

Current Science

RADIO AGE

Everyday Mechanics

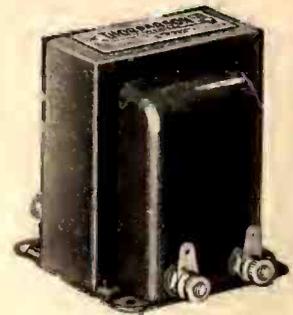
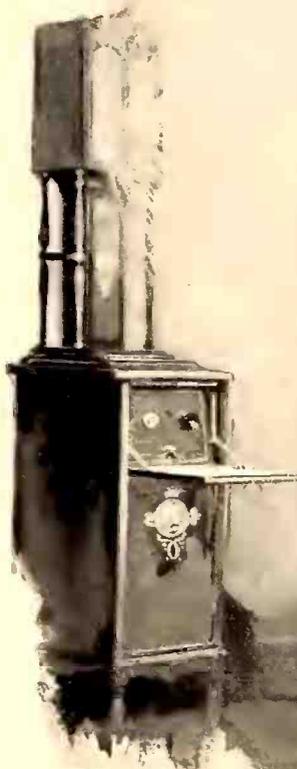


**How Trains Are
Controlled By
Radio**

(Page 23)

**March
1927**

25¢



Thordarson Amplifying
Transformer R-200

"The soul of music slumbers in the shell
Till waked and kindled by the master's spell."
(Samuel Rogers — "Human Life").



WITHIN your set slumbers a world of music which you can charm to a living fullness and richness of tone by installing Thordarson Amplification.

The manufacturers of leading quality receivers have recognized in Thordarson Amplifying Transformers a fidelity of musical reproduction which removes the ordinary artificial tones of radio and replaces them with living harmonies.

Whether you are buying a complete receiver, or whether you are building your own—if you enjoy music—be sure that your transformers are Thordarsons.

THORDARSON

RADIO TRANSFORMERS

Supreme in Musical Performance!

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



Standard
on the
Finest

(3550)

FREE!



"MEN! Here's the 'dope' you've been looking for"

HOW TO GET INTO THE RADIO BUSINESS

Many Earn **\$50 to \$250 a Week** in Work That is Almost Romance

If you're earning a penny less than \$50 a week, clip coupon now for FREE BOOK! New book, profusely illustrated, tells all about the Radio Profession, thousands of opportunities—in work that is almost romance! You can learn quickly and easily at home, through our tested, improved methods, to take advantage of these great opportunities! Why go along at \$25 or \$35 or \$45 a week, when you can pleasantly and in a short time learn to be a Radio Expert, capable of holding the big pay jobs—many men in Radio now earn \$50 to \$250 a week

Clip Coupon for Free Book

Don't envy the other fellow who's pulling down the big cash. Our proven home-study training methods make it possible for you, too, to get ready for a better job, to earn enough money so you can enjoy the good things of life. Most amazing book ever written on Radio tells how—thousands of interesting facts about this great field, and how we can prepare you, quickly and easily in your spare time at home, to step into a big-pay Radio job. You can do what thousands of others have done through our training. GET THIS NEW FREE BOOK. SEND COUPON TODAY.

J. E. SMITH, President

NATIONAL RADIO INSTITUTE

WASHINGTON, D. C.
Dept. C-91



These Instruments FREE of Extra Cost

All instruments shown here and others—SIX BIG OUTFITS—sent to all our students free of extra cost.

Clip coupon now—find out all about this big unequalled offer while you still have time to take advantage of it. Our training is intensely practical—these instruments help you learn to do the practical work. Receiving sets, from simplest kind to thousand-mile receiver. Many other big features.



J. E. SMITH
President

My Radio Training Is the Famous "Course that Pays for Itself"

Spare time earnings are easy in Radio when you know it the way we teach you. Increase your income almost from the start of your course through practical knowledge we give you. We show you how to hold the job, then our big Free Employment Department helps you get one. Free Book, "Rich Rewards in Radio" tells how.

Howard B. Luce of Friedens, Pa., made \$320 in 7 weeks during his spare time. D. H. Suitt of Newport, Ark., writes, "While taking the course I earned in spare time work, approximately \$900." Earl Wright of Omaha, reports making \$400 in a short time while taking his course—working at Radio in his spare time only. Sylvester Senso, 207 Elm Street, Kaukauna, Wis., made \$500.

And when your training is completed you're ready to step into a real big Radio job like C. C. Gielow, Chief Operator of the Great Lakes Radio Telegraph Company; E. W. Novy, Chief Operator of Station WRNY; Edward Stanko, Chief Operator of Station WGR; and hundreds of other N. R. I. Trained men. The National Radio Institute, originators of Radio Home-Study Training, established 1914, today offers you the same opportunity these men had, under a contract that pledges you full satisfaction or money refunded on completing our training. It's your big chance to get into Radio—mail coupon for FREE Book and proof.



NOW!
Special
Short Time
Offer
6
BIG
OUTFITS

National
Radio
Institute,
Dept. C-91
Washington,
D. C.

Dear Mr. Smith
Without obligating me in any way, send me your FREE BOOK, "Rich Rewards in Radio," and all information about your practical, home-study, Radio Course.

Name.....Age.....

Address.....

Town.....

SEND THIS COUPON TODAY

Current Science

RADIO AGE

Everyday Mechanics

Established March, 1922

Volume 6

March, 1927

Number 3

CONTENTS FOR MARCH ISSUE

Cover design by A. P. Mehlum

Editorials	4
A Loop and Four Tubes.....	5
By Armstrong Perry	
Building the Hammarlund-Roberts.....	7
By Leslie G. Biles	
The Froth Estate.....	10
By Joseph Balsamo	
Static and Statistics.....	16
By Dorothy B. Stafford	
Current Science.....	19
March Evening Skies.....	21
Everyday Mechanics	23
Ideal Model Worlds Record Super.....	25
By F. A. Hill	
Pickups and Hookups by Our Readers.....	33
Ridding Supers of Repeat Points.....	44
Corrected Broadcast List.....	46-48-50-52-54
Log-a-wave Chart.....	56
Classified Advertisements.....	Third Cover

Radio Age is published monthly by RADIO AGE Inc.

Member: Audit Bureau of Circulations.

Publication Office, Mount Morris, Ill.

404 North Wesley Ave.,

Address all communications to RADIO AGE, Inc.

Executive, Editorial and Advertising Offices

500 N. Dearborn Street, Chicago, Ill.

FREDERICK A. SMITH, *Editor*

F. A. HILL, *Associate Editor*

M. B. SMITH, *Business Manager*

Advertising Manager

HARRY A. ACKERBURG

500 N. Dearborn St., Chicago, Ill.

Eastern Representative

HEVEY & DURKEE, 15 West 44th St., New York, N. Y.

Pacific Coast Representative

CONGER & MOODY, Sharon Bldg., San Francisco, Calif.

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

Final Advertising forms close on the 20th of the 2nd month preceding date of issue

Vol. 6, No. 3. Issued monthly. Subscription price \$2.50 a year. March, 1927. Entered as second-class matter at post office at Mount Morris, Illinois, under the Act of March 3, 1879.

Copyright, 1927, by RADIO AGE, Inc.

Chats With the Editor

CLIMAXING their work on super-heterodynes our staff is presenting in this issue's blueprint section the Ideal Model of the Worlds Record super which has been built for operation in connection with power supply and filament battery elimination. Quality has been stressed, at the same time preserving the distance getting features of this receiver. For those who have followed this series the present article should be of more than ordinary interest.

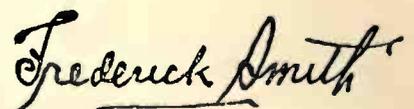
Scientific articles and notes on everyday mechanics are attracting the attention of our readers and quite a few letters of commendation have been received by the editors. We are always glad to know the desires of our readers and to fill these requirements to the best of our ability.

Armstrong Perry has been taking the novice by the hand, helping him along the rocky road of radio to a point where a four-tube set used with a loop is described. What Mr. Perry has in mind for his next article we cannot imagine, but we know it will be good and our newly-made radio fans will devour it with interest and approbation.

What is known as the pioneer broadcasting station in the world is being described by Dorothy Brister Stafford who has been a regular contributor to this magazine. Her sprightly comments on broadcast stations have been relished as much by our readers as by our editors.

Those who have been engaged in building the well-known Hammarlund-Roberts receiver will find the second installment of the article by Mr. Biles quite complete in details. The various diagrams were printed in the first article which appeared in the February issue.

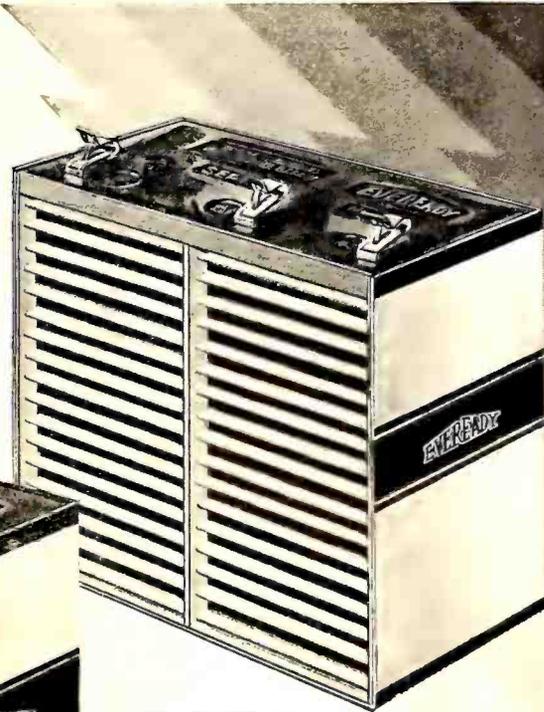
Quite often we receive a letter from a fan who is not able to purchase a high-priced eliminator and who wishes to make as much of the required material personally instead of buying it readymade. In our next issue William H. Fine tells how to make a simple and inexpensive B eliminator, which will deliver sufficient voltage and current for almost any ordinary receiver, providing it is constructed in accordance with the instructions given.



Editor of RADIO AGE.

NEW!

*Eveready Layerbilt
"B" Battery No.
486, the Heavy-
Duty battery that
should be specified
for all loud-speaker
sets.*



*The Layerbilt pat-
ented construction
revealed. Each layer
is an electrical cell,
making automatic
contact with its
neighbors, and fill-
ing all available
space inside the bat-
tery case.*

DIFFERENT!

For greatest economy all loud speaker sets require the new Eveready Layerbilt "B" Batteries

IT WILL pay you, in convenience and reliability as well as in dollars and cents saved, to use this remarkable battery.

The reason for the Eveready Layerbilt's surprising performance lies in its exclusive, patented construction. No other battery is like it. It is built in flat layers of current-producing elements, making practically a solid block. The layers make connection with each other automatically, and occupy all available space inside the battery case. Layer-building packs more active materials in a given area, and makes those materials produce more electricity.

Every loud-speaker set should use Heavy-Duty batteries, for they alone offer economy on modern receivers. When you buy new "B" batteries, be sure to get the Heavy-Duty size, and remember that the Eveready Layerbilt has proved to be the longest lasting, most economical of all Heavy-Duty batteries.

Our laboratories are continually testing batteries, and in all our tests we have yet to find a battery that is equal to the new improved and radically different Eveready Layerbilt "B" Battery No. 486. The development and perfecting of this remarkable

battery is an outstanding battery-building achievement. It is the result of many years' experience plus the facilities and resources of the pioneer manufacturers of all dry cell batteries.

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

Tuesday night is Eveready Hour Night
—9 P. M., Eastern Standard Time, through
the following stations:

- | | |
|------------------|-------------------|
| WEAF—New York | WTAM—Cleveland |
| WJAR—Providence | WWJ—Detroit |
| WEEI—Boston | WGN—Chicago |
| WTAG—Worcester | WOC—Davenport |
| WFL—Philadelphia | WCCO—{Minneapolis |
| WGR—Buffalo | {St. Paul |
| WCAE—Pittsburgh | KSD—St. Louis |
| WSAI—Cincinnati | WRC—Washington |
| | WGX—Schenectady |

RADIO EDITORIALS

IT IS with a good deal of pleasure that RADIO AGE adds several pages of fiction to the radio, current science and everyday mechanics which make this month's portion for our readers. We are sure that those who start reading this first installment of "The Froth Estate" will not miss any of the succeeding chapters. In arranging for the publication of this novel the editors have selected a story that deals with the drama that exists within the inner offices of great newspapers. It is not so much a narrative of the adventures of the star reporter and the sob-sister—those topics have been receiving liberal attention for years—but it is a stirring story about newspaper publishers, department managers and editors.

How is it that we know so little about the daily lives of the men and women behind our great journals? They deliver the gossip of the world at our doors each day but nobody has turned the tables and written humanly, understandingly and sympathetically about the big folks of "The Fourth Estate," which Col. Minimil so quaintly mispronounces.

What happens when a new daily attempts to place its newspapers on the corner stands in a great city? The next installment of "The Froth Estate" will tell about a tremendous circulation war. The army of Bill Rosson, publisher of a "confession and diary daily," is going to shoot it out with the invaders under young Daly Minimil, who believes that freedom of the press should include the privilege of circulating the newspapers which the press runs off.

Mr. Joseph Balsamo, author of the story, is sketching no portraits of publishers or editors in his story. In order to avoid any suspicion of such bad taste he has created his own characters and his own community and started them off on the way of adventure. Mr. Balsamo knows his vegetables and in opening the doors of the editorial sanctum to give his readers a peep at hidden mysteries we feel confident he will reveal incidents and events that will mingle romance and humor with sufficient brush-strokes of melodrama to compel enthusiastic interest to the very end of the tale.

What reason for including a newspaper novel in a radio magazine, it may be asked. Well, the Fortunatus Gazette is building a powerful broadcasting station. That's one reason. Another is that a good story needs no excuse for itself anywhere and gets a welcome everywhere.

* * * * *

IN ANNOUNCING that it would welcome censorship of newspapers to eliminate the smut that fills a good many daily newspapers these days the New York Daily News says editorially:

"We hate bureaucracy. We hate the suppression of free speech. But unless the minds of the children of New York are to be drenched in obscenity, it seems to us that a censorship of the press as well as of the theater, must come."

The same peril menaces many other American com-

munities outside of New York. It is a national, not a localized, condition.

The serial story "The Froth Estate" is going to explain why editors print smut. The story is to have a back ground of humor and drama and we are confident it will entertain while it is carrying a big message to readers who perhaps will welcome the facts in this form, written by a man who knows the business of news-gathering and news printing.

* * * * *

AS THE March issue of this magazine goes to press definite action is reported from Washington as to legislation controlling broadcasting stations. Sometimes we think the radio industry, in giving its attention to this most important matter of regulating the number of stations, their wave-lengths and their intervals of silence, the industry is overlooking a matter that is just as vital as the Washington situation. Those manufacturers and merchandisers of radio equipment who devoutly wish for a further stabilization of the business and a greater prosperity for it, for twelve months in the year instead of six months, may do well to remember that the best way to sell radio merchandise is to create an increasing demand for it. The best way to create that demand and maintain it is to make the broadcast programs so good that no family will want to miss what their neighbors are enthusiastically talking about. The best way to sell a radio set to a person who has been holding off is to convince him that in not owning a receiver he is absolutely robbing himself of delightful entertainment by our Josef Hoffmans, Schumann-Heincks, John McCormacks and our Kubeliks. He should be convinced because he is depriving himself of just those delights.

It would not be a bad idea to make an improvement in the range and volume of summer entertainment. If there is a continuous line of excellent music on the air throughout the summer the radio business will begin to lose its seasonal aspect. At least it will not suffer from malnutrition for four months out of twelve. In the theater the play's the thing. In radio the program's the thing. And that means the broadcast program, not the Washington legislative program.

* * * * *

NO CIRCUIT ever published in RADIO AGE has received the enthusiastic approval of its readers that has marked the World's Record Super-Eight. Hundreds of back numbers, principally the November, 1926, and the January, 1927, issues, have been delivered through the mail to those who missed those numbers and the demand still is insistent. It will please the RADIO AGE followers to learn that development of this circuit will appear in future issues so that several variations of the general scheme of the hook-up may be studied. For those who are willing to invest in the higher-priced equipment the circuit published in this issue will no doubt prove immensely interesting. These various circuits are wired and tested in our own laboratory before publication.

Current Science
RADIO AGE
 Everyday Mechanics

M. B. Smith
 Business Manager

A Monthly Publication
 Devoted to Practical
 Radio

Frederick A. Smith
 Editor

A Loop and Four Tubes

By

ARMSTRONG PERRY

THERE is a time in life when erecting an aerial is a joyous adventure, but that is before the waist line catches up with the chest measurement. As the years slip away, such stunts as climbing trees and balancing on ridgepoles cause thrills of another frequency. By that time the cost of extra tubes and fixin's is not so large a proportion of the monthly income, so the indoor loop, with amplification enough to make it effective, begins to make a strong appeal to the set builder.

A loop three feet in diameter, more or less, picks up a small amount of energy as compared with a straight aerial fifty to one hundred feet long, even when they are operated at the same height from the ground. The energy picked up decreases as the square of the distance of the aerial above the earth, so the loop loses plenty by the time it is down to the ground floor. According to the formula, it ought to pick up less than nothing in a basement, but Dr. Rogers, a famous inventor, was able to secure good results from underground loops. He found static much less troublesome when his aerial was below the surface of the earth. Some scientists account for this by saying that two groups of waves are radiated from a transmitter, one group through the earth and the other through the ether above the ground. Anyhow, a loop

will bring in audible signals anywhere if the receiver has enough stages of amplification.

There is not much use of trying to use a small loop with less than four tubes, three of which are radio-frequency amplifiers, nor is it safe to count on bring-



A good example of the small loop aerial. This is one of many installed by the Huth-Funken Telephone Company of Berlin in the offices of customers who wanted to receive the stock market reports by radio

ing in Honolulu at Metuchen, New Jersey, even with twice that number of tubes. High-power transoceanic code stations can be brought in with a good-sized spool of wire for an aerial, but speech and music do not carry as far as dots and dashes. With a good loop and four tubes, a hundred miles is a good average, though a thousand miles may be

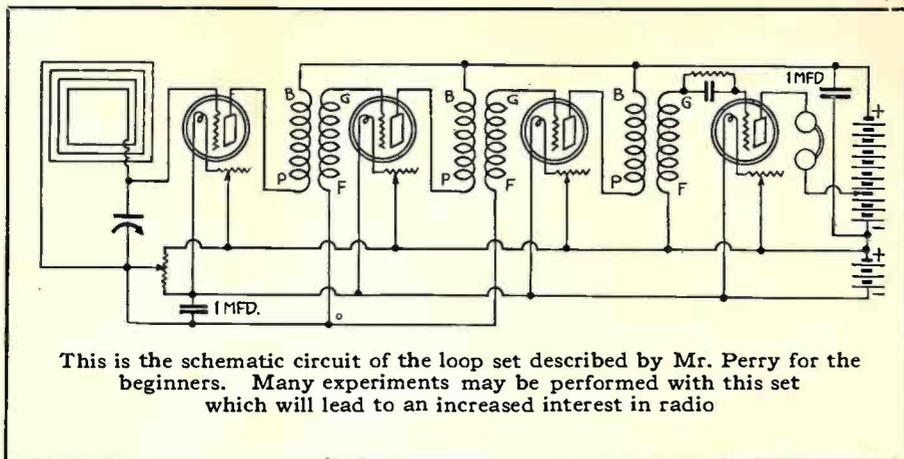
covered often enough to make ether-fishing an interesting sport.

Easy to Build

CONSTRUCTION of the loop can be made easy or difficult. There are two main differences between the loop and the straight aerial: the shape, and the fact that both ends of the loop are attached to the receiver instead of one end as in the case of the straight aerial.

A simple loop can be made by running a wire around the room on the picture molding. Such a wire may be used either as a loop, with one end attached to the antenna post of the receiver and the other to the post marked "Ground," or as a straight aerial with one end attached to the antenna post and the other end free.

Another method is to construct the loop on a closet door. The large outside turn may be fastened first, or the builder may work from the inside out. In either case, the ends should be made fast to binding posts located where they will not be knocked loose by the heads, arms, knees or feet of those who hang wearing apparel in the closet or store in it the makin's of a wet day. The damage to the anatomy will be repaired quickly by Nature, of course, but she will not do a thing for screw holes that have been splintered. They look awful, even when puttied up or filled with plastic wood. From



the loop the wires may lead to the set by any convenient route, but the shorter it is the better. Long wires are likely to pick up interference from light wires and other sources.

Portable loops can be made on any available frame, such as an antique reel used by ladies of a past generation for making skeins of the yarn as it came from the spinning wheel. The frame and the loop may be square, octagonal, oval or of any desired shape. The wires should be evenly spaced and firmly held in place. The spacing makes a difference, but it requires higher mathematics to express it adequately. Anyone who desires to go into the matter exhaustively can secure a pamphlet from the Superintendent of Documents, Government Printing Office, Washington, D. C. The reader will be exhausted before the subject is. A practical loop for this set is one three feet square, with ten turns of insulated wire spaced one-half inch between turns. Insulated wire should be used always in making loop aeriels. Taps may be taken off at any point if variability is desired.

The loop has other advantages besides its small size and its convenience. It has directional effects. The electro-magnetic field that forms a part of the advancing radio wave has a greater effect upon an aerial wire that is at right angles to its plane than it has upon one whose plane is parallel to that of the field. There are radio waves coming toward a receiver from all directions, and as the loop is turned on its axis one station fades out and another comes in. If wife is wise, she

can tune out the prize fight and bring in the Sunday School lesson merely by adjusting the door on which the loop is constructed when she goes to the closet to get hubby's slippers.

Taking a diagram from a radio catalogue—and that is a safe place to take it from if the dealer has been in business for five years or more without being murdered—we find that one end of the loop connects directly with the grid of the first radio-frequency amplifier tube. The other end leads to the middle point of a potentiometer, where there is a slider or some other variable connection. Across the two terminals of the loop is shunted a variable condenser of .0005 microfarads capacity.

One end of the potentiometer is connected to all four of the filament rheostats, the secondary coil of the third amplifying transformer, the negative terminal of the "B" battery, and the positive terminal of the "A" battery. This potentiometer is a necessary part of most radio-frequency amplifier circuits. It steadies the action of the tubes and helps to prevent howling. The other end of it connects with the filament terminals that are not connected with the filament rheostats.

The plate of the first tube connects with the primary coil of the first radio-frequency transformer. The other end of the primary connects with the primaries of the two other amplifying transformers and the connecting wire goes on to the positive terminal of the "B" battery.

The secondary of the first transformer, and also the secondary of the second transfor-

mer, are connected to the slider, or other variable contact, in the middle of the potentiometer, and also to that end of the loop which does not lead to the grid of the first tube.

The secondary of the third transformer goes to a combination grid leak and condenser, which is installed between the secondary and the grid of the detector tube. The grid leak should be variable, providing from one-half to six or more megohms of resistance. The condenser is of .00025 microfarads capacity. The other end of the secondary connects with that wire from the potentiometer which, as stated above, connects with all of the filament rheostats. It is possible, of course, to use one rheostat for all the filaments, but it is desirable to have at least two: one for the amplifier tubes and the other for the detector tube.

This completes the hook-up except for the phones, which are connected with the plate of the detector tube and with one of the positive terminals of the "B" battery. This battery should deliver 45 volts, but the phone connection should be shifted from one positive terminal to another until the results of the different available voltages are determined.

Aerial or Loop

THIS receiver should work as well with a straight antenna as with a loop, although the directional effect of the loop will be lost by the change. Radio-frequency receivers are likely to be sensitive, and a short antenna may give better results than a long one. Anything from twenty-five feet up, or down, may be tried and experiments will lead to some interesting comparisons. A ground wire is connected to one of the terminals left vacant by the removal of the loop.

It is well to remember, when building a radio-frequency receiver, that it is very sensitive to interference of all kinds. Energy may be transferred from one coil to another although it was farthest from the thoughts of the builder to permit any such interaction. The transformer

(Continued on page 36)

Building *the* Hammarlund-Roberts

(Part Two)

By LESLIE G. BILES

IT WILL be well for the builder to observe closely the system employed in assembling and wiring. Usually it is the custom to assemble the entire receiver and then do all the wiring. Here the assembly is done jointly with the wiring. This tends toward ease of building because the hand is not hindered by the obstruction of parts not yet in place. The section method of building up the shield makes it possible to wire easily the parts which will later be completely enclosed by the shield.

The first step in the construction of the receiver is to attach the front panel to the baseboard and mount the panel instruments as shown in the picture diagram.

Now mount tuning condenser No. 1 with its small shield. The single hole mounting nuts on this and the other tuning condensers are not used and may be discarded.

After removing the mounting nuts and the short shafts from the remaining two condensers, mount one of them, first placing shield section No. 1A between the condenser and the panel.

Loosen the screws in the friction brakes of all condensers. Now slide the two aluminum strips of the foundation unit in place, taking care to place them in their correct positions. Then slide shield section 1E on top of these strips and under the lip of the panel shield section so that the holes in the lip of the panel shield, the bottom shield and the strips line up.

Socket No. 2 should then be screwed in place and socket No. 1 is fastened to the baseboard in line with socket No. 2.

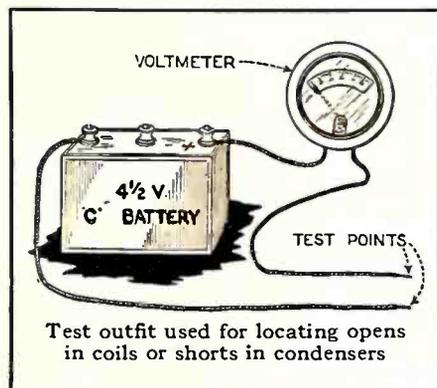
Now loosen the two set screws in the rotor of the first tuning condenser, slide the shaft back so that $\frac{3}{8}$ " projects beyond the rear bearing and then retighten

the rotor set screws. Mount one of the Auto-Couple coil cams on the projecting shaft so that the set screw in the cam is exactly on top (looking down on the set) when the plates of the condensers are all the way in.

Before mounting the coils on their condensers remove the long adjusting screws in the square brass posts at the primary end of the coils because they will be extremely difficult to remove when the assembly is completed.

After removing these screws mount the coils on the two condensers as shown, using the brackets and screws packed with the coils.

The cams on tuning condensers



No. 2 and No. 3 are not yet to be mounted but the same mounting instructions given above will later apply to these two condensers.

The assembly is now ready for the first part of the wiring.

Use the special wire solder in the foundation unit and a light iron which should first be cleaned and properly tinned.

Be extremely sparing with the amount of flux used and use just enough solder to run in the joint and make a firm connection. Large gobs of solder are entirely unnecessary and only serve to make an otherwise good job look unworkmanlike. If the iron is

hot enough to cause the solder to flow freely, no trouble should be experienced in making neat and permanent joints.

In wiring all leads should be run by the most direct route and no attempt should be made to secure square bends or other old fashioned ideas in wiring. Care should be taken to see that none of the wires interfere with the full motion of the condenser rotor plates moving primary coils and their cams and flexible connectors.

Now make the connections between the first coil, antenna switch, condenser and first R-F socket as shown in Fig. 4 and also in the picture diagram.

Now erect shield section No. 1-B screwing the lip of the shield to the shield strip, and fasten the corner of the two shield sections by means of one of the shield corner clamps.

Secure a soldering lug to the hole in the center of the shield, the head of the screw and the lug being on the outside.

Run a wire from this lug to upper end of soldering lug terminal R of condenser No. 1.

Now make the connections to the second R F stage. As each wire is put in place, check the connection with the picture diagram.

Connect terminal E of coil No. 2 through the remaining hole in the shield to the unattached terminal of Equalizer No. 1.

It might be mentioned here that for convenience in wiring some wires will be cut to designated lengths and only attached at one end. When the other end of the wire is later attached the wire should be cut to the exact length required.

Solder a 6" length of wire to one end of the resistance strip in the foundation unit. Solder the other end of the resistance strip

to a soldering lug secured in place by the binding nut on terminal plus of socket No. 2.

Attach a 7" wire to terminal B of coil No. 2.

Attach an 8" wire to terminal P of socket No. 2.

Attach a 7" piece of wire to the unattached terminal of Equalizer No. 2.

Shield section 1D may now be erected, fastening it in the same manner as section 1B was fastened.

Pass the free end of the resistance strip wire through the shield hole and then attach it to terminal A of the rheostat (the terminal next to the shield).

Thread the free end of the wire attached to terminal B socket No. 2 through the remaining hole in the shield. The free end will be connected later.

Secure a soldering lug in the center hole of shield section 1D.

Attach the grid leak clips to the .00025 mfd. fixed condenser using the screws furnished with the condenser. To one of the terminals on the under part of the condenser, attach the grid condenser connecting strip. The hole in the other end of the strip slips over terminal G of socket No. 3.

Condenser No. 3 should now be mounted. Place shield sections 1C and 2A together so that the condenser mounting holes in the sections coincide. Then mount the condenser against section No. 2A using two $\frac{1}{4} \times 6/32$ round head screws which pass through both shield sections and hold these sections together. Erect this assembly, first placing shield section No. 2E under the lip of shield section No. 2A, taking care that the two socket holes in this section coincide with the socket fastening holes in the shield strip. Fasten the lips of the two shield sections to the shield strip and secure the corners with corner pieces.

Thread the free end of wire from terminal P socket No. 2 through shield section 1C and 2A as shown in the diagram.

Thread the free end of wire from Equalizer No. 2 through the same shield section as shown in the diagram.

Fasten socket No. 3 in place,

and run a wire from the lower end of soldering lug R terminal of condenser 3 to terminal minus of socket No. 3.

Mount coil No. 3 to condenser No. 3.

Terminal F of coil No. 3 to terminal minus of socket No. 3.

The free end of wire from Equalizer No. 2 to terminal E of coil No. 3.

The free end of wire from terminal P of socket No. 2 to terminal P of coil No. 3.

The upper end of soldering lug terminal S of condenser No. 3 to terminal G of coil No. 3.

Terminal G of coil No. 3 to the free end of the grid condenser.

Attach a 7" wire to terminal plus of socket No. 3.

Attach a 4" wire to terminal P of socket No. 3.

Part One of this article by Mr. Biles appeared in the February issue of RADIO AGE. In building the set the present article refers back to the diagrams and figures shown in the preceding number.

Those who are accustomed to building receivers will be able to build from the February issue. For those who cannot work from a schematic, this article gives the detailed procedure for building the set.

—Editor.

Attach a 6" wire to terminal B of coil No. 3.

Shield section No. 2B can now be erected.

Mount the midget condenser in the large hole in shield section No. 2B in the position shown. The large spacing washer in the foundation unit will be required in mounting the condenser to the shield.

Terminal S of the midget condenser to terminal G of coil No. 3.

Shield section No. 2D should now be erected.

Thread free end of wire from terminal plus of socket No. 3 through shield section 1D.

Thread free end of wire from terminal B of socket No. 3 through shield.

Thread free end of wire from terminal B of coil No. 3 through shield, using hole near the front of the shield.

This completes the wiring of the radio frequency end of the

receiver. The extension shaft of the foundation unit and the two coil cams can now be put in place and adjusted as follows:

Push the shaft through condenser No. 2 and then thread on one of the coil cams with the knob of the cam toward the front panel. Continue the shaft through condenser No. 3 until $\frac{3}{8}$ " of the shaft projects beyond the rear bearing of the condenser. Then turn the movable plates of the two condensers until a position is reached where the set screws in the rotors of the condensers can be reached with a screw driver. Tighten one screw in each rotor slightly and then by means of the shaft turn the plates entirely out of mesh and gently force the rotor sections of the two condensers into line by pressing them up against their respective stops. Then by means of the shaft turn the rotors so that the set screws may again be reached and all screws tightened securely, making sure that the rotors of the condensers have not shifted out of line.

If the condenser shaft turns very stiffly this can be remedied by lining up the condensers properly. One method of doing this is to loosen the screws holding the shields to the shield strips and turn the condenser shaft back and forth several times, at the same time moving back and forth the shield sections supporting condenser No. 3 until a spot is found where the condenser turns most freely. Hold the shield firmly in this position and retighten all screws in the shield mounting strips.

The cams for coils No. 2 and No. 3 should then be adjusted to their proper positions.

Shield section No. 2C may now be erected and work started on the audio amplifier unit.

Mount the ten binding posts on the side of the sub-panel having two countersunk holes. Between the A Batt plus binding post and the top of the panel place a soldering lug.

Next the three amperites are mounted, first removing the screws and nuts from the amperite mounting strips and substituting the six $\frac{5}{8} \times 4/36$ round head screws provided in the

foundation unit. These screws should be passed through the amperite clip and the amperite base strip and secured under the sub-panel by a nut under which is placed a soldering lug.

Sockets No. 4 and 5 (without bases) are now to be mounted. To mount them it is necessary to take them apart by removing the screw in the bottom part of the socket and pulling the two halves apart. The half with the springs is pushed up through the large hole in the sub-panel and then the top half replaced so that the pin in the top section fits in the slot in the bottom section. The screw holding the halves together should then be replaced.

A soldering lug should be placed under the heads of the P terminal and the minus terminal screws of socket No. 5.

Next secure a soldering lug on the top side of the sub-panel directly in front of amperite No. 3. A soldering lug is also placed on the under side of the panel and held in place by the nut.

Then similarly attach soldering lugs to the hole on the edge of the panel near socket No. 4.

Now remove the screws from the .001 mfd. fixed condenser and fasten it to the under side of the sub-panel. Soldering lugs should then be attached to each terminal of the condenser.

The transformers are then mounted with their terminals in the positions shown in the diagram.

All of the wiring now to be done takes place on the under side of the sub-panel. These connections are clearly indicated on the picture diagram by broken lines. The connections represented by solid lines are not to be made until after the audio amplifier unit has been mounted in place.

When these connections have been made the audio unit which is ready to be mounted on the baseboard, and then the radio frequency and audio frequency ends of the receiver are to be hooked up.

End of wire from P of socket No. 3 to P of transformer No. 1.

End of wire from "plus" of socket No. 3 to "B" of amperite No. 1.

Free end of wire from "B" of coil No. 3 to lug "B" on sub-panel.

Free end of wire from terminal B of coil No. 2 to soldering lug B on sub-panel.

The soldering lug on shield section No. 1D to the soldering lug on the minus terminal of socket No. 5.

The soldering lug on the P terminal of socket No. 5 to the P terminal of the jack.

Terminal B of jack to 135 V plus binding post.

Soldering lug on A plus binding post to terminal B of switch (the outer terminal).

Terminal C of switch (near front panel) to soldering lug A on sub-panel.

Checking Your Work

WITH assembly and wiring completed the builder will do well to follow a systematic course of testing, for even the most careful workman sometimes makes mistakes and a slight error in wiring may cause considerable damage. The following procedure is therefore recommended:

Connect the plus terminal of the A battery to the binding post marked A Bat plus. Then touch the wire from the minus side of the A battery to the metal part of the A Bat-binding post (the tubes are not yet in the set). If a spark occurs it indicates an error in the filament wiring, entire filament circuit should be checked until the mistake is found and corrected.

If no spark occurs make the connection to the A Bat-binding post and turn the combination volume control-filament switch in a counter-clockwise direction as far as it will go. The switch is now off. All five tubes should be placed in their sockets *but not one should light*.

With the volume control full on and with all the tubes in their sockets, remove the wire from the A Bat-binding post and connect it to the plus terminal of a voltmeter. Connect one end of another wire to the minus terminal of the voltmeter and touch the other end of this wire to each of the two C Bat-posts and the 45 V, 67 V, 90 V and 135 V posts. In no case should there be any

movement of the voltmeter needle. If any movement should occur the circuit on which it occurs should be traced and the error corrected.

After completing the above tests replace the plus A wire on the A Bat plus binding post and turn the volume control to the "off" position.

You are now ready to connect the "B" and "C" batteries. First connect the "C" batteries and then the "B" batteries.

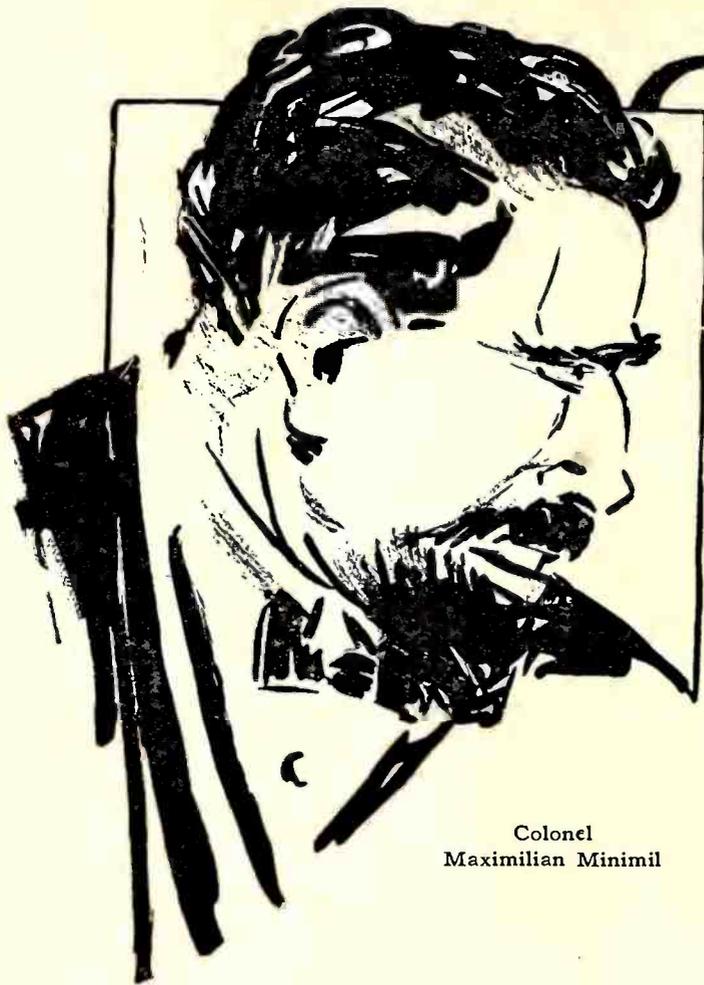
Final Adjustment

AFTER completing the connections to all batteries the antenna should be attached to the middle post of the antenna switch and the ground wire should be connected directly to the minus terminal of the "A" battery. Now plug in the loud speaker and the receiver is ready to operate.

Turn the volume control in a clockwise direction as far as it will go and slowly turn the two tuning dials simultaneously, keeping both at approximately the same settings. As soon as a station is heard, turn back the volume control until the signal becomes barely audible. Then adjust each tuning dial separately for loudest signal and set the volume control so that the output from the loud speaker is *quite soft*. Now adjust the Midget condenser (on the left side of the detector stage shield) to the point where the signal is loudest. Then carefully retune the second tuning dial for loudest signal and then make a final adjustment of the midget. Once set, this midget compensating condenser should need no further attention.

We are now ready to adjust the equalizing condensers. First tune in a loud signal at about 30 on the dials. Then disconnect the wire running to the "minus" post of the first socket, leaving the tube in the socket however. Now, with a wooden stick sharpened like a screw driver, turn the screw in the center of the first equalizer until the signal is at a minimum or disappears entirely. Now replace the wire on the post of the first socket. This completes the balancing of the first

(Continued on page 32)



Colonel
Maximilian Minimil

The FROTH

the Colonel carried full facial foliage as standard equipment. His dark beard was grizzled and coarse but it was well kept, for he long since had given over the habit of munching fine cut. He had not eschewed tobacco for any ethical reason. He simply found that in building up the Minimil fortunes he had had no time to expectorate and anyhow, in the touch and go of the game, it was seldom safe to turn's one head away from the main source of pasteboard supplies.

Col. Minimil was fifty-five years old, hale, hearty and strong in wind and limb. He was proud of his six feet two of virile manhood and of the fact that he had not been indicted for fifteen years. His clothes, like his home and his fleet of high-powered closed cars and his office, insinuated prosperity just as the steam calliope suggests that a circus is in town. His eyes were dark brown, deep set under shaggy brows and his masterful hands were calloused and gnarled from long years of pushing away propositions that promised less than forty per centum.

His fathers came to the western world with Cortez and he traced his genealogy directly back to a romantic marriage between a Spanish officer and an Aztec princess. In his safety deposit vaults he treasured a document, uttered less than half a century after the conquest of Mexico, in which it was set out that one Montezuma Minimil, grandson of a quartermaster sergeant on the staff of Cortez himself, had bequeathed a pecan grove to the public library of Azlatzcan. This piece later began to exude crude oil and by an odd freak of circumstance agents of the present Minimil bought the land, cut down the pecan trees and turned the library building into a refinery. Not being blessed with a knowledge of his ancestral tongue Col. Minimil always spoke of this good stroke as the Ashcan Development.

"Son" said the Colonel, on the morning of October 16, 1925, "if you will tear yourself away from your other arduous duties long enough to call at my office at 3 o'clock this afternoon, you will learn something to your advantage."

Daly Sayles Minimil knew his onions. He didn't plead another engagement nor was he so foolish as to ask questions. Daly was like that because his father was like that.

THE city of Fortunatus for a decade had been a source of amazement for the rest of the country. Located in Coma, the latest state to add its starry spangle to the permanently waved banner of the republic, the city had grown from nowhere into a big time metropolis before the elder inhabitants realized it. The place awoke suddenly to the diverting discovery that it was a huge patchwork of wickedness and virtue, that it had a traffic problem, a state primary election scandal, a high birth rate, a prosecuting attorney who was a darb at politics and an equally contaminated water supply.

One of the strangest facts about the growth of Fortunatus was that the city stood as a civic contradiction of the tradition that a great town necessarily must rise from the shore of the sea, straddle the current of a mighty river or lave the municipal feet in the limpid shallows of an expansive inland sea. Fortunatus had none of these littoral advantages but it seemed certain nevertheless, that yet a few years more and it would be one of the half dozen greatest communities in the world. Situated between Maine and California and south of the Canadian border the city was the heart of a network of hard roads and took generous toll of the world's gas-driven commerce.

Col. Maximilian Minimil, the biggest man in Fortunatus, occupied the most extensive suite of offices in the tallest building in the city. Like so many other rugged trail-blazers who had started from scratch,

ESTATE

by Joseph Balsamo



Daly Sayles Minimil

At 3 o'clock the young man stepped out of an imported gas-hog at the renaissance entrance of the Minimil building. He wore a raccoon coat and no hat. In his right hand he carried a first edition of "The Constant Nymph." Turning to the military attache who occupied the driver's seat, Daly said simply: "Take Miss Sartorius to the Green Ink Club." He smiled in response to the girl's good-bye salute and hastened away.

The elder Minimil looked up from the coupons that lay in profusion on the glistening top of his mellow mahogany table-desk. It was a chilly day, but bright and clear and the sun was filtering through the mulioned windows, laying a soft tint of old gold upon the figure of the Colonel. One window, slightly open, admitted a gentle zephyr which toyed with the draperies of rose-colored French brocade, tossing them inward and upward and at intervals permitting the insistent sunshine to enter so effulgently that even the form of Miss Sadie Long, the colonel's secretary, lost some of its similarity to a mailing tube. Miss Long had been selected by the Colonel's wife. She stood, then, in a sort of matinee aurora as she said quietly to Colonel Minimil:

"Mr. Daly Minimil is here to see you."

"Why in hell doesn't he come in then?"

"Very good, sir." Miss Long had read so many books of English fiction that she talked like a butler.

"Listen, Dale, you've been talking for several years about wanting to go into the newspaper business. You're not worth a damn in my business, or any other business, so far as I have discovered. You might succeed with a daily paper. Look at that slant-head Rossom. He made good. His paper has just licked my candidate for the governorship.

"Enfield licked" exclaimed Daly. "How'd Rossom do it?"

"By supporting him."

"I don't get it," said Daly.

"Neither does Rossom. He hasn't found out yet

that the people knock off any candidate his sheet indorses."

"So," mentioned Daly, "you think if I started a newspaper and supported all political candidates you opposed—"

"Correct" said the Colonel. "The people are tired of having an editor's selected list of candidates shoved under their nose. Newspaper publishers can give us the news but who gave 'em the privilege of doing our thinking for us?"

"The Gods of Olympus, maybe." Daly was thinking fast and enjoying it.

"So's your old man" said the Colonel, who always made a leap for the curb when conversation took a literary turn.

"When do we start?" inquired Daly.

"Right now."

Daly took off his raccoon coat.

"What's the appropriation?" he asked.

"Ten million dollars."

Daly sat down.

II

CONCRETE foundations for the reception of immense printing presses and the sinking of caissons had hardly begun when the people of Fortunatus acquired the habit of calling the enterprise "Minimil's Folly." The Colonel was not a bit disturbed by this pleasant and human attitude of his neighbors, enemies and friends. As marble walls went up and Corinthian colonades arose and joined the

classic facade the Colonel encouraged the builders with feverish enthusiasm.

Fortunatus drove past the imposing pile and raised an eyebrow. The population already enjoyed three morning and six afternoon dailies. Leading citizens who might have possessed some sympathetic interest in the birth pains of the new palladium were deaf to the Minimil ballyhoo. They felt they were under the cold scrutiny of seven established newspaper owners. A bird on the editorial page is worth two in the blue prints.

"We're about as welcome as the plague in this here Froth Estate" chuckled the Colonel. "But while we are still in our corner we can be making our plans for giving 'em hell."

"The main thing is to give 'm a good newspaper when the time comes," laughed Daly. "You see it was Edmund Burke's idea that the Fourth Estate involved big social responsibilities."

"Social Flapdoodle" scorned the Colonel. "A good newspaper is only another name for a sock full of buckshot."

Daly sighed. He began to realize it was going to be difficult to keep his male parent out of the hand grenade bin. The old man said nothing further but Daly with misgiving, saw the Colonel's eyes smolder and he knew the embers of past conflicts were only awaiting the opening of the editorial damper to burst into new flame.

Late in June work had progressed to the point where it seemed advisable to call a conference of all the heads of departments. Daly had been acquiring an editorial and business staff and preliminary details were under way. Aside from Daly himself and, of course, the elder Minimil, the most important men in the personnel of the Fortunatus Gazette were Dana Greeley Franklin, editor; Elmer Shortrate, advertising director, Zenus Babbitt, business manager, and A. B. C. Burroughs, circulation director. That first conference was a solemn occasion, the forerunner of many others. The Gazette was about to balance itself uncertainly for a breath-taking instant and then take the first step as a going concern.

They assembled in Colonel Minimil's office but for once the Colonel was contented to seat himself without the circle. He occupied a chair near a window where he could see and hear, but it was plain that Daly was the executive in charge. Daly wished the chair which he drew up to the table might have been less like a throne in a Gloria Swanson movie. He observed that Burroughs, the new circulation manager, was embarrassed at having dropped a bit of cigarette ash on the \$5,000 rug. Burroughs wore a gunman cap but he knew his street corners. Mr. Shortrate was more at ease. He had been connected with a prosperous confession and diary daily and was accustomed to elegance. Mr. Babbitt was tapping a front tooth with a pencil and mentally estimating what the money spent for this regal office would bring if invested at the usual 6 per centum. Dana Greeley Franklin was

furtively eyeing the Colonel, scenting an elemental foe. Miss Long sat at her own desk of quarter-sawed solid mahogany and fell to wishing that the jade green shade on the heavily elegant desk lamp were rose-tinted to match the curtains. Green was so trying on a complexion naturally inclined toward sallow.

Daly called upon Franklin for a word as to how editorial plans and policies were shaping up.

"We are almost ready" said Franklin. "We have arranged for wire news and a world-wide cable service has been contracted for. The editorial staff is almost complete. We will be prepared for the first turn on the presses on July 1."

"What are you going to do about those damned crooks who are trying to steal the R. and N. power franchise?"

Colonel Minimil boomed the question at Franklin as if he were to follow it up with a grip on the editor's throat.

"Why" said Franklin, "I am not familiar with the situation but—"

"Pardon me, dad," interposed Daly as he saw his sire rise and prepare for action. "We will get to that in good time. What we want to do here today is to get a line on general plans and policies, not details."

"All right, Dale" the Colonel replied, subsiding into his chair, "but don't forget what I told you about that sock."

Daly paid no heed. He turned to Shortrate and asked him if the advertising department had anything to report.

"We have canvassed the field pretty thoroughly" said Shortrate, "and have signed up some pretty fair business. But lots of 'em are going to wait to see what we do."

"They want further evidence as to our editorial policy I suppose," said Daly. "It might be well to mention the fact here that our editorial policy will not be touched by advertising influence, regardless of how sincerely we may hope that the advertisers will approve of us."

"Quite naturally" said Shortrate.

The Colonel looked over at Burroughs and made a sweep with his hand as if he were swishing a gnat away from the end of his nose.

Shortrate leaned forward and picked up a sheaf of memoranda.

"Income from circulation, from the sale of the paper on the newsstands and to mail and home delivery subscribers, will be of secondary importance to the Gazette" he said. "Circulation, in these days of thick newspapers and the high cost of white paper is *per se* a liability and not an asset. The more you sell the more money you lose. "But" and here Mr. Shortrate raised a trained conference forefinger, "circulation is necessary in order to obtain any adequate volume of advertising at productive rates."

Shortrate here turned and looked fixedly at Franklin.

"And when I say circulation I mean the proper kind of circulation. I want to stress that fact with the

thought that to succeed we must have co-ordination of editorial, advertising and circulation effort."

"Would you specify?" asked Mr. Franklin. He was wishing the director would not make speeches and stress things with the thought.

"With pleasure," assented Mr. Shortrate. "There are five groups of people in our country.

"Group I—2 per cent. Morons in asylums and public institutions.

"Group II—18 per cent. They have the intelligence of a 9-year old child. Their incomes are from \$500 to \$1,000 a year, even though they are adults.

"Group III—60 per cent. They have the intelligence of a child of thirteen with incomes of \$1,000 to \$3,000 a year."

At this point Miss Long walks unsteadily to the water cooler and takes a drink.

"Group IV—16 per cent. They have 18-year old intelligence and their incomes range from \$5,000 to \$25,000."

Mr. Babbitt wipes his brow between Group IV and Group V, although the room is not warm.

"Group V—4 per cent. Their incomes are from \$25,000 up. They form the genius group. Educators, lawyers, preachers and scientists are included in this group."

Col. Minnil looked over at Burroughs and laid the upper lid of his right eye completely over his right eyeball and left it there for some time.

"Cheerful guy," whispered the Colonel.

"Now, mind you," continued Shortrate, "fully 90 per cent of the buying power of this country is represented in Groups III and IV. It is the buying power that produces response to advertising. In order to get advertising, therefore, and in order to retain it you must have a newspaper that appeals particularly to Groups III and IV."

Franklin shrunk in his chair. "Good Lord," he said.

"Let's cut out the editorial page."

Daly turned to Burroughs. "What's your reaction?" he asked, and Franklin squirmed again.

"My idea exactly," exclaimed Burroughs. "Jazz it up. Flocks of comics. Two or three sex serials running in every issue. Shortrate's figures look tough for the so-called human race but we got to play the cards as they lay. Snap it up, that's my personal idea."

"If girls wore long skirts Ros-som's paper would have been out of

business long ago," seconded the Colonel.

"Give 'em some of the highbrow stuff of course," suggested Shortrate, "but for every page of straight news give 'em two pages of jazz.

Franklin looked appealingly at Day and a message of mutual understanding passed between them. The editor was wondering why a wise providence permitted the invention of advertising departments.

Daly reflected there were kinks in the newspaper profession that he, as a layman, had not suspected. But there was a pretty good brain under the slicked



"What's the appropriation?" Daly asked
"Ten million dollars."
Daly sat down.

GORDON
MARTIN

back hair of the younger Minimil and he was by no means such a coot as his pants made him appear.

"I would dislike very much," he said, "to undertake the operation of a newspaper which was to be edited down to a group rather than up to a group. I realize that there is some technical truth in Mr. Shortrate's analysis. There are hundreds of thousands of persons who are crying for thrills in ink but I am not going to limit any newspaper of mine to a few comic strips, several doses of high pressure fiction and a photographer with a trained menagerie of bathing beauties. We shall be able, I hope, to so edit the *Fortunatus Gazette* that it will be entertaining without scorching the hand that buys it. I will not be the publisher of a daily aphrodisiac. I am not an anatomist and I don't want to sell a handbook on the human form divine to my neighbors and my neighbor's children. Mr. Franklin will produce news, pictures, editorials and features that should interest any normal American public. Mr. Burroughs will sell that product. Mr. Shortrate will handle the by-product, which is advertising. I hope I make myself clear. If not are there any questions?"

There was a silence in the dimly lighted room. Babbitt mentally stamped it as a good speech but he said nothing. Shortrate assured himself Daly Minimil was an ass but he didn't mention it aloud. Burroughs made a great to-do about getting out a fresh cigarette. A blush suffused the face of the enraptured handmaiden at the typewriter but the new tint could not prevail against a jade green lamp-shade and the lady merely became saffron.

Franklin smiled at the Colonel.

"A new jewel in the breastplate of Athena," he murmured.

"Thanks for the buggy ride," replied the colonel, giving Franklin a hard look. Then he turned to Miss Long.

"Sadie, the next time you see Bill Rossom just tell him for me that the *Gazette* will have the *Clarion* licked on selectivity, distance and volume and that ours is a single control set. Santa Claus is on the way to Bill's place with a sockful of static."

Tom Gubbins, foreman of the press room, and Dan O'Reilley, foreman of the composing room, entered the conference at this moment and sat gingerly on the edges of their Louis XVI chairs as the conferees proceeded to new business. Tom told Dan afterward that he felt almost immoral.

"Why does that bird have his office in a parlor?" he wanted to know.

III

MAVIS MINIMIL was modern. She was so advanced that even her dust was invisible to her plodding father. The young woman talked frankly about things that made her mother cough. But she was a good girl and earnestly wanted to be something more than a rich man's daughter. She had tried settlement work, founded a home for waifs, financed a research into the lives of the boll weevil and corn borer,

and written for a magazine on the order of Mencken's. When Col. Minimil gave a \$10,000,000 impetus to Daly's ambition to be a newspaper publisher she thought it extravagant although even her house dresses were original Poiret models.

"Mavis doesn't think caviar is fit to eat unless the Russian coat of arms is stenciled on each egg," Ethelyn Sartorius told the bridge club one afternoon.

Mavis only laughed. She simply didn't care. She was thrilled by Dale's good fortune and she refrained from commenting too freely on his obvious delinquencies as a publisher. She was secretly planning to tabasco the humorous column on the *Gazette's* editorial page. She had contributed to such columns of other newspapers but her offerings mostly came back. One columnist, pressed for time and weighed down by heaps of mail, used a rubber stamp in warding off the fast ones from Mavis and her ilk. Their offerings went back bearing the simple legend "Too hot to handle."

Mavis thought this was vulgar. She was pleased, though, to reflect that she had saved the rejected wheezes. The *Gazette* should have them all. It can be imagined with what delicious amusement Mavis listened to a conversation that took place at the dinner table one evening in the Minimil's private fortress.

Mrs. Minimil was vastly proud of the family's venture into journalism. She thought it was much better to be referred to as Daly's mother than as the Colonel's wife. Of course Maximilian was all right but he was looking out from behind a set of old whiskers at a new world he did not understand. There were many things Mrs. Minimil did not get in their full significance, but she found time, what with fighting servants and embonpoint, to step into the parade occasionally. She marched in an Independent Woman's Association parade one memorable day and her enthusiasm was only slightly dulled by the fact that she forgot in which ward she lived and discovered she was carrying a banner in a squad of ladies recruited from the gas house district.

It had been an arduous day for Daly and the Colonel. The *Gazette* was to go on the news stands the following night, with the early editions that make a morning newspaper so difficult to distinguish from evening for the *Gazette's* wagon and truck drivers and for the newsboys who were to handle the paper at stands all over *Fortunatus* and its environs. Bill Rossom of the *Clarion* had sworn that the *Gazette* should not be sold from the stands that handled his *Clarion*. His corner men had vowed they would not stand for competition on their own corners or on any of the other three corners at intersections where they merchandised their papers. The elder Minimil had tried to make amicable arrangements with Rossom but had made no progress. It looked as if the other six newspaper proprietors would stand with Rossom, giving him their moral, financial and whatever other support the common cause required.

Col. Minimil and Daly had been discussing this matter when Mrs. Minimil brought forward her first

suggestion for putting the Gazette across with a bang.

"Dale, dear," she said, "you remember Lizzie Farley, the nurse who took care of Mavis after she fell off the front terrace wall into a clump of bridal veils?"

Daly remembered vaguely.

"Well, you can't tell how far a cat will jump," said his mother. "She never looked to me as if she had sense enough to pound sand into a rat hole but she's turned out to be a successful authoress. She wrote that fiction story in the Clarion entitled 'Petted and Parted' and it went so strong they had her write a sequel called the 'Heart of a Typist.'"

"Did that turn out to be strong, too?" asked Daly.

"Oh, extremely," exclaimed Mrs. Minimil. "Very strong. And Mr. Rossom is advertising her now as The Tear Gas Bomb of Modern Letters."

"High pressure promotion, I'll say," commented Daly.

"You must have read some of the 'Heart of a Typist,'" insisted his mother, "it has been appearing so long in the Clarion."

"Is it the one where the working girl is engaged to an earnest young man and she meets a wealthy married business man and he takes her to a roadhouse and on the way back that night they spill in the ditch and—"

"Dale, that's it. You have read it."

"Yes, mother dear, I wasn't sure at first but I recall now that I came across it in the original Egyptian, written on papyrus."

"Daly, do be serious for once. You'll love this. I met Miss Fairleigh this afternoon and she says she has a story almost written which she will sell to the Gazette."

"I didn't get the name," said Daly, "did you say it was Farley or Fairleigh?"

"Ysobel Fairleigh now, Dale. You know most artists change their names a bit when they go before the public."

"And a very tasty appropriation," agreed Daly. "Now what is the name of the serial she wants to sell the Gazette?"

"Who Necks?"

"Pardon me?" said Daly.

"Who Necks?"

"Sounds like a grocer's clerk with a hare lip," puzzled Daly, as Mavis laughed. "But I'll bite; who IS next?"

"Necks! Necks! Not next," explained his mother, laughing immoderately, as matrons will, at the quaint mistakes of their children.

"Good Lord!" said Daly, "Sorry mother."

"Yes," exclaimed Mrs. Minimil "and I arranged everything with Miss Fairleigh except the price. I thought you would want to decide about that. What do you think she should get?"

Dale glanced at his father. "Mother," he said, "I am not yet familiar with the practice and technique in such cases as you have outlined but offhand I would suggest that wood alcohol would be just about the correct thing."



MAVIS

What Mrs. Minimil thought of this will never be known for just as she was about to express an opinion of it the butler entered and announced that Mr. Daly was wanted at the telephone, "An urgent matter, he said, sir."

"It's that damned Rossom starting something new," shouted the Colonel as he arose to follow Daly into the library. "There is a popular idea, Mavis, that the next war is going to be in the air but I want to tell you and Ma that the next war is going to be fought on the streets of Fortunatus. Where's my hat?"

II

BILL ROSSOM, owner and publisher of the Fortunatus Clarion, was a lithe, tallish man of about 45 years who literally had been kicked into fame and wealth. In his younger years he had determined to earn international acclaim as Broncho Bill Rossom and his first step was to undertake to ride a horse. He rejected Wyoming and Montana as suggested scenes for the burgeoning of his ambition and chose the movie lots of Los Angeles. He soon learned to snatch a gun from his holster in less than one minute and after a few trials was able to ride bare-back without holding onto the horse's mane. It remained only for him to develop a bit of extra business. This consisted of standing on the ground and, with an agile step and leap, alighting upon the back of the horse, without the aid of stirrup, fence or horse block.

His big blue eyes and shock of straw-colored hair stamped him as one favored of the movie gods. With what an inimitable air he could turn, just before killing the cattle rustler who had kidnapped Isis Osiris, the

(Continued on page 45)

Static and Statistics

By

Dorothy Brister Stafford

IF YOU own a radio receiver you are perfectly familiar with that grand and glorious feeling of impotent rage that comes over you when, with the batteries all up in shape, the tubes burning brightly, and you all set to tune in on some fine program, up bobs old man Static and throws a wooden shoe into the machinery. It was with some such comfortable feeling that we approached the typewriter today with a nice bunch of statistics that had turned up on our desk, all primed to talk about an anniversary that proved beyond the shadow of a doubt that our youthful prodigy of radio broadcasting was old enough to have a history, when something else came to light to divert us to the extent that until we can set down what we think about it we are a total loss so far as being an historian is concerned.

This disturbance was brought about by the reading of a "fable" by a "radio reviewer," which, if it has accomplished no other purpose, has succeeded in taking most of the joy out of life this bright winter morning, and while from its tone, it was

obviously composed while the writer was suffering from an acute attack of liver trouble, or in the darkest hour of the morning after the night before, it nevertheless has filled us with a righteous indignation that demands immediate expression.

In the aforesaid arraignment the writer has gone to infinite pains to convince the radio listener that the average large broadcasting station is conducted by a group of half-baked college boys and third-rate entertainers of the small-time class, who regard their audience as a huge joke, and operate on the theory that anything is good enough for the listener out in Hicksville; and the idea is very subtly gotten over that broadcasting is not to be taken as a serious business, as it is more or less of a side-issue for those engaged in it. Personally we are at an utter loss to understand just what a writer expects to gain by such an absurd and unjust attitude, or why an editor should print anything so palpably designed to influence his readers against the first rate stations. Coming as it does shortly after the

formation of the greatest combination for organized broadcasting the industry has yet seen, and all the publicity attendant upon the event it seems improbable that any sane person should give it credence, but so prone is the average reader to believe "what he sees in the papers" that we haven't a doubt but that many listeners will take it in entire good faith as a truthful expose of what is back of their entertainment. Heaven knows radio is having a rocky enough road to travel this winter, what with the broadcasting chaos and heterodyning moans developing on all our favorite wave-lengths without any additional stones being fired in its way from the inside. And why a man who presumably makes a portion of his living out of the industry should take a nip out of the hand that is feeding him will take its place alongside other great radio mysteries, such as why the queen failed to materialize when several million people were waiting breathlessly for the royal voice to come over the hook-up. The charitable, friendly feeling of the radio audience toward the



Readers who have tuned in KDKA for the past few years cannot have failed to hear the Little Symphony under the baton of Victor Saudek. The organization is shown in the accompanying picture



Charles Heinroth, organist, has furnished a number of Sunday recitals through the pioneer station at Pittsburgh

purveyors of its programs is the very life and breath of broadcasting, and while all of us know of a score or more stations we'd gladly see annihilated for their interference with the really important broadcasters, such a sweeping indictment as this is bound to do nobody good.

One wonders if such a condition isn't made possible by the fact that the position of "radio reviewer" on the average newspaper is a most nebulous occupation at best. When, in the course of human events, the conventional editor discovered he had to have a radio page, he didn't know exactly who was going to do it. If the paper boasted a musical critic, the buck was usually passed to him, with the result that he condemned everything outside the realm of classical music and usually succeeded in utterly bewildering the bulk of the radio audience. We know of one instance where the radio page is handled by the sporting editor, simply because he happens to be a radio bug—and the result, while doubtless snappy reading to some listeners, must wring the heart of any program director who reads his account of a symphony concert. There is the occasional exception where the editor has regarded the matter

seriously and employed a person with some general knowledge of music, a catholicity of ideas, and a genuine interest in what he is doing, with the result that the writer has raised his new profession to the dignity of that of the critic of the drama, literature or music. But too often the condition reminds us of that existing back in our early days when three or four of us were sitting up with the corpse of a morning paper, and the "Bessie Blake" column of advice to girls was done by anyone who had no more pressing duties at the moment. The pathetic spectacle of the hard-boiled telegraph editor, his bald head glistening with perspiration, one suspender held up with a safety-pin and the omnipresent package of Mailpouch protruding from a hip-pocket, wrestling with the problem of "Two Cuties" who want to know if they shall invite the boy-friends in after a dance, often comes back when we read some such authentic "review" as the foregoing—for we can fancy it's being composed under just such circumstances.

We presume the fact that we have just unpacked our hat-box after a trip to the Big City, where we like to go each winter to see some shows and meet people who are doing things, and which this year included visits to some of the more important studios with the result that we are brimming with enthusiasm and admiration for the way they *are* conducted, has something to do with our disturbance over such a prejudiced distortion of facts. We admit that we don't love and admire the ways and personnel of all radio stations—we haven't had several years contact with the business without discovering some clay feet—but just as all the really great people we have ever met in any profession have been the simplest and the kindest, the individuals and the stations that have disillusioned us are those that don't matter very greatly.

The atmosphere of the great broadcasting station is one of amazing efficiency, extreme

courtesy and an overwhelming interest in what the listening public thinks of them. And why should it be otherwise? Isn't the attitude of the public of paramount importance in any undertaking? True, it isn't possible for the great station to extend unlimited invitations to every owner of a radio set to come around and be entertained when he is in the city—we've never seen a busier place outside a metropolitan newspaper office as the dead line approaches than a big broadcasting studio on an important night—but the one waking thought of all concerned seems to be how the program is getting on the air and how it is going to be received. If these earnest toilers have anything in their heads besides radio we were unable to discover it. The old story of the sailors who spent their shore leave boat-riding in Central Park was recalled when we asked an extremely versatile young man, who bewildered us by the multiplicity of his duties, what he did when he went home, and received the prompt answer, "Why, I turn on the set."

Spirit of Youth

TRUE the spirit of youth is rampant—but where isn't it these days? Aren't some of the most momentous things in literature, art and drama being



Alice King, soprano, is frequently heard from KDKA



Christine Miller Clemson is another of the sopranos who is frequently heard from the Westinghouse station at Pittsburgh

done by those under thirty? And you may be sure, in the great broadcasting station where there is a position calling for a man of more years and discretion, that is just the sort of a person you will always find holding down that job. Where there is need for youthful vision and unspoiled enthusiasm there is invariably an energetic younger man bubbling over with the joy of living and the opportunities of this great new field. We should like to take the writer of the derogatory article into the station we have in mind for an hour or so, and if he didn't eat his ill-assorted collection of words before he got out it would be because he would be so consumed with chagrin that his epiglottis would refuse to function. We want to devote an entire article to this particular station at some future date, and will now get on with the business in hand, which has to do with that grand old patriarch of broadcasting,—KDKA. But we would like to tell you that the first question of all these busy broadcasters we've met lately,—leaders of great orchestras, busy young men who are conducting half a dozen different musical units, opera singers, musicians who divide time between concert engagements and commercial

features—has been invariably, "How do they like us out in your neighborhood?" "Are we getting over?" Do they care about the radio audience? Well, rather.

And while we have had no such personal contact with the artists and staff at KDKA, we know the same spirit exists at the Westinghouse station, or it wouldn't now be celebrating its sixth season and receiving honorable mention as the dean of our broadcasters. Think of it! Radio is so new to the most of us that it seems incredible that anything connected with it could be having a sixth anniversary. But an interesting series of dates has been furnished by the Pittsburgh station, which will constitute the Genesis of the history of broadcasting when it is written.

It was Nov. 2, 1920, that KDKA first went on the air to do regular broadcasting, and the subject matter was the result of the Harding-Cox election. Other interesting first time performances include Jan. 2, 1921, when the first service was broadcast direct from a church; Jan. 15, 1921, marked the first pick-up from a banquet hall where Herbert Hoover was the principal speaker. Feb. 18, 1921, was the first pick-up from a hotel, and the same date must have been a great day in Pittsburgh for it was then that the first report was received that KDKA had been heard outside the United States, the confirmation coming from London and several points in Canada. April 11 of the same year marked the introduction of the prize-fight to the air, when Florient Gibson, sports announcer, gave a blow-by-blow account of a lightweight battle direct from the ring-side, paving the way for the Dempsey-Carpentier contest in Jersey City the following July. Beginning also in April the regular broadcasting of baseball scores was inaugurated by KDKA.

Trail Blazers

IN FACT it appears that we are indebted to Pittsburgh for practically all our standard

features, and while to those of us who are accustomed to the highly specialized broadcasts of today those initial experiments would undoubtedly seem very crude, it is interesting to note that they paved the way and set a line of conduct that is still adhered to by practically every standard station in the country. Those trail blazers must have had an exciting time with no established precedents to follow, and it is a matter worth noting that a religious service should be practically their first attempt, for one would naturally assume that there would be some timidity in producing anything so radical until the attitude of the listening public had been determined. But apparently timidity and lack of assurance have played no part in the history of broadcasting. The rash pioneers were willing to try anything once, and one supposes that the explorers at the receiving end were so amazed by the marvel of being able to hear anything that they bore little relation to the critical, over-pampered listeners of today.

Speaking of this pioneer station, one feels safe in saying that there is no dial-twister throughout the land, no matter

(Continued on page 34)



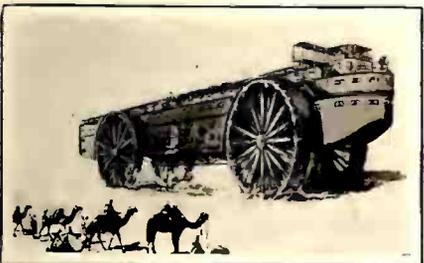
Jim Hughes, director and announcer of the Teaberry Entertainers. This feature is one of the largest permanent broadcasting features on the air, consisting of a twelve piece symphonic orchestra and quartette, heard weekly through KDKA

Current Science



Listening in on First New York-London Talk

The first telephonic channel of speech between London and New York was recently opened when Walter S. Gifford, President of the American Telephone and Telegraph Company spoke from his New York office to Sir Evelyn Murray, secretary of the General Post Office of Great Britain in London, officially dedicating this newest achievement in science. Photo shows Mr. Gifford speaking for the first time with London while officials of the A. T. & T. listen in. Left to right—E. S. Bloom, president of the Western Electric Company; F. B. Jewett, vice president of the A. T. & T.; J. J. Carty, vice president; Walter S. Gifford; Bancroft Gherardi, vice president and chief engineer; E. B. Craft, executive vice president Bell Telephone Laboratories; N. T. Guernsey, vice President; A. W. Page, vice president



Ship on Wheels May Solve Travel Problem

The future "ship of the desert" will not be the traditional camel, in the view of Johann-Cristoph Bishoff, a Kiel inventor, who has evolved a craft which he believes will meet all modern demands for speed, effectiveness and freight and passenger carrying capacity in traversing the earth's arid regions. The "desert ship" is really a gigantic motor vessel, nearly 300-feet long, 38 feet in breadth and standing about 50 feet high, resting on four huge wheels nearly 40-feet in diameter. The strange craft will accommodate 300 persons and have a capacity for fifty tons or more of freight. And it is estimated it will be able to travel about twenty miles an hour. Powerful gasoline engines supply the motive power. Photo shows a sketch of the monster "desert ship" showing the comparison in size with the old mode of travel—the camel.

Science Amateurs Do Good Work



Psychologist Demonstrates New Crime Detector

Dr. A. P. Link, Instructor in Psychology at New York University, recently demonstrated how with the use of specially devised apparatus to measure the electrical resistance of the human skin an electrical stethoscope which enables the audience to hear the thumping of the heart of the person under examination, science can aid in detecting and apprehending criminals



Makes Experiments With Tesla Coils

Doctor Raymond Morgan, professor of physics in the University of Pennsylvania who gave an illustrated lecture on radio communication with elaborate experimental demonstrations

NO LONGER is the typical scientist a stooped gray-beard, who wears a long coat and spouts jawbreaking words in Latin and Greek. As a matter of fact, he never was, but today there is even less justification for the myth than ever before. To people who still cherish the old tradition, however, a visit to a scientific meeting such as that of the American Association for the Advancement of Science, which was held in Philadelphia during the holidays, would be a revelation. Here were gathered nearly 5,000 workers in all fields of science, from Archaeology to Zymology in the alphabet, from Astronomy down to Geophysics in the subjects of which they treat. Among this 5,000 were many of the leaders in their fields, but the long beards were in a very small minority.

Those lucky people who go to Florida for the winter will be able to see another amateur observatory which has been established in Miami by S. Lynn Rhorer, and is now in its fifth season. At this observatory a battery of telescopes is used every clear night to instruct visitors in the mysteries of the heavens.

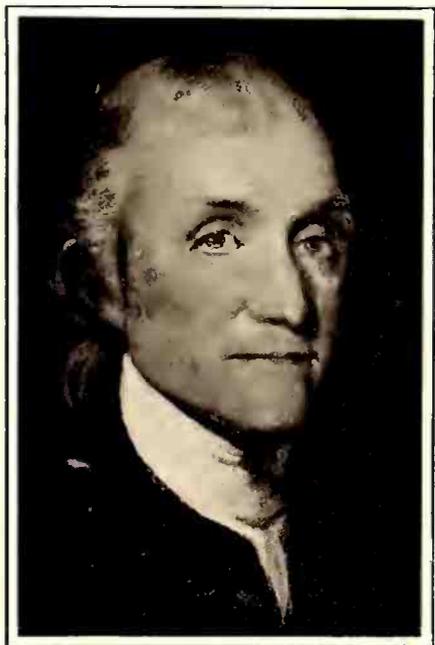
THERE is a large class of stars known as "variables" which change in brightness more or less periodically. Most of these are bright enough to be seen with a small telescope, but to check up on their variations, a large number of observations, made fairly close together, are required. The A. A. V. S. O., as it is called, with its large number of small telescopes, watches these and its members report regularly to the Harvard Observatory. These amateur as-



George Langford, the factory executive who turned archaeologist to make one of the most important discoveries in America, relating to early Indian civilizations, shown at his "diggings"

tronomers are drawn from all walks of life—one very active member, until his recent death, was a Pittsburgh locomotive engineer, who came in from his run about midnight, and then observed until daylight.

Somewhat similar to him is an amateur astronomer in South Africa, R. Watson, who already has the discovery of several comets to his credit, as well as a "nova," a new star which flashed out from previous obscurity into brightness for a time, then dying out again. Mr. Watson is a telegraph operator, on a night shift, and when he returned to his home early one morning, when other respectable people were sound asleep, he no-



Joseph Priestley, the 18 century clergyman who distinguished himself by the discovery of oxygen. In the later years of his life, he was forced to leave England for religious reasons, and he settled near Philadelphia

ticed a star in the constellation of Pictor, the "Painter," which he had never noticed before. This was the new star of nova, and its discovery was immediately spread far and wide to astronomers throughout the world. Another amateur discoverer of comets, as well as of "asteroids" or small planets, was the late Rev. Joel H. Metcalf, a Unitarian minister of Winchester, Mass.

But astronomy is by no means the only science that has its amateur devotees. Take the instance of a prominent New York investment banker, who lives in one of the city's suburbs, Tuxedo Park. This man, Alfred L. Loomis by name, has established at his home a private laboratory where he is experimenting himself, and aiding other scientists to experiment, on "long shots"—scientific problems that offer too little immediate return for the average university laboratory to investigate, but that may develop into something of importance.

In an entirely different field of science, that of archaeology, a hard-worked factory executive in Illinois has distinguished himself, George Langford, of Joliet, has taken up Indian mound excavating as many men take up golf. At that, he gets more exercise than most golfers, because what he has to do in his hobby is to work all day, when he has one to spare, with a pick and shovel like an ordinary laborer, with only one volunteer assistant to help him. But already his hobby has developed into a real pursuit of science, with important results, which has already won for him a place in the circles of his chosen science.

His digging has been at the "Fisher mounds," near Joliet, and is important because he has unearthed three, and perhaps, four, layers of remains of Indian civilizations, that existed on the spot at various times in the past. In Old World archaeology several layers of culture above each other are not unusual, but it is rare in America. Another important outcome of Mr. Langford's work is that for the first time a possible clue has been found to the earlier home of the Iroquoian Indian nation, who



The Southern Cross Observatory at Miami, Florida, established by an amateur astronomer, S. Lynn Rhorer, of Atlanta, for the purpose of instructing the public in the mysteries of the heavens

played an important part in our colonial history. Previously, no remains of the Iroquois have been found west of Ohio, but in the second layer of the Fisher mounds pottery, ornaments and weapons suggestive of the workmanship of this race have come to light after remaining buried for many centuries. And under them are relics representing a still earlier group of Indians, about which little is yet known. Altogether, Mr. Langford has found hundreds of skeletons, as well as enormous quantities of the other relics.

So science is not the dry study of uninteresting facts nor is it necessarily a solemn pursuit fit only for greybeards. When men, and women, from all walks of life take it up as a hobby, and are able to help advance it, there must be something in it of interest!



Hon. James Hartness, former governor of Vermont, with the turret telescope which he invented and constructed. A tunnel connects the observatory with his home, a few hundred feet away

March Evening Skies

Anniversary of Discovery of Planet Uranus

By

JAMES STOKLEY

(Science Service)

THOUGH the heavens have little to offer in March in the way of such spectacular occurrences as eclipses, there is one event which is always welcome, and happens on the 21st at 9:59 a. m., Eastern Standard Time. That is the Vernal Equinox, when the sun crosses the equator on its way north, and Spring commences, bringing along its assortment of back-lots baseball, hurdy-gurdies, and poems on spring. But even though the winter has been fairly mild the season is always welcome, despite the poems and hurdy-gurdies.

Since the path of the sun, in which the planets also move, or the zodiac, is divided up into twelve equal "signs," another way of expressing what happens at the vernal equinox is to say that the sun enters the sign of Aries. Aries is a constellation which could be seen in the evening a few months ago. Now it is too near the sun to be easily visible, even though the sun is not in the constellation when it is in the sign. The zodiac is not a recent invention. It was established thousands of years ago, when men thought the part of the sky the sun was in had some mystic influence on people born at that time. Though such ideas have long since been given up by reputable scientists, some of the old terms are still used. In fact, the observations of the old astrologers, misguided though they were in their motive for studying the stars, really formed the foundation for the modern science of astronomy.

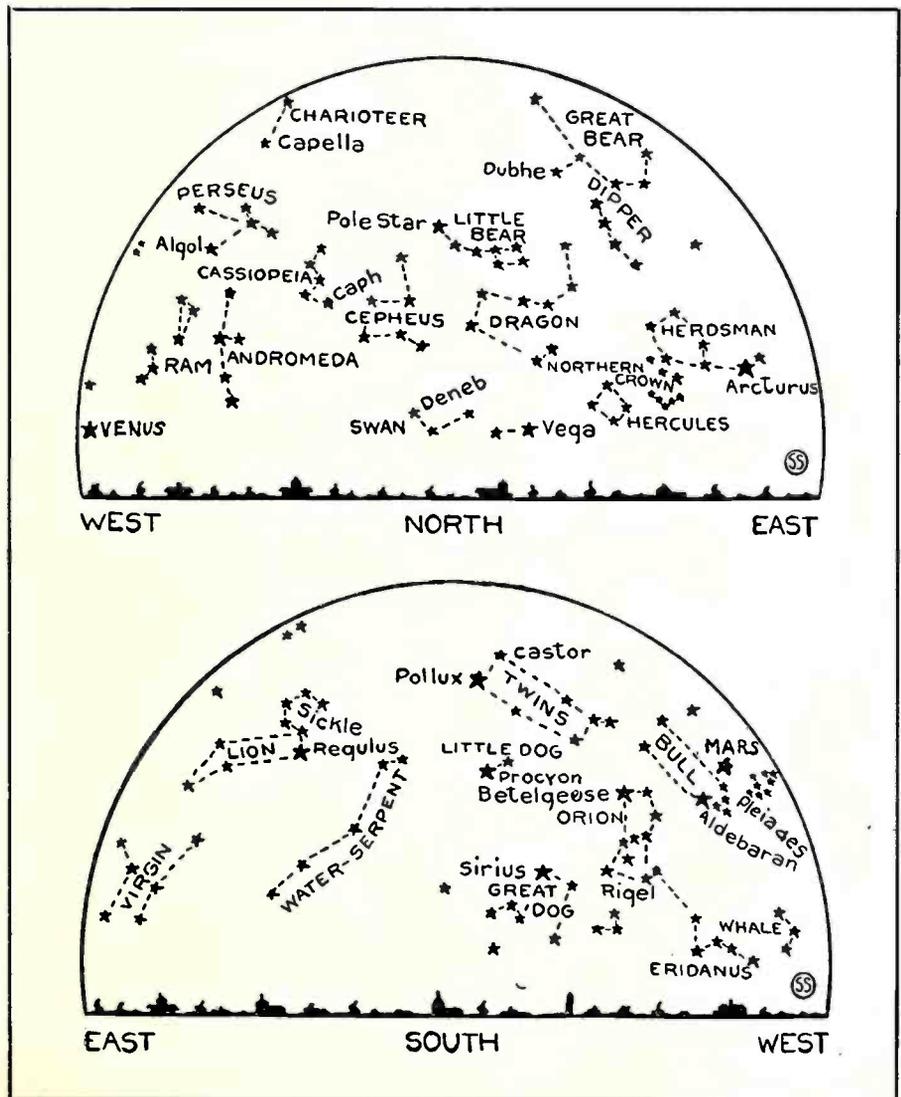
A few thousand years ago, the constellation of Aries coincided in the sky with the sign of Aries, but owing to what is called "precession of equinoxes," the skies have changed

since then. On the 21st, the sun will not be in the constellation of Aries, but in the neighboring one of Pisces, the Fishes, and it will be some 23,000 years until the signs again fit the constellations.

Bulges at Equator

THIS precession of the equinoxes is a result of the fact that the earth is spinning. We usually think of the earth as being a sphere, but it is really not spherical. It is what mathematicians call an oblate

spheroid, which means, in the case of the earth, that it bulges a little at the equator, just like some of the people on it. This is caused by the centrifugal force due to the earth's rotation. When you spin a weight around your head on the end of a string, it tries hard to fly away, but the string keeps it from doing so, unless you let go. In the same way, the part of the earth at the equator tries to fly away from the center, but the force of gravity keeps it from doing so. However, it does succeed in



getting a little farther from the center than the surface at the north or south pole, with the result that the earth is not perfectly spherical. Another incidental effect of the earth's centrifugal force is that a person weighs less at the equator than he would at the North Pole, because this force tends to throw him away from the surface. Of course, no scales would show the difference, because the weights also would be lighter. But the diminution of gravity at the equatorial regions can be measured experimentally in another way, for the swing of a pendulum varies with the intensity of gravitation.

Gravitational Effects

HEAVENLY bodies all exert more or less gravitational effect on each other, depending on their mass and distance. Because of its proximity to us, the moon has considerable effect on the earth, producing the tides, for example, and so does the sun. If the earth were a perfect sphere the gravitational effect of the moon would be the same regardless of its position. As it is, except at the fourteen day intervals when the moon is directly over the earth's equator, the moon's gravity acts more on the parts of the earth's bulge near it than the part on the opposite side. The result is that it tries to pull it into the same plane again, but as the earth keeps it from responding to the pull. However, in combination with a similar effect of the sun, it does cause the earth to turn slowly, so that a line drawn directly up from the north Pole will trace out a circle in the sky. In 28,500 years, the circle would be completed. Another result of the "precession" is that what we call the pole star was not always such, nor will it always be so, though for the next few centuries it will be close enough for most of us.

Aries, then, a few thousand years ago, was the constellation in which the sun appeared at the beginning of spring and this was also, in many ancient coun-

tries, the beginning of the year.

But if we go back about 6,000 years, Aries had not yet reached the position of the vernal equinox, and the constellation Gemini, the twins, visible these evenings in the southern skies, held this important post. It has been said that its stars represent a pair of twins and symbolize the equal length of day and night at this time of year. Some similar symbolic meaning has been claimed for a mythological story about the twins. Castor and Pollux were their names, and they were the sons of Leda. They possessed what might be termed alternate immortality. As soon as one was killed, the other revived, and this, it has been held, symbolizes day and night.

Probably the earliest record of any astronomical event is associated with Castor and Pollux, the two stars of the Twins, or alpha and beta Geminorum, as the astronomer calls them. On ancient Babylonian monuments and boundary stones, archaeologists have frequently found what is called the "Triad of Stars"—a crescent moon, with the horns upward, and two stars beside it.

Ancient New Year

ACCORDING to an English astronomer, E. W. Maunder, the two stars represented Castor and Pollux. At the time, 6,000 years ago, the priests were interested in the first new moon of the year, for their calendar depended on the moon as well as the sun, and the year began at the vernal equinox. At this time of year, in Babylonian days, Castor and Pollux could be seen low in the western twilight just after sunset, and when the new crescent moon appeared alongside them, it was the signal to the priests that the new year had started. So important was this phenomenon that they recorded it on their boundary stones and monuments to be preserved to this day.

Coming down to more modern times, the constellation

Gemini is associated with another important astronomical event, the anniversary of which comes this month. The ancients knew only the naked eye planets, Mercury, Venus, Mars, Jupiter and Saturn. Sir William Herschel was the first to add to them, and on March 13, 1781, he discovered Uranus. In "The Watchers of the Sky," Alfred Noyes has Herschel say, referring first to the reflecting telescope with which he made the discovery:

" It was the work of my own hands,

A new one, with an eye six inches wide,

Better than even the best that Newton made.

Then, as I turned it on the Gemini,

And the deep stillness of those constant lights,

Castor and Pollux, lucid pilot-stars,

Began to calm the fever of my blood,

I saw, O, first of all mankind I saw

The disc of my new planet gliding there

Beyond our tumults, in that realm of space."

Uranus is now in the morning sky, but it is so faint that a telescope is always necessary to reveal it. Venus and Mars are both visible in the evening sky this month, however. The former is in the constellation of Taurus, in the southwest, not far from the first magnitude star Aldebaran, which it resembles, both in brightness and color. Mars, however, may be recognized, because it is to the north. Venus can be seen low in the western twilight, especially towards the end of the month, for then it will set about two hours after the sun. It so bright, about six times as bright as Sirius, the brightest star, that it is easy to distinguish.

Everyday Mechanics

Use X-Rays To Detect Fake Pearls

WITH the growing use of imitation pearls almost indistinguishable from the real article, as well as of the so-called "culture" pearls grown by introducing small bits of foreign material inside the shell of a living pearl oyster, it has become increasingly necessary for jewelers to possess some infallible method of distinguishing these manufactured articles from the real pearls produced naturally by the pearl-bearing shellfish. Science has come to the rescue with several devices which measure the properties of a pearl or which permit the jeweler to look through it under an enormously powerful light, thus disclosing, if the pearl be not too large, the tell-tale central impurity of a culture pearl. A new and more universal method, making use of X-rays instead of light rays, was described recently to the French Academy of Sciences by J. Galibourg and F. Ryziger, of Paris. A narrow beam of the X-rays is thrown against the pearl, beyond which is an ordinary photographic film covered with black paper, as are the films used by dentists to take X-ray photographs of teeth. On this film there appears a pattern of dots made by the X-rays. This pattern indicates the internal nature of the pearl. With proper care, it is said that any culture pearl can be distinguished thus from the genuine article.

Shale Oil Industry May Rival Coal

DISTILLATION of shale, which promises to become very important to the entire nation, is not a new way of getting oil at this time of approaching scarcity, but is merely an

old method brushing its cobwebs off after over half a century of disuse in the United States. In France it is older yet, for there the production of oil from shale started in 1838, according to Dr. G. C. Riddell, consulting engineer of New York. In Scotland, oil was obtained from shale before 1850, but the best of the raw material is today exhausted. Shale pits 3000 feet deep show how the industry once flourished.

In 1850 oil was distilled from shale in Utah and Pennsylvania, and the development of a great shale industry would have resulted but for the discovery of well oil. The "liquid gold" fever following the development of oil in drilled wells in Pennsylvania caused the interest in shale oil to dwindle and then die, just as an impending scarcity has brought it to life again.

To date 186 patents have been granted in the United States for the production of oil from shale. Five of these were granted in 1858, fifteen in the next six years, and none at all after that until 1891. From 1891 to 1914 ten patents were granted, from 1915 to 1919, thirty-four and from then to the present time one hundred and seven.

The competitive production of oil by distilling bituminous rocks is no longer in doubt, Dr. Riddell states, for in California it has been produced for three years at less than one dollar a barrel including all overhead charges. This is far below the average cost of American well oil.

The question as to what is to become of the vast amount of spent shale that will result with the development of the industry is puzzling many theorists. The by-product can be used for making pressed, refractory and



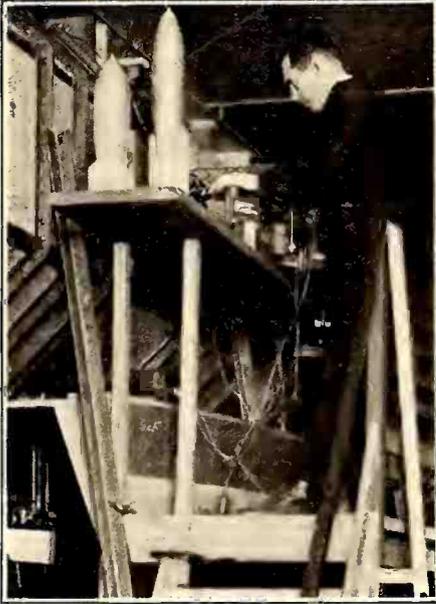
Automatic Train Stop Device is Demonstrated

A new electric device for halting trains automatically and which practically eliminates possibilities of crashes, was demonstrated on the Reading railway near Winslow Junction, New Jersey. The electrically controlled safety device, costing \$750,000 to install, acts independently of the engineer. When the locomotive reaches the danger zone it automatically sets the air brakes and the train comes to a dead stop. A special train made up of two coaches and drawn by the Reading's fastest locomotive going at a speed of 85 miles an hour was brought to a dead stop during the test. Photo shows the train stopped at the signal post by the automatic device



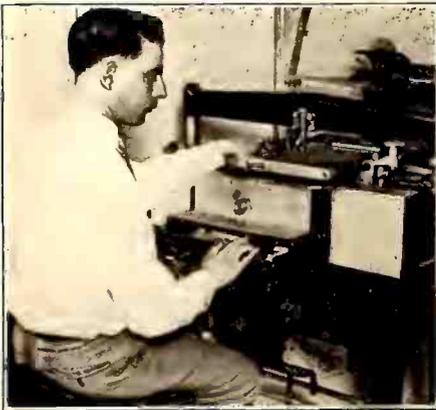
Photo shows Philemon S. Lewis, superintendent of the Atlantic City Division pointing to the control box on the side of the locomotive

insulating brick and tile, Dr. Riddell says, and at present it has found lesser uses as road material, concrete building



Wind Tunnel Used to Test Aerial Bombs

An engineer of the Bureau of Standards is shown in the process of testing aerial bombs for resistance to help airmen in getting accurate hits. The air tunnel in which the bombs are tested has an artificial velocity of air current equal to 80 miles. Engineers of the Bureau also use the tunnel for testing of airplane accessories



World's First Magazine for the Blind

Introduced by its blind inventor into Los Angeles several months ago, the first monthly magazine for the blind proves so popular that it is enlarged to 60 pages for national circulation. "The Braille Mirror" became possible as a result of the invention of special presses and stereotypes by J. Robert Atkinson, its publisher. Mr. Atkinson, stricken with blindness at 35 years of age, had no previous experience in the mechanical line before he began his experiments. The magazine covers a wide range of subjects and enables many blind persons to read advertisements for the first time in their lives. Picture shows a blind operator at the typesetting machine invented by Atkinson

blocks and as a filtering substance in the sugar industry.

That the new shale industry is destined to become as great as the coal industry is now, is recognized by engineers and geologists generally. The new business will be developed in the now sparsely populated regions, Dr. Riddell points out, and towns, roads, water systems, movies and other kinds of civilization will appear there.

Light Shining on Mineral Produces Electric Current

A PIECE of the mineral molybdenite, one of the chief sources of the metal molybdenum, used in steel manufacture, may replace the fragile photoelectric cell in some forms of scientific work, says Dr. W. W. Coblenz, of the U. S. Bureau of Standards.

Dr. Coblenz has been studying what he calls the actinoelectric effect of molybdenite, the property that causes it to convert light energy falling on it into electrical energy. Previously he found that pieces of the mineral have closely adjacent spots which generate either positive or negative electricity. The result is that when the whole crystal is exposed to light the positive and negative currents neutralize each other, and very little effect is noted, but if a single one of the spots is selected and illuminated, a current is produced of sufficient intensity to be indicated with a galvanometer.

Very recently, Dr. Coblenz has found crystals in which all of the sensitive spots give the same kind of electricity, either positive or negative. When one of these crystals is completely illuminated, a considerable current, as compared with the others, is produced. By using vacuum tube amplifiers, such as are used in radio, the current may be magnified greatly and the crystal made available as a delicate detector of light.

Such a crystal is sensitive to the visible light waves and to the infra red, or heat waves, which are similar, but vibrating too slowly to be visible.

Eavesdropping Is Hard on Transoceanic Phone

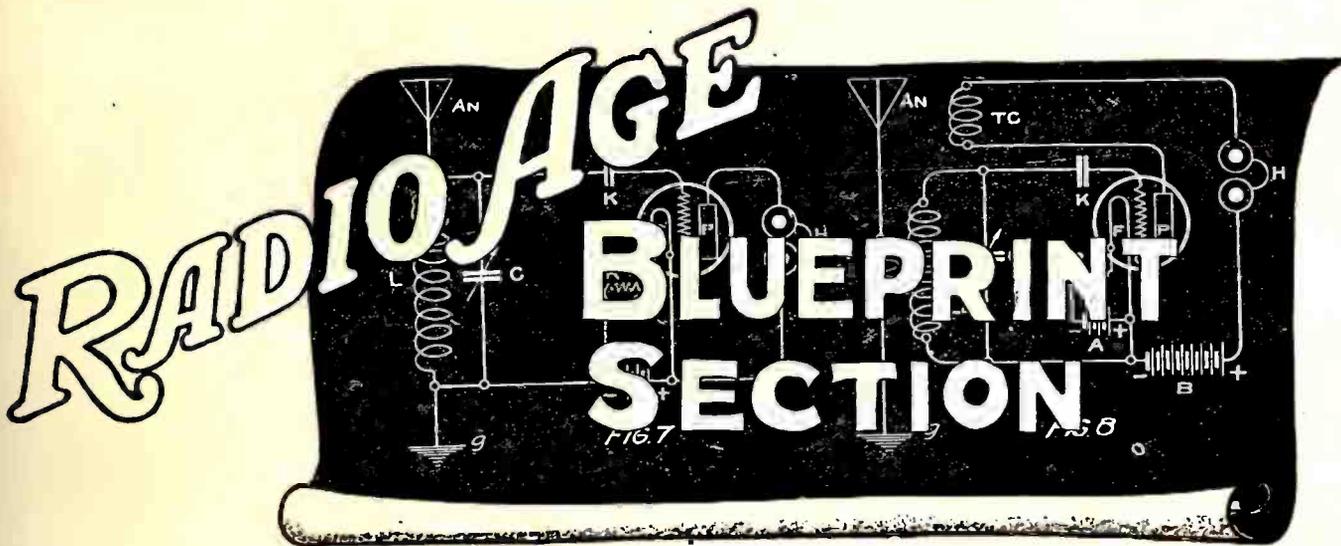
HARD times are in store for many transatlantic gossips who might wish to indulge in a little eavesdropping on the new overseas radiophone service recently opened. Officials of the American Telephone and Telegraph Company state although absolute secrecy of the transatlantic telephony is not guaranteed, it will be difficult to listen in because a special transmitting system is used. This is the suppressed carrier method, by which the voice is sent through the ether without a carrier wave. In the ordinary receiver, an unintelligible jumble is all that one hears, but when a receiving set is used that restores the missing carrier, it is fully understandable.

Another difficulty of listening in, at least so far as the United States is concerned, is that the signals from London are so faint. It was in order to get them as loud as possible that the telephone company placed the receiving set at Houlton, Maine, 700 miles of long distance lines away from New York, so that at best, an interloper would only be able to hear one side of the conversation.



Engineers Wear Overcoats in This Engine Room

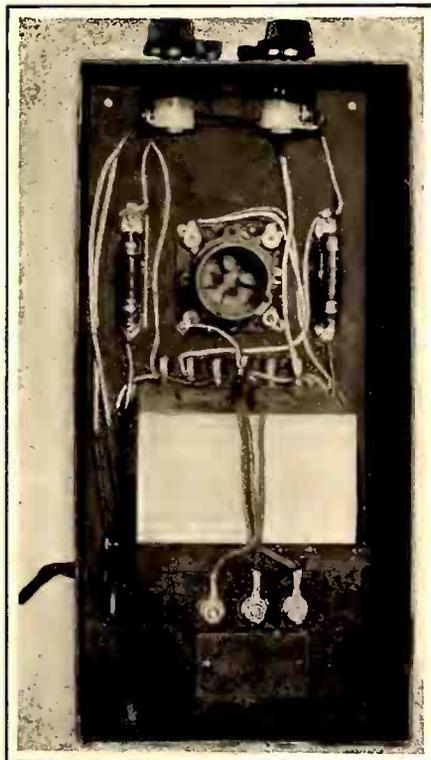
For the first time in the history of the American merchant marine an engine room crew were in danger of freezing on an ocean voyage. Ordinarily the warmest part of a vessel is its engine room. But the converted motorship "Tampa" with its Worthington Deisel engines give off no heat whatever, owing to their elaborate and highly efficient cooling systems. On a trip to Bremen made recently, the engine room gang of the Tampa wore overcoats on the trip across



Building Ideal Model of the Worlds Record Super 8

*Brings Set Up To Its
Highest Efficiency*

By F. A. HILL
(Associate Editor)



In this photograph is shown the 171 power compact which furnishes A current for the 171 tube filament; B and C voltages for the 171 power tube, and the B voltages for the balance of the receiver

shown in Figure 2 on page 27. Do not try to wire the set from this drawing. Use the schematic on page 31 (Figure 4) for the superheterodyne, and the schematic on page 30 (Figure 3) for the power compact. However for the location of the various articles the layout shown in Figure 2 will give a clear idea to the home constructor for whom these articles are written.

Photographically on page 29 is shown a bottom view of the subpanel assembly. Some of our readers have tried with disastrous results to wire up a set from a photograph. We suggest in the interest of accuracy (and economy of your own time) that you use the regular schematic for that purpose—at best a photograph can only show the parts and wires but without regard to their electrical accuracy.

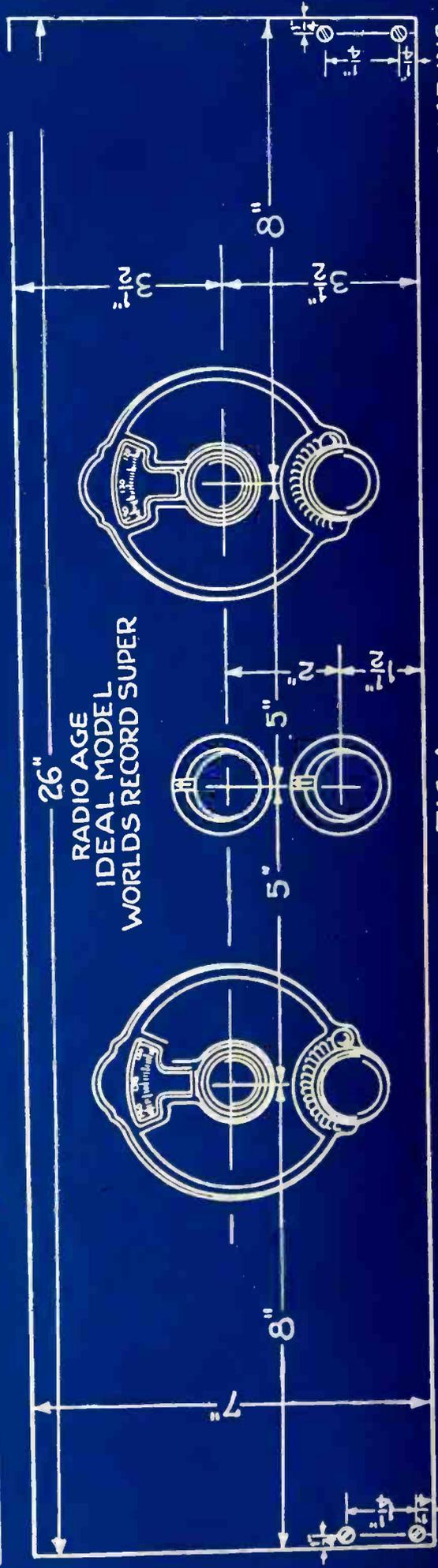
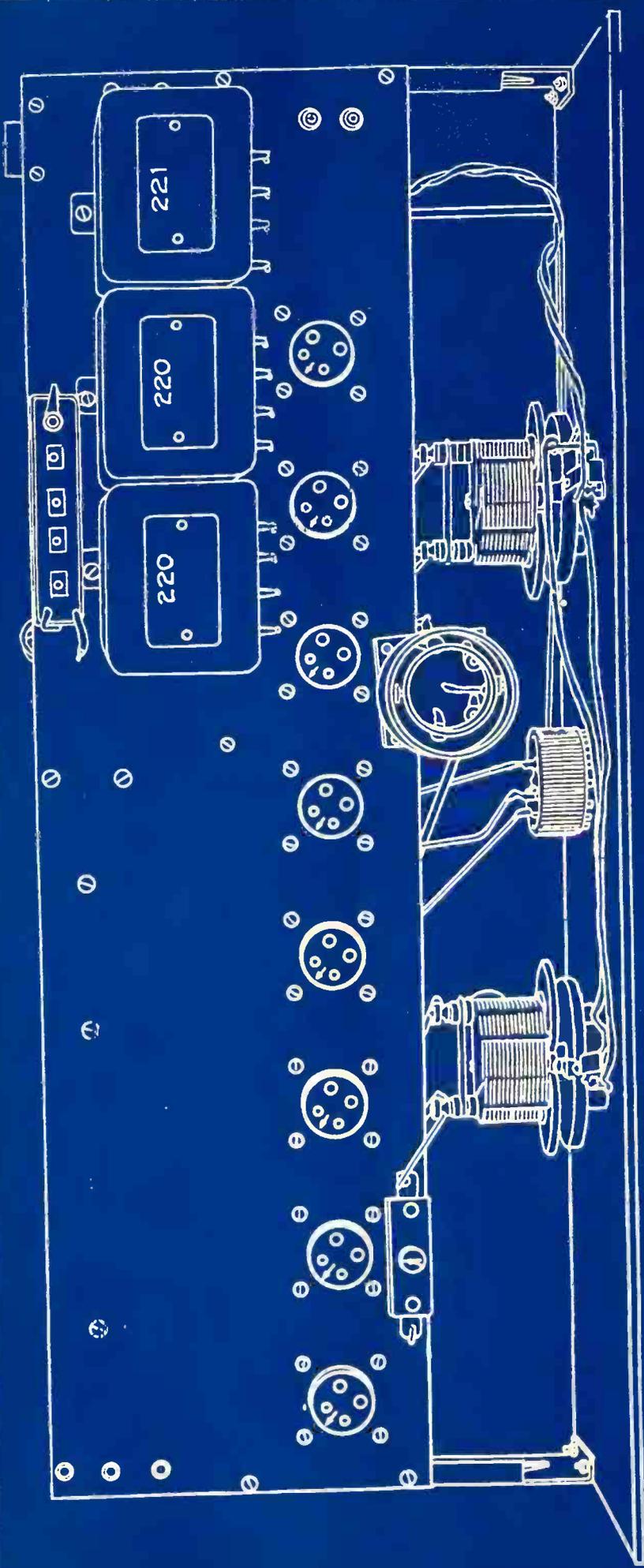
BEFORE commenting on the receiver itself we will refer to the Thordarson R-171 compact shown schematically in Figure 3 on page 30. Inside the dashed lines will be found a 110 volt AC primary; a 5 volt AC, center tapped, secondary for the fila-

PRACTICAL work on the various models of the Worlds Record series has now reached a climax with the presentation of the Ideal Model in this month's issue of RADIO AGE. While no great departures have been made in the basic circuit, a few refinements have been added to bring the set up to the maximum of efficiency and the minimum of working parts.

For one thing the subpanel method of assembly has been utilized to give greater symmetry to the wiring and the arrangement of the parts. This has also permitted the mounting of bypass condensers and intermediate transformers beneath the subpanel.

Both the front panel and the subpanel are 7 by 26 by 3-16 inches. The dimensions of the front panel are shown in the blueprint Figure 1, lower portion. The upper portion of the drawings on page 26 shows the top view of the subpanel with the line of sockets and the two audio transformers and one output transformer in place.

Arrangement of the apparatus underneath the subpanel is



RADIO AGE
 IDEAL MODEL
 WORLDS RECORD SUPER

FIG. 1

RADIO AGE INC.

COPYRIGHT 1927

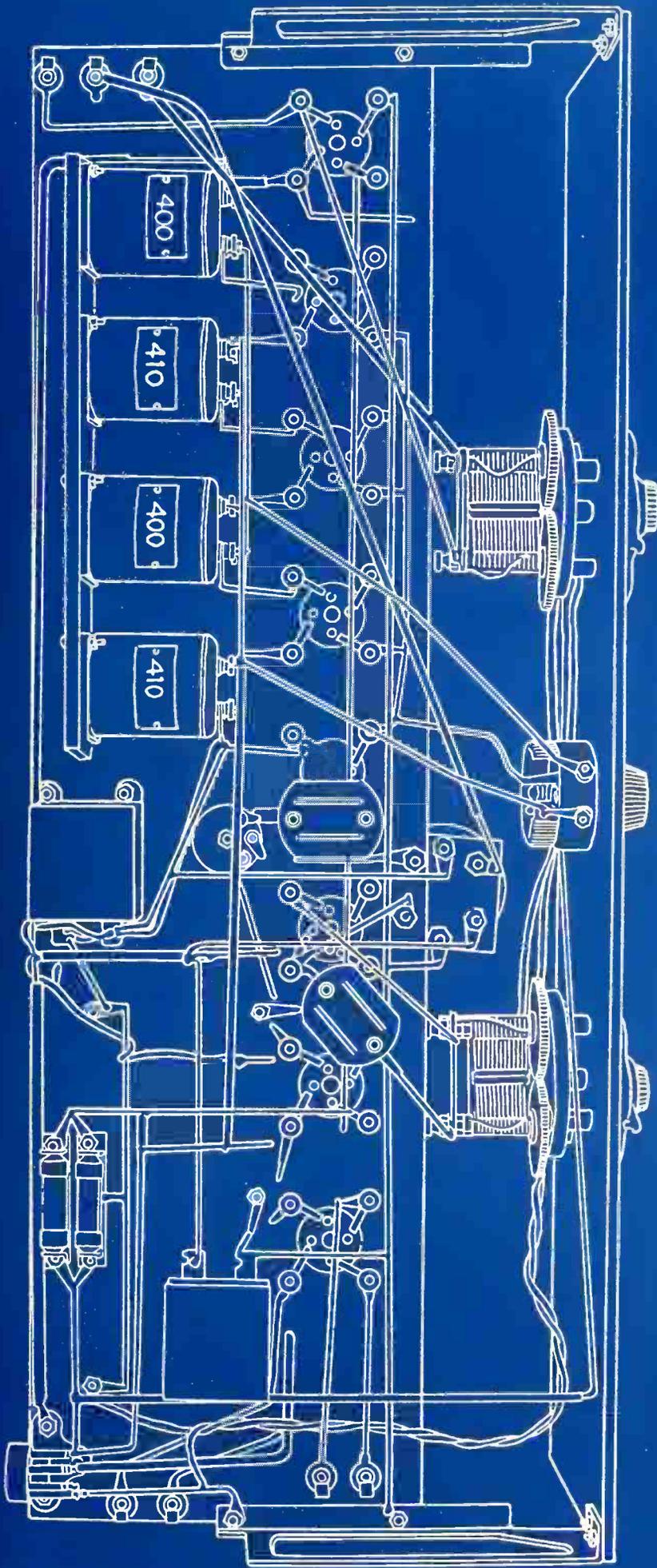


FIG. 2 BOTTOM VIEW IDEAL MODEL
WORLDS RECORD SUPER

ments of the 171 tube; two 30 henry choke coils; a high voltage secondary, also center tapped, and two one-half microfarad buffer condensers which are to go across the elements of the full wave gas tube rectifier. The high voltage condensers, C3, 4, 5, 6 and 7 are contained inside the Tobe Deutschmann block for the 171 compact. Proper connecting lugs are provided on this block so that connections from it to the Thordarson compact may be made as short as possible.

Fixed resistances may be used if desired (and we personally prefer them) but in this model two variable ones, made by Allen-Bradley and running from zero to fifty thousand ohms, are used. Their position is also shown in the schematic. The fixed 10,000 ohm resistor in series with the variable resistance controlling the 45 volt output is an Aerovox while the 2,000 ohm resistor in series with the center tap of the filament transformer and the negative B is an Allen-Bradley, cartridge type. Rectifier tubes used with the compact were the new 85 milliamper tubes made by the Q. R. S. interests in Chicago. These tubes have been run up to their manufacturers' rating and have given excellent results. They fit in the standard UX sockets and thus require no special method of assembly.

In the upper section of Figure 3, are shown the first and second audio stages of the receiver. The filament of the 171 tube being AC is not supplied from the set itself but from the 5 volt winding of the 171 compact. Grid bias for this tube is secured through the 2,000 ohm resistance between the center tapped filament transformer and the negative B line. This bias will be automatic and depend upon the amount of current consumed in the plate circuit of the 171 tube. Please notice that while the grid return of the first audio transformer goes to the negative of the set's C battery, the grid return of the second audio goes to the negative A and B whence it secures its bias on account of the 171 filaments not being a part of the set filament supply. The output transformer is used to isolate the di-

LIST OF PARTS

(Articles shown below were used in the model constructed by members of the staff. Other parts of equal merit may be used if desired.)

Receiver

- 2 Remler .0005 mfd variable condensers
 - 2 Selectone type 400 long wave transformers
 - 2 Selectone type 410 long wave filters
 - 1 Thor radio frequency coupler (plug-in type)
 - 2 Silver-Marshall audio transformers
 - 1 Silver-Marshall output transformer
 - 1 Qualitone center tapped loop
 - 3 Sangamo 1 mfd bypass condensers
 - 1 Sangamo .006 mfd fixed condenser
 - 1 Sangamo .002 mfd fixed condenser
 - 1 Frost 6 ohm filament rheostat
 - 1 Frost 100,000 ohm variable resistor
 - 1 Amperite 4-A for 1 ampere
 - 1 X-L variodenser type N
 - 1 Jones base mounting plug
 - 7 Carter imp cord tip jacks
 - 1 Silver-Marshall RF choke coil
 - 1 7½ volt Eveready C battery
 - 2 Formica 7x26x3/16 panels
 - 2 Benjamin standard panel brackets
 - 8 Benjamin cushion sockets for subpanel mounting
 - 1 Abox filter
 - 1 Balkite 5 Ampere charger
- #### Power Compact
- 1 Thordarson R-171 power compact
 - 1 Tobe Deutschmann condenser block for same
 - 2 Allen-Bradley 0-50,000 ohm heavy duty variable resistors
 - 1 Allen-Bradley 2,000 ohm cartridge resistance
 - 1 Aerovox 10,000 ohm fixed resistor
 - 1 Q. R. S. 85 milliamper full wave rectifier tube

rect current from the loud speaker windings.

If desired the entire power compact may be encased in an iron (or other metal) container as shown in the photograph on page 25. This permits not only portability and neatness of appearance, but also allows the set owner to use the compact as a source of power for any other receiver he may happen to have on hand, providing the last tube in such receiver is changed over to use AC on the filament of the 171 tube. Those who have been accustomed to the small rating B eliminators of any kind, will be somewhat startled at the increase in quality on all tones due to a power tube and a greater

reserve of power in the compact arrangement than in any of the previous forms of B eliminators.

Filament battery elimination is secured from a 5 ampere Balkite charger through an Abox filter which works perfectly.

Going now to the super itself the wiring diagram is shown in blueprint Figure 4. A center tapped loop is used in order to gain regenerative qualities in the first detector which instead of using a grid condenser and leak, makes use of the rectifying properties of a grid negatively biased. This bias is obtained from a common C battery which also carries the pickup coil of the oscillator and the grid return of the second detector. Thus rectification in both the first and second detectors is by the bias method, while the pickup coil is located in this line because of its being more or less at a low potential position in the circuit, obviating the necessity of long wires in the actual grid line itself.

Filament control has again been simplified. This time the first and second detectors, the oscillator and the first audio tube filaments are placed on a one ampere Amperite (4-A) which is shown as R2, while the three intermediate filaments are placed on a 6 ohm rheostat, R1, and may be varied as desired. A further control is a 100,000 ohm variable resistor placed across the primary coil of the last iron core intermediate, as shown in the schematic.

Tuning control is accomplished by a .0005 mfd. Remler on the left side of the set which spans the loop circuit, while another Remler .0005 mfd. at the right goes across from grid to plate of the oscillator tube. A Sangamo .006 mfd. condenser is put in series with the variable condenser to act as a protective measure against accidental shorting of the variable condenser plates and this adding another victim to the tube morgue which most experimenters maintain. This fixed condenser will not have any perceptible effect upon the tuning of the oscillator circuit, although its inclusion will prevent accidents.

FOR the loop input terminals three Carter imp cord tip jacks were used. Another two jacks of the same type were used for the filament terminals from the compact, while two more jacks were put on the subpanel for the output transformer leads to the loud speaker.

Drilling templates for the Benjamin sockets to be mounted directly on the subpanel are furnished with the unassembled sockets. The inch holes may be made either with a one inch fly-cutter, or a circle of small holes may be drilled and the center knocked out. For speed in construction a panel cutter that will make an inch hole will be much more satisfactory.

Bias on the intermediate grids is secured from the common C battery and will be somewhat critical for best results. The audio bias will generally run from $1\frac{1}{2}$ to 3 volts negative.

Regeneration in the loop is controlled by the X-L variodenser which should be set for a value which will give regeneration (but not oscillation) at a point about midway between the upper and lower ranges of the broadcast channels, say about 300 or 333 meters. Then the condenser may be left alone and the set logged easily for the entire 94 broadcast channels.

In this article we are not much concerned with the logging of the receiver, since it will run quite true to form with the others which appeared in the November, 1926, and the January, 1927,

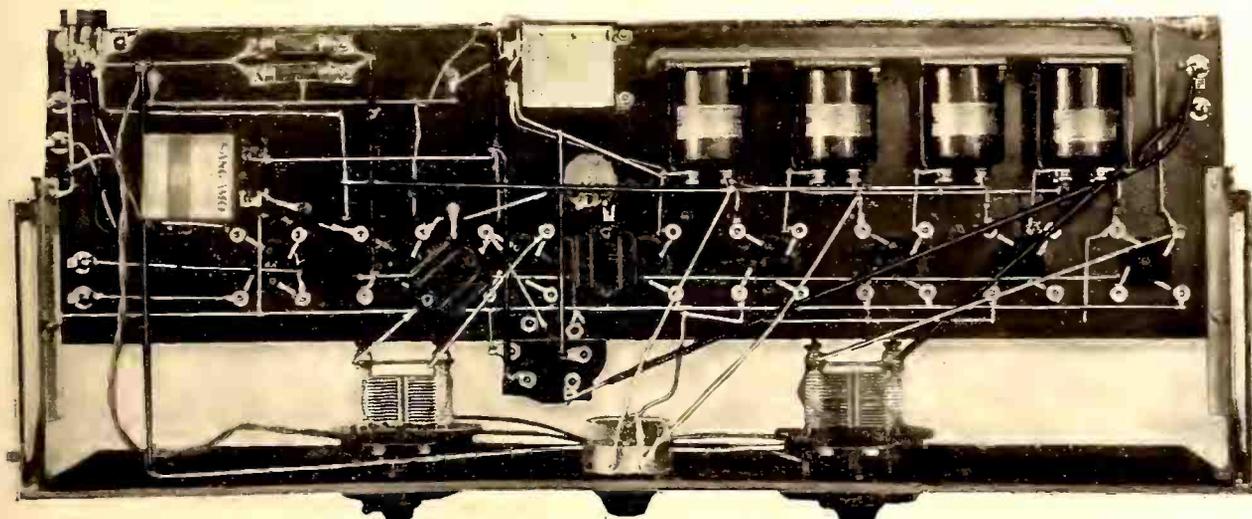
issues. In its operation by the staff the contested points were rechecked to see that nothing had gone amiss in its construction or in the peaking of the intermediates. Hotbeds of radio dissension on most receivers center around 970 kilocycles, 670 kilocycles and 640 kilocycles, and it was our desire to see that ten kilocycle separation was possible with this receiver as with the previous ones. Between WGN on 990 kilocycles and WGES on 950 kilocycles there should be KOIL 980, KDKA 970, and CNRR 960 kilocycles. These three should be neatly separated if utmost advantage is taken of the directional effects of the loop.

Ten kilocycles below WQJ on 670 kc you should pick up WOS on 680 kc, while ten kilocycles above WQJ you should have no trouble in tuning in WJZ on 660 kc. The same should hold true around KFI on 640 kc, with KMA on 650 kc and WFAA on 630 kc. With this set KFI became a laboratory criterion for reception on his signal strength several adjustments being made to see if the volume could be brought up higher. Loud speaker volume on KFI with perfect tone quality was secured without trouble and maintained night after night. The occasional exceptions were when WAPI down in Alabama persisted in polluting the air with third rate music, which we feel did not suit the taste of our distance hunting readers. At times WRC in Washington

can muddle up KFI's wave into a distorted tone. One of the evenings on which the receiver was in operation Los Angeles was brought in at 8 p. m. Central standard time, which was considered fairly neat work. No tests were made on the set Monday nights for obvious reasons.

When KRLD at 840 kilocycles is not on the air, CZE Mexico City may be tuned in on the loud speaker. During intervals when WCFL is not on the air (and WFAF is not too strong) KGW may be brought in although this will depend much more on luck than on design since this West Coaster is not particularly permanent as to volume.

A few last words before finishing the series on the World's Record sets. If blasting occurs on locals shift to a 112 in the first detector stage and go back to a 200-A or 201-A for long distance work. Do not keep the loop too highly regenerative since too much regeneration will introduce distortion into the signal. Use voltages (plate) as shown in the schematic because these values have been worked out for best quality. Do not expect *louder* signals on the 171 than on the ordinary tube, but do look for better *quality*. Do not place bypass condensers too near to air core filters since their proximity to the metal might alter the characteristics. Do not build the set in a hurry—take your time and make it a worthwhile job for you will probably keep it for some time to come.



In this photograph is shown the bottom view of the Ideal model constructed in our laboratory. Do not try to wire by this picture. Use the schematic, blueprint figure 4 and be certain of electrical accuracy

Building the Hammarlund-Roberts Set

(Continued from page 9)

R. F. stage and the same procedure should now be following with the second R. F. stage.

The antenna "short" "long" switch enables the receiver to be adapted to different types of antennae and should be experimented with until the operator becomes familiar with the best position of the switch for the different wavelengths.

In general, the two tuning dials will read more nearly alike with this switch in the "long" position and this position will also afford the greatest selectivity. When throwing this switch from one position to another it will be necessary to slightly readjust the first tuning dial.

Batteries and Tubes

FOR the operation of the receiver the batteries and amperites required depend on the type of tube used. It may be noted that the new detector tube UX-200-A or CX-300-A may be used in any of the combinations of storage battery tubes which are listed herein. It is recommended that this type of tube be used if great sensitivity is desirable or if reception over extreme distances is an object of special importance. No change in either battery voltages or amperites is required.

Although either dry cell or storage battery tubes will prove entirely satisfactory, it should be noted that in general, storage battery tubes are more satisfactory than the dry cell type and should therefore be used where possible.

The new power tubes which have recently become so popular well deserve their popularity. For maximum operating efficiency they call for somewhat

higher plate voltages and consume a little more A and B current than the 201-A type of tube, but this is more than repaid in the form of greater volume and greater freedom from distortion caused by overloading. Therefore, it is recommended that type 112 or 171 tubes be used in the last audio stage of storage battery tube combinations, and the 120 type in dry cell tube combinations.

A tube combination which is highly recommended for the average installation, is shown below. It may be used without making any changes in the receiver and can be depended on for stability, volume and tone quality.

UX201-A or CX301-A in sockets Nos. 1, 2, 3 and 4. UX112 or CX312 in socket No. 5. 6 volt storage "A" battery. 3 .45 volt "B" batteries. 2 4½ volt "C" batteries.

To secure in full the advantages of the 171 type of tube, 4 45 volt "B" batteries should be used, and a 40 volt "C" battery should be connected to the "C" Bat-1 (2nd audio) binding post. With these voltages the plate current drawn under normal conditions is 18 or 20 milliamperes, which is too much to safely pass through the windings of the average loud speaker.

This difficulty can be easily overcome by connecting a choke coil (such as used in B eliminator filters) directly across the terminals of the loud speaker jack. As the resistance of the average loud speaker windings is considerably higher than the direct current resistance of such a choke, most of the 18 or 20 milliamperes of plate current will pass through the choke coil and so prevent the burning out of the speaker windings. At the same time the alternating current impedance of the choke is so high that practically all of the voice currents will go through the loud speaker and no loss of volume will be noticed.

If the method suggested herewith is used the choke coil may be placed in the rear portion of the left side of the cabinet, two wires run from the terminals of

WORLD Radio Units

Save You 50%

"A" Current
From Your Light Socket



World "A" POWER UNIT

Automatically provides even, unvarying "A" current from the moment you throw on your set switch. A marvelous improvement—at less than half the cost of any similar equipment. Finer reception, uninterrupted by "fadouts" and "screeches." Absolutely noiseless. Assures full tone quality from your set and wider D X range. Shipped complete, subject to inspection on receipt of price, \$12.75—or C. O. D. if you wish.

\$12.75 Complete

Built for Long Life



Clearest Truest "B" Power with World Storage

"B" Batteries 12 Cell 24 Volt

Sturdy construction. Solid Rubber Case protection. Recharged for almost nothing. Endorsed and listed as standard by Radio News Lab., Pop. Radio Lab., Pop. Sci. Inst. Standards, Lefax, Inc. and other famous Radio Authorities.

Send No Money Just state number wanted, and we will ship same day order is received by Express, C. O. D., subject to examination. 5% discount for cash with order.

Extra Offer: 4 Batteries in series (96 volts) \$10.50.

Radio Storage "A" Battery - 6 Volt



Unequaled battery value! 25 ampere capacity. Ideal for Trickle Charger. Solid Rubber Case. Shipped C. O. D. subject to inspection, for only \$5.00. Send to-day. 5% discount for Cash with order on any World Unit.

\$5.00

WORLD BATTERY COMPANY
1219 So. Wabash Avenue
Dept. 81 Chicago, Illinois

Set your radio dials at 288.3 meters for the World Storage Battery Station W S B C.
Variety—New Talent—Always Interesting.

FREE This Wonderful Radio Book

The World's Largest Exclusive Radio Mail Order House will send you—FREE—this wonder catalog of radio bargains containing over 2000 items of everything in RADIO, including all the latest Sets, Kits and Parts, at rock-bottom prices that Save You one-third to one-half.

5-TUBE SETS AS LOW AS \$24.90
Latest 1927 Models

Table and Console models with built-in loud speakers. Beautiful, genuine mahogany and walnut cabinets. All sets at amazingly low prices.

SEND FOR BOOK TODAY
Send letter or postal, and this bargain radio catalog will come to you absolutely free. Write Today.

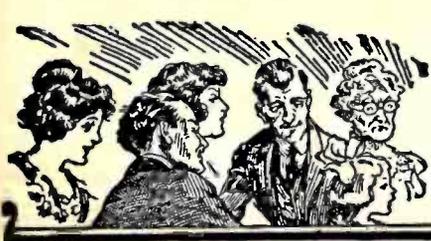
RANDOLPH RADIO CORPORATION
84 Union Ave. Dept. 226 Chicago, Ill.

SUBSCRIBE NOW!

Keep abreast of the times from Radio, Scientific and Mechanical Standpoints.

\$2.50 a Year

the choke through the space between the front and rear shields, and then soldered to the terminals of the jack.

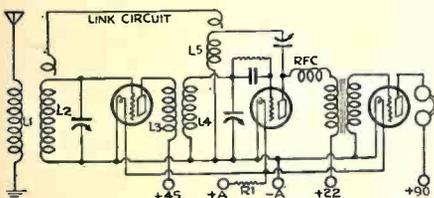


Pick-ups and Hook-ups by our Readers



THE material appearing under the title "Pickups and Hookups by Our Readers" in RADIO AGE, is contributed by our readers. It is a department wherein our readers exchange views on various circuits and the construction and operation thereof. Many times our readers disagree on technical points, and it should be understood that RADIO AGE is not responsible for the views presented herein by contributors, but publishes the letters and drawings merely as a means of permitting the fans to know what the other fellow is doing and thinking.

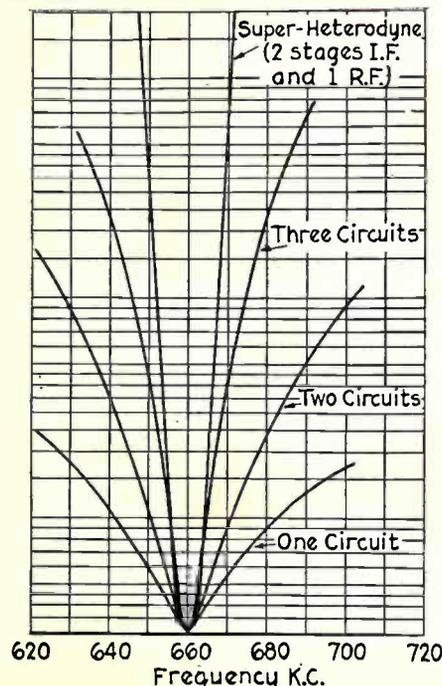
NOT long ago one of our readers, Gilbert D. Dust, R. R. 6, Dallas, Texas, sent us a circuit arrangement which he has found very satisfactory and which in the original form of submission appeared to be a very complicated circuit. However, a little analysis finally evolved the diagram which follows:



As will be seen this is one stage of radio followed by a regenerative detector and one stage of audio (though in Mr. Dust's sketch two stages of audio were shown). The link circuit shown in this diagram is interesting and might be duplicated by experimenters for their own information and satisfaction. The constants for the set are simple: L1 is the primary coil, consisting of about 10 turns of wire; L2 is about 35 to 40 turns, depending on the variable used; L3 is the primary of the RF coupler and has 10 turns while the secondary, L4, has about 35 to 40 turns; L5 is the regenerative coil of about 25 turns. All coils except the regenerative coil, are wound on a 3½ inch tubing with No. 20 DCC wire; the regenerative coil is wound on a 2½ inch tube with No. 24 DCC wire. If you already have an antenna coil and a three circuit tuner you can hook them into this scheme. The link circuit is but a piece of No. 18 DCC wire looped around the secondary coil four turns

from the grid end and carried over and looped over the top of the regenerative coil, L5. Probably the link circuit permits a semi-regenerative condition in the first RF tube. At any rate it is interesting and what's more the log which Mr. Dust furnished us is both lengthy and indicative of considerable skill in DX hunting.

RELATIVE selectivity of the different types of sets in use is very aptly illustrated in the accompanying diagram which is excerpted from a recent article on the progress during 1926 of radio receiving sets written by Dr. Alfred N. Goldsmith.



In the diagram it is assumed the receiver in each case is tuned to a frequency of 660 kilocycles (455 meters). The signal field strength required to produce a standard signal of comfortable intensity in the loudspeaker has

been plotted as the ordinate of the curves at this point. As the signal frequency is altered (leaving the receiving set unchanged) the corresponding field strength to produce the same standard signal in the loud speaker are plotted.

As will be seen, the single-circuit receiver requires but little increase in the field strength of an undesired signal, as much as 50 kc. removed from the original frequency, to cause the loudspeaker to reproduce it with standard signal strength. The two-circuit receiver, on the other hand, requires a considerably greater field strength of an interfering signal 50 kc. off the desired frequency to produce an equal disturbance.

When the selectivity curve for the three-circuit receiver is examined, it will be seen that signals as much as 50 kilocycles removed from the desired frequency will be practically excluded unless their intensity is extremely high. This is true in even greater measure for a super-heterodyne receiver with one stage of tuned radio frequency and two stages of intermediate frequency tuning. Under present broadcasting condi-

Cruel Treatment

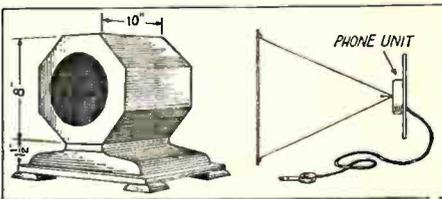


"An' what's more, if I catch you fighting again I'll make you listen in to the bedtime stories every night on the radio!"

tions, the ideal curve would be a flat-bottom curve with vertical sides, the width of the bottom being 10 kilocycles (and extending from 655 to 665 kilocycles in the case under consideration). In all the preceding curves, receivers having high efficiency radio frequency tuning stages, electrically separated from each other by one-way amplifiers, have been assumed.

It is clear from the preceding that the trend of receiver design, based on present-day selectivity requirements, has set strongly toward multi-tuning-stage amplification (at radio frequencies and intermediate frequencies).

JOSEPH WEIGHTMAN of Middletown, Ind., makes a simple cone speaker by means of soldering a lug to the center of a common headphone unit, and attaching it to a cone of parchment paper. The housing may be any form, the sketch below showing the kind preferred by Mr. Weightman.



HAROLD E. TAYLOR, 1365 Cass Ave., Detroit, Mich., writes to inform us of his results with the Clough 7 tube super published in the January issue of this magazine. He tuned in successively KPO and KFI and also WHB, while within three miles of WWJ. He arranged the audio end so that the output of the first stage of audio led to the input stage of a Western Electric 6025-B power amplifier. He also found that from an analysis of the oscillator readings his long wave transformers were peaked at approximately 44 kilocycles. (The manufacturer peaked these transformers at 55 kilocycles.) Perhaps a difference of tube capacities would affect the frequency shift; also the proximity of the intermediates to other metallic objects. Other readers have been playing with the Clough 7 tube super and report extremely good results.

FREQUENTLY we have been asked by readers to give them data on the construction of intermediate transformers. This is a subject that is rather touchy with us since we have found as a general rule that satisfaction is not obtained by the reader when making his own intermediates and the failure on his part is reflected back upon the staff of the magazine. So as a consequence we do not recommend that readers make their own intermediate coils. So many factors can enter into the makeup of these units that if a well equipped laboratory has a hard time in keeping accurate matching of inductance values, what chance has the poor home constructor with limited apparatus to manufacture what must of necessity be a precision piece of apparatus. If members of the staff would not care to tackle the construction of intermediates then we feel we would be derelict in our duty if we intimated that readers might be successful in making their own. It might be perfectly well for a man to make his own mission rocker, or even a davenport, but few individuals would be successful in making their own alarm clock or watch.

BEN SINEFSKY, Box 73, Rothschild, Wis., is one of the first of our readers to report by letter excellent results with the World's Record super 8 which was published in abbreviated form in the November, 1926, issue, and elaborated upon in the January, 1927, issue of this magazine.

Likes Science

MELLON ENGINEERING CO.
Pottstown, Pa.
Jan. 26, 1927

Radio Age, Inc.,
500 N. Dearborn St.,
Chicago, Illinois
Gentlemen:

I wish to tell you that I like the new sections of your magazine. "Keeping Step with Science" and "Everyday" Mechanics", very much. As a whole I think your magazine is one of the best on the subject of radio. However, I'd like to see more articles like "How a Variable Condenser Affects your Set Tuning" by Kirk B. Morcross.

Your faithful Booster,
(Signed) Ralph Mellon

Static and Statistics

(Continued from page 18)

what his geographical location, who hasn't at some time in his career heard KDKA. In our own early days it seemed that the first week the triumphant cry was, "I've got Pittsburgh," and the second week, "I can't get anything but Pittsburgh." True, at that time, due to its reputation as our most exasperating fader, no one in our vicinity ever thought of receiving all off a program from KDKA, but in this era of tremendous power, and receivers which amaze us by their performance, the fading is reduced to a minimum, and it is now possible to spend an evening with the Pittsburgh station with as good reception as any other equally distant broadcaster. At times, in fact, they register with such volume that it is either a case of turning them out or getting out of the house, and if there is anyone in South Africa who hasn't heard the Westinghouse Band, when the engineers are trying to get it there, he would do well to check up on his set.

One is constantly running across some interesting experiment when tuning in on this station which would relieve the monotony, if such a thing could exist where such a versatility of broadcasts is going on from the various studios from morning till night. And the many educational and informative programs that are continually going on the air are as familiar to the average listener as the murky condition of the atmosphere surrounding KDKA's antennae. One notes a painstaking thoroughness in everything they do. For instance when Pittsburgh gives football scores it isn't the results of a meagre dozen or more major games you hear—it's a sporting lexicon of every contest taking place on American soil that day. And so dependable are the news broadcasts from the Pittsburgh Post studio that when something of importance breaks, it is a common thing to hear, "Well, we'll wait and get it from Pittsburgh."

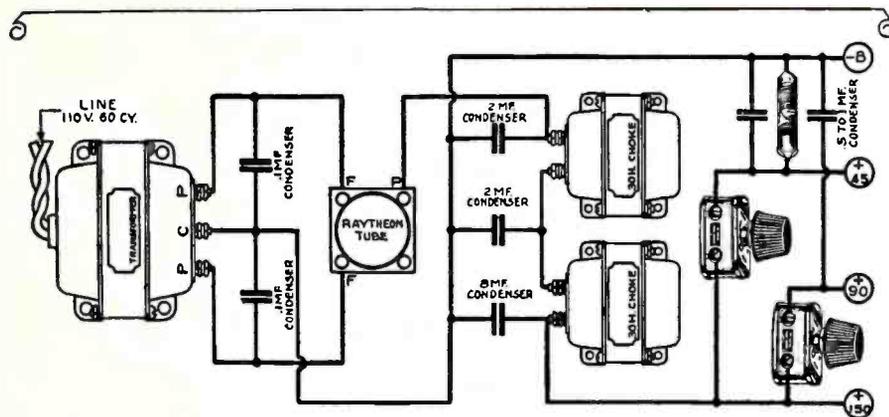
Our oldest friends among KDKA's standard features are the aforesaid Westinghouse Band and Victor Saudeck's Little Symphony Orchestra, the latter one of those sterling radio organizations that is always to be depended upon for sound presentations of standard works. In the days before the large symphony orchestras were put on the air we were indebted to this group for some of our most precious half-hours of musical enjoyment, and they still preserve their high standard.

In addition to its sustaining programs, KDKA presents a number of commercial features, one which has interested us being the Teaberry Hour, and in addition has its own combination of hook-ups, though whether this claim is to be continued under its apparent arrangement with the National Broadcasting Company is not entirely clear at the present time.

But whatever develops in this rapidly moving industry, one is confident that the pioneer station will go steadily on furnishing us with dependable entertainment as it did back in those primitive days when its audience was listening painfully through uncomfortable headsets instead of taking its ease before elaborate mahogany cabinets from which rolls music in tremendous volume. And one notes with much satisfaction that no matter how many pirates perch on the 309 meter wave, the Westinghouse station apparently just increases its power and comes roaring through as though it were alone on the air.

Openshaw Now With Pilot
MARTIN OPENSHAW, of Amperite fame, has resigned from the Radiall Company to accept the post as General Sales Manager of Pilot Electric Manufacturing Company, Inc., Brooklyn, New York.

Be Sure To Order
 YOUR APRIL COPY OF
 RADIO AGE NOW
 Startling Developments in
 Receivers Coming



Improve Your B-Eliminator with Allen-Bradley Resistors

WHEN you build a B-Eliminator, be sure that your kit contains Bradleyohm-E for plate voltage control and Bradleyunit-A for the fixed resistors. Then you will be assured of perfect plate voltage control.

Bradleyunit-A

PERFECT FIXED RESISTOR

This solid, molded fixed resistor has no glass or hermetic sealing in its construction. It is a solid unit, molded and heat-treated under high pressure, that is not affected by temperature, moisture and age. The end caps are silver-plated, and can be soldered without affecting the accuracy of the Bradleyunit. By all means, use Bradleyunit-A when you need a fixed resistor in your radio hookup.



Bradleyohm-E

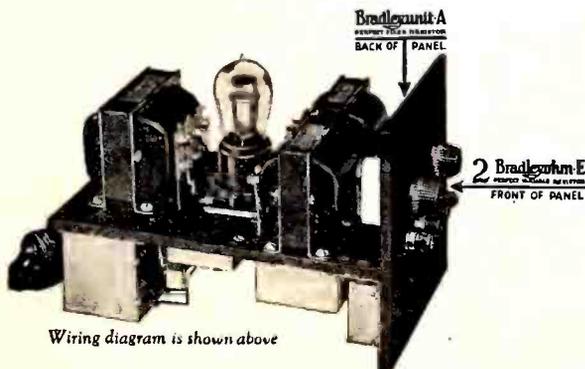
PERFECT VARIABLE RESISTOR

This oversize variable resistor is used as standard equipment for accurate plate voltage control by leading B-Eliminator manufacturers. The scientifically treated discs in Bradleyohm-E provide stepless, noiseless, plate voltage control, and the setting will be maintained indefinitely. Ask for Bradleyohm-E.



Always insist that Bradleyohm-E and Bradleyunit-A are included with your B-Eliminator kit. You then will be assured of perfect voltage control.

ALLEN-BRADLEY COMPANY
 289 Greenfield Ave. :: Milwaukee, Wis.



Write for
 Folder
 Giving Seven
 B-Eliminator
 Hookups.

Use Allen-Bradley Perfect Radio Devices

A Loop and Four Tubes

(Continued from page 6)

dragging in things. The builder must be as careful about his angles as a Chinese architect. The Chinaman builds his house without any regard to the line of the street because a certain position of the house will make it hard for the evil spirits to come in. Take a tip from the Chinaman or the goblins will get you. Parallel wires have an inductive effect upon each other when the current is flowing. To reduce induction to the minimum, wires should be at right angles.

Shielding often is used by amateur and professional set builders. The shields are metal plates or boxes and they are grounded so that any roving field of energy that is seeking a playmate may be intercepted and precipitated to earth.

The diagram shows no tuning coils, which proves that not all manufacturers and dealers put into a diagram everything that they have for sale. The variable condenser shunted across the loop takes care of the tuning. It is placed in the antenna or ground lead when the loop is discarded. A 50-turn coil or a vari-

ometer might be employed. It would be connected to the antenna and the ground wire, and the end next to the antenna would be connected with the grid of the first amplifier tube.

In order to secure satisfactory results with a loud speaker, it probably would be necessary to add two stages of audio-frequency, with one of the new power tubes in the last stage. Radio-frequency amplification builds up the weak signals to the point where they can pass the detector, but it does not increase the volume of sound as audio-frequency amplification does.

This is the set to build when the family declares itself to be sick of radio loud speakers, or when the family monopolizes the household receiver and prevent dad or the oldest son from hearing what they crave for. With the phones on and his favorite station tuned in, the constructor can let the rest of the world go by.

The diagram lends itself readily to the construction of a portable set. In the early days of broadcasting a Washington inventor built a set in a suitcase and it made a hit. With a collapsible loop, or one built in the cover of the case, such a receiver can be carried easily in an automobile, train or steamship. It might be very valuable as a means of keeping in touch with the stock market or produce exchange. Trucking and taxi concerns have used such outfits for the purpose of communicating orders to drivers, saving the time and mileage required for visiting or calling up a central office. They were successful, so far as one-way communication could be satisfactory, but it is impractical in these days of crowded airlines to equip trucks and cabs with transmitters to use in acknowledging receipt of orders, and drivers are as expert in using alibis as in using radio.

It is hardly necessary to tell the amateur who has worked his way up to a four-tube set that the selection of parts is highly important. The best are the cheapest in the long run or in the short run either. Good work-

manship is essential to success. A one-tube set may work after a fashion even if it is thrown together, but when three stages of radio-frequency are employed, every connection must be made with care so that it will be non-microphonic. The tubes must be cushioned so that slight jars will not set the bells a-ringing. Wires must be as short as possible and must be placed at angles that will minimize inductive effects and effects of capacity. Panels must be of excellent insulating quality. Necessary marks on panel and baseboard must be scratched, not made with a pencil. A pencil mark makes a good grid leak but it can do a lot of damage when it connects parts that should not have a conductive pathway between them.

An extra ground wire may reduce interference. Four miles from America's strongest transmitting station an experimenter ran out a wire from his six-stage radio-frequency amplifier and laid it on the lawn. After that he was able to hear stations that formerly were drowned out by interfering waves from the powerful station. These were so strong that at times they made the loud speaker diaphragm throw a stream of air that would blow out a match, while the speaker bellowed like a factory whistle.

Four tubes provide an opportunity for endless experiments and valuable discoveries may be made. Resistance or capacitive coupling may be used in place of transformer coupling. Different types of tubes may be tested in all sorts of combinations. A four-tube set should be able to bring in the European broadcast stations when the radio weather is good.

Constructors who enjoy the building process more than quick results can design a four-tube set from the bottom up. Others will prefer to purchase a kit with diagrams and templates. Complete kits can be purchased from many manufacturers and dealers, with panels all drilled and everything included except what the packer forgot to put in.

PATENTED

SUBANTENNA!

The One Great New Thing In Radio



Amazing New UNDERGROUND ANTENNA

Eliminates All INTERFERENCE

Gets Distance Clearly.

Here you are, "Distance" fans! Install this new type underground "pick up system." Get distant stations loud and clear like local. SUBANTENNA banishes STATIC and all other air noises. Lets the broadcast come through clean.

Uses Filtered Ground Waves. Power line leaks, arc-light crackles, STATIC and all air noises are filtered out from the broadcast and grounded by SUBANTENNA before the broadcast reaches the set. The greater distance and clarity of your set will amaze you.

Nothing Else Like It. Not just a wire. Consists of special composition wire differently insulated and sheathed in a lead jacket and containing a series of three "building up" coils. Nothing else will do what SUBANTENNA does. Nothing else in the world like it.

FREE TRIAL OFFER! We want you to test SUBANTENNA. We want you to enjoy the thrill of loud, clear DX reception when your old aerial will give you nothing but STATIC and crackles. Write at once for FREE TRIAL OFFER and scientific explanation of SUBANTENNA. Write NOW!

CLOVERLEAF MANUFACTURING CO.,
2716-W Canal St., Chicago.

NEW YEAR - NEW IDEA

PATENT YOUR IDEAS

FREE Inventors Recording Blank
Confidential Advice. Send Sketch

Z. H. POLACHEK Reg. Patent Attorney
Consult. Engineer

70 WALL STREET, NEW YORK

Please Mention Radio Age When Writing to Advertisers.

DEPENDABLE RADIO EQUIPMENT

TRANSMITTING APPARATUS

A Complete Stock at "CHIRAD"

IN addition to our regular broadcast apparatus we carry a very good stock of transformers, chokes, grid leaks, high test condensers, etc., for transmitting purposes.

New Catalog Now Ready

Dealers and set builders, write for our new catalog and special discounts. Please address us on your business letterhead.

CHICAGO RADIO APPARATUS COMPANY
415 South Dearborn St.,
Chicago

CHIRAD—RADIO—CHIRAD

Bradleyometer

THE PERFECT POTENTIOMETER

Uses graphite disc resistors which are noiseless and not affected by atmospheric conditions. Metal parts are nickel plated. One hole mounting. Finish and knob match Bradleystat. Made in 200 and 400 ohm ratings.



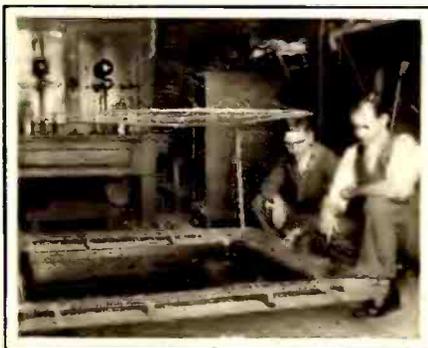
Allen-Bradley Co.

Electric Controlling Apparatus

289 Greenfield Avenue Milwaukee, Wis.

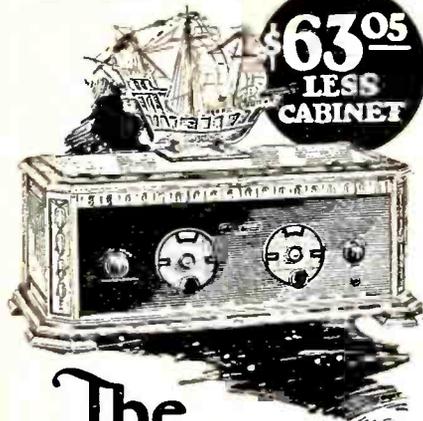


Above is shown the new Timmons Concert grand cone speaker, which instead of being an exact oval, is an elliptical cone, having its driving mechanism located at the lower focal point of the ellipse. Offsetting the driving unit, it has been determined by the Timmons Radio Products Co., results in securing a much greater surface for actuation with a limited physical dimension of the cone itself. Recent tests by the staff of RADIO AGE have shown it to be equal to, if not better than, our laboratory criterion.



Protect Oil Fields From Lightning

Protection of oil fields from lightning is believed by western oil men to be assured through the scientific researches of John Milton Gage and his associate, Dr. Alfred Walter Simon, of Los Angeles. By means of wire devices encircling the oil tanks, the inventors hope to ward off the shafts of lightning and save millions of dollars for the oil companies of this country. Gage is the inventor of the apparatus. Netting above the pool of oil built into the experimenters' laboratory at Los Angeles represents thunder clouds. John Milton Gage (right), points at "protection wires" which in the laboratory experiments fend off the shafts of lightning from above



The Fullest Value in Radio

— plus the joy of building it yourself

WONDERFUL as the Hammarlund-Roberts Receiver was in 1926, when over 70,000 were built at home with uniform success, this year finds the New Hi-Q* Set incorporating many features which make it even finer value than ever before!

One interesting advance is complete shielding which prevents coupling between stages and eliminates oscillation. Another is Automatic Variable Coupling—a new feature which gives maximum and equal amplification over the entire tuning range. Its circuit is a marvel of efficiency and all parts are matched.

The result is a quality of TONE—a degree of VOLUME—and a keenness of SELECTIVITY which are a distinct radio achievement.

Anyone can build the New Hi-Q* Set at home and save money. Follow simple instructions in the "How to Build" book and in a few hours have a radio equal to \$150 to \$200 factory-made units of similar efficiency.

Parts Complete **\$63.05**
(Less cabinet)



The most complete radio instruction book ever written.

Get a copy from your dealer today or send 25 cents direct.

Hammarlund ROBERTS Hi-Q

*High ratio of reactance to resistance. High ratio—Great selectivity—Loud Signals.

HAMMARLUND-ROBERTS, Inc.
1182-D Broadway, New York City

\$75 A WEEK BUILDING RADIO SETS

In Your Spare Time

Join the Radio Association of America. Learn how to build and repair sets. The Association will train you—start you out in business, if you wish. Be the radio "doctor" of your community. \$3 an hour upwards easily made.

Earns \$500 in Spare Time

"I have at last found myself", writes Lyle Follick, Lansing, Mich. "I have already made over \$500." Werner Eichler, Rochester, N.Y., "... have made over \$50 a week in my spare time." Our members are starting radio stores, increasing their salaries, securing better positions, passing radio operator examinations, earning big money in spare time.

Join Association Now

Are you interested in Radio for pleasure or profit? Join now because we have a Special Plan whereby your membership need not cost you a cent. Only limited number of these memberships acceptable. Write now for details—before it is too late.

Mail this Coupon—

Radio Association of America,
Dept. RA-3, 4513 Ravenswood Ave., Chicago

Send me details of your special Radio Association membership plan.

Name

Address

City

State

An Index to the Best in Radio Hookups!

HOW long have you postponed making that favorite hookup of yours because you couldn't find reliable and clear diagrams? We have laid aside a limited number of back issues of RADIO AGE for your use. Below are listed hookups and diagrams to be found in them. Select the ones you want and enclose 30 cents in stamps for each one desired.

January, 1925

- A Six-Tube Super-Het.
- An Efficient Portable Set.
- A Tuned Plate Regenerator.
- Making a Station-Finder.

February, 1925

- A Three Circuit Regenerator.
- A Real Low Loss Set.
- Blueprints of a 3-tube Reflex.

March, 1925

- A 5-Tube R. F. Receiver.
- How to Wind Low Loss Coils.
- A Short Wave Receiver.
- Blueprints of a Two-Tube Ultra Audion and a Regenerative Reflex.

April, 1925

- A 3-Tube Portable Set.
- "B" Voltage from the A. C. Socket.
- An Amplifier for the 3-Circuit Tuner.
- Blueprints of a Five-Tube Radio Frequency Receiver.

May, 1925

- A "Quiet" Regenerator.
- How to Make a Tube-Tester.
- A Unique Super-Het and an Improved Reintartz.
- A Six-Tube Portable Receiver Illustrated with Blueprints.

June, 1925

- Reducing Static Disturbances.
- A Seven-Tube Super-Heterodyne.
- Browning-Drake Receiver.
- Overcoming Oscillations in the Roberts Receiver.

July, 1925

- Learning Tube Characteristics.
- How Much Coupling?
- Blueprints of Conventional Radio.
- Symbols and Crystal Detector Circuit.

August, 1925—50c per copy

- How to Attain Smooth Tuning.
- Alternating Current Tubes.
- Deciding on a Portable Super.
- And a big 60-page blueprint section.

September, 1925

- Thirty-one ways to prevent self-oscillation.
- Tuning efficiency with two controls.
- Ideal Audio Amplifier Circuits.
- Blueprint section.

October, 1925

- Auto-Transformer Coupling.
- Some Facts about Quality.
- An Improved Slide-Wire Bridge.
- Blueprints of Circuits Using Single and Dual Controls.

November, 1925

- A Good Audio Oscillator.
- An Efficient Short-Wave Transmitter.
- Blueprints—Adding R. F. Stages.

December, 1925

- Tuned R. F. and Regeneration.
- Radio Age Model Receiver.
- Inductive Gang-Control Receiver.
- Tuning with Chart Curves.

January, 1926

- Radio Age January Model Set.
- A Four-Tube Toroid Set.

- Power Supply Device—Blueprint Feature.
- Finishing Your Radio Cabinet.

February, 1926

- February Radio Age Model Set.
- Plug-in Coil Receiver.
- Universal Testboard—Blueprint.
- Eliminating Audio Distortion.

March, 1926

- Improving the Browning-Drake.
- Rheostatless Tubes in a Set.
- Which Type Intermediate?
- How to Make a Wavemeter—Blueprint.

April, 1926

- Shielding Your Receiver.
- Home Testing Your Tubes.
- Balanced Capacity Receiver.
- Several Sets on One Antenna.

May, 1926

- Short Wave Transmitter—Blueprint.
- Simplifying Battery Charging.
- List of European Broadcasters.
- Protecting your Inventions.

June, 1926

- Antenna Design.
- Simple Crystal Set.
- Improving the Neutrodyne.
- Golden Rule Receiver—Blueprints.

July, 1926

- Compact Portable Super.
- Short Wave Receiver.
- Shielded Golden Rule Set.

August, 1926

- Receiver, Transmitter and Wavemeter.
- Beginners 200 mile Crystal Set.
- History of Amateurs.
- Changing to Single Control.

September, 1926

- How to Make a Grid Meter Driver
- Short Wave Wavemeter
- Power Amplifier for Quality (Blueprint)

October, 1926

- Crystal Control Low Power Transmitter (Blueprint)
- Raytheon Design for A B C Elimination
- What Type Loud Speaker to Use
- Nine Tube Super Brings Back Faith

November, 1926

- Blueprints of the Henry-Lyford.
- World's Record Super With Large Tubes.
- How to Use a Power Tube in Your Set.
- Illuminated Controls on 4 Tube Receiver.

December, 1926

- Starting Radio with Crystal Set.
- Six Tube Shielded Receiver.
- Types of Rectifiers Discussed.

January, 1927

- Full Data on World's Record Set.
- Dual TC Receiver.
- Clough Super Design.

February, 1927

- Building the Hammarlund-Roberts
- Making a 36 Inch Cone Speaker
- Data on the B-T Power Six.
- Browning Drake Power Operated.

Radio Age, Inc., 500-510 N. Dearborn St., Chicago

See that screw

**A SCREW DRIVER
ADJUSTS AN X-L
IN CROWDER
PLACES**



XL VARIO DENSER
RESULTS in easier tuning, more distance, volume and clarity—greater stability. Indorsed by leading radio authorities. Model "N"
A slight turn obtains correct tube oscillation on all tuned radio frequency circuits. Neutrodyne, Roberts two tube, Browning-Drake, MoM urdo Silver's Knockout, etc., capacity range 1.8 to 20 micro-micro farads. Price \$1.00

Model "G"
With grid clips obtains the proper grid capacity on Cockaday circuits, filter and intermediate frequency tuning in heterodyne and positive grid bias in all sets.
Capacity range: Model G-1 .00002 to .0001 MFD., Model G-5 .0001 to 0005 MFD., Model G-10 .0003 to .001 MFD. Price \$1.50

X-L Push Post
Push it down with your thumb, insert wire, remove pressure and wire is firmly held. Releases instantly. Price 15c.
Also furnished seven to a strip. Nicely marked in white with seven standard markings. Price \$1.50.

Information on Request
X-L RADIO LABORATORIES
2424 N. Lincoln Ave. Chicago, Ill.

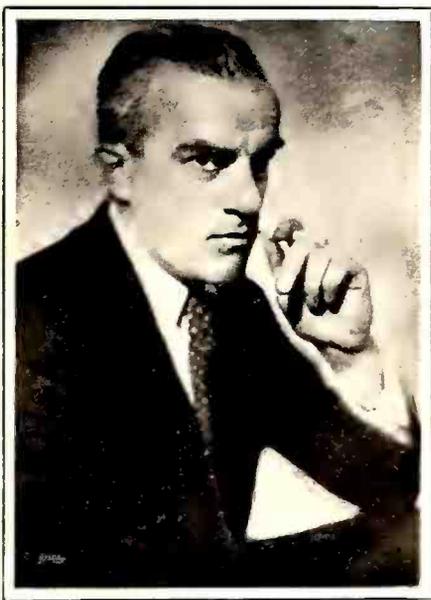
Free 60-page Reference Book

POLK'S REFERENCE BOOK FOR DIRECT MAIL ADVERTISERS
Shows how to increase your business by the use of Direct Mail Advertising. 60 pages full of vital business facts and figures. Who, where and how many prospects you have. Over 8,000 lines of business covered.
Write for your FREE copy.
R. L. POLK & CO., Detroit, Mich.
599 POLK DIRECTORY BUILDING
Branches in principal cities of U. S.

PATENTS

To the Man with an Idea

I offer a comprehensive, experienced efficient service for his prompt, legal protection and the development of his proposition.
Send sketch of model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.
My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.
Booklet of valuable information and form for properly disclosing your idea free on request. Write today
RICHARD B. OWEN, Patent Lawyer
81 Owen Bldg., Washington, D. C.
41-M Park Row, N. Y. City



He Talks to the Air

Arthur ("Bugs") Baer, newspaper and vaudeville humorist, who recently appeared in Eveready Hour program.
"Bugs" had his own private idea of how a radio announcer should disport himself between musical numbers of a program, so he was asked by Eveready Hour program directors to prepare his announcements as well as deliver them.

Good News for Radio Listeners

RADIO legislation of an adequate nature now seems assured with the agreement by congressional conference committees embodying the following provisions:

A commission of five members appointed by the President for a term of six years each. The commission will have original jurisdiction in granting, renewing and revoking all station licenses for a period of one year. Thereafter the Secretary of Commerce shall be the originating source, and only matters of a controversial nature appealed either by the Secretary or any party aggrieved will be handled by the commission. The Secretary of Commerce is given all administrative functions and full control over operators and their licenses. The act is to take effect upon passage and signature by the President. All commissioners must divest themselves of any radio interests or radio holdings. Broadcasters must sign a waiver of their right against the government to use any wavelength.

FRESHMAN AUTOMATIC CHARGER

Connects Right to Your Light Socket

\$15



NO MORE "A" BATTERY TROUBLES

Sold by Authorized Freshman Dealers Only
Write for new literature
CHAS. FRESHMAN CO., INC.
Freshman Bldg., New York

GET DISTANCE

\$1

AMAZING INVENTION FOR ANY RADIO

Why confine your radio programs to a few local stations when the expensive concerts, dance music and lectures of hundreds of big cities are ready for you? Connect this DISTANCE GETTER to your radio, tune according to instructions and presto—note the distant programs roll in! Satisfaction Guaranteed
Your money instantly refunded if you are not satisfied. The article on proper tuning, furnished FREE with each Distance Getter, alone is worth the price. Galloway of Chicago writes: "Results beyond all expectations. Cuts thru locals like a knife." Homes of Palos, Ill., says: "Send three more for my friends. I get Denver and California easily."

MAIL COUPON TODAY

HAZLETON LABORATORIES
4554 Malden St., Dept. RA, Chicago, Ill.
Send me Distance Getter, postpaid. Enclosed find \$1.00 (M. O., stamps or check).
Send C. O. D. plus small postage added.

Name

Address

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

"B" BATTERY ELIMINATOR

Only \$ **7.95**

MONEY-BACK GUARANTEE
No more worry with "B" Batteries! Hook up a Roll-O "B" Battery Eliminator and forget battery troubles forever. This wonderful new invention means better reception, sharper tuning. Gives you more real pleasure from your set.

Completely Equipped—No "Extras" to Buy
Operates perfectly on direct or alternating current, giving up to 90 volts current, and using the full wave of the power supply. Simple directions enclosed—anyone can plug it in to any kind of set up to six tubes. Constant voltage gives set more power. Costs no more than set of good "B" Batteries. Solidly built in beautifully finished metal case, with genuine Bakelite top.

SEND YOUR ORDER NOW
Don't blame your set because run down "B" Batteries won't let it work right. Order your Eliminator NOW. Write name and address on a piece of paper, pin a dollar bill to it, and mail it TODAY. Pay postman balance (\$6.95 plus a few cents postage) when he delivers your Eliminator. Use it ten days. If not more than satisfied, return it and get your money back.
THE ROLL-O RADIO CO.
Dept. T-2 3d & Sycamore, Cincinnati, O.

Amazing New 5-Tube Radio At Very Small Cost Improves Reception 100%

Lieut. Sterling G. Sears of the U. S. Naval Reserves has perfected a marvelous new 5-tube Radio that improves average home reception about 100%. Due to special features, this Radio is extraordinarily selective and powerful, easy to operate, very economical on Battery consumption—and costs only about one-third of the usual price of 5-tube machines. Perfect satisfaction absolutely guaranteed, and a 10-day Free Trial offered to all who wish to try it. Full information together with reports of tests made by experts will be sent FREE to all who write at once to Geo. W. Naylor, Jr., Dept. 316N, 161 Chambers St., New York City. Write today—no obligation!

CHELSEA

Send for Details on NEW Illuminated, Single Control Sets, Table and Console.

Chelsea Models \$26 to \$99.50. Write to-day!
Chelsea Radio Co., Chelsea, Mass.

Shield Your Radio Cabinet

Make your set selective and cut out your local stations. Our METALLIZED PAPER does the work better than individual shielding. It is easy to put on with ordinary glue. Enough for the inside of the largest cabinet, sent prepaid with full instructions for \$1.00. GUN METAL CO., Ave. K, Decatur, Ill.

MAR-CO Illuminated
back-panel controls
set the 1927 style.

Free Mailing Lists

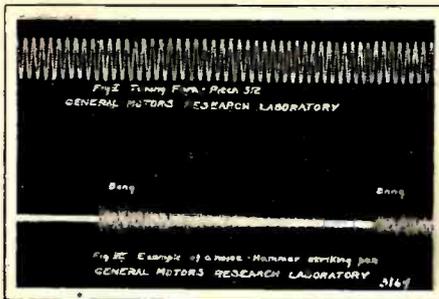
Will help you increase sales
Send for FREE catalog giving counts
and prices on thousands of classified
names of your best prospective customers—
National, State and Local—Individuals,
Professionals, Business Concerns.

99% Guaranteed by refund of 5¢ each

ROSS-Gould Co. 315 N. 10th St. St. Louis

Radio Is Used to Find Auto Noises

WHAT does the voice look like? Of course you have never seen it. But visitors to the General Motors building in Detroit recently were able to see projected upon a screen the sound waves their voices made. They saw, also, how General Motors has harnessed radio and put it to work to make better automobiles. It was a demonstration in popular form of the more delicate and elaborate apparatus used in the G. M. Research Laboratories for finding automobile noises.



What the microphone tells about a motor. Upper pattern shows a tuning fork vibrating at a pitch of 512 cycles. The lower pattern is that produced by striking on the pan of the car with a hammer. Note the change in the pattern at the moment of impact

Noises are sounds having irregular and complex waves. To study them, it is necessary to reproduce them faithfully on a photographic film, where they may be measured. The resulting data are used to trace the offending noise to its source. The apparatus used in the General Motors Laboratories consists of three distinct units:

1. The microphone.
2. The vacuum amplifier.
3. In the oscillograph a tiny spot of light reflected from the moving element vibrates back and forth across the photographic film revolving on a drum. After development the film shows a trace representing the wave form, intensity and pitch of the sound picked up by the microphone.

Ordinary radio equipment is not accurate enough for this work, and each of these devices must be specially built.

Noise hunting in cars is difficult because vibrations may be



Locating a vibrating tuning fork in front of a microphone as shown in this picture, gives the effect shown in the oscillograph pattern shown at the top of the smaller photo

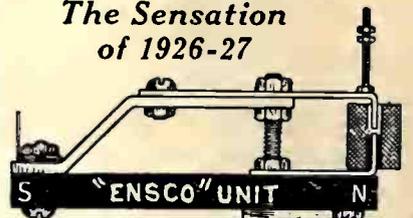
"telegraphed" from one member to another. There is always the danger that the wrong member will be accused of making the noise. It often happens, too, that when the real source is found, the changes necessary to remove it cannot be made. In such cases one or more of the members, through which the noise is being "telegraphed" to the air and the passenger's ears, must be changed so that they will no longer respond to the vibrations of the offending part.

MAKE YOUR OWN CONE OR ROLL SPEAKER

GENUINE ENSCO KIT

Only \$10

The Sensation
of 1926-27



MAKE YOUR OWN THREE FOOT CONE SPEAKER IN LESS THAN AN HOUR. Complete parts furnished in kit form. We guarantee this speaker the equal of any manufactured cone speaker at any price.

With this THREE FOOT CONE SPEAKER you hear all the tones. It brings out the true depth and beauty of orchestral and instrumental music. Can be operated softly for living room music or full volume for dancing, and without trace of distortion. Kit includes famous "ENSCO" cone unit, the only direct-drive, distortionless unit for large cones; Alhambra Fonotex for big cone, with brass apex, blueprints showing five different types of cone and roll speaker construction. All necessary instructions. Buy this wonderful speaker under our absolute guarantee. Your money back if you are not convinced that it is the finest reproducing medium obtainable at any price. It works on any set, with ordinary Tubes or with Power Output.

Send No Money!

Write your name plainly as indicated below, then mail and complete kit will be forwarded to you. Just pay postman \$10.00 upon delivery.

ENGINEERS' SERVICE CO.
25 Church St. (Desk A), New York City
WESTERN DISTRICT OFFICE AND
STUDIO
911 Steger Building Chicago, Ill.

Studies Three Inch Pieces of Light

A METHOD for cutting off three-inch pieces from a beam of light, like a meat cutter slicing a bologna sausage, though the light moves at 186,000 miles a second, was described to the members of the American Physical Society, at Philadelphia, by Dr. Ernest O. Lawrence and Dr. J. W. Beams, of Yale University.

Though light travels so fast it can encircle the earth seven times in a second, Dr. Lawrence and Dr. Beams made use of a shutter that turned the light on and off with such rapidity that each "piece" of light was only about three inches in length.

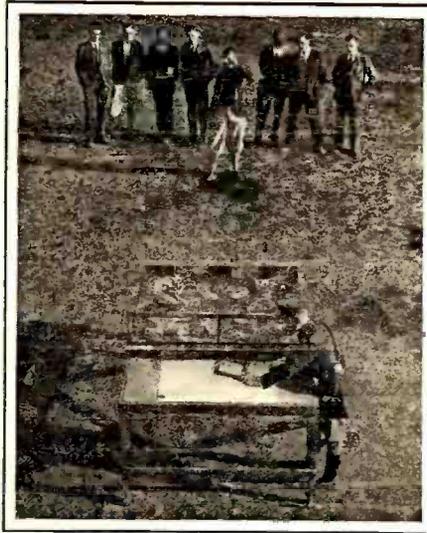
The investigation was undertaken in an endeavor to measure the length of what are called "quanta" of light, for according to modern ideas, light is transmitted as separate pulses, each of which is called a quantum. Physicists have been uncertain as to how long these quanta are, but by some it was believed that they were as much as a yard in length.

These extremely short flashes of light were measured by a very delicate photoelectric cell, which gives off an electric current when illuminated, and they found that so long as the total amount of light reaching the cell was the same, the resulting current was not affected by the length of the individual flashes. One three inches long produced as much effect as a piece of light many miles or more in length, and this shows, say the investigators, that the individual quanta are less than three inches in length.

Gurney with Ensco

MIL O GURNEY, formerly technical editor of Radio Digest, has opened a Western district office and studio of the Engineers Service Co., at room 911 Steger Bldg., Chicago, Ill.

This gives the Chicago area representation in a product—cone speakers—which are now attracting a good deal of attention from the radio fans.



War Map Indicates Gun Fire

War conditions in miniature are now produced on a map built by Major Fred B. Englis and Capt. Fay B. Prickett, of the Princeton Military Science Dept., for artillery students in the University's Reserve Officers Training Corps. The map represents a terrain about four square miles. The student officer views the map through field glasses, gives his firing data to the battery and at the word "Fire," a puff of smoke, like that of a bursting shell appears on the spot indicated by the firing data. Photo shows a student viewing the map and giving the firing data to Major Englis, shown regulating the battery fire on the map

No Guess Work about voltages



from the Bremer-Tully B-POWER UNIT

There are no variable resistances—no knobs to turn. You simply "plug in" on the panel according to the number of tubes. Nothing else to do except turn the switch. Capacity 150 volts at 60 mils.

Price \$49.50 complete with Raytheon tube.

Send for Better Tuning. 11th Edition which tells about B-Eliminators as well as Counterphase Sets, Kits, Parts, etc.

BREMER-TULLY
520 So. Canal St.,
Chicago, Ill.

SUBSCRIBE
TO RADIO AGE NOW
\$2.50 A YEAR

OPERATE YOUR RADIO FROM LIGHT SOCKET for 6³⁹



Only \$1 Down

AMAZING INVENTION ELIMINATES "A" BATTERY TROUBLES

Why take your battery out to be charged or bother with chargers when for a small sum you can convert your set into an electrically operated radio? By connecting with your present A battery as an accumulator your A battery current can be drawn right from the light socket. You can secure more volume, get distance easily, and never have to worry about your battery going "dead." Electrically-operated radios are the latest improvement, and are recommended by the leading radio authorities.

OPERATES 1 TO 15 TUBE SETS

Has separate binding posts so that it is equally effective for large and small radios. Completely equipped with cord, plug, and ready to connect to your present set. Battery must be used for accumulator (your present 6 volt battery is all right.) Just make a few simple connections and in two minutes you can forget about your A current supply. No changes need be made in your set.

FULLY GUARANTEED

Your Money Back If Not Satisfied
The laboratory has expended years of research to make this pleasure possible for you. The high cost of electric operation is now wiped away and everyone can now enjoy the superior results of this up-to-date invention. You will be delighted with the volume and distinctness of your radio programs.

MONARCH MFG. CO., Dept. RA.
4554 Maiden St.,
Chicago, Ill.

Send at once your A Battery Device.
Enclosed find \$1.00. I agree to pay postman balance amounting to \$5.39 plus postage.

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

SOMETHING NEW IN RADIO



You need no longer delay your purchase of a high quality receiving set. With "New Idea" you may now buy as you go and decorate the cabinet to express your individuality. The complete Art-Cabinet model may be purchased much as you would a sectional bookcase.

You can start with the Rinke CX-6 tube tuned radio frequency receiver, purchased on a ten-day trial basis. This may be used as an ordinary table set. Price \$75.00.

You may then add a portable case, which provides a space for your own name, for only \$12.50.

Next comes the New Idea Art Cabinet as shown in the illustrations, with a full set of beautiful panel decorations. All panels being removable, you may use plain cabinet or decorate with pictures, tapestry, needlework, etc. The panel decorations being interchangeable, you will never tire of this beautiful cabinet. \$57.50.

Each unit sold separately — particulars on request. Your satisfaction guaranteed or money refunded within ten days. Buy from agent or order direct from factory.

(Agents, please write for our ProPosition.)



The New Idea Radio Co.

3658 W. Grand Ave.
CHICAGO

Fish Paralyzed

ONE of the latest freaks displayed by lightning is the paralysis of fifteen fish reported to the U. S. Bureau of Fisheries from one of its stations in Maine. After a severe thunderstorm the fish were found lying in the bottom of the pond apparently lifeless. After raising them to the surface it was found they could move their heads but the bodies were paralyzed. After several days their condition was unchanged. The other fish in the ponds were affected only by a loss of appetite for a couple of days.



Thousands of friends of Jack Nelson will be interested in learning that the famous studio star is taking a rest from active duty and that he has severed his connection with the Mooseheart-Palmer House-Edgewater Beach Hotel-Herald and Examiner station, known rather cursoriously over the air as WEBH and WJJD. The four-ply radio station was not the best background for a man of Jack's ability in any event. Where so many interests are combining, perhaps for reasons of economy, to present programs, there is likely to be a tendency toward a lack of individuality. Jack is nothing if not individual. He was the pioneer who made WDAP famous five years ago. Radio listeners will be glad to have him back on the air where he can have more latitude and do his stuff in his own way

Prof Gets Mike Fright

A college professor, trained in speaking, recently took fright at the microphone of WGY and found himself speechless. He was scheduled to deliver a ten minute talk between selections by a high school chorus of fifty voices. The young people left the studio as the speaker was being introduced by the announcer. The professor went to microphone but no sound came and he began to wave his arms in signal of distress so the announcer cut the microphone off.

"Bring the chorus back in the studio," begged the professor.

So the young people were herded back and the professor began his talk, confidence returned with the atmosphere of the school room.

HERE IT IS! Marvelous Townsend "B" ELIMINATOR (Complete)

only
4.95
\$1.00 down
Balance C.O.D.



Direct From Factory
at Lowest Price on Record

Great news! For half the price of a set of "B" batteries you can now enjoy greatly improved reception and be done with unreliable "B" batteries. We make the Townsend "B" Eliminator complete in our own factory. That's the reason we can give you at such a remarkably low price a high quality instrument backed by a real guarantee. Users report splendid results. A fine "B" Eliminator at the lowest price on record. Our 10 days Free Trial proves it.

**10 Days
FREE
TRIAL**
You are the
Judge.

MONEY BACK If Not Amazed and Delighted
You alone are the judge. We could not afford to make this guarantee if we were not sure of the Townsend "B" Eliminator's splendid performance. Delivers up to 100 volts on any set up to six tubes, on direct or alternating current—any cycle. Gives full wave rectification. Full tone, clarity and volume.

Rush Order Today Simply put your name and address on a piece of paper, pin a \$1 bill to it and get it into the mail at once. Your "B" Eliminator will be sent you promptly. Deposit \$3.95 only with the postman. Try out for ten days—then if not thrilled by improvement in operation, return Eliminator to us and purchase price will be refunded in full. You don't need to put up with battery nuisance another day when it is possible to own a "B" Eliminator at this startlingly low price. Send for it today.

Townsend Laboratories, 713 Townsend St., Dept. 31, Chicago, Ill.

RADIO We want to hear from hard-hitting radio dealers operating live-wire stores who want to make the best jobber connection in America.

DEALERS

Our eight big warehouses furnish you with the finest products in radio. And we ship fast.

WANTED

Write today on your letterhead for big catalog of nationally advertised lines. Ask for L 1009

WAKEM & McLAUGHLIN, Inc.
225 E. ILLINOIS STREET, CHICAGO, ILL.

World Record Fans

For the benefit of those interested in the World Record Super which has recently been described in RADIO AGE, we have set aside a limited number of November, 1926 and January, 1927 issues. These may be secured for thirty cents apiece. They contain full details on all of the work done with these supers.

A higher priced, higher quality, model is shown in the blueprint section of this issue—it may also be secured for thirty cents.

Radio Age, Inc.,

500 N. Dearborn Chicago, Ill.

(Continued from page 15)

belle of Belvidere, and smile inscrutably into the camera, almost unbelievably scornful of the two gun with which Looney Luke had him covered! Isis was over there now, waiting to share in the triumph of the final rehearsal. Officers of Apollo Pictures, Inc., were in the eager gallery of spectators. Apollo Pictures had hastened Bill through his novitiate, spurred on by the fact that the only other available actor-rider recently had lost his health by habitually leaving ginger ale out of his rickeys and the starving nation was crying for more blood and sand and sage brush.

When all was ready Bill's tall figure straightened as if galvanized. His eye flashed as he took an extra hitch in his belt and slapped the dust out of his chaparros. Stepping forward in his first major movement of his symphony he placed his right foot upon a grape fruit which had been lost by a screen-mad little girl from Indianola, Ia. The grape fruit emitted a damp hiss but it was too late. This trivial mishap so modified Bill's leap that instead of jumping upward at an angle of 82 degrees he jumped horizontally.

Percival, the grand old roan of the silver sheet, caught Bill on his starboard midriff. The horse grunted horridly and then, turning about and seeing Bill lying cold upon the synthetic desert sands the faithful old fellow walked over leisurely and stepped, once, on Bill's face.

Upon departing from Los Angeles Bill Rossom went directly from the hospital to the railroad station. He was accompanied by Isis Osiris, who had nursed him through his convalescence, with the aid of the hospital doctors and nurses, and who was now to follow him to the world's end, if need be, for she had surrendered her heart and her hope of a career at the same time.

Nobody in Fortunatus knew the true story of this chapter in Bill's life, with the exception of Bill and Isis. Bill never thought it necessary or in good taste to speak of it and Isis had no opportunity to do so,

for as soon as Bill began to make really important money Isis spent her winters in Florida and her summers in Switzerland.

As Bill stopped at the cashier's desk of the hospital to pay his chits he was mildly surprised at the obsequious way in which the cashier handed him the bad news. Secretly he had been worrying lest his adventure should have made him the butt of ribald or college humor. But there was no lurking smile behind the courtesy and deference of the cashier. As Bill and Isis strode along the train platform at the station, porter after porter bowed as porters bow only to the truly great. Once started on their journey the Pullman conductor asked Bill if he would not prefer to change his drawing room to one with a southern exposure.

"There is something wrong somewhere," mused Bill. "Whom do these people think me to be?"

Isis looked across the tiny compartment at him, the dawning of a great idea playing upon her countenance.

"I've got it, Bill," cried Isis. "It's your face."

She handed him her mirror and for the first time since Percival stepped on him Bill looked upon the image of his countenance. It was the face of a master of men. The horse's foot had raised his brow and widened it. His eye, formerly pleasant, now, under over-slung brows, had a malevolent expression which made him catch his breath. His mouth, once ordinarily good, had been kneaded into an expression of grim determination and abysmal cunning. It was such a mouth that must have been the first to say: "They shall not pass." His nose, once Greek, was Roman.

"I see," exulted Bill Rossom, hurling aside the mirror, "I see, I see."

Hours later, as the train went around a bend, Bill and Isis caught a glimpse of distant skyscrapers, hundreds of them, etching a jagged skyline.

"Fortunatus!" whispered Bill. "I will play on that town like a fiddle."

A KICK IN THE FACE

transformed Bill Rossom from a third rate movie actor into a master of men—

This startling metamorphosis is but one of the thrilling events in the absorbing serial, "The Froth Estate," by Joseph Balsamo, now running in RADIO AGE.

A big circulation war between powerful newspaper interests; a gigantic tussle in which no weapon is barred nor money spared to insure the defeat of the newcomer in the field.

Read the April issue of this magazine for details of a plot undreamt of in the annals of newspaperdom.

Place your order now with your newsdealer for the April edition; or better still turn to page 51 where you will find a handy subscription blank. Fill it in now to make sure of your getting each installment of this galvanic narrative, the first of its kind ever published in the world.

500 N. Dearborn St. **RADIO AGE, Inc.** Chicago, Ill.

Absorption Circuit Used to Rid Super of Repeats

Experimenters May Find Solution of Their Problem in Recent Patent

ONE of the most interesting circuit arrangements, from an experimental standpoint, is disclosed in the recent application granted by the patent office to William F. Diehl, of Jamaica, N. Y., on a method of coupling an absorption circuit to the oscillator of a superheterodyne to eliminate repeat points in its operation.

Application was filed on December 19, 1924, and granted on November 30, 1926. The description given herein is taken from the claims in the Diehl papers.

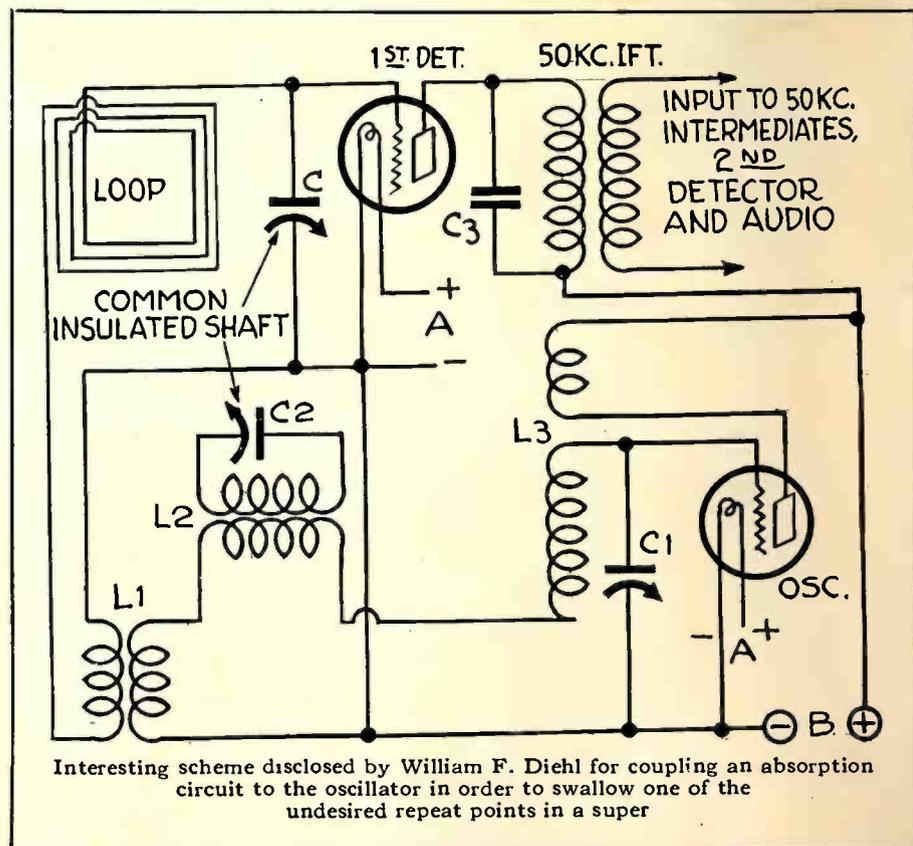
In the conventional superheterodyne the oscillator creates a locally generated current, which when combined with the signal current (incoming from the loop or antenna) gives in the plate circuit of the first tube, a current of intermediate frequency. This plate circuit is tuned to the intermediate frequency by the capacity C3 across the primary of the intermediate transformer, and passes through amplification into the intermediate stages where it is finally detected and amplified by audio transformers. The frequency of the current supplied to the intermediate amplifier is equal to the difference in frequency of the signal current coming into the loop and that current generated by the oscillator. From this it will be seen that the same value of intermediate frequency will be obtained for two values of frequency in the oscillator circuit. This circuit can be set to generate either a higher or lower frequency than that of the incoming signal, resulting in the appearance of a given station's signals in two positions on the oscillator dial. This has been considered an objection-

able feature of the super, and the method outlined by Mr. Diehl is advanced to eliminate one of the repeat points, by the following improvement:

A third circuit is added to the conventional super, consisting of L1 and L2 in the schematic on this page. L1 is the usual pickup winding, while L2 is a tuned absorption circuit. This absorption circuit is coupled electrically to the oscillator circuit, and mechanically coupled to the loop circuit through a common insulating shaft for the rotors of the capacities C and C2.

Assuming a received signal of 1000 kilocycles, an intermediate frequency of 50 kilocycles; the conventional super would receive with an oscillator setting of either 950 or 1050 kilocycles.

With the addition of the absorption circuit which is tuned to 1050 kilocycles, resistance will be introduced into the oscillator circuit at 1050 kilocycles and prevent oscillation at that frequency, leaving, however, the 950 kilocycle oscillation required to mix with the incoming signal. Or the absorption circuit may be set for 950 kilocycles so that with this setting resistance is increased at 950 kilocycles in the oscillator, stopping its oscillation at that value, and letting the 1050 kilocycle oscillation go through unimpaird. The values of intermediate frequency are merely illustrative. The system should work with any of the commercially made long wave transformers. The degree of efficiency with which the system



Interesting scheme disclosed by William F. Diehl for coupling an absorption circuit to the oscillator in order to swallow one of the undesired repeat points in a super

works will depend a great deal on the care with which the absorption circuit L2 is made. The portion of the absorption circuit which is spanned by C2 should be approximately equal in inductance to the value of the grid tuned inductance in the oscillator. Its coupling primary may be of approximately five to ten turns, the exact value being found by the individual experimenter. The coupling coil L1 may be any type of winding, about five to ten turns per coil. Capacity C2 should be equivalent to that of C1 in the oscillator circuit.

As yet this system has not had any commercial application of which we know, but from the tinkerer's viewpoint it will serve to while away the hours at the workbench, making up the coupling units to work best for absorption purposes.



Here is "Doctor" Glenn and his patient Mr. Ford. When the Famous Lullaby Boys arrived in Cincinnati to broadcast over WLW, the Crosley station, big Ford was ill and some of the first of their programs were broadcast direct from their hotel, where Ford remained in bed

Ancient Living Cells Found in Cactus Plant

WHAT are perhaps the oldest living cells in the world have been discovered by Dr. D. T. MacDougal, of the Carnegie Institution of Washington, in the stems of some of the giant cactus plants on the Arizona desert. These remarkable Methuselaha among living cells are certainly more than a hundred years old; some may be two hundred years old. All living creatures, including man, are composed of tiny living units which can be seen under powerful microscopes. These are the



Navy Has Private Hospital for Sick Carriers

Chester Brackhausen, trainer at the Anacostia pigeon loft, is shown giving first aid to "Endurance," one of the birds carried on the Alaskan Mapping Expedition and also a veteran of the A. E. F., having served as a carrier during the World War. "Endurance" is one of the prize birds of the thousands of carriers trained at the naval air station for use in the service. Anacostia has the largest training loft for carrier pigeons in the United States

cells. Although men may live a hundred years or even a little longer, the living cells of the muscles and the blood and other tissues usually die from time to time and are replaced by new cells. Only in the nervous organs, including the brain, is it probable that individual living cells last during the entire life of the body. In the body of a very old man a few brain cells may be as old as he is and almost as old as the cells which Dr. MacDougal has found.

Young Sea Worms Fathered by Live Wire

FIRST stages of growth of the eggs of a common sea worm, Nereis, have been produced in the laboratory, with no other father than an electric wire, by Dr. Ware Cattell of Memorial Hospital. The work was done at the marine biological laboratory at Woods Hole, Mass.

Dr. Cattell placed egg-bearing female worms in dishes of sea water, and turned an electric current on them with specially designed apparatus. The shock caused them to discharge their eggs, which were subsequently found to be acting as though they had been fertilized in the normal manner with the male elements. A part of these

electrically activated eggs carried on growth as far as the earlier stages of larval life.

During the past few years, unfertilized eggs of many species of animals have been caused to develop, sometimes to advanced stages, by chemical treatment, heating, pricking with needles, and a number of other stimuli; but the present experiment is the first in which an electric shock has performed the function of parenthood.

SM Freaks Or Fundamentals?



S-M audio and output transformers have enjoyed the same phenomenal popularity as have other S-M products—simply because every feature of their design is based upon fundamental engineering practices.

As an example, the primary impedance of an S-M 220 audio transformer (the factor which governs the "flatness" of the frequency versus amplification performance curve) is the highest of any known transformer. It is 19,000 ohms at 30 cycles—626,000 ohms at 1,000 cycles.

The factor that results in high primary impedance—and uniform amplification—is the high primary inductance. High primary inductance is the direct result of a large number of primary turns and a large core of high grade steel. The primary inductance of an S-M 220 is 100 henries, under operating conditions. It is the highest of any known transformer.

Therefore, remember when you buy an audio transformer that uniform amplification from 30 cycles up to 5,000 depends upon primary impedance, this upon primary inductance, this in turn upon a large core and many turn windings, and these upon the physical size of the transformer.

There is no short cut of good engineering to real quality. That is why the S-M 220 audio, the design of which is not a feat in mathematical juggling, but an application of sound engineering, is guaranteed to give you better quality than you've ever heard before. That's why the return average under this unheard of guarantee is but one in every four thousand.

SILVER-MARSHALL, INC.
850 W. Jackson Blvd.
Chicago U. S. A.

Correct List of Broadcast Stations

KDKA	Westinghouse Electric & Mfg. Co. E. Pittsburgh, Pa.	309	KFSD	Airfan Radio Corp.	San Diego, Calif.	246	
KDLR	Radio Electric Co.	Devils Lake, N. D.	231	KFSG	Echo Park Evan. Assn.	Los Angeles, Calif.	275
KDYL	Intermountain Bdestg Corp.	Salt Lake City, Utah	246	KFUL	Thomas Groggan & Bros.	Galveston, Texas	258
KFAB	Nebraska Buick Auto Co.	Lincoln, Neb.	341	KFUM	W. D. Corley.	Colorado Springs, Colo.	240
KFAD	Electrical Equipment Co.	Phoenix, Ariz.	273	KFUO	Concordia Seminary.	St. Louis, Mo.	545
KFAF	A. E. Fowler.	San Jose, Calif.	217	KFUP	Fitzsimmons General Hospital.	Denver, Colo.	234
KFAU	Independent School Dist.	Boise, Idaho	280	KFUR	Peery Bldg. Co., Inc.	Ogden, Utah	224
KFBB	F. A. Buttrey & Co.	Havre, Mont.	275	KFUS	Louis L. Sherman.	Oakland, Calif.	256
KFBC	W. Z. Azbill.	San Diego, Cal.	380	KFTU	University of Utah.	Salt Lake City, Utah	263
KFBK	Kimball-Upson Co.	Sacramento, Calif.	535	KFVD	Chas. & W. J. McWhinnie.	Venice, Calif.	208
KFBL	Leese Bros.	Everett, Wash.	224	KFVE	Benson Broadcasting Corp.	St. Louis, Mo.	240
KFBS	School District No. One.	Trinidad, Colo.	238	KFVG	First M. E. Church.	Independence, Kans.	236
KFBU	Bishop N. S. Thomas.	Laramie, Wyo.	375	KFVI	Headquarters Troop, 56th Cavalry.	Houston, Texas	240
KFCB	Nielson Radio Supply Co.	Phoenix, Ariz.	238	KFVN	Carl E. Bagley.	Fairmont, Mjnn.	227
KFCR	Santa Barbara Broadcasting Co.	Santa Barbara, Calif.	413	KFVR	Olinger Corporation.	Denver, Colo.	244
KFDD	St. Michael Cathedral.	Boise, Idaho	275	KFVS	Cape Girardeau Battery Sta., Cape Girardeau, Mo.	224	
KFDM	Magnolia Petroleum Co.	Beaumont, Texas	316	KFVY	Radio Supply Co.	Albuquerque, N. M.	250
KFDX	First Baptist Church.	Shreveport, La.	236	KFWB	Warner Bros. Pictures.	Hollywood, Calif.	252
KFDY	South Dakota State College.	Brookings, S. D.	300	KFWC	L. E. Wall.	San Bernardino, Calif.	291
KFDZ	Harry O. Iverson.	Minneapolis, Minn.	231	KFWF	St. Louis Truth Center.	St. Louis, Mo.	214
KFEC	Meier & Frank.	Portland, Ore.	252	KFWH	F. Wellington Morse, Jr.	Eureka, Calif.	254
KFEL	Eugene P. O'Fallon, Inc.	Denver, Colo.	254	KFWI	Radio Entertainments, Inc.	San Francisco, Calif.	250
KFEQ	Scroggin & Co.	St. Joseph, Neb.	268	KFWM	Oakland Educational Society.	Oakland, Calif.	326
KFEY	Bunker Hill & Sullivan.	Kellogg, Idaho	233	KFWO	Lawrence Mott.	Avalon, Calif.	211
KFFP	First Baptist Church.	Moberly, Mo.	242	KFWU	Louisiana College.	Pineville, La.	238
KFGQ	Boone Biblical College.	Boone, Iowa	300	KFWV	KFWV Studios.	Portland, Ore.	213
KFH	Hotel Lassen.	Wichita, Kans.	268	KFXB	Bertram C. Heller.	Big Bear Lake, Calif.	203
KFHA	Western State College of Colo.	Gunnison, Colo.	252	KFXD	Service Radio Co.	Logan, Utah	205
KFHL	Penn College.	Oskaloosa, Iowa	240	KFXF	Pike's Peak Broadcasting Co.	Denver, Colo.	430
KFI	E. C. Anthony, Inc.	Los Angeles, Calif.	467	KFXH	Bledsoe Radio Company.	El Paso, Texas	242
KFIF	Benson Polytechnic Institute.	Portland, Ore.	248	KFXJ	R. G. Howell.	near Edgewater, Colo.	216
KFIO	North Central High School.	Spokane, Wash.	272	KFXR	Classen Film Finishing Co.	Oklahoma City, Okla.	214
KFIO	First Methodist Church.	Yakima, Wash.	256	KFXV	Harry M. Costigan.	Flagstaff, Ariz.	205
KFIU	Alaska Electric Light & Power Co.	Juneau, Alaska	226	KFYF	Carl's Radio Den.	Oxnard, Calif.	214
KFIZ	Commonwealth Reporter.	Fond du Lac, Wis.	273	KFYJ	Houston Chronicle Pub. Co. (Portable)	Houston, Tex.	238
KFJB	Marshall Electric Co.	Marshalltown, Iowa	248	KFYO	Buchanan-Vaughan Co.	Texarkana, Tex.	210
KFJF	National Radio Mfg. Co.	Oklahoma City, Okla.	261	KFYR	Hoskins-Meyer, Inc.	Bismarck, N. Dak.	248
KFJI	E. E. Marsh.	Astoria, Ore.	246	KGAR	Tucson Citizen.	Tucson, Ariz.	244
KFJM	University of North Dakota.	Grand Forks, N. D.	278	KGBS	A. C. Dailey.	Seattle, Wash.	227
KFJR	Ashley C. Dixon & Son.	Portland, Ore.	263	KGBU	Alaska Radio Co.	Ketchikan, Alaska	229
KFJY	Tunwall Radio Co.	Fort Dodge, Iowa	246	KGBX	Foster Hall Tire Co.	St. Joseph, Mo.	348
KFJZ	W. E. Branch.	Ft. Worth, Tex.	254	KGBY	Albert C. Dunning.	Shelby, Nebr.	203
KFKA	Colo. State Teachers College.	Greeley, Colo.	273	KGBZ	Federal Livestock Remedy Co.	York, Nebr.	333
KFKB	J. R. Brinkley.	Milford, Kan.	434	KGCA	C. W. Greenley.	Decorah, Iowa	280
KFKU	The University of Kansas.	Lawrence, Kans.	275	KGCB	Wallace Radio Institute.	Oklahoma, Okla.	331
KFKX	Westinghouse Elec. & Mfg. Co.	Hastings, Neb.	288	KGCG	Moore Motor Co.	Newark, Ark.	240
KFKZ	State Teachers College.	Kirksville, Mo.	225	KGCH	Wayne Hospital.	Wayne, Nebr.	434
KFLR	University of New Mexico.	Albuquerque, N. M.	254	KGCI	Liberty Radio Sales.	San Antonio, Texas	240
KFLU	San Benito Radio Club.	San Benito, Texas	236	KGCL	Louis Wasmer.	Seattle, Washington	238
KFLV	Swedish Evangelist Church.	Rockford, Ill.	229	KGCN	Alva E. Smith.	Concordia, Kansas	210
KFLX	George Roy Clough.	Galveston, Texas	240	KGCR	Cutler's Broadcasting Service.	Brookings, S. D.	252
KFMR	Morningside College.	Sioux City, Iowa	261	KGCU	Mandan Radio Ass'n.	Mandan, N. D.	285
KFMX	Carlton College.	Northfield, Minn.	337	KGCCX	First State Bank.	Vida, Mont.	240
KFNF	Henry Field Seed Co.	Shenandoah, Ia.	461	KGDA	Home Auto Co.	Dell Rapids, S. D.	254
KFOA	Rhodes Department Store.	Seattle, Wash.	454	KGDE	Jaren Drug Co.	Barrett, Minn.	232
KFOB	KFOB, Inc.	Burlingame, Calif.	225	KGDI	Northwest Radio Service Co.	Seattle, Wash.	416
KFON	Nichols & Warriner, Inc.	Long Beach, Calif.	233	KGDJ	R. Rathert.	Cresco, Iowa	203
KFOO	Latter Day Saints' Union.	Salt Lake City, Utah	236	KGDM	V. G. Copping.	Stockton, Calif.	217
KFOR	Tire & Electric Co.	David City, Neb.	226	KGDO	C. H. & Henry Garrett.	Dallas, Tex.	285
KFOT	College Hill Radio Club.	Wichita, Kans.	231	KGDP	Boy Scouts of America.	Pueblo, Colo.	261
KFOX	Tech. High School.	Omaha, Nebr.	248	KGDR	Radio Engineers.	San Antonio, Tex.	240
KFOY	Beacon Radio Service.	St. Paul, Minn.	252	KGDX	William Erwin Antony.	Shreveport, La.	291
KFPL	C. C. Baxter.	Dublin, Texas	252	KGDY	J. Albert Loesch.	Oldham, S. Dak.	210
KFPM	The New Furniture Co.	Greenville, Texas	242	KGDW	Frank J. Rist.	Humboldt, Nebr.	242
KFPR	Los Angeles County Forestry Dept.	Los Angeles, Cal.	231	KGEF	Trinity Methodist Church.	Los Angeles, Calif.	517
KFPW	St. Johns M. E. Church.	Carterville, Mo.	258	KGEH	Eugene Broadcast Station.	Eugene, Oregon	236
KFPY	Symons Investment Co.	Spokane, Wash.	273	KGEK	Beehler Elect. Equipment Co.	Yuma, Colo.	252
KFOA	The Principia.	St. Louis, Mo.	261	KGEL	Ernest W. Ellison.	Jamestown, N. D.	225
KFOB	Lone Star Bdcast Co.	Fort Worth, Texas	508	KGEM	E. R. Irey & F. M. Bowles.	El Centro, Calif.	281
KFOD	Anchorage Radio Club.	Anchorage, Alaska	300	KGEO	Fred W. Herrmann.	Minneapolis, Minn.	330
KFOU	W. E. Riker.	Holy City, Calif.	231	KGER	C. Merwin Dobyns.	Long Beach, Calif.	326
KFOW	C. F. Knierim.	Seattle, Wash.	216	KGES	Central Radio Electric Co.	Central City, Nebr.	205
KFOX	Alfred M. Hubbard.	Seattle, Wash.	210	KGEU	L. W. Clement.	Lower Lake, Calif.	222
KFOZ	Taft Products Co.	Hollywood, Calif.	226	KGEW	City of Fort Morgan.	Fort Morgan, Colo.	256
KFRB	Hall Bros.	Beeville, Texas	248	KGEX	Central Radio Co.	Muscatine, Iowa	256
KFRC	Don Lee, Inc.	San Francisco, Calif.	268	KGEY	J. W. Dietz.	Denver, Colo.	204
KFRU	Stephens College.	Columbia, Mo.	500	KGEZ	Flathead Broadcasting Assn.	Kallispell, Mont.	352



Officially Specified
for the

HAMMARLUND-ROBERTS
"Hi-Q" Receiver

A remarkable, new radio-frequency tuning unit, combining a Space-wound Coil with the "Midline" Condenser. The primary coupling is varied automatically to the most efficient point for each condenser setting. Ideal for any tuned radio frequency circuit.

Write for Folder

Hammarlund Mfg. Co.

424-438 West 33rd St., New York City

For Better Radio

Hammarlund
PRECISION
PRODUCTS

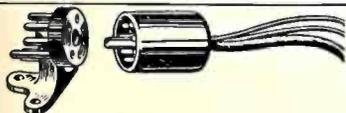
RESULTS

ONLY Amperite can give utmost life and performance from your tubes. Controls tube filament current automatically. Eliminates hand rheostats. Safeguards against tube damage and premature burn-outs. Simplifies wiring. Accept no substitute. Types for all tubes. Price \$1.10 complete. Sold everywhere. Write for FREE Hook-Ups and Construction Data to Dept. RA-3.

RADIALL COMPANY
50 Franklin Street, New York City



AMPERITE
REG. U.S. PAT. OFF.
The "SELF-ADJUSTING" Rheostat



Remember . . .

on your present set, or the one you're building, you can't sacrifice the added convenience, neatness and mechanical superiority of the

Jones
MULTI-PLUG
THE STANDARD SET CONNECTOR

Type BM, with 4 ft. cable, price \$3.50

Ask Your Dealer

HOWARD B. JONES

618 S. Canal St. Chicago, Ill.

Geranium-Scented Boiler Rooms For Power Plants

DIPHENYL oxide, a white reek like geranium scent raised to the nth degree, is the newest stunt in the efforts of engineers to get double work out of every shovelful of coal that goes into the firebox. The trick consists simply of using the chemical in one boiler to run one engine, and then using the exhaust vapor from that engine, still very hot, to raise steam from ordinary water in a second boiler, according to Dr. H. H. Dow, manufacturing chemist of Midland, Mich. Dr. Dow has been experimenting with one of these bi-fluid boiler systems for some months, and states that it has proven itself quite successful and very economical of fuel.

The idea of getting double use from the original firing of fuel was tried first with mercury as the liquid in the first, or high-temperature boiler. From certain points of view this metallic liquid is almost ideal, but its great weight and considerable initial expense, together with constant losses, interposed engineering and economic difficulties. Furthermore, any leakage of mercury vapor is almost certain to be injurious to the workmen in the plant, because mercury is exceedingly poisonous. For these reasons therefore Dr. Dow sought for another liquid that would be light, cheap, and non-poisonous, and still have high capacity for carrying heat over into the second boiler to generate steam for the second engine.

A number of organic chemical compounds were found to possess these qualities, but at the temperatures used in boilers they tended to break apart into other compounds useless for power purposes and to clog the boilers with carbonaceous materials of no use for carrying heat. Diphenyl oxide, however, has been used and recondensed and used over again many times at a pressure of 200 pounds per square inch and a temperature of 800 degrees Fahrenheit, with

Use These Coils and Improve any Radio Receiver

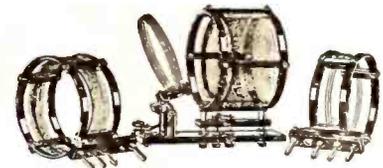
AERO COIL
SUPER-SENSITIVE

INDUCTANCE UNITS



TUNED RADIO FREQUENCY KIT
\$12.00

The Aero Coil Tuned Radio Frequency Kit illustrated above will positively improve the performance of any receiver. Patented Aero Coil construction eliminates radio frequency losses and brings tremendous improvement in volume, tone and selectivity. Kit consists of three matched units. The antenna coupler has variable primary. Uses .00035 condenser. 8-page color circuit, layout and instruction sheet for building the supersensitive 5-tube Aero-Dyne receiver packed FREE with each kit. Extra copies, 75c each. Instructions include insert showing how to wire up for a power tube if desired.



LOW WAVE TUNER KIT
\$12.50

Completely interchangeable. Adapted by experts and amateurs. Range 15 to 130 meters. Includes three coils and base mounting, covering U. S. bands, 20, 40 and 80 meters. You can increase the range of this short wave tuner by securing coils Nos. 4 and 5. Combined range of 15 to 550 meters. Both interchangeable coils fit same base supplied with short wave kit and use the same condensers. Coil No. 4 price \$1.00; Coil No. 5 price \$4.00.

Get these coils from your nearest dealer. If he should be out of stock, order direct from the factory

AERO PRODUCTS, INC.,
Dept. 106

1772 Wilson Avenue Chicago, Illinois

but little deterioration. It weighs but little more than water, as contrasted with mercury, which is heavier than lead. Its price is only 30 cents a pound in quantity lots, which according to Dr. Dow makes its cost, volume for volume, less than two per cent that of mercury. The compound has been produced hitherto in comparatively limited quantities, because its only use has been in the perfume industry, but Dr. Dow states that there is no limit on the bulk that can be made.

KGFB	A. G. Dunkel	Iowa City, Ia.	224	KWTC	J. W. Hancock	Santa Ana, Calif.	261
KGFF	Earl E. Hampshire	Alva, Okla.	205	KWUC	Western Union College	Le Mars, Iowa	252
KGO	General Electric Co.	Oakland, Calif.	361	KWWG	City of Brownsville	Brownsville, Texas	278
KGRC	Gene Roth & Co.	San Antonio, Texas	315	KXL	KXL Broadcasters	Portland, Ore.	400
KGRS	Gish Radio Service	Amarillo, Tex.	234	KXRO	Brott Laboratories	Seattle, Wash.	240
KGTT	Glad Tidings Tabernacle, Inc.	San Francisco, Cal.	207	KYA	Pacific Broadcasting Corp.	San Francisco, Calif.	400
KGU	Marion A. Mulrony	Honolulu, Hawaii	270	KYW	Westinghouse Electric & Mfg. Co.	Chicago, Ill.	535
KGW	Oregonian Publishing Co.	Portland, Ore.	492	KZM	Preston D. Allen	Oakland, Calif.	240
KGY	St. Martins College	Lacey, Wash.	278	WAAD	Ohio Mechanical Institute	Cincinnati, Ohio	258
KHJ	Times-Mirror Co.	Los Angeles, Calif.	405	WAAF	Chicago Daily Drivers Journal	Chicago, Ill.	278
KHQ	Louis Wasmer	Spokane, Wash.	395	WAAM	Isaiah R. Nelson	Newark, N. J.	263
KICK	Atlantic Automobile Co.	Anita, Ia.	273	WAAT	F. V. Bremer	Jersey City, N. J.	235
KJBS	J. Brunton & Sons Co.	San Francisco, Calif.	220	WAAW	Omaha Grain Exchange	Omaha, Nebr.	384
KJR	Northwest Radio Service Co.	Seattle, Wash.	384	WABB	Harrisburg Radio Co.	Harrisburg, Pa.	204
KKP	City of Seattle, Harbor Dept.	Seattle, Wash.	260	WABC	Atlantic Broadcasting Corp.	New York, N. Y.	316
KLDS	Reorganized Church of Jesus Christ, Independence, Mo.		441	WABF	Markle Broadcasting Corp.	Pringleboro, Pa.	411
KLS	Warner Brothers	Oakland, Calif.	250	WABI	1st Universalist Church	Bangor, Me.	240
KLX	Tribune Publishing Co.	Oakland, Calif.	508	WABO	Hickson Electric Co., Inc.	Rochester, N. Y.	278
KLZ	Reynolds Radio Co.	Denver, Colo.	384	WABR	Scott High School	Toledo, Ohio	263
KMA	May Seed & Nursery	Shenandoah, Iowa	461	WABW	College of Wooster	Wooster, Ohio	207
KMED	W. J. Virgin	Medford, Ore.	250	WABX	Henry B. Joy	Mt. Clemens, Mich.	246
KMIC	J. R. Fouch	Inglewood, Calif.	387	WABY	John Magaldi, Jr.	Philadelphia, Pa.	242
KMJ	Fresno Bee	Fresno, Calif.	234	WABZ	Colis Place Baptist Church	New Orleans, La.	275
KMMJ	M. M. Johnson Co.	Clay Center, Nebr.	229	WADC	Allen T. Simmons	Akron, Ohio	258
KMO	Love Electric Co.	Tacoma, Wash.	250	WAFD	Albert P. Parfet	Detroit, Mich.	312
KMOX	Voice of St. Louis	St. Louis, Mo.	280	WAGN	R. L. Miller	Royal Oak, Mich.	275
KMTR	Echophone Mfg. Co.	Los Angeles, Calif.	372	WAGS	Willow Garage, Inc.	Somerville, Mass.	250
KNRC	C. B. Juneau	Santa Monica, Calif.	238	WAIT	A. H. Waite & Co.	Taunton, Mass.	229
KNX	Los Angeles Express	Los Angeles, Calif.	337	WAIU	American Insurance Union	Columbus, Ohio	294
KOA	General Electric Co.	Denver, Colo.	322	WAMD	Raddison Radio Corp.	Minneapolis, Minn.	244
KOAC	Oregon Agriculture College	Corvallis, Oreg.	280	WAOK	A. H. Andreasen	Ozone Park, N. Y.	248
KOB	N. Mex. College of Agric.	State College, N. Mex.	349	WAPI	Alabama Polytechnic Institute	Auburn, Ala.	461
KOCH	Omaha Central High School	Omaha, Neb.	258	WARC	American Radio & Research	Medford, Mass.	261
KOCW	Oklahoma College for Women	Chickasha, Okla.	252	WARS	Amateur Radio Specialty Co.	Brooklyn, N. Y.	295
KOIL	Mona Motor Oil Co.	Council Bluffs, Iowa	306	WASH	Baxter Laundry Co.	Grand Rapids, Mich.	256
KOIN	KOIN, Inc.	Portland, Ore.	319	WATT	Edison Elec. Illum. (Portable)	Boston, Mass.	244
KOMO	Fisher's Blend Station, Inc.	Seattle, Wash.	306	WBAA	Purdue University	W. Lafayette, Ind.	273
KOWW	Frank A. Moore	Walla Walla, Wash.	285	WBAC	James Milliken University	Decatur, Ill.	270
KPCB	Pacific Coast Biscuit Co.	Seattle, Wash.	521	WBAK	Pennsylvania State Police	Harrisburg, Pa.	275
KPJM	Wilburn Radio Service	Prescott, Ariz.	215	WBAL	Consolidated Gas & Power Co.	Baltimore, Md.	246
KPO	Hale Bros., Inc.	San Francisco, Calif.	428	WBAP	Carter Publication, Inc.	Ft. Worth, Tex.	476
KPPC	Pasadena Presbyterian Church	Pasadena, Calif.	229	WBAW	Braid Elec. Co. & Waldrum Drug Co.	Nashville, Tenn.	236
KPRC	Houston Printing Co.	Houston, Texas	297	WBAX	John H. Stenger, Jr.	Wilkes-Barre, Pa.	256
KPSN	Star-News	Pasadena, Calif.	316	WBBC	P. J. Testan	Brooklyn, N. Y.	250
KQW	First Baptist Church	San Jose, Calif.	333	WBBL	Grace Covenant Presbyterian Church	Richmond, Va.	229
KQV	Doubleday-Hill Electric Co.	Pittsburgh, Pa.	275	WBBM	Atlas Investment	Chicago, Ill.	226
KRAC	Caddo Radio Club	Shreveport, La.	220	WBBP	Petoskey High School	Petoskey, Mich.	238
KRE	Berkeley Daily Gazette	Berkeley, Calif.	256	WBBR	People's Pulpit Assoc.	Rossville, N. Y.	416
KRLD	Dallas Radio Laboratories	Dallas, Tex.	357	WBBW	Ruffner Junior High School	Norfolk, Va.	222
KROW	Oregon Broadcast Co.	Portland, Ore.	231	WBBY	Washington Light Inf.	Charleston, S. C.	268
KRSC	Radio Sales Corp.	Seattle, Wash.	500	WBBZ	C. L. Carrell	(Portable), Chicago, Ill.	216
KSAC	Kansas State Agricultural College	Manhattan, Kans.	341	WBCN	Foster & MacDonnell	Chicago, Ill.	266
KSBA	W. G. Patterson	Shreveport, La.	261	WBES	Bliss Electrical School	Takoma Park, Md.	222
KSD	Pulitzer Publishing Co.	St. Louis, Mo.	545	WBET	Boston Transcript Co.	Boston, Mass.	384
KSEI	Broadcasting Association	Pocatello, Idaho	261	WBKN	Arthur Fiske	Brooklyn, New York	291
KSL	Radio Service Corp.	Salt Lake City, Utah	300	WBMC	Malbrook Co.	Woodside, N. Y.	294
KSMR	Santa Maria Valley Railroad	Santa Maria, Calif.	283	WBMH	Braun's Music House	Detroit, Mich.	353
KSO	Berry Seed Co.	Clarinda, Iowa	405	WBMS	G. J. Schowerer	North Bergen, N. J.	224
KSOO	Sioux Falls Bdcst. Ass'n.	Sioux Falls, S. D.	360	WBNY	Baruschrome Corp.	New York, N. Y.	322
KTAB	Associated Broadcasters	Oakland, Calif.	303	WBOQ	Atlantic Bdcst. Corp.	Richmond Hill, N. Y.	236
KTAP	Robert B. Bridge	San Antonio, Texas	263	WBRC	Birmingham Broadcasting Co.	Birmingham, Ala.	248
KTBI	Bible Institute	Los Angeles, Calif.	294	WBRE	Baltimore Radio Exchange	Wilkes-Barre, Pa.	231
KTBR	M. E. Brown	Portland, Ore.	263	WBRL	Booth Radio Laboratories	Tilton, N. H.	420
KTHS	New Arlington Hotel	Hot Springs, Ark.	375	WBRS	Universal Radio Mfg. Co.	Brooklyn, N. Y.	394
KTNT	N. Baker	Muscataine, Iowa	333	WBSO	Babson's Statistical Org.	Wellesley Hills, Mass.	242
KTUE	Uhalt Electric	Houston, Texas	263	WBT	Charlotte Chamber of Commerce	Charlotte, N. C.	275
KTW	First Presbyterian Church	Seattle, Wash.	454	WBZ	Westinghouse Elect. & Mfg. Co.	Springfield, Mass.	333
KUJ	Puget Sound Broadcasting Co.	Seattle, Wash.	352	WBZA	Westinghouse Elect. & Mfg. Co.	Boston, Mass.	333
KUOA	University of Arkansas	Fayetteville, Ark.	300	WCAC	Connecticut Agricultural College	Mansfield, Conn.	275
KUOM	University of Montana	Missoula, Mont.	244	WCAD	St. Lawrence University	Canton, N. Y.	263
KUSD	University of South Dakota	Vermillion, S. D.	278	WCAE	Kaufman & Baer Co.	Pittsburgh, Pa.	461
KUT	University of Texas	Austin, Texas	231	WCAJ	Nebraska Wesleyan University	University Pl., Nebr.	254
KVI	Puget Sound Broadcasting Co.	Tacoma, Wash.	342	WCAL	St. Olaf College	Northfield, Minn.	337
KVOO	Southwestern Sales Corp.	Bristow, Okla.	375	WCAM	City of Camden	Camden, N. J.	337
KVOS	L. L. Jackson	Seattle, Wash.	333	WCAO	Monumental Radio Inc.	Baltimore, Md.	275
KWCR	H. F. Parr	Cedar Rapids, Iowa	296	WCAR	Southern Radio Corp.	San Antonio, Texas	263
KWG	Portable Wireless Telegraph Co.	Stockton, Calif.	248	WCAT	School of Mines	Rapid City, S. Dak.	240
KWKC	Wilson Duncan Studios	Kansas City, Mo.	236	WCAU	Universal Broadcasting Co.	Philadelphia, Pa.	278
KWLC	Luther College	Decorah, Iowa	431	WCAX	University of Vermont	Burlington, Vt.	250
KWSC	State College of Washington	Pullman, Wash.	349	WCAZ	Carthage College	Carthage, Ill.	246

Further Notes on the Worlds Record Super 8

QUITE a number of super fans have written in regarding the superheterodyne featured by RADIO AGE on page 18 of the January, 1927, issue. Out of the host of letters received only two readers have failed to get the results they expected. Their questions have since been answered and it is hoped by this time these two gentlemen will have fixed up their set.

Two or three points may be of interest to those who have either built the set, or contemplate doing so. The schematic circuit shown on page 18 is electrically correct and should be followed for the wiring. The choke coil shown in the drawing as RFC may be eliminated from this set if desired since using a series feed on the oscillator plate the coil is not essential.

For use with batteries (dry or wet) the 22, 67, 90 and 135 volt connections are correct. However for use with eliminators having only four taps, the 67 and 90 volt wires may be joined together and run to the 90 volt tap on the eliminator. The 22 and 135 volt wires are all right for either eliminator or batteries, but since most eliminators have only the 45, 90 and 135 volt taps some provision had to be made for the 67 volt terminal being supplied.

Another point of interest is the fact the bias on the intermediate stages (to which is joined the audio bias) is more or less critical for best results. Tune in a distant station (or a local with volume cut down) and then adjust the bias on the intermediates for best quality and volume. The C battery in the center tap of the loop may also be shifted until a value is found that delivers best quality and volume.

If the loop circuit is too highly regenerative (that is, oscillates too freely) the .0005 mfd. fixed condenser shown between the plate of the first detector and the filament of the same tube, should be used. If the loop circuit does not oscillate at all, the .0005 mfd. condenser referred to should be removed.

Make sure that at least 22 volts



\$17⁵⁰ complete

\$12⁵⁰ complete

The Lowest Priced Quality "B" Eliminator

Livermore Falls, Maine. Have been using your Eliminator for a year and well satisfied with it as it gives good results and is free from any hum.
ELMER A. RIGGS.

Duluth, Minn. Your Eliminator has given me wonderful continuous service for the past year.
F. A. LOHMER.

St. Louis, Mo. Your Eliminator is wonderful. I am recommending it to all my patients as I think it a wonderful value.
DR. A. C. BURLAN.

Columbus, Ohio. Your Eliminator has been in service for a year and I am very well satisfied with it.
LEO C. SPRAGUE.

San Jose, Calif. Have had your Eliminator for a year and it has given perfect satisfaction.
W. S. SAWDEY.

Cleveland, Ohio. After nineteen months of service my Ferbend Eliminator is still giving excellent results and has stood up against much higher priced outfits.
R. ST. BARNHOFF.

Beaver, Penn. I have been using your Eliminator for a year now and have wonderful results with it.
R. L. McCULLOUGH.

Corsicana, Texas. One year ago I bought one of your Eliminators and have been very well pleased with it.
DR. HUBERT B. LOVE.

Aledo, Ill. The Eliminator I bought from you a year ago works fine.
WILLARD RUSE.

The moment you see the good Ferbend "B" Eliminator you understand why during its first two years of successful service it has made nearly 50,000 friends. "Singular Value" is written all over this fine instrument.

Outstanding Quality, however, is confirmed only through proof of lasting good performance—so we ask you to read the interesting endorsements reproduced here. They are only a few out of thousands—but actually your best means of verifying the information we give you.

How can we produce a Quality Instrument at a price so spectacular? Because we are pioneer specialists in the manufacture of "B" Eliminators—because every component part is designed, made and assembled under one roof—because our overhead is many times lower.

The Original Ferbend "B" Eliminator operates direct from your Electric Light Socket on 110-120 volt A. C. Lighting Circuit. Delivers up to 100 volts. Price \$12.50. The electrolytic method combined with full wave rectification gives results far superior to those obtained by any other method.

The New Ferbend High Voltage Model for extremely large sets and all sets using power tubes. Delivers up to 180 volts. One Control adjusts voltages on all taps. Price \$17.50.

Equal to the Best—at a cost less than half! Sooner or later you will purchase a "B" Eliminator. Why pay more?

Money-Back Guarantee

See Your Dealer—or Send Direct

Shipment made direct on receipt of price, or C.O.D. if preferred. Use for 10 days to convince yourself—if unsatisfactory write us within that time and purchase price will be refunded. Send Coupon TODAY.

FERBEND ELECTRIC COMPANY

431 West Superior Street

Chicago, Illinois

FERBEND "B" ELIMINATOR

FERBEND ELECTRIC CO.
431 W. Superior St., Chicago, Ill.

- Send \$12.50 model.
- Send \$17.50 model.
- Send at once. Payment enclosed.
- Send C. O. D. Send Literature.

Name

Address

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

Approved and passed by the rigid Laboratory Tests of the two foremost Radio Laboratories in America—Radio News and Popular Radio.

Makers of the original and genuine



Please Mention Radio Age When Writing to Advertisers.

WCBA	Charles W. Heimbach.....	Allentown, Pa.	254	WFLA	Boca Raton Radio Corp.....	Boca Raton, Fla.	440
WCBD	Wilbur Glenn Voliva.....	Zion, Ill.	345	WFRL	Flatbush Radio Labs.....	Brooklyn, N. Y.	330
WCBE	Uhalt Radio Co.....	New Orleans, La.	263	WGAL	Lancaster Elec. Supply & Const. Co.....	Lancaster, Pa.	248
WCBH	University of Mississippi.....	Oxford, Miss.	242	WGBB	H. H. Carman.....	Freeport, N. Y.	244
WCBM	Hotel Chateau.....	Baltimore, Md.	229	WGBC	First Baptist Church.....	Memphis, Tenn.	278
WCBR	C. H. Messter.....	Providence, R. I.	234	WGBF	Fink Furniture Co.....	Evansville, Ind.	239
WCBS	H. L. Dewing, Portable.....	Providence, R. I.	242	WGBL	Scranton Broadcasters, Inc.....	Scranton, Pa.	240
WCCO	Washburn-Crosby Co.....	Anoka, Minn.	416	WGBR	G. S. Ives.....	Marshfield, Wis.	229
WCFL	Chicago Fed. of Labor.....	Chicago, Ill.	492	WGBS	Gimbel Brothers.....	Astoria, L. I., N. Y.	316
WCFT	Knights of Pythias Home.....	Tullahoma, Tenn.	252	WGBU	Florida Cities Finance Co.....	Fulford By-The-Sea, Fla.	278
WCGU	C. G. Under.....	Lakewood, N. J.	351	WGBX	University of Maine.....	Orono, Me.	234
WCLO	C. E. Whitmore.....	Camp Lake, Wis.	231	WGCP	May Radio Broadcast Corp.....	Newark, N. J.	252
WCLS	WCLS Inc.....	Joliet, Ill.	214	WGES	Oak Leaves Broadcasting Corp.....	Chicago, Ill.	316
WCMA	Culver Military Academy.....	Culver, Ind.	258	WGHB	Fort Harrison Hotel.....	Clearwater, Fla.	266
WCOA	City of Pensacola.....	Pensacola, Fla.	252	WGHP	G. H. Phelps.....	Detroit, Mich.	270
WCOM	172nd Field Artillery.....	Manchester, N. H.	252	WGL	International Broadcasting Corp.....	New York, N. Y.	442
WCOT	Jacob Conn.....	Olneyville, R. I.	265	WGM	Verne and Elton Spencer.....	Jeanette, Pa.	269
WCRW	Clinton R. White.....	Chicago, Ill.	416	WGMU	A. H. Grebe & Co.....	(Portable) New York	236
WCSH	Congress Square Hotel Co.....	Portland, Maine	500	WGN	The Tribune.....	Chicago, Ill.	303
WCSO	Wittenberg College.....	Springfield, Ohio	248	WGR	Federal T. and T. Co.....	Buffalo, N. Y.	319
WCWK	Chester W. Keen.....	Fort Wayne, Ind.	234	WGST	Georgia School of Technology.....	Atlanta, Ga.	270
WCWS	Chas. W. Selene (Portable).....	Bridgeport, Conn.	232	WGWB	Radiocast Corporation.....	Milwaukee, Wis.	384
WCX	Detroit Free Press.....	Pontiac, Mich.	517	WGY	General Elec. Co.....	Schenectady, N. Y.	379
WDAD	Dad's Auto Accessories, Inc.....	Nashville, Tenn.	226	WHA	University of Wisconsin.....	Madison, Wis.	535
WDAE	Tampa Daily Times.....	Tampa, Fla.	273	WHAD	Marquette University.....	Milwaukee, Wis.	275
WDAF	Kansas City Star.....	Kansas City, Mo.	366	WHAM	Eastman School of Music.....	Rochester, N. Y.	278
WDAG	J. Laurence Martin.....	Amarillo, Texas	263	WHAP	W. H. Taylor Finance Corp.....	New York, N. Y.	431
WDAH	Trinity Methodist Church.....	El Paso, Texas	268	WHAR	F. D. Cooks Sons.....	Atlantic City, N. J.	275
WDAY	Radio Equipment Corp.....	Fargo, N. Dak.	261	WHAS	Courier-Journal & Louisville Times.....	Louisville, Ky.	400
WDBE	Gilham Electric Co., Inc.....	Atlanta, Ga.	270	WHAZ	Rensselaer Polytechnic Institute.....	Troy, N. Y.	379
WDBJ	Richardson Wayland Elec. Corp.....	Roanoke, Va.	229	WHB	Sweeney School Co.....	Kansas City, Mo.	366
WDBK	Bdcast Co.....	Cleveland, Ohio	227	WHBA	C. C. Shaffer.....	Oil City, Pa.	250
WDBO	Rollins College.....	Winter Park, Fla.	240	WHBC	Rev. E. P. Graham.....	Canton, Ohio	254
WDBZ	Kingston Radio Club.....	Kingston, N. Y.	233	WHBD	Chamber of Commerce.....	Bellefontaine, Ohio	222
WDEL	Wilmington Elec. Specialty Co.....	Wilmington, Del.	266	WHBF	Beardsley Specialty Company.....	Rock Island, Ill.	222
WDGY	Dr. George W. Young.....	Minneapolis, Minn.	263	WHBL	C. L. Carrell (Portable).....	Chicago, Ill.	216
WDOD	Chattanooga Radio Co., Inc.....	Chattanooga, Tenn.	256	WHBM	C. L. Carrell (Portable).....	Chicago, Ill.	216
WDRC	Doolittle Radio Corp.....	New Haven, Conn.	268	WHBN	First Ave. Methodist Church.....	St. Petersburg, Fla.	238
WDFW	Dutee Wilcox Flint, Inc.....	Cranston, R. I.	441	WHBP	Johnstown Automobile Co.....	Johnstown, Pa.	256
WDFM	Radio Industries Broadcast Co.....	Newark, N. J.	280	WHBQ	St. John's M. E. Church South.....	Memphis, Tenn.	233
WDXL	WDXL Radio Corp.....	Detroit, Mich.	297	WHBU	Riviera Theatre & Bing's Clothing.....	Anderson, Ind.	219
WDZ	J. L. Bush.....	Tuscola, Ill.	278	WHBW	D. R. Kienle.....	Philadelphia, Pa.	216
WEAF	National Broadcasting Co.....	New York, N. Y.	491	WHBY	St. Norbert's College.....	West de Pere, Wis.	250
WEAI	Cornell University.....	Ithaca, N. Y.	254	WHDI	W. H. Dunwoody Institute.....	Minneapolis, Minn.	278
WEAM	Bor. of N. Plainfield.....	North Plainfield, N. J.	261	WHEC	Hickson Electric Co., Inc.....	Rochester, N. Y.	258
WEAN	The Shepard Co.....	Providence, R. I.	367	WHFC	Triangle Broadcasters.....	Chicago, Ill.	258
WEAO	Ohio State University.....	Columbus, Ohio	294	WHK	The Radio Air Service Corp.....	Cleveland, Ohio	273
WEAR	Willard Storage Battery Co.....	Cleveland, Ohio	389	WHN	George Schubel.....	New York, N. Y.	361
WEAU	Davidson Bros. Co.....	Sioux City, Iowa	275	WHO	Banker's Life Co.....	Des Moines, Ia.	526
WEBC	Walter Cecil Bridges.....	Superior, Wis.	242	WHOG	Huntington Bdcastrs. Assn.....	Huntington, Ind.	242
WEBE	Roy W. Waller.....	Cambridge, Ohio	234	WHT	Radiophone Broadcasting Corp.....	Deerfield, Ill.	238
WEBH	Edgewater Beach Hotel.....	Chicago, Ill.	370	WIAD	Howard R. Miller.....	Philadelphia, Pa.	250
WEBJ	Third Avenue Railway Co.....	New York, N. Y.	273	WIAS	Home Electric Co.....	Burlington, Iowa	254
WEBL	R. C. A. Show (Portable).....	New York, N. Y.	226	WIBA	Capital Times-Strand Theatre.....	Madison, Wis.	236
WEBQ	Tate Radio Corp.....	Harrisburg, Ill.	226	WIBG	St. Paul's Protestant E. Church.....	Elkins Park, Pa.	222
WEBR	H. H. Howell.....	Buffalo, N. Y.	244	WIBI	Frederick B. Zittel, Jr.....	Flushing, L. I., N. Y.	219
WEBW	Beloit College.....	Beloit, Wis.	268	WIBJ	C. L. Carrell (Portable).....	Chicago, Ill.	216
WEDC	E. Denemark Station.....	Chicago, Ill.	250	WIBM	C. L. Carrell (Portable).....	Chicago, Ill.	216
WEEI	The Edison Elec. Illuminating Co.....	Boston, Mass.	349	WIBO	WIBO Broadcasters, Inc.....	Chicago, Ill.	226
WEHS	A. T. Becker.....	Evanston, Ill.	242	WIBR	Thurman A. Owings.....	Weirton, W. Va.	246
WEKD	Foulkrod Radio Engineering Co.....	Philadelphia, Pa.	250	WIBS	T. F. Hunter.....	Elizabeth, N. J.	203
WEMC	Emanuel Missionary College.....	Berrien Springs, Mich.	316	WIBU	The Electric Farm.....	Poynette, Wis.	222
WENR	All-American Radio Corp.....	Chicago, Ill.	266	WIBW	C. L. Carrell (Portable).....	Chicago, Ill.	216
WEPS	R. G. Matheson.....	Gloucester, Mass.	295	WIBX	WIBX, Inc.....	Utica, N. Y.	234
WEW	St. Louis University.....	St. Louis, Mo.	360	WIBZ	A. D. Trum.....	Montgomery, Ala.	231
WFAA	Dallas News & Dallas Journal.....	Dallas, Tex.	476	WICC	Bridgeport Bdcast. Stations.....	Bridgeport, Conn.	285
WFAM	Times Publishing Co.....	St. Cloud, Minn.	273	WIL	Benson Radio Co.....	St. Louis, Mo.	258
WFAV	University of Nebraska.....	Lincoln, Neb.	270	WIOD	Earl G. Fisher Co.....	Miami, Fla.	248
WFBC	First Baptist Church.....	Knoxville, Tenn.	255	WIP	Gimbel Bros.....	Philadelphia, Pa.	508
WFBE	Garfield Place Hotel Co.....	Cincinnati, Ohio	232	WJAD	Jackson's Radio Eng. Laboratories.....	Waco, Texas.	353
WFBG	The Wm. F. Gable Co.....	Altoona, Pa.	278	WJAG	Norfolk Daily News.....	Norfolk, Neb.	270
WFBJ	St. John's University.....	Collegeville, Minn.	236	WJAK	Kokomo Tribune.....	Kokomo, Ind.	254
WFBL	The Onondaga Co.....	Syracuse, N. Y.	252	WJAM	D. M. Perham.....	Cedar Rapids, Iowa	268
WFBM	Merchants Heat & Light Co.....	Indianapolis, Ind.	268	WJAR	The Outlet Co.....	Providence, R. I.	484
WFBR	Fifth Infantry National Guard.....	Baltimore, Md.	254	WJAS	Pittsburgh Radio Supply House.....	Pittsburgh, Pa.	275
WFBZ	Knox College.....	Galesburg, Ill.	254	WJAX	City of Jacksonville.....	Jacksonville, Fla.	337
WFCI	Frank Crook, Inc.....	Pawtucket, R. I.	258	WJAY	Cleveland Broadcasting Corp.....	Cleveland, O.	436
WDFD	F. D. Fallain.....	Flint, Mich.	234	WJAZ	American Bdcast Corp.....	Mt. Prospect, Ill.	329
WFI	Strawbridge and Clothier.....	Philadelphia, Pa.	394	WJBA	D. H. Lentz, Jr.....	Joliet, Ill.	207
WFKB	Vesta Battery Corp.....	Chicago, Ill.	217	WJBB	Financial Journal.....	St. Petersburg, Fla.	245

(and possibly up to 45 with different tubes) is applied to the plate of the oscillator to make certain it will oscillate over its entire range. This voltage can be gradually cut down until a value is reached where the oscillator just maintains oscillation. The same can be said to be true of the first detector. Too low a voltage on its plate might prevent regenerative effects in the loop, while too great a voltage might produce entirely too much regeneration and finally oscillation in the loop circuit.

Again we would emphasize the necessity of using good tubes. One poor tube in one of the intermediate stages, or the first detector, will cause its owner considerable worry until the offending tube is located and replaced with a good one.

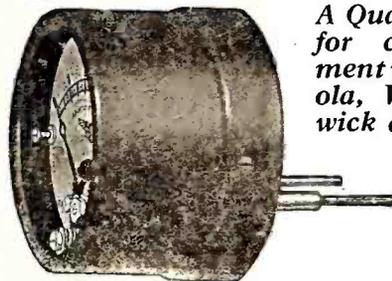
It is also not advisable to have too much metal (such as an audio transformer) located close to one of the air core intermediates since the presence of such metal will materially change the operation of that particular filter.

It should also be remembered while the long wave transformers are peaked at one value for 201-A tubes, their peak will be different if used with the 199 type. This shift in kilocycles may run anywhere from 10 to 15 kilocycles. For example a long wave transformer peaked for 40 kilocycles with 201-A tubes will probably peak at around 55 kilocycles when used with 199 tubes. The same would hold true for peaks of almost any transformer.

In operation of the set on locals at times there will be a tendency towards distortion on loud signals. Under such circumstances it is advisable to remove the 200-A detector tube and insert a UX112 which is much sturdier and less apt to stagger under heavy loop energy shock.



Pattern
No. 135-A



A Quality Voltmeter
for checking fila-
ment voltage of Radi-
ola, Victor, Brun-
swick and other sets

Filament Control

Voltmeter control of radio tube filaments—

- improves reception
- saves tubes
- preserves batteries
- gives you additional radio satisfaction

These are several real advantages

The Jewell pattern No. 135-A tip jack voltmeter plugs into the tip jacks installed on the panel of many of the new radio sets on the market. Scale ranges of 0-5, 0-7 or 0-50 volts, are available. It has an adjustment feature that insures horizontal position of the scale regardless of the tip jack arrangement.

Write for special circular No. 1015.

Jewell Electrical Instrument Co.

1650 Walnut St., Chicago

"27 Years Making Good Instruments"



We Carry a Complete Line of Parts

For the Ideal Model Worlds Record Super 8 and other circuits.

In writing us SPECIFY just what hook-up you are interested in

WHOLESALE RETAIL

NEWARK ELECTRIC CO.

"Nothing But Radio"

226 WEST MADISON STREET

TELEPHONE

MAIN 4627



CHICAGO

ILLINOIS

RADIO AGE SUBSCRIPTION BLANK

Radio Age, Inc.
500 North Dearborn Street, Chicago

\$2.50 A YEAR

Gentlemen: Please enter my subscription for RADIO AGE, for one year, beginning with the issue, for which I enclose \$2.50.

Name.....

Street Address.....

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

Send cash, money order or draft

(3-27)

Worlds Record Supers Custom
Built for

Power and Quality

Ten Kilocycle Selectivity

BREIT RADIO COMPANY

417 LAKE ST., MAYWOOD, ILL.

WJBC	Hummer Furniture Co.	LaSalle, Ill.	234	WMAF	Round Hills Radio Corp.	Dartmouth, Mass.	441
WJBI	Robert S. Johnson	Red Bank, N. J.	219	WMAK	Norton Laboratories	Lockport, N. Y.	266
WJBK	E. F. Goodwin	Ypsilanti, Mich.	233	WMAL	M. A. Leese	Washington, D. C.	294
WJBL	Wm. Gushard Dry Goods Co.	Decatur, Ill.	270	WMAN	Haskett Radio Station	Columbus, Ohio	278
WJBO	Valdemar Jensen	New Orleans, La.	268	WMAQ	Chicago Daily News	Chicago, Ill.	447
WJBR	Omro Drug Stores	Omro, Wis.	227	WMAZ	Kingshighway Presbyterian Church	St. Louis, Mo.	248
WJBT	John S. Boyd	Chicago, Ill.	468	WMAZ	Mercer University	Macon, Ga.	261
WJBU	Bucknell University	Lewisburg, Pa.	211	WMBA	LeRoy Joseph Beebe (Portale)	Newport, R. I.	250
WJBW	C. Carlson, Jr.	New Orleans, La.	270	WMBB	American Bond & Mortgage Co.	Chicago, Ill.	250
WJBY	Electric Construction Co.	Gadsden, Ala.	260	WMBC	Michigan Broadcasting Co., Inc.	Detroit, Mich.	256
WJBZ	Roland G. Palmer	Chicago Heights, Ill.	420	WMBD	Peoria Heights Radio Lab.	Peoria Heights, Ill.	279
WJJD	Supreme Lodge, L. O. of Moose	Mooseheart, Ill.	370	WMBE	Dr. C. S. Stevens	St. Paul, Minn.	220
WJPW	J. P. Wilson	Ashtabula, Ohio	240	WMBF	Fleetwood Hotel Corp.	Miami Beach, Fla.	384
WJR	Jewett Radio & Phonograph Co.	Pontiac, Mich.	517	WMBG	Havens & Martin	Richmond, Va.	220
WJUG	U. B. Ross	New York, N. Y.	517	WMBH	Edwin Dudley Aber, Portable	Chicago, Ill.	280
WJY	Radio Corp. of America	New York, N. Y.	405	WMBI	Moody Bible Institute	Chicago, Ill.	288
WJZ	Radio Corp. of America	Bound Brook, N. J.	454	WMBJ	Wm. Roy McShaffrey	Monessen, Pa.	278
WKAF	WKAF Broadcasting Co.	Milwaukee, Wis.	261	WMBK	John C. Slade	Hamilton, Ohio	360
WKAQ	Radio Corp. of Porto Rico	San Jaun, P. R.	341	WMBL	Bonford Radio Studios	Lakeland, Fla.	410
WKAR	Michigan State College	East Lansing, Mich.	286	WMBM	Seventh Day Adventist Church	Memphis, Tenn.	245
WKAU	Laconia Radio Club	Laconia, N. H.	422	WMBO	Radio Service Laboratories	Auburn, N. Y.	238
WKBA	Arrow Battery Co.	Chicago, Ill.	210	WMBS	Mack's Battery Co.	Harrisburg, Pa.	360
WKBB	Sanders Bros.	Joliet, Ill.	283	WMC	Commercial Pub. Co.	Memphis, Tenn.	500
WKBC	H. L. Ansley	Birmingham, Ala.	225	WMCA	Greely Sq. Hotel Co.	Hoboken, N. J.	341
WKBE	K. & D. Electric Co.	Webster, Mass.	270	WMHA	Young Men's Hebrew Ass'n	New York, N. Y.	230
WKBF	N. D. Watson	Indianapolis, Ind.	244	WMPC	First Methodist Church	Lapeer, Mich.	222
WKBG	C. L. Carrell (Portable)	Chicago, Ill.	216	WMRJ	Peter J. Prinz	Jamaica, N. Y.	227
WKBH	Callaway Music Co.	LaCrosse, Wis.	250	WMSG	Madison Sq. Gard. Bdcast. Corp.	New York, N. Y.	302
WKBI	F. L. Schoenwolf	Chicago, Ill.	220	WMVN	Edward J. Malone, Jr.	Newark, N. J.	476
WKBK	Gospel Tabernacle Inc.	St. Petersburg, Fla.	282	WNAB	Shepard Stores	Boston, Mass.	280
WKBL	Monrona Radio Mfg. Co.	Monroe, Mich.	250	WNAC	Shepard Stores	Boston, Mass.	430
WKBM	J. W. Jones	Newburgh, N. Y.	285	WNAD	University of Oklahoma	Norman, Okla.	254
WKBO	Camith Corporation	Jersey City, N. J.	220	WNAL	Omaha Central High School	Omaha, Nebr.	258
WKBP	Enquirer and News	Battle Creek, Mich.	265	WNAT	Lenning Brothers Co.	Philadelphia, Pa.	250
WKBQ	Starlight Amusement Park	New York, N. Y.	285	WNAX	Dakota Radio Apparatus Co.	Yankton, S. Dak.	244
WKBS	P. M. Nelson	Galesburg, Ill.	361	WNBH	New Bedford Hotel	New Bedford, Mass.	248
WKBT	First Baptist Church	New Orleans, La.	252	WNJ	Herman Lubinsky	Newark, N. J.	350
WKBU	H. K. Armstrong (Portable)	Newcastle, Pa.	238	WNOX	Peoples Tel. & Tel. Co.	Knoxville, Tenn.	268
WKBV	Knox Battery and Electric Co.	Brookville, Ind.	236	WNRC	W. B. Nelson	Greensboro, N. C.	224
WKBW	Churchill Evang. Ass'n	Buffalo, N. Y.	362	WNYC	Dept. of Plants & Structures	New York, N. Y.	526
WKBY	Fernwood Wuick (portable)	Danville, Pa.	220	WOAI	Southern Equipment Co.	San Antonio, Texas	394
WKBZ	K. L. Ashbacher	Ludington, Mich.	256	WOAN	J. D. Vaughn	Lawrenceburg, Tenn.	356
WKDR	Edward A. Dato	Kenosha, Wis.	428	WOAX	Franklyn J. Wolff	Trenton, N. J.	240
WKJC	Kirk Johnson & Co.	Lancaster, Pa.	258	WOBB	Longacre Eng. & Const. Co.	Chicago, Ill.	555
WKRC	Kodel Radio Corp.	Cincinnati, Ohio	422	WOCB	Orlando Broadcasting Co.	Orlando, Fla.	294
WKY	Hull and Richards	Oklahoma City, Okla.	275	WOC	Palmer School of Chiropractic	Davenport, Iowa	484
WLAC	Life & Casualty Ins. Co.	Nashville, Tenn.	226	WOCL	A. D. Newton	Jamestown, N. Y.	275
WLAL	First Christian Church	Tulsa, Okla.	250	WODA	O'Dea Temple of Music	Paterson, N. J.	391
WLAP	Wm. V. Jordan	Louisville, Ky.	275	WOI	Iowa State College	Ames, Iowa	270
WLB	University of Minnesota	Minneapolis, Minn.	278	WOK	Neutrowound Radio Mfg. Co.	Homewood, Ill.	410
WLBA	Philadelphia School of Wireless Tel.	Philadelphia, Pa.	236	WOKO	Harold E. Smith	Peekskill, N. Y.	232
WLBC	D. A. Burton	Muncie, Ind.	224	WOKT	Titus-Ets Corporation	Rochester, N. Y.	340
WLBE	J. H. Fruitman	Brooklyn, N. Y.	231	WOMT	Mikado Theater	Manitowoc, Wis.	254
WLBF	E. L. Dillard	Kansas City, Mo.	211	WOO	John Wanamaker	Philadelphia, Pa.	508
WLBG	R. A. Gamble	Petersburg, Va.	332	WOOD	Grand Rapids Radio Co.	Fernwood, Mich.	242
WLBH	Joseph J. Lombardi	Farmingdale, N. Y.	230	WOQ	Unity School	Kansas City, Mo.	278
WLBI	Aloysius Yare	East Wenona, Ill.	297	WOR	L. Bamberger and Co.	Newark, N. J.	405
WLBK	Henry Grossman	Cleveland, Ohio	300	WORD	People's Pulpit Assn.	Batavia, Ill.	275
WLBL	Wisconsin Dept. of Markets	Stevens Point, Wis.	278	WOS	State Market Bureau	Jefferson City, Mo.	441
WLBN	William Evert Hiler (Portable)	Chicago, Ill.	225	WOW	Woodman of the World	Omaha, Nebr.	526
WLBO	Frederick A. Tribbe, Jr.	Galesburg, Ill.	243	WOWO	Main Auto Supply Co.	Fort Wayne, Ind.	227
WLBQ	E. Dale Trout	Atwood, Ill.	23	WPAB	Radio Corp. of Virginia	Norfolk, Va.	319
WLBK	Alford Radio Company	Belvidere, Ill.	335	WPAK	N. D. Ag. College	Agricultural College, N. D.	275
WLCI	Lutheran Association	Ithaca, N. Y.	266	WPAP	(See WQAO)	Cliffside, N. J.	361
WLBI	Liberty Weekly, Inc.	Elgin, Ill.	303	WPCC	North Shore Cong. Church	Chicago, Ill.	258
WLIT	Lit Bros.	Philadelphia, Pa.	394	WPCH	Concourse Radio Corp.	New York, N. Y.	273
WLPP	Robert A. Fox	Ashland, Ohio	220	WPDQ	H. L. Turner	Buffalo, N. Y.	205
WLS	Sears Roebuck & Co.	Crete, Ill.	345	WPEP	Maurice Mayer	Waukegan, Ill.	213
WLSL	Lincoln Studios	Cranston, R. I.	441	WPG	The Municipality of Atlantic City	Atlantic City, N. J.	300
WLTS	Lane Technical High School	Chicago, Ill.	258	WPRC	Wilson Printing & Radio Co.	Harrisburg, Pa.	216
WLW	Crosley Radio Corp.	Harrison, Ohio	422	WPSK	Pennsylvania State College	State College, Pa.	261
WLWL	Paulist Fathers	New York, N. Y.	384	WQAA	Horace A. Beale, Jr.	Parkersburg, Pa.	220
WLBT	Harold Wendell	Crown Point, Ind.	230	WQAE	Moore Radio News Station	Springfield, Vt.	246
WLBW	Matthew B. Greiner	Canastota, N. Y.	220	WQAM	Electrical Equipment Co.	Miami, Fla.	285
WLBV	John F. Weimer & D. A. Snick	Mansfield, Ohio	231	WQAN	Scranton Times	Scranton, Pa.	250
WLBW	Petroleum Telephone Co.	Oil City, Pa.	321	WQAO	Calvary Baptist Church	Cliffside, N. J.	361
WLBX	John N. Brahy	Long Island City, N. Y.	231	WQJ	Calument Rainbo Broadcasting Co.	Chicago, Ill.	444
WLBZ	Aimone Electric	Iron Mountain, Mich.	250	WRAF	The Radio Club (Inc.)	LaPorte, Ind.	227
WLBZ	Thompson L. Guernsey	Dover-Foxcroft, Maine	299	WRAH	S. N. Read	Providence, R. I.	235
WMAC	C. B. Meredith	Casnovia, N. Y.	275	WRAK	Economy Light Col.	Escanaba, Mich.	256

Standardization Is Responsible For Radio Industry Stabilization

By A. J. CARTER*

THERE has been recently a great deal of comment through the medium of the press regarding the need for standardization in the radio industry. It is apparent that the radio public does not realize what great strides already have been made. Neither do they appreciate what a vast amount of research is required.

Great care must be taken to prevent standards from being adopted that will limit or retard the development of new products and ideas. Consequently this is a task that can be done only by engineers who have had experience in every phase of the industry.

The Radio Manufacturers' Association is ideally equipped to carry out this work since it is composed of the principal and representative manufacturers of the radio industry, consequently having the support and co-operation of their engineering departments.

The work is being carried out systematically by means of sub-committees composed of engineers and representatives of interested manufacturers. Public opinion and that of manufacturers is solicited by means of questionnaires. This information, supplemented by the experience of engineers, forms the basis of a recommended standard specification which is submitted at a regular meeting for final acceptance.

Sub-committees have been formed to investigate the following subjects. Many of their recommendations have already been adopted; others will make their reports at subsequent meetings:

1. Wiring Devices (Cords, colors, cord tips, etc.).
2. Variable Condensers and Dials.
3. Rheostats.
4. Transformers.
5. Plugs, Jacks and Switches.
6. Sockets.
7. Receiving Sets.
8. Vacuum Tubes.
9. Test Instru-

10. Arrestors and Aerials.
11. Panels.
12. Resistance Units.
13. Condensers (Fixed).
14. Radio Wiring for Buildings.

New committees are being formed from time to time and this work will be carried on indefinitely. It is the aim of the R. M. A. eventually to standardize the entire industry.

The co-operation of the Institute of Radio Engineers and the excellent support of the industry as a whole have resulted in bringing about, in two years, a degree of standardization that required from six to ten years in the automobile and other industries.

It would be too lengthy to give details regarding the benefits already derived from this work. One of the most important effects, however, has been the tendency toward stabilization, which is brought about in the following manner.

The raw material supplier is benefited because there is a greater demand for standard material. Consequently he can anticipate demands, carry a larger stock, and give better deliveries at a reduced cost.

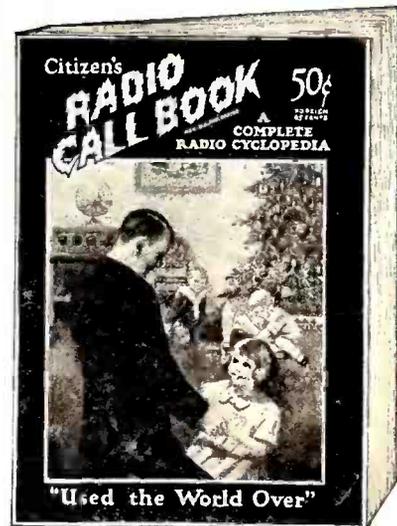
The manufacturer having a ready source of raw material can keep his plant running constantly, make prompt deliveries, thus preventing cancellation of delayed orders.

Radio misfits have practically ceased to exist. Parts are interchangeable, therefore the dealer and jobber are not required to carry duplicate stocks of parts. The manufacturer has, in this way, earned the confidence of the trade. In view of this the jobber and dealer are likely to order in advance of the consumer demand.

Standardization has already enabled manufacturers to furnish the consumer with a better product at a lower cost.

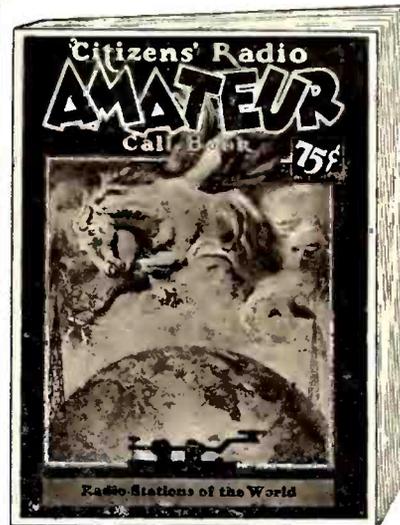
The radio industry has made rapid progress and it is largely due to the foresight of the R. M. A.

RADIO'S LEADING PUBLICATIONS



The CITIZEN'S RADIO CALL BOOK is Radio's Greatest Publication. Circulation 300,000. Contains all the latest information of construction so simply told anyone can build superheterodynes as easily as laboratory men. Large rotogravure section contains beautiful photos of leading station announcers and entertainers. Also contains the most complete list of the World's broadcasting stations—every one—their transmitting schedules, wave lengths, slogan and plenty of space under each to log that station for future reference. Really Radio's Greatest Publication. You'll be delighted.

Price only 50 cents postpaid.



The CITIZEN'S RADIO AMATEUR CALL BOOK is an international list of call letters, names and addresses of the World's amateur transmitters—ARRL official traffic relay stations list. Compiled from official sources and the most authentic list obtainable anywhere. Remember, the whole World—U. S., Canada, England, Australia, France, Germany, etc. The whole international list. Also commercial ship and land stations.

Price only 75 cents postpaid.

If you are unable to obtain either of the above mentioned publications from your news dealer or radio store, they will be sent postpaid upon receipt of the amount in U. S. stamps, coin, check or P. O. money order.

Citizen's Radio Call Book
508 S. Dearborn St.
Chicago Illinois

*Chairman Standards Committee, R. M. A.
President Carter Radio Co.

WRAM	Lombard College.....	Galesburg, Ill.	244
WRAV	Antioch College.....	Yellow Springs, Ohio	263
WRAW	Avenue Radio & Electric Shop.....	Reading, Pa.	238
WRAX	Beracah Church, Inc.....	Philadelphia, Pa.	268
WRBC	Immanuel Lutheran Church.....	Valparaiso, Ind.	278
WRC	Radio Corp. of America.....	Washington, D. C.	468
WRCO	Wayne Radio Co.....	Raleigh, N. C.	252
WREC	Wooten's Radio Shop.....	Whitehaven, Tenn.	254
WREO	Reo Motor Car Co.....	Lansing, Mich.	285
WRES	H. L. Sawyer.....	Woloaston, Mass.	300
WRHF	Wash. Radio Hospital Fund.....	Washington, D. C.	256
WRHM	Rosedale Hospital, Inc.....	Minneapolis, Minn.	252
WRK	Doron Bros.....	Hamilton, Ohio	270
WRM	University of Illinois.....	Urbana, Ill.	273
WRMU	A. H. Grebe & Co., Inc.....	Motor Yacht "MU-1"	236
WRNY	Experimenter Publishing Co.....	Coyetsville, N. Y.	374
WRR	City of Dallas.....	Dallas, Tex.	246
WRRS	Racine Radio Corp.....	Racine, Wis.	360
WRSC	The Radio Shop.....	Chelsea, Mass.	270
WRST	Radiotel Mfg. Co., Inc.....	Bay Shore, N. Y.	216
WRVA	Larus & Brother Co., Inc.....	Richmond, Va.	256
WSAI	United States Playing Card Co.....	Cincinnati, Ohio	326
WSAJ	Grove City College.....	Grove City, Pa.	229
WSAN	Allentown Call Publishing Co. Inc.....	Allentown, Pa.	229
WSAR	Daughy & Welch Electrical Co.....	Fall River, Mass.	322
WSAV	Clifford W. Vick.....	Houston, Tex.	248
WSAX	Zenith Radio Corp. (Portable).....	Chicago, Ill.	268
WSAZ	Chase Electric Shop.....	Pomeroy, Ohio	244
WSB	Atlanta Journal.....	Atlanta, Ga.	428
WSBC	World Battery Co.....	Chicago, Ill.	288
WSBF	Stix Baer & Fuller.....	St. Louis, Mo.	273
WSBT	South Bend Tribune.....	South Bend, Ind.	316
WSDA	Seventh Day Adventist Church.....	New York, N. Y.	261
WSEA	Virginia Beach Broadcasting Co.....	Virginia Beach, Va.	517

WSIX	638 Tire & Vulc. Co.....	Springfield, Tenn.	250
WSKC	World's Star Knitting Co.....	Bay City, Mich.	263
WSM	Nashville Life & Accident Ins. Co.....	Nashville, Tenn.	283
WSMB	Saenger Amuse. Co.....	New Orleans, La.	319
WSMH	Shattuck Music House.....	Owosso, Mich.	240
WSMK	S. M. K. Radio Corp.....	Dayton, Ohio	275
WSOE	School of Engineering.....	Milwaukee, Wis.	246
WSOM	Union Course Laboratories.....	Woodhaven, N. Y.	288
WSRO	Harry W. Fahrlander.....	Hamilton, Ohio	252
WSSH	Tremont Temple Bap. Church.....	Boston, Mass.	261
WSUI	State University of Iowa.....	Iowa City, Iowa	484
WSVS	Seneca Vocational School.....	Buffalo, N. Y.	219
WSWS	Richmond Harris & Co.....	Batavia, Ill.	275
WSYR	Clive B. Meredith.....	Syracuse, N. Y.	353
WTAD	Ill. Stock Medicine Corp.....	Quincy, Ill.	236
WTAG	Worcester Telegram.....	Worcester, Mass.	545
WTAL	Toledo Broadcasting Co.....	Toledo, Ohio	252
WTAM	Willard Storage Battery Co.....	Cleveland, Ohio	389
WTAQ	C. S. Van Gordon.....	Eau Claire, Wis.	254
WTAR	Reliance Electric Co.....	Norfolk, Va.	261
WTAW	Agricultural & Mech. Col. of Texas College Sta., Texas		270
WTAX	Williams Hardware Co.....	Streator, Ill.	231
WTAZ	Thomas J. McGuire.....	Lambertville, N. J.	261
WTHO	W. J. Thomas Radio Co.....	Ferndale, Mich.	407
WTIC	Travelers Insurance Co.....	Hartford, Conn.	476
WTRC	20th Dist. Republican Club.....	New York, N. Y.	240
WTRL	Technical Radio Laboratory.....	Midland Park, N. J.	280
WWAE	L. J. Crowley.....	Chicago, Ill.	242
WWJ	Evening News Assn. (Detroit News).....	Detroit, Mich.	353
WWL	Loyola University.....	New Orleans, La.	275
WWNC	Chamber of Commerce.....	Asheville, N. C.	254
WWPR	Detroit Police Dept.....	Detroit, Mich.	300
WWVA	John C. Stroebel, Jr.....	Wheeling, W. Va.	349
WWRL	Woodside Radio Labs.....	Woodside, N. Y.	258

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
CFCT	Victoria City Temple.....	Victoria, B. C.	329
CFCU	The Jack Elliott (Ltd.).....	Hamilton, Ont.	341
CFHC	Henry Birks & Sons.....	Calgary, Alta.	434
CFKC	Thorold Radio Supply.....	Thorold, Ont.	248
CFQC	The Electric Shop (Ltd.).....	Saskatoon, Sask.	329
CFRC	Queens University.....	Kingston, Ont.	450
CFXC	Westminster Trust Co.....	Westminster, B. C.	291
CFYC	Commercial Radio (Ltd.).....	Vancouver, B. C.	411
CHBC	The Calgary Albertan.....	Calgary, Alta.	434
CHCM	Riley & McCormack (Ltd.).....	Calgary, Alta.	434
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.	511

CJCL	A. Couture.....	Montreal, Que.	279
CJGC	London Free Press.....	London, Ont.	329
CKAC	La Presse.....	Montreal, Que.	411
CKCD	Vancouver Daily Province.....	Vancouver, B. C.	397
CKCK	Leader Pub. Co.....	Regina, Sask.	476
CKCL	Dominion Battery Co.....	Toronto	357
CKCO	Ottawa Radio Association.....	Ottawa, Ont.	434
CKCX	Int'l Bible Students Ass'n.....	Toronto	291
CKFC	First Congregational Church.....	Vancouver, B. C.	411
CKLC	Wilkinson Electric Co. (Ltd.).....	Calgary, Alta.	434
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.	435
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.	384

Republic of Mexico

CYB	Mexico City.....	380	CYL	Mexico City.....	400	CZE	Mexico City.....	350
-----	------------------	-----	-----	------------------	-----	-----	------------------	-----

Republic of Cuba

PWX	Cuban Telephone Co.....	Havana	400	5DW	R. S. Calderon.....	Matanzas	200	6KW	F. H. Jones.....	Tuinucu	272
2BY	F. W. Borton.....	Havana	260	6VY	Jose Ganduxe.....	Cienfuegos	260	7SR	S. Rionda.....	Central Elia	350
20K	M. G. Velez.....	Havana	360	6JK	F. H. Jones.....	Tuinucu	340	8BY	A. Ravelo.....	Santiago de Cuba	250
20L	Oscar Collado.....	Havana	257								

Great Britain

2LO	London.....	365	5XX	Daventry.....	1600	2ZY	Manchester.....	378
5IT	Birmingham.....	479	2RN	Dublin.....	390	5NO	Newcastle.....	404
5WA	Cardiff.....	353	6BN	Bournemouth.....	386	5SC	Glasgow.....	422
2BE	Belfast.....	440				2BD	Aberdeen.....	495

France

Lyons.....	550	Paris (Eiffel Tower).....	2,650	Paris.....	1,780	Paris.....	458
------------	-----	---------------------------	-------	------------	-------	------------	-----

**Short Waves Improve
With Sunspots**

RECEPTION of radio broadcast programs on fairly long waves generally gets worse as spots on the sun increase, but with short waves, of about 34 meters length, it gets better, Greenleaf W. Pickard told the Institute of Radio Engineers at their annual session. Advantage has been taken of this phenomenon in the new transatlantic radio phone service, because the voice is sent from New York to London simultaneously on long and short waves, so that as transmission with the long waves gets worse, the short wave transmission improves.

Mr. Pickard has been studying the relations between activity of the sun, as indicated by the presence of sunspots, magnetic storms on the earth, and radio reception. He began the study in March, 1926, and has continued it to the present, measuring chiefly the reception from station WBBM of Chicago, which operates on a wave length of 226 meters. There is a very close correlation shown between the magnetic character of the days, as determined at the Cheltenham, Md., magnetic observatory of the U. S. Coast and Geodetic Survey, and the radio reception at the time. When the monthly averages are taken, there is no obvious relation between the sunspots and magnetism of radio reception, said Mr. Pickard, but when weekly averages are used "an increase of solar activity is paralleled by an increase in magnetic disturbance and a decrease in reception."



**SELECTONE
TRANSFORMERS**

TESTED—MATCHED—GUARANTEED

Designed by E. H. Scott, whose famous receiver, the WORLD'S RECORD SUPER, established FOUR world records for long distance reception.

**HIGHEST AMPLIFICATION
FINEST TONE QUALITY**

SELECTONE Untuned Transformer—R400—has specially designed closed iron core, which limits interstage coupling and is impregnated in a vacuum so that all characteristics of coil remain constant. The coil design gives an extremely high amplification. Can be used in any circuit requiring a long wave transformer. **PRICE, \$6.00**

**PERFECTLY MATCHED
GREATEST SELECTIVITY**

SELECTONE Tuned Stage Transformer—R410—is air core. The matching of these filters is so perfect that where extreme selectivity is desired, two can be used and are guaranteed to match perfectly. **PRICE, \$6.00**

Either 199 or 201A Tubes Can Be Used

FREE

Send for illustrated literature describing Selectone Transformers and tests they undergo.

If your dealer cannot supply you, order direct

SCOTT TRANSFORMER CO.

7620 Eastlake Terrace,

Chicago, Ill.

**Device Eliminates
Gears in Engines**

AT A RECENT meeting of the Royal Society of Arts, in London, George Constantinesco delivered, by invitation of the Society, a lecture describing recent developments of his remarkable device called the "torque converter," replacing the usual gear-shift systems of automobiles and similar machines. This device is described by some engineers as being the most remarkable innovation in the science of mechanics since the invention of the steam engine. One of the problems encountered in many applications of power is the problem of varying the speed of a moving machine without changing the speed of the engine which drives it. In gasoline automobiles, for example, it is neces-

sary to provide some gear-shift arrangement, by which the driver can operate his car rapidly or slowly, the speed of the engine changing much less than does the speed of the rear wheels. The new device does away with this necessity.

FREE RADIO GUIDE

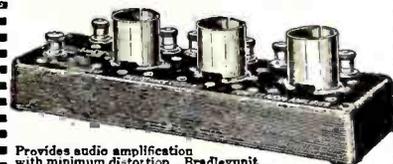
GET THE MOST FROM YOUR SET Gives special hook-ups with illustrations. Shows the latest wrinkles, newest developments in radio. Get the set you want here and save up to 50%. The best in parts, kits, complete factory-built sets and supplies. Learn how to get best results from your set. Quick service. Write for free 164 page copy NOW; also please send names of other radio fans.
BARAWIK CO., 540-544 Monroe St., Chicago, U. S. A.

WINDSOR HORN and CONE Loudspeakers and Loudspeaker Consoles
WINDSOR FURNITURE COMPANY
1416 Carroll Avenue, Chicago, Illinois
Los Angeles Branch, 917 Maple Ave.

MALE HELP

FIREMEN, BRAKEMEN, BAGGAGEMEN, (white or colored), sleeping car, train porters (colored), \$150-\$250 monthly. Experience unnecessary.
278 Railway Bureau, East St. Louis, Ill.

Bradley-Amplifier
Resistance-Coupled
PERFECT AUDIO AMPLIFIER



Provides audio amplification with minimum distortion. Bridgman molded resistors used in the Bradley-Amplifier do not vary with age and are not affected by atmospheric conditions. Can be used to replace transformer amplifiers in standard radio sets with decided increase in tone quality.

Allen-Bradley Co.

Electric Controlling Apparatus

289 Greenfield Avenue Milwaukee, Wis.

KC	Meters	STATIONS	DIALS		
			1	2	3
1480	202.6				
1470	204.0				
1460	205.4				
1450	206.8				
1440	208.2				
1430	209.7				
1420	211.1				
1410	212.6				
1400	214.2				
1390	215.7				
1380	217.3				
1370	218.8				
1360	220.4				
1350	222.1				
1340	223.7				
1330	225.4				
1320	227.1				
1310	228.9				
1300	230.6				
1290	232.4				
1280	234.2				
1270	236.1				
1260	238.0				
1250	239.9				
1240	241.8				
1230	243.8				
1220	245.8				
1210	247.8				
1200	249.9				
1190	252.0				
1180	254.1				
1170	256.3				
1160	258.5				
1150	260.7				
1140	263.0				
1130	265.3				
1120	267.7				
1110	270.1				
1100	272.6				
1090	275.1				
1080	277.6				
1070	280.2				
1060	282.8				
1050	285.5				
1040	288.3				
1030	291.1				
1020	293.9				

KC	Meters	STATIONS	DIALS		
			1	2	3
1010	296.9				
1000	299.8				
990	302.8				
980	305.9				
970	309.1				
960	312.3				
950	315.6				
940	319.0				
930	322.4				
920	325.9				
910	329.5				
900	333.1				
890	336.9				
880	340.7				
870	344.6				
860	348.6				
850	352.7				
840	356.9				
830	361.2				
820	365.6				
810	370.2				
800	374.8				
790	379.5				
780	384.4				
770	389.4				
760	394.5				
750	399.8				
740	405.2				
730	410.7				
720	416.4				
710	422.3				
700	428.3				
690	434.5				
680	440.9				
670	447.5				
660	454.3				
650	461.3				
640	468.5				
630	475.9				
620	483.6				
610	491.5				
600	499.7				
590	508.2				
580	516.9				
570	526.0				
560	535.4				
550	545.1				

CLASSIFIED ADVERTISEMENTS

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

The classified advertising rates are but five cents per word for a single insertion. Liberal discounts are allowed on three, six and twelve-time insertions, making rate of 4 1-2, 4 and 3 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 the April issue must be sent in by February 25.

AGENTS WANTED

I AUTO GAS SAVER FREE
To introduce. Amazing car performance. Doubles mileage. CRITCHLOW, Inventor, C-90, Wheaton, Illinois.

AGENTS: Make \$8 to \$15. Daily. White Rose Polish. Send 50c for full size sample and particulars. **WHITE ROSE DISTRIBUTORS**, Box 2551, Memphis, Tenn.

WANTED, AN ACTIVE MAN TO TAKE ORDERS for Hardy fruit trees, berry bushes, evergreens, flowering shrubs and roses. Liberal commission. Free replacement. Sales instruction and outfit free. **Sherman Nursery Company**, attention Mr. Smith, Charles City, Iowa.

AUTOMOBILE ACCESSORIES

FREE CIRCULAR—INSTANT COLD WEATHER starting for Ford, Chevrolet and Star owners—P. O. Box 1523-E, Denver, Colorado.

BOOKS AND MAGAZINES

Electric Fun! Seventy stunts, 110 volts, \$1. Cecutting, Campbell, Calif.

FREE—Two big New Magazines and information worth hundreds of dollars to you. Enclose 2c stamp. Salesmanager, Box 74-R, Beaver Dam, Wisconsin.

What could be better than magazine subscriptions for gifts. Send stamp 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, an 807 cloth bound book containing 10,000 proven formulas for the manufacturer, workshop, laboratory, office and home. Sent prepaid upon receipt of \$4.00. Send stamp 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, Ill.

BUSINESS OPPORTUNITIES

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

CODE

DO YOU WANT TO MEMORIZE THE WIRELESS TELEGRAPH CODE? THE CORYDON SNYDER CODE METHOD IS EASIEST, QUICKEST, PATENTED. Send 10c coin for complete method to Corydon Snyder, 1243 Rosemont Avenue, Chicago, Illinois.

COLLECTIONS

Three Collection Letters That Actually Collect: Product, 23 years' experience, \$1.75. Address J. A. Hillman, Lynchburg, Virginia.

DOGS

BEAUTIFUL REGISTERED BULL PUPS \$15. Bull-dogs, 501 Rockwood, Dallas, Texas.

MISCELLANEOUS

FOR SALE: WATCHMAKER'S LATHE at a bargain. R. Jaegermann, 5815 Easton Ave., St. Louis, Missouri.

HELP WANTED

SET BUILDERS! We furnish jobs for you. (No fee) competent men needed today in every community to build LC-27 and Hammarlund-Roberts Sets. Big money for you if you can qualify. Register NOW, giving particulars, experience, references. **Allen-Rogers, Inc.**, 118 E. 28th Street, New York, N. Y.

PERSONAL

LONELY HEARTS: Exchange letters; make interesting new friends in our jolly club. Particulars free. **Eva Moore**, Box 908, Jacksonville, Florida.

RHEUMATISM, NEURITIS—WHY SUFFER? Guaranteed complete treatment mailed, postpaid \$1.50. Persons Pronounced Incurable should try. This Remedy gets you results or money refunded. Square dealing. Write **PROF. GUHA, BOX R-166, HUNTINGTON, IND.**

RADIO

Build the Quadraformer Super VI. A real five tube set. Genuine Essential Kit, \$17.50 including instructions. Booklet 25c. Literature on request. **R. P. Tomamichel**, 2244 Seminary Avenue, Chicago, Illinois.

$\frac{1}{8}$ " square copper wire for low wave transmitting inductance 3 or 4" diameter coils 5 and 6c per turn prepaid on orders for \$1.00. Less than \$1.00 10c extra for postage. **George Schulz**, Calumet, Michigan.

TROUBLE-SHOOTING. Do you know the key to the knowledge of any electrical circuit? You can find correct answer in a booklet written by nationally known authorities on Radio and Electricity. Ask your radio dealer for "Practical Guide for Every Radio Builder and Owner" or Send 10c to-day to Universal Test Equipment Co., 2939 N. Oakley Ave., Chicago, Ill. Sold at all news stands in the city of Chicago.

Buyers Service for Readers of Radio Age. I will buy for you standard radio merchandise if you cannot obtain same in your locality. Remit list price of articles wanted, and if same not obtainable by me I will make refund. **R. P. Tomamichel**, 2244 Seminary Ave., Chicago, Illinois.

Guaranteed tubes, 199 and 201A types \$1.00 each. \$7.50 units to make a loud speaker of your Phonograph only \$2.49. \$4.00 list head phones going at \$1.69. This is real value, a standard make 3 tube set with long range and lots of volume for \$8.95. (less accessories), while they last. \$12.00 loud speakers with genuine Bakelite Bell at \$6.95. Write for our prices before you buy your radio parts. **Outlet Sales**, 112 Calvert Ave., Detroit, Michigan.

RADIO TROUBLES OVER. Hoff's trouble finder locates, explains Remedy, 103 radio ailments. Particulars free. **Smith**, 516 Main, St. John, N. B.

IVORY RADIO PANEL beats them all. Write for FREE Sample. **Ivorylite Radio Panel Co.**, 3330 Ave. G, Fort Worth, Texas.

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 stamp 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., .007" for radio frequency transformers, 50c cubic inch, postage extra. At least $\frac{1}{2}$ cash with order—balance C. O. D. **Geo. Schulz**, Calumet, Michigan.

99.7% Pure aluminum for Rectifiers, B Eliminators, Trickle chargers and transmitters $\frac{1}{2}$ " round, $\frac{1}{4}$ x1" rectangular 5c inch, $\frac{1}{4}$ x $\frac{3}{4}$ 4c inch, $\frac{3}{8}$ " round lead elements $\frac{3}{16}$ " long 15c, 7 for \$1.00 all with brass terminals, prepaid to 5 zone. No order less than \$1.00. **Geo. Schulz**, Calumet, Michigan.

PURE ALUMINUM and lead rectifier elements, holes drilled, with brass screws and nuts per pair 1-16", 1"x4", 13c, 1x6, 13c, 1x4x6, 17c, 1x2x6, 19c, single elements half price. Sheet aluminum 1-16", \$1.00, 1-8" \$1.90. Lead \$1.00 square foot all prepaid. **Geo. Schulz**, Calumet, Michigan.

CONDENSERS. 800 VOLT FILTER. .1 mfd 45c, .25 51c, .5 60c, 1, 75c, 2, \$1.20, 3, \$1.80, 4, \$2.40, 1500 VOLT FILTER, .1 51c, .25 60c, .5 75c, 1, \$1.05, 2, \$1.95, 3, \$2.70, 4, \$3.60. **ELIMINATOR BLOCKS**, 2, 2, and 8 \$5.70, 2, 2, 8 and 1 \$6.15, 2, 2, 8, 1 and 1 \$6.60, .1 and .1 in series 90c. Many other capacities. Acme transformers and chokes. **THE RADIO CLUB, INC.**, La Porte, Ind.

3 element Rectifier jars for B eliminators, B battery chargers and transmitters, 1 jar takes the place of 2 ordinary jars. $\frac{1}{4}$ "x $\frac{3}{4}$ " 99.7% pure aluminum, rubber covers binding posts 3" inside diameter \$1.00 each, 4 for \$3.00, prepaid to 5th zone. $\frac{1}{2}$ cash with order balance C. O. D. Satisfaction or money back, **George Schulz**, Calumet, Mich.

Ultradyn-Model L2. Complete parts as specified by Lacault, including Cabinet and engraved panel. Guaranteed good as new. Cost \$99.50, will sell for \$60.00. **Donald W. Church**, Sterling, Illinois.

RADIO PANEL ENGRAVING: Single panels, quantity work and special engraving of any description. Highest standards of workmanship. We have served prominent Radio Age experimenters and broadcast engineers for several years. **A. L. WOODY**, Room 704, 19 South Wells St., Chicago.

VICTOREEN No. 170 superheterodyne transformers \$4.50 postpaid. Chelton #3 plate midnet condensers \$1.05 postpaid. **L. W. Crosby**, 19 Railroad Avenue, Swampscott, Mass.

Tubes, all kinds. Including latest power tubes at cut prices and special discount, send 2 cent stamp for Prices and Particulars. **Web Radio Company**, Box 849, Chicago, Ill., Dept. TE.

Eliminator parts 50H choke \$2.00, 30H choke \$1.75, 20H choke \$1.00. Write for list of parts including condensers and transformers. Postage prepaid. **Radio Parts Sales Company**, Box 24, Orange, N. J.

EUROPEAN broadcast on two tubes. Simple and cheap to construct. Blue prints 50c. **Triangle Drafting Service**, 5124 Sheridan Road, Chicago, Illinois.

Save up to 50% on Nationally Advertised Radio parts. Send for our new price list of Radio Kits, "B" eliminators, Radio Receivers and Parts. **NATIONAL RADIO-PRINT CO.**, Room 404, 200 Broadway, New York.

Radio Panel Lamp. Rests on top cabinet. Lights dials. Uses battery current. Complete with bulb \$1.25, postpaid. Satisfactory or money back. **Robert Stevenson**, Lancaster, Ohio.

RADIO STAMPS

WANTED—Radio Station Stamp Collectors Everywhere. Write Chas. A. Philidus, 510 East 120th Street, New York, N. Y.

SALESMEN WANTED

Make \$100 WEEKLY in spare time. Sell what the public wants—long distance radio receiving sets. Two sales weekly pays \$100 profit. No big investment, no canvassing. **Sharpe of Colorado** made \$955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. **OZARKA, INC.**, 431 N. LaSalle Ave., Chicago.

WANTED TO BUY

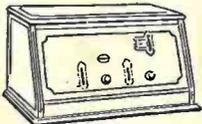
Full value paid for old GOLD jewelry, silver or platinum. Packages returned if our offer not satisfactory. **Elaine Specialty Company**, 3330 Ave. G, Fort Worth, Texas.

Radio Age Classified Ads Bring Results

Please Mention Radio Age When Writing to Advertisers.

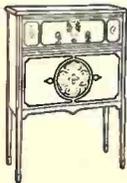
CROSLEY 1927 RADIOS

Each set giving the utmost in radio enjoyment at its price. All prices slightly higher West of the Rocky Mountains. All prices are without accessories.



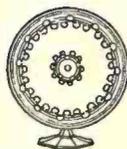
The 5-50—\$50

Enthusiastic owners report amazing performance—a drum delivering stations loud, clear and sharp; each an almost imperceptible turn of the drum apart. Write station letters on drum, return to them at will. Single drum Station selector, Acuminators, power tube adaptability and all metal chassis that shields the units from each other. Beautifully finished. Mahogany cabinet with rose gold trimmings. Also made with 6 tubes—6-60—\$60.



"6 Tube RFL-90"
Console, \$98

Introducing the double drum station selector! Crosley's winning non-oscillating perfectly balanced tuned radio set. Includes Musicone skillfully built into exquisite console mahogany cabinet of two-tone finish to match finest surroundings. Room for batteries and all accessories; 40 inches high; 30 1-2 inches wide.



THE CROSLEY MUSICONE

The secret of the popularity of this biggest selling loud speaker on the market lies in its actuating unit. This and NOT the cone shape is the reason for its perfect reproduction of all audible sound. BEWARE of imitations. There is only one genuine Musicone. It is built solely by Crosley under mass production methods which makes its unmatched value possible.

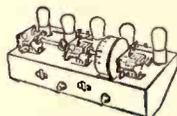


Crosley sets are licensed under Armstrong U. S. Patent No. 1,113,149, or under patent applications of Radio Frequency Laboratories, Inc., and other patents issued and pending.



CROSLEY 1927 FEATURES

Many exclusive—other found only in highest priced radios. THE "CRESCENDON"
When, on ordinary radios, ears must strain to catch a station miles away, a turn of the Crescendon on Crosley radios instantly swells reception to room filling volume. An exclusive Crosley feature.



ALL-METAL SHIELDED CHASSIS

This truly great radio achievement, found in several Crosley sets, furnishes a substantial frame for mounting elements, produces excellent alignment of condensers, shields the units from each other, prevents interstage, improves the stability of the circuit, increases selectivity

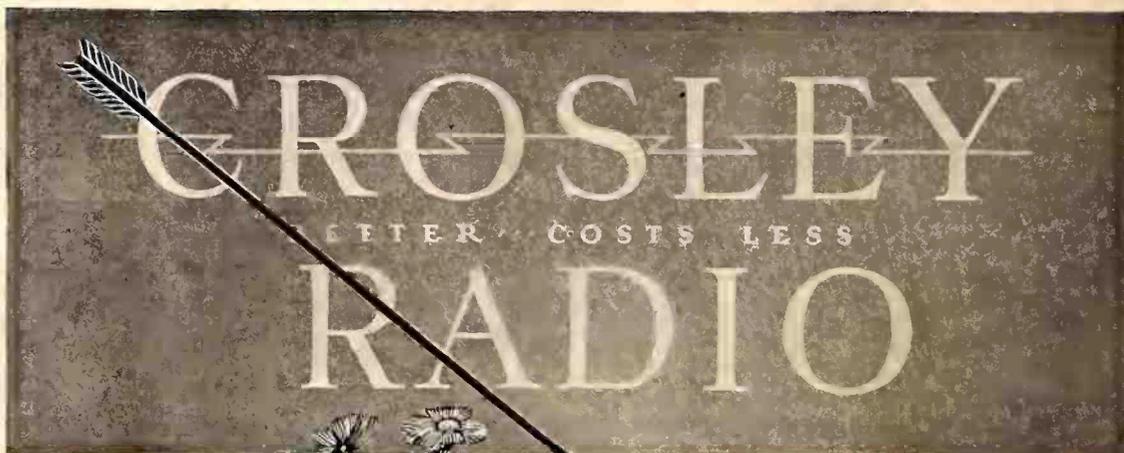
and saves costs by standardizing this phase of manufacture.

THE SINGLE-DRUM STATION SELECTOR

Nothing in radio equals the joy or the convenience of single drum control. Crosley's single drum control enables you to find the stations sought without log book or "tuning."
"THE ACUMINATORS"
Crosley Acuminators permit tuning in—loud and clear—weak stations

missed over and entirely missed by ordinary single dial radios. In tuning high powered and local stations they are not used. They are an exclusive Crosley feature.

POWER TUBES
Power tube adaptability marks the Crosley "5-50," "5-75" and "RFL" sets. This feature typifies Crosley provision for best radio reception at moderate cost.



Single Drum Control
5-75 CONSOLE

\$75.

Marvelous exclusive Crosley "Crescendon" and "Acuminators" increase volume on distant stations and bring in programs entirely missed and passed by on ordinary one-dial control radios.

In this 5-75 Console, Crosley again brings to the radio public all the advanced ideas in radio at a price within the reach of all. Console model stands 40 inches high. The Crosley Musicone is skillfully built into the cabinet. Ample space for batteries and all accessories. A mahogany cabinet with rose gold trimmings makes it possible to match the surroundings in any home.

6 tube model—The 6-85
\$85.

Write Dept. 63



The Crosley Radio Corporation
Powell Crosley, Jr., Pres.

Prices slightly higher West of the Rocky Mountains

