely rounded out on every point—earn up to $200 and $250 a week. Radio is a new industry with plenty of fine positions unfilled. There are countless opportunities in Radio for a man to earn a splendid salary. But these are not opportunities as far as you are concerned, unless you are fully qualified for them. The only way to qualify is through knowledge—training—practical, complete training that fits you to get and to hold a better position in the Radio field.

For the beginner, I have a complete training that will take him from beginning to end. To the Radio dealer I'll give the technical and practical knowledge he has to have. I will round out and bring up to date the experienced Radio operator's knowledge. I can take a Radio service man who has a pretty good idea of the "how" but very little idea of the "why," and give him the practical and theoretical knowledge he must have before he can hope to climb higher on the Radio ladder. I can take the college engineering student, or the graduate engineer, who wishes to specialize in Radio, and give him what he needs.

What other line offers such an opportunity as Radio? From $2,000,000 a year in 1920 to $500,000,000 a year in 1926; from 1,000 persons engaged in Radio in 1920 to 300,000 in 1926. That's its record. The accomplishment of television and the many other inventions constantly being made promise the same sort of boom for the future.

If you're already in the Radio business, stay in it. But prepare yourself for advancement and more money. If you're not in Radio yet, get in. Men always do their best at work that interests them.

Send Coupon for Free 64-Page Book

My free 64-page book is filled with facts and photos relative to Radio and its opportunities, and tells all about my new and greater system of Radio training. Under my practical methods, you can study at home in your spare minutes, and get a thorough, clear, practical and expert knowledge of Radio in from 4 to 12 months. The time required depends on your previous knowledge, your ability, and the time you can spare for study. You keep right on with the job you have—no necessity for your leaving home or living on expense.

This proposition is open to anybody who is not satisfied with his job, his prospects, or his Radio knowledge. Regardless of how much you know already (or if you don't know the first thing about Radio technically) I'll fit my methods to suit your needs. No particular amount of general education is needed to start—many men I've trained didn't even finish the grade schools.

If you want to enter into any correspondence about your own situation, anything you write will come directly to me and will be held strictly confidential. Send the coupon at the right, or write me a letter today.

Address: J. E. SMITH, President

National Radio Institute

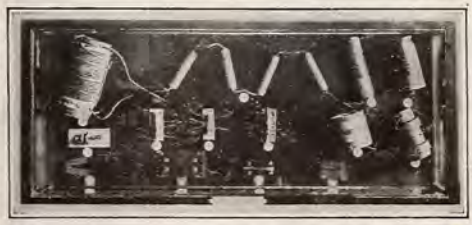
"Oldest and Largest Radio Home-Study School in the World"
Washington, D. C.

Employment Service to all Graduates

Originators of Radio Home Study Training

THE BEGINNING OF RADIO, 1898-1902

Below is the historical Marconi apparatus. These "jiggers" are transmitters and receivers, used by Marconi in his first Radio experiments.



RADIO TELEVISION—FIRST DEMONSTRATION, 1927

Below, television apparatus in operation—perhaps the best indication of the enormous progress made by Radio during the past 25 years. Now we not only can transmit any sound by Radio, we have learned to SEE by Radio as well.

Mail this Coupon for free information

J. E. SMITH, President,
National Radio Institute,
Dept. O-91, Washington, D. C.

Dear Mr. Smith: Kindly send me your free 64-page book about your new and greater Radio training system. I understand this request places me under no obligation, and that no salesman will call on me.

Name.....

Address.....

Town..... State.....

Please Mention Radio Age When Writing to Advertisers.

RADIO AGE

Established March, 1922

Volume 7 *November, 1927* *Number 3*

CONTENTS
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CONGER & MOODY, Higgins Bldg., Los Angeles, Calif.

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Chats

FOLLOWING our announcement in the October issue we are publishing this month the description of a superheterodyne circuit which presents absolutely new features. But aside from the unique phases of the receiver it has qualities which will be sure to make it popular. Mr. Freimann's article on this Quadrode Superheterodyne tells of the superior performance of the set when carefully tested in our laboratory and makes it clear, also, that here is an outfit that, despite its simplicity of construction and operation, measures up to the best results obtained by the more complicated superheterodynes. Set builders who have hesitated to tackle superheterodyne construction but who have wished to do so, will find this simplified super a dish to their taste.

* * *

Interest in set building and in kits is maintained at a mark that scarcely would have been predicted a year ago. It appears that the anticipated falling off in "how-to-make" radio has not developed. On the other hand there are general signs of increased interest.

One sure register of technical radio interest is to be found in our correspondence from fans. They are more enlightened as to what they want than they were two or three years ago but they are just as enthusiastic. It had been a rather commonly heard prediction that interest in technical radio would slump off sharply after the first glow of enthusiasm, just as interest in automotive engineering and interest in talking machine mechanics died away. But it is now apparent that there will remain indefinitely a large number of fans who will not be satisfied unless they can make their own.

Frederick Smith

Editor of RADIO AGE.

... Modern

Here is the Eveready Layerbilt "B" Battery No. 486, Eveready's longest-lasting provider of Battery Power.

Radio is better with *Battery* Power

NOT because they are new in themselves, but because they make possible modern perfection of radio reception, batteries are the modern source of radio power.

Today's radio sets were produced not merely to make something new, but to give you new enjoyment. That they will do. New pleasures await you; more especially if you use Battery Power. Never were receivers so sensitive, loud-speakers so faithful; never has the need been so imperative for pure DC, Direct Current, that batteries provide. You must operate your set with current that is smooth, uniform, steady. Only such current is noiseless, free from disturbing sounds and false tonal effects. And only from batteries can such current be had.

So batteries are needful if you would bring to your home the best that radio has to offer. Choose the Eveready Layerbilt "B" Battery No. 486, modern in construction, developed exclusively by Eveready to bring new life and vigor to an old principle—actually the best and longest-lasting Eveready Battery ever built. It gives you Battery Power for such a long time that you will find the cost and effort of infrequent replacement small indeed beside the modern perfection of reception that Battery Power makes possible.

NATIONAL CARBON CO., INC.
New York UCC San Francisco
Unit of Union Carbide and Carbon Corporation

Tuesday night is Eveready Hour Night —9 P. M., Eastern Standard Time

WEAF—*New York*
WJAR—*Providence*
WEEI—*Boston*
WFI—*Philadelphia*
WGR—*Buffalo*
WCAE—*Pittsburgh*
WSAI—*Cincinnati*
WTAM—*Cleveland*
WWJ—*Detroit*
WGN—*Chicago*
WOC—*Davenport*
WCCO—*Minneapolis, St. Paul*
KSD—*St. Louis*
WDAF—*Kansas City*
WRC—*Washington*
WGY—*Schenectady*
WHAS—*Louisville*
WSB—*Atlanta*
WSM—*Nashville*
WMC—*Memphis*

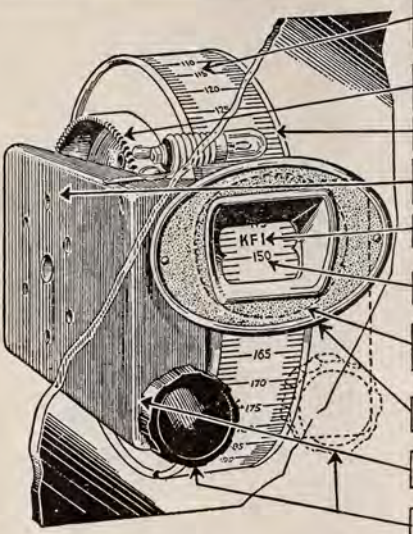
Pacific Coast Stations— 9 P. M., Pacific Standard Time

KPO—KGO—*San Francisco*
KFOA—KOMO—*Seattle*
KFI—*Los Angeles*
KGW—*Portland*

EVEREADY
Radio Batteries
—they last longer

The air is full of things you shouldn't miss

SIXTEEN REMLER REASONS WHY!



1 Readily changeable, white cardboard indicator strips. Supplied for clock-wise or counter-clock-wise reading.

7 No back lash. Fine-tooth gear driven by spiral-cut pinion.

5 Station Settings spread over 15 inches of space.

6 Heavy brass bracket supports condenser; rigid construction.

3 Space provided for call letters.

2 Large, easily read figures.

9 Round hole for escutcheon plate; no special tools necessary.

4 Attractive bronze escutcheon plate.

8 Vernier control; Special shaft cannot bind in bushing.

10 Right or left hand control.

REMLER *Drum* DIAL

Exclusively specified in the
Magnaformer 9.8 Circuit
—and many others—

1 360° rotation of shaft and reduction drive give vernier control.

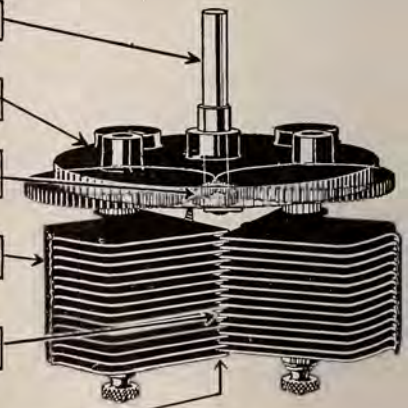
2 Proper placing of insulating material minimizes resistance to radio frequency currents.

3 Complete insulation of plates from dial and dial shaft and provision for grounding dial and shaft give absolute freedom from body capacity effects.

4 Plates carefully aligned by hand and soldered rigidly in position at three points.

5 Balanced Twin-Rotor construction gives utmost smoothness of operation.

6 Shape of plates permits attainment of very low minimum capacity and wide tuning range.



REMLER *Twin-Rotor* CONDENSER

REMLER Gang CONDENSERS—both 2-in-line and 3-in-line—incorporate all the advantages of the Twin-Rotor Condenser. No common rotor. Balancing condensers provided.

REMLER
DIVISION OF
GRAY & DANIELSON MANUFACTURING CO.
260 FIRST ST., SAN FRANCISCO
CHICAGO NEW YORK
EASTERN WAREHOUSE, ELKHART, INDIANA

NINE YEARS OF RADIO EXPERIENCE

Front panel and some of the parts and accessories used in the Radio Age Short Wave Receiver

The Radio Age Short Wave Receiver

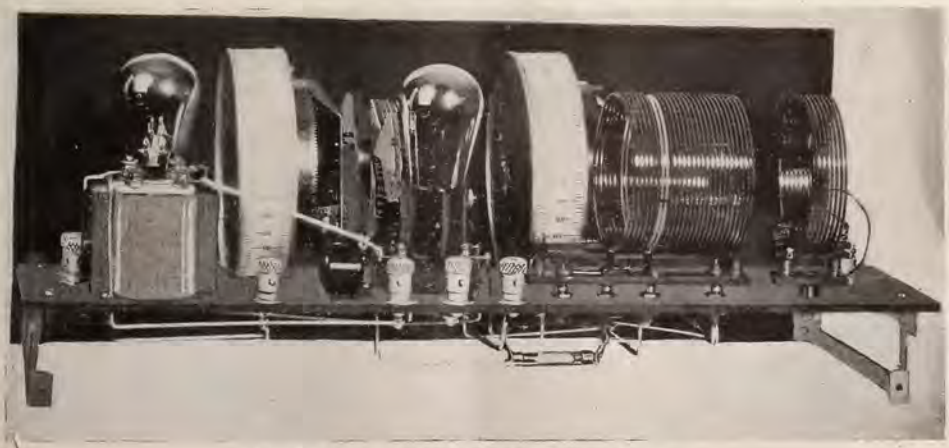
This instrument was designed and built in the laboratory of the Radio Age testing station, 9BRE

THERE is as much room below 100 meters as there is above, and in fact, a lot more. To the average person this territory is so much wilderness infested by wild Hams and kindred parasites. In other words, a refugee for those who don't dare go any where else. Maybe so. Then, why is it that the mightiest radio interests in the world are fighting for a slice of this useless ether for their individual employment? The answer is simple; the short waves are the most valuable of all the channels. Phenomenal distances are covered with ease, it takes only hundredth as much power to bridge a gap as on 300 meters, tuning is so sharp there is practically no interference.

Here may be found powerful transatlantic stations which keep a twenty-four hour schedule, amateurs in all parts of the world, KDKA and twenty other short wave phone broadcasters, as well as numerous foreign phone stations, the Navy and private interests.

It should not be understood that the short wave receiver belongs merely to the amateur who can read code. Broadcast listeners who have not the slightest knowledge of dots and dashes have new and wonderful fields of entertainment opened to them by the short wave set. Not only may the broadcast listener enjoy delightful programs on the low waves (not possible to get on ordinary receivers) but they can bring in these programs from a distance in the daylight hours and under adverse weather conditions that would possibly prevent reception on the higher waves.

Just recently the Puget Sound tug boats were equipped with short wave radiophones. Any one is free to listen who so desires. The broadcasters run some excellent programs, and there is no jamming and interference as on the higher channels. World history has been made on short waves. When Byrd flew over the North Pole he informed the world of the fact on short waves, and again while he crossed the Atlantic. The only clew to the fate of several fiyers was received on short waves. Most all airplanes that have radio use short waves. Numerous expeditions in the remotest corners of the world keep in touch with the home office on short waves. The famous Catalina



Back panel view of the Radio Age Short Wave Receiver.

Channel swim was scooped on short waves before other mediums could function. All this is free to him who has a short wave receiver.

The only requisite is a knowledge of the code. This is easy to master. Concientious endeavor will familiarize one to such an extent the funny buzzes cease to be static and become letters spelling words, connected together into sentences. It is a great thrill to hear a mess of dots and dashes slowly evolve into a serious statement that an expedition has just discovered something new, or a great catastrophe has befallen someone. Those of us who heard the Dallas Spirit fall know this only too well. The results are worth the effort.

Before any signals may be heard a receiver must be built, so let us roll up our sleeves and get busy. The parts selected are those which have proved their worth time and again. They are all standard and may be obtained on the open market. We chose them carefully, picking those which performed best in the combination of the finished receiver.

Now that all the parts contained in the list are on hand we will lay out our panel and baseboard. This should always be done before a single hole is drilled. Quite often it will be found that a certain instrument must be moved a fraction of an inch to make room for another. If it is already mounted this cannot be done without leaving unsightly holes. The only correct way to lay out a panel is by using a square and a pair of dividers. It is slow and often tedious, but the results are accurate. We have already done this, and the readers may avail themselves of our efforts by obtaining the drilling templets supplied by the service department of this publication at a cost of twenty-five cents. Paste this templet to the panel and with a centerpunch and hammer make an indentation for every hole. Care must be used, both to make sure the impression is in the correct spot, and also that a light enough blow is struck not to crack the panel. The correct size drill is indicated, as well as countersunk holes.

Rubber is used for panel and baseboard because it is the best dielectric obtainable in workable form, and it is far easier to handle than other insulating materials.

The instruments to be mounted on the panel are the two tuning condensers, the rheostat and cord tip jacks. Next we will fasten the two brackets to the panel, and in turn subpanel to them. The chassis is now complete, ready for the instruments to be mounted.

It will be noted that the coil jacks are removed from the supporting strip furnished by the manufacturer and placed directly in the subpanel. This shortens the leads considerably, makes a neater set and allows all the connections to be made on the under side.

The grid condenser and leak are mounted on the under side of the subpanel, placing them in a position where the leads will be shortest. Mounting screws are furnished with the condenser, as well as clips to contain the gridleak.

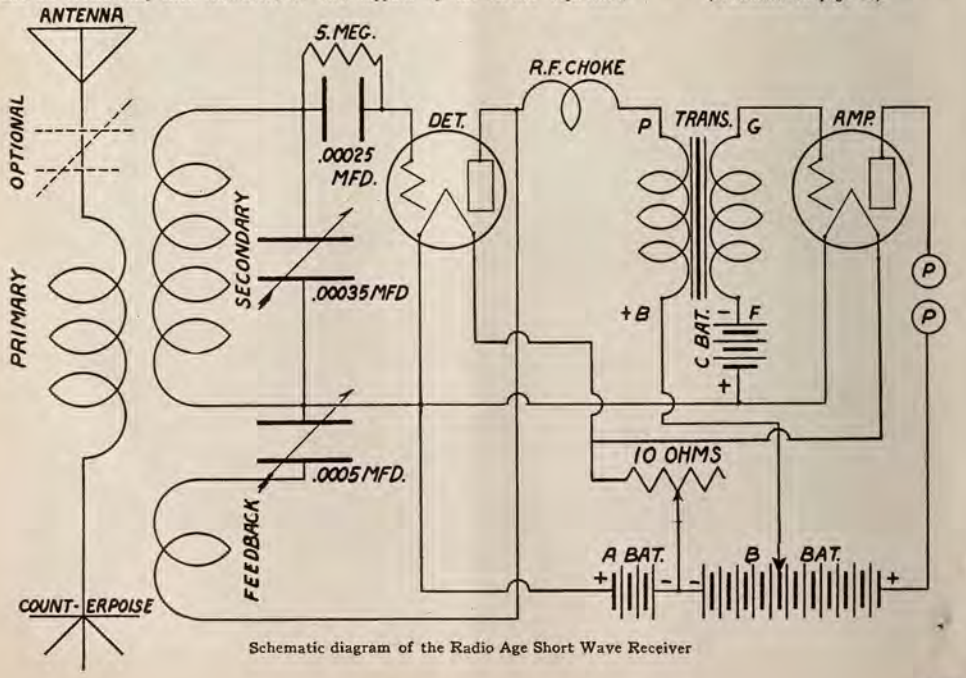
Surface mounting sockets are used, for as many leads are above the subpanel as below and it is just as easy to have the leads going down as it is to have them coming up.

In wiring, about five lengths of square

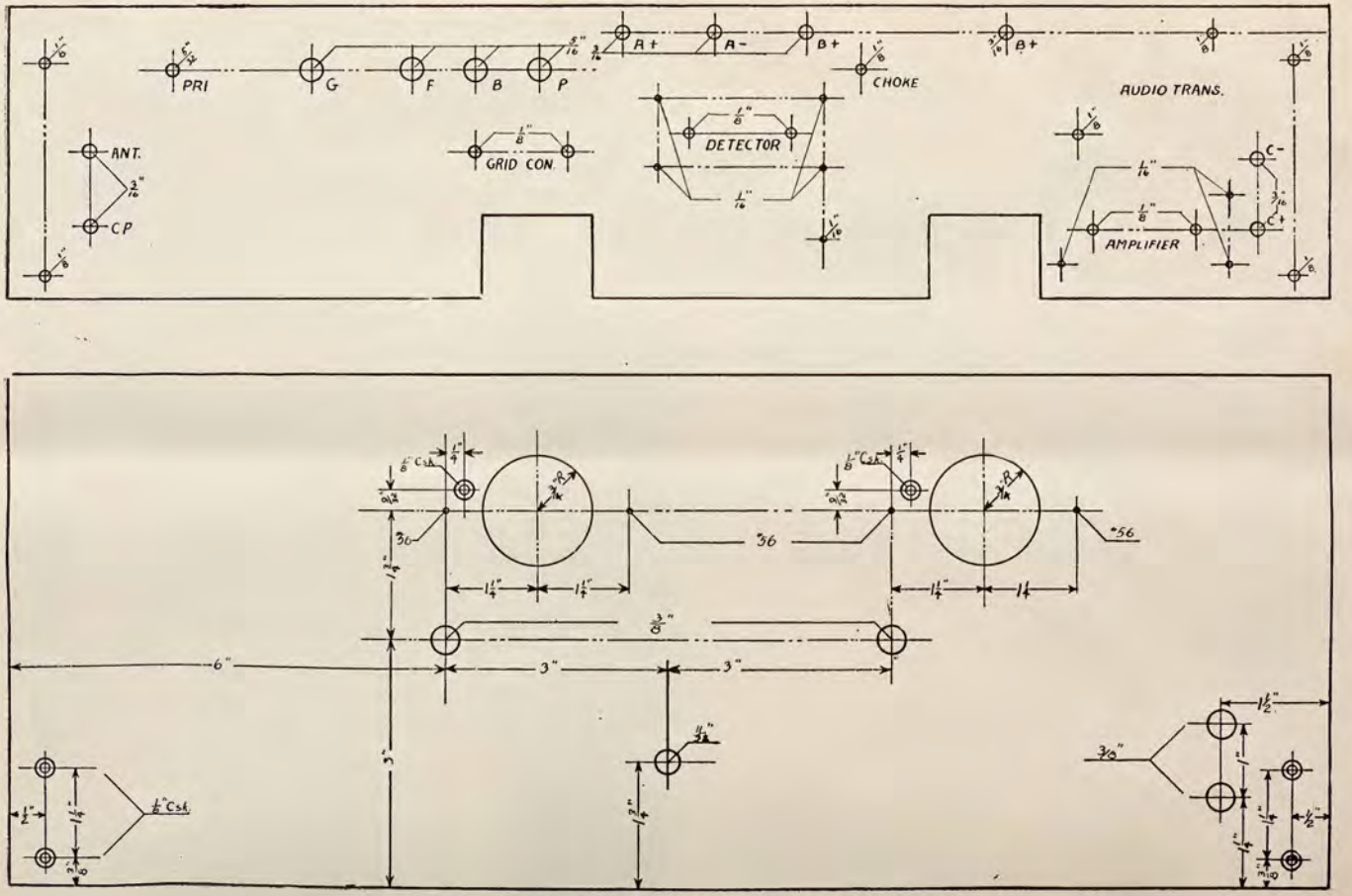
(Continued on page 36)

List of Parts and Accessories

One set of Chirad Short Wave Coils.
One Remler 639 Condenser, .0005 mfd.
One Remler 659 Condenser, .0001 mfd.
Two Remler Left Hand Drum Dials, No. 110.
One Remler 35 Choke Coil.
Two 530 Frost Sockets.
One 1920, 20 ohm Frost Rheostat with switch.
Two 235 Frost Cord Tip Jacks.
One Thordarson R-151 6-1 Audio Transformer.
Eight XL Push Top Binding Posts, marked as indicated.
Two Benjamin 8629 Shelf Supporting Brackets.
One Sangamo .00025 Grid Condenser with Clips.
One Lynch Metalized Resistor, 3 Megohm.
One 7 x 18 x 3-16 inch Rubber Panel.
One 4 x 18 x 3-16 inch Rubber Subpanel.
Ten Feet Square Tinned Bus Bar.
Two 201-A Tubes.
Two 45 volt B Batteries.
One 4½ volt C Battery.
One Six volt Storage Battery.
Headphones.
Connecting wire, nuts, screws, etc.



Schematic diagram of the Radio Age Short Wave Receiver



Templets of panel and baseboard of the Radio Age Short Wave Receiver

The Aero-Seven Receiver

THE design of the Aero-Seven receiver is one of distinction in the radio kit field. It claims several new features as follows: A special feature eliminating the objectionable detuning of the first stage of radio frequency amplification by the antenna, a common defect in many so-called single dial sets; the use of Aero Universal Coils, which are tapped in such a way as to allow the use of the new high-mu tubes for radio frequency amplifiers, with a considerable gain in both the sensitivity and the selectivity of the receiver; the use of these tubes in a perfectly balanced resistance coupled amplifier to produce exceptional tone quality and volume; and the embodyment of a special foundation unit consisting of drilled and decorated panels, with mounting brackets so that the construction of the receiver is simplified to an assembly operation. A front view of the completed receiver, Figure 1, shows the workmanlike appearance of the receiver that may be constructed by the home builder.

Many of the present-day single control receivers have the first radio frequency transformer tuned by one of the units of the gang condenser. In spite of any care in matching of the coils and condensers there is no provision made against the detuning of the first stage by antennas of different electrical characteristics. This effect is not noted in the succeeding stages as the other transformers each operate out of the plate circuits of similar tubes and hence similar impedances. A very simple means has been resorted to in the design of the Aero-Seven in order to eliminate this defect. As will be seen in the circuit diagram, Figure 2, the antenna is connected across the 1,000-ohm resistor in the grid circuit of the first radio frequency tube, thereby allowing the first R. F. transformer to operate out of the impedance of a tube in similar manner to the rest of the transformers in the receiver. The size of this resistor has been carefully chosen so as to permit the voltages set up in the antenna to be effectively transferred to the grid of the first amplifier tube.

As will be seen from the circuit diagram, the remainder of the radio frequency features are the tried and tested standards of the past, with the exception of the employment of high-mu tubes as radio frequency amplifiers. This feature is made possible by the design of the Aero Universal Coil. This coil is an arrangement of an exceptionally efficient, secondary construction that has been on the market for several years, with a primary arranged so as to get the most effective coupling coefficient to the secondary and tapped so as to produce primary impedances of widely varying values on the different taps. The highest of these values is secured by the use of tap No. 1 as the plate and the No. 4 tap as the B battery connection, as shown in the circuit diagram. When employed in this connection the impedance is of such a value as to perform very effectively with the high-mu tubes now on the market, such as the UX240 and the CX340. At the plate potential used (90 volts), these tubes on the average show a figure of merit, as generally accepted in engineering work, of 1.6 times the figure of merit for the usual 201A type of construction. This figure of merit may be realized in the design of a practical receiver either in selectivity or in amplification, or partially in both. In the design of the Aero Universal Coil the primary impedance was so proportioned as to conform to the latter possibility. The result is an extremely sensitive receiver of extreme selectivity.

An innovation in the matching of the radio frequency stages has been employed by matching the Aero coils in kits of three at two widely separated frequencies in the broadcast band. It has been found after considerable investigation of the subject that if two or more coils match at one wavelength that they will not necessarily match at another wavelength at the other end of the broadcast band. In order to prevent the receiver from falling out of tune at one end of the dial and in at other points of the dials, the Aero coils are matched at the factory at 250 meters and also at 500 meters. It has been found that by matching the coils in this manner that they will be sure of maintaining the same inductance over the whole broadcast band. The Amsco gang condenser used to tune these coils is one of exceptional accuracy and is provided with small compensating capacities to adjust for small differences in the wiring and tube capacities of the various stages. This adjustment will be described later.

Preliminary to constructing the AERO-SEVEN, a word about the Aero Noskip No. 60 choke coil used in the set. It has two nuts at the mounting end, the outer one of which is the only one supposed to be removed by the set constructor. The remaining one is intended to hold the engraved bakelite disc at the same end in place, and should not be removed. The Aero Noskip No. 60 choke coil is made of very fine wire, of especial design, and we caution you against substituting other chokes in circuits where it is recommended. Furthermore, we like to tell you not to tamper with it on the inside because of the very fine wire. Each one is tested at the factory, and is mechanically and elec-

Figure 1—Front panel view of the Aero-Seven Receiver

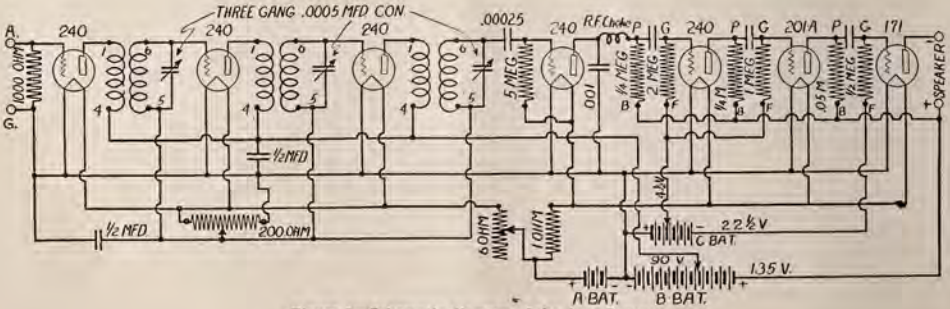


Figure 2—Schematic diagram of the Aero-Seven.

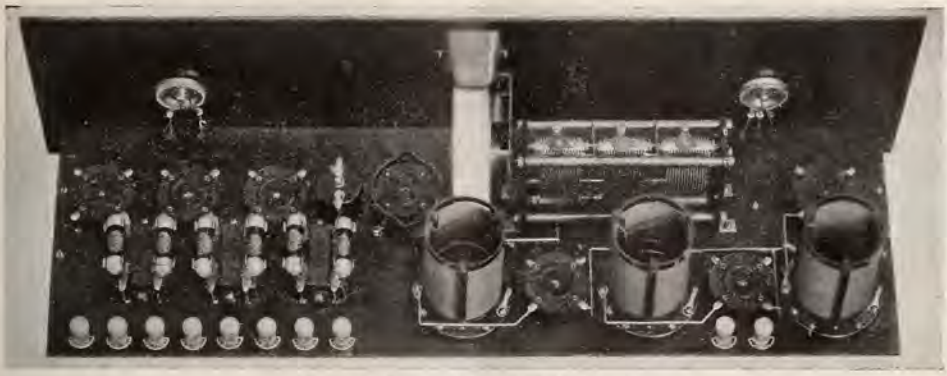


Figure 3—Rear panel view of the Aero-Seven.

trically without defects. If, however, regardless of the above instructions, the choke is taken apart, be careful of the very fine wire in putting it together again. If, in the latter event, your set fails to function, you have broken the very fine wire in this choke. In which case, you should have it repaired or purchase a new one.

In the assembly of the receiver the subpanel is the best starting point, as most of the work may be done on it without putting on the front panel, thus allowing the work to progress unhampered. Looking at Figure 3, we see the back of the assembly. The first radio frequency tube socket is partially hidden behind the first radio frequency coil, but is mounted with one screw so that the grid and plate terminals are nearest the first Aero coil. Across the back of the panel are mounted the second two radio frequency tube sockets in the same direction as the one previous. This places the grid and plate connections closest to the points to which they are to connect. Next, closer to the front panel side and in succession, are mounted the Amsco cushion detector socket and the three audio sockets. If these latter are mounted with the grid and plate terminals toward the binding post holes and the Amsco resistor couplers directly behind, a practically direct connection is secured to the plate and grid terminals.

In the blank space in front of the radio frequency coils and sockets is mounted the Amsco triplet condenser. Four brackets are supplied with this condenser, which may be secured by carefully removing the nuts at the corner bracing rods, *one at a time*, and placing the long side of the bracket over the stud and replacing the nut firmly. The brackets should be mounted on the side opposite the small adjustment condensers, so that in mounting these adjustments will be perfectly accessible. The condenser is then bolted down to the subpanel with the shaft extending near the center of the receiver.

The panel brackets should now be put on so as to support the subpanel while working. All the minor accessories, such as binding posts, condensers, etc., may now be put on before the receiver is wired. These accessories are better shown in the bottom view, Figure 4. Holes are provided for all these fittings and in some cases holes which were used to hold objects to the top of the panel are used for one or both ends of another object on the bottom.

Looking at Figure 3, we have from right to left, the 1,000-ohm Carter resistor used in the antenna input circuit, the Carter ½-mf. bypass used across the potentiometer, another across the 90-volt B supply, the Amsco resistor mounting with grid leak, the .001 bypass across the plate and filament of the detector tube, and the Carter 1-ohm resistor for the "A" circuit.

After all these have been mounted the subpanel is ready to wire in accordance with the circuit diagram, Figure 2. The wiring is so simple that most of it can be followed out from the photographs. It should be noted that in most cases where a circuit is to pass through the subpanel that a hole has been provided in the drilling of the foundation unit, and where no hole is provided the lead is intended to pass through the panel by use of the nearest mounting screw of that piece of apparatus.

The bracket from the Silver-Marshall drum dial should now be mounted under single hole mount nut of the condenser and the front panel prepared. The dial plate should be mounted on the panel with the Carter 200-ohm potentiometer at the left, the rheostat at the right, and the battery switch below, the connection screws of both pointing downward. This done, the panel may be screwed to the assembly by means of the panel bracket holes and the holes in the drum dial bracket. Care should be taken that the shaft and collar assembly of the drum dial are in place before putting on the panel. Now, by putting on the drum and with a screw driver inserted in the lips of the shaft mechanism the drum may be slid along the condenser shaft and into the aperture of the drive shaft and released. At the same time the dial should read 100 degrees with the condenser plates full in and the set screw is then locked on the condenser shaft.

The remainder of the wiring to the potentiometer and rheostat may now be completed and the receiver is ready to set up.

(Continued on page 28)

List of Aero-Seven Parts

	List Price
1 Aero-Seven Foundation Unit: consists of drilled and engraved front panel, 7x24x⅛; drilled subpanel, 7x23 x3/16; two Aero subpanel brackets and actual size blue print	$12.00
1 Aero TRF Kit, Code U-12 (3 coils)	12.00
1 Aero Choke No-Skip No. 60	1.50
1 Silver-Marshall Drum Dial	3.00
1 Carter Battery Switch D	.65
1 Carter 200-ohm "IMP" Potentiometer	1.25
1 Carter 6-ohm "IMP" rheostat	1.00
1 Carter H-1000 Resistor	.30
1 Carter H-1 Resistor	.25
1 Carter .00025 Mfd. Condenser with Clips	.50
1 Carter .001 Mfd. Condenser	.50
2 Carter ½ Mfd. Bypass Condensers	1.80
10 X-L. Binding Posts, Lettered=Aerial, Ground A+, A—, 2C—, B90+, Amplificer, B+, Speaker+, Speaker—.	1.50
1 Amsco Floating Socket	1.00
6 Amsco Plain Sockets @ $0.50	3.00
1 Amsco .0005 Mfd. Triple Condenser	11.25
1 Amsco Grid Gate Mounting	.30
1 Amsco 5 Meg. Grid Gate	.50
1 Kit AMSCO Aero-7 Resistance Coupled Audio	7.00
Screw Assortment and Bus Bar	.25
List	$59.55

1928 Nine-in-Line Super-Heterodyne

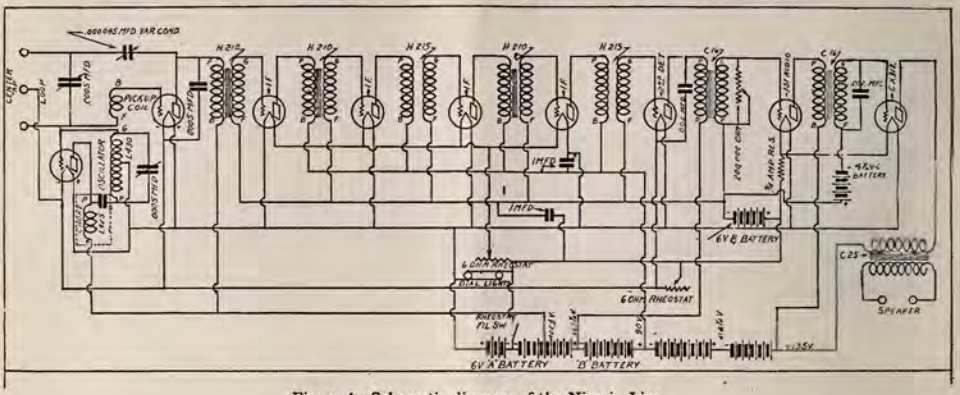


Figure 4—Schematic diagram of the Nine-in-Line.

THE H F L Nine-in-Line Super-Heterodyne certainly needs no introduction to radio fans since in the past two years it has been one of the leading receivers. This receiver delighted thousands of radio DX fans in its remarkable ability to extract stations in remote and distant corners of the United States—and even foreign stations—through the conglomeration of powerful local broadcasters in congested areas such as represented here in Chicago. No doubt many who built the set last year feel that it couldn't be improved upon.

There are refinements in the 1928 receiver which will attract the man who has already built the set and the new prospect for a receiver capable of getting distance under the present conditions and still preserve the fine qualities of music and speech as they are presented from the broadcasting stations. The outstanding refinements are the new audio transformers which have the characteristic of reproducing all the notes with uniform intensity so that an orchestra, for instance, will sound like the orchestra playing in the ballroom of a large hotel and not like an orchestra playing the same melody yet distinctively different from the original. That is, the low notes, mediocre notes and high notes are relatively the same as they burst forth from the loud speaker. The new Remler drum dials are here incorporated giving the set a snappy finished appearance and making the tuning easier.

The simplicity of assembling and wiring the set, which has been in the past one of the outstanding features, is well retained. All the leads are extremely short and direct which also adds to the electrical efficiency of the receiver. As can be readily observed from the name Nine-in-Line, nine tubes are used in the receiver. A first detector, four intermediate stages of amplification (using three iron core untuned transformers and two sharply peaked transformers), one oscillator, one second detector and the conventional two stages of audio frequency.

The receiver built in the laboratory of the RADIO AGE a few weeks previous to the writing of this article produced very gratifying results. The first night it was tried, a Sunday night, stations from coast to coast were easily tuned in. KFI, the west coast criterion, was brought in with ample volume to fill a room with music. It being Sunday night there were, of course, not quite as many local stations on the air as on an ordinary week day night. The tone quality is very good. The set tunes smoothly without breaking into annoying oscillations and was as a whole very easy to operate. A very

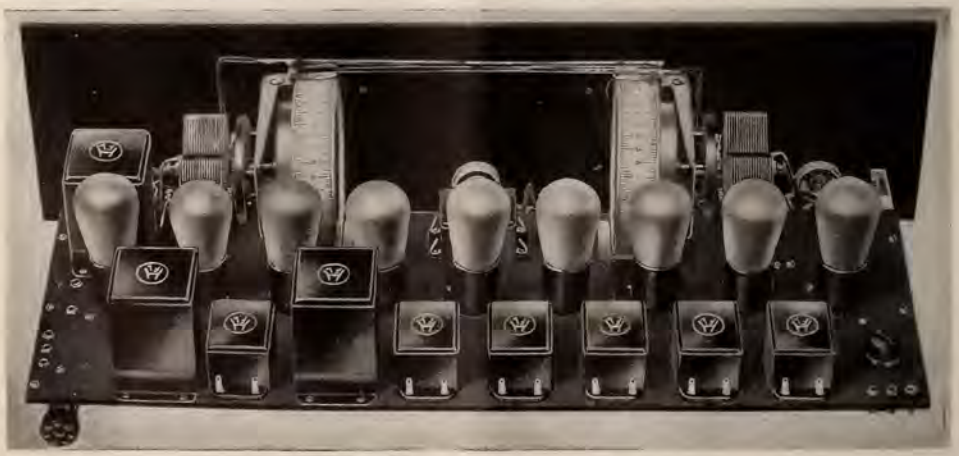


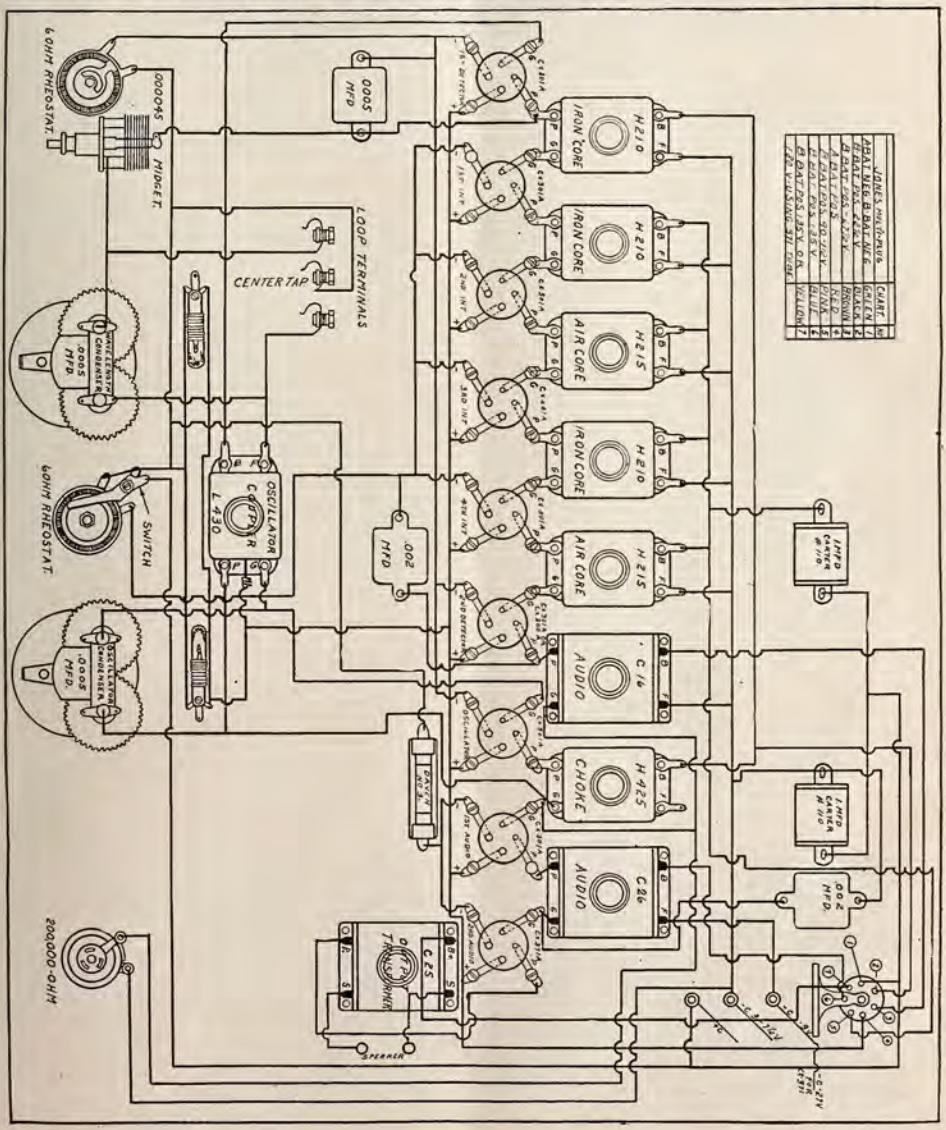
Figure 1—Photograph of complete set.

smooth volume control is provided to afford signals that can be heard a block away or in just a whisper.

Assembling and wiring the set was an interesting operation. All the parts coordinated perfectly. There is available on the market a front and sub-panel already drilled for the parts to be mounted thereto. As the parts are taken out of the boxes they are screwed down to the sub-panel in the proper places as indicated in Figure 2. Soldering lugs should be inserted on all the machine screws holding the transformers to the panel and also on all the filament terminals of the tube sockets, for electrical connections. Most of the lugs from the plate grid terminal of the transformers should be soldered directly to the tube sockets making practically no leads. Solid bus bar wire can be conveniently used in wiring up the set and the lugs bent so that the wires will be straight or at an angle. This gives the set a very neat and commercial appearance. Spring washers beneath all nuts are a great advantage as they prevent the nuts from loosening and making a poor electrical connection.

Assembling the new drum dial and condenser is probably a novel experience but as the fittings are quite obvious there is no difficulty. On the right hand dial, however, slight changes may have to be made so that the condenser will be mounted the opposite way from the left hand condenser. This is simply a changing of the position of the shaft and putting on another gear provided for that purpose with

(Continued on page 32)



Back-panel view of the completely assembled Camfield Super-Selective Ten

The Campfield Super-Selective Ten

RADIO is, and as it is most progressing, and we have before us today the Camfield Super-Selective Ten, which combines a Tuned Radio Ferquency circuit and the Super-Heterodyne.

This remarkable receiver functions best when used with an aerial and ground. It is well known that even the most diminutive of aerials picks up more current than a loop. The only reason aerials and supers were not used together long ago was that the super refused to differentiate between stations. It could not handle all the power collected by the antenna.

By consulting the diagram one will readily see how this trick is possible. Three stages of radio frequency amplification are placed ahead of the detector, one untuned, the others governed by a three gang condenser.

The untuned stage acts as a ballast, stabilizing the circuit and greatly retarding unwanted oscillation. This receiver positively will not squeal nor howl when being tuned.

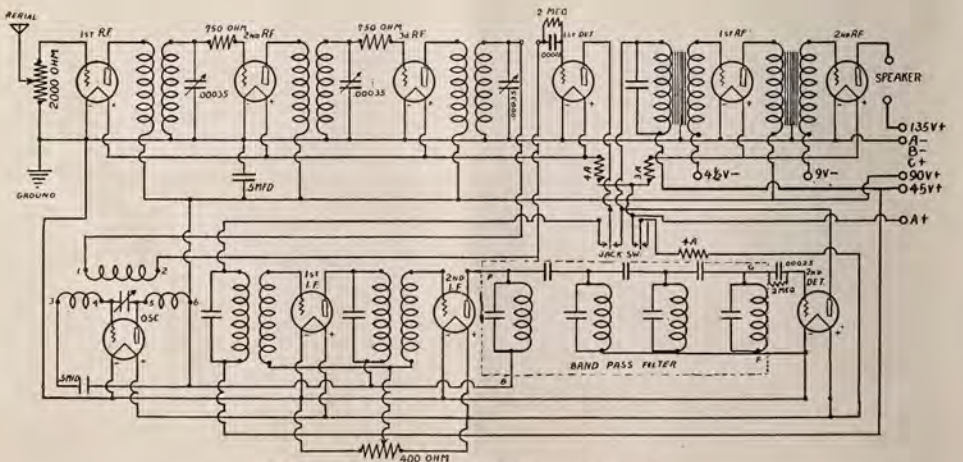
Tuning is extremely sharp, due to the employment of a new device on the market, a 10 Kilocycle Band Pass Filter. This device prevents stray waves from visiting the second detector. Only the frequency to which the first detector is tuned is allowed to pass. This is quite desirable for use in metropolitan districts for it enables one to tune right through the high powered ether paralyzer next door and drag in the favorite back in the old home town. The Camfield Super-Selective Ten is the first receiver to make use of a filter circuit of this sort, and by the way it works it will not be long till there are plenty of others.

Tone quality is perfect. Sharply peaked intermediates are avoided and the filter allows a sufficient breadth of channel to let the overtones and musical side bands pass undisturbed. This means that the full musical scale is faithfully reproduced, from the deepest growl to the highest squeak.

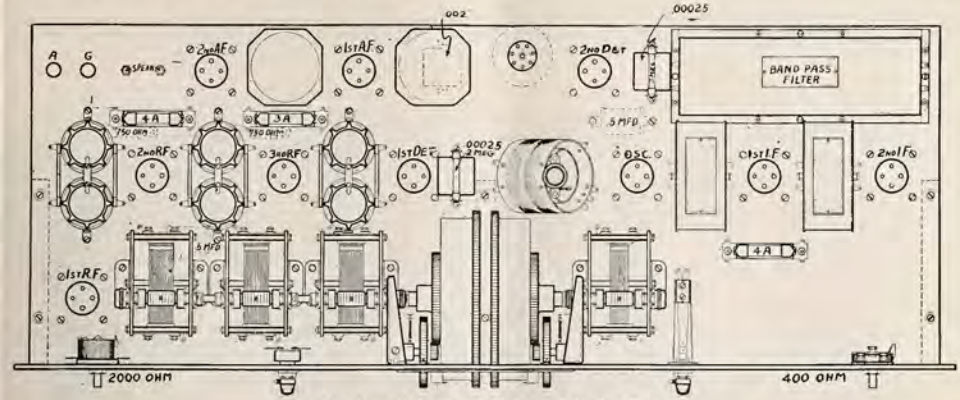
Now that we have made an appeal both to the man who hates QRM and the lover of fine music we will also include the midnight prowler who is satisfied with nothing short of Manila or Cape Town. This receiver is sensitive, very much so. There are three stages of radio frequency amplication ahead of the first detector. No matter how many tubes after this first detector, signals are heard no farther than it is able to detect. There is a minimum point of audibility, below which no sound is heard. With the additional radio frequency tubes ahead, this point of audibility may be considerably lowered giving phenomenal range. D. X. is a matter of selection of tubes, batteries, aerial and ground, coupled with patience and skill on the part of the operator. Many new trans-Atlantic records will be made this winter with the Camfield Super-Selective Ten.

There are only two tuning controls, because most of us have but two hands. That is all that is needed anyway for they do the work to perfection.

The three T. R. F. condensers must be



Schematic diagram of the Camfield Super-Selective Ten



Graphic chart of the Camfield Super-Selective Ten

LIST OF PARTS

- 1 251 Camfield .00025 mfd. Variable Condenser
- 3 351 Camfield .00035 mfd. Variable Condenser
- 1 10 inch Camfield Steel Shaft
- 4 pair Camfield Condenser Support Brackets
- 1 Camfield Kit of 3 Camfield Type 44 Duoformers
- 1 620 Camfield Oscillator Coupler
- 1 10KC Rusco Band Pass Filter
- 2 95KC Rusco Transformers
- 1 Carter .001 mfd. Fixed Condenser
- 1—IR400 Carter 400 ohm Potentiometer
- 1—MW2000 Carter 2000 ohm Potentiometer
- 2 105 Carter .5 mfd. By-Pass Condensers
- 2 Carter .00025 mfd. Grid Condensers with Clips
- 2 Lynch 2 Meg ohm Grid Leaks
- 2 330 Tyrman Audio Transformers
- 1 Tyrman Double Vernier Drum Dial
- 1 10 Carter Battery Switch
- 1 6 Carter Jack Switch
- 2 Carter 750 ohm Resistances
- 2 Carter Tip Jacks
- 10 9044 Benjamin Sockets
- 3 Karas Sub-Panel Brackets
- 2 Engraved Eby Binding Posts
- 1 PM Jones Multiplug
- 2 4A Amperites
- 1 3A Amperites
- 1 Celeron 7" x 30" x 3/16" Drilled and Engraved Front Panel
- 1 Celeron 10" x 29" x 3/16" Drilled Sub-Panel
- 40 Feet Acme Celatsite Wire

synchronized down to a hairs breadth, or the set wont work. This sounds formidable, but it is simple. Tune in a station and then disengage the set screw for two of the condensers and adjust till in resonance with the third. An hour is plenty of time for this.

One advantage in building this receiver is that it may be constructed in two sections if desired. One will notice by consulting the diagram that the receiver may be either a six tube T. R. F. or a ten tube super, at the throw of a switch. The switch connects the first detector tube directly to the audio amplifier in one position, and when thrown to the other, lights the super tubes and connects the oscillator, intermediates and second detector. A more desirable arrangement than this cannot be found.

The super has been considered the most satisfactory circuit for use under conditions formerly prevailing. But broadcasters have increased power and crowded together till the overlapping of harmonics has become a serious matter. In fact it is so bad in certain localities the beat note of one station may be used as a heterodyne for another, making it possible to remove the oscillator tube from the socket and still have perfect reception, if such circumstances may be called perfect.

A super designed to function on an intermediate frequency of 50 kilocycles or thereabouts will pick up the local stations regardless of the oscillator dial setting if there happens to be another station on the air in the neighborhood having a frequency either 50 kilocycles above or below the one intended to be heard. Needless to say, results are far from gratifying.

In the Super Ten this condition is entirely eliminated as intermediate frequency transformers, peaked at 95 kilocycles, are used. There are no stations in the United States that are exactly 95 kilocycles apart. This frequency coupled with the three stages of T. R. F. spells freedom from harmonic interference.

The filter used in this receiver has been designed to pass a band of frequencies 10 kilocycles wide between 90 and 100 kilocycles. All frequencies lying within this range are amplified equally by the intermediate stages. The filter is designed to cut off very sharply on both sides of this band, and the circuit, therefore, has excellent selectivity.

It must be remembered that the frequency of a broadcasting station at any given wavelength is not absolutely constant. It is modulated by the frequency of the voice or music being transmitted and therefore varies within 5 kilocycles of the rated frequency, either above or below. If a circuit is not designed to give practically uniform amplification over a band of frequencies 5 kilocycles above or below that of the incoming wave, some of the voice or music frequencies will not be

(Continued on page 28)

Bottom View of Camfield Super-Selective Ten

The Quadrode—A New Super-Heterodyne

By Frank Freimann

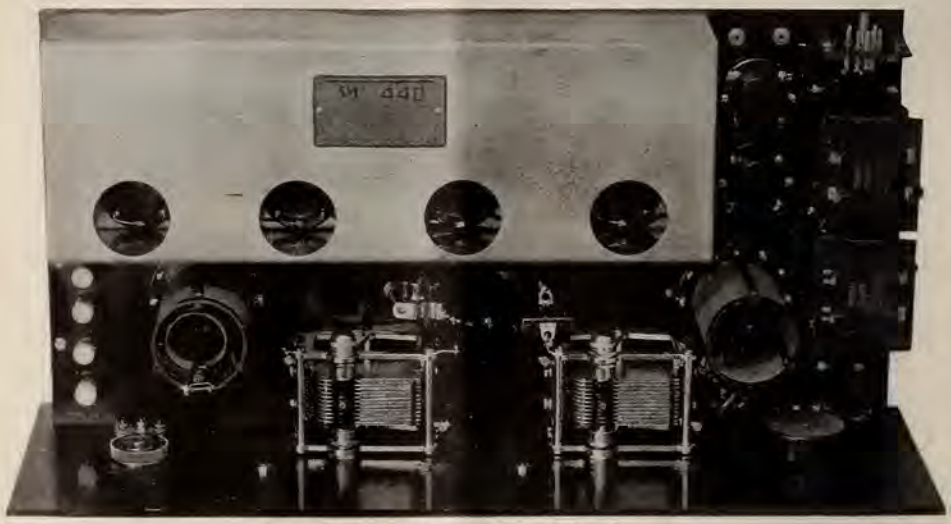


Figure 1.—Back panel view of Quadrode Superheterodyne

WE are bringing to our readers a new super-heterodyne which we know will be met with enthusiasm. We have long been wondering why the Quadrode Vacuum Tube (four electrode) was not adapted to the many possibilities which this interesting tube affords. A month ago we started working towards a super-heterodyne of a highly efficient nature which would be simple enough to attract the man who, because of its complicated character, has been afraid to build a super-heterodyne. We planned a super-heterodyne simple enough in construction to be built by one who has had little or even no experience with radio receivers and yet a super-heterodyne as generally efficient as the most complicated of receivers we know today. And here the Quadrode Vacuum tube immediately presented itself as the solution for a simple mixer circuit.

Fortunately we already have on the market a highly efficient intermediate frequency amplifier which we immediately decided to use in our new receiver, due to its simplicity and high amplifying ability. The amplifier was described in the October issue of RADIO AGE and is already familiar to the radio experimenter as the S-M 440 Jewelers Time Signal receiver, manufactured by Silver-Marshall, Inc. This instrument itself reduces the complications of the super-heterodyne many fold. Instead of having a series of transformers to wire up into an intermediate amplifier—complications which entail dozens of connections, not to mention the worries as to whether or not the transformers are matched—the S-M 440 amplifier merely has eight connections to be made to the associated parts of the receiver.

The one tube mixer, the S-M catacomb, and a simple two-stage audio amplifier constitute the unique Quadrode Super-heterodyne shown in the photograph, Figure 1.

The special tube which serves the dual purpose of detector and oscillator more efficiently than the conventional two-tube circuit, needs perhaps some description as very little publicity has been given this very excellent tube in this country. In foreign countries its merits are more fully recognized and the tube is more commonly in use, whereas here in America there has been no such device developed and made available until this late date.

The Voltron Quadrode we are here employing is the development of the K & H Electrical Corporation, and consists of a very substantial filament, two grids, one on each side of the filament, and a common plate. The characteristics of each side of the tube is practically identical, that is, the inter-electrode impedance and capacity is the same. Double grid tubes that have previously made their debut on the market are the type having one grid within the other. A tube of this kind has two decidedly different characteristics, one equivalent to a High Mu (high amplification and very high plate resistance) and the other a Low Mu; therefore the tube does not lend itself to all purposes. The Voltron Quadrode looks externally exactly like any other tube of the more common type except for the base, which has five points instead of four, so spaced that the tube can be plugged into a socket designed for a five prong type of tube.

The connections on the socket can be followed according to the way the socket is marked except the cathode connection (the extra connection) which is the additional grid. The plate resistance of the tube is about 20,000 ohms.

The Quadrode Super-heterodyne is not only simple in construction but easy in tuning as well, since there are no regeneration controls and since there is no possibility for the detector circuit to oscillate; yet regeneration is always present in the detector circuit, thus increasing the sensitivity and selectivity of the set. The two dials run together over the whole wave length range with a deviation of less than five points. This makes the set particularly easy to tune because one knows that the dials are in resonance as long as the numbers on the dials correspond.

The set can be used on either an inside loop aerial or a short outside aerial. Most of the experiments were conducted with a wire connected through a small condenser to the house lighting system as an antenna. In this manner KFI was received with enough volume for good loud

SM Power Amplification With Tone

The Jewelers Time Signal Amplifier

The Silver-Marshall 440 Jewelers Time Signal Amplifier is a three stage R. F. amplifier and detector completely wired and sealed in a copper and brass catacomb and tuned exactly to 112 K. C., the 2677 meter wavelength of the U. S. Naval Observatory Station at Arlington (NAA).

Each of the four circuits of the amplifier is sectionally shielded. The selectivity is so great that interference from other wavelengths is impossible. The amplification is tremendous—higher than that of any 3-stage long wave amplifier that can be constructed from standard parts today. Thousands have been sold, for it's the best long wave amplifier ever developed. The 440 simplifies construction and eliminates all guesswork. Price $35.00.

New S-M Transformers

Two new S-M audio transformers are now available and chosen for the Quadrode Receiver. Type 240, 3:1 ratio audio provides practically the same characteristics as the famous S-M 220, the largest selling high grade audio transformer, except for slightly less accentuation of notes below 80 to 100 cycles. Type 241 output protects speaker windings and boosts low note reproduction. Used together, a pair of 240's and a 241 provide an ideal audio amplifier in small space, at low cost, and with low power consumption—and they provide the 5000 cycle cut-off so necessary under present broadcast conditions to keep heterodyne squeals and noise at a minimum. Due to their small size, these transformers will fit in almost any of the older receivers, and once installed, will work wonders in tone quality improvement. Size 3 7-16 inches high, 2 1-4 inches wide, 2 5-8 inches deep, weight 2 lbs. 4 oz. each. Price, 240 audio, $6.00; 241 output $5.00.

S-M audio transformers hold the record again this season—for the largest sales in their class—and again for specification for more circuits than any other types!

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

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

Then there's the new 660-171A Unipac, a similar model for 112 or 171 tubes that will far outperform ordinary 210 packs, and it also supplies ABC power for any receiver at all using A. C. tubes. It is priced at $66.00.

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

SILVER-MARSHALL, INC.

850 West Jackson Blvd. Chicago, Ill.

If you want all data on the Unipac, the new transformers, and other new S-M developments just drop the coupon below with 10c to cover mailing in an envelope, and we'll send it all to you.

Silver-Marshall, Inc.
850A West Jackson Blvd., Chicago

Please send me all data on the Unipacs, new transformers, etc. Enclosed is 10c to cover postage.

Name.....

Address.....

speaker operation. The set was equally sensitive when using a loop for the pick-up. Due to the high amplification of the intermediate frequency amplifier a large antenna was found unnecessary. Ten kilocycle separation between stations is very practical. Only when too close to a powerful local station is a separation of more than ten to twenty kilocycles necessary to bring in distant stations. Due to the splendid characteristics of the new S-M 240 audio frequency transformers which are employed in this receiver, very accurate reproduction of the broadcast music and voice is realized. There is no drummy sound to the music even when stations from a great distance are received. All in all the quality is beautiful.

The highest grade materials available on the market are used in the make-up of this receiver, yet the set can be built for about $90.00 which is within reach of many builders who have found the more expensive super-heterodynes restricted because of the cost in building.

This set is unusually compact. With the present tendency towards receivers twenty-six inches and longer, the Quadrode Super-heterodyne is a delightful contrast, being only twenty-one inches long, seven inches high and ten inches deep. Nevertheless the parts are not so crowded as to hamper greatest efficiency in operation. This set indeed has a portable feature.

Seven tubes are used, one Voltron double grid tube, five Voltron 201A tubes and one Voltron 171 power tube. The Quadrode in the mixer circuit, four 201A's in the S-M 440 amplifier, 1 201A in the first stage of audio—and the power tube, of course, in the last stage. A Yaxley cable plug and connector for the batteries is used making the connecting and disconnecting of the set a matter of seconds.

The schematic wiring diagram is shown in the blue-print, Figure 2. The mixer circuit consists of a Quadrode tube, the antenna coupler U99 and its tuning condenser C1. This is the in-put circuit to the tube. Four binding posts are used so that either a wire antenna or loop can be used. If the antenna is used, the ground is connected to G post and the antenna to A post while the other two binding posts are connected together by a piece of wire completing the circuit from the secondary of the coil to the grid condenser. When a loop is used, the terminals are connected to the two outside binding posts marked L and the connection between the shorted binding posts is removed thus connecting the loop directly across the tuning condenser C1. If the wire between the upper two posts is not removed, the secondary of the coil will be connected across the loop and interfere with its operation. U100 is the oscillator coupler and C2 its tuning condenser. As can be observed, the plate of the tube is common to both the in-put circuit (detector circuit), the oscillator circuit, and the out-put or first intermediate transformer. In other words, there are three frequencies in this one circuit, the frequency of the station which is desired, the frequency to which the oscillator is tuned, and the beat frequency which is the difference in frequency between the station frequency and the oscillator frequency. The beat frequency is that to which the intermediate frequency amplifier is tuned, namely 112 kilocycles. The pickup coil is entirely eliminated. It is apparent that there is no need for the pick-up coil since all three frequencies are already in the plate circuit of the mixer tube.

Front panel of Quadrode Superheterodyne

To illustrate this we will suppose that WMAQ is desired and condenser C1 is tuned so that the secondary circuit of the antenna coupler will be in resonance with 670 kilocycles (448 meters) than the oscillator condenser C2 must be tuned to 568 kilocycles. These two frequencies combined net a frequency difference of 112 kilocycles which will be amplified to a very large value by the intermediate frequency amplifier, then rectified by the second detector which is incorporated in the S-M 440, and then amplified to any desired volume by the two audio frequency stages. The oscillator condenser is always tuned to a frequency lower by 112 kilocycles than that of the desired broadcasting station frequency. The .001 mfd condenser in series with the oscillator tuning condenser straightens the tuning characteristics of this circuit so that the dial readings on the in-put, or antenna, and oscillator circuit will always be alike. Only on stations lower than 350 meters is it possible to use the "upper setting" or the frequency *higher* by 112 kilocycles than that of the station frequency, thus preventing repeating of the low wave stations on the upper part of the dial to a marked degree.

The S-M Jewelers Time Signal receiver designed to receive the time signals from NAA on 112 kilocycles works at an ideal frequency for a super-heterodyne amplifier because the two oscillator settings are so wide apart (224 kilocycles). When the oscillator is set to the lower setting and the local station should be 224 kilocycles lower, the possibility of interference is very much reduced because of the great percentage of difference in frequency from that of the station which is desired. If the intermediate amplifier was tuned to half that frequency or about 55 kilocycles, the percentage of interference would be twice as great. Thus the advantage of working on a high intermediate frequency is readily apparent. Each stage of the S-M 440 amplifier is carefully shielded so that no energy is fed from one stage back to another due to coupling between stages and this makes a much higher gain per stage possible than with the usual transformers mounted in a row. Accurately tuned air-core transformers are in each stage. These transformers are all identical so that each stage is tuned to the same frequency making a perfect frequency band pass about ten kilocycles wide.

Amplification and oscillation in the S-M 440 is controlled with a 200 ohm potentiometer which is connected across the filament terminals of the mixer tube. The terminal to the right, number 3, should be connected to the negative lead, and the left hand terminal, number 1, should be connected to the positive lead. When the knob of the potentiometer is turned to the right, the grid of the tubes become less positive in potential and the amplification is increased. When the knob is turned to the left, the potential on the grid is more positive and the amplification is increased. When the knob turned to maximum—the extreme right—no positive potential will be impressed on the grids of the intermediate frequency tubes and oscillation in the amplifier will likely result. The maximum amplification is at the point just below which the tubes start going into oscillation. As the amplification is increased by making the grids less positive, the selectivity is also slightly increased, and as the amplification is decreased due to an increased positive potential on the grids, the selectivity of the amplifier diminishes. This is a very desirable characteristic since the quality on local stations will be better when the intermediate amplifier is a little broader. As the amplification is increased to receive distant stations, the selectivity of the amplifier automatically increases, which is very advantageous in cutting through the locals.

By-pass condensers C5 and C6 are quite essential, especially when the set is operated on a "B" battery eliminator. One condenser is connected from terminal B, where the 45 volt lead terminates from the detectors, to the amplifier case, and the other condenser is connected from N on the S-M 440 amplifier to the case. The copper housing is already connected to the negative A terminal inside the amplifier. The second detector in the amplifier is biased by 4½ volts negative. This is used in preference to a grid condenser and leak because with this method a larger out-put from the intermediate frequency stages can be handled without distortion of the music. The out-put of the detector is connected to the two stage audio amplifier.

The new S-M 240 audio transformers which are in no small way responsible for the fine quality obtainable from this

receiver are worthy of some comment here. These transformers have just been placed on the market and we find them especially fine for the use with a superheterodyne, or any other extremely selective receiver, due to the characteristic of amplifying the very high notes which are to some degree reduced when passing through a very sharply tuned radio frequency amplifier. The higher notes are restored to normal proportions after they are amplified by these two audio stages. The transformers are mounted almost directly against one another without any bad effects due to coupling between transformers.

The grid return of the first audio stage is connected to the negative A battery instead of using a C battery since this tube is not handling any large volume of power. A one volt bias is impressed on the grid by virtue of the voltage drop across the 3A Amperite. The grid of the power tube is connected to minus 45 volts for C bias since this tube handles much more power.

The 200,000 ohm potentiometer is connected across the secondary of the first audio transformer to serve as a volume control. This, incidentally has a stabilizing effect on the audio amplifier. The left hand terminal of the potentiometer, number 3, is connected to the filament terminal of the secondary, the right hand terminal, number 1, is connected to the grid terminal of the secondary while the grid of the tube is connected to the middle terminal of the potentiometer. In this way the volume is increased as the knob of the potentiometer is turned towards the right and decreased as it is turned to the left. The filament voltage of all the tubes is reduced to five volts by the two Amperites 5A and 3A. The four tubes in the S-M 440 amplifier and the double grid tube are governed by the 5A Amperite and the two audio tubes are governed by the 3A Amperite. Filament rheostats were found unnecessary.

Figure 3 in the blue-print section shows the dimensions for drilling the front and sub-panels. The panels should be first accurately laid out, marked with the center punch and then drilled with a sharp drill so that the holes will line up perfectly. The condensers and two potentiometers, battery switch and dials should be mounted on the front panel first. The 200 ohm Frost potentiometer to the left side, and the 200,000 ohm Frost potentiometer on the right side. The sockets, coils and fixed condensers, cord tip jacks, binding posts and battery plug receptacle should be mounted on the sub-panel before the audio transformers and the S-M 440 amplifier are mounted. The U99 Aero antenna coupler is mounted on the right side and the U100 Aero oscillator coupler is mounted on the left side. The U96 coil should be mounted so that the terminals 3 and 4 face the panel to permit the antenna and ground wires to go through the hole which is provided for this purpose in the sub-panel. This will line up the other holes for wires automatically. The U100 coil should be mounted so that the terminals 1 and 2 (plate coil) face the front panel and the hole through which the wires are to pass. The parts already mounted should be wired first with leads coming up through the proper holes for the S-M 440 and the two audio transformers before these latter parts are mounted. This leaves more room to work in. The long wires beneath the panel may be cabled or run directly from one hole to another. In the accompanying diagrams the wires were run parallel to make a neat appearance.

Soldering lugs are not necessary except on the variable condensers. Tinned No. 20 cotton covered wire as is used by the telephone company for cabling, makes the wiring job very easy. This wire can be obtained in radio stores and in a variety of colors. The ends of the wires should be skinned and the wires twisted around the screwed terminals then screwed down tightly. Small spring washers beneath all screws will insure permanent connections. Soldering lugs may be used if preferred to this type of connections. The filament circuits and B and C battery wires leading from the Yaxley battery connector should be wired first leaving the terminals free on top of the panel to be connected to the S-M 440 amplifier and to the audio transformers. Be sure to wire up the 200 ohm potentiometer so that the right hand side is the negative terminal, making the volume increase as the knob is turned to the right as has already been explained. If the out terminals are reversed, the action will be backwards.

The mixer circuit should be wired next. The binding post closest to the front panel should be connected through the hole made for that purpose to terminals 4 and 5 on the U96 coil and from there to the right hand side of the potentiometer (positive terminal); also terminal 5 should connect to frame of condenser. The wire from the second binding post should be run up through the same hole and connected to No. 3 terminal. The third binding post can be connected directly to No. 6 terminal from the bottom of the panel through provided hole.

It is immaterial as to which grid is used for the in-put circuit or the oscillator circuit. The grid condenser should be mounted to one grid terminal by bending over one end of lug on the condenser and screwing same onto F grid terminal. The wire from the fourth binding post should be brought up through the hole beneath the grid condenser and connected to the stator plates of the left hand condenser and from there to the top terminal of the grid leak. The .001 series condenser can be connected directly to the stationary place of the oscillator tuning condenser so that it is in a vertical position and the wire connected from the bottom of the fixed condenser to No. 6 terminal of U100 coil and from there through the hole in the panel and underneath the panel to the other grid terminal of the mixer tube. The frame of the condenser (rotary plate) is connected to No. 5 terminal and from there to the negative terminal of one of the tube sockets. A wire from No. 1 terminal of U100 is run through the hole provided near this terminal along the bottom of the panel and up through the hole near the plate terminal of the mixer tube, to P.

A wire is run underneath the panel from No. 2 terminal of the oscillator coil and brought up through the hole provided for the P connection on the S-M 440 amplifier. The .00025 is connected from No. 1 terminal to negative filament. The center tap of the 200 ohm potentiometer is connected (through the hole directly beneath the terminals) to the N terminal to which is also connected one end of the ½ mfd by-pass condenser.

A lead is connected from the blue terminal of the battery connector (No. 4) through the large hole near the receptacle along the bottom of the panel to terminal B on right side of S-M 440 amplifier. The wire should come up through the same

(Continued on page 20)

Bottom view of Quadrode Superheterodyne

Parts for Quadrode Super-Heterodyne

1—Aero Antenna coupler No. U-96
1—Aero Universal Oscillator coil U100
2—Camfield .0005 S. L. F. condensers
2—Kurz-Kasch vernier dials
1—S-M 440 amplifier
2—S-M 240 audio transformers
2—S-M 511 sockets
1—S-M 512 socket
1—S-M 540 bracket (pair)
1—Frost 200,000 ohm potentiometer
1—Frost 200 ohm potentiometer
1—Yaxley cable plug and connector
1—Yaxley on-off switch
4—X-L binding posts (antenna, ground and two loops)
1—5A Amperite
1—3A Amperite
1—Carter .00025 condenser with clips
1—Carter .0002 fixed condenser
1—2 meg. Polymet leak
2—1 Carter mfd condenser
1—10 x 20 x 3/16" sub panel
1—7 x 21 x 3/16" front panel
1—Sangamo .001 condenser

Accessories

1 Voltron 171 tube
1—Voltron double grid tube
5 Voltron 201A tubes
1 Loop aerial
1 Wire or aerial—Luxem and Davis

Batteries

National Carbon Co.
1—Lead-In-Electrad

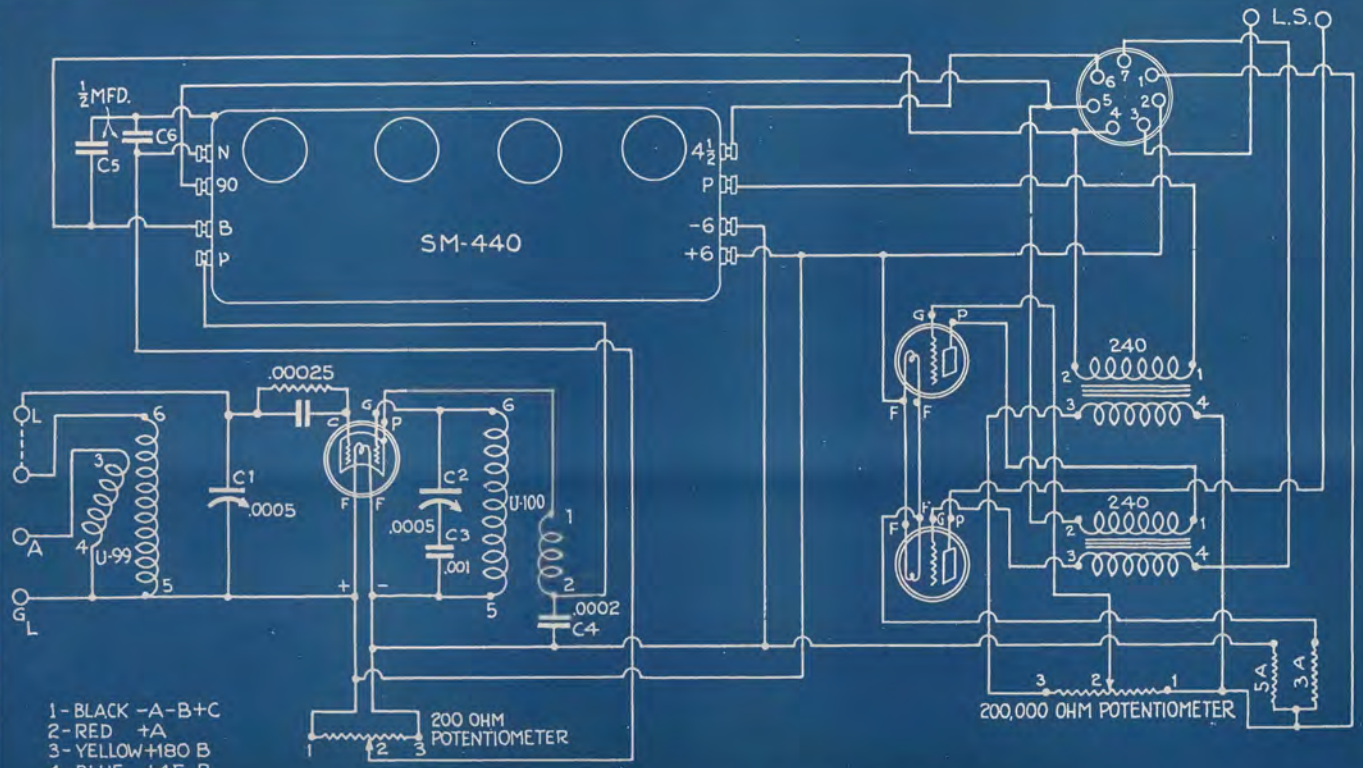


FIG. 2 QUADRODE ~ SUPERHETERODYNE

- RADIO AGE -

RADIO AGE INC.

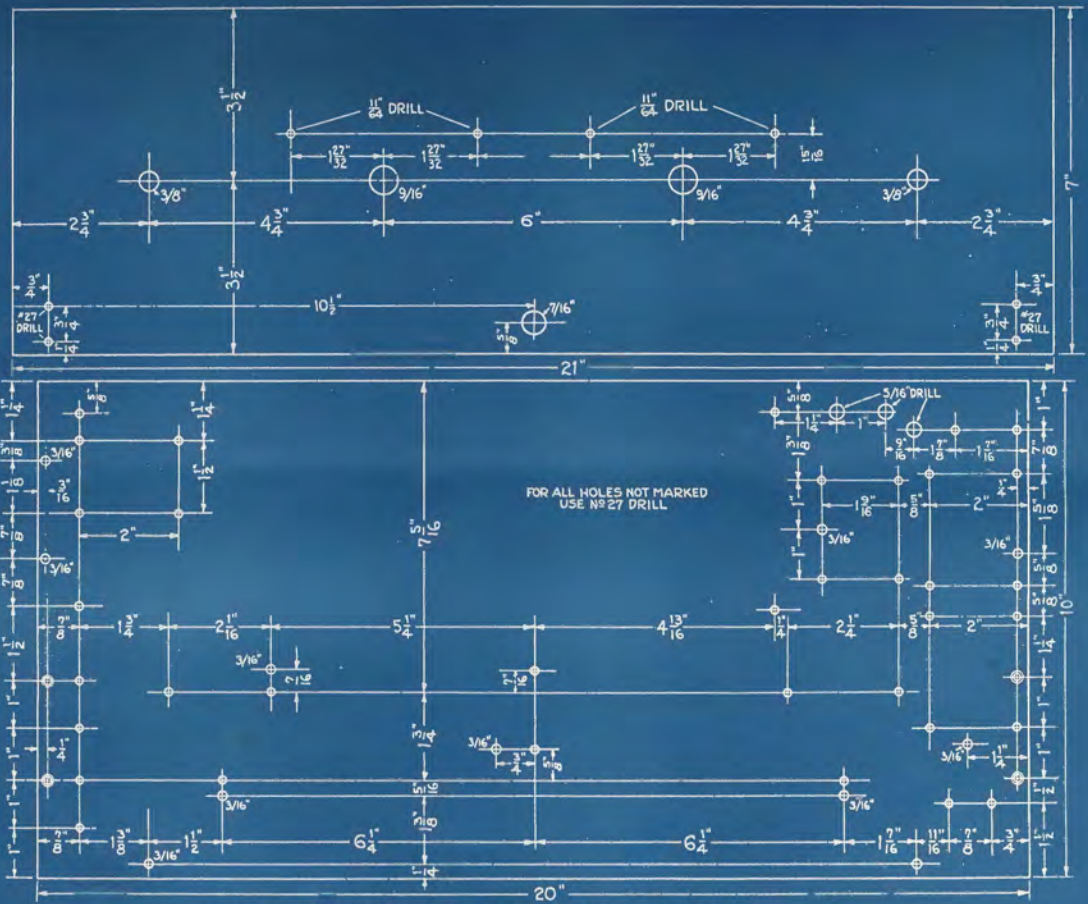


FIG. 3 QUADRODE SUPERHETERODYNE
RADIO AGE

(Continued from page 17)

hole as P wire. To this terminal is also connected one end of the other ½ mfd by-pass condenser. The other ends of the two by-pass condensers are connected together and to a screw in one corner of the amplifier which holds the metal box to the sub panel. A wire is run in the same manner from the 90 terminal of the amplifier to the grey terminal (plus 90) of the battery connection. Two short wires should also be soldered to these two battery and connection terminals, the other ends of which are to be later connected to the audio transformers. The 90 volt wire is brought up on the amplifier end through the same holes as the N wire. From the 4½ terminal of the Yaxley connection (brown) run the wire along the bottom of the panel and up through hole on the out-put side (right side) of S-M 440 and connect to 4½ volt C terminal.

A wire is connected from the green terminal of the battery connector to terminal No. 4 on the second audio transformer. A wire is run from the yellow terminal to one of the loud speaker cord tip jacks, the wire from the other jack to the plate of the last tube. The wires terminating at the transformer soldering lugs are clearly shown in the diagram of figure 2 and can be easily followed without detailed description here as to how they should be run.

The terminal on the right side of the 200,000 ohm Frost potentiometer should be connected to the negative A battery lead which terminates at the Amperites near the front of the panel. On the left side of the potentiometer (looking at the potentiometer from the front of the set) a wire should be run to No. 3 terminal on the first audio transformer. A wire from the center terminal of the potentiometer should run directly across the top of the panel to the first tube socket and connect to the grid terminal. The first audio tube and audio transformer is towards the back of the sub panel. The filament wiring is quite obvious.

As can be judged from the photographs, the finished set looks very neat and business like. When mounted in an attractive cabinet of either a console or table model type, it will hold it's own with the handsomest of receivers and in performance do even more. Any good B battery eliminator will work well. An A eliminator appliance can also be used if preferred to the conventional storage battery. The results obtainable from the Quadrode Superheterodyne are well worth the effort and money spent in building it. We are sure this receiver will delight thousands of radio fans who undertake to build it.

Accurate blue-print and templets for the Quadrode Super-heterodyne are available through the RADIO AGE office at the price of 25 cents per blue print.

Tuning Up

"Pardon me a moment, please," said the dentist to the victim, "but before beginning this work I must have my drill."

"Good gracious, man!" exclaimed the patient, "can't you pull a tooth without a rehearsal?"

These are the AERO Universal Coils

Two Wonderful Inductances

Adaptable to All Tubes

No. 100 AERO Universal Coil (Code U-100) - Price $4.00
AERO Universal Antenna Coupler (Code U-96) Price $4.00

That Make Possible the Fine Performance of the QUADRODE Superheterodyne Receiver

Described Elsewhere in This Issue

Of course you'll want to build the Quadrode Superheterodyne Receiver featured in this issue of Radio Age. It's a mighty good set—powerful, selective, and possessing wonderful tone qualities.

The AERO Universal Coils used in this circuit are responsible, to a great extent, for the splendid efficiency and fine performance of this receiver. These super-sensitive inductance units are twice-matched, and are adaptable to 201-A, 199, 112, and the new 240 and A. C. tubes.

Patented construction features eliminate losses to the greatest possible degree. You'll find these coils the finest inductances thus far produced.

When ordering parts for the Quadrode Superheterodyne from your dealer, order these AERO Universal Coils by code number.

No. 100 AERO Universal Coil (Code U-100) . . . . . Price $4.00
AERO Universal Antenna Coupler (Code U-96) . . . . Price $4.00

Other AERO Kits Employing Supersensitive AERO Universal Coils

AERO Universal Tuned Radio Frequency Kit

Especially designed for the Improved Aero-Dyne 6. Kit consists of 4 twice-matched units. Adaptable to 201-A, 199, 112, and the new 240 and A. C. Tubes. Tuning range below 200 to above 550 meters. This kit will make any circuit better in selectivity, tone and range. Will eliminate losses and give the greatest receiving efficiency.

Code No. U-16 (for .0005 Cond.)..... $15.00
Code No. U-163 (for .00035 Cond.)..... 15.00

Important Notice —A New Service

We have arranged to furnish the home set builder with complete Foundation Units for the Improved Aero-Dyne 6, the Aero 7, and for the Chicago Daily News 4-Tube Receiver and the Aero Transmitter Set, drilled and engraved on Westinghouse Micarta. Detailed blueprints and wiring diagram for each circuit included in foundation units free. Write for information and prices.

AERO SEVEN Tuned Radio Frequency Kit

Especially designed for the Aero 7. Kit consists of 3 twice-matched units. Coils are wound on Bakelite skeleton forms, assuring a 95% air dielectric. Tuning range from below 200 to above 550 meters. Adaptable to 201-A, 199, 112, and the new 240 and A. C. Tubes.

Code No. U-12 (for .0005 Cond.)..... $12.00
Code No. U-123 (for .00035 Cond.)..... 12.00

You should be able to get any of the above Aero Coils and parts from your dealer. If he should be out of stock order direct from the factory.

AERO PRODUCTS, Inc.

Dept. 106
1772 Wilson Ave., Chicago, Ill.

Radio's Newest Receiver

The Quadrode Super

Complete Parts List

1—Aero Antenna coupler U96	$ 4.00
1—Aero Universal Oscillator coil U100	4.00
2—Camfield .0005 S. L. F. condensers	12.00
2—Kurz-Kasch Vernier dials	4.00
1—S-M 440 amplifier	35.00
2—S-M 240 audio transformers	12.00
2—S-M 511 sockets	1.00
1—S-M 512 socket	.75
1—S-M 540 Bracket (pair)	.70
1—Frost 200,000 ohm potentiometer	1.75
1—Frost 200 ohm potentiometer	1.25
1—Yaxley cable plug and connector	3.00
1—Yaxley on-off switch	.50
4—X-L binding posts (antenna, ground and 2 loops)	.60
1—5A Amperite	1.10
1—3A Amperite	1.10
1—Carter .00025 condenser with clips	.50
1—2 meg. Polymet leak	.25
2—1 mfd. condensers, Carter	2.50
1—10x20x3/16 in. sub panel	4.50
1—7x21x3/16 in. front panel	3.44
1—Sangamo .001 condenser	.50
1—Carter .0002 fixed condenser	.45
	$92.39

Accessories

1—Voltron Quadrode tube	4.50
1—Voltron 171 power amplifier	4.50
5—Voltron super-sensitive 201A amplifiers at $1.25	6.25
	$15.25

Substantial discounts to professional set builders and the trade.

A full line of standard parts and accessories carried. Headquarters for Silver-Marshall Unipacs, Shielded Sixes, Reservoir B, Temple Drum Speakers, Setco A Eliminator, etc.

From us you can get all parts for the new Quadrode Super-radio's latest development—which is described in detail in this issue of Radio Age. Each and every part is most carefully inspected and checked—no substitutions anywhere—each and every item exactly as specified by the designer. It goes without saying that you want to own the Quadrode Super, the first receiving set which makes use of the new double grid tube—seven tubes doing the work of eight and in a more efficient manner.

Orders can be filled on the complete list of parts, complete tube kits and all accessories. All carry the guarantee of Setbuilders Supply Company. Or if you need but an individual part your order will be taken care of in the same prompt, efficient manner.

Our stock and adequate shipping facilities enable us to make immediate shipment either on complete kits or on individual units. Send your order to us or ask us to send you our complete literature.

The Improved Laboratory Super

The sensation of the shows, the set that everyone is talking about. The super in the three to five hundred dollar price class, with tone incomparable, that will bring in distance just as if every night was "silent night." The Improved Laboratory Super will bring in distant stations with loud speaker volume that are barely audible with other receivers. Its selectivity allows the separation of distant stations within ten kilocycles of powerful locals—not occasionally but regularly. No matter where you live the Improved Laboratory Super is the finest set you can build or buy. This set has been endorsed and approved by Radio Broadcast, Citizens Radio Call Book, Radio Review, Popular Radio—in fact, by every prominent authority. Complete parts, including walnut metal panel and pierced steel sub-base, complete $89.45. Send for literature.

Setbuilders Supply Co.,
516 South Peoria St., Chicago.

Please send me all data on the Quadrode Super and the Improved Laboratory Receiver for which I enclose 10c.

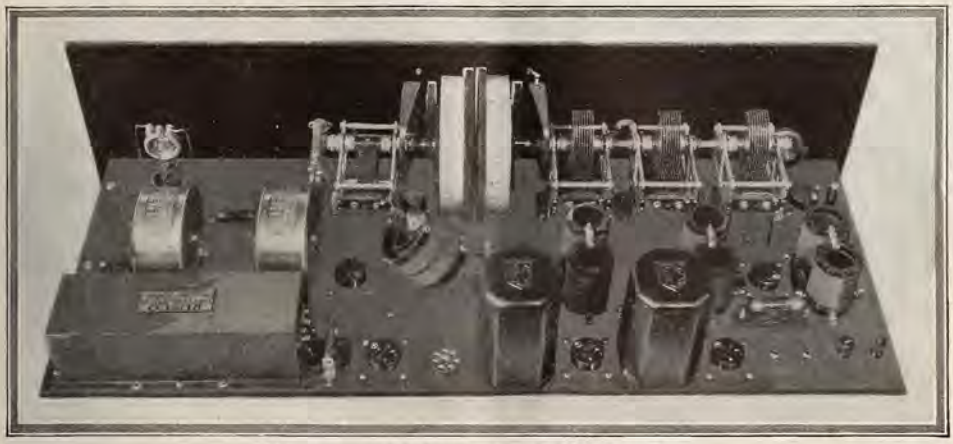
Name_____

Address_____

SETBUILDERS SUPPLY COMPANY

516 South Peoria Street **Chicago, Ill.**

Camfield Super-Selective "10"
2- Dial Control



Showing complete built-up Camfield "10" Receiver

Camfield Super Selective "10"

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

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

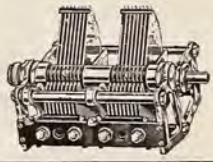
This new circuit embodies all the latest improvements—simplified control by means of two Tyrman Drum Dials, Tyrman Audio Transformers, Camfield Condensers, Rusco Band Pass Filters and especially selected parts to make a perfectly balanced receiver of the highest quality yet available at a very modest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

TYPE 22K DUOFORMER

Kit of Three Matched Duoformers, $10

PRICES—CAMFIELD PRODUCTS

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



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

1. To facilitate sharp tuning and perfect balancing in sets of the unit-control type, condensers are adjustable, which makes possible the perfect equalization of all circuits after the receiver has been completely wired. This eliminates use of vernier or trimmer condensers. Complete instructions and a special tool for making adjustment are packed with each double and three-gang condenser.

2. The shaft may be shortened or lengthened or entirely removed without affecting the adjustment of the rotor plates. This provides a simple means for connecting several units together with a single shaft and any where from one to six condenser units may be operated with one dial.

3. May be mounted from either end by reversing the shaft cap nut and the panel mounting nut. After shaft cap nut has been removed, shaft may be extended from opposite end of condenser by loosening set screws on rotor hub.

4. A variable spring tension is provided and the rotor is mounted on ball bearings which insure extremely smooth running over a long period.

5. Beautifully finished. Rotor and stator plates are of bright dipped brass. All other parts are hand buffed and nickel plated.

6. A pair of special brackets for mounting condensers on base-board or sub-panel furnished at a slight additional cost. With the use of these brackets, several single condensers may be mounted in a row on a base-board or sub-panel and all operated with a single shaft.

"A Tribute to a Leader"

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

Camfield Super-Selective 9 and 10.
The Tyrman Ten.
Madison Moore Super.
Madison Moore AC Operated Radio Frequency Circuit.
Citizens Super 8.
Camfield Duoformer 7.
Camfield Shielded-Grid Seven.
Camfield Duoformer 5.
Thompson Super 7.
Hagerman's Organtone.
Dar-Mac Nine.
Strobodyne.
And many others.

On actual demonstration the Camfield Super-Selective 9 will out-perform any other receiver. Its exclusive features mean real service and satisfaction to the man who builds his own. Do not pass up this wonderful opportunity. Set Builders in all parts of the country who have built the Camfield Super-Selective 9 are enthusiastic.

We stand back of this circuit and are ready to help you in every way. If you have any special questions regarding this circuit we will welcome a personal call or a letter from you. Either will receive our immediate attention.

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

CAMFIELD RADIO MANUFACTURING CO.
35 E. Wacker Drive, Dept. RA, Chicago, U. S. A.

COUPON

Dear Sirs:
Please send me the facts on the Camfield S-S "10," also on the new Shielded-Grid Seven.

Your Name .....

Address .....

.....

Shielded Grid Tube Announced

THE Radio Corporation of America has finally announced the coming of the shielded grid tube developed some time ago by Doctor A. W. Hull of the General Electric Company. Although the tube was developed almost two years ago, there has been much secrecy about it and it has been kept off the market until now, for some unknown reason. We have been hearing rumors of this wonderful Aladdin's Lamp for some time, and here and there appeared unofficial information regarding same, in various publications, some of them proclaiming this wonder of wonders as "revolutionary." It is true that much can be expected from this really remarkable invention which was originally discovered several years ago by the German scientist Doctor Schottky. However, the tube was never developed to its full scope until a few years ago by Dr. Hull.

According to an article by Dr. Hull which appeared some time ago in the PHYSICAL REVIEW, the effect of inter-electrode capacities within the tube are practically entirely eliminated by virtue of the additional grid, or mesh, which shields the usual grid from the plate—or plate from the grid if you so prefer to put it. The parasite and bugbear of the radio frequency amplifier, mainly oscillation, which limit the amplification to a low value and cause all the unstability and squeals and howls with which we are familiar. Where now the amplification for tube (at broadcast frequency) is from 6 to 16 per stage, and the latter only in cases of well shielded and balanced circuits, the new tube affords an amplification from 20 to 35 per stage, depending upon the efficiency of the tuned plate circuit. With the detrimental capacity removed the tube becomes a true one-way repeater with all the complications of balancing out capacities removed. Doctor Hull in the new tube has found unlimited and undreamed of amplification available with properly shielded stages.

He states that stage after stage of amplification can be effectively added until the amplification is so great that the minute tube noises or "short effect" saturate the last tube. In his experiments with five tubes an amplification of about 2,000,000 was attained. Just imagine, with three stages of amplification at a gain of 30 per stage the total amplification is 18,000, where with the best balanced and shielded three-stage amplifier the gain is less than 3,500; the ordinary three-stage neutrodyne or unamplified amplifier yields a gain from 1,000 to 1,500. In a super-heterodyne intermediate amplifier, tuned to about 50 kilocycles, an amplification of 75 per stage is quite feasible, Dr. Hull says.

At broadcast frequencies the same number of tuned circuits will still be necessary, that is, three or four to get the selectivity required to cut through local stations in a congested area, hence the number of tubes in the radio frequency amplifier will not be decreased but the sensitivity will increase many fold with absolute freedom from oscillation. If no great amount of amplification is desired, however, a number of tuned circuits may be used in parallel and fewer tubes used in the amplifier. The super-heterodyne should still reign supreme because of the greater possibility in selectivity and the greater gain per stage.

The new tube will most certainly be food for the experimenter, and of the most delicious variety. The Radio Corporation announces that the tube will be on the market at the end of the present year. The new Radiotron will be known as UX-222. It has a filament, a plate and two grids, in place of the usual three element employed in our present tube. The second grid is responsible for its high amplification and freedom from oscillation. It is intended primarily for radio frequency amplification (without neutralization or stabilizing resistance) in circuits especially designed for it.

Radiotron UX-222 may also be used as a "space charge grid" tube in audio frequency circuits. It is also useful in other experimental circuits, where a double grid, four element tube can be used.

Quoting Mr. Bucher, assistant vice president of the Radio Corporation of America: "It should be realized, however, that this tube will not bring about any revolutionary developments in the radio industry, nor will it render obsolete the type of sets now in use or being sold. It must be remembered that all of these tubes give greater radio frequency amplification per tube than former type, nevertheless, a certain number of tuned circuits must be used under present day broadcasting conditions to obtain adequate selectivity; therefore, all things considered, the new Radiotron will not necessarily reduce the number of tubes required in a given broadcast receiver."

The new Radiotron has a standard four-prong UX base and differs in external appearance from the ordinary tube by the addition by a small metal cap at the top of the glass envelope for a fifth connection to the controlled grid, or shield. The filament terminal voltage for this tube is 3.3 volts and the filament current consumption is .132 amperes. A filament resistor makes it usable with a six-volt storage battery. The recommended plate voltage is 135 volts. The shielding grid is connected to the 60-volt tap of the B battery. Instead of transformer coupling direct coupling through a condenser and tuned plate circuit, is used between tubes.

Switching Tubes

In times gone by, the efficiency of a multi-tube receiver could often be greatly increased by switching the tubes around. Some tubes functioned better as R. F. amplifiers while others gave better results as detectors or A. F. amplifiers. By trying each tube for each different function in a receiver the most efficient arrangement was readily found. Improved manufacturing methods have now made such switching of tubes unnecessary.

Announce New System

An announcement is made by the De-Forest Radio Company, Jersey City, N. J., of the development and perfection of a "fundamentally new system of radio reception." This new system is the conception of and the result of long research by Dr. George A. Somersalo, well known Finnish physicist and former Research Engineer of the DeForest Company. In an interview, an official of the DeForest Co. stated:

"It is frequently claimed that all fundamental patents relating to radio receiving are owned or controlled by a certain group of large interests. That this contention is without foundation has been fully demonstrated by the advent of Dr. Somersalo's system.

"The Somersalo system, which is controlled by Arthur D. Lord, Receiver-in-Equity of the DeForest Radio Company, provides a fundamentally new method of obtaining radio frequency amplification without infringing any existing patents.

"For those who are technically inclined, it may be stated that, in the Somersalo system, selectivity is obtained by the use of a special form of high frequency tuning filter placed in the antenna circuit ahead of the first tube. The rest of the circuit is untuned, the only variable or adjustable apparatus or values being the rheostats if such method of controlling the filament supply be used.

"Many attempts have been made to construct an efficient and at the same time a selective filter system. These earlier attempts failed because efficiency had been sacrificed at the expense of selectivity. A proper solution seemed impossible until Somersalo made his discovery, making use of a peculiar arrangement of coils in the filter system, which in itself is quite simple. In his system, the signal passes through a series of tubeless filters without any voltage reduction whatsoever, and is later amplified by tubes.

"An extremely important feature is that the need of neutralization is practically eliminated. It is, of course, necessary to reduce the inherent feed-back in the first tube by one of the various well-known methods, not to prevent squealing, however, since there is hardly a tendency towards squealing, but in order to sharpen the tuning if such be necessary. With regard to the other tubes, nothing is needed to suppress oscillations, as there is no oscillation present. This is a very important point of design which eliminates one of the greatest difficulties in set construction."

Automatic Safeguard

Where a rheostat is used to control the filament current to a group of radio-frequency tubes, and thus to function as a volume control, it is a good plan to use an automatic filament control unit in series with the rheostat. The automatic control unit should be the same as would be used if the rheostat were not in the circuit. Thus if the rheostat is turned up all the way the tubes will be burning only at their normal temperature and the filaments cannot be overloaded by careless operation of the rheostat.

AERO-SEVEN RECEIVER

10-Kilocycle Selectivity

Utilizing New 340 Tubes

Battery, Electrical or A C Operation

Unique Features

The Aero-Seven Receiver, which is being featured in the prominent radio magazines and newspapers, is a new tried and tested tuned R. F. circuit, incorporating the most modern radio improvements at a popular price. It is a distinct innovation in a tuned R. F. receiver, utilizing three stages of R. F. and three stages of resistance-coupled audio. Circuit is built around the famous improved Aero Universal Coils, with improved Amsco S. L. tuning 3-gang condenser, S-M single-control drum dial and the tried and tested parts of famous manufacturers. Such names as Carter, X-L, Westinghouse, Aero, Amsco and Silver-Marshall assure you of a circuit that is the final word in perfection.

Distinct features are: the new Hi-Mu tube at input and in R. F. stages, potentiometer control, higher amplification, 10-kilocycle selectivity and **true** single control.

The Aero-Seven has a broadcast range from below 200 meters to over 550 meters (1500-500 kc) and requires no shielding as with the small Aero coils, direct pick-up is negligible and coupling between coils is the very minimum. The coils are twice-matched at both high and low frequencies of the broadcast band, thus eliminating many difficulties in single dial control and overcoming one of the principle causes of disappointments.

The adjustable compensators on the Amsco condensers facilitate the equalization of circuits, solving the major problem of tandem tuning.

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

New and Unique Hookup
3 Stages of Radio Frequency
3 Stages of Audio Amplification

The Aero-Seven has a new and unique hook-up that incorporates three stages of R. F. and three stages of audio. There are two stages of tuned radio frequency and a special coupling stage, the secondary function of which is to prevent antenna detuning, thereby giving single control which is both theoretically and practically perfect. This independent antenna circuit is of a new and efficient design and employs a resistance connected between the antenna and ground inputting to the first grid circuit. Five CX340 tubes are used—3 in the R. F. circuit, one detector and one in the audio.

In the three audio stages, one 171 power tube is used, one 201A tube and the one CX340 tube in the input.

The circuit, therefore, is different from the usual 7-tube R. F. circuits, which variations contribute to its optimum selectivity, perfect quality and thrilling volume.

The combination of all the various parts, the matching of the Aero Universal Coils, together with the Amsco compensating 3-gang condenser, with true single control and potentiometer control, greatly simplifies operation and tuning, while adding efficiency to the circuit.

First Use of New CX340 Tubes—1-6/10 Times Better

Utilizing the new CX340 Cunningham tubes in place of the usual 201A, gives the Aero-Seven the distinction of being the first circuit using this superior method. CX340 tubes are 1-6/10 times more effective than 201A tubes, having a 5-volt filament and .25 amperes; plate, 180 volts maximum. In this receiver 90 volts is used constantly on the plate for the R. F. circuit, something seldom attempted but efficiently worked out here. It is a High Mu tube, having a high amplification factor (Mu-30) and is used both as a detector and as a radio and audio amplifier. The Aero-Seven is specially designed to operate with this new and better CX340 tube and the results secured will be a pleasing revelation to you. It is surprising what tone and volume is secured with a minimum use of current.

Resistance Coupled Audio Amplification

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

10 Kilocycle Selectivity Now a Real Fact

Ten kilocycle selectivity is OPTIMUM Selectivity. It means a receiver that tunes sharply enough to eliminate interference and yet does not tune so sharply as to cause distortion. It is the ideal tuning characteristic. "Optimum tuning," says the engineer, when he means a perfect set.

Why bother with anything but the best? Why put up with anything but 10-kilocycle selectivity, as represented in the Aero-Seven circuit?

Due to the low-loss construction of the coils and condensers in the Aero-Seven and the great selectivity introduced into the circuit itself, you get selectivity so sharp that you cannot get two stations at one time under present broadcast reradiations, at the same time providing adequate frequency margin to prevent high "cut off"—distortion.

Imagine what this means in perfect radio reception. Selectivity, the ability to tune in clearly, sharply, without fear of disturbance in getting the station you want whenever you want it—that's something every radio fan has long desired. It is an actuality in the Aero-Seven—a feature that is necessary in an up-to-date circuit—a feature that you get in the Aero-Seven when you build it.

New, Modern, Proved Features in Aero-Seven

10 Kilocycle selectivity.
Resistance coupled amplification.
Uses new CX340 tubes instead of 201A.
3 stages of R. F.
3 stages of audio amplification.
Extreme D-X reception.
Potentiometer control.
Silver-Marshall single drum dial.
True single control.
Aero Coils are twice matched at both high and low frequencies.
Amsco adjustable condensers.
Carter resistances.
Westinghouse Foundation Unit.
X-L Posts.
High quality parts throughout.
Range below 200 to above 550 meters (1,500-500 KC).
Low loss characteristics throughout.

See article in this issue, also articles in leading magazines on electrically operated Aero-7 and A C operated Aero-7.

Perfectly compensated—variation in antenna circuit doesn't affect it.
Wiring underneath sub-panel.
Simple construction.
Easy to build in quick time.
The most popular-priced 7-tube circuit.

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

An Opportunity for Set Builders

The set builder will find the Aero-Seven a most profitable receiver to build. It is an extremely simple circuit—efficient, high grade and having a record of exceptional performance. It could hardly be duplicated in a factory-built set at double the cost.

You can make big money building this set for your friends and get a real "kick" out of it yourself.

Complete parts, drilled and engraved panels and foundation units are being distributed through the jobbing trade and are available at leading radio stores everywhere. If your dealer cannot supply you, order direct giving your dealer's name and we will see that you are supplied promptly.

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

Get the facts. Mail the coupon and 10c stamps for this valuable booklet. Send today—NOW!

Aero Products, Inc.
Dept. 711 1768 Wilson Ave., Chicago.

Dear Sirs: Enclosed find 10c for which please send me assembly diagrams, construction data and all the facts in building the new Aero-Seven Receiver.

Name .....

Address .....

Get the Facts—MAIL NOW→

AERO PRODUCTS, INC.
1768 Wilson Ave., Dept. 711 Chicago, U. S. A.

Associated Manufacturers—Amsco, Aero, Carter, Westinghouse-Micarta, Silver-Marshall, X-L

The Aero-Seven

(Continued from page 9)

The antenna and ground are connected to the two posts at the left of the set and battery connections in the manner marked at the right. It will be noted from the circuit diagram that the —A BAT post is used as well for the —B and +C. The +AMP B BAT post should be supplied from a 180-volt battery for the amplifier and power stages, while the C battery on the power stage will be 35 to 40 volts.

The Amsco resistors should be unpacked and inserted in the clips of the Resisto-couplers in the order shown in the circuit diagram form, left to right while facing the front panel.

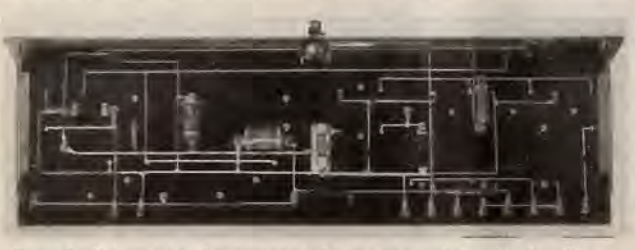


Figure 4—Bottom view of arrangement of minor accessories used in Aero-Seven.

The tubes necessary for the operation of the receiver are as follows: Five UX-240 or CX-340, which are placed in the radio frequency sockets, the detector and the first stage of audio frequency; one UX-201A or CX-301A, for use in the second audio stage; and a UX-171 or CX-371, for use in the last or power stage. Where extra good quality is desired, the second stage should employ a 112 tube rather than the 201A, particularly when receiving loud signals from a nearby station.

In lining up the radio frequency stages, a screw driver should be made from a sliver of wood or bakelite to use on the condenser adjustment. These midget capacities should be screwed all the way out as a preliminary and a station tuned in, preferably on the lower waves. After tuning to maximum volume the dial reading should be decreased ever so slightly. If the signal is a weak one it will disappear by this procedure, while if a strong one it will only be diminished in volume. After this has been done the small condensers are adjusted with the wooden screw driver until the volume is at maximum. In the course of doing this it may be noted that as a perfect adjustment is approached the receiver may oscillate. In this case the potentiometer should be retarded as much as necessary to prevent this and then proceed with the adjustment for maximum volume.

With this adjustment made the receiver is in perfect operating condition over the entire wave band.

Ray: Why do they have most all radio broadcasting stations on top of tall buildings?

Bray: So nobody can throw bricks at the performers.

Independent Directors

Announcement of the permanent board of directors to manage the affairs of the Radio Protective Association—the anti-trust organization of the independent manufacturers—was made after a meeting of the membership at the Palmer House, Chicago, during the Chicago Radio Show.

As a result of the growth in the membership, the board was increased from five to eleven members, particularly to give representation to the new members of the association in the East.

The new board of directors follows:

Harry G. Sparks, Sparks-Withington Company, Jackson, Mich.

Fred S. Armstrong, Vesta Battery Corporation, Chicago.

R. W. Augustine, Joy-Kelsey Corporation, Chicago.

H. R. Rose, Shamrock Manufacturing Co., Newark, N. J.

H. Chirelstein, Sonatron Tube Co., New York, N. Y.

Duane Wanamaker, Grigsby-Grunow-Hinds Co., Chicago.

L. Mandel, Metro Electric Co., Chicago.

J. Wiechers, Western Coil & Electrical Co., Racine, Wis.

Arthur D. Lord, DeForest Radio Co., Jersey City, N. J.

Alexander Weiss, Marti Electric Co., West Orange, N. J.

Ernest Kauer, C. E. Manufacturing Co., Providence, R. I.

Mr. Armstrong remains treasurer of the association and Oswald F. Schuette, executive secretary in charge of the headquarters at 134 South LaSalle Street, Chicago.

As the decisive step in the battle of the Radio Protective Association against the radio trust, it was decided that the association is to undertake the defense of any dealer or jobber of a member who may be sued for patent infringement by the Radio Corporation of America, or its constituent companies—the America Telephone & Telegraph Company, the General Electric Company and the Westinghouse Company.

Sixty-six representatives of independent manufacturers at the Chicago Radio Show attended the meeting. At a meeting held at the Hotel Astor in the preceding week, fifty-two were present. The association is only two months old, and its members point to its directorate as proof that as an organization it will have to be reckoned with in shaping the future of the radio industry.

Camfield Super Selective Ten

(Continued from page 13)

properly amplified and distortion will result.

Building this receiver is a simple task. All parts are laid out with mathematical accuracy in such a fashion that a single centerline passed through a dozen holes. By carefully consulting the diagrams and layouts one cannot go wrong in the assembling.

The wiring is nearly all on the under side of the sub-panel out of sight and out of harms way. Such small parts as are liable to be in the way and may readily be placed in concealed locations are also put here. All connections are soldered and carefully wiped with a rag saturated with alcohol.

The large hole in the panel for the drum dial requires a bit of painstaking work. It may be either cut out on a drill press with an expansion bit, if one is available, or it may be drilled around the circumference and the plug pushed out. Be careful in doing this, or the panel may break in two. Time spent in careful workmanship is never wasted.

To obtain the best of results good tubes must be used. For the radio, intermediate oscillator and first audio, 201-A tubes are used, the two detectors are 200-A, and the last audio a 112. A total of 135 volts plate current is needed, furnished either

Panel of the Camfield Super-Selective Ten

by B Batteries or an eliminator. If an A Eliminator is used it must be one that delivers parallel feed, for series feed is useless in a super-heterodyne. Though not included in the original plans, an output filter is most desirable for obtaining the highest quality of reproduction.

Test Your Tubes

It is a good plan to have the tubes in a receiver tested after every three or four hundred hours of service. If a receiver is in use an average of three hours per day for instance, it will be worth while to have a service man test the tubes about once every four months, and to replace any that are found to be wearing out. This is particularly important where the receiver makes use of rheostats for the adjustment of the tube filament supply because if a single tube starts to wear out there will be a tendency to make up the decreasing volume by turning the other tubes up higher and the usual result is that several tubes are prematurely worn out, whereas replacement of the one poor tube would have saved the others.

And what do you want for Christmas, little boy?

Youngster—Nothin' but a three-step polyphase heterodyne regenerative unit and a reflex inductive oscillatory tube for my radio.

Now a World Chain

International rebroadcasting, heretofore a one-way service from the United States to other countries, east, south and west, is now a two way service.

On successive mornings, Oct. 27 and 28, WGY, the General Electric Company station at Schenectady, N. Y., picked up and rebroadcast station 2FC of Sydney, Australia, 9970 miles away. Music carried on the late evening program of the Australian station became breakfast hour music for WGY's audience. The signals started off in the spring-time and reached Schenectady in the fall, but in spite of the difference in season, WGY's audience heard the music from 7:50 to 8:30 a. m., Thursday, which Sydney listeners were getting between 10:50 and 11:30 Thursday night.

In May of this year WGY broadcast a series of early morning programs for Australian and New Zealand listeners. These programs were carried on two short wave stations 2XAF and 2XAD. Martin P. Rice, manager of broadcasting for the General Electric Company addressed the far eastern listeners extending to them the greetings of the United States. Five Australian stations picked up the short wave signals and rebroadcast them. Reports indicated that the rebroadcast signal was exceptionally clear and fortunately free from static and fading.

The success of this broadcasting delighted the Australians but left their technical man dissatisfied. The picture couldn't be complete until the courtesy could be returned. A few weeks ago the chief engineer of Amalgamated Wireless Ltd. of Sydney notified the management of WGY that test programs would be transmitted by 2FC on 28.5 meters and they asked the Schenectady engineers to rebroadcast if possible. Dates for test programs were Oct. 25, 27, and 28. Signals on the first morning were unsatisfactory, but Oct. 27, voice and music were coming through so well that WGY went on the air with the rebroadcast entertainment for forty minutes. There was some static and the fading surge was present at all times, but the signal, whether voice or music, was never inaudible. Just before the sign-off at 11:30 p. m. Sydney time, a male quartet sang: "The more we are together, the merrier we'll be," and in that song forecast what may ultimately prove the highest mission of radio, the promotion of international understanding.

In transmitting 2FC, WGY has established an American record in rebroadcasting. Two years ago a station of the British Broadcasting Company was picked up in the United States and rebroadcast by WJZ and WGY, but this is as far as rebroadcasting of foreign stations has gone in this country. The signals of the European and other foreign stations were not strong enough for rebroadcasting purposes. Now, however, there is a trend toward the short waves in other countries. Station PCCJJ of Eindhoven, Holland, is using a short wave station that has reached out well and AGA, a German station working on 14 meters, has been heard occasionally in the United States.

(Continued on page 35)

Radio Dealer's Stocks

According to a survey of radio dealers' stocks just completed by the Electrical Equipment Division of the Department of Commerce, the first of its kind ever officially undertaken returns from 7,842 dealers out of a total of 31,485 indicate that there was an average of 9 receiving sets and loud speakers per reporting dealer on October 1, 1927. "B" and "C" battery's stocks showed an average of 31 per reporting dealer, in units of 45 volts, and 7 storage batteries for "A" power, whereas eliminators averaged 5 per dealer. Receiving set tubes, not A. C., averaged 63 per dealer, whereas A. C. ones averaged 4. The survey showed that other types of tubes for rectifying purposes averaged 5 per dealer.

A total of 936 jobbers were circularized of which 236 replied. The number of receiving sets per reporting jobber was 373, loud speakers 385, "B" and "C" batteries 1220—45 volt units, Storage batteries 105, eliminators 254, tubes other than A. C. ones 3,140, A. C. tubes 97, and rectifying tubes 171, all per jobber.

Herewith is a table showing combined dealers and jobbers stocks, actually reported:

	No. on Hand
(1) Receiving Sets	
(a) Radio Receiving Sets without accessories, for operation	153,817
(b) Radio Receiving Sets wired for A. C. operation not including power supply	9,498
(2) Loud Speakers.	
(a) Loud Speakers only	153,001
(b) Loud Speakers with associated power amplifier	5,018
(3) Batteries.	
(a) Dry "B" and "C" Batteries in terms of 45 volt units	534,721
(b) Storage Batteries not associated with trickle chargers	77,143
(4) Socket Power Units.	
(a) "A" Socket Power Units using storage battery	15,560
(b) "A" Socket Power Units not using storage battery	7,503
(c) "B" Socket Power Units with or without "C"	51,979
(d) "A" and "B" Socket Power combined units with or without "C"	26,237
(5) Vacuum Tubes (Receiving).	
(a) Tubes designed for operation from 6 volts D. C.	1,008,278
(b) Tubes designed for operation from 4 volts D. C.	230,053
(c) AC Tubes (either heater or filament type)	52,147
(6) Rectifying Tubes or Units.	
(a) High voltage tubes or other rectifying units for "B" power supply	58,070
(b) Low voltage tubes or other rectifying units for "A" power supply	18,546

Details by states will be available later.

SUPERS IN DECEMBER

Read the December issue of Radio Age for another extensive group of how-to-make articles on the latest supers.

1928 Nine-in-Line Super Heterodyne

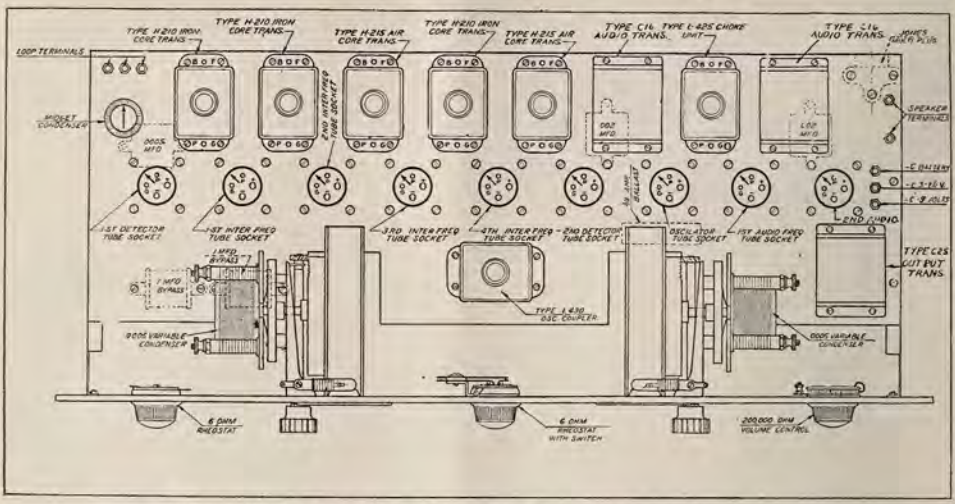


Figure 2—Showing the relative positions of parts in the 1928 Nine-in-Line Receiver.

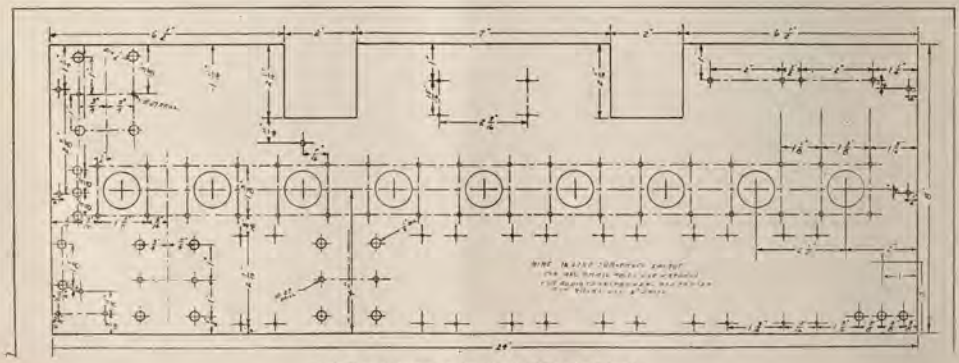
(Continued from page 11)

every condenser. A Carter 6 ohm rheostat is mounted on the left hand side of the panel. A Carter 6 ohm rheostat with filament switch is mounted in the center, while a 500,000 Hi-ohm is mounted on the extreme right in the position indicated as the "MODIFIER". This completes the assembling of the front panel.

Figure 3 illustrates very clearly the wiring of the various parts while Figure 2 shows the relative positions these parts take on the front panel and sub-panel. Detailed explanation is unnecessary as it is illustrated in these drawings.

Figure 4 shows the schematic diagram of the Improved 1928 Nine-in-Line. The first tube to the left is the oscillator tube and coil L430 and L425 comprise the oscillator circuit. In the completed set the oscillator tube is the seventh tube to the right. The oscillator coupler L430 is between the two variable condensers and the choke coil H425 is mounted between the two audio transformers. The following tube is the first detector.

The first two transformers are of the iron core type H210 designed for the purpose of amplifying only while the third and fifth transformer are of the air core type tuned to about 37 kilocycles. The third, fourth, fifth and sixth tubes in the diagram are the intermediate frequency amplifier tubes. The seventh tube is the second detector. The combination of the iron core and air core transformers yield a comparatively high amplification and allow a frequency band to pass of not more than 10 kilocycles. The eighth and ninth tube are the audio frequency amplifier tubes and C16 transformers are the associated audio frequency transformers. C25 is the out-put transformer which prevents the plate current in the last tube from flowing into the loud speaker and possibly injuring the winding. A 4½ to six volt bias is impressed on the four intermediate stages second detector and first audio frequency amplification stage, while a bias of 4½ volts additional is put on the last tube if it is of the 112 type of tubes with a 135 plate voltage, making the total bias on the last tube about 9 volts. However, if the 171 type of tube is used in the last stage, 180 volts of plate voltage, a 45 volt C battery should be used connecting the positive side of the B battery directly to the negative A battery. This is recommended in preference to the 112 type. The center tap of the loop is



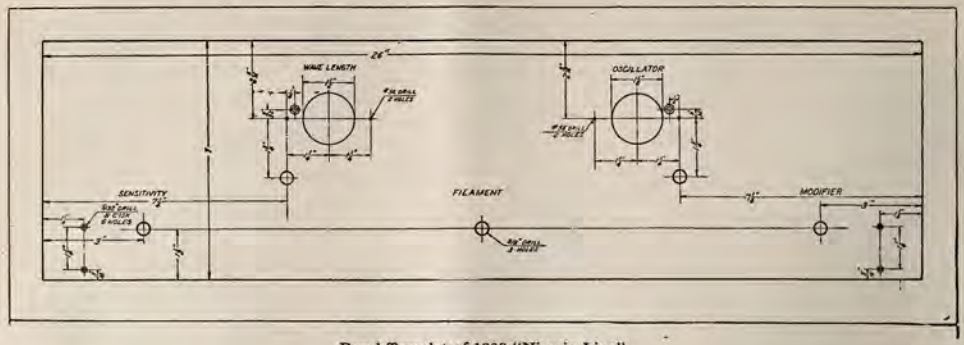
Sub-Panel templet for 1928 "Nine-in-Line".

connected to the filament terminal of the first detector tube. No grid condenser and leak is used in the first detector circuit. The oscillator grid return is connected to the positive filament. An Amperite R4 is provided to maintain the filament of the last two tubes at 5 volts.

Twenty-two and ½ volts of B battery are used on the oscillator and first detector, 67 volts on the second detector and 90 volts on the intermediate stages. If the 112 tube is used, 135 volts can be applied to the first stage audio tube as well as the last stage. However, if 180 volts are used for the 171 type of tube this should be impressed on the last tube only and 90 volts or 135 volts on the first audio tube.

Some of the by-pass condensers in this set are of more importance than they may appear at a glance at the circuit diagram. The .0005 mfd fixed condenser connecting from the plate terminal of the detector tube to the minus filament terminal, for instance, is quite necessary. This condenser changes the impedance in the plate circuit of the first detector tube so that the detector tube will not oscillate uncontrollably. Leaving this condenser off is sure to cause whistles and instability on the lower part of the wave length band. The .4045 midget condenser is the feed-back condenser to control regeneration in the loop circuit. This device provides greater sensitivity and at the same time will help to sharpen up loop tuning because of the regeneration present. This condenser is mounted on the sub-panel since it requires adjustment only once at about the center of the wave length.

The .002 condenser across the primary of the first audio transformer provides a low impedance path for the radio frequency component in that circuit. One mfd condenser is connected from the B battery terminal, 90 volt, to the negative filament terminal to prevent radio frequency passing through the B battery. The 6 ohm rheostat which has the switch mounted to it is marked "FILAMENT" in the center of the panel, and controls the filament current to the four amplifying tubes. The amplification of the intermediate stages is regulated by increasing or decreasing the current going through the tube with the variations produced by the rheostat when it is turned one way or the other. The other 6 ohm rheostat "Sensitivity" on the right hand side of the panel, controls the two detector and oscillator tubes. The 200,000 ohm Hi-ohm is the volume control and is connected directly across the secondary of the first audio transformer. This is marked "VOLUME" on the extreme left hand side of the panel. The in-put resistance is the first audio tube, is increased or decreased with this resistor and the out-put from the speaker accordingly regulated. When resistance is at the maximum the out-put is greatest and when resistance is at minimum the out-put is very low. The filament voltage is automatically switched on when the rheostat "Volume" is turned from minimum towards maximum. The theoretical function of this super is practically identical with any super-heterodyne of this type in use and today is common knowledge to most radio fans.



Panel Templet of 1928 "Nine-in-Line".

so we will not discuss it here.

The photograph (Figure 1) is a very clear picture of the set as it looks when complete. The three cord tip jacks on the right are for the loop while the three jacks on the left are for the C battery; the two in the center of the panel to the right are for the loud speaker. The cable plug receptacle is visible beneath the panel to the left. This makes it a simple matter to connect or disconnect the receiver from the battery and loop. The knob to the right is the midget condenser control for regeneration. All the wiring is beneath the sub-panel, only the wires connecting the dial lamps are visible.

In tuning the set, rotate both dials at the same time so that the numbers will be almost alike. In tuning for distant stations, the sensitivity control should be turned almost completely to the right or maximum and left that way until later on. The center knob or "FILAMENT" control should be turned to the right until the set oscillates which is indicated by whistles or other noises. Slowly rotate the oscillator dial and follow the wave-length dial so that both dials are in resonance which can be noticed by the hissing noise. When the dials are out of resonance the hiss disappears. Once the set is logged it will remain so permanently. Until the log is complete, the tuning should be done very slowly as otherwise stations will be passed over unnoticed. After a distant station is tuned in, adjustment should be made on the midget condenser, which until now should have been so set that the plates are completely out of mesh. This condenser should be adjusted preferably on a station around 300 meters. If oscillations occur in the detector when the dials are retuned, the midget condenser should be again adjusted to the point where oscillation ceases and the signals are at their maximum intensity. After this the SENSITIVITY control can be adjusted for best results and then left that way. Any given station can be tuned in at two positions on the oscillator dial amounting to a frequency difference equivalent to the B frequency which is in this case about 37 kilocycles. That is, the two positions at which a station can be tuned in are twice 37 or 74 kilocycles. Some times a given station will come in better at the upper setting than the lower setting or visa versa, due to interference on either one or the other of the settings. Several hours of experimenting will soon lead to skillful handling of the dials.

List of Parts for 1928 "Nine-in-Line"

3—H. F. L. Transformers No. H210
2—H. F. L. Transformers No. H215
2—H. F. L. Transformers No. C16
1—H. F. L. R. F. Choke L425
1—H. F. L. R. F. Transformer L430
1—H. F. L. Output Transformer C25
9—Benjamin Sockets No. 9044
2—Benjamin Brackets No. 8629
2—Remler Universal Drum Dials
2—Remler .0005 mfd. Variable Condensers
2—Carter 1 mfd. By-pass Condensers
1—Carter .0005 mfd. Fixed Condenser
2—Carter .002 mfd. Fixed Condensers
1—Carter 6 ohm Rheostat
1—Carter 6 ohm Rheostat with Switch
8—Carter Cord tip jacks
1—Carter 200,000 ohm "Hi-Ohm"
1—Jones Type BM Multiplug
1—Celeron 7"x26"x3/16" Drilled and Engraved Panel
1—Celeron 8"x24"x3/16" Drilled Sub-Panel
1—3A Amperite
30—Feet Acme Celesite Wire
1—Package Kester Radio Solder
Miscellaneous Lugs, Screws, Nuts, etc.

Chicago Radio Fan Hears Australia in Midsummer

Chicago, Ill.—"It can't be done—but here it is," says Virgil C. Zeis, of 106 S. Thatcher Avenue, Riverforest, Illinois, as he produces his verification of reception from The Westrailian Farmers Limited, relating to the reception of Radiophone 6WF, located at Perth, Australia. The reception was accomplished in the wee small hours of the morning on June 25th, proving that the early bird with a good set gets the long distance stations.

Mr. Zeis uses a superhetrodyne in his radio prowling around the globe, in which he has included a number of his own ideas. He has built the circuit around the World's Record Super transformers more generally known as Selectone R-410 and R-400, which are manufactured by the Scott Transformer Company.

In a recent letter to Mr. E. H. Scott, the designer of the Selectone radio transformers, he says:

"Dear Mr. Scott:

"I feel sure that you will be interested to know that the receiver I am using, which employs your transformers, is performing wonderfully. I have just received verification of reception of 6WF at Perth, Australia, on the morning of June 25th, 1927. This station came in with sufficient volume to be heard all over the downstars of a big house."

He climaxes his letter with the modest mention, "I have also received Station JOCK at Japan, and am at present waiting for vertification of this reception."

Now a World Chain

(Continued from page 29)

WGY is known throughout the world as a result of rebroadcasts of its short wave stations. Perth, Australia, over 11,000 miles away has picked up the Schenectady stations and rebroadcast. Last winter a half hour from WGY was a program feature of the British Broadcasting Company every Tuesday night for several weeks. Stations in South America, Germany, Spain and France have all carried WGY's programs. So well known is the reliability of 2XAF and 2XAD's signals that cables are generally received when sporting events of international interest are planned. On the eve of the Dempsey-Sharkey, and Dempsey-Tunney fights, 2XAF was asked to broadcast these features. Men in the service, Army or Navy, have already written WGY from distant posts, requesting that the Army-Navy football game be carried on short waves. Three polar expeditions reported receiving the Dempsey-Tunney fight story via 2XAF.

Engineers of WGY are hopeful that the management of 2FC may be interested in carrying a special program for the United States at an hour when more listeners will find it convenient to be at their radio sets. This would mean that Australia must start its program about 6:00 a. m.

Linked Broadcasting

One chance of relief from the present overcrowded situation of the radio broadcasting stations in the United States was indicated by O. H. Caldwell, Member of the Federal Radio Commission for the Eastern District, at a meeting of the New York Section of the American Institute of Electrical Engineers in October. The plan is to have a number of the broadcasting stations use the same radio wave for the same program. There is a growing tendency for broadcasting stations to operate in "chains," a number of stations being connected by long-distance telephone wire so that all broadcast simultaneously a program coming from the same studio. On one recent occasion as many as 87 stations in all parts of the country were thus linked together. Such linked stations now use different wavelengths, so that the ether over the United States is apt to be clogged with the self-same program material.

One wavelength would be enough, for then anyone who wanted that program could tune in on that wavelength and receive any one of the stations in the chain broadcasting it. The chief difficulty in arranging this is the technical one of keeping all of the stations exactly on the same wavelength. A very tiny variation would spoil the result, as the stations would then interfere with each other. The problem is not unlike that of an orchestra leader, who must see to it that all the musicians under his baton are playing in exactly the same key. Mr. Caldwell believes, however, that this technical difficulty will soon be solved.

Short Wave Receiver

(Continued from page 6)

bus are needed. There is no advantage in square bus other than it is rigid and stays where it is put. Often the capacity between wires has a material effect on signals. If flexible wire is used, a slight jar will be sufficient to completely throw the circuit out of resonance, destroying the calibration.

Use nothing else but rosin core solder in soldering connections. Be sure that the iron is applied to the wires until the solder and rosin flux flow freely insuring a good electrical contact. Often when rosin core solder is used and not heated properly the rosin will form a coating beneath the solder which results in a poor electrical connection or none at all. Do not use acid or paste flux.

Instruments for use on short waves are far more critical than is generally believed. A condenser which is perfect on 300 meters is a dismal failure on forty. The condensers must have rigid plates and must stay where placed. Moving one a hair's breadth is enough to lose a station. This requires a very low vernier ratio. The condensers selected meet these requirements, especially in conjunction with drum dials which will tune to half a hair's breadth and not move at all when the fingers are removed from the knobs.

On each dial is mounted a pilot light which is run directly from the six volt storage battery. The lighted dial is a sure tonic to the nerves, relieving all strain while tuning closely.

To be really efficient a coil must have a minimum dielectric in the field, have spaced turns and be wound with heavy wire. The ones we use fill these requirements to a dot. They are mounted on a transparent form and are rugged enough to withstand such rough handling as they are bound to receive. It is possible to remove one coil from the socket and place another in in less than three seconds, giving an almost instantaneous shifting of wave bands.

A single primary coil is used which will easily handle all bands. This is mounted on a pivot so it may be rotated to vary the coupling. The primary circuit is not critical, but many operators find that by using a primary condenser they are able to increase the volume of signals and add to the selectivity. If the same aerial is used for both the broadcast and short wave receivers, then the condenser has to be employed. Any old one you happen to have on hand will be good enough.

In order to regenerate the radio frequency current must be fed from the plate into the feedback coil. By consulting the diagram one will see that there is a choice of two channels, the other one through the amplifying transformer. This latter course is most undesirable so to prevent radio frequency current from entering, a choke must be used. This choke must be small and compact. It successfully retards all tendency of high frequency current to pass but allows the B potential to reach the plate without loss.

If code signals are especially desired a high ratio transformer must be used. One of six to one ratio will give greatest volume and plenty of distortion. This is advisable for it is often necessary to distort a signal to make it stand clear of a background of static or other interference. If music and voice is wanted most then a regular broadcast transformer is desirable. On 90 volts a 4½ volt bias is used. It is not advisable to use a higher plate voltage than this. As this receiver is designed primarily for headphone use only one step of amplification is included. Loudspeaker reception on short waves has been as a rule a bit unsatisfactory for signals are so sharp it is quite hard to tune them in.

In connecting the batteries to the receiver place them as close to the set proper as is possible. Cabinets are not much good for they interfere with the receiver. It sounds rather queer to the uninitiated, but a set of this nature will tune a full fifteen meters lower on the largest coil when out of a cabinet than when in it. Opening the lid of the cabinet changes the tuning five meters. If the receiver must be housed, place it within a grounded metal case. Now to get back to the batteries. On short waves every piece of wire in the circuit acts as a miniature aerial. If the battery leads amble all over the room they are liable to set up some interference. An eliminator is no good, for the hum cannot be ironed out on wavelengths lower than forty meters.

The operations of this set is similar to the old style regenerative receiver, only a lot sharper. Tuning is fairly easy, the regenerative condenser being far from critical. If the tuning is disturbed when this condenser is swung it is a sign that the receiver is not functioning properly. Also while on the subject, no signals should be heard when the aerial and counterpoise are disconnected unless set is inductively coupled to another in the same room. Signals with the aerial off are positive proof that the set has too much wire in it. On twenty meters every Ford within 200 feet will be distinctly audible, and at times are quite objectionable. No other car save certain trucks have any effect.

In the first night of operation in our laboratory this receiver picked up signals from the Philippines, Syria and Czecho-Slovakia, not to mention numerous stations in America. Since that time we have logged every continent but Africa and expect to get that soon. All of these were of course telegraphic, that is, code.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of RADIO AGE, published monthly at Mount Morris, Illinois, for October, 1927.

State of Illinois } ss.
County of Cook }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Frederick A. Smith, who, having been duly sworn according to law, deposes and says that he is the President of the RADIO AGE, Inc., and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, RADIO AGE, Inc., Frederick A. Smith, President, 500 N. Dearborn St., Chicago, Ill.; Editor, Frederick A. Smith, 500 N. Dearborn St., Chicago, Ill.; Managing Editor, Frederick A. Smith, 500 N. Dearborn St., Chicago, Ill.; Business Manager, M. B. Smith, 500 N. Dearborn St., Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member must be given.) RADIO AGE, Inc., 500 N. Dearborn St., Chicago, Ill.; Frederick A. Smith, 500 N. Dearborn St., Chicago, Ill.; M. B. Smith, 500 N. Dearborn St., Chicago, Ill.; Estate of J. H. Lohbeck, deceased, St. Louis, Mo.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is..... (This information is required from daily publications only.)

FREDERICK A. SMITH,
Editor.

Sworn to and subscribed before me this 15th day of October, 1927.

(SEAL) AMANDA FRIIS.

My commission expires Mar. 5, 1929.

Court Victory for A. R. R. L.

Municipal ordinances designed to limit or regulate amateur radio transmitting stations within their jurisdiction are unlawful and unconstitutional and cannot be enforced, in the opinion of Judge A. M. J. Cochran, of the district court of Kentucky, who has just handed down a decision in a test suit brought by a member of the American Radio Relay League, requesting an injunction against a Wilmore, Ky., radio ordinance.

Pointing out that radio communication was obviously interstate commerce, and as such was subject only to Federal regulation and control, Judge Cochran turned down a plea for dismissal on the part of the city authorities and sustained the request of the League's counsel for an injunction preventing enforcement of the local ordinance.

The Wilmore ordinance, which is similar to many other municipal ordinances, was passed by the city in 1926, and was aimed at amateur stations operated within the city limits. Various regulations in connection with the operation of such stations were set down, and a yearly license fee of $100 was imposed.

The American Radio Relay League of Hartford, Conn., the national association of amateur radio operators, immediately instituted suit for an injunction on behalf of the local operator through its counsel, Mr. Paul M. Segal, of Denver, Colo. Mr. Segal, who has had considerable experience in radio legal matters, pointed out that amateur radio communication was interstate commerce and of such a nature as to require a uniform system of regulation for the entire country.

"Since amateur radio communication admits of a uniform system of regulation throughout the United States," pointed out Mr. Segal, "it follows that the complete and exclusive regulation thereof is vested in Congress and its agencies, and that the non-action of Congress upon any phases of amateur radio is equivalent to a declaration that in those respects it shall be free and unregulated.

"In amateur radio communication," he continues, "there is practically nothing of local concern. Wavelength, power, note, type of apparatus, time of operation, etc.; all these are matters of national and international concern and hence far above the power of the State or the municipality to reach through the police power."

The decision of Judge Cochran is expected to constitute a valuable precedent in connection with similar regulatory measures now in effect in other cities throughout the country. In addition, Mr. Segal believes that few new measures along these lines will be passed, in view of the outcome of the Wilmore suit.

The text of Judge Cochran's opinion is as follows: "This suit is before me on defendant's motion to dismiss the bill for want of equity and that it does not state facts sufficient to entitle plaintiff to the relief which he seeks.

"The plaintiff is an amateur radio operator. He lives in and operates an amateur radio station located in the City of Wilmore, a municipality of this State located in this District. This he has done since

Correct List of Broadcast Stations

KDKA	Westinghouse Electric & Mfg. Co.	E. Pittsburgh, Pa.	315
KDLR	Radio Electric Co.	Devils Lake, N. D.	206
KDYL	Intermountain Bdcstg Corp	Salt Lake City, Utah	258
KELW	Earl L. White	Burbank, Calif.	229
KEX	Western Broadcasting Company	Portland, Ore.	222
KFAB	Nebraska Buick Auto Co.	Lincoln, Neb.	309
KFAD	Electrical Equipment Co.	Phoenix, Ariz.	273
KFAU	Independent School Dist.	Boise, Idaho	285
KFBB	F. A. Buttrey & Co.	Havre, Mont.	275
KFBC	W. Z. Azbill	San Diego, Calif.	248
KFBK	Sacramento Bee	Sacramento, Calif.	535
KFBL	Leese Bros.	Everett, Wash.	224
KFBS	School District No. One	Trinidad, Colo.	238
KFBU	Bishop N. S. Thomas	Laramie, Wyo.	428
KFCB	Nielson Radio Supply Co.	Phoenix, Ariz.	244
KFCR	Santa Barbara Broadcasting Co.	Santa Barbara, Calif.	211
KFDM	Magnolia Petroleum Co.	Beaumont, Texas	375
KFDX	First Baptist Church	Shreveport, La.	236
KFDY	South Dakota State College	Brookings, S. D.	394
KFDZ	Harry O. Iverson	Minneapolis, Minn.	216
KFEC	Meier & Frank	Portland, Ore.	214
KFEL	Eugene P. O'Fallon, Inc.	Denver, Colo.	248
KFEQ	Scroggin & Co.	St. Joseph, Neb.	206
KFEY	Bunker Hill & Sullivan	Kellogg, Idaho	233
KFGQ	Boone Biblical College	Boone, Iowa	210
KFH	Hotel Lassen	Wichita, Kans.	246
KFHA	Western State College of Colo.	Gunnison, Colo.	254
KFHL	Penn. College	Oskaloosa, Iowa	212
KFI	E. C. Anthony, Inc.	Los Angeles, Calif.	468
KFIF	Benson Polytechnic Institute	Portland, Ore.	214
KFIO	North Central High School	Spokane, Wash.	246
KFIU	Alaska Electric Light & Power Co.	Juneau, Alaska	226
KFIZ	Commonwealth Reporter	Fond du Lac, Wis.	268
KFJB	Marshall Electric Co.	Marshalltown, Iowa	248
KFJF	National Radio Mfg. Co.	Oklahoma City, Okla.	272
KFJI	E. E. Marsh	Astoria, Ore.	250
KFJM	University of North Dakota	Grand Forks, N. D.	331
KFJR	Ashley C. Dixon & Son	Portland, Ore.	283
KFJY	Tunwall Radio Co.	Fort Dodge, Iowa	240
KFJZ	W. E. Branch	Ft. Worth, Tex.	250
KFKA	Colo. State Teachers College	Greeley, Colo.	400
KFKB	J. R. Brinkley	Milford, Kan.	242
KFKU	The University of Kansas	Lawrence, Kans.	254
KFKZ	State Teachers College	Kirksville, Mo.	225
KFLR	University of New Mexico	Albuquerque, N. M.	416
KFLU	San Benito Radio Club	San Benito, Texas	236
KFLV	Swedish Evangelist Church	Rockford, Ill.	268
KFLX	George Roy Clough	Galveston, Texas	270
KFMR	Morningside College	Sioux City, Iowa	441
KFMX	Carlton College	Northfield, Minn.	337
KFNF	Henry Field Seed Co.	Shenandoah, Iowa	270
KFOA	Rhodes Department Store	Seattle, Wash.	447
KFOB	KFOB, Inc.	Burlingame, Calif.	225
KFON	Nicholas & Warriner, Inc.	Long Beach, Calif.	242
KFOR	Tire & Electric Co.	David City, Neb.	217
KFOX	Tech. High School	Omaha, Nebr.	258
KFOY	Beacon Radio Service	St. Paul, Minn.	285
KFPL	C. C. Baxter	Dublin, Texas	275
KFPM	The New Furniture Co.	Greenville, Texas	231
KFPR	Los Angeles County Forestry Dept.	Los Angeles, Cal.	232
KFPW	St. Johns M. E. Church	Carterville, Mo.	263
KFPY	Symons Investment Co.	Spokane, Wash.	246
KFQA	The Principia	St. Louis, Mo.	322
KFQB	Lone Star Bdcast Co.	Fort Worth, Texas	261
KFQD	Anchorage Radio Club	Anchorage, Alaska	345
KFQU	W. E. Riker	Holy City, Calif.	250
KFQW	C. F. Knierim	Seattle, Wash.	217
KFQZ	Taft Products Co.	Hollywood, Calif.	232
KFRC	Don Lee, Inc.	San Francisco, Calif.	254
KFRU	Stephens College	Columbia, Mo.	250
KFSD	Airfan Radip Corp.	San Diego, Calif.	441
KFSG	Echo Park Evan. Assn.	Los Angeles, Calif.	275
KFTL	C. C. Baxter	Dublin, Tex.	252
KFUL	Thomas Groggan & Bros.	Galveston, Texas	258
KFUM	W. D. Corley	Colorado Springs, Colo.	236
KFUO	Concordia Seminary	St. Louis, Mo.	545
KFUP	Fitzsimmons General Hospital	Denver, Colo.	227
KFUR	Peery Bldg. Co., Inc.	Ogden, Utah	225
KFUS	Louis L. Sherman	Oakland, Calif.	256
KFUT	University of Utah	Salt Lake City, Utah	500
KFVD	Chas. & W. J. McWhinnie	Venice, Calif.	208
KFVE	Benson Broadcasting Corp.	St. Louis, Mo.	234
KFVG	First M. E. Church	Independence, Kans	225
KFVI	KFVI Broadcasting Co.	Houston, Texas	238
KFVS	Cape Girardeau Battery Sta.	Cape Girardeau, Mo.	224
KFWB	Warner Bros. Pictures	Hollywood, Calif.	261
KFWC	L. E. Wall	San Bernardino, Calif.	222
KFWF	St. Louis Truth Center	St. Louis, Mo.	214
KFWI	Radio Entertainments, Inc.	San Francisco, Calif.	268
KFWM	Oakland Educational Society	Oakland, Calif.	236
KFWO	Lawrence Mott	Avalon, Calif.	218
KFWV	KFWV Studios	Portland, Ore.	229
KFXB	Bertram C. Heller	Los Angeles, Calif.	353
KFXF	Colorado Radio Corp.	Denver, Colo.	283
KFXJ	Mt. States Radio Dis., Inc.	(Portable) Colorado	216
KFXR	Classen Film Finishing Co.	Oklahoma City, Okla.	224
KFXY	Harry M. Costigan	Flagstaff, Ariz.	205
KFYF	Carl's Radio Den	Oxnard, Calif.	238
KFYR	Koskins-Meyer, Inc.	Bismarck, N. D.	240
KGA	Northwest Radio Service Co.	Spokane, Wash.	261
KGAR	Tucson Citizen	Tucson, Ariz.	234
KGBS	A. C. Dailey	Seattle, Wash.	203
KGBU	Alaska Radio Co.	Ketchikan, Alaska	229
KGBX	Foster Hall Tire Co.	St. Joseph, Mo.	288
KGBY	Dunning & Taddikon	Shelby, Nebr.	203
KGBZ	George R. Miller	York, Nebr.	213
KGCA	C. W. Greenley	Decorah, Iowa	248
KGCB	Wallace Radio Institute	Oklahoma, Okla.	216
KGCG	Moore Motor Co.	Newark, Ark.	224
KGCH	Wayne Hospital	Wayne, Nebr.	294
KGCI	Liberty Radio Sales	San Antonio, Texas	220
KGCL	Louis Wasmer	Seattle, Wash.	231
KGGN	Concordia Bdcstg. Co.	Concordia, Kans.	208
KGCR	Cutler's Broadcasting Service	Brookings, S. D.	208
KGCU	Mandan Radio Assn.	Mandan, N. D.	208
KGCX	First State Bank	Vida, Mont.	225
KGDA	Home Auto Co.	Dell Rapids, S. D.	234
KGDE	Jaren Drug Co.	Barrett, Minn.	205
KGDJ	R. Rathert	Cresco, Iowa	203
KGDM	V. G. Koping	Stockton, Calif.	217
KGDP	Boy Scouts of America	Pueblo, Colo.	224
KGDR	Radio Engineers	San Antonio, Tex.	203
KGDX	William Erwin Antony	Shreveport, La.	213
KGDY	J. Albert Loesch	Oldham, S. D.	207
KGDW	Frank J. Rist	Humboldt, Nebr.	207
KGEF	Trinity Methodist Church	Los Angeles, Calif.	263
KGEH	Eugene Broadcast Station	Eugene, Ore.	201
KGEK	Beehler Elect. Equipment Co.	Yuma, Colo.	263
KGEN	E. R. Irey & F. M. Bowles	El Centro, Calif.	225
KGEO	Raymond D. Chamberlain	Grand Island, Nebr.	205
KGEQ	Fred W. Herrmann	Minneapolis, Minn.	203
KGER	C. Merwin Dobyns	Long Beach, Calif.	216
KGEU	L. W. Clement	Lower Lake, Calif.	227
KGEW	City of Fort Morgan	Fort Morgan, Colo.	219
KGEY	J. W. Dietz	Denver, Colo.	201
KGEZ	Flathead Broadcasting Ass'n.	Kalispell, Mont.	205
KGFB	A. G. Dunkel	Iowa City, Iowa	224
KGFF	Earl E. Hampshire	Alva, Okla.	205
KGFG	Full Gospel Church	Oklahoma City, Okla.	216
KGFH	Frederick Robinson	La Crescenta, Calif.	224
KGFI	M. L. Eaves	Fort Stockton, Texas	220
KGFJ	Ben S. McGlashan	Los Angeles, Calif.	208
KGFK	Kittson County Enterprise	Hallock, Minn.	224
KGFL	Trinidad Broadcasting Co.	Trinidad, Colo.	222
KGFM	Geo. W. Johnson	Yuba City, Calif.	211
KGFN	Haraldson & Thingstad	Aneta, North Dakota	200
KGFP	Mitchell Broadcast Co.	Mitchell, South Dakota	212
KGO	General Electric Co.	Oakland, Calif.	384
KGRC	Gene Roth & Co.	San Antonio, Texas	220
KGRS	Gish Radio Service	Amarillo, Tex.	244
KGTT	Glad Tidings Tabernacle, Inc.	San Francisco, Cal.	207

October, 1924. He has a license to do so from the United States. It was granted October 19, 1925, for two years by the Secretary of Commerce, under the Act of August 13, 1912, and was extended March 15, 1927 by the Federal Radio Commission, appointed under the Act of February 23, 1927, by General Order No. 1 until further orders therefrom. The designation of his station is 9ALM.

"On October 1, 1926, the defendant by its Board of Council passed an ordinance requiring all persons, firms and corporations operating a radio broadcasting station, either commercial or amateur, to pay a license tax therefor and providing a penalty for failure to do so. The tax provided is not on the property of the radio operator, but on the business of radio broadcasting. Radio communications are all interstate. This is so though they may be intended only for intrastate transmission. And interstate transmission of such communications may be seriously affected by communications intended only for intrastate transmission. Such communications admit of and require a uniform system of regulation and control throughout the United States. And Congress has covered the field by appropriate legislation. It follows that the ordinance is void as a regulation of interstate commerce.

"The motion to dismiss is overruled.

A. M. J. COCHRAN, Judge."

Marconi Uses "Mike"

The inventor of radio, Senator Guglielimo Marconi, hadn't faced a microphone for more than five years until he went on the air in a brief message to the American people, through Station WRC at Washington, during his recent hurried visit to the United States to address the international radio conference.

Marconi hadn't time to visit the station studio, so wires were strung through his hotel corridors and a microphone installed in his room. He spoke, in shirt sleeves, necktie in hand, while dressing to attend a farewell dinner in his honor at the Italian embassy, after which he was to catch a midnight train to New York to make his boat, which sailed the following morning.

The amazement of the world, twenty years ago, at the invention of the young Italian genius, seemingly was equalled by Marconi's amazement at the extent to which America has developed radio.

"Brodcasting in America," he said, "has gone far beyond all early expectations. Its preeminence in this country today is due in large part to intelligent public interest and the appreciation of radio possibilities by American technical and merchandising organizations and the support they have given to its development.

"I am told that a series of programs is soon to be put on over a chain of no less than 28 stations by General Motors. Hardly a greater proof of the dependability and value of radio broadcasting could be given than the decision to utilize so extensive a network in development of radio programs.

"The adoption of radio broadcasting by an industrial organization of the magnitude of General Motors is ample proof that radio is definitely accepted as an efficient and powerful method of maintaining contact with the public."

KGU	Marion A. Mulrony	Honolulu, Hawaii	270
KGW	Oregonian Publishing Co	Portland, Ore.	491
KGY	St. Martins College	Lacey, Wash.	244
KHJ	Times-Mirror Co	Los Angeles, Calif.	405
KHQ	Louis Wasmer	Spokane, Wash.	370
KICK	Atlantic Automobile Co	Anita, Iowa	461
KJBS	J. Brunton & Sons Co	San Francisco, Calif.	220
KJR	Northwest Radio Service Co	Seattle, Wash.	348
KKP	City of Seattle, Harbor Dept	Seattle, Wash.	265
KLDS	Reorganized Ch. of Jesus Christ,	Independence, Mo.	238
KLIT	Lewis Irvine Thompson	Portland, Ore.	207
KLS	Warner Brothers	Oakland, Calif.	246
KLX	Tribune Publishing Co	Oakland, Calif.	508
KLZ	Reynolds Radio Co	Denver, Colo.	268
KMA	May Seed & Nursery	Shenandoah, Iowa	270
KMED	W. J. Virgin	Medford, Ore.	268
KMIC	J. R. Fouch	Inglewood, Calif.	224
KMJ	Fresno Bee	Fresno, Calif.	366
KMMJ	M. M. Johnson Co	Clay Center, Nebr.	379
KMO	Love Electric Co	Tacoma, Wash.	254
KMOX	Voice of St. Louis	St. Louis, Mo.	300
KMTR	Radio Corp	Hollywood, Calif.	526
KNRC	C. B. Juneau	Santa Monica, Calif.	375
KNX	Los Angeles Express	Los Angeles, Calif.	337
KOA	General Electric Co	Denver, Colo.	326
KOAC	Oregon Agriculture College	Corvallis, Oreg.	326
KOB	N. Mex. College of Agric.	State College, N. Mex.	394
KOCH	Oamaha Central High School	Omaha, Neb.	258
KOCW	Oklahoma College for Women	Chickasha, Okla.	252
KOIL	Mona Motor Oil Co	Council Bluffs, Iowa	278
KOIN	KOIN, Inc	Portland, Ore.	319
KOMO	Fisher's Blend Station, Inc	Seattle, Wash.	307
KOWW	Frank A. Moore	Walla, Walla Wash.	300
KPCB	Pacific Coast Biscuit Co	Seattle, Wash.	231
KPJM	Wilburn Radio Service	Prescott, Ariz.	214
KPNP	Central Radio Co.	Muscatine, Iowa	211
KPO	Hale Bros., Inc	San Francisco, Calif.	422
KPPC	Pasadena Presbyterian Church	Pasadena, Calif.	229
KPRC	Houston Printing Co	Houston, Texas	294
KPSN	Star-News	Pasadena, Calif.	316
KQW	First Baptist Church	San Jose, Calif.	297
KQV	Doubleday-Hill Electric Co	Pittsburgh, Pa.	270
KRAC	Caddo Radio Club	Shreveport, La.	220
KRE	Berkeley Daily Gazette	Berkeley, Calif.	256
KRLD	Dallas Rado Laboratories	Dallas, Tex.	461
KRLO	Freeman Lang & A. B. Scott	Los Angeles, Calif.	216
KROX	N. D. Brown	Seattle, Wash.	211
KRSC	Radio Sales Corp	Seattle, Wash.	211
KSAC	Kansas State Agricultural College	Manhattan, Kans.	333
KSBA	W. G. Patterson	Shreveport, La.	268
KSD	Pulitzer Publishing Co	St. Louis, Mo.	545
KSCJ	The Journal	Sioux City, Iowa	244
KSEI	Broadcasting Association	Pocatello, Idaho	333
KSL	Radio Service Corp	Salt Lake City, Utah	303
KSMR	Santa Maria Valley Railroad	Santa Maria, Calif.	273
KSO	Berry Seed Co	Clarinda, Iowa	227
KSOO	Sioux Falls Bdcst. Ass'n	Sioux Falls, S. D.	210
KTAB	Associated Broadcasters	Oakland, Calif.	280
KTAP	Robert B. Bridge	San Antonio, Texas	229
KTBI	Bible Institute	Los Angeles, Calif.	283
KTBR	M. E. Brown	Portland, Ore.	283
KTCL	Amer. Radio Tel. Co	Seattle, Wash.	278
KTHS	New Arlington Hotel	Hot Springs, Ark.	384
KTNT	N. Baker	Muscatine, Iowa	256
KTUE	Uhalt Electric	Houston, Texas	213
KTW	First Presbyterian Church	Seattle, Wash.	394
KUJ	Puget Sound Broadcasting Co	Seattle, Wash.	200
KUOA	University of Arkansas	Fayetteville, Ark.	297
KUOM	University of Montana	Missoula, Mont.	375
KUSD	University of South Dakota	Vermillion, S. D.	484
KUT	University of Texas	Austin, Texas	232
KVI	Puget Sound Broadcasting Co	Tacoma, Wash.	234
KVOO	Southwestern Sales Corp	Bristow, Okla.	349
KVOS	L. Kessler	Seattle, Wash.	210
KWBS	Schaeffer Mfg. Co	Portland, Ore.	201
KWCR	H. F. Parr	Cedar Rapids, Iowa	384
KWG	Portable Wireless Telegraph Co	Stockton, Calif.	345
KWKC	Wilson Duncan Studios	Kansas City, Mo.	222
KWLC	Luther College	Decorah, Iowa	249
KWSC	State College of Washington	Pullman, Wash.	394
KWTC	J. W. Hancock	Santa Ana, Calif.	353
KWUC	Western Union College	Le Mars, Iowa	244
KWWG	Chamber of Commerce	Brownsville, Texas	278
KXL	KXL Broadcasters	Portland, Ore.	220
KYA	Pacific Broadcasting Corp	San Francisco, Calif.	309
KYW	Westinghouse Electric & Mfg. Co	Chicago, Ill.	526
KZM	Preston D. Allen	Oakland, Calif.	246
WAAD	Ohio Mechanical Institute	Cincinnati, Ohio	268
WAAF	Chicago Daily Drovers Journal	Chicago, Ill.	359
WAAM	Isaiah R. Nelson	Newark, N. J.	349
WAAT	F. V. Bremer	Jersey City, N. J.	246
WAAW	Omaha Grain Exchange	Omaha, Nebr.	375
WABC	Atlantic Broadcasting Corp	New York, N. Y.	326
WABF	Markle Broadcasting Corp	Pringleboro, Pa.	205
WABI	1st Universalist Church	Bangor, Me.	389
WABO	Hickson, Electric Co., Inc	Rochester, N. Y.	232
WABQ	Keystone Broadcasting Co	Philadelphia, Pa.	261
WABW	College of Wooster	Wooster, Ohio	248
WABY	John Magaldi, Jr	Philadelphia, Pa.	248
WABZ	Colis Place Baptist Church	New Orleans, La.	248
WADC	Allen Theater	Akron, Ohio	297
WAFD	Albert P. Parfet	Detroit, Mich.	219
WAGM	R. L. Miller	Royal Oak, Mich.	225
WAGS	Willow Garage, Inc	Sommerville, Mass.	216
WAIT	A. H. Waite & Co	Taunton, Mass.	214
WAIU	American Insurance Union	Columbus, Ohio	283
WALK	Albert A. Walker	Bathayres, Pa.	204
WAMD	Raddison Radio Corp	Minneapolis, Minn.	225
WAPI	Alabama Polytechnic Institute	Auburn, Ala.	326
WARS	Amateur Radio Specialty Co	Brooklyn, N. Y.	227
WASH	Baxter Laundry Co	Grand Rapids, Mich.	256
WATT	Edison Elec. Illum	Boston, Mass.	201
WBAA	Purdee University	W. Lafayette, Ind.	273
WBAK	Pennsylvania State Police	Harrisburg, Pa.	300
WBAL	Consolidated Gas & Power Co	Baltimore, Md.	285
WBAO	James Milliken University	Decatur, Ill.	268
WBAP	Ft. Worth Star Telegram	Ft. Worth, Texas	500
WBAW	Waldrum Drug Co	Nashville, Tenn.	248
WBAX	John H. Stenger, Jr	Wilkes-Barre, Pa.	250
WBBC	Brooklyn Bdcstg. Corp	Brooklyn, N. Y.	227
WBBL	Grace Covenant Presbyterian Church	Richmond, Va.	248
WBBM	Atlass Investment	Chicago, Ill.	389
WBBP	Petoskey High School	Petoskey, Mich.	240
WBBR	People's Pulpit Assoc	Rossville, N. Y.	256
WBBW	Ruffner Junior High School	Norfolk, Va.	236
WBBY	Washington, Light Inf	Charleston, S. C.	500
WBBZ	C. L. Carrell	Chicago, Ill.	204
WBCN	Great Lakes Broadcasting Co	Chicago, Ill.	288
WBES	Bliss Electrical School	Takoma Park, Md.	297
WBET	Boston Transcript Co	Boston, Mass.	265
WBKN	Arthur Faske	Brooklyn, N. Y.	268
WBMH	Braun's Music House	Detroit, Mich.	211
WBMS	G. J. Schowerer	North Bergen, N. J.	268
WBNY	Baruschrome Corp	New York, N. Y.	236
WBOQ	Atlantic Bdcst. Corp	Richmond Hill, N. Y.	326
WBRC	Birmingham Broadcasting Co	Birmingham, Ala.	244
WBRE	Baltimore Radio Exchange	Wilkes-Barre, Pa.	250
WBRL	Booth Radio Laboratories	Tilton, N. H.	232
WBRS	Universal Radio Mfg. Co	Brooklyn, N. Y.	211
WBSO	Babson's Statistical Org	Wellesley Hills, Mass.	384
WBT	Charlotte Chamber of Commerce	Charlotte, N. C.	258
WBZ	Westinghouse Elect. & Mfg. Co	Springfield, Mass.	333
WBZA	Westinghouse Elect. & Mfg. Co	Boston, Mass.	333
WCAC	Connecticut Agricultural College	Mansfield, Conn.	275
WCAD	St. Lawrence University	Canton, N. Y.	366
WCAE	Pittsburgh Press	Pittsburgh, Pa.	517
WCAH	C. A. Entrekin	Columbus, Ohio	535
WCAJ	Nebraska Wesleyan University	University Pl., Nebr.	379
WCAL	St. Olaf College	Northfield, Minn.	236
WCAM	City of Camden	Camden, N. J.	224
WCAO	Monumental Radio Inc	Baltimore, Md.	384
WCAT	School of Mines	Rapid City, S. D.	248
WCAU	Universal Broadcasting Co	Philadelphia, Pa.	278
WCAX	University of Vermont	Burlington, Vt.	254
WCAZ	Carthage College	Carthage, Ill.	341
WCBA	Queen City Radio Station	Allentown, Pa.	222
WCBD	Wilbur Glenn Voliva	Zion, Ill.	345
WCBE	Uhalt Radio Co	New Orleans, La.	227
WCBM	Hotel Chateau	Baltimore, Md.	384
WCBR	C. H. Messter	Providence, R. I.	201

The Melody Ship

And now comes the unexpected—A loud speaker that is really pleasing to look at. Perhaps it may be considered rash to speak of the loud speaker as a thing of beauty but the Melody Ship is an object that combines the great advantage of a utility with its handsomeness.

The Melody Ship is a new loud speaker. To all appearances it is a beautiful ship model handsomely decorated, sails of an intricate net work of riggings, rope ladders and guides that seem to wander aimlessly amongst the sails and masts.

On close observation one will notice that the decorated main sail is the diaphragm of a loud speaker. Behind the diaphragm one will see a loud speaker unit fastened to the main mast. Two slender wires running from the unit is the only indication that the ship is anything but an excellent replica of a historic vessel. The evolution of the loud speaker has been from the horn type to the cone type, the most advanced change in loud speakers. The cone type because of its large diaphragm and peculiar construction of the reproducing unit has a wider tonal range than the horn type. Following the development of the cone speaker much attention has been given to combining beauty with tone quality.

With this idea in mind which provides a loud speaker which would be beautiful both to the eye and ear, J. E. Sanders, an engineer of the Miniature Ship Models, Incorporated, of Philadelphia, has developed such a practical instrument after many months of experimentation. The reproducer which he called the Melody Ship is both unique in its design and beautiful in appearance. He has reproduced a number of the most historical ships of many centuries ago and incorporated with them the melody sail. The ship is made entirely of wood which is a distinct aid to toning quality and eliminates counter vibrations which cause distortion. Every part of the ship is a material aid in catching the vibration of the speaker and enriching the tone quality.

The development of the Melody Ship was not merely an accident. Many months of diligent labor and experimenting were spent before Mr. Sanders arrived at the present degree of perfection. Many difficulties had to be overcome in shaping the diaphragm to conform to the shape of the ship's sail. Even the seemingly insignificant joining together of the seam in the diaphragm presented almost insurmountable obstacles. It was found that the different tone qualities resulted from the manner in which the melody sail was placed on the ship.

When Mr. Sanders developed the Melody Ship he did so with the idea of using it solely for his own use but the novelty of the idea met with such instantaneous approbation that he incorporated it with the ship models that he was manufacturing in the knock down form.

It is a very simple matter to build one of these radio loud speaker ship models in a few hours. The building of ship models has become so simplified that small boys and even small girls are building them in all parts of the world. The knock down system of building by what the

WCBS	H. L. Lewing	Springfield, Ill.	210
WCCO	Washburn-Crosby Co.	Anoka, Minn.	405
WCFL	Chicago Fed. of Labor	Chicago, Ill.	484
WCGU	C. G. Under	Lakewood, N. J.	211
WCLO	C. E. Whitmore	Camp Lake, Wis.	227
WCLS	WCLS, Inc.	Joliet, Ill.	216
WCMA	Culver Military Academy	Culver, Ind.	258
WCOA	City of Pensacola	Pensacola, Fla.	250
WCOC	Crystal Oil Co.	Columbus, Miss.	231
WCOT	Jacob Conn	Olneyville, R. I.	225
WCRW	Clinton R. White	Chicago, Ill.	224
WCSH	Congress Square Hotel Co.	Portland, Maine	361
WCSO	Wittenberg College	Springfield, Ohio	256
WCWK	Chester W. Keen	Fort Wayne, Ind.	229
WCWS	Bridgeport Bdcst. Sta.	Bridgeport, Conn.	214
WCX	Detroit Free Press	Pontiac, Mich.	441
WDAD	Dad's Auto Accessories, Inc.	Nashville, Tenn.	225
WDAE	Tampa Daily T mes	Tampa, Fla.	268
WDAF	Kansas City Stair	Kansas City, Mo.	370
WDAG	J. Laurence Martin	Amarillo, Texas	263
WDAH	Trinity Methodist Church	El Paso, Texas	234
WDAY	Radio Equipment Corp.	Fargo, N. D.	361
WDBJ	Richardson Wayland Elec. Corp.	Roanoke, Va.	231
WDBO	Orlando Broadcasting Co.	Orlando, Fla.	288
WDBZ	Boy Scouts of America	Kingston, N. Y.	216
WDEL	Wilmington Elec. Specialty Co.	Wilmington, Del.	265
WDGY	Dr. George W. Young	Minneapolis, Minn.	263
WDOD	Chattanooga Radio Co., Inc.	Chattanooga, Tenn.	246
WDRC	Doolittle Radio Corp.	New Haven, Conn.	275
WDWF	Dutee Wilcox Flint, Inc.	Cranston, R. I.	375
WDWM	Radio Industries Broadcast Co.	Newark, N. J.	361
WDZ	J. L. Bush	Tuscola, Ill.	278
WEAF	National Broadcasting Co.	New York, N. Y.	491
WEAM	Bor. of N. Plainfield	North Plainfield, N. J.	240
WEAN	The Shepard Co.	Providence, R. I.	319
WEAO	Ohio State University	Columbus, Ohio	283
WEAR	Willard Storage Battery Co.	Cleveland, Ohio	400
WEBC	Head-of-the-Lakes Radio Station	Superior, Wis.	242
WEBE	Roy W. Waller	Cambridge, Ohio	248
WEBH	Edgewater Beach Hotel	Chicago, Ill.	366
WEBJ	Third Avenue Railway Co.	New York, N. Y.	256
WEBQ	Tate Radio Corp.	Harrisburg, Ill.	225
WEBR	H. H. Howell	Buffalo, N. Y.	242
WEBW	Beloit College	Beloit, Wis.	259
WEDC	E. Denemark Station	Chicago, Ill.	242
WEEI	The Edison Elec. Illuminating Co.	Boston, Mass.	448
WEHS	A. T. Becker	Evanston, Ill.	216
WEMC	Emanuel Missionary College	Berrien Springs, Mich.	238
WENR	Great Lakes Broadcasting Co.	Chicago, Ill.	288
WEPS	Matheson Radio Co., Inc.	Gloucester, Mass.	297
WEW	St. Louis University	St. Louis, Mo.	353
WFAA	Dallas News & Dallas Journal	Dallas, Texas	500
WFAM	Times Publishing Co.	St. Cloud, Minn.	252
WFBC	First Baptist Church	Knoxville, Tenn.	234
WFBE	Garfield Place Hotel Co.	Cincinnati, Ohio	246
WFBG	The Wm. F. Gable Co.	Altoona, Pa.	280
WFBJ	St. John's University	Collegeville, Minn.	273
WFBL	The Onondaga Co.	Syracuse, N. Y.	259
WFBM	Indianapolis Power & Light Co.	Indianapolis, Ind.	225
WFBR	Fifth Infantry National Guard	Baltimore, Md.	225
WFBZ	Knox College	Galesburg, Ill.	248
WFCI	Frank Crook, Inc.	Pawtucket, R. I.	225
WFDF	F. D. Fallain	Flint, Mich.	349
WFHH	Chamber of Commerce	Clearwater, Fla.	366
WFI	Strawbridge and Clothier	Philadelphia, Pa.	405
WFIW	The Acme Mills, Inc.	Hopkinsville, Ky.	280
WFKB	Vesta Battery Corp.	Chicago, Ill.	224
WFLA	Boca Raton Radio Corp.	Boca Raton, Fla.	213
WFRL	Flatbush Radio Labs.	Brooklyn, N. Y.	219
WGAL	Lancaster Elec. Supply & Const. Co.	Lancaster, Pa.	252
WGBB	H. H. Carman	Freeport, N. Y.	246
WGBC	First Baptist Church	Memphis, Tenn.	278
WGBF	Fink Furniture Co.	Evansville, Ind.	236
WGBI	Scranton Broadcasters, Inc.	Scranton, Pa.	231
WGBS	Gimbel Brothers	Astoria, L. I., N. Y.	349
WGCP	Lanter Piano Co.	Newark, N. J.	280
WGES	Oak Leaves Broadcasting Corp.	Chicago, Ill.	242
WGHP	G. H. Phelps	Detroit, Mich.	319
WGL	International Broadcasting Corp.	Secaucus, N. Y.	294
WGM	Verne and Elton Spencer	Jeanette, Pa.	208
WGMU	Atlantic Bdcst. Co.	New York, N. Y.	201
WGN	The Tribune	Chicago, Ill.	306
WGR	Federal T. and T. Co.	Buffalo ,N. Y.	303
WGST	Georgia School of Technology	Atlanta, Ga.	270
WGWB	Radiocast Corporation	Milwaukee, Wis.	219
WGY	General Elec. Co.	Schenectady, N. Y.	379
WHA	University of Wisconsin	Madison, Wis.	319
WHAD	Marquette University	Milwaukee, Wis.	294
WHAM	Stromberg-Carlson Tel. Mfg. Co.	Rochester, N. Y.	278
WHAP	W. H. Taylor Finance Corp.	New York, N. Y.	236
WHAR	F. D. Cooks Sons	Atlantic City, N. J.	273
WHAS	Courier-Journal & Louisville Times	Louisville, Ky.	461
WHAZ	Rensselaer Polytechnic Institute	Troy, N. Y.	379
WHB	Sweeney School Co.	Kansas City, Mo.	337
WHBA	C. C. Shaffer	Oil City, Pa.	261
WHBC	Rev. E. P. Graham	Canton, Ohio	236
WHBD	Chamber of Commerce	Bellefontaine, Ohio	222
WHBF	Beardsley Specialty Company	Rock Island, Ill.	222
WHBL	James H. Slusser	Chicago, Ill.	204
WHBM	C. L. Carrell	Chicago, Ill.	201
WHBN	First Ave. Methodist Church	St. Petersburg, Fla.	297
WHBP	Johnstown Automobile Co.	Johnstown, Pa.	229
WHBQ	WHBQ, Inc.	Memphis, Tenn.	232
WHBU	Bings Clothing—Riviera Theater	Anderson, Ind.	219
WHBW	D. R. Kienzle	Philadelphia, Pa.	220
WHBY	St. Norbert's College	West de Pere, Wis.	250
WHDI	W. H. Dunwoody Institute	Minneapolis, Minn.	246
WHEC	Hickson Electric Co., Inc.	Rochester, N. Y.	232
WHFC	Triangle Broadcasters	Chicago, Ill.	216
WHK	The Radio Air Service Corp.	Cleveland, Ohio	265
WHN	Loew's State Broadcasting Station	New York, N. Y.	395
WHO	Banker's Life Co.	Des Moines, Ia.	535
WHT	Radiophone Broadcasting Corp.	Deerfield, Ill.	416
WIAD	Howard R. Miller	Philadelphia, Pa.	220
WIAS	Home Electric Co.	Burlington, Iowa	476
WIBA	Capital Times-Strand Theatre	Madison, Wis.	240
WIBG	St. Paul's Protestant E. Church	Elkins Park, Pa.	441
WIBJ	Frederick B. Zittell, Jr.	Flushing, L. I., N. Y.	268
WIBJ	C. L. Carrell	Chicago, Ill.	201
WIBM	C. L. Carrell	Chicago, Ill.	201
WIBO	WIBO Broadcasters, Inc.	Chicago, Ill.	416
WIBS	N. J. National Guard	Elizabeth, N. J.	203
WIBU	The Electric Farm	Poynette, Wis.	217
WIBW	C. L. Carrell	Chicago, Ill.	204
WIBX	WIBX, Inc.	Utica, N. Y.	238
WIBZ	A. D. Trum	Montgomery, Ala.	231
WICC	Bridgeport Bdcst. Station	Bridgeport, Conn.	214
WIL	Benson Radio Co.	St. Louis, Mo.	258
WIOD	Earl G. Fisher Co.	Miami, Fla.	248
WIP	Gimbel Bros.	Philadelphia, Pa.	508
WJAD	Hotel Raleigh	Waco, Texas.	448
WJAG	Norfolk Daily News	Norfolk, Neb.	286
WJAK	Kokomo Tribune	Kokomo, Ind.	234
WJAM	D. M. Perham	Cedar Rapids, Iowa	384
WJAR	The Outlet Co.	Providence, R. I.	484
WJAS	Pittsburgh Radio Supply House	Pittsburgh, Pa.	270
WJAX	City of Jacksonville	Jacksonville, Fla.	337
WJAY	Cleveland Broadcasting Corp.	Cleveland, O.	227
WJAZ	American Bdcast. Corp.	Mt. Prospect, Ill.	263
WJBA	D. H. Lentz, Jr.	Joliet, Ill.	322
WJBB	Financial Journal	St. Petersburg, Fla.	345
WJBC	Hummer Furniture Co.	LaSalle, Ill.	227
WJBI	Robert S. Johnson	Red Bank, N. J.	256
WJBK	E. F. Goodwin	Ypsilanti, Mich.	220
WJBL	Wm. Gushard Dry Goods Co.	Decatur, Ill.	213
WJBO	Valdemar Jensen	New Orleans, La.	263
WJBR	Gensch and Stearns	Omro, Wis.	227
WJBT	John S. Boyd	Chicago, Ill.	389
WJBU	Bucknell University	Lewisburg, Pa.	214
WJBW	C. Carlson, Jr.	New Orleans, La.	238
WJBY	Electric Construction Co.	Gadsden, Ala.	234
WJBZ	Roland G. Palmer	Chicago Heights, Ill.	208
WJJD	Supreme Lodge, L. O. of Moose	Mooseheart, Ill.	266
WJPW	J. P. Wilson	Ashtabula, Ohio	208
WJR	Station WJR, Inc.	Pontiac, Mich.	441
WJZ	Radio Corp. of America	Bound Brook, N. J.	454
WKAQ	Radio Corp. of Porto Rico	San Juan, P. R.	341
WKAR	Michigan State College	East Lansing, Mich.	285
WKAV	Laconia Radio Club	Laconia, N. H.	224
WKBB	Sanders Bros.	Joliet, Ill.	216

manufacturer supplies, all necessary parts and complete instructions for assembling, has been an added impetus to ship model building.

Now that the loud speaker has been incorporated with the ship model it is expected that the small ship replica will have even greater use.

Paralysis of Tubes

Vacuum tubes, in use today, for the most part, have so-called thoriated tungsten filaments, the action of which, even at this late date, is not fully appreciated by the average listener.

The electronic emission of the thoriated tungsten filament, according to S. Ruttenberg, Chief Engineer of the Radiall Company, depends upon the presence of a layer of thorium atoms on the outer surface of the filament. It will be noted that, unlike the oxide-coated filament found in some tubes, the thoriated tungsten filament is not merely thorium-coated, but it is permeated throughout its entire mass with the rare element thorium. During the normal operation of such a filament, the thorium on the outer surface is gradually evaporated, reducing the emission current and, if permitted to continue, rendering the tube short-lived.

However, while the heat of the filament serves to evaporate the thorium particles on the surface, it is also boiling fresh thorium particles out of the mass and up to the surface. Thus the surface is being continually replenished. Just so long as the filament voltage is not increased beyond 10 per cent above the rated value, this evaporation and replenishing process continues at an equilibrium rate, so that a constant layer of thorium is maintained on the surface.

When subjected to an over-voltage on the filament, however, the evaporation becomes excessive, so that the tube accordingly becomes more or less paralyzed. Operating these tubes at sub-normal voltages is also liable to paralyze them slowly, as the filament temperature is then so low that the process of boiling out the thorium from the interior of the filament becomes abnormally retarded. Hence it is important that the thoriated tungsten filament tubes be operated strictly at their rated voltage, by means of hand rheostats with an accurate voltmeter, or, better still and simpler, by means of amperites, the self-adjusting rheostats.

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WKBE	K. & D. Electric Co.	Webster, Mass.	229
WKBF	N. D. Watson	Indianapolis, Ind.	252
WKBG	C. L. Carrell	Chicago, Ill.	201
WKBH	Callaway Music Co.	LaCrosse, Wis.	220
WKBI	F. L. Schoenwolf	Chicago, Ill.	322
WKBL	Monrona Radio Mfg. Co.	Monroe, Mich.	205
WKBN	Radio Electric Service Co.	Youngstown, Ohio	214
WKBO	Camith Corporation	Jersey City, N. J.	219
WKBP	Enquirer and News	Battle Creek, Mich.	213
WKBQ	Starlight Amusement Park	New York, N. Y.	219
WKBS	P. M. Nelson	Galesburg, Ill.	217
WKBT	First Baptist Church	New Orleans, La.	252
WKBV	Knox Battery and Electric Co.	Brookville, Ind.	217
WKBW	Churchill Evang. Ass'n	Buffalo, N. Y.	217
WKBZ	K. L. Ashbacker	Ludington, Mich.	200
WKDR	Edward A. Dato	Kenosha, Wis.	322
WKJC	Kirk Johnson & Co.	Lancaster, Pa.	252
WKRC	Kodel Radio Corp.	Cincinnati, Ohio	333
WKY	WKY Radio Co.	Oklahoma City, Okla.	288
WLAC	Life & Casualty Ins. Co.	Nashville, Tenn.	226
WLAP	Virginia Avenue Baptist Church	Louisville, Ky.	268
WLB	University of Minnesota	Minneapolis, Minn.	246
WLBC	D. A. Burton	Muncie, Ind.	210
WLBF	E. L. Dillard	Kansas City, Mo.	211
WLBG	R. A. Gamble	Petersburg, Va.	214
WLBH	Joseph J. Lombardi	Farmingdale, N. Y.	232
WLBI	Legion Broadcasters, Inc.	East Wenona, Ill.	238
WLBL	Wisconsin Dept. of Markets	Stevens Point, Wis.	319
WLBM	Browning Drake Corp.	Boston, Mass.	231
WLBN	William Evert Hiler	Chicago, Ill.	204
WLBO	Frederick A. Tribbe, Jr.	Galesburg, Ill.	217
WLBP	R. A. Fox	Ashland, Ohio	203
WLBQ	E. Dale Trout	Atwood, Ill.	203
WLBR	Alford Radio Company	Belvidere, Ill.	322
WLBT	Harold Wendell	Crown Point, Ind.	322
WLBV	John F. Weimer & D. A. Snick	Mansfield, Ohio	207
WLBW	Petroleum Telephone Co.	Oil City, Pa.	294
WLBX	John N. Brahy	Long Island City, N. Y.	204
WLBY	Aimone Elec.	Iron Mountain, Mich.	210
WLBZ	Thompson L. Guernsey	Dover-Foxcroft, Maine	208
WLCI	Lutheran Association	Ithaca, N. Y.	248
WLIB	Liberty Weekly, Inc.	Elgin, Ill.	306
WLIT	Lit Bros.	Philadelphia, Pa.	405
WLS	Sears Roebuck & Co.	Crete, Ill.	345
WLTS	Lane Technical High School	Chicago, Ill.	484
WLW	Crosley Radio Corp.	Harrison, Ohio	428
WLWL	Paulist Fathers	New York, N. Y.	370
WMAC	C. B. Meredith	Casenovia, N. Y.	225
WMAF	Round Hills Radio Corp.	Dartmouth, Mass.	428
WMAK	Norton Laboratories	Lockport, N. Y.	545
WMAL	M. A. Leese	Washington, D. C.	303
WMAN	First Baptist Church	Columbus, Ohio	234
WMAQ	Chicago Daily News	Chicago, Ill.	447
WMAY	Kingshighway Presbyterian Church	St. Louis, Mo.	248
WMAZ	Macon Junior Chamber of Commerce	Macon, Ga.	270
WMBA	LeRoy Joseph Beebe	Newport, R. I.	204
WMBB	American Bond & Mortgage Co.	Chicago, Ill.	252
WMBC	Michigan Broadcasting Co., Inc.	Detroit, Mich.	244
WMBD	Peoria Heights Radio Lab.	Peoria Heights, Ill.	205
WMBE	Dr. C. S. Stevens	St. Paul, Minn.	208
WMBF	Fleetwood Hotel Corp.	Miami Beach, Fla.	384
WMBG	Havens & Martin	Richmond, Va.	207
WMBH	Edwin Dudley Aber	Chicago, Ill.	204
WMBI	Moody Bible Institute	Chicago, Ill.	263
WMBJ	Wm. Roy McShaffrey	Monessen, Pa.	232
WMBL	Bonford Radio Studios	Lakeland, Fla.	229
WMBM	Seventh Day Adventist Church	Memphis, Tenn.	210
WMBO	Radio Service Laboratories	Auburn, N. Y.	220
WMBQ	Paul J. Gollhofer	Brooklyn, N. Y.	204
WMBR	Premier Electric Co.	Tampa, Fla.	252
WMBS	Mack's Battery Co.	Harrisburg, Pa.	234
WMBU	Paul J. Miller	Pittsburgh, Pa.	217
WMBW	Youngstown Bdcstg. Co., Inc.	Youngstown, O.	214
WMBY	Robert A. Isaacs	Bloomington, Ill.	200
WMC	Commercial Pub. Co.	Memphis, Tenn.	517
WMCA	Greely Sq. Hotel Co.	Hoboken, N. J.	370
WMPC	First Methodist Church	Lapeer, Mich.	234
WMRJ	Peter J. Prinz	Jamaica, N. Y.	207
WMSG	Madison Sq. Gard. Bdcast. Corp.	New York, N. Y.	236
WNAC	Shepard Stores	Boston, Mass.	353
WNAD	University of Oklahoma	Norman, Okla.	240
WNAL	Omaha Central High School	Omaha, Nebr.	258
WNAT	Lenning Brothers Co.	Philadelphia, Pa.	283
WNAX	Dakota Radio Apparatus Co.	Yankton, S. Dak.	303
WNBA	M. T. Rafferty	Forest Park, Ill.	208
WNBF	Howitt-Wood Radio Co.	Endicott, N. Y.	207
WNBH	New Bedford Hotel	New Bedford, Mass.	261
WNBJ	Lonsdale Baptist Church	Knoxville, Tenn.	207
WNBL	Gray, Trimble & Smith Electric Co.	Bloomington, Ill.	200
WNBO	John Brownlee Spriggs	Washington, Pa.	211
WNBR	Popular Radio Shop	Memphis, Tenn.	229
WNBQ	Gordon P. Brown	Rochester, N. Y.	203
WNJ	Herman Lubinsky	Newark, N. J.	280
WNOX	Peoples Tel. & Tel. Co.	Knoxville, Tenn.	265
WNRC	W. B. Nelson	Greensboro, N. C.	224
WNYC	Dept. of Plans & Structures	New York, N. Y.	535
WOAI	Southern Equipment Co.	San Antonio, Texas	303
WOAN	J. D. Vaughn	Lawrenceburg, Tenn.	286
WOAX	Franklin J. Wolff	Trenton, N. J.	240
WOC	Palmer School of Chiropractic	Davenport, Iowa	353
WOCL	A. D. Newton	Jamestown, N. Y.	224
WODA	O'Dea Temple of Music	Paterson, N. J.	294
WOI	Iowa State College	Ames, Iowa	265
WOK	Chicago Beach Hotel	Homewood, Ill.	252
WOKO	Harold E. Smith	Peekskill, N. Y.	216
WOKT	Titus-Ets Corporation	Rochester, N. Y.	210
WOMT	Mikado Theater	Manitowoc, Wis.	222
WOO	John Wanamaker	Philadelphia, Pa.	508
WOOD	Walter B. Stiles, Inc.	Fernwood, Mich.	261
WOQ	Unity School	Kansas City, Mo.	337
WOR	L. Bamberger and Co.	Newark, N. J.	422
WORD	People's Pulpit Assn.	Batavia, Ill.	275
WOS	State Market Bureau	Jefferson City, Mo.	469
WOW	Woodman of the World	Omaha, Nebr.	508
WOWO	Main Auto Supply Co.	Fort Wayne, Ind.	229
WPAP	(See WQAO)	Cliffside, N. J.	395
WPCC	North Shore Cong. Church	Chicago, Ill.	224
WPCH	People's Broadcasting Corp.	New York, N. Y.	309
WPEP	Maurice Mayer	Waukegan, Ill.	216
WPG	The Municipality of Atlantic City	Atlantic City, N. J.	273
WPRC	Wilson Printing & Radio Co.	Harrisburg, Pa.	210
WPSC	Pennsylvania State College	State College, Pa.	300
WPSW	Philadelphia School of Wireless Tel.	Philadelphia, Pa.	203
WQAA	Horace A. Beale, Jr.	Parkersburg, Pa.	216
WQAM	Electrical Equipment Co.	Miami, Fla.	322
WQAN	Scranton Times	Scranton, Pa.	261
WQAO	Calvary Baptist Church	Cliffside, N. J.	395
WQJ	Calument Rainbo Broadcasting Co.	Chicago, Ill.	448
WRAF	The Radio Club (Inc.)	LaPorte, Ind.	208
WRAH	S. N. Read	Providence, R. I.	200
WRAK	Economy Light Co.	Escanaba, Mich.	283
WRAM	Lombard College	Galesburg, Ill.	248
WRAV	Antioch College	Yellow Springs, Ohio	341
WRAW	Avenue Radio & Electric Shop	Reading, Pa.	238
WRAX	Beracah Church, Inc.	Philadelphia, Pa.	283
WRBC	Immanuel Lutheran Church	Valparaiso, Ind.	238
WRC	Radio Corp. of America	Washington, D. C.	468
WRCO	Wayne Radio Co.	Raleigh, N. C.	217
WREC	WREC, Inc.	Whitehaven, Tenn.	254
WRES	H. L. Sawyer	Woloaston, Mass.	217
WRHF	Wash. Radio Hospital Fund	Washington, D. C.	319
WRHM	Rosedale Hospital, Inc.	Minneapolis, Minn.	252
WRK	Doron Bros.	Hamilton, Ohio	205
WRM	University of Illinois	Urbana, Ill.	273
WRMU	Atlantic Bdcasting Co.	New York, N. Y.	201
WRNY	Experimenter Publishing Co.	Coyetsville, N. Y.	309
WRR	City of Dallas	Dallas, Tex.	353
WRRS	F. G. Leavenworth	Racine, Wis.	322
WRSC	The Radio Shop	Chelsea, Mass.	205
WRST	Radiotel Mfg. Co., Inc.	Bay Shore, N. Y.	211
WRVA	Larus & Brother Co., Inc.	Richmond, Va.	254
WSAI	United States Playing Card Co.	Cincinnati, Ohio	361
WSAJ	Grove City College	Grove City, Pa.	224
WSAN	Allentown Call Publishing Co. Inc.	Allentown, Pa.	222
WSAR	Daughy & Welch Electrical Co.	Fall River, Mass.	252
WSAX	Zenith Radio Corp.	Chicago, Ill.	204
WSAZ	Chase Electric Shop	Huntington, W. Va.	242
WSB	Atlanta Journal	Atlanta, Ga.	476
WSBC	World Battery Co.	Chicago, Ill.	232

30 Days FREE TRIAL 5 Year Guarantee

MARWOOD

The 1928 Sensations! 8 Tube-1 Control

All Electric Or Battery Operation

AGAIN Marwood is a year ahead—with the Radio sensation of 1928—at a low price that smashes Radio profiteering. Here's the sensation they're all talking about—the marvelous 8 Tube Single Control Marwood for BATTERY or ALL ELECTRIC operation. Direct from the factory for only $69.00 retail price—a price far below that of smaller, less powerful Radios. Big discount to Agents from this price. You can't beat this wonderful new Marwood and you can't touch this low price. Why pay more for less quality? To prove that Marwood can't be beat we let you use it on 30 Days Free Trial in your own home. Test it in every way. Compare it with any Radio for tone, quality, volume, distance, selectivity, beauty. If you don't say that it is a wonder, return it to us. We take the risk.

Only $69 RETAIL PRICE

Big Discount to Agents From This Price

New Exclusive Features

Do you want coast to coast with volume enough to fill a theatre? Do you want amazing distance that only super-power Radios like the Marwood 8 can get? Do you want ultra-selectivity to cut out interference? Then you must test this Marwood on 30 Days Free Trial. An amazing surprise awaits you. A flip of your finger makes it ultra-selective—or broad—just as you want it. Every Marwood is perfectly BALANCED—a real laboratory job. Its simple one dial control gets ALL the stations on the wave band with ease. A beautiful, guaranteed, super-efficient Radio in handsome walnut cabinets and consoles. A radio really worth double our low price.

ALL ELECTRIC 8 Tube 1 Control $98 RETAIL PRICE

Buy From Factory—Save 1/2

Why pay profits to several middlemen? A Marwood in any retail store would cost practically three times our low direct-from-the-factory price. Our policy is highest quality plus small profit and enormous sales. You get the benefit. Marwood is a pioneer, responsible Radio, with a good reputation to guard. We insist on the best—and we charge the least. If you want next year's improvements NOW—you must get a Marwood—the Radio that's a year ahead.

Get Our Discounts Before You Buy a Radio

Don't buy any Radio 'til you get our big discounts and catalog. Save half and get a Radio that IS a Radio. Try any Marwood on 30 Days Free Trial at our risk. Tune in coast to coast on loud speaker with enormous volume, clear as a bell. Let your wife and children operate it. Compare it with any Radio regardless of price. If you don't get the surprise of your life return it. We take the risk. Don't let Marwood low prices lead you to believe Marwood is not the highest quality. We have smashed Radio prices. You save half.

6 Tube—1 Control

This is the Marwood 6 Tube, 1 Control for BATTERY or ALL ELECTRIC operation. Gets coast to coast on loud speaker with great volume. Only $47.00 retail. Big discounts to Agents. Comes in handsome walnut cabinets and consoles. This low price cannot be equalled by any other high grade 6 tube Radio. Has the volume of any 7 tube set. If you want a 6 tube Radio you can't beat a Marwood and you can't touch our low price.

$47 RETAIL PRICE

Big Discount to Agents From this Price

AGENTS

Make Big Spare-Time Money

Get your own Radio at wholesale price. It's easy to get orders for the Marwood from your friends and neighbors. Follow quick when they compare Marwood quality and low prices. We want local agents and dealers in each territory to handle the enormous business created by our national advertising. Make $100 a week or more in spare time demonstrating at home. No experience or capital needed. We show you how. This is the biggest season in Radio history. Everybody wants a Radio. Get in now. Rush coupon for 30 Days Free Trial, beautiful Catalog, Agents' Confidential Prices and Agents' New Plan.

Big Discount to Agents From this Price

Has Complete A-B Power Unit

A REAL ALL ELECTRIC Radio with one of the best A-B power units on the market—no batteries needed—at the world's lowest price. This Marwood can't be excelled at ANY price. If you have electricity in your home, just plug into the light socket and forget batteries. No more battery trouble and expense. Costs less than 2c a day to operate. Always have 100% volume. ALL ELECTRIC Radios are high priced because they are new. We cut profit to the bone and offer a $250.00 outfit for $98.00 retail price. Big discount to Agents. Don't buy any Radio 'til you get details of this sensational new ALL ELECTRIC Marwood.

Rush for Free Trial

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5315 Ravenswood Ave., Dept. B-3, Chicago, Ill.
Send Agents' Confidential Prices, 30 Days Free Trial, New Catalog and Agents' New Money Making Plan. No obligations on my part.

Name.....

St. or RFD.....

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

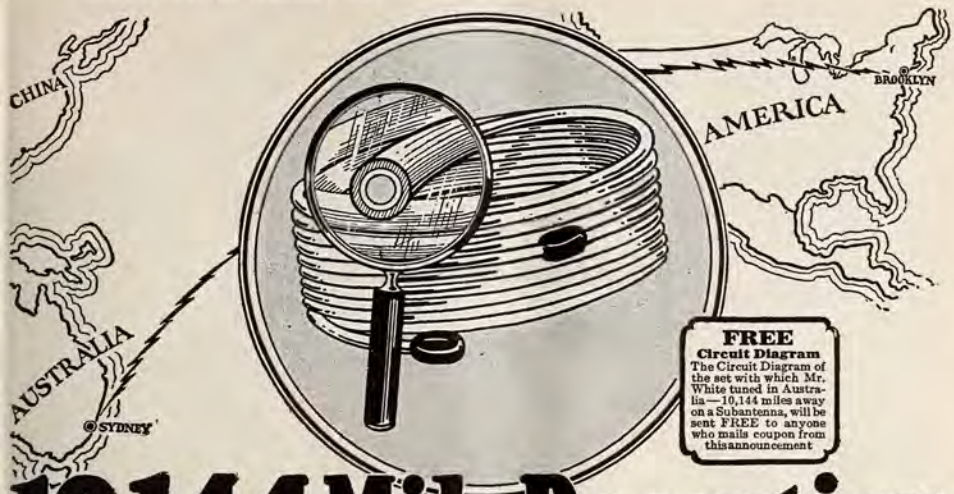
MARWOOD RADIO CORP.

5315 Ravenswood Ave.
Dept. B-3 Chicago, Ill.

WSBF	Broadcasters	St. Louis, Mo.	441
WSBT	South Bend Tribune	South Bend, Ind.	238
WSDA	City Temple	New York, N. Y.	227
WSEA	Virginia Beach Broadcasting Co.	Virginia Beach, Va.	219
WSIX	638 Tire & Vulc. Co.	Springfield, Tenn.	213
WSKC	World's Star Knitting Co.	Bay City, Mich.	492
WSM	Nashville Life & Accident Ins. Co.	Nashville, Tenn.	341
WSMB	Saenger Amuse. Co.	New Orleans, La.	322
WSMK	S. M. K. Radio Corp.	Dayton, Ohio	297
WSOE	School of Engineering	Milwaukee, Wis.	270
WSOM	Union Course Laboratories	Woodhaven, N. Y.	246
WSRO	Harry W. Fahrlander	Hamilton, Ohio	384
WSSH	Tremont Temple Bap. Church	Boston, Mass.	250
WSUI	State University of Iowa	Iowa City, Iowa	422
WSVS	Seneca Vocational School	Buffalo, N. Y.	205
WSYR	Clive B. Meredith	Syracuse, N. Y.	252
WTAD	Ill. Stock Medicine Corp.	Quincy, Ill.	236
WTAG	Worcester Telegram	Worcester, Mass.	517
WTAL	Toledo Broadcasting Co.	Toledo, Ohio	280
WTAM	Willard Storage Battery Co.	Cleveland, Ohio	400
WTAQ	Gillette Rubber Co.	Eau Claire, Wis.	254
WTAR	Reliance Electric Co.	Norfolk, Va.	275
WTAS	Richmond Harris & Co.	Batavia, Ill.	275
WTAW	A. & M. Coll. of Texas	College Sta., Texas	309
WTAX	Williams Hardware Co.	Streator, Ill.	322
WTIC	Travelers Insurance Co.	Hartford, Conn.	476
WTRL	Technical Radio Laboratory	Midland Park, N. J.	207
WWAE	L. J. Crowley	Chicago, Ill.	232
WWJ	Evening News Assn.	Detroit, Mich.	375
WWL	Loyola University	New Orleans, La.	275
WWNC	Chamber of Commerce	Asheville, N. C.	297
WWRL	Woodside Radio Laboratories	Woodside, N. Y.	268
WWVA	John C. Strobel, Jr.	Wheeling, W. Va.	389

Dominion of Canada

CFAC	Calgary Herald	Calgary, Alta.	434
CFCA	Toronto Star Pub. & Prtg. Co.	Toronto, Ont.	356
CFCF	Marconi Wireless Teleg. Co., (Ltd.) Ca. Mont., Que.		411
CFCH	Abitibi Power & Paper Co. (Ltd.)	Iroquois Falls, Ont.	500
CFCK	Radio Supply Co.	Edmonton, Alta.	517
CFCN	W. W. Grant (Ltd.)	Calgary, Alta.	434
CFCR	Laurentide Air Service	Sudbury, Ont.	410
CFQC	The Electric Shop (Ltd.)	Saskatoon, Sask.	329
CFRC	Queens University	Kingston, Ont.	268
CFXC	Westminster Trust Co.	Westminster, B. C.	291
CFYC	Commercial Radio (Ltd.)	Vancouver, B. C.	411
CHCS	The Hamilton Spectator	Hamilton, Ont.	341
CHIC	Northern Electric Co.	Toronto, Ont.	357
CHNC	Toronto Radio Research Society	Toronto, Ont.	357
CHUC	International Bible Ass'n.	Saskatoon, Sask.	329
CHXC	R. Booth, Jr.	Ottawa, Ont.	434
CHYC	Northern Electric Co.	Montreal, Que.	411
CJCA	Edmonton Journal	Edmonton, Alta.	517
CJGC	London Free Press	London, Ont.	329
CKAC	La Presse	Montreal, Que.	411
CKCD	Vancouver Daily Province	Vancouver, B. C.	411
CKCK	Leader Pub. Co.	Regina, Sask.	312
CKCL	Dominion Battery Co.	Toronto	360
CKCO	Ottawa Radio Association	Ottawa, Ont.	434
CKCX	Int'l Bible Students Ass'n.	Toronto	291
CKFC	First Congregational Church	Vancouver, B. C.	411
CKNC	Canadian National Carbon Co.	Toronto, Ont.	357
CKOC	Wentworth Radio Supply Co.	Hamilton, Ont.	341
CKY	Manitoba Tel. System	Winnipeg, Man.	384
CNRA	Canadian National Railways	Moncton, N. B.	322
CNRC	Canadian National Railways	Calgary, Alta.	435
CNRE	Canadian National Railways	Edmonton, Alta.	517
CNRM	Canadian National Railways	Montreal, Que.	411
CNRO	Canadian National Railways	Ottawa, Ont.	434
CNRQ	Canadian National Railways	Quebec, Que.	341
CNRR	Canadian National Railways	Regina, Sask.	312
CNRS	Canadian National Railways	Saskatoon, Sask.	329
CNRT	Canadian National Railways	Toronto, Ont.	357
CNRV	Canadian National Railways	Vancouver, B. C.	291
CNRW	Canadian National Railways	Winnipeg, Man.	405

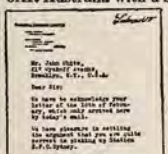


FREE
Circuit Diagram
The Circuit Diagram of the set with which Mr. White tuned in Australia—10,144 miles away on a Subantenna, will be sent FREE to anyone who mails coupon from this announcement

10,144 Mile Reception with a SUBANTENNA

Mr. JOHN WHITE of Brooklyn, N. Y.—who tuned in Australia with 6 tube set and a SUBANTENNA

10,144 miles—and the music came in loud and clear! Mr. J. O. White residing at 217 Wyckoff Ave., Brooklyn, New York, established the world's distance record for reception within the B.C.L. band of 200 to 550 meters by tuning in 2FC and 3AR Australia with a simple six tube tuned radio frequency set—*and a Subantenna*. Think of it! 10,144 miles, and reception that was not only audible—but loud, crystal clear, enjoyable music and song that Mr. White listened in on for some time before tuning it out and seeking other far away stations. The results obtained by Mr. White prove the distance getting capabilities of Subantenna beyond all doubt. For Mr. White writes that during his tests, neither 2FC nor 3AR could be heard on a two hundred foot up-in-the-air aerial, but the instant that he switched back to Subantenna, either station came in clearly.



Confirmation letter from 2FC, Sydney Australia

Confirmation letter from 3AR, Melbourne, Australia

Other users get greatly increased distance

Cuba—also South America

"To show you that I received a program from Station PWX in Havana, Cuba, I enclose herewith a verification card from that station. On January 28th I received a program on my set broadcasted from Buenos Aires, South America, at 10:15 in the evening. Many other long-distance stations have been heard on my set after installing the Subantenna. I never could receive such distance on my outside antenna."—W. C. F. Chicago

More Stations—No Static

"I get plenty of stations with my Subantenna, on the loud speaker, that I have never been able to reach with my outside aerial. It absolutely cuts down interference to the minimum, *cuts static out too—not just partly out—but ALL out.*"—H. S. M., North Carolina.

Results—Almost Unbelievable!

"After years of testing aerials I at last found the master in the Subantenna. The first night I used it was a very hot summer night. Static was very bad on my outdoor aerial. I connected my Subantenna and one could hardly believe the results. It was wonderful."—F. L. C., Massachusetts.

Says "Static Is No More"

"I have received the Subantenna. My [illegible] son installed it. STATIC IS NO MORE well satisfied. I can tune in stations I could coax out of the air even though I long aerial."—A. E. F., Kansas

GROUND WAVES are Practically STATIC-FREE—That's Why Subantenna Gives Greater Distance and Clarity

The same radio waves that you have always taken out of the air, also travel through the ground. The only difference between the air and ground components of the broadcast wave, is that the latter is practically static free, while the air component is always accompanied with static or noise of one kind or another. Scientists have long recognized this fact, and knew that if some device could be perfected for the reception of ground waves, clear, loud, long distance reception would be a reality for the owner of the modest three or four tube set as well as for the possessor of the larger, more powerful set. Subantenna is the answer—tried, tested and proved by thousands of owners of all kinds of sets, and recommended to you by such leading radio laboratories as Radio News, Popular Radio, Radio Digest, and others.

TRY IT ON YOUR SET FREE

Install Subantenna. Leave your old aerial up. Select a bad night when DX is almost impossible with the ordinary aerial. Make a comparison station for station, connecting first your aerial, then Subantenna. If, from stations that are just a mess of jumbled noise with the old aerial, you don't get reception that rivals local in sweetness and clarity the instant you switch to Subantenna, this test won't cost you even a single penny. Obtain a Subantenna from your dealer or send coupon at once for scientific explanation of Subantenna and for particulars of GUARANTEE and FREE TRIAL OFFER. [illegible]

CLOVERLEAF MANUFACTURING [illegible]
2713-K Canal Street - - CHICAGO, ILLIN

Please Mention Radio Age When Writi[illegible]

CLASSIFIED ADVERTISEMENTS

If you have anything to buy or sell, don't overlook RADIO AGE'S classified advertisements.

The classified advertising rates are but four cents per word for a single insertion. Liberal discounts are allowed on six and twelve-time insertions, making rate of 3 and 2 cents a word per insertion respectively. Unless placed through an accredited advertising agency, cash should accompany all orders. Name and address must be included at foregoing rates. Minimum contract charge $1.00.

All Classified ads for December issue must be sent in by Nov. 10.

AGENTS

RADIO AGENTS—Make Big Money—Easy! selling Marvelous New Sets and Accessories. Buy from factory at lowest prices. Get New Catalog with thousands of nationally advertised bargains. FREE Call Book. Write today. American Auto and Radio Co., Dept. 138, American Radio Bldg., Kansas City, Mo.

AIRPLANES

SEND FOR free illustrations and plans of our wonderful two-piece, companion type, small, high lift wing monoplane, and information on how to build this ship, and be sure it will fly; also propeller literature. Crawford Airplane Manufactory, 2225 American Avenue, Long Beach, California.

BOOKS AND MAGAZINES

What could be better than magazine subscriptions for gifts. Send them for our special list of subscription bargains. Midland Products, Dept. R. A., 524 Courtland Ave., Park Ridge, Illinois.

Twentieth Century Book of Receipts, Formulas and Processes, a 307 cloth bound book containing 10,000 proven formulas for the manufacturer, workshop, laboratory, office and home. Sent prepaid upon receipt of $4.00. Send dime for our 48 page catalog of latest and best practical, scientific mechanical and industrial books. Midland Products Co., Dept. RA, 524 Court and Ave., Park Ridge, Ill.

BOYS

Boys get a three foot model aeroplane free. No selling. Write for particulars. Aero Shop, 3050 Huribut Ave., Detroit, Michigan.

RADIO SET FREE. form magazine clubs among friends. Club list free. Spencerian Agencies, Los Angeles, Brentwood Heights, California.

BUSINESS OPPORTUNITIES

PECAN-Orange-Fig Groves "On the Gulf". Monthly payments. Guaranteed care. Big, quick returns. Suburban Orchards, Dept. R. Biloxi, Mississippi.

LAND FREE If planted to bananas. Bananas bear a full crop the second year. $5.00 monthly will plant five acres, which should pay $1,500 profit annually. Reliable Companies will cultivate and market your bananas for 1-3. Bananas ripen every day and you get your check every 90 days. For particulars address Jantha Plantation Co., Empire Building, Block 980, Pittsburgh, Pa.

FOR SALE—Patent on fountain mop and duster. I have party offered to take five hundred dozen per month. Lester Doak, McMinnville, Tennessee.

DETECTIVES

BE A DETECTIVE. Make secret inquiries; obtain evidence. Earn big money. Work home or traveling. Write, ____

ELECTRICAL

ELECTRIC FUN! Seventy stunts, 110 volts, $1. Cecutting, Campbell, Calif.

FORMULAS

20c—Any Formula, 20c. "Hawkins," 215R Lasanimas, Colorado Springs, Colorado.

MALE HELP WANTED

MEN, get Forest Ranger job; $125-$200 mo. and home furnished; permanent, hunt, fish, trap. For details, write Norton, 259 Temple Court, Denver, Colo.

MISCELLANEOUS

NEUTRODYNE AND HETERODYNE ARE GOOD AS FAR AS THEY GO. THE BEST ONE TUBE SET FOR PYORRHEA IS I-O-DINE (tooth-paste). SATISFACTION GUARANTEED. FIFTY CENT TUBES BY MAIL. IODINE PRODUCTS COMPANY, LAUREL, MISS.

GILLETTE STYLE Razor with 10 Blades 60c Prepaid. Loud Speaker $3.89. Speaker Unit $1.10 prepaid. Transformer 25c. Mele Station A. New Haven, Conn.

PANEL ENGRAVING

SINGLE PANEL and medium quantity engraving of highest quality. Also panel drilling, meter cutouts and machine engraving on small parts. Careful attention to single panels and special work. Write for price-list. A. L. Weedy, 19 S. Wells Street, Chicago.

PERSONAL

Spirit life proved through method lost during European Dark Ages. Free description. R. C. Hill, 602 W. Jefferson, Detroit, Mich.

RADIO

EXTRA HEAVY Antenna wire 7 No. 18 $1.50 100 feet. 17 No. 22 braided 3-8" wide $2.00 100 feet all prepaid. Geo. Schulz, Calumet, Michigan.

Radio set builders send for our new wholesale catalog. It's free. Kansas City Radio Company, Kansas City, Mo.

Radio Books—Construction of a modern Super Heterodyne Type Receiver Including Testing and Operation $1.00; Henley's 222 Radio Circuit Designs, 267 pages, $1.00; The ABC of Vacuum Tubes used in Radio Reception 132 pages, 75 cents; Henley's Workable Radio Receivers 196 pages $1.00; Experimental Wireless Stations 392 pages $2.00; Wireless Telegraphy and Telephony Simply Explained 154 pages $1.00. Sent prepaid on receipt of price. Send dime for our 48 page catalog of latest and best practical, scientific, mechanical and industrial books. Midland Products Co., Dept. RA, 524 Courtland Ave., Park Ridge, Illinois.

SILICON Transformer Steel cut to order .014". 10 lbs. 25 cents, 5 lbs. 30 cents, less than 5 lbs. 35 cents per lb., 4 cubic inches to the lb. postage extra. At least ½ cash with order—balance C. O. D. Geo. Schulz, Calumet, Michigan.

[illegible] ALUMINUM and lead rectifier elements, holes d, with brass screws and nuts per pair 1-16", 13c, 1x6, 15c, 1½x6, 17c, 1½x8, 19c, single half price. Sheet aluminum 1-16", $1.00, .90. Lead $1.00 square feet all prepaid. Geo. Calumet, Michigan.

For Sale: One improved "Aero" regenerative kit, for .00035 condensers. Price $5.00. Also the following straight line frequency condensers, two Bremer-Tully .00035 condensers, price $3.00 each, one DeJur .00035 condenser, price $2.00, one Amsco .0005 condenser, price $2.00, two Chelton midget condensers $1.00 each, one set of Browning-Drake coils, price $2.50, one All-American self tuned radio frequency transformer, price $2.00, one "Aero" antenna coupler, price $2.50. Earn Fry, P. O. Box 187, Earlham, Iowa.

For Sale at Half Price. 5 201A Amperites, 1 pr. Benjamin brackets, 2 Clarostats, 1 Frost 20 ohm rheostat 1. 5 Amsco Variable condensers, 1 .00035 mfd 4 .0005 mfd., 8 Dubilier 1. mfd bypass condensers, 1 Frost push pull switch, 1 Carter Imp 50 ohm rheostat, 1 Frost double circuit jack, 2 Jefferson Concertone Transformers, 2 Bruno coil forms. Some parts are slightly used, others are new. Z. Grobiewski, 9 N. Market St., Nanticoke, Pa.

LOG-CHART UR RADIO by the newest, simplest and easiest way. Absolutely no writing—A MERE DOT locates that station as received on ur radio in respect to Call Letters, wave length and dial reading. Stations from all parts of the world: Includes outline map of the United States. Priced 25c. Deaflie Radio Laboratory, 505 Madison Square Bldg., Chicago or 229 Whittemore Pontiac, Michigan.

UX226 and UY227 A. C. filament transformers $3.50. Low voltage transformers to your specifications $4.50. 50H 85MA chokes $2.50, 100H 125MA heavy duty chokes $5.75. See our new lists on meters condensers, eliminator parts, etc. Radio Parts Sales Co., Orange, N. J.

500-MILE RADIO. $2.95 postpaid. Needs no tubes, batteries, or electrical current. Over 300,000 homes have them. Picture and folder sent free. National Radio Sales Co., Fuller Bldg., Wichita, Kansas.

Radio repairing and building. Write for information. Radio, Box 92, Oakhill, West Virginia.

Large Core 3-1 Audio Transformers $1.50, Raytheon "BH" Kit $16.75, 50H—125 MA choke $5.75, 30H—60MA shielded choke $2.25, 30H—85 MA choke $2.50, 110V-350V Raytheon Transformer $3.50. Write for special lists chokes, Transformers, Meters, etc. Radio Parts Sales Co., Orange, N. J.

Genuine RCA UV 202 5 watters, brand new in original cartons. Can be used as transmitting tubes or power tube. Only $2.25 each prepaid. Mitchell Radio Co., 3520 Sheridan Road, Chicago, Ill.

METERS—CONDENSERS—"B" eliminator parts. Power transformers $2.00 up. High grade chokes $2.25 up. Write for lists of specials. We can quote prices on any material you require. Radio Parts Sales Co., Orange, N. J.

RUBBER STAMPS

RUBBER STAMPS and supplies. 20c per line. Cushion Mounted. Catalog for stamp. Newman & Son, Auburn, Nebraska.

RUBBER STAMPS! Name, Address, two lines 25c. Three Lines 35c. C. Brush Company, Auburn, Nebraska.

SALESMEN WANTED

75 MILES ON 1 GALLON—New Moisture Gas Saver. All Cars. 1 Free. CRITCHLOW, A2-91, Wheaton, Ill.

STAMPS

1000 different $1.00, 500 different 50c, 50 French colonials 14c. Koehler, 842 Meredith St., Dayton, Ohio.

100 foreign stamps and hinges free to approval applicants; postage four cents. Bafs, 1133 Riverview Ave., Dayton, Ohio.

TYPEWRITERS

TYPEWRITERS, all standard makes, $10 up. Fully Guaranteed. Free Trial. Write for COMPLETE illustrated lists. Northwestern Typewriter Exchange, 121 N. Francisco Ave., Chicago.

sified Ads Bring Results

BUILD A SHIP MODEL LOUD SPEAKER

$12.50

$12.50

A combination of a beautiful ship model and a loud speaker that is easily worth $100. You can build it yourself in a few spare hours with no other tool than a small tack hammer.

Size: 26 inches high; 12 inches wide; 27 inches long (overall). The La Pinta, a reproduction of one of the famous Fifteenth Century ships.

The famous Melody Ship which has met with instant approval everywhere it has been shown and played can now be purchased in knock down form at the startlingly low price of $12.50. This remarkable speaker combines

PERFECT TONE -- PLENTY OF VOLUME -- NO DISTORTION

No doubt you have often admired ship models and yearned to possess one but could not do so because the price was too high. Now it is possible to own a beautiful ship model and loudspeaker combined at a small cost. Let the WORLD'S LARGEST BUILDERS OF SHIP MODELS AND SHIP MODEL LOUD SPEAKERS supply you with all the necessary parts, cut to fit and ready to assemble from which you can build a beautiful model of the historic Mayflower, the Santa Maria or the La Pinta in a few hours. To all outward appearances the completed model is a beautiful ship model but upon closer observation a loudspeaker can be seen cleverly incorporated into the mainsail.

The loud speaker unit is of the Electro Magnet type. Power amplification is not needed to force the low tones through. They come through with perfect ease and do not interfere with the high notes, giving faithful reproduction at all frequencies. The mainmast, upon which the unit is securely fastened is seated two inches deep in a three and a half pound solid wood hull, making it impossible for counter vibrations to affect the perfect reproduction of the Melody Sail. The driving pin is attached to our super-vibrating, especially prepared, Melody Sail. The installation of the Melody Sail does not change the appearance of the model in any way. Melody ships come in three beautiful models, the Mayflower, the Santa Maria and the La Pinta, with parts cut to fit and ready to assemble. No tool needed but a small hammer.

You need not know anything about ship building or carpenter work in order to build one of these ships. No special knowledge of ship model building is necessary either. We will supply all the parts from the hull down to the smallest piece of rigging, all cut to fit and ready to assemble. You cannot go wrong. Diagrams and plans of parts that are included with each kit tell exactly what to do with each part.

These plans show you step by step just how the model is constructed. Everything is made so simple that even a small child can build a beautiful model.

All you need is a small hammer to tap the parts into place. Here is a part of the instructions copied word for word from the diagram and instruction sheet that goes with the kits. "Take part No. 57 place it in front end of part No. 56 and tap lightly with a hammer. Next take part No. 58 and place it up against No. 57 and tap it with a hammer to bring it into place."

Easy! Nothing simpler. The instructions are like that from beginning to end. Do this and that and before you realize it a beautiful ship model has grown before your eyes.

Write for our free beautifully illustrated catalog which contains photographs of all our models together with complete details and price of each. We will send this catalog without obligation to you. Fill in the coupon below and we will act upon it immediately.

If, after assembling the model you do not think it worth many times the purchase price, return it to us in good condition and we will gladly refund your money.

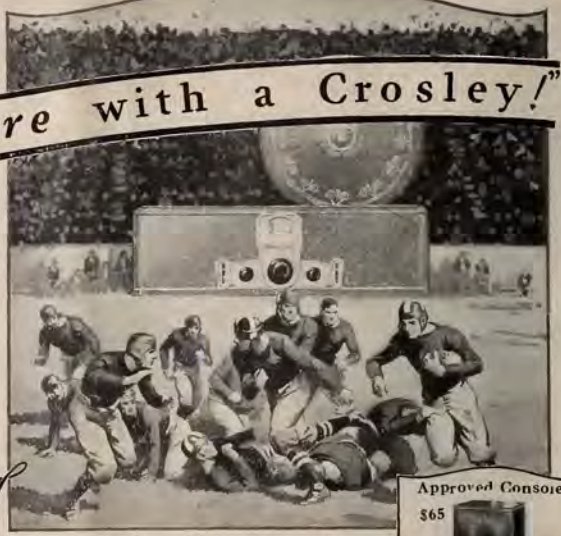
MINIATURE SHIP MODELS, Inc.
3818-20-22-24 Baring St., Philadelphia, Pa.
Canadian Branch: 1485 Bleury St., Montreal, Canada
Canadian Prices Slightly Higher. Send all Canadian Orders to Canadian Office.

MINIATURE SHIP MODELS, Inc., DEPT. Z2
3818-20-22-24 Baring St., Phila., Pa.
Please send me complete parts, cut to fit and ready to assemble
for the Melody Ship.....for which
I agree to pay postman $12.50, plus postage.
PLEASE PRINT NAME AND ADDRESS PLAINLY
Name .....
Street or R. F. D. .....
City .....
State .....

When the ball goes 'round the end for 40 yds.

"—You're *there* with a Crosley!"

The Crosley Radio Corporation: Can you explain "balancing," so folks can understand it? We technical people know that Hazeltine's neutrodyne principle is a wonderful thing. If you can make it understandable to laymen you're good. Yours truly, Lorish & Richardson, Young, Chicago, Ill.



Nature always puts obstacles in our way. When men begin to study a new invention or discovery they find that there are many problems to solve before a successful device can be built. This was the case with the steam engine, the printing press, the automobile, the aeroplane, and every other major invention that you can think of.

The vacuum tube is, perhaps, one of the most remarkable inventions ever made. We found that we could use it to amplify the radio signals. But when we tried to tune these amplifiers, so that they would help us select the desired signal, we found that the vacuum had a tendency to misbehave.

Signal Voltages Going into Amplifying Tube

When a tube is used to amplify, the output voltage is much stronger than the input voltage. This is the natural result of the amplification. But there is a path back through the tube through which some of the strong output voltage can get back to the input side of the tube. This voltage is then again amplified and again returns, getting stronger each time, the result being that the tube goes wild. It becomes a miniature broadcasting station on its own hook.

Signal Voltages Leaving Tube Greatly Amplified but Some Run Around to Entrance and Crowd in with the Little Incoming Signals

If we can provide a second path from the output circuit to the input circuit, so arranged that the voltage which comes back through this second path is opposed to the voltage that comes back through the tube itself we can prevent the trouble. This is called "balancing" because the second path is adjusted so that it exactly balances the path through the tube.

Amplified Signals Returning to Tube Mixing It Up with Incoming Signals

Hazeltine Divides Bolshevik Voltages Balancing Each Other by Opposing Each Other They Cause No Rumpus in the Tube and Program Signals Go Thru Amplifier Without Interference

The Hazeltine method of balancing (or neutralizing) this path through the tube has several unique advantages over all the other methods that have been proposed. This is why Crosley Radios use the Hazeltine "neutrodyne" method.

THIS new Crosley Bandbox

6 TUBE RECEIVER *de luxe*

is the national radio hit at $55.

The "All American" radio of 1928! With license to participate in the enormous radio resources of The Radio Corporation of America, The General Electric Co., The Westinghouse Co., The American Telephone and Telegraph Co., and The Hazeltine and The Latour Corporations, the Crosley Bandbox of 1928 is an "eleven" of super-efficient features and amazing co-ordinated performance. In it are incorporated:

1—The best idea of balancing.
2—The best ideas of shielding.
3—The best ideas of sharp tuning.
4—The best idea of controlling volume.
5—The best idea of station selection.
6—The best idea of finish and color.
7—The best idea of power tube use.
8—The best idea of console installation.
9—The best idea of power supply connections by enclosing all leads in a cable.
10—The best idea of AC tube operation.
11—The best idea of converting AC current to necessary radio DC.

Operation of the Bandbox receiver from house current is possible with the AC model at $65, which uses the new amazing R. C. A. AC tubes. Power converter costs $60 more.

These new Bandbox receivers are now on display at over 16,000 Authorized Crosley dealers. Their faultless reception of the many wonderful events constantly on the air is proving such a startling demonstration that a national enthusiasm sweeps the country in the natural exclamation—"You're *there* with a Crosley!" If you cannot locate the nearest dealer, write Dept. 63 for his name and literature.

Approved Consoles

$65 $85 $35

Selected by Powel Crosley, Jr. as ideal, acoustically and mechanically for the installation of the Crosley "Bandbox." Genuine Musicone built in. Crosley dealers secure them from their jobbers through

H. T. ROBERTS CO.
1340 S. Michigan Ave.,
Chicago, Ill.

Sales Agents for Approved Console Factories

Showers Brothers Company
Bloomington, Ind.

The Wolf Mfg. Industries
Kokomo, Ind.

IMPROVED MUSICONES

Musicones improve the reception of any radio set. They are perfect affinities in sounds and reproductive effectiveness for Crosley Radios. A full-table model with brown mahogany finish, stands 50 inches high, $27.50 —16-inch Super-Musicone as pictured above with "Bandbox", $18.75 —12-inch Ultra Musicone, $9.75.

CROSLEY RADIO

THE CROSLEY RADIO CORPORATION
Powel Crosley, Jr., Pres. Cincinnati, Ohio
Montana, Wyoming, Colorado, New Mexico and West prices slightly high.

Crosley is licensed only for Radio Amateur, Experimental and Broadcast Reception

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