

RADIO AGE

The Magazine of the Hour

September, 1922

Price 25 cents



PAINTED BY JAMES HART, AFTER KEYSTONE PHOTO

How To Make a Cheap Reinartz Set—In This Number

RADIO AGE INSTITUTE

To insure 100% value to readers of advertisements, as well as 100% value to the advertisers themselves, radio equipment is now being tested and indorsed by the

RADIO AGE INSTITUTE
64 WEST RANDOLPH STREET
CHICAGO, ILLINOIS

No charge is made for testing and approval, and all merchandise will be returned as soon as possible, transportation expenses to be paid by the manufacturer. Lists of makers of approved radio goods will be published from time to time.

SERVICE DEPARTMENT FOR READERS

Please remember that Radio Age has one of the best radio instructors in the United States, who is ready to answer any technical question. This costs you nothing.

RADIO AGE

The Magazine of the Hour

Volume 1

Number 4

CONTENTS

	PAGE
Novice Gets Good Results with Armstrong Super-Regenerative Circuit.....	3
By FRANK D. PEARNE	
Bank Uses Radio to Serve Public.....	4
How to Construct a Cheap, Efficient, High Grade Regenerative Set.....	5-6-7
By FRANK D. PEARNE	
First National Radio Congress.....	8
Problem of Power Transmission.....	9
CHARLES P. STEINMETZ	
Marconi Discusses Short Waves.....	11
GUGLIEMO MARCONI	
News of Anti-Static War.....	11-12
Who Saw Broadcasting Vision?.....	13
Introducing K F A F.....	15
Thought waves from the Editorial Tower.....	17
By FREDERICK SMITH	
Questions and Answers.....	22-23
FRANK D. PEARNE	
List of New Broadcasting Stations.....	24
List of Stations Broadcasting Market reports.....	25-26-27
Federal Act Regulating Radio.....	29-30-31

RADIO AGE is published monthly by
RADIO AGE, INC.

Publication office Mount Morris, Ill.
Chicago Office, Garrick Building, 64 W. Randolph St.

FREDERICK SMITH, *Editor*
FRANK D. PEARNE, *Technical Editor*
M. B. SMITH, *Business Manager*

Advertising Managers:
YOUNG & WARD
308 North Michigan Avenue, Chicago, Ill.

Eastern Representative:
GEO. W. STEARNS
Flatiron Building, New York City, N. Y.

Advertising Forms Close on 19th of the Month
Preceding Date of Issue.

Issued monthly. Vol. I, No. 4. Subscription price \$2.50 a year. Application made for transfer of entry as second class matter from the post office at Chicago, Illinois, to the post office at Mount Morris, Illinois

Copyright, 1922, by RADIO AGE, Inc.

Do It Better!

Any radio magazine that keeps pace with radio must be a magazine that improves materially with each issue. Radio is going forward by leaps and the boy who is operating a small receiving set today is the broadcaster of tomorrow.

With pleasure, therefore, we offer our readers this month a magazine in a brand new dress, for appearance sake, and contents that cannot fail to grip the interest of fans everywhere.

Everybody is talking about the Reinartz tuner. Professor Pearne in this issue tells how to make a Reinartz outfit at small expense, which will enable the maker to hear stations up to 1,500 miles distant.

Also everybody is talking about the Armstrong Regenerative Circuit. Mr. Pearne tells how a novice built one for his car that worked perfectly. Diagram accompanies article.

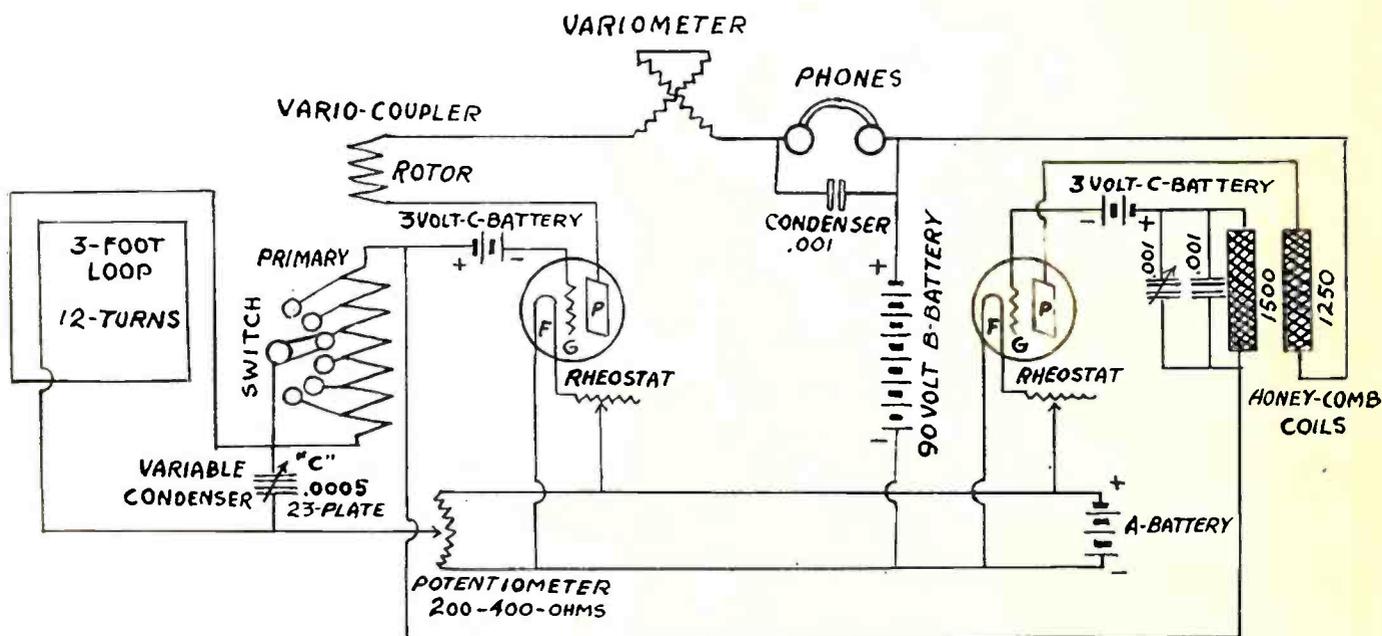
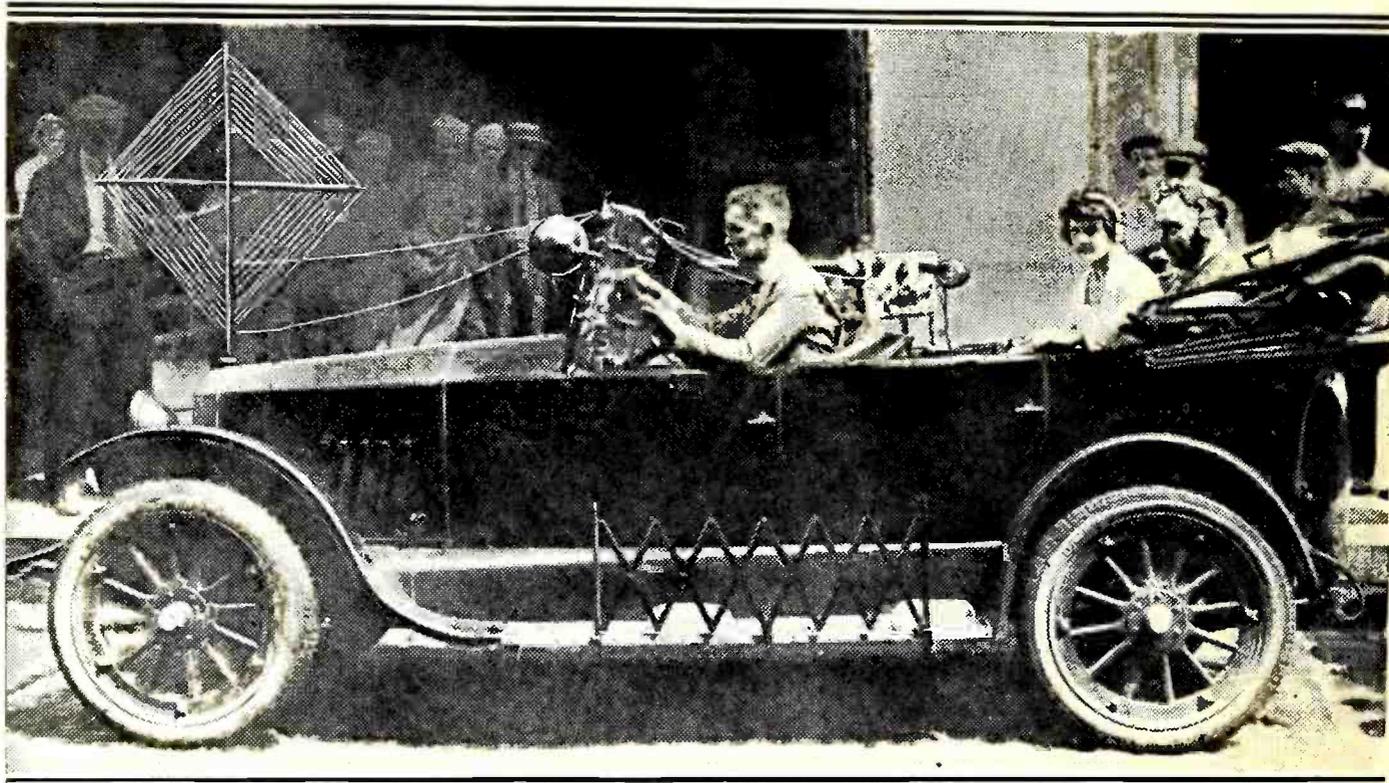
Everybody wants to know where and what the new broadcasting stations are. A list is published in this number.

Everybody wants to know which stations send out market, crop, weather, and other useful news reports. The list of hundreds of stations in this number covers the entire United States.

Next month we will publish the Bureau of Standards illustrated article for amateurs on how to make a tube detector set at small cost to replace the crystal set which has been outgrown. This is an official government article. Don't miss it.

Read RADIO AGE for information carried in no other daily, weekly, or monthly radio publications.

This Auto-Man Solved the Circuit



ARMSTRONG SUPER-REGENERATIVE CIRCUIT.

Above is a photograph of Paul B. Coats, in his car, in which he has installed his own Armstrong super-regenerative set, with loop aerial set into the radiator cap. Mr. Coats is sitting at the wheel. Below is a diagram of the circuit which Mr. Coats used in this remarkable outfit, and with which he has received messages from stations as far away as Newark. See descriptive story of Mr. Coats' set on opposite page.

RADIO AGE

"The Magazine of the Hour"

M. B. SMITH
PUBLISHER

PUBLISHED MONTHLY GARRICK BLDG CHGO.

FREDERICK SMITH
EDITOR

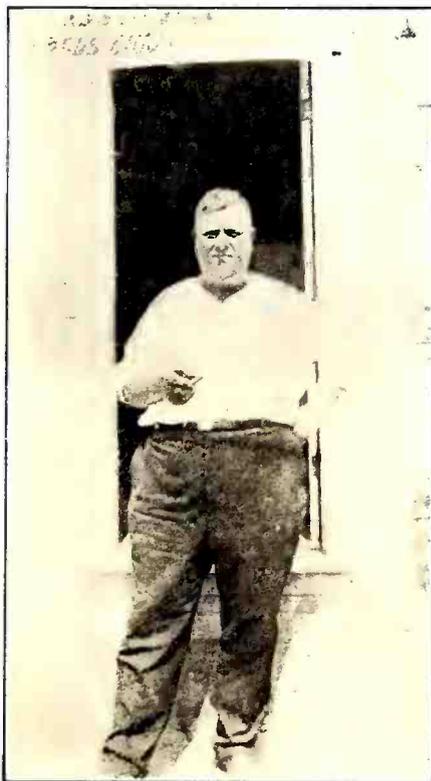
Novice Gets Good Results With Armstrong Super-Regenerative Circuit

By F. D. PEARNE

WHILE many radio experts are wrestling with the new Armstrong super-regenerative circuits, trying to find the best one and to solve the problem of getting them to work, along comes Paul B. Coats, an amateur of about sixty days' experience in radio work, with a real Armstrong circuit set up and working splendidly in his automobile. Mr. Coats is Vice President of the Milburn Puncture Proof Tube Co., located at 336 W. 47th Street, Chicago, Ill., and became inoculated with the radio bug just two months ago.

Unlike most beginners, who are satisfied to start out with the crystal detector and tuning coil, he aimed higher and, after building three circuits of the Armstrong super-regenerative type, was rewarded with the successful outfit which he is now using. The circuit uses only two tubes (both amplifiers) and is conspicuous in the absence of any complicated apparatus. With a three-foot loop of twelve turns mounted on the radiator of his car he can listen in and get Kansas City, Denver, Detroit, Indianapolis, Pittsburgh and Newark.

Now, I know what you are going to think: "Another newspaper story," and this is the reason that I am giving Mr. Coats' address, so that the skeptical readers may get in touch with him and receive first-hand information. The most interesting feature of this outfit is the fact that location does not seem to affect it. For example, with the car parked at the waters' edge in Milwaukee, Wis., KDKA at Pittsburgh was picked up, and upon moving the car to the top of one of Milwaukee's famous hills, no differ-



PAUL G. WOOD, Hilliard, O., who is a radio camper.

ence in the reception could be noticed. Another noticeable feature is the lack of interference from local disturbances. Mr. Coats very generously offered to draw up his circuit for the benefit of those who are interested in these different Armstrong circuits. The diagram is a reproduction of this circuit.

The loop consists of twelve turns of wire on a frame three feet square. A variable condenser "C" of .0005 M. F. (23 plate) is connected across the terminals of the loop. The vario-coupler used is of the ordinary type, but I would suggest the use of one in which the roter could be continuously revolved, for the rea-

son that no connections will have to be changed in testing, as this allows reversing the direction of the winding by simply turning the dial 180 degrees.

The variometer should also be arranged so that the roter can turn all the way around. This is not necessary, however, but it makes it unnecessary to reverse the connections, if when testing it is found that connections should be reversed. The phones are shunted by a .001 condenser (a 43-plate variable will do). Two honey-comb coils of 1,500 and 1,250 value respectively are placed in inductive relation as shown. These should be placed on the regular mounting so that the distance between them may be varied for adjustment. Two condensers, one a fixed condenser of .001 M. F. and one a variable of .001 M. F., are placed in parallel across the terminals of the 1,500 honey-comb-coil.

A "C" battery of three volts is connected in each of the grid circuits as shown. These can be two small dry cells, such as are used in flashlight work. The negative side should be connected to the grid. The "B", or plate battery, is ninety volts. The lower end of the loop connects to the arm of a potentiometer, which is connected across the "A" battery. A switch should be connected in the "A" battery circuit, so that the current can be cut off from the potentiometer when not in use, to prevent waste of current. This potentiometer can have any resistance from 200 to 400 ohms. It will be noticed that the upper terminal of the loop connects, not only to the condenser, but also to the end of the primary winding of the coupler, and to the switch lever. The tubes are both amplifying tubes.

Bank Uses Radio to Serve Public

Timely Service of Cleveland's Largest Bank Fills a Real Need in 500-Mile Radius

THE Union Trust Company of Cleveland announces, through Mr. A. H. Scoville, Vice President, in charge of the Bond Department, the installation of a radio broadcasting station, in operation August 15.

The new station will be a 500-watt outfit of the very latest design which, under favorable conditions, has an effective radius of 500 miles.

From 9:00 until 9:45 and from 10:00 to 10:45 in the morning, and from 2:00 to 2:45 and from 3:00 until 3:45 in the afternoon the new Union Trust Radio Broadcasting Station will send out full and authoritative information on the major movements in the stock and bond market, together with latest prices on farm and dairy products. Intervals between quotations will be filled with the important financial news accumulating over the private wires of the Union Trust Company.

The new station will bring not only to the city dweller who owns a receiving set, but to the farmer as well, up-to-the-minute information on the major movements of the financial world, together with the vital news of all the markets. It will enable the farmer, who does not himself own a receiving outfit, to call up his local bank, who will have a receiving set, and obtain the very latest quotations on his farm and dairy products, insuring proper buying and selling upon the farmer's part. It will enable the city dweller, within a radius of 500 miles from Cleveland, to obtain the very latest news from the financial world.

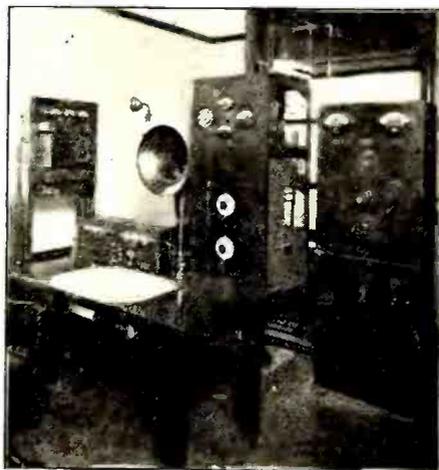
In effect, the Union Trust radio broadcasting station will supply practically the entire Fourth Federal Reserve District with an up-to-the-minute four-times-a-day newspaper of the events of importance in the commercial and financial world.

Once a week, in the evening, from 7:00 to 8:00, the very best entertainment program available in Cleveland will be broadcasted.

This timely innovation by the Union Trust Company again marks Cleveland as the leading financial center of the Middle West, for the new station will render a financial service literally broadcast over a radius of hundreds of miles and will

give the banker in the smaller towns, his customers and all others using radio receiving sets, the very concrete advantages incident to the private wires and other unusual machinery peculiar to a large bank like the Union Trust.

Lobby and window bulletins will be supplied banks with receiving sets throughout the Fourth Federal



Radio Room in Cleveland Bank.

Reserve. These bulletins will be changed twice daily and will contain quotations on the more active stocks and bonds, with the latest movements in the money market, in addition to such financial and commercial news as may be of interest to the general public.

It will enable the bank customer in the hundreds of cities surrounding Cleveland to be in four-times-a-day contact with the elaborate wire and information service at the command of The Union Trust Company and it will make Cleveland the pivot for the latest thing in banking service.

No effort is being spared by The Union Trust Company to make their sending station one of the most complete in the country. It is the equal of any commercial sending station at the present time and Mr. Scoville promises that every endeavor will be made to keep it up to date in the minutest particular, for, as Mr. Scoville well points out, the service which a bank can render its patrons is used comparatively little, but through the radio The Union Trust will render this service to thousands upon thousands of people throughout the entire Fourth Federal Reserve District, thus mul-

tiplying the service of The Union Trust Company many hundred times over, while at the same time attracting the ears of the Central West toward Cleveland, and the progressive spirit of service for which Cleveland has always stood.

Wireless Starts Train

In the presence of an assemblage of business leaders of the Pittsburgh district, the International Trade Special, carrying thirty-three cars of equipment for the electrification of the Chilean State Railways, was started recently by wireless from the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company.

This is the first time in history that such a wireless feat has been accomplished and it portends the tremendous possibilities for the use of wireless in railroad work.

The International Trade Special was started on its long journey when E. M. Herr, President of the Westinghouse Company, closed a switch on a pole near the railroad track on which the train was standing. The closing of this switch closed the wireless electrical circuits laid out by radio experts and engineers, and this reacted on the circuits in the locomotive, releasing the controller.

The release of the controller by wireless then started the International Trade Special and marked an event unparalleled in history and in wireless engineering. After the train was put in motion by the wireless arrangement, a locomotive engineer, who was sitting in the cab, in accordance with the requirements of the Interstate Commerce Commission, took charge of the train.

The assembled guests, although expecting to witness an unprecedented event, were amazed by the facility with which the locomotive was started by wireless, and, for a moment, stood silently in wonderment at the feat. Then they started cheering and continued cheering until the long train had left the electric plant.

The shipment, which was the largest single consignment of electrical apparatus for railroad electrification ever made in the world, was the second complete train of railway electrification equipment to be sent to Chile.

How to Construct a Cheap, Efficient, High Grade Regenerative Set

By F. D. PEARNE

Chief Instructor in Electricity at Lane Technical High School

FOR the amateur who wants to build a real receiving set and does not feel that he can afford to spend the money, I submit the following specifications of the Reinartz tuner, which, according to my many correspondents, is giving far greater satisfaction than the well-known vario-coupler and vario-meter set. This set is claimed by many users, to bring in signals which cannot be heard with the other well-known types, and the small investment required to build it is one of the features which recommend it to the experimenter. All of the inductances are wound upon the same form, which are of the well-known "spider web" type.

Construction.

The mounting is made by cutting out a disc of fiber one-sixteenth of an inch thick and six and one-half inches in diameter. If fiber cannot be obtained, good heavy cardboard can be used, but it must be very carefully varnished with shellac before the winding is put on. Cut out the disc as described and divide the outside edge into eleven parts. Draw a circle two and one-half inches in diameter upon the disc to locate the bottom of the slots, then at each of the divisions cut a slot one-eighth of an inch wide from the outside edge to the inner circle so marked.

After all the slots have been cut, a coat of shellac varnish, or celluloid cement, is put on and, when dry, the form is ready for winding. It is a good idea to study the circuit as shown in Figure 3 before starting to wind. Note where the taps are taken off, as a great deal depends upon just the right number of turns being used. Leave all taps at least twelve inches long, so that no splicing will have to be done when the inductance is connected to the switches. The best wire to use for the winding is No. 26 cottename or silk enamel insulation, although plain cotton insulation will do if the maker is careful in his work. Begin winding at the bottom of any one of the slots, leaving an end at least twelve inches in length for connections. Wind in and out of the slots as shown in Figure 2 until fifteen turns have been put on. In counting

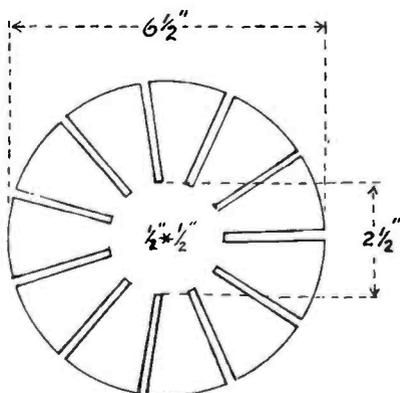


FIGURE 1.

these turns after they have been put on remember that only one-half of the turns will be visible on one side of the disc, so that when seven turns show on one side and eight on the other, it means fifteen complete turns.

When fifteen turns are in place, make a twelve-inch loop, twisting it together, so that this twist will come up tight to the slot, then the tap will not lose its identification among the numerous other taps to come. Continue the winding in this way, taking off a tap at every fifteen turns until sixty turns are in place. At the last turn cut the wire off, leaving the twelve inches for connection. If these instructions have been followed faithfully there will now be three taps and two ends projecting from the disc. It is a good plan to bring out these taps in different slots; that is, the first tap comes out in the next slot to the one in which the coil was started and the next tap in the next slot, etc., as this makes the identification of the wires much easier. This

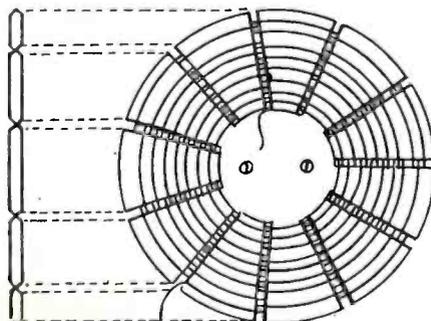


FIGURE 2.

coil is shown at the bottom of the diagram in Figure 3, and is marked "inside coil."

Now start the next coil in the next vacant slot, leaving the customary twelve-inch end; wind one turn only and bring out a loop. Continue in this way, taking a tap off at every turn until you have ten turns. Instead of cutting the wire at the end of the tenth turn, bring out another tap and wind fifteen more turns before you bring out the next tap. After the tap on this fifteenth turn, wind twenty-eight more turns, tapping them at every seventh turn, except the last one which will be a single end, as it is the finish of the winding. Now check up the number of turns with the diagram Figure 3 and see that the correct number of turns have been put on. There should be sixty turns on the inside coil and fifty-three on the outside coil. Now after the winding is completed, paint the coil all over with some insulating varnish, such as shellac or celluloid cement. Both of these windings together will just about fill the form. The best way to mount the coil is to cut off a piece of curtain-pole (wood) about one inch long, place it against the center part of the disc and fasten it to the panel with two brass screws. (Do not use iron screws, as they will tend to dampen the oscillations.)

If the set is to be mounted in a cabinet, it will be better to mount the coil with the piece of curtain-rod on a separate piece of wood, in an upright position, as this will give better access to the wires when it comes time to make the connections. The switches and contact points can be purchased at any radio supply store. Two variable condensers are necessary, one shown at "C" in Figure 3 should have a capacity of .001 M. F. and the one shown at "D" in the same figure should have a capacity of .0005 M. F. The rest of the apparatus required is the same as that used in any other regenerative set, viz.: One grid leak and condenser, one detector tube and socket, one storage "A" battery (6 volts), one plate, or "B" battery (twenty-two two and one-half volts), and one pair

of two or three thousand ohm receivers.

Figure 3 shows how all the connections are to be made, and the builder can mount the outfit as he pleases, either in a box with a panel front, or on a table or base-board. The method of winding the coil is shown at "B" in Figure 2. If this set is carefully constructed, the results obtained will surprise the most skeptical reader and with one step of amplification it will produce results equal to two steps of amplification on the vario-coupler and variometer set. The amplifier, however, should be of a specially designed circuit, which will be explained for those wishing to add it to their sets.

Amplification for Reinartz Tuner.

Figure 4 shows the method of adding one step of amplification to the Reinartz tuner. In this circuit a variable condenser is shown in place of the grid-leak and condenser. The use of either of these is optional with the builder. The variable condenser will give better tuning effects, but the set will work very well if the grid-leak and fixed condenser is used; in fact, the set from which these specifications were taken used the fixed condenser and grid-leak. The method of connecting the amplifier to the circuit is similar to that of the ordinary circuit. The head phones are removed from the circuit shown in Figure 3 and replaced with the primary winding of a ten to one ratio audio amplifying transformer. In the set from which these specifications were taken, this primary winding of the transformer furnished enough reactance to make the tube oscillate properly, but this is not always the case. If it is found that the filament has to be burned at a dangerous degree of brilliancy to produce the oscillations, then an extra inductance should be inserted in the circuit at the point marked "X" in Figure 4. If however, the tube is found to oscillate without crowding the filament, then this extra inductance "X" should not be inserted.

If it is found that the inductance is necessary it can be made by making a small form similar to the one on which the two coils are wound, but much smaller, and winding six turns of wire of the same size as that used on the large coil. This has been found by experiment to be the correct number of turns and should not be changed. The secondary of the transformer is

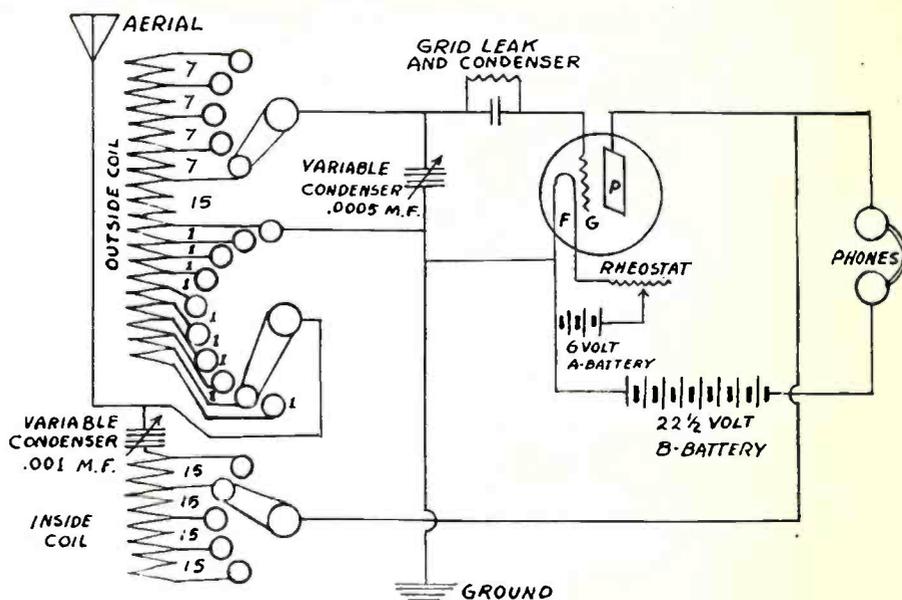


FIGURE 3

connected to the grid and filament circuit as shown in Figure 4.

The circuit shows only one set of "B" batteries used for both the detector and amplifier tube plates, but stronger signals may be obtained by adding another twenty-two and one-half volt "B" battery between the head phones and the battery shown on the drawing. This is shown in Figure 6. It is absolutely necessary to see that the positive side of the "B" battery is connected to the part of the circuit, which eventually gets to the plate,

and the negative side must always be connected to the filament. Another important thing is to see that the rotating part of the condenser "C" is connected to the aerial, and that the rotating part of condenser "D" is connected to the earth. The set will not give good results unless this is done.

The connections to the aerial, ground, and batteries are taken out through the back of the case, to avoid using binding posts on the front of the panel, as this always makes an unsightly wiring job. If desired,

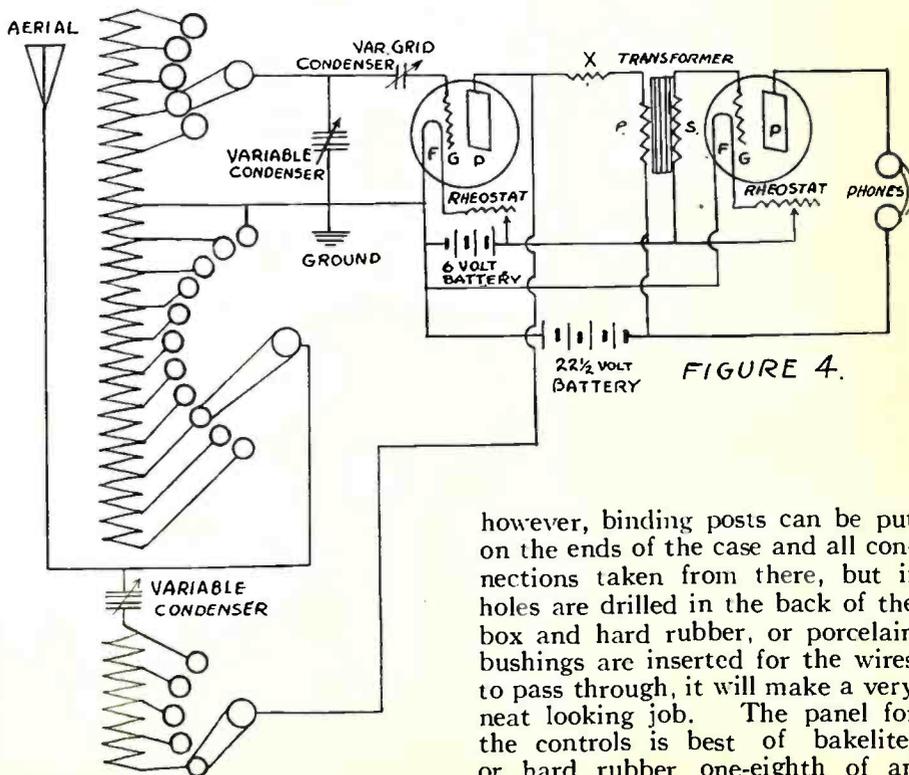


FIGURE 4.

however, binding posts can be put on the ends of the case and all connections taken from there, but if holes are drilled in the back of the box and hard rubber, or porcelain bushings are inserted for the wires to pass through, it will make a very neat looking job. The panel for the controls is best of bakelite, or hard rubber one-eighth of an

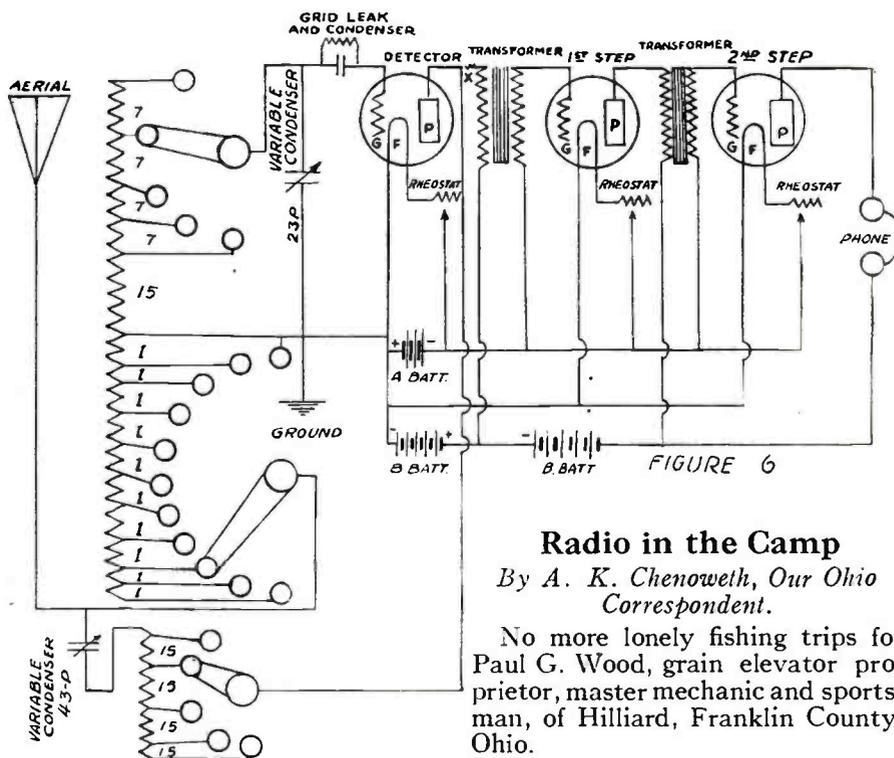
inch thick, eighteen inches long and eight inches high. The sockets and tubes are mounted directly behind the controlling rheostats and the holes in the panel shown above the rheostats are for the purpose of watching the brilliancy of the tube filaments.

The two dials shown are used for the purpose of adjusting the variable condensers and if a variable condenser is used in place of the fixed condenser and grid-leak, then another dial must be used for this purpose and the arrangement of the panel will have to be altered to suit the case. The spider-webb coil is mounted as far back in the box as possible and is placed directly behind the switches to facilitate the connections. The addition of this amplifier will make a wonderful addition to the set, but if it is desired to carry the amplification farther, another step of audio frequency amplification may be added.

Addition of the Second Step of Amplification.

Figure 6 shows the method of adding two steps of audio frequency amplification to the Reinartz tuner. While this addition is very seldom necessary, still there are some fans who can not get signals too loud to suit them and this circuit is shown for the benefit of those who want to go the limit. When I say limit, I think I have found a good word, for this is about as far as the amplification can go with this set without injury to the receivers, or loud speakers.

The diagram shown in this figure will be clearly understood without going into details, if the reader has carefully followed through the preceding circuits. The only changes shown are in the addition of the second step, and the addition of two more "B" batteries of twenty-two and one-half volts each. These batteries must be connected in such a way that the positive of one of them connects to the negative of the next, etc. This is clearly shown in the diagram. If a loud speaker is to be used in any of the circuits, it is placed where the receiver is shown in the different diagrams. The transformers used may be of the ordinary audio frequency type, the one used in the first step to be a ten to one ratio, while that used in the second step is a three or three and one-half to one ratio. Any one of these circuits will give great satisfaction to the user and with a little patience and care in adjusting he should have no trouble in receiving signals from 1,500 miles in the winter time.



Radio in the Camp

By A. K. Chenoweth, Our Ohio Correspondent.

No more lonely fishing trips for Paul G. Wood, grain elevator proprietor, master mechanic and sportsman, of Hilliard, Franklin County, Ohio.

For many years, Mr. Wood has spent his week ends and vacation times in a shack some twenty miles from his home, on the banks of a stream running through several Central Ohio counties.

When the radio first reached this section, Mr. Wood installed one of the largest and most elaborate sets at his grain plant. He secures the market reports each day and in addition tunes in on all of the available stations for concerts, programs, etc. His plant is by far the most popular place in the village and his business in side-lines, including seeds, feeds, coal, etc., has been doubled.

Each week end, when he goes to his camp, he loads the radio receiving outfit into his auto and in place of a talking machine, or bothersome companions, he goes it alone, with his radio.

Reaching camp and setting his lines for the night, he connects the machine with the aerials already in place and while waiting for the fish to bite, he enjoys concerts, speeches, solos, etc. When he is ready for sleep, he tunes in on one of the bed-time stories—and passes on to slumberland.

Sunday morning, after running his lines and eating breakfast, Mr. Wood tunes in on one of the wonderful sermons, and while courting Mother Nature, keeps his spiritual being in tune with the day.

In the afternoon, the instrument is tuned to receive a sacred concert and in the evening he again listens in on one of the main broadcasting stations.

Making Switchboards

There are few trades that demand as many painstaking operations as telephone switchboard installing, the intricacies of which are well illustrated in an analysis of the work just completed on the Lexington Exchange, the newest of New York's central offices. Before the switchboard was declared ready for service, the Western Electric installers on the job were forced to make 619,082 soldered connections. In the task of making the wiring connections in the installation, they used 236,616 feet of telephone cable, which contained 8,858,450 feet of copper wire.

Toledo Is Optimistic

Interest in radio, which had fallen off during the summer months is reviving, local dealers report. A. J. Gogel, president of the Toledo Radio Club and manager of the radio department of the Athletic Supply Co., says the change in weather conditions as fall approaches and the fact that different stations are increasing their power of sending are two causes for the reviving interest.

"In the last two weeks," he says, "unusual distances have been reached. One Toledo doctor who sits up nearly every evening until 12 and 1 o'clock listening in on the different stations reports that in one night he heard Memphis, Atlanta, Kansas City, St. Louis, Chicago, Toledo, Detroit and Dubuque, Ia.

Send \$1.00 to Radio Age, 64 Randolph Street, Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year. Thus you will be getting two months free.

First International Radio Congress

Celebrities of Electrical World Assemble at Pageant of Progress in Chicago

THE International Radio Congress, which assembled in Chicago on August 6, 7 and 8, as a feature of the Pageant of Progress, produced sessions that were as interesting and as important as any radio conferences held since wireless began to sweep the country. Leaders in electrical invention assembled from all parts of the country and exchanged view in public meetings on the Municipal Pier.

So successful was the congress that resolutions were passed at the closing session favoring an annual congress. At a banquet at the Electric Club of Chicago on the evening of August 8 promises were made by the national leaders in the radio world that they would give their personal presence and support to such an annual conference.

In other columns of this issue of Radio Age are published the fullest extracts from addresses made by Charles P. Steinmetz and Guglielmo Marconi. The latter's brief paper was read by Mr. Clark of the Radio Corporation, as the distinguished inventor could not attend the sessions in person.

Guests at the banquet were: Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company; Maj.-Gen. Geo. O. Squier and Maj. J. O. Mauborgne of the United States Signal Corps; Lieut.-Col. Louis R. Krumm and Samuel Kintner of the Westinghouse Electric and Manufacturing Company; Dr. H. W. Nichols, John Mills and R. E. Heising of the Western Electric Company; Dr. Louis Cohen, Dr. J. H. Dellinger and Francis W. Dunmore of the United States Bureau of Standards; George H. Clark of the Radio Corporation of America; Benjamin Miessner, former expert of the United States Navy, and H. H. G. Mathews of the American Radio Relay League.

The contribution of Chicago men to the progress of radio was illustrated by the personnel of a group of experts, which the Western Electric Company sent to deliver important messages at the congress.

Two of these men particularly are Chicago products.

Perhaps the best known is John

International Radio Congress

August 7.

Opening remarks by the president of the Radio Congress. Maj. J. O. Mauborgne, signal officer of the 6th Army Corps Area.

Benj. Miessner on "A Secrecy System in Radio Communication."

Samuel M. Kitner, general radio engineer, research dept. of the Westinghouse Electric and Mfg. Company on "The Technique of Broadcasting."

John Mills, research engineer of the Western Electric Company, on "The Human Voice and Its Electrical Transmission," illustrated by motion pictures.

Louis Cohen, consulting engineer Signal Corps. U. S. Army, Washington, D. C., on "Wired Wireless and Its Application to Broadcasting on Power Lines."

R. E. Heising, research engineer of the Western Electric Company, on "How Speech Is Carried."

Dr. J. H. Dellinger, physicist in charge of radio laboratory of the bureau of standards, Washington, D. C., on "The Interference Problem in Radio Telephony."

Senator Guglielmo Marconi on "Radio Telephony," illustrated by lantern slides. Because of urgent business matters, Senator Marconi sailed for home on July 8, but authorized George Clark of the Radio Corporation of America to deliver his paper.

Discussion

August 8.

R. H. G. Matthews, central division manager of the American Radio Relay league, on "Amateur Radio."

Lieut.-Col. Louis R. Krumm, superintendent of radio operations of the Westinghouse Electric and Manufacturing Company, on "Broadcasting Operations, present, and Future."

Dr. H. W. Nichols, Research engineer of the Western Electric Company, on "Radio Communication."

Francis W. Dunmore, radio laboratory bureau of standards, Washington, D. C., on "A Relay Recorder for Remote Control by Radio."

Maj.-Gen. George O. Squier, chief signal officer U. S. Army, Washington, D. C., will speak on a subject concerning "Line Radio" provided official duties do not accidentally prevent attendance.

Dr. Charles P. Steinmetz, chief consulting engineer of the General Electric Company, on "The Problem of Radio Power Transmission." Discussion. Report of Radio Committee, Pageant of Progress. George E. Carlson, chairman.

Mills, one of America's leading electrical engineers and author of several technical books dealing with the development of the present system of radio and telephonic communication. He spoke on "The Human Voice and Its Electrical Transmission."

Mr. Mills was born and educated in Chicago, graduating in 1901 from the University of Chicago. He studied as a graduate of Chicago at the University of Nebraska, and later at the Massachusetts Institute of Technology. He was an instructor in physics and electrical engineering for some years at the Western Reserve University of Cleveland and at Colorado College.

Early last spring the world awakened one morning to learn that the captain of the steamship America, 400 miles at sea, had conversed with the President of the American Telephone and Telegraph Company at his home in New Canaan, Conn., by radio telephone. This demonstration was largely the outcome of work carried on by the Western Electric Company engineering staff under the supervision of H. W. Nichols, a 56-year-old research physicist.

Nichols received his bachelor of science degree from Armour institute in 1908. A year later he received a degree as master of science from the University of Chicago. He returned to Armour and after two years earned his degree as an electrical engineer. Later he was awarded the degree of doctor of philosophy by the University of Chicago. To continue his work he then accepted an assistant professorship in electrical engineering at Armour institute.

"Radio telephony is obviously the only way of transmitting speech to and from ships at sea, aeroplanes in flight and isolated points such as rock-bound lighthouses or isolated ranches where wire communication involves a prohibitive expense," said Dr. Nichols. "It is also peculiarly fitted for the broadcasting of news, entertainment and instruction.

"In California the radio telephone has been connected successfully to the wire telephone circuits and the Bell system has in operation a com-

(Continued on page 10.)

Problem of Radio Power Transmission

By CHARLES P. STEINMETZ

Chief Consulting Engineer, General Electric Company

(Address delivered at International Radio Congress, Chicago)

THE successful development of radio communication by telegraph and telephone raises the question of the possibility, or impossibility, of radio power transmission.

In some respects, radio power transmission exists today, for the message which you receive by radio has been carried by the power of the electro-magnetic wave from the sending to the receiving station. However, while the sending station sends out electro-magnetic waves of a power of several kilowatts, or even hundreds of kilowatts, this power scatters in all directions, and it may be only a fraction of a milliwatt, which we receive, that is, less than a millionth of the power sent out. But this small power is sufficient, when amplified, to give us the message.

The problem of power transmission essentially differs from that of the transmission for communication, that in power transmission most, or at least a large part of the power, sent out by the generating station, must arrive at the receiving station, to make it economical to transmit the power.

Hence, the problem of radio power transmission is that of directing the radio waves so closely that a large part of their power remains together so as to be picked up by the receiving station. Much successful work has been done in directing radio waves, and for instance our Transatlantic stations send out most of their power Eastwards. But still even as directed the power scatters over the coasts of Europe from Norway to Spain, so that it is impossible to pick up an appreciable part of it.

The limits of impossibility of concentrating a beam of radio waves may be illustrated by comparison with a beam of light. Light is an electro-magnetic wave, differing from the radio wave merely by having a wave length many million times shorter. While usually the light scatters in all directions, like the wireless wave, we can direct it in a concentrated beam by the searchlight. But there is inevitably a scattering of the light in the searchlight beam, and when the beam starts perhaps with a square-yard section at the searchlight mirror,



DR. CHARLES P. STEINMETZ

at 10 miles distance it has at the very best scattered to a diameter of 2,000 feet, and at 100 miles distance the beams cover a section of 16 square miles. If it were a beam of radio power, it would thus require at 100 miles distance a receiving station covering 16 square miles—about four miles wide and, what is still more difficult, four miles high, to pick up a large part of the power.

The cause of this scattering is two-fold. First, the inevitable imperfections of any apparatus. No

matter how perfect a reflector, there are slight imperfections, and at 100 miles distance, they seriously count. Furthermore, even with an absolutely perfect reflector the beam of light would stay together only if the light came from a mathematical point. As it must, however, come from a small area, this causes an inevitable scattering, which at best gives an angle of scattering of about two degrees. This is about 100 times as much as would be permissible to economically transmit power a hundred

miles by a direct radio beam. Thus the probability of power transmission by directed radio is very small, except perhaps in very special cases, where the distances are moderate and the efficiency of transmission of secondary importance.

The second possibility of radio power transmission—at least theoretically—is by resonant vibrations or standing waves. Suppose we had a very large sending station sending out electro-magnetic waves not of hundreds, but of hundred thousands or millions of kilowatts, and suppose we could find a wave length, where the absorption in the passage of the wave through space is sufficiently small so as to be negligible compared with the amount of power.

Assuming first there were no receiving stations. Then the waves issuing from the sending station would circle the globe and return to the sending station, and if the wave length is adjusted so that the return wave coincides with the outgoing wave, it would return its power, and little power would be required from the sending station to maintain such a system of high power standing waves—only enough to supply the losses—just as little power is required in an electric wire transmission system, to maintain the voltage wave, as long as no current is taken off.

Suppose now we erect a second station, tuned for the same wave length as the sending station. It would resonate with the standing electro-magnetic wave issuing from the sending station, thereby stop its passage by absorbing its energy. It would, as we may say, punch a hole in the standing wave sheet coming from the sending station. Power would then flow into this hole; the sending station would begin to send out additional power to maintain the wave sheet, and this power would be received by the receiving station. This would give a real radio power transmission.

Any receiving station of suitable design would then be able to pick up power from the universal power supply carried by the standing wave sheet covering the earth. Also, several sending stations may send out power. These may either have different wave lengths, then would not interfere, and the receiving station could be tuned to receive power from any of the generating stations. Or—what would be preferable—all the generating stations would be tuned to the same wave length, that is, the same frequency.

Then they would have to be synchronized and operate in synchronism, just as different electric generating stations on the same transmission line are operated in synchronism.

Theoretically, this is an interesting speculation, but whether it could ever become a possibility, would depend on the question, whether a radio wave of such length could be found, as to make the losses of power by absorption, etc., economically permissible, and whether stations for such wave length and power would be economically feasible. Furthermore, it would have to be an international development. Therefore, even if such radio transmission by a stationary electro-magnetic wave sheet were possible, its realization at best is rather distant, so that the present outlook for radio power transmission is very remote. I thought it of interest, however, to bring this before you as an interesting speculation of future possibilities.

(Continued from page 8.)

bined wire and radio system at Catalina Island. Ship-to-shore radio telephone has been worked out quite thoroughly and it is now possible to call up on the telephone and talk to a properly equipped ship from almost any point in the United States.

"In a congested district such as our large cities, however, an analysis of the number of simultaneous telephone conversations that can be carried on in a restricted area shows that the radio cannot compete with the wire telephone.

"In justice to the requirements of special services which can be performed only by the radio, such as broadcasting in the cities and special transmission of various classes in the more remote regions, it is probable that future practice and possibly future legislation will tend to restrict radio telephony to those fields which cannot be served by the wire system."

Major J. O. Mauborgne was elected president for another year on motion of Commissioner George E. Carlson of the department of gas and electricity, and empowered to appoint a Ways and Means Committee, and minor committees to prepare for next year's congress.

The Radio Club of Illinois gave a luncheon and reception in honor of Maj. Gen. George O. Squier, and Charles P. Steinmetz at their club-rooms at 16 West Ontario Street.

New Rectigon for Charging Batteries

A new type of rectigon known as the "Radio-Type" rectigon, designed primarily to charge 11- or 12-cell plate batteries, such as are used for radio receiving sets, but also suitable for charging 3-cell filament batteries or 3- and 6-cell automobile starting and lighting batteries, is being manufactured by the Westinghouse Electric & Manufacturing Company.

This type of rectigon is similar to the private garage type, being portable, well finished, automatic in operation, and free from oil and grease. Although primarily designed to charge 11- or 12-cell batteries at 0.2 amperes, it is supplied with a tap in the transformer winding which makes it possible to charge 3-cell batteries at 2 amperes and 6-cell batteries at 1-1/2 amperes.

At the top of the transformer is a fuse block which is so arranged that, when the fuse is in the extreme left position, the rectigon will charge an 11- or 12-cell battery and, when the fuse is at the right, will charge a 3- or 6-cell battery. Since only one fuse can be inserted at one time, there is no possibility of an incorrect connection.

After the fuse is in the proper position, the rectigon can be started by clasp the battery clips over the terminals on the battery and turning on the current at the lamp socket. To stop charging, the current is turned off and the battery is disconnected.

The cost of operation of this rectigon is very low, being about 1/2 cent a kilowatt-hour. The bulbs have a long life and need to be changed only at very infrequent intervals.

Iowa University Busy

Extensive equipment is to be added to the broadcasting station of the State University of Iowa at Iowa City. Professor A. H. Ford, of the College of Applied Science, will give a three-hour course in the subject of radio science during the coming year.

The university will continue the operation of its wireless telegraph station which has functioned in the past as a means of relaying results of football games, other sports, weather reports and so forth.

The call letters of the university's radio-telephone station will be WHAA. The wireless telegraph call will be 9YA as it has been in the past.

Send \$1.00 to Radio Age, 64 Randolph Street, Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year. Thus you will be getting two months free.

Vaugh MacCaughey, head of Hawaiian public schools, is arranging to install standard receiving sets in all rural schools. Extension courses, especially in agriculture, will be broadcasted from the University of Hawaii.

Marconi Discusses "Short Waves"

Italian Genius Writes Paper for Chicago Radio Congress

URGENT business compelled Senator Guglielmo Marconi to return to Italy before the International Radio Congress, in connection with the Pageant of Progress, Chicago, August 7 and 8. He prepared the following paper, however, and it was read by George H. Clark, of the Radio Corporation of America:

"Since the beginning of radio activities, the wave lengths have been getting longer and longer and in every case non-directive, or "broadcast" transmission has been used; that is, the radio signals have been radiated in all directions into space, that one particular receiving station out of the millions of possible receivers may gather in the signal. Only in the last year, when broadcasting of general information has become popular, has the 'radial' feature of modern radio communication really been utilized at all.

"One of the reasons that short waves have been neglected so long is that there is far greater 'fading' experienced with their use. That is, signals might be extremely strong at one moment and the next moment might die to inaudibility, a characteristic which is by no means so marked when the wave length is made greater.

"It has long been appreciated that, apart from fading, short waves were much more efficient than long, as, for instance, the recent achieve-

ment of American amateurs in reaching England with only a few hundred watts on a short wave length, whereas commercial stations on wave lengths hundreds of times longer must use powers of several hundred kilowatts.

"The point to be noted here, however, is that the amateurs happened to 'get through' once, out of thousands of times of failure, and succeeded that once because 'absorption' or 'fading' happened to be noticeably absent for a brief period, whereas the commercial stations get through practically all the time.

Power Is Concentrated.

"Now, directional transmission offers a further possibility for getting messages through with low power because all the power that is available is concentrated over a few degrees of arc rather than sent, uselessly, in every direction in order to be utilized in one only. Directional transmission, moreover, means reflection of the created energy by local reflectors so as to catch and send back energy that otherwise would go in the wrong direction, and since reflectors must have comparable dimensions to their reflected waves, it is not today practicable to reflect wave lengths of thousands of meters in length. But with waves of fifty meters it is another question. Directional transmission, therefore, is possible on short wave lengths.

"Direction reception, or picking up a message that is coming from one given direction and not picking up others from sources of different location, has been with us for some time, so that we can directly make use of this for the new development of radio.

"We have, therefore, the long-known fact that short waves, per se, are ideal from the standpoint of energy; we have the possibility of directing these waves in one direction; we can also sharpen the eyes of our receiver so it is blind in all but one direction and especially keen in that one. There still remains the problem of the intermediate absorption.

"Distances of fifty miles have been reached already on this short wave directive work, using radio-telephony, and experiments on far greater powers are now in progress.

"A further application of this directive transmission is in the establishment of 'radio lighthouses.' A radio transmitter is rotated constantly, sending out therefore a beam of radio waves just as a lighthouse sends out a beam of light. A different Morse character is sent out automatically for every major position of the beam around a circle, and by this means a ship can tell exactly her position with respect to the lighthouse. This is being tried out in England now under practical conditions."

News of the Anti-Static War

THE battle against static goes merrily on and it appears that those who aim to thwart the atmospheric disturbances hope to do so in widely different ways. One experimenter tries the underground aerials, another pins his faith to outside perpendiculars loops, and still another use, the horizontal outside antennae with startling methods as to length.

An antenna designed to eliminate static interference, nine miles in length, has been installed at the chief receiving station of the Radio Corporation of America at Riverhead, L. I. The aerial is supported on poles, thirty feet above the

ground. One end is grounded through a non-inductive resistance and the other through a variable inductance. With the antenna the station is receiving European stations operating on 15,000 meters, or in other words, electro-magnetic waves, each approximately nine miles in length.

In explanation of the principles employed in the use of the large aerial, P. H. Boucheron of the Radio corporation furnished the following analogy:

"If we look upon the new antenna as a large lake and the wind as the static, we can get an idea how it works. Now, suppose the wind is blowing across the lake from east

to west. At the eastern end there will be few or no ripples, but as we get to the western end the ripples will gradually increase in size to full waves. If the shore at the western end is a gentle slope of sandy gravel, the waves will be dissipated.

"If, on the other hand, the shore is precipitous the waves will be reflected and will disturb the eastern end of the lake. Now this antenna, having a non-inductive resistance at its non-receiving end, corresponds to a sandy shore, because it absorbs the static and interfering waves and does not reflect them.

"Carrying the analogy further,

if we place a stationary paddle wheel at the western end of the lake, which is revolving uniformly and producing waves of a uniform character, these waves will travel steadily forward toward the eastern end and will not be interrupted by or stopped by the wind. This paddle wheel corresponds with the transmitting station and the waves it sends out are equivalent to the waves from the European station.

"The tests which have been conducted at Riverhead completely confirm this theory. When the receiving apparatus is placed at the end, which is graduated through the non-inductive resistance, it is impossible to hear anything but a terrific roar due to continuous static discharge. Using the wire properly as 'wave' antenna, trans-Atlantic wireless communication can be carried on without any difficulty, despite the static."

This antenna system can not be carried out by the amateurs because of lack of space, but the system suggests many promising methods which radio engineers are busy on and hope to solve this problem of remedying, if not eliminating, static in the radiophone broadcast entertainment.

As the result of experiments conducted by the radio section of the postoffice department, announcement is made that the day of the aerial is over. The elimination of the aerial antenna is incidental to experiments conducted by the department in an attempt to limit or eliminate static interference.

The following description of the tests conducted has been made by James C. Edgerton, superintendent of the radio section:

"The air mail radio section has eliminated the use of regular transmitting antenna for receiving purposes altogether, as it has been found that the static conditions prevalent especially in the Middle West made receiving impossible. Results have been obtained, however, through the use of three different methods of receiving, which are selected to conform to local conditions. There are large vertical outside multiple turn loops, secondly underground horizontal loops and lastly underground antenna.

"The best results are obtained with the underground antenna when it can be laid in damp soil with a straight away of 1,000 feet. The horizontal buried loop is more or less of a new departure and has been very successful when well insulated and buried in water or very damp earth.

"In actual use well-constructed underground antenna such as are used in the majority of the fifteen stations in the air mail circuit, the results are rather unusual. Communication has been carried on in the Middle West between air mail stations when lightning was actually striking nearby. As a matter of fact it has been possible to carry on communication when the currents induced in the antenna from nearby lightning discharges blew out the arc. Receiving on an ordinary antenna would have, of course, been impossible long before the storm reached the vicinity."

Gas an Ally of Radio

Gas is an important factor in the manufacture of telephone apparatus. The heat required in the production of the delicate apparatus used in the communication systems of the world and in radio broadcasting equipment makes necessary two of the largest privately operated gas tanks in the country. They are owned by the Western Electric Company, which in its manufacturing plant at Chicago, uses daily enough gas to supply a city of from 80,000 to 100,000 inhabitants. This immense amount of gas is consumed entirely in productive operations requiring exceptionally high temperatures, none whatever being used for generating power or for heating buildings.

The applications of gas in telephone and radio telephone manufacturing are many and diversified. It heats the large ovens in the foundries, it softens the glass used to make switchboard lamps and vacuum tubes, it heats the lead presses which put the heavy lead coating around miles and miles of telephone cable every day, it softens iron in the annealing ovens and hardens it in the tempering ovens, it heats beakers and crucibles in the chemical laboratory and it performs a thousand and one other tasks in the big works.

The Chicago gas plant is operated twenty-four hours a day in three eight-hour shifts and is equipped to send out 135,000 cubic feet of gas an hour under peak-load conditions. The usual maximum is about 105,000 cubic feet an hour, and at times the output reaches one and a half million cubic feet per day.

Send \$1.00 to Radio Age, 64 Randolph Street, Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year. Thus you will be getting two months free.

Chicago District Leads

Growth in code interest among amateurs is best measured, according to officials, by the increased number of licensed amateurs within the last year, and by indications of a consistent increase for some time to come.

Every receiving set represents a potential transmitting set, officials believe, especially where the owner is a boy with a scientific mind, and every encouragement is being given to that boy in the way of helping him to get an operator's license. Incidentally, when the new radio law is enacted, most licenses to amateurs will be granted for code transmission only, it is understood.

The following detailed tabulation of the number of licenses by each Federal radio inspection district will give some idea of the trend of radio, especially of the growth of interest in code transmission. The figures are for the year ended June 30, 1921, and for the year ended June 30, 1922:

	1921	1922
1st Dist., Boston, Mass.	2083	2490
2d Dist., New York City	2063	2336
3d Dist., Baltimore, Md.	991	1863
4th Dist., Savannah, Ga.	206	342
5th Dist., New Orleans, La.	425	740
6th Dist., San Francisco, Cal.	1255	1685
7th Dist., Seattle, Wash.	513	752
8th Dist., Detroit, Mich.	1463	2635
9th Dist., Chicago, Ill.	1761	3030

Totals.....10759 15873

The difference between the two totals reveals that 5,114 new licenses have been granted during the year just ended.

Atlanta Journal's Record

Only six left now.

Dixie's greatest radio station, WSB, has been heard in forty-two states of the Union, leaving exactly a half dozen Rocky Mountain and Pacific Coast States as the only parts of the country where "The Voice of the South" has not carried southern music and southern messages.

H. S. Wiggers, of the Pacific Electric Company, Sheridan, Wyoming, writes The Journal radio department that he not only heard one of WSB's 10:45 concerts, but that he heard it so clearly and enjoyably that he put it through a loud speaker for the benefit of a group of friends.

Colorado reported hearing WSB's call for the second time in the same mail that bought the Wyoming letter. J. F. Schwartz, lumber dealer, of Estes Park, Colo., in the mountains north of Denver, was the listener.—[Atlanta Journal.



Anything involving mechanics interests the Japanese. They are imitators, rather than initiators, along mechanical and scientific lines. Japan, being a warlike country, protects carefully its various means of domestic and foreign communication. For this reason alone, the Japanese are not permitted to play with radio, as Americans are privileged to do. But there is a big plant in Tokyo called the Nippon Electric Co. which is a subsidiary of the Western Electric Co. The picture shows the employes of this concern, dressed in grotesque costumes and playing a Japanese game.

Who Saw the Broadcasting Vision?

Harry Phillips Davis, Was the First Man to Foresee
the Popular Appeal of Radio

"FRANK, I'm going to close your station."

Paradoxical as the statement may seem, this was the actual start of radio broadcasting as we now know it. The concerts on regular schedules, advance programs, entertainment in the air, all came from closing "Frank's station" and opening KDKA, the first radiophone station in the world.

For "Frank" was Frank Conrad, assistant chief engineer of the Westinghouse Company, and the man who made the statement was Harry Phillips Davis, Vice President of the Westinghouse Company.

Mr. Davis had come into his office that morning in September, 1920, with an idea. The idea had come to him while reading the advertisement in his evening paper. In a corner of a full page ad, he

came across the words, "Mr. Conrad will send out phonograph records this evening." This advertisement was in the interest of the store's amateur radio department and was explaining to local radio amateurs that Mr. Frank Conrad, who had operated his station intermittently since the war, would send out by radio, phonograph records on a certain evening. The Conrad station was very well-known to amateurs all over the country, for it was one of the new amateur stations licensed to operate during the war. This special operating was in the interests of government research work, which the Westinghouse Company was doing, and also to test some apparatus.

Mr. Davis could not forget his idea. He was struck with the fact that the radiophone fundamentally

did not lend itself only to private communication but that it had a universal field of usefulness and that through it, one could communicate to hundreds, thousands or millions; all could listen who had the suitable "ear," for if a certain class of people were interested enough to listen to music from a few records there was a possibility of increasing this small audience of radio listeners to an enormous number by sending out entertainments, current events, etc., in a regular and interesting manner. Why confine one's audience to a small portion of the country? Why not build a big station and let everyone, who wanted to, hear? Why not make radio broadcasting a public service?

Mr. Davis was so struck with his idea of a public broadcasting service that the first thing he said to his

Secretary on entering his office next morning was "ask Frank to come in."

"Frank," as has been previously explained, was Mr. Conrad, who having been taken so abruptly with his chief's statement, could only listen to what followed.

"Frank, my idea is that you stop sending from your station and we will start a regular service from our experimental station here at East Pittsburgh. We can arrange for a suitable wave length, and I believe if we do this, it will be the beginning of a radio broadcasting public service which seems to me to have wonderful possibilities."

The conference with Mr. Conrad lasted a short time and Mr. Davis called other conferences before actual work on the broadcasting started. It was not until November 11, 1920, that KDKA was formally opened with the broadcasting of election returns.

The remainder of the history of KDKA is now common property. Everyone, almost, now knows that there are more than 200 broadcasting stations in the United States and that the radio audience numbers into the millions each night.

Not everyone knows, that it was a single line in a newspaper which suggested to the Vice President of one of the largest electrical manufacturing companies in the world, the big thing of turning a scientific novelty into a new kind of public service by unfolding a new field of communication.

Mr. Davis was one of the best equipped men in the electrical industry to take up the difficult problems of broadcasting. He has been a leader in the electrical industry since his college days, and has been issued nearly 100 patents covering electrical apparatus. He is an engineering genius and is known, not only as a designing engineer of high rank, but also as a man who gets things done. His ability to accomplish results rapidly has already been proved in the history of his company's broadcasting achievements. This ability was also admirably illustrated during the war. He was, at that time, in charge of production at the East Pittsburgh Works and the duty of fulfilling the government contracts for munitions was his. Probably no more colossal manufacturing task was ever given anyone. The quantities involved were enormous; the time limits short; the specifications most rigid; new and undreamed of problems arose at every step; the government's plan changed with bewildering frequency; material,

competent help, and transportation facilities became almost unobtainable; and innumerable other difficulties were encountered. Yet, in spite of everything, the work was done and it was done properly and on time. Not a single promise made to the government was broken.

This is all by way of illustrating the character of the man who first saw that radio broadcasting was something that held greater possibilities than just being the plaything of the amateur.

Mr. Davis was born at Somersworth, New Hampshire. He was graduated from the Worcester Polytechnic Institute with the degree of B. S. in Electrical Engineering in 1890, and after a trip to Europe and a few months spent with the Thompson-Houston Company, entered the Detail Engineering Department of the Westinghouse Company in 1891. In 1896 he was placed in charge of this department; in 1908 he was made manager of the Engineering Department. This position he held until 1911, when he was elected Vice President.

Mr. Heising's Genius

When the three-electrode audion or vacuum tube, the invention that made radio telephony possible, came into being along in 1912, it set to working the mental machinery of Reginald A. Heising, a young physicist, working for a degree as Master of Science in the University of Wisconsin.

"If I could put into a vacuum tube the amount of energy produced by the voice and get it out many times amplified in the form of high frequency power in an antenna, what an advance it would be," thought this young scientist.

Armed with his degree he went to work on this problem in the research laboratories of the Bell System operated by the Western Electric Company. Six weeks after he started, his first patent, establishing the basic principle of the Heising modulation system, was applied for. Since that time he has been engaged in perfecting the discovery. How well he has solved the problem was proved by the award in 1921 to him of the Morris Liebmann memorial prize by the Institute of Radio Engineers. This is the highest tribute which the radio fraternity can bestow upon a fellow scientist.

In the communication field today the Heising system of modulation is a fundamental law and the young inventor whose work in research brought it about holds an enviable position in the world of scientific achievement.

Farm Wives Made Happy

By A. K. Chenoweth, Our Ohio Correspondent.

The radio threatens seriously one of the greatest sources of enjoyment for years of the country women of Central Ohio, following the installation recently of several radio receiving sets in one neighborhood.

There was a time when the old-fashioned telephone party-line held fast the hearts of the country women—but it's not so today!

Radio has arrived. And the men seeking to transact business over their telephones are having the time of their lives, and getting their business deals across over the telephone with much less expenditure of labor and violations of the anti-swearing law.

The women have dropped their daily conversations over the phone with the neighbors and have taken to listening in on the news, which comes from everywhere and nowhere, as it seems. They have given up for good, they say, the habit of spending half of the morning and perhaps half of the afternoon, talking over the party-line and are now enjoying direct communication with women from all parts of the country.

Their field has been widened and although they do not get to hear the news from the cross-roads' store quite so often, or so soon, they say that the gossip from the air is much more interesting and, why, they are actually getting acquainted with many of the greatest artists in the nation.

And they do not intend to neglect their other work, it appears. The other day we saw a woman busy in her kitchen, engaged in ironing the family washing and having the time of her life with a radio receiver clamped over her ears—listening to a concert in Detroit. Later in the day, she tuned in with another broadcasting station and when her husband came in from the field, she had the latest daily market report ready for his inspection.

When our country lady goes to town for the weekly or semi-weekly visit and some of her city friends starts to "lord it over her" by telling of the wonderful new radio set she has at home, Mrs. Farmer turns her nose to the sun, and opens a regular conversation on the best from the "voices of the air." And, my, how she enjoys the chagrin of her city sister, who for so many years had ridden rough-shod, as it were, over her country relation!

Introducing K F A F

Denver's latest broadcasting station is an important one. It is K F A F, operated by the Western Radio Corporation and the Denver Post. The establishment of this station means additional programs of news and musical entertainment for fans throughout the west:

George S. Walker, owner of the Western Typewriter Sales Company, and president of the Western Radio Corporation, some time ago determined to build the best radio transmitting station between Chicago and the Pacific Coast.

He engaged Elden F. Horn, a radio veteran in Chicago research work and development, to engineer construction. George Walker, Jr., is vice president and manager of the company and Fred D. James is Secretary. Mr. Horn supervises the manufacture of radio equipment for the corporation.

The Charles E. Wells Music company has furnished the artists' studio at the big broadcasting station with a Haddorff piano and a Victrola, with an elaborate assortment of up-to-date records. The Wells Music Company will also furnish regularly a program of local song birds and musicians and occasionally players and artists of national reputation.

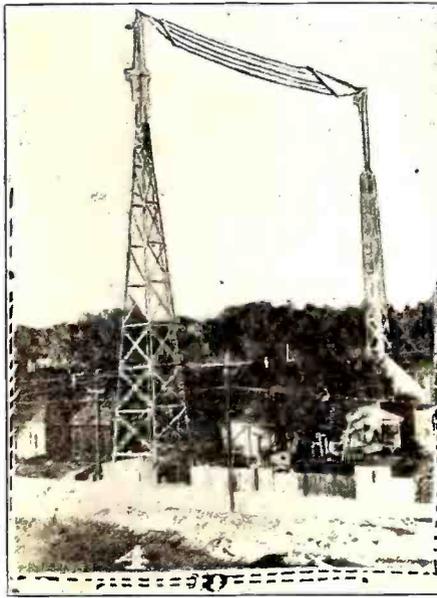
The aerial is a flat-top "T" type of six wires, supported on twenty-four-foot spreaders. The lead-in is of the cage type. The entire aerial is supported by the two towers which rear their heads 120 feet above the street.

The original construction provided for towers 140 feet high, but it was found necessary to reduce the height of the steel masts twenty feet, since it was impossible to guy the big steel superstructure to adjacent property. Heavy winds played havoc with the superstructure, and it was necessary to make repairs three times. Now the towers are self-supporting and securely guyed as well.

The station's power plant consists of a three-phase motor directly coupled to a 2,000-volt generator and an excitor furnishing current for the fields of the large machine. The broadcasting plant is equipped with one of the best wave meters available.

The studio is commodiously and elegantly furnished, and the walls are draped with heavy fabric to absorb confusing echoes, so that the voices of artists will be transmitted true to life.

Mr. Horn constructed and operated a spark station in Chicago be-



Aerial and Towers of New Denver Station

fore the days of the radio craze. His Chicago station, 9AJA, was accorded much publicity a few years ago in radio publications because of its wonderful efficiency and the great distance covered on the small power. His little station was frequently heard at points from Toronto, Canada, to Orlando, Fla., on voice transmission.

In the fall of 1921 Mr. Horn installed a 100-watt CW station, which was heard in Alaska, the canal zone, Yokohama, Japan, Honolulu, and by ships at sea 1,700 miles east of New York, says the Denver Post. Nightly conversations with amateurs in practically every state in the union were carried on, and Mr. Horn was complimented and honored by government and other radio experts.

During the past few years Mr. Horn has also been occupied writing technical works on radio and has delivered lectures at colleges and radio conventions.

Detroit School Plans

Radio classes and classes for foreign women are two of the most interesting features of the Detroit evening school department, under the Board of Education.

The catalog of Detroit Junior College evening classes, which open September 18, announces a course in radio, at Central High School. This course consists of daily code practice, combined with frequent lectures on the theory and handling of equipment. A set which has a range of 1,000 miles and a receiving record of Germany and Japan, will be used in the study.

Big French Station

The big wireless station of the Centre Radioelectrique de Paris at Sainte Assise, France, said to be the most powerful radio in Europe, is in operation, having been officially opened on August 6. This puts New York and Paris in direct touch with each other for the first time and marks a new era in international communication.

Pressing a key at the French company's central control station at No. 79 Boulevard Haussmann, Paris, an operator flung a dot and dash message 3,000 miles and more through the air to No. 64 Broad Street, the central control of the Radio Corporation of America, as easily and quickly as one might telephone from Manhattan to Brooklyn. And the answer was shot back almost instantaneously.

As described by radio experts here, the service means a tremendous impetus to commerce by wireless across the Atlantic Ocean. With inauguration of the new company, the French government has ceased to control the radio in France and private initiative is to take the place of governmental administration.

The official opening of the station was the occasion of a number of radiograms dispatched between France and America. Chief among these were messages of congratulations and good will exchanged between President Millerand and President Harding.

Philadelphia Show

Following the exceptional successes which we met last spring in staging the radio shows at Pittsburgh and Detroit, the American Radio Exhibitors' Association are outlining a campaign for this fall and winter. Invitations have been received from cities in all sections of the country and the first to be accepted and staged will be that at Philadelphia, September 27 to 30 inclusive. This will be followed by others to be announced later.

A careful check-up on the total sales by jobbers and manufacturers alone at the Detroit show brings out the startling fact that more than two million dollars of business was transacted on the floor. This, of course, does not include the impetus given to the industry in general by the educational work which we carried on.

Send \$1.00 to Radio Age, 64 Randolph Street, Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year. Thus you will be getting two months free.

Radio Broadcasting in Great Britain

Interview with A. P. M. FLEMING, British Electrical Expert

"GREAT Britain will solve the interference problem in radiophone broadcasting by government control and regulation," according to A. P. M. Fleming, C.B.E., manager of the research and educational department of the Metropolitan-Vickers Electrical Company, Manchester, England. Mr. Fleming represented England at the international convention of the Institute of Electrical Engineers and the International Electro-Technical Commission at Niagara Falls, just ended.

"We have learned many valuable lessons from the broadcasting experience of the United States," said Mr. Fleming after his visit to KDKA, pioneer broadcasting station of America, situated in the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company. One of the things we have learned is to avoid the establishment of innumerable radio stations, with no plan of cooperation between them. Eight 1 1-2 kw. stations are contemplated and some of these will probably be built this year. These stations will be located in the principal cities throughout the British Isles and will be operated so as to eliminate the chaos usually found where no rules are in force.

"We have no such thing as broadcasting in Britain at present in the sense in which the term is used in America," he said. "Government restrictions have prevented it, on account of the possible interference with the requirements of the navy, mercantile, marine, war services and aeroplane traffic. But the largest manufacturers of radio apparatus have cooperated with the British Government officials in working out plans for the proper control of broadcasting.

"The broadcasting stations will be operated on strictly regulated wave lengths and other set rules, which will be published for the guidance of radio receiver owners. Every radio set owner will be required to pay an annual tax, also, and there will doubtless be special restrictions applying in times of national emergency.

"One thing that British manufacturers have had to do that was not necessary in America is to study out closely the cost of receiving sets. The average Britisher can afford to spend very much less than



A. P. M. FLEMING,
English Radio Engineering Expert

the American in purchasing apparatus of the nature of a luxury. But even with that drawback British manufacturers see a great field ahead for radio."

Mr. Fleming, in addition to representing the Institute of Electrical Engineers of England at the Niagara Falls convention, is making a survey of radio developments in America. His survey may have considerable bearing on the regulations drawn up for government control of broadcasting in England.

His technical career is interesting. After receiving his training at the Finsbury Technical College, he spent the following year at the London Electric Supply Corporation at Deptford, and after a short period with Messrs. Elliott Brothers, Instrument Makers, he crossed the Atlantic and joined the Westinghouse Electric & Manufacturing Company at East Pittsburgh. Two years later he went to Trafford Park, so that he now completes a period of 20 years' service with the Metropolitan-Vickers Company.

For some years he was the company's insulation specialist, dealing with all investigations relating to insulation, the testing of new materials and the investigation of electrical failures. Afterwards he was appointed superintendent of the transformer department and

was responsible for the design and manufacture of all the transformers turned out by the firm, totalling some millions of kilowatts. During this period he supervised the department's manufacture of insulating materials and electrical windings of all kinds. Almost from the commencement he was responsible for the training of the apprentices at Trafford Park and in 1912 he established the works' school. The capacity of this school has grown from the original number of 100 trade apprentices to 650 at the present day, and in addition to this there are about 80 public or secondary school boys and 100 university men undergoing special courses of training.

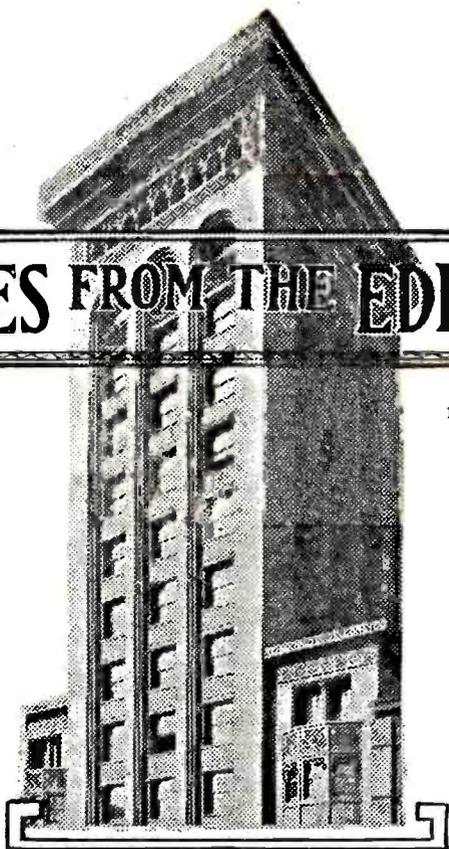
Since 1916 he has been head of the Research Organization of the company, and also of the educational and training work. The design and equipment of the extensive Research Laboratories recently built are his work.

In the midst of all these duties, Mr. Fleming has found time to produce a number of books as author or collaborator on the subjects which he has made his life work. He has also read a number of papers before the Institution of Electrical Engineers and other kindred bodies, and on matters relating to welfare work before the Welfare Workers' Institute Conference.

Radio at Legion Games

Radio will play a large part in the American Legion's athletic games to be held in Syracuse, Friday, September 22, according to an announcement just made by Bernard F. Ryan, chairman of the American Legion's New York State Athletic Committee.

"The crowds who attend these games held for the benefit of the Veterans' Mountain camp at Tupper Lake will be provided with continuous musical radio entertainments," Mr. Ryan said. "Furthermore, the results of the races and games will be announced over the loud speaking amplifying devices which will be placed at convenient points in the immense Syracuse University stadium. H. A. Peiser, of the Syracuse Radio Telephone Co., is negotiating with several other sources in New York to install a microphonic arrangement in the stadium that will enable the notables present, among them President Harding, Governor Miller, General Pershing, Judge K. M. Landis and acting Secretary of the Navy Theodore Roosevelt, to address the crowds in the stadium from their respective boxes.



THOUGHT WAVES FROM THE EDITORIAL TOWER

EARLY last spring this publication called attention of its readers to the fact that great progress in radio might be looked for in the Middle West. That was one reason why it appeared probable that the Middle West could and would support a magazine published in the Mississippi Valley and devoted extensively to radio interests 1,000 miles west of New York.

In the light of that prediction and that expressed hope it is interesting now to glance over the figures showing the growth of radio in various government inspection districts in the United States. This survey of official reports shows that the growth of interest in code transmission has been much greater in the Middle West and West than it was in the eastern districts.

For example, the first inspection district, with headquarters in Boston, issued 2,083 licenses to amateurs in the year ending June 30, 1921. At that time the first district had a larger number of licensed operators than any other district. Now the Boston district is fourth in the list. Chicago is first, with 3,030 and the Detroit district is second, with 2,635. New York shows up third, as headquarters of the second district, with 2,336.

Interest in radio has been encouraged and stimulated by the energetic and intelligent leadership of the Detroit News in the eighth district. In Chicago the excellent broadcasting programs of the Westinghouse station K Y W literally swept tens of thousands of fans into the radio game. Now there are numerous stations in Chicago and in cities throughout the rich states which comprise the ninth district. Detailed information on the license records is published elsewhere in this number.

Madison Street in Chicago has so many radio shops that it has come to be known as "Radio Row." But the title might almost as well be applied to Wells Street, north and south of Madison, as every few

weeks sees additional electrical and radio stores opened in that thoroughfare.

St. Louis and Kansas City have brought Missouri into the forefront in radio activity and an impressive portion of the mail that arrives in the office of Radio Age comes from Missouri readers. After six months of very satisfactory progress this magazine is pleased that it has had the opportunity to be a part of radio progress in the Middle West and that it was privileged to grow with the growth of the Middle West interest in radio.

CABLES from London indicate that England is enjoying a wave of radio enthusiasm which appears to have prospects of permanence. It is also reported that some injury is being done to radio interest among amateurs by the flooding of the market there with inferior apparatus, chiefly from France and the United States. Not wishing England any bad luck, we are pleased to note that the bootlegging radio equipment manufacturers are seeking a foreign outlet for their wares. It will not be long before English novices will learn, just as American novices have learned, that there are various grades of radio merchandise on the shop counters and that a little care and investigation will fully protect the average buyer. Substantial

manufacturers in this country who advertise their products and take pride in establishing their firm name and their trade mark at the same time they are establishing a market for their goods are very sure not to be foisting inferior stuff on the trade and on the public. It follows logically that a publisher who exploits advertisements of inferior goods is party to deception and is building nothing but lack of confidence in his publication. Frank D. Pearne, technical editor of Radio Age and director of Radio Age Institute, is prepared to answer questions as to the merits of radio apparatus offered for sale in the Chicago territory. He requests only that the necessary time be given for investigation of those sets and appliances with which he is not already familiar. Read Radio Age advertisements and send your inquiries to Radio Age Institute and you will not be bootlegged.

LLOUD speakers were installed on the Municipal Pier during the Chicago Pageant of Progress. The pier is so large that many of the horns were used. One afternoon a child was separated from its parents on the great pier. The fact was communicated to the broadcasting station and within a few seconds the thousands then wandering about the pageant exhibits were listening to a description of the child and to information as to where the parents could be located when the child was found. Within another few minutes there was a happy reunion of parents and kiddie. The incident was interesting as a suggestion of what radio may do in city-wide searches for lost persons, and even for criminals, when the development of radio shall have made street corner loud speakers a common feature of big town life.

Radio instruction will be offered to the manual training classes in the Peru-LaSalle (Ill.) Township High School this year.

Radio and Motoring

It may not be commonly known that as early as August, 1919, wireless telephone sets were in use on a few automobiles. Necessarily these instruments were more or less crude, and for the purpose of experimentation, but they served as a nucleus for a quite general movement today to equip automobiles and trucks with radio as a matter of course.

This, of course, opens up a fascinating line of thought. Imagine, for example, how extraordinarily useful such equipment would prove to the trucking business. The dispatcher or owner could keep in continuous conversational touch, for the purpose of giving instructions, with all his drivers. The driver, instead of leaving his seat and telephoning to the office, if he is in town, could simply "switch on" the instrument and without delay get in touch with headquarters. If he were in trouble out on the road he in the same way could quickly communicate this fact. This and many other instances are referred to by a recent Firestone Ship-by-Truck bulletin.

The latter case is where wireless would prove extremely useful to the motorist, and while the efficient radio could not transport him any gasoline, it would soon get some on the way via service car. Imagine, too, the advantage of the salesman being able to keep in touch through this means with the home office or the touring party being able to transmit to those at home the wonders of the scenic effects they were witnessing.

The banker or other business man could keep in touch with the trend of the market, important telegrams that have arrived and how affairs at the office are progressing.

The imagination staggers under the possibilities that the radio presents and it may not be long before the car and truck owner may be able to experience this utility.—[Wallie Birmingham, in Chicago Evening Post.

County Fair Concerts

A radio concert feature will be given at the Franklin (Ohio) county fair to be held at Hilliard, north of London, on September 13, 14 and 15.

Secretary LeRoy Dobyms has announced that a receiving set is being installed at the fair grounds and that arrangements are being made with Columbus broadcasting stations to put on special programs during the afternoon and evenings of the fair.

Nauen to Be Enlarged

That famous long-distance radio station, Nauen, in Germany, is to be altered so as to increase its range and to meet the increasing traffic in the United States and Argentine Republic. Twenty-five million marks additional capital is being raised by the Trans-Radio Company, and a beginning has already been made with the constructive work. The plans include the erection of seven new masts, each 689 feet high, and the dismantling of four of the existing masts.

Crosley's Great W L W Will Greet U. S. Fans This Month

Final touches are being applied to the new and powerful radio broadcasting station being constructed by the Crosley Manufacturing Company, Cincinnati, Ohio, and within a very few weeks the call W L W, now so well known to thousands of wireless enthusiasts, will be flashed out with power enough behind it to make it audible in every nook and corner of the United States.

The plant is being constructed by the corps of engineers employed by the Crosley Company, each member of which has had wide experience in the radio field, and the work is being done under the supervision of Charles E. Kilgour and Dorman Israel, regarded as among the most efficient wireless telephony engineers in the middle west. Powel Crosley, Jr., president and owner of the Crosley Company, has issued orders that the new station be as efficient and elaborate as any in the country, and is spending thousands of dollars that his instructions may be followed.

The old station is located in the former plant of the Crosley Company, but the new one is being constructed in the new and large factory recently taken over. This is at the corner of Colerain and Alfred streets, one of the most centrally located sections of the city of Cincinnati. The entire third floor of the plant has been turned into the radio station, and the studio and reception rooms will accommodate more than 100.

Some idea of the power behind the new plant may be obtained from the following:

Four 250 Watt radiotron tubes will be used, two as oscillators and two as modulators, with the Heising system of modulation used in connection with speech amplifier. This speech amplifier will be composed of three Western Electric No. 216 A, amplifying tubes, arranged with one connected to the microphone circuit, with its output impressed upon the other two, which will be arranged as a pushpull amplifier.

Their output is impressed on two 50 Watt Radiotrons, operated back to back, or as the push pull system, while the output of the entire amplifier is impressed upon the grids of the modulator tubes. Normal radiation will be nine amperes, using the Hartley oscillating circuit.

This set also can be operated as a master oscillator-modulating outfit, using one 50 watt tube as a master oscillator, modulated by

another 50 watt tube. The high frequency output of this unit will be amplified by one 250 watt tube, and its output, in turn, amplified by three 250 watt radiotrons. Sufficient tests have not yet been made to determine which will be the better method of transmission.

The antenna is 140 feet long, with an average height of 125 feet. This is composed of twelve wires on 23 foot spreaders. The four outside wires are doubled and the lead-in is a cage one inch in diameter and made up of 768 strands of No. 30 wire. The counterpoise is 60 feet below the antenna at the lead-in end and 90 feet at the other end. This contains 15 wires on 34 foot spreaders, the four outside wires being doubled as in the case of the antenna proper.

The high voltage supply is obtained from a Glow Electric motor generator composed of two 1000 volt, 1 1-2 K W generators coupled to a five-horsepower three phase 220 volt squirrel cage motor. One 3-4 K W exciter is belted to the set and supplies 220 volts for the field excitation.

Although it may be impossible to open this new station before the middle of September, elaborate preparations already are being made for the opening night.

This concert will be started at 8 p.m. and will continue until midnight, stopping only at the necessary "stand by" periods and when the Arlington station is broadcasting time signals. On the program will be opera singers, jazz orchestras, instrumental soloists, and all others whose work of art are certain to please those thousands of persons who will be listening in. In addition there will be the usual story for little children, an address by Mr. Crosley in which he will greet his thousands of unseen friends, and addresses probably by Harry L. Davis, governor of Ohio and by Mayor Carrel, of Cincinnati.

And every operating night thereafter there will be programs of great interest, one man devoting all his time to the preparation of them. During the day there also will be elaborate programs, intermingled with government weather reports and the very valuable market quotations supplied by the Fifty-third National Bank, of Cincinnati, and the reports of the New York Stock Exchange, supplied by the Westheimer Company, brokers, also of Cincinnati.

Featured in Radio Shops

The Hatfield Company

A radio set purchased today from a dealer out of business tomorrow means absence of service to the purchaser. It is well, therefore, to regard the past performance of your radio dealer before investing too much of your money in his enthusiasm.

The Hatfield Electric Company of Indianapolis came into existence in the year 1887 under the name of the Indianapolis District Telegraph Company, the owner at that time being Charles C. Hatfield. This company was formed to install night watch signal boxes for the protection of factories and office buildings and the operation of a package and message delivery system.

In the spring of 1888, Mr. Hatfield entered into the electrical contracting business as a side line to the Indianapolis District Telegraph Company. Although very few contracts were had during the first year the reputation established by the Indianapolis District Telegraph Company began to show results and during the four years following 1887 the business rapidly grew into large proportions.

In 1892, Mr. Charles C. Hatfield took into partnership with him, his son, T. Barlow Hatfield, the present head of the Hatfield Electric Company.

The years between 1892 and 1900 showed continued and successful growth to the company. In 1901, the business was expanding by adding electrical appliances and supplies of a varied character and from that time until 1906, the business continued to show really remarkable strides, necessitating a change to larger quarters.

In 1906, the Indianapolis District Telegraph Company sold its assets and good will, in respect to their telegraph, messenger and delivery business, to the American District Telegraph Company and gave all of the attention of the organization to the electrical contracting and dealer business. The name was then changed to Hatfield Electric Company.

From 1905 to 1915, the business was conducted at 36 South Meridian Street. In 1915, the business was again moved, occupying its present location, 102 South Meridian Street.

In that same year occurred the death of Charles C. Hatfield. The Hatfield Electric Company was then incorporated, taking over the partnership formerly conducted by C. C. Hatfield and T. B. Hatfield.

From that date on the business continued to grow into large proportions. At no time in the history of the Hatfield

In the fall of 1921 the company entered into the radio field. In March, 1922, they erected their Broadcasting Station (WOH) one of the most powerful and efficient Broadcasting Stations in the Middle West.

The Hatfield Electric Company began the manufacture and distribution of complete radio receiving sets only after a very thorough investigation. Ex-

haustive tests were made by experts and not until Mr. Hatfield was personally assured of the practicability of the Hatfield sets would he permit of their general distribution. The policy of the company until recently has more or less restricted that distribution to points adjacent to the state of Indiana. The company did not want Hatfield sets sold promiscuously throughout the country until every phase of radio manufacture and merchandising had been thoroughly tested.

It is, therefore, with confidence that the Hatfield organization today faces radio as an industry. They believe they have designed one of the most efficient receiving sets on the market and they believe their record as a successful corporation in other electrical fields is such as to inspire confidence on the part of their customers.

(Editor's Note: The foregoing was culled from "The Broadcaster," a monthly periodical of the Hatfield Electric Co. of Indianapolis. Mr. Harrison Durant is the editor.)

Broadcasting Opera

The Chicago Radiophone Broadcasting Station of the Westinghouse Electric & Manufacturing Company holds one world's record of which it is very proud. KYW, as it is registered with the government, was the first station in history to broadcast grand opera. This occurred during the celebrated regime of Mary Garden as director of the Chicago Grand Opera Company and was the particular event of the radio world during the time opera was broadcast. KYW was, also, the only broadcasting station ever to broadcast an entire operatic season as it did in Chicago during the season just ended.

Since it was first started KYW has been faithfully operating every night as well as during the day. In addition to broadcasting grand opera, it put into effect a number of innovations in radio, among which were the broadcasting of daily stock reports from the Chicago Board of Trade rooms. Another new thing which Chicago first tried was the installation of a pipe organ in the broadcasting studio in order to send out this beautiful music when selections were played that required an organ for best rendition.

The station at KYW, which is on top of the Commonwealth Edison Building, has recently been made more powerful and has had its antenna raised. With these changes, a far greater range can be expected from this station next winter than it previously had.

Atlanta, Ga., newspapers have aroused a lot of interest in their radio rivalry. The *Constitution* and the *Journal* report messages from distant points telling how their broadcasting has been picked up in St. Louis, and westward, and the *Journal* reports it reached Merida, Yucatan State, in Mexico.

Free Radio Concerts

Following is a list of Chicago radio shops where the public is welcomed to hear radio concerts:

Macauley & Nevers, 155 West Madison Street.

National Radio company, 6 North Wells Street.

Newark Electric company, 230 West Madison Street.

Illinois Electric company, 314 West Madison Street.

Electric Service Products company, 12 South Wells Street.

Telephone Maintenance company, 20 South Wells Street.

Manhattan Electric Supply company, 114 South Wells Street.

Triangle Electric company, 160 West Lake Street.

Chicago Radio Dealers, 122 North Dearborn Street.

Dearborn Radio store, 110 North Dearborn Street.

Lyon & Healy, 243 South Wabash Avenue.

Revell & Co., 141 South Wabash Avenue.

The Music Shop, 214 South Wabash Avenue.

Stebbins Hardware company, 15 West Van Buren Street.

Central Electric company, 316 South Wells Street.

Kraut & Dohnal, 325 South Clark Street.

Commonwealth Edison company, 72 West Adams Street.

The Fair, 137 South Dearborn Street.

Chicago Radio Apparatus company, 415 South Dearborn Street.

Steiner Electric company, 115 North Wells Street.

Electric & Radio Supply company, 165 North Wells Street.

Chicago Electric Supply company, 360 West Madison Street.

Leiter Stores, State and Van Buren Streets.

Chicago Salvage Stock store, 509 South State Street.

Ray-Di-Co organization, 1215 Leland Avenue.

Northern Radio Supply corporation, 544 West Washington Street.

Benson company, 2429 South Michigan Avenue.

Kramer Radio company, 4713 Sheridan Road.

Grayland Electric company, 4063 Milwaukee Avenue.

Frankel Bros., Diversey Parkway and Lincoln Avenue.

Marks Electric and Radio shop, Leland and Sheridan Road.

Apex Radio company, inc., 1103 West 69th Street.

General Radio Supply company, 5052 Broadway.

Hillinger Electric shop, 7024 North Clark Street.

United Radio & Electric company, 236 South Halsted Street.

Spreading the Gospel

(From Atlanta (Ga.) Journal.)

The Wesley Memorial church, pioneer in the movement to spread the Gospel throughout the land through the aid of radio, reports tremendous interest in this project by churches within the receiving radius of WSB since the Journal installed special apparatus at the church and began broadcasting the evening services.

According to H. K. Chapman, lay leader at Wesley Memorial, requests for prices and information concerning receiving sets for installation in remote districts where the word of God is seldom heard are being received from Methodist Churches wishing to fall in line with the Wesley Memorial's plan.

Another splendid feature inaugurated by the Wesley Memorial Church of Atlanta, is the installation of a radio receiving set with a loud speaker in the main auditorium of the church. An invitation is extended to all by the church to drop in and listen to the programs broadcast during the day from WSB.

The Journal's radio department has received many letters acknowledging the clear reception of the services from the church, broadcast every Sunday evening by WSB and the following is but one among many received by the pastor, Dr. B. F. Fraser.

H. L. Phillips, Seneca, S. C.: "Your sermon tonight (August 6) was enjoyed by several listening on my radio at my home here. You could be heard plainly and distinctly all over the room.

W. M. Brier, Tigerville, S. C.: "Away up in the Blue Ridge mountains of South Carolina you had an audience of some fifteen or twenty people last night (August 6), who sat on the porch of the lodge and listened to you preach to your congregation in Atlanta. We heard the singing of the people and that last song, 'Perfect Day' was fine. We heard you say 'I invite your attention to this text for the evening' and after a pause, 'possibly there is no more familiar passage in the Scripture than the one I have chosen for a text.' Your closing announcements were very clear. If you have never experienced sitting and listening to a minister hundreds of miles away, you cannot fully appreciate the solemnity of the occasion; everybody sits with rapt attention, even leaning forward in their seats in order not to miss a word. To my mind it places the greatest responsibility on the preacher he has ever had. The novelty may wear off but before that time comes there will be many who will listen to the solemn words of the ministers and be drawn closer together by the sweet singing of the people. Not until I sat listening to you last night had I seen God's hand in the working of the miracle radio. I could not go forward last night and shake your hand but I can write a letter and tell you how much I appreciated your words."

Send \$1.00 to Radio Age, 64 Randolph Street, Chicago, and receive this middle-west radio periodical for six months.

Magnavox in School

A most interesting installation has recently been completed for the Piedmont High School, Piedmont, California, involving a distinct improvement over present methods of inter-classroom communication.

Developed by The Magnavox Company, pioneers in the field of devices for sound amplification, the installation consists of a central or master station and 25 receiving stations, each equipped with a No. LS-2 Magnavox Telemegaphone, the motor generator and battery being installed in a steel cabinet in the basement.

The master station is operated like an ordinary telephone (as illustrated). Talking into the Magnavox in ordinary tones, the speech is amplified in any or all of the 25 classrooms as desired, in sufficient volume to be distinctly audible to all the students.

While similar Magnavox installations have already been developed for hotel, railroad terminal and similar commercial uses, this is its first application to school service. A distinctly novel feature of this particular installation also is the fact that, by means of a special switch, broadcasted radio lectures and concerts may be connected so as to be reproduced in any or all the classrooms by the same Magnavox Telemegaphones.

One month for drawing the plans and another month for installing the equipment were required by the Magnavox engineers in charge.

This new development of radio reception and amplification suggests most interesting possibilities in other fields.

Philadelphia Show

The American Radio Association which staged the successful Radio Shows in Pittsburgh and Detroit last spring announce that the first Philadelphia show which was postponed from June until this fall will be held in the Industrial Exposition building in the Quaker City, September 27 to 30 inclusive.

Philadelphia, the third largest market in America, did not develop interest in the industry as quickly as some other cities but, with the impetus which has been given during the past summer and spring, the dealers, jobbers and manufacturers are now looking to this rich field as their next campaign grounds. Surrounded by large populous cities, Philadelphia, in addition to its almost two million people, is the trading center for three million more.

A general invitation to dealers within this trading area is being sent out by the managers of the show who plan to make this a mart for buying fall and winter supplies. Special days will be reserved for these visitors and facilities for the transacting of this business will be afforded.

Mr. L. T. Davies will be in direct charge of the affair, and will be assisted by the members of his experienced staff as well as by the Philadelphia dealers and jobbers. The usual educational features which the American Radio Exhibitors' Association afford at their shows will be on the program at this show.

The Radio Hom-charger

Beauty has been combined with utility in the new RADIO HOMCHARGER DE LUXE, a battery charging rectifier developed by the Automatic Electrical Devices Company, 146 West Third Street, Cincinnati, Ohio, especially for the HOMCHARGING of Radio A and B batteries.

Finished in a dull mahogany and beautiful old gold, it harmonizes with the finest room furnishings, and permits the radio enthusiast to recharge his battery after an evening's entertainment, without even disconnecting it from his set.

The RADIO HOMCHARGER DE LUXE is constructed upon the same perfect operating principle used in the Type A HOMCHARGER, which has heretofore been the most popular battery charging rectifier in the radio field. Its working parts are entirely enclosed, eliminating all danger of shock and fire. It is constructed of the highest grade materials throughout—moulded Bakelite Base—Jewel Ammeter—Oversized Silicon Steel Transformer. There are no frail castings to break, as all parts are made from highest quality stampings.

It will fully charge any A or B storage battery overnight at a cost of only a few cents. Conforms to the latest Underwriters' requirements and requires no watching.

It is being sold by all the leading radio, electrical and accessory dealers at the uniform price of \$18.50. The above company has issued a very handsome booklet, illustrating the Radio HOMCHARGER DE LUXE in actual colors, which is free for the asking.

WIRELESS

New License Quiz Book

FOR

APPLICANT

TO

United States Government

New Rating of

Radio Operator's License Examinations

This is the first edition printed with the new rules, regulations and gradings laid down by the government. It gives a full description of various hook-ups, new devices, practical equations, international law and regulations, official gradings, diagrams, definitions and other important information.

No amateur or wireless professional can afford to be without this book.

107 pp. 80 Illus. Price \$1.00

RADIO AGE
64 W. Randolph St. Chicago

Fake Radio Stock Promotion

PREDICTION that the radio industry would attract flocks of fake promoters and financial parasites have come true, according to the findings of the Better Business Bureau of New York City. This organization had been in operation for only a few days when it began receiving complaints against alleged wild-cat radio companies that were hawking their securities throughout the city.

The Bureau has just made public a report of the investigation of what it terms one of the most reprehensible of these blue-sky, mushroom companies, organized a few months ago with an authorized capital of \$4,000,000, the par value of the stock being \$1. The sales organization of the company has been active in hawking stock and has already taken in many thousands of dollars.

According to H. J. Kenner, Manager of the Better Business Bureau, radio get-rich-quick schemers are running true to form. They organize their corporations on a shoe-string and induce the public to finance their ventures and pay for manufacturing or distributing experiments. Having launched their stock sales campaigns, the wild-cats take care of themselves first, by fat salaries for services, which consist principally in selling to the public more stock through wild promises. The cost of promotion is prohibitive, forty to ninety per cent of the money paid for stock going to the sales organization.

"Their cupidity stirred by the popularity of radio, professional promoters—and others—are attempting to broadcast among wage earners and other uninformed investors millions of shares of stock in enterprises alleged to be formed for the purpose of manufacturing and distributing radio apparatus for amateur uses," says the special report of the Better Business Bureau, in discussing the first get-rich-quick radio scheme it has investigated. Right at the beginning of its investigation the Bureau recognized in the leading spirit of this particular outfit a professional promoter whose methods in promoting a motor stock last year called for action by the National Vigilance Committee of the Associated Advertising Clubs of the World.

"In line with the usual practice of venders of blue-sky securities, this radio stock was recently advanced in price from \$1 (par value) to \$1.50," says the bulletin, which quotes an official of the company as saying that this boost was justified as the company had been making big profits all the time, 300 per cent being the average made on most of the products turned out.

But the trouble with the 300 per cent profit, the Bureau found, was that it existed mostly on paper. The company was producing so little that its profits from merchandise sales were almost negligible. Nevertheless, an executive of the company stated that because of enormous profits, shares would be selling for \$4 each, before the snow flies.

But, according to the Better Business Bulletin, the leading promoter of the company admitted, under cross-examination, that his concern would be insolvent if he did not feed it money constantly from stock sales. Another official of the company admitted early this month that his company was insolvent; that it had not operated at a profit and that the unfilled orders, which stock salesmen said were piled up in the offices of the company, amounted to only a few thousand dollars.

During the past few months, the bulletin states, the radio company in question has been flooding the United States mails with stock-selling literature of the wild-cat variety. Thus, the officers members of the board of directors and others connected with the company were described in glowing terms as world leaders in their line who had forged their way to the top in this new industry.

One of the directors is described as the former financial advisor of one of the most famous banking houses of the world, who had been the associate of J. P. Morgan, Cornelius M. Bliss, Jr., Governor Benjamin Strong, Jr., J. D. Rockefeller, Jr., the late Henry P. Davison, Herbert Hoover and others.

The bulletin states that the director in question promptly denied that he had ever achieved these financial honors and then severed his connection with the radio company. It states also that the promoters claimed a vice president of one of the best known and most reliable banking houses of New York City has joined their Board of Directors, but that this also proved false.

"In order to impress prospective stockholders with the flourishing condition of the corporation," the bulletin continues, "Salesmen said that enormous profits were being made, that 40 to 50 men were at work in the factory leased by the company in New Jersey, and that its products had been bought by the De Forest Company and by Butler Brothers, the mail order house.

"Investigation showed these statements to be false. According to an official of the company, not more than 12 people, mechanical and clerical, were employed in the company's so-called plant at Newark, at the time these statements were being made to credulous prospects. Officers of the prominent companies named as customers deny that they have purchased goods of this radio products company."

Another advertising claim stated that the output of four factories had been taken over by this flourishing radio concern, but according to the Better Business Bureau Bulletin, "This representation narrows down to the fact that contracts have been made with two small factories to take their products at prices which a consulting engineer of the radio company has admitted to be 'high'."

"Not the least deceptive of the buncombe employed in the selling of the stock has been the radio-equipped motor car which has been driven about the

streets of New York," the bulletin continues. And it points out that the car, which was used to create interest in radio in general and the company's securities in particular, was actually not equipped with apparatus of the corporation's own manufacture.

The Better Business Bureau found further that an invention exploited eloquently by the radio company as one that would revolutionize the industry had not been patented, so claimed by the company, but that applications for patents were merely pending, and that the control of the patent was the subject of a court dispute between the radio company and the inventor. In closing, the Better Business Bureau bulletin states:

"Authoritative information available in the radio industry does not bear out the claim that,

"Manufacturers of every kind of radio telephone accessories, parts and equipment are today taxing hundreds of factories to their limit.

"While the future demand for radio supplies is expected to be considerable, following the summer season dullness, there is no indication that the demand will be abnormal. Dealers and jobbers have, in general, adequate stocks on hand and manufacturers already established have caught up with the demand. On dependable trade authority, it can be said that, today, where is no shortage of radio apparatus for amateur use, and none is anticipated, because factories already in production will be able to fill orders promptly.

"Literally, thousands of new companies have been incorporated, within the present year, to manufacture radio apparatus. No one can predict with any great degree of certainty the extent to which radio enthusiasm on the part of amateurs or its users in commerce will stimulate and sustain demand for apparatus and parts. It is anticipated that progress will take place along broad lines in the distribution of educational and market information, development depending largely on improvements in broadcasting and, to some extent, in receiving, apparatus. It appears that commercial use of radio will be limited, and of a kind which may supplement and extend, rather than compete with, the present public service of telegraph and telephone systems.

"The development of radio at present is in the hands of substantial business men who are interested in its sane progress. These men have their feet on the ground and are neglecting no opportunity to advance this new art and industry. Improvements are being made scientifically by trained technical men specializing in research work. It is possible that unattached inventors and professional promoters, may, by chance, present opportunities of merit to investors, but, in such event, the public should know that these new enterprises are subject to much more than normal business hazards and risks."

Questions and Answers

"Trouble" Department of Radio Age, Conducted by Frank D. Pearne, Technical Editor

L. L., NEWARK, ILL.

Question: I have a vacuum tube detector outfit, but am unable to get any reception. Please send me a hook-up for the outfit. I have an aerial about ninety feet long and about thirty feet high, a rheostat, six-volt battery, a vacuum tube and socket, a grid leak and condenser, an inductance coil, a potentiometer, a plate battery and a pair of 2,000 ohm receivers. Am sending sketch showing the way it was connected when I purchased it, but I am unable to hear anything. Please let me know what to do as I am anxious to get it to working.

Answer: If your set was purchased with the connections which you show in your sketch, it never did work and never will until the circuit is changed. If you will send me a description of the inductance used in the set I will send you a hook-up by return mail, but as you show it, it is impossible to tell just what you are using.

J. W. R., Indianapolis, Ind.

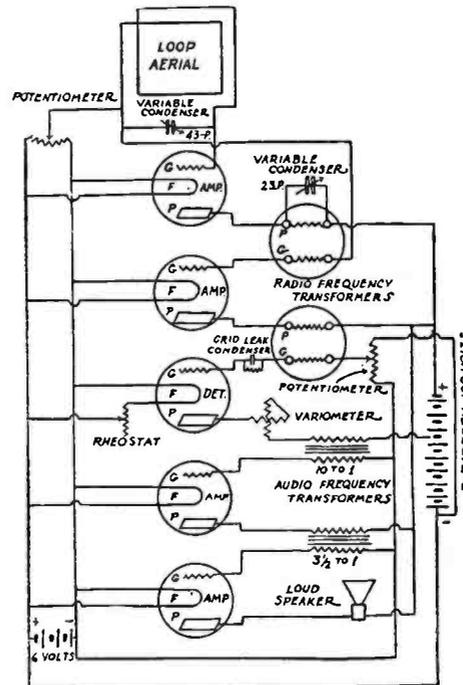
Question: I have constructed the receiving set given on page seven of your June issue of Radio Age. I hear very well using head phones, but would like to hook up a loud speaker. How would you suggest that I arrange the amplifying set so as to just add it to my present set? On page fourteen of the June issue, is an article by Edwin Nielson, showing a set-up using three crystals and two amplifying transformers. Is this a good method? Is the arrangement shown right for a loud speaker, or should the "B" battery be moved up into the second amplifying circuit? I am enclosing a sketch of my circuit.

Answer: I have had no personal experience with Mr. Nielson's circuit, so cannot say as to its value, but he claims to have tried it with great success. Your present set should work very well in connection with it, but I would not change the position of the battery if I were you. Also, the phones which you show in the circuit, should be disconnected when the primary of the transformer is connected as shown. It would be advisable to use a switch in the "B" battery circuit, so that the current can be cut off when not in use. Any ordinary audio-frequency transformer should do this work, but it should have a ten to one ratio.

F. G. M., Marengo, Ill.

Question: Do you think that my set, shown on the enclosed paper, could be improved by adding two or three steps of radio frequency? Will radio frequency amplification give louder results than audio frequency? Will I have to change my aerial, that is, must it be larger for radio frequency, or will the one described work all right? Can you give me a good circuit which I can use for this purpose?

Answer: Yes, I think the radio frequency would help a great deal. Do not



get the impression, however, that this is going to increase the volume of sound to any marked degree. Radio frequency, if connected in the circuit ahead of the detector, will bring in signals from stations much farther away than those which are received without it, but they do not produce much amplification. As a general thing two or three steps of radio frequency are used first to bring in the distance, then the detector cuts it down to audio frequency and it is then amplified in volume by two steps of audio frequency amplification. All the aerial you will require for such a set will be a loop four feet in diameter, with six turns of wire on it, about a half an inch apart. This is used in the room with the set. The accompanying hook-up will explain how it is done.

L. M. McD., Jr., Michigan City, Ind.

Question: I am enclosing a drawing of my circuit which I believe is the same as that used in the Paragon. I had no trouble with it until about a week ago when it seemed to work all right for a little while and then the music began to get weaker. Any adjustment I used would not make it any louder and it continues to act the same way now. The connections are all right and my batteries are in good condition, but what gets me is that it will work for a little while every time I listen in, and in a few minutes it is gone. Can you tell me what is the matter?

Answer: Yes. Your filament battery is weak. You do not say what kind of a battery you are using, but I suppose it is a storage battery. Don't let your eye-

sight fool you. The filaments may seem to burn brightly, but still there is not quite power enough to give results. When you first start to listen in, your battery has had a rest, and has recovered slightly, but after a few minutes' use the pressure begins to drop, although the filaments apparently are as bright as they should be. Give your battery a charge if it is of the storage type and if you are using dry cells, throw them away and get new ones.

B. H. R., Anamosa, Iowa.

Question: My antenna is 100 feet long and about 40 feet high, using two No. 14 wires. Is this good enough to get the broadcasting stations from Chicago? What is the wave length of it and what would be its wave length if I used four wires instead of two? Should it run east and west, or north and south? If this antenna is not good will you please tell me how to improve it?

Answer: Your aerial is very good and you should not have any trouble in getting stations much farther away than Chicago if you have a set which is sensitive enough to pick them up. It is not possible to accurately calculate the wave length of an aerial having more than one wire and the only way to get this correctly is to make a test with a wave meter. In regard to the direction in which it should run, this is a matter for you to judge. If you are close to heavy power lines you will have no choice, but will have to run at right angles to these lines. If you are free from any troubles of this kind, then you should point your aerial towards the station from which you desire to get signals.

M. V., Chicago, Ill.

Question: I am getting interested in radio and want to get a good set. What make of instrument would you recommend which will give good service for a distance of 500 miles? Could I buy the parts and make it myself? I am very ignorant when it comes to anything electrical, but am quite handy with tools.

Answer: I regret that it is against the policy of this publication to recommend any particular make of instrument, but if you will look through the advertisements in this issue, you may rest assured that any of the sets advertised are good, as this magazine will not publish advertising matter from any concern which is not right with their customers. I would not advise you to build the set yourself unless you have had some experience in this kind of work.

P. A. B., Minneapolis, Minn.

Question: Can you advise me so that I can tell the members of our radio club how to construct a three-stage radio frequency, detector, and two stages of audio frequency set, using duolateral or

Questions and Answers

"Trouble" Department of Radio Age, Conducted by Frank D. Pearne, Technical Editor

honey-comb coils and loop antenna for long distance receiving?

Answer: This circuit would require a great deal of space in this column so I am going to suggest that you add the three stages of radio frequency just ahead of the detector, if you now have the described set. If you have not already constructed such a set, I strongly advise you to give it up and use the circuit shown in this column and addressed to "F. G. M., Marengo, Ill.," as this does not require nearly as much apparatus and my experience has been that this set using the radio frequency amplification is far superior to the honey-comb circuit which you mention. Better yet, if you want to get wonderful results at a very small expense, I would suggest the two tube Armstrong super-regenerative circuit explained in this issue. I refer to the one used by Mr. Paul B. Coats on his automobile.

F. Z., Milwaukee, Wis.

Question: I am a subscriber to your magazine and live in Milwaukee, Wis. I would like to know if I could make a set for about \$30, and if I can, please let me know? Please send me the whole plan and let me know what the cost will be.

Answer: I doubt very much if you can make a set that will hear the eastern stations, for the reason that the three bulbs necessary will cost about \$18, and the batteries will cost at least \$13, which will alone cover your estimated expense, without any of the other materials. I believe the cheapest and most powerful set for this purpose is the Armstrong super-regenerative set shown installed on an automobile in this issue. This set uses only two tubes and is more powerful than any three-tube set which I have seen. It should cost complete about \$40.

M. H., Ft. Branch, Ind.

Question: Will you please send me a hook-up using two variometers, one variocoupler, and two stages of radio and two stages of audio frequency amplification? How far should I hear with this outfit? Could I use a loop aerial and get good results? How far could I hear with a loop? Myself and two other fellows are thinking of installing a broadcasting station here. Would you advise it? If there are any charges for this hook-up and questions, please enclose your bill and I will forward a check for same.

Answer: I am sending this hook-up by mail. You should be able to hear 1,500 miles or more with this. If you will use the circuit shown in this column in answer to the question by F. G. M. you can hear just as much and it is less expensive. You can use a loop aerial and get better results than with the other type. In my opinion radio frequency sets operate better with a loop. You can hear just as far, or farther with the loop, but you must turn the end of the loop towards the station you desire to hear,

Shorthand and Radio



Miss Ruth Baker, of Pittsburgh, who increases her speed in shorthand by taking down speeches and programs from her radio receiving set.

A novel aid in the study of shorthand, the taking of dictation from wireless speeches and programs, is the latest means of utilizing radio receiving sets in Pittsburgh.

Ruth Baker, who lives at 118 East Ohio Street, Pittsburgh, Pa., listens in and transcribes the text of speeches into shorthand notes, while enjoying the radio program, broadcasted from KDKA, the Westinghouse Electric & Manufacturing Company's radio broadcasting station at East Pittsburgh, Pa., and thus finds unlimited opportunity for practice.

"It's really fun," Ruth declares. "I like to hear the wireless program and I just take down shorthand notes while I am listening to the speakers. Then, instead of having to study my shorthand after the entertainment, all I have to do is to transcribe my notes for practice. It makes study a pleasure."

The method is recommended as an excellent one by Prof. O. B. Hughes, head of Park Institute, Pittsburgh, where Ruth attends. Many other schools are advising their pupils to employ the radio in similar fashion.

as no results will be obtained if the flat side faces the transmitting station. Broadcasting stations are expensive toys, if you want to reach out very far. You must take a Government examination

Cincinnati Exposition

Arrangements have just been completed for the Cincinnati Electrical and Radio Exposition which will take place October 2 to October 7, inclusive, at Music Hall.

The exposition will embrace exhibits, contests and entertainments more diversified and extensive than ever previously undertaken in this city.

Everything electrical will be shown, including devices for communication, notification and safety warnings, but particularly specializing in appliances for household use and radio equipment.

The exhibits will occupy the south wing of Music Hall, while the auditorium will be used every afternoon and evening for radio concerts, lectures on radio topics by authorities of national reputation who will be brought here by the exposition management for the purpose.

In addition to the radio entertainments and discussions there will also be given demonstrations and informative talks upon the use of electrical household labor-saving appliances by domestic experts.

The radio section of the exposition will embrace exhibits of the many improvements and developments perfected in recent months and taking place at a season of the year just after radio communication has suffered somewhat by the impediment of "summer static," the inventions and discoveries that have minimized that handicap will receive particular attention and attract special interest.

The management has arranged to attract and encourage the radio amateurs of this section by offering valuable prizes for the best home-made radio receiving sets made by pupils of the graded and high schools of the city and vicinity.

A noteworthy series of demonstrations will be given in both radio sending and receiving. The management has arranged to broadcast concerts from one of the annexes, receiving and amplifying them in the auditorium so that auditors and spectators may visit both the sending and the receiving stations and visualize and hear radio communication from both ends.

Except for entertainment purposes, however, the radio exhibits will form but one section of the exposition, and the exhibits and demonstrations of the usefulness of electrical devices and household appliances will be given equal prominence.

and get a license before you can use it. There is no charge for information given in these columns, as this is part of the service furnished by the Radio Age to its subscribers.

McElroy Is Champion

The Radio Marathon, held Sunday morning, August 6, at 10 a. m., in Congress Hall of the Pageant of Progress Exposition on the Chicago Municipal Pier, was a highly interesting and unusual event, and the first of its kind ever held in the Middle West.

The Radio Marathon was a speed contest for radio operators in receiving straight commercial press in the Continental Code, and simultaneously transcribing the message on regulation Western Union typewriters.

Contestants included T. R. McElroy of the Western Union Telegraph Company, from Boston, holder of the present world's record of 56½ words per minute; B. G. Seutter, of the New York Times Radio Department, from New York; Benedict D. Brankey, of the Western Union Telegraph Company, from Chicago; and M. Swartz, assistant radio inspector, 9th district.

The test was conducted by Lawrence R. Schmitt, formerly United States Radio Inspector, 9th District. The judges were Captain Alfred Thomas of the Radio Corporation of America, E. A. Beane, U. S. Radio Inspector, 9th District, and Mr. Schmitt.

At 10:00 a. m., the contestants were seated at the test table on the stage of Congress Hall, wearing the telephone head sets and at attention with their typewriters, ready for the signal to start. The automatic sending machine clicked off the dots and dashes from a tape delivered under seal for this contest. The starting speed was 40 words a minute. Succeeding tests were run for two-minute intervals, increasing the speed 2 words per minute at each test.

Brankey was eliminated at 46 words a minute, Swartz at 48. The contest was now on between Seutter and McElroy. Seutter was eliminated at 52 words a minute. McElroy was presented with the diamond medal by Geo. E. Carlson, Commissioner of Gas and Electricity of the City of Chicago, when he copied 52 1/5 words per minute, perfect copy.

McElroy attempted to beat his world's record of 56½ words a minute with three errors. He succeeded in copying 55 1-10 words per minute perfect copy, and in another test copied 58 words per minute with five errors. This is considered by all operators to be little short of marvelous. In commercial work, manual speed is usually limited to not more than 45 words per minute. A machine is used for copying greater speeds and the message as copied on a tape is repeated at a slower speed to permit its transcription. McElroy's skill places him in a class as a human machine. To add interest for the spectators, the dots and dashes were sent through a loud speaker. Many of the audience expressed surprise that any one could be able to decipher the code. McElroy's record message at the rate of 55 1/10 words per minute was as follows:

"STATES ARMY CORPS WILL BE RECEIVED BY THINKING FOLK

NEW STATIONS

List of stations broadcasting market or weather reports (485 meters) and music, concerts, lectures, etc. (360 meters), alphabetically by call letters.

Call signal.	Station operated and controlled by—	Location of station.	Wave lengths.
KDZW	Claude W. Gerdes.....	San Francisco, Calif., 2198 O'Farrel St.....	360
KDZX	Glad Tidings Tabernacle.....	San Francisco, Calif., 1536 Ellis St.....	360
KDZZ	Kinney Bros. & Sipprell.....	Everett, Wash., 1705 Hewitt Ave.....	360
KFAB	Pacific Radiofone Co.....	Portland, Ore., 108 N. Broadway.....	360
KFAC	Glendale Daily Press.....	Glendale, Calif., 222 S. Brand Boulevard.....	360
KFAD	McArthur Bros. Mercantile Co.....	Phoenix, Ariz., 134 S. Central St.....	360
KFAE	State College of Washington.....	Pullman, Wash.....	360
KFAF	Western Radio Corp.....	Denver, Colo., 737 Lincoln St.....	360
KFAJ	University of Colorado.....	Boulder, Colo.....	360
WEAN	Shepard Co.....	Providence, R. I.....	360
WEAO	Ohio State University.....	Columbus, Ohio.....	360, 485
WEAP	Mobile Radio Co.....	Mobile, Ala., O'Gwinn Building.....	360
WEAQ	Young Men's Christian Association.....	Berlin, N. H.....	360
WEAR	Baltimore American & News Publishing Co.....	Baltimore, Md., Munsey Building.....	360
WEAS	Hecht Co.....	Washington, D. C., Seventh and F Sts. NW.....	360
WEAT	John J. Fogarty.....	Tampa, Fla., 707 Azelee St.....	360
WEAU	Davidson Bros. Co.....	Sioux City, Iowa.....	360
WEAV	Sheridan Electric Service Co.....	Rushville, Nebr.....	360
WEAX	T. J. M. Daly.....	Little Rock, Ark., P. O. Box 614.....	360, 485
WEAY	Will Horwitz, jr.....	Houston, Tex., 612 Travis St.....	360
WEAZ	Donald Redmond.....	Waterloo, Iowa, 1120 Bercth Ave.....	360
WEH	Midland Refining Co.....	Tulsa, Okla. (300 S. Main St., Eldorado, Kans.).....	360, 485
WFAB	A. H. Belo & Co.....	Dallas, Tex.....	360, 485
WFAC	Carl F. Woese.....	Syracuse, N. Y., 802 McBride St.....	360
WFAD	Superior Radio Co.....	Superior, Wis., 2326 John Ave.....	360
WFAG	Watson Weldon Motor Supply Co.....	Salina, Kans., 217 N. Santa Fe St.....	360
WFAG	H. C. Spratley Co.....	Poughkeepsie, N. Y., 357 Main St.....	360
WFAG	Radio Engineering Laboratory.....	Waterford, N. Y., Sixth and Broad Sts.....	360
WFAG	Electric Supply Co.....	Port Arthur, Tex., 637 Proctor St.....	360
WFAJ	Hi-Grade Wireless Instrument Co.....	Asheville, N. C., 47 Zillicoa St.....	360
WFAK	Domestic Electric Co.....	Brentwood, Mo., 908 Pine St.....	360
WFAJ	Houston Chronicle Publishing Co.....	Houston, Tex.....	360, 485
WFAM	Times Publishing Co.....	St. Cloud, Minn.....	360
WFAN	Hutchinson Electric Service Co.....	Hutchinson, Minn.....	360, 485
WFAP	Brown's Business College.....	Peoria, Ill.....	360
WFAQ	Missouri Wesleyan College and Cameron Radio Co.....	Cameron, Mo.....	360
WFAJ	Hall & Stubbs.....	Sanford, Me., 1 Bennett St.....	360
WFAS	United Radio Corp.....	Fort Wayne, Ind., 107 E. Main St.....	360
WFAT	Daily Argus-Leader.....	Sioux Falls, S. Dak., 109 N. Main Ave.....	360
WFAU	Edwin C. Lewis.....	Boston, Mass., 121 Federal St.....	360
WFAV	University of Nebraska, department of electrical engineering.....	Lincoln, Nebr.....	360, 485
WFAW	Miami Daily Metropolis.....	Miami, Fla.....	360
WFAZ	Arthur L. Kent.....	Binghamton, N. Y., 199 Court St.....	360
WFAZ	Daniels Radio Supply Co.....	Independence, Kans.....	360
WFAZ	South Carolina Radio Shop.....	Charleston, S. C.....	360
WGAB	Q R V Radio Co.....	Houston, Tex., 1213 Prairie Ave.....	360
WGAC	Orpheum Radio Stores Co.....	Brooklyn, N. Y., 637 Fulton St.....	360
WGAD	Spanish American School of Radio telegraphy.....	Ensenada, P. R.....	360
WGAF	Goller Radio Service.....	Tulsa, Okla., 20 E. Eleventh St.....	360
WGAG	New Haven Electric Co.....	New Haven, Conn., 296 Elm St.....	360
WGAI	W. H. Gass.....	Shenandoah, Iowa, 413 Seventh Ave.....	360
WGAK	Macon Electric Co.....	Macon, Ga.....	360
WGAL	Lancaster Electric Supply & Construction Co.....	Lancaster, Pa., 23 E. Orange St.....	360
WGAM	Orangeburg Radio Equipment Co.....	Orangeburg, S. C.....	360
WGAN	Cecil E. Lloyd.....	Pensacola, Fla., 216 W. Romana St.....	360
WGAO	W. G. Patterson (Glenwood Radio Corp.).....	Shreveport, La.....	360
WGAP	Southwest American.....	Fort Smith, Ark., 507 Rogers Ave.....	360
WGAS	Ray-Di-Co Organization.....	Chicago, Ill., 1547 N. Wells St.....	360
WGAT	American Legion, Department of Nebraska.....	Lincoln, Nebr., 314 Richards Block.....	360
WGAU	Marcus G. Limb.....	Wooster, Ohio, 235 E. Liberty St.....	360
WGAU	B-H Radio Co.....	Savannah, Ga., 204 W. Broughton St.....	360
WGAU	Ernest C. Albright.....	Altoona, Pa., 1918 W. Chestnut St.....	360
WGAU	North Western Radio Co.....	Madison, Wis., 250 State St.....	360
WGAU	South Bend Tribune.....	South Bend, Ind.....	360
WHAA	State University of Iowa.....	Iowa City, Iowa.....	360
WHAB	Clark W. Thompson (Fellman's Dry Goods Co.).....	Galveston, Tex.....	360, 485
WHAC	Cole Bros. Electric Co.....	Waterloo, Iowa.....	360
WHAD	Marquette University.....	Milwaukee, Wis.....	360
WHAE	Automotive Electric Service Co.....	Sioux City, Iowa.....	360
WHAF	Radio Electric Co.....	Pittsburgh, Pa.....	360

EVERYWHERE. AMERICAN LEGION OFFICIALS RECENTLY STARTED ON GENERAL SAWYER'S TRAIL. THEY ACCUSED HIM OF HASTENING AND HOLDING UP THE PROGRAM OF FEDERAL HOSPITALIZATION. GENERAL SAWYER IS CHIEF COORDINATOR OF THE HOSPITALIZATION BOARD. THEY HAD BETTER INVOKE PUBLIC SENTIMENT BACK OF GENERAL SAWYER INSTEAD OF HOBBLING HIM, ASSERTED MR. DAWES. THEN HE SAID THERE WAS ALTOGETHER TOO MUCH RUNNING TO COVER BY GOVERNMENT OFFICIALS EVERY

TIME THE AMERICAN LEGION GROWLED AT THEM, FEARING THAT THE SEEDLESS PUBLIC WOULD ALL TOO QUICKLY ASSUME THAT THE LEGION WAS RIGHT WHATEVER THE FACTS MIGHT BE. MR. DAWES ASSERTION OF HIS."

The time was started with the word, "will." Five letters were taken as the average word. The word "seedless" was checked by the judges and found to be correct with the punchings on the sending tape.

After Mr. McElroy had won the contest by copying 52 1/5 words per minute

perfect copy, Commissioner Carlson offered a prize of \$50.00 additional in case the World's record was beaten. As stated above, Mr. McElroy established a World's record of 55 1/10 words per minute perfect copy. Before awarding the prize, and to remove all doubt as to whether or not 55 1/10 words perfect copy was superior to 56 1/2 words per minute with four errors, which was the previous record, Commissioner Carlson obtained an opinion from a commission of five experts relative to this record. The commission consisted of Mr. E. J. Nally, President of the Radio Corporation of America, Mr. E. R. Shute, Operating Engineer of the Western Union Telegraph Company, Captain Alfred Thomas, District Manager of the Radio Corporation of America, Mr. E. A. Beane, U. S. Radio Inspector, 9th District, and Mr. L. R. Schmitt. The entire commission are uniformly agreed that perfect copy is the standard for consideration, and are, therefore agreed that 55 1/10 words per minute perfect copy is a new world's record.

Chicago's Winter Show

January has been selected as the month when the second annual National Radio Exposition will be held in Chicago. This was chosen for several reasons. By that time the radio industrial atmosphere will have sufficiently cleared to enable the manufacturer, jobber and dealer to know where he stands, the annual inventories will have been taken, and an adjustment will have been reached in this rapidly growing industry which will have stabilized it to a large degree.

There was another factor in causing the Advisory Committee of the second National Radio Exposition to select this particular time for the second National show. Consultation with exhibitors in the First National Exposition, held in the Leiter building, Chicago, June 26 to July 1, revealed the fact that the big men in the industry were convinced that with the opening of the new year will come many changes in the radio situation. Long distance reception will have been so much improved as to enable Chicago to hear music and world news direct from England, Scotland and Panama, as well as the most distant points in the United States.

The First Regiment Armory, 16th Street and Michigan Avenue, has been selected as the place for holding the second annual National Radio Exposition, and the dates are to be January 13 to 20, inclusive, according to Milo E. Westbrook, who is the pioneer in staging radio exposition truly national in character.

One of the features of the second National exposition, as it was in the first, will be the participation of the schools. The high school boy is not only looked upon as the radio manufacturer of the future, but he is the surest vehicle to carry radio into the home.

The school exhibit at the second National Radio Exposition will be on a more extensive scale than at the first show.

GET YOUR MARKET REPORTS FROM ONE OF THESE STATIONS

THE following is a broadcasting schedule of market reports by radio. These reports are sent as press items, except where it is indicated that they are sent in code form. Forms are necessary for copying the reports sent by code, sample copies of which may be obtained from this bureau for Federal and air mail stations and for all others by writing to the broadcasting station direct. While this schedule is not complete, it is the most accurate that can be prepared from the information available and will be revised as rapidly as data are received. With the exception of Federal stations, practically all market, crop, and weather reports are sent out on 485 meters, while entertainment, news, etc., are broadcast on 360 meters.

Federal, State and private market reports.
[Submitted by Bureau of Agricultural Economics.]

Name and call letters of station.	Nature of reports.	Source.	Time of transmission.	Type of transmission
Arlington, Va. (Washington, D. C.), Navy Radio Station, NAA.	Live stock receipts five or more principal markets (code).	Federal	Eastern standard time. 8.45 a. m.	Telegraph 5950 meters continuous wave transmission
	Weather forecast.....	do	10.00 a. m.	Do.
	Hog market flash, Chicago and St. Louis.....	do	11.15 a. m.	Do.
	Fruit and vegetable shipments and shipping point information.....	do	11.20 a. m.	Do.
	Fruit and vegetable markets.....	do	1.40 p. m. ¹	Do.
	Crop reports and special market news.....	do	2.25 p. m. ¹	Do.
	Closing live stock markets.....	do	3.45 p. m. ¹	Do.
	Hay and feed markets, Monday, Wednesday, and Friday.....	do	4.00 p. m. ¹	Do.
	Weather forecast.....	do	5.00 p. m. ¹	Do.
	Daily market gram.....	do	5.30 p. m. ¹	Do.
	Weather forecast.....	do	9.45 p. m.	Do.
Ames, Iowa: Iowa State College, WOI.	Information not available.....		Central time	Phone.
Atlanta, Ga.: Atlanta Constitution, WGM.	Information not available.....		do	Do.
Atlanta, Ga.: Atlanta Journal, WSB.	Weather reports.....	Federal	Central time. 12.00 noon	Phone.
	Market report, close on cotton, grain, and spot quotations.....		2.30 p. m.	Do.
	Entertainment.....	Local	4.00 p. m.	Do.
	Ball score, news, etc.....	do	5.00 p. m.	Do.
	Entertainment.....	do	7.00 p. m.	Do.
Austin, Tex.: University of Texas, WCM.	Opening cotton and grain markets.....		9.30 a. m.	Phone.
	Noon call on cotton.....	Local	12.30 p. m.	Do.
	Live stock report.....	do	2.45 p. m.	Do.
	Close on cotton and grain.....	do	3.15 p. m.	Do.
	Laredo onion report and general shipping point news.....	do	4.00 p. m.	Do.
	Report on markets of Dallas, Fort Worth, Houston, and San Antonio, and general crop information.....	do	8.00 p. m.	Do.
Boston, Mass. (Worcester): Clark University, WCN.	Weather reports.....	Federal	Eastern time. 11.15 a. m.	Do.
	Massachusetts State market reports.....	State		Do.
	Weather reports.....	Federal	5.15 p. m.	Do.
Bridgeport, Pa.: Diamond State Fiber Co., WBAG.	Market and crop reports.....	do	11.45 a. m.	Do.
	(Music Thursday).....	Local	7.30 p. m.	Do.
Buffalo, N.Y.: Federal Telegraph & Telephone Co., WGR.	New York State market reports.....	State	12.00 noon	Do.
	Weather reports.....	Federal	5.30 p. m.	Do.
	New York State market reports.....	State	5.30 p. m.	Do.
	Education talks and entertainment.....	Local	7.30 p. m.	Do.
Charlotte, N. C.: Southern Radio Corporation, WBT.	Weather reports.....	Federal	11.00 a. m.	Do.
	Ball scores, etc.....	Local	6.00 p. m.	Do.
	Market reports.....	Federal	8.00 p. m.	Do.
	Entertainment.....	Local	8.30 p. m.	Do.
Chicago, Ill.: Westinghouse Electric & Manufacturing Co., KYW.	Fruit, vegetable, live stock, and grain (code).....	Federal	Central time. 2.15 p. m.	Do.
	Fruit, vegetable, live stock, grain and dairy products (code).....	do	4.15 p. m.	Do.
	Fruit, vegetable, live stock, and feeds.....	do	6.00 p. m.	Do.
	Fruit, vegetable, live stock, grain, and dairy products (code).....	do	7.30 p. m.	Do.
Cincinnati, Ohio: Cincinnati Radio Manufacturing Co., WIZ.	Wholesale fruit and vegetable report.....	do	12.00 noon	Do.
	Live stock reports, Chicago and St. Louis.....	do	3.00 p. m.	Do.
Crosley Manufacturing Co., WLW.	Financial and market report.....	do	Eastern time. 1.00 p. m.	Do.
	Entertainment, etc.....	Local	3.00 p. m.	Do.
	Talks, news items, music.....	do	3.00 p. m.	Do.
Precision Equipment, WMH.	Wholesale fruit and vegetable report.....	Federal	Central time. 11.00 a. m.	Do.
	Live stock report, Chicago and St. Louis.....	do	4.00 p. m.	Do.
¹ Not broadcasted on Saturdays from June 15 to Sept. 15.				
Dayton, Ohio: Rike-Kumler Co., WFO.	Weather report.....	Federal	Central time. 11.30 a. m.	Phone.
	Entertainment and news.....	Local	9.00 a. m.	Do.
	do.....	do	11.00 a. m.	Do.
	Market report and weather.....	Federal		Do.
	News and entertainment, Monday, Wednesday, Thursday.....	Local	4.00 p. m.	Do.
	do.....	do	7.00 p. m.	Do.

(Continued on next page.)

Lightning Arresters

Many of our readers are still worrying about the lightning scare pertaining to outside aerials. Nearly every day I receive requests for information on this subject and to those interested I wish to say that recent investigation shows that there is actually less danger from this source with an aerial than without; but when the reader reads something like the following, it is no wonder that he becomes anxious.

"Watch out for lightning—beware of fire—injury—or death, as a result of using your radio set with a roof aerial. Thunder-storms with attendant lightning may kill you while you sleep. Protect your family, and your friends. Safeguard your life with a Hoosis lightning protector."

Wow—w—but that does get one scared, but is it a warning from the fire department, or does the municipal or federal government issue such warnings? No, not at all; this is merely an advertisement in the newspapers attempting to sell lightning arresters by the "scare-'em-stiff" method. I do not wish to discourage the use of lightning arresters, because occasionally they do protect delicate radio receiving instruments, and because in some localities they are required by law, but I do wish to discourage hysterical fears, unfounded in most cases, and greatly exaggerated in others. The reason why you need not worry about lightning will be explained in this column tomorrow.—[F. D. P. in Chicago Herald and Examiner.

Wireless Patent Suit

New York.—Action to restrain the Wireless Specialty Apparatus Company from continuing to publish a series of "patent warning" advertisements has been brought in the Supreme Court of New York.

"The suit is being watched with considerable interest by wireless interests, including hundreds of radio apparatus manufacturers and radio dealers throughout the country, who will be guided by court decision as to their rights in regard to the alleged patent infringements contained in the "warning" advertisements.

"The suit is being prosecuted by the Freed Eisemann Radio Corporation, 255 4th Avenue, supported by a group of radio apparatus manufacturers known as the "Independent Radio Manufacturers, Inc."

Operators Suspended

First-class, second-grade license, No. 1359, issued at Baltimore, Md., August 29, 1921, has been suspended for a period of three months for violation of section 5, act of August 13, 1912, in that he willfully interfered with the transmission of another station.

First-class, second-grade license, No. 3895, issued at New York, N. Y., June 27, 1922, has been suspended for a period of three months for violation of article 6 of the International Convention service regulations, in that he carried on an unofficial conversation with the operator of another vessel.

Federal, State, and private market reports—(Continued.)

Name and call letters of station.	Nature of reports.	Source.	Time of transmission.	Type of transmission.
Detroit, Mich.: The Detroit News, WWJ.	Entertainment, etc.	do.	9.30 a. m.	Do.
	Weather report	Federal	10.15 a. m.	Do.
	United States time signals	do.	11.55 a. m.	Do.
	Entertainment	Local	12.05 p. m.	Do.
	Market quotations	do.	3.30 p. m.	Do.
	Weather report	Federal	4.05 p. m.	Do.
	Sport and world news	Local	5.00 p. m.	Do.
Eldorado, Kans.: Midland Refining Co., WAH.	Entertainment	do.	7.00 p. m.	Do.
	Weather and market report	Federal	10.30 a. m.	Do.
	Market report	do.	1.30 p. m.	Do.
	Weather report	do.	3.30 p. m.	Do.
Elko, Nev.: Air mail radio station, KDEJ.	Entertainment	Local	5.00 p. m.	Do.
	Market report (Saturday)	Federal	1.00 p. m.	Do.
	Live-stock receipts (code)	do.	8.30 a. m.	3000 arc undamped.
	Live stock Chicago (code)	do.	12.00 noon	Do.
Fort Worth, Tex.: Fort Worth Record, WPA.	Entertainment	do.	4.00 p. m.	Do.
	Weather report	do.	11.30 a. m.	Phone.
	Market report	do.	2.30 p. m.	Do.
	Ball scores and news	Local	4.00 p. m.	Do.
	Entertainment	do.	6.00 p. m.	Do.
The Star-Telegram, WBAP.	News and weather reports	do.	7.30 p. m.	Do.
	Produce, grain, and cotton opening	Federal	10.00 p. m.	Do.
	Weather report (code)	do.	8.45 a. m.	Do.
	Cotton, grain, sugar, and cattle report (code)	Local	11.00 a. m.	Do.
Great Lakes, Ill. (Chicago, Ill.): Navy radio station, NAJ.	Live-stock receipts (code)	do.	2.00 p. m.	Do.
	Fort Worth cash grain	do.	3.30 p. m.	Do.
	Live-stock receipts (code)	Federal	8.00 a. m.	Telegraph 4900 meters continuous-wave transmission
	Hog market flash, Chicago	do.	8.50 a. m.	Do.
	Weather forecast	do.	9.00 a. m.	Do.
	Hog flash five or more markets	do.	10.00 a. m.	Do.
	Fruit and vegetable shipments, and shipping point information	do.	10.10 a. m.	Do.
	Dairy products market report, New York and Chicago	do.	10.40 a. m.	Do.
	Live-stock market:			
	Chicago	do.	11.45 a. m.	Do.
	Kansas City	do.	11.25 a. m.	Do.
	St. Louis	do.	11.40 a. m.	Do.
	St. Paul	do.	12.00 noon	Do.
	Omaha	do.	12.20 p. m.	Do.
	Chicago close code, advance estimated	do.	12.40 p. m.	Do.
Reports:				
Grain report (code)	do.	1.45 p. m.	Do.	
Fruit and vegetable market report	do.	2.30 p. m.	Do.	
Hay and feed market report	do.	3.45 p. m.	Do.	
Dairy and poultry market report	do.	5.00 p. m.	Do.	
Daily marketgram	do.	6.00 p. m.	Do.	
Weather forecast	do.	9.30 p. m.	Do.	
Hutchinson, Minn.: Hutchinson Electric Service Co., WFAN.	Weather and market reports as transmitted by University of Minnesota.	State	1.00 p. m.	Phone
	Market reports, estimated receipts Kansas City, St. Louis, and Chicago hog opening, and Kansas City grain (code).	Federal and State	9.30 a. m.	Do.
Jefferson City, Mo.: Missouri State marketing bureau, WOS.	Kansas City and St. Louis live stock and Kansas City grain	do.	11.30 a. m.	Do.
	Chicago butter and eggs, St. Louis potatoes, and Kansas City grain (code)	do.	2.00 p. m.	Do.
	Marketgram, general market information (daily except Tuesdays and holidays)	do.	5.00 p. m.	Do.
	Grain market reports for the Kansas City Board of Trade (half-hour schedule).	Local	Central time. 9.30 a. m. to 12.30 p. m.	Do.
Kansas City, Mo.: Sweeney Radio Electric Co., WHB. Western Radio Co., WOQ.	Hog report	Federal	9.45 a. m.	Do.
	Live Stock Kansas City (code)	do.	11.30 a. m.	Do.
	Fruit and vegetable	do.	11.40 a. m.	Do.
	Grain report (code)	do.	2.00 p. m.	Do.
	Live stock Kansas City (code)	do.	2.10 p. m.	Do.
	Live stock Chicago (code)	do.	2.20 p. m.	Do.
	Fruit and vegetable, Kansas City, Chicago, and St. Louis	do.	2.30 p. m.	Do.
Lincoln, Nebr.: University of Nebraska, WFAV.	Repeat the 2 and 2.30 p. m. reports.	do.	7.30 p. m.	Do.
	Omaha hogs and sheep, and grain report for Chicago, Omaha, and Kansas City.	Federal	10.10 a. m.	Do.
	Weather forecast, Nebraska	do.	Pacific time.	Do.
Los Angeles, Calif.: Leo J. Meyberg Co., KYJ.	Weather forecast	do.	9.00 a. m.	Do.
	Lectures University of Southern California	Local	2.30 p. m.	Do.
Madison, Wis.: University of Wisconsin, WHA.	Stock exchange report	do.	4.00 p. m.	Do.
	Music and entertainment	do.	4.00 p. m.	Do.
	Chicago, potatoes, hogs, cattle, sheep, eggs, butter, cheese, poultry, and hay (code)	Federal	Central time. 12.00 noon	Telegraph.
Manhattan, Kans.: Kansas State Agricultural College, WTG.	Weather for Wisconsin	do.	12.20 p. m.	Do.
	Weather same as at 12.20 p. m.	do.	12.25 p. m.	Phone.
	United States time signal	do.	12.59 p. m.	Do.
Memphis, Tenn.: Reichman-Crosby Co., WKN.	Weather forecast	do.	9.55 a. m.	Do.
	Weather and opening cotton market	do.	11.45 a. m.	Do.
	Close on cotton, live stock, and produce	do.	2.30 p. m.	Do.
	Baseball news	Local	6.00 p. m.	Do.
	Entertainment	do.	8.15 p. m.	Do.
	Sermons (Sunday)	do.	11.00 a. m.	Do.

¹Not broadcasted on Saturdays from June 15 to Sept. 15.

Federal, State, and private market reports—Continued.

Name and call letters of station.	Nature of reports.	Source.	Time of transmission.	Type of transmission.
Milwaukee, Wis.: Gimbel Brothers Department Store, WAAK.	Market quotations of Milwaukee Chamber of Commerce.	do.	Daylight saving, central time. 10.00, 11.00, 12.10 and 1.25.	Do.
	Weather forecast (Wisconsin).	Federal.	11.00 a. m.	Do.
Minneapolis, Minn.: University of Minnesota, WLB	Weather report, Minnesota, Wisconsin, North Dakota, South Dakota, and Montana.	Local.	Central time. 12.00 noon.	Telegraph and followed by phone.
	St. Paul live stock summary of morning's market.	State and Federal.	12.00 noon.	Do.
Newark, N. J.: Westinghouse Electric & Manufacturing Co., WJZ.	Minneapolis wheat closing cash and futures, Minneapolis and St. Paul potatoes, summary.	Local and Federal.	7.30 p. m.	Do.
	Market reports, New York City wholesale fruit and vegetable.	State.	Eastern time. 12.00 noon.	Do.
North Platte, Nebr.: Air mail radio station, KDHM.	New York City wholesale fruit and vegetables, eggs, hay, butter, etc.	do.	6.00 p. m.	Do.
	Live stock receipts (code).	Federal.	Central time. 9.30 a. m.	Telegraph.
Omaha, Nebr.: Air mail radio station, KDEF.	Live stock Chicago (code)	do.	12.00 noon.	4000 meters, arc undamped.
	do.	do.	5.00 p. m.	Do.
Pittsburgh, Pa. (East Pittsburgh) Westinghouse Electric Manufacturing Co., KDKA.	Live stock, Kansas City.	do.	8.00 p. m.	Do.
	Live stock, Omaha, Nebr.	do.	8.30 p. m.	Do.
Reno, Nev.: Air mail radio station, KDEK.	Live stock receipts (code)	do.	9.00 a. m.	Telegraph.
	Live stock, Chicago (code)	do.	11.00 a. m.	2500 met. arc undamped.
Richmond, Ind.: Palladium Printing Co., WOZ.	Live stock, Omaha (code)	do.	12.00 noon.	Do.
	Live stock, Kansas City (code)	do.	1.00 p. m.	Do.
Rochester, N. Y.: Rochester Times Union, WHQ.	Grain, Omaha (code)	do.	2.00 p. m.	Do.
	Live stock, Chicago	do.	4.30 p. m.	Do.
Rock Springs Wyo.: Air mail radio station, KDHN.	Live stock, Kansas City	do.	7.00 p. m.	Do.
	Live stock, Omaha	do.	7.30 p. m.	Do.
Schenectady, N. Y.: General Electric Co., WGY.	Live stock, Omaha	do.	Eastern time. 7.45 p. m.	Phone.
	Fruit and vegetable (Pittsburgh), live stock (Chicago), grain.	Federal.	7.45 p. m.	Do.
St. Louis, Mo.: St. Louis University, WEW.	Chicago, hay and feed.	Local.	7.45 p. m.	Do.
	Live stock receipts (code)	Federal.	Pacific time. 9.00 a. m.	Telegraph.
Stix-Baer & Fuller Co., WCK.	Live stock, Chicago (code)	do.	1.00 p. m.	3200 met., arc undamped.
	Indianapolis markets.	Local.	Central time. 12.00 noon.	Phone.
Springfield, Mass.: Westinghouse Electric & Manufacturing Co., WBZ.	Weather forecast.	Federal.	4.00 p. m.	Do.
	Complete market report.	Local.	4.00 p. m.	Do.
State College, N. Mex.: New Mexico College of Agriculture and Mechanical Arts, KOB.	Weather, local news, music.	Federal and local.	6.30 p. m.	Do.
	New York State market reports.	State.	Eastern time. 7.45 p. m.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Live stock receipts (code)	Federal.	Mountain time. 9.00 a. m.	Telegraph.
	Live stock, Chicago (code)	do.	12.00 noon.	3000 met., arc undamped.
Toledo, Ohio: The William B. Duck Co., WHU.	Live stock, Chicago	do.	4.30 p. m.	Do.
	Live stock, Kansas City	do.	8.00 p. m.	Do.
Toledo, Ohio: The William B. Duck Co., WHU.	Live stock, Omaha	do.	8.30 p. m.	Do.
	New York City market fruit and vegetables, butter, eggs, poultry, hay, and country dressed meat.	State.	Eastern time. 7.00 p. m.	Phone.
Tampa, Fla.: Tampa Daily Times, WDAE.	Market report, live stock receipts St. Louis and Chicago hog opening (code).	Federal.	Central time. 10.15 a. m.	Do.
	St. Louis and Kansas City opening, trend of market, Liverpool cables.	do.	10.15 a. m.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Fruit and vegetable, Chicago potatoes, live stock, St. Louis close, closing grain market.	do.	2.15 p. m.	Do.
	Market reports Saturday.	do.	1.00 p. m.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Merchants Exchange reports, opening future market.	Local.	8.40 a. m.	Do.
	Future market receipts and shipments.	do.	9.40 a. m.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Future market.	do.	10.40 a. m.	Do.
	do.	do.	11.40 a. m.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Closing future market cash grain prices.	do.	12.40 p. m.	Do.
	Weather forecast.	Federal.	Eastern time.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Massachusetts State market reports.	State.	Do.	Do.
	Time signals.	Federal.	Mountain time. 11.55 a. m.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Weather forecast.	do.	12.00 noon.	Do.
	Crop reports.	do.	12.05 p. m.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Music and entertainment.	Local.	8.00 p. m.	Do.
	Information not available.		Eastern time.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Grain market (Toledo).	State.	Eastern time. 9.40-12.30 and 1.40	Do.
	Live stock and vegetables.	do.	12.30 p. m.	Do.
Tampa, Fla.: Tampa Daily Times, WDAE.	Baseball and news.	do.	5.00 p. m.	Do.
	Musical entertainment Tuesday and Thursday.	Local.	9.00 p. m.	Do.

(Continued on next page.)

Federal Radio Body

At the request of the Secretary of Commerce each of the ten Government departments have appointed representatives on an Interdepartment Advisory Committee on Governmental Radio Broadcasting. There are, in addition, representatives of the office of the chief coordinator, Bureau of the Budget, and the United States Shipping Board. The membership of the committee is as follows: Agriculture, W. A. Wheeler, Radio Development Section; Commerce, Dr. S. W. Stratton, director, Bureau of Standards; Interior, O. P. Hood, chief mechanical engineer, Bureau of Mines; Justice, S. Ely, chief clerk; Labor, A. E. Cook, office of the Secretary; Navy, Commander D. C. Bingham, Naval Communication Service; Post Office, J. C. Edgerton, air mail division; State, W. S. Rogers, International Communications Conference; Treasury, L. J. Heath, Public Health Service; War, Maj. Gen. G. O. Squier, chief signal officer; Chief Coordinator, Capt. H. P. Perrill, assistant coordinator, Bureau of the Budget; United States Shipping Board Emergency Fleet Corporation, F. P. Guthrie, head of radio division, operating department.

The chairman of the committee is Dr. S. W. Stratton and the secretary is Dr. J. H. Dellinger, chief of the radio laboratory, Bureau of Standards, Department of Commerce. In accordance with recommendations of the committee an experimental system of Government broadcasting by "primary" broadcast stations has been established, utilizing only previously existing Government stations and equipment. The "primary" stations are stations which broadcast official Government news by continuous wave (code) telegraphy for the purpose of furnishing this information to local broadcast stations for rebroadcasting by radiophone. The eight stations thus far included send out daily bulletins of Government news, mostly agricultural market data. They are: Arlington, Va. (Navy, 5950 meters), Great Lakes, Ill. (Navy, 4900 meters), Washington, D. C. (Post Office, 1980 meters), Omaha, Nebr. (Post Office, 2500 meters), North Platte, Nebr. (Post Office, 4000 meters), Rock Springs, Wyo. (Post Office, 3000 meters), Elko, Nev. (Post Office, 3000 meters), Reno, Nev. (Post Office, 3200 meters).

The committee has recognized the principle that radio must be used, primarily, for types of service that can not be as satisfactorily given by other means of communication, and that therefore radio broadcasting should not be used in general where wire telegraphy or telephony or printed publication would be as satisfactory. It is possible that the scope of the committee's activities may be extended beyond the subject of broadcasting, and that the committee will act in an advisory capacity to the Secretary of Commerce in matters of Government radio regulation and will consider all radio questions of interdepartmental interest.—Submitted by Bureau of Standards.

Announcing

The Second
**NATIONAL
 RADIO
 EXPOSITION**
 1st Regiment Armory
CHICAGO
JAN. 13 to 20
1923 (incl.)

to be conducted along the same successful lines as was the National Show held in Chicago last June.

January is the ideal month for perfect radio reception, also the time when inventories have been made thereby enabling dealers to buy with intelligence and safety.

WRITE TODAY
for Diagram

**Second
 National
 Radio
 Exposition**

417 S. DEARBORN ST.
CHICAGO

Federal, State, and private market reports—Continued.

Name and call letters of station.	Nature of reports.	Source.	Time of transmission.	Type of transmission.
Tulsa, Okla.: Midland Refining Co., WAH.	Live stock reports.....	Federal.....	<i>Central time.</i> 10.30 a. m. and 1.30 p. m.	Do.
	Weather forecast.....	do.....	10.30 a. m. and 3.30 p. m.	Do.
	Concerts (not regular).....	Local.....	7.45 p. m.....	Do.
University Place, Nebr.: Nebraska Wesleyan University, WCAJ.	Weather forecast and news.....	Federal and local.....	<i>Central time.</i> 8.50 a. m.....	Phone.
	Omaha live stock, Chicago grain (code and press). Concerts, lectures, etc., Tuesday and Thursday.	Federal.....	4.00 p. m. daily 12.15 p. m. Saturday. 9.30 p. m.....	Do. Do.
	Washington, D. C. Fruit and vegetable (Washington, D. C.).....	Federal.....	<i>Eastern time.</i> 10.30 a. m.....	Phone, 1169 meters.
Washington, D. C. Department of Agriculture, WWX.	Live stock receipts and St. Louis and Chicago hog opening (code). Live stock, Chicago and St. Louis close (code). ¹	do.....	12.30 p. m.....	Do.
	Crop reports and special market news. ¹	do.....	3.00 p. m.....	Do.
	General fruits and vegetables. ¹	do.....	3.30 p. m.....	Do.
	Dairy products, New York and Chicago (code). ¹	do.....	5.00 p. m.....	Do.
	Grain. ¹	do.....	5.30 p. m.....	Do.
	Live stock and grain (code). ¹	do.....	7.30 p. m.....	Do.
	Fruit and vegetable. ¹	do.....	8.00 p. m.....	Do.
Wichita, Kan.s.: The Cosradio Co., WEY.	Board of trade reports; information not available.			Phone.

¹Not broadcasted on Saturday from June 15 to Sept. 15.
 NOTE.—When no form number is indicated straight copy is used.

SPECIAL LAND STATIONS

Special land stations, alphabetically by names of stations.

[Additions to the List of Radio Stations of the United States, edition of June 30, 1921.]

Station.	Call signal.	Wave lengths.	Station controlled by—
Abilene, Tex.....	5ZAX	200,375.....	Eugene W. Wood, 340 Butternut Street.
Atlanta, Ga.....	4X1	200,275.....	Technological High School
Belmar, N. J.....	2XAO	Variable.....	Radio Corporation of America, 233 Broadway, New York, N. Y.
Dallas, Tex.....	5ZAY	200,375.....	A. H. Belo & Co.
Delanco, N. J.....	3XP	250.....	Henry M. Neely.
Fayetteville, Ark.....	5ZAZ	200,375.....	Lawrence W. Stinson, 354 North West Street.
Great Neck, N. Y.....	2XAN	Variable.....	Harry Alexander, 20 West Thirty-fourth Street, New York, N. Y.
Madison, Wis.....	9XL	360.....	North Western Radio Co., 250 State Street.
Mobile, Ala.....	5XAE	200,375.....	Mobile Radio Co., O'Gwinn Building.
New Brunswick, N. J.....	2XAM	Variable.....	Radio Corporation of America, 233 Broadway, New York, N. Y.
Oklahoma City, Okla.....	5XAF	200,375.....	Roswell B. Downing.
Orange, Tex.....	5XAD	Variable.....	Gray & Gray.
Philadelphia, Pa.....	3XAG	200,250.....	Westinghouse Electric & Manufacturing Co., 214 North Twenty-second Street.
Pittsburgh, Pa.....	8XW	Variable.....	Radio Electric Co., 1427 Liberty Avenue.
Pittsburgh, Pa.....	8XX	200,375.....	Duquesne University.
San Francisco, Calif.....	6XAU	Variable.....	Wilson McQuire Co., 1004 Treat Avenue.
Tampa, Fla.....	4XJ	285,325.....	Thompson Electric Co., 102 West Lafayette Street.
Washington, D. C.....	3XO	200,375.....	Central High School.
Waterbury, Conn.....	1XT	360.....	Bristol Co.
Winthrop, Mass.....	1XQ	Variable.....	Lloyd C. Greene, 88 Somerset Avenue.
Worcester, Mass.....	1XSdo.....	Otis C. White, 17 Herman Street.

Special land stations, grouped by districts.

Call signal.	District and Station.	Call signal.	District and station.
1XQ	First district:		Fifth district:
1XS	Winthrop, Mass.	5XAD	Orange, Tex.
1XT	Worcester, Mass.	5XAE	Mobile, Ala.
	Waterbury, Conn.	5XAF	Oklahoma City, Okla.
	Second district:	5ZAX	Abilene, Tex.
2XAM	New Brunswick, N. J.	5ZAY	Dallas, Tex.
2XAN	Great Neck, N. Y.	5ZAZ	Fayetteville, Ark.
2XAO	Belmar, N. J.	6XAU	Sixth district: San Francisco, Calif.
	Third district:		Eighth district:
3XAG	Philadelphia, Pa.	8XX	Pittsburgh, Pa.
3XO	Washington, D. C.	8XW	Do.
3XP	Delanco, N. J.	9XL	Ninth District: Madison, Wis.
4X1	Fourth district:		
4XJ	Atlanta, Ga.		
	Tampa, Fla.		

Please Mention "Radio Age" When Replying to Advertisers

Federal Act Regulating Radio

Measure Now Pending in United States Senate Committee on Interstate Commerce

Mr. Kellogg introduced the following bill; which was read twice and referred to the Committee on Interstate Commerce.

A BILL

To amend an Act to regulate radio communication, approved August 13, 1912, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled. That the Act of Congress entitled "An Act to regulate radio communication," approved August 13, 1912, is amended by striking-out sections 1, 2 and 3 thereof and by inserting in lieu thereof the sections 1, 2 following:

"Section 1. A. That no person, company or corporation within the jurisdiction of the United States shall use or operate any apparatus for radio communication by telegraphy or telephony as a means of intercourse among the several States or with foreign nations, or upon any vessel of the United States engaged in interstate or foreign commerce, or for the transmission of radiograms or signals by telegraphy or telephony the effects of which extend beyond the jurisdiction of the State or Territory in which the same are made, or where interference would be caused thereby with the transmission or reception of messages or signals from beyond the jurisdiction of said State or Territory, except under and in accordance with a license in that behalf granted by the Secretary of Commerce and except as hereinafter authorized.

"B. That the Secretary of Commerce from time to time shall (a) classify licensed radio stations and the operators required therein; (b) prescribe the nature of the service to be rendered by each class of licensed station and assign bands of wave lengths thereto; (c) make, alter, and revoke regulations applicable to all licensed stations not inconsistent with this Act or any other Act of Congress or with the terms of any radio communication convention to which the United States is a party concerning the service to be rendered by each class of stations so established; the location of any station; the wave lengths to be used by any station; the kinds of instruments or apparatus in any station with respect to the external effect produced thereby; the power and the purity and sharpness of the waves of each station or the apparatus therein; the area to be served by any station and the times and methods of operating any station or the apparatus therein; (d) make such other regulations not inconsistent with law as he may deem necessary to prevent interference between all stations affected by this Act.

"C. That radio stations belonging to and operated by the United States and

used exclusively for communications of official business, shall not be subject to the provisions of paragraphs A and B of this section. Every other station owned and operated by the United States shall be subject to the provisions of said paragraphs A and B of this section. All stations owned and operated by the United States and all other licensed stations on land and sea shall have special call letters designated by the Secretary of Commerce, and such stations and the designated call letters shall be included in the list of radio stations of the United States as published by the Department of Commerce. Radio stations owned and operated by the United States and used exclusively for the communication of official business shall use such wave lengths as shall be assigned to each by the President, and shall observe such regulations as the Secretary of Commerce may make to prevent undue interference with other radio stations and rights of others, except that upon proclamation by the President that there exists war or a threat of war or a state of public peril or disaster or other emergency, the President may suspend for such time as he may see fit all such regulations of the Secretary of Commerce applicable to such stations owned and operated by the United States.

"D. That every such license shall provide that the President of the United States in time of war or public peril or disaster, may cause the closing of any station for radio communication and the removal therefrom of all radio apparatus or may authorize the use or control of any such station or apparatus by any department of the Government upon just compensation to the owners.

"Sec. 2. A. That paragraph A of Section 1 of this Act shall not apply to persons sending radio messages or signals through a radio station belonging to and operated by the United States for the transmission exclusively of official business nor to persons sending such messages on a foreign ship while the same is within the jurisdiction of the United States.

"B. That the station license required hereby shall not be granted to, or after the granting thereof such license shall not in any manner, either voluntarily or involuntarily, be transferred to (a) any alien or the representative of any alien; (b) nor to any foreign government or the representative thereof; (c) nor to any company, corporation, or association organized under the laws of any foreign government; (d) nor to any company, corporation, or association of which any officer or director is an alien or of which more than one-fifth of the capital stock having voting power is owned or controlled by aliens or their representatives or by a foreign government of representative thereof, or by any company, corpora-

tion, or association organized under the laws of a foreign country.

"Such station license, the wave length or length authorized to be used by the licensee, and the rights therein granted shall not be transferred, assigned, or in any manner, either voluntarily or involuntarily, disposed of to any other person, company, or corporation without the consent in writing of the Secretary of Commerce.

"C. That the Secretary of Commerce, subject to the limitations of this Act, in his discretion, may grant to any applicant therefor a station license provided for in Sections 1 and 2 hereof, except that he may grant such license only to a station which is in the interest of the general public service.

"No license granted by the Secretary shall be for a longer term than 10 years, and any license granted may be revoked as hereinafter provided. Upon the expiration of any license the Secretary, in his discretion upon application therefor, may grant a renewal of such license for the same or for a lesser period of time.

"The Secretary of Commerce is hereby authorized to refuse a license to any person, company, or corporation, or any subsidiary thereof which, in the judgment of the Secretary, is monopolizing or seeking to monopolize radio communication, directly or indirectly, through the control of the manufacture or sale of radio apparatus or by any other means. The granting of a license shall not estop the United States from prosecuting such person, company, or corporation, for a violation of the law against monopolies or restraint of trade.

"D. That the Secretary of Commerce may grant licenses only upon written application therefor addressed to him, which application shall set forth such facts as he by regulation may prescribe as to the citizenship, character, and financial, technical, and other ability of the applicant to operate the station; the ownership and location of the proposed station and of the stations with which it is proposed to communicate; the wave lengths and the power desired to be used; the hours of the day or other periods of time during which it is proposed to operate the station; the purposes for which the station is to be used, and such other information as he may require. Such application shall be signed by the applicant under oath or affirmation.

"E. That such station license as the Secretary of Commerce may grant shall be in general form as he may prescribe, but each license shall contain in addition to other provisions a statement of the following conditions to which such license shall be subject: (a) The ownership or management of the station or apparatus

HOMCHARGE

YOUR RADIO BATTERY

for a Nickel

ENJOYABLE Radio Concerts and Maximum Receiving Range are obtained only when your battery is fully charged.

THE
RADIO
HOMCHARGER
DE LUXE

charges your "A" or "B" battery over night. Silent and clean in operation—requires no watching—may be used right in your living room.

Connects to any lamp socket. Self-polarizing—fully automatic—cannot overcharge or injure the battery.

Entirely enclosed—approved by Underwriters. Unconditionally GUARANTEED. Lasts a lifetime.

Beautifully finished in Mahogany and Gold—the most efficient and handsome recharger ever produced. Sold by all dealers, \$18.89 complete. Send for Bulletin 637. IT'S FREE.

THE AUTOMATIC
ELECTRICAL DEVICES CO.

West Third Street
Cincinnati, Ohio

Over 50,000 HOMCHARGERS in Use

Radio Needs Trained Men

Radio is sweeping the country like wild fire. Thousands of dollars are being spent for expensive outfits. RADIO EXPERTS are needed everywhere to keep this equipment in order and to sell and install new outfits.

Be a Radio Expert

I will train you quickly and easily in your spare time, to become a RADIO EXPERT so you can install, construct, repair and sell Radio equipment. I am a Graduate Electrical Engineer and from actual experience I will give you exactly what you must know to make the really big money in radio.

FREE My Consultation Service to you is FREE. This outside help which I gladly give you is, in itself, worth more than the small cost of the Complete Course.

START NOW

Don't let others beat you to the big money. Start now and within a few weeks' time I will train you at home, at an amazingly low cost, to become a RADIO EXPERT. Write for "Radio Facts" sent free without obligation.

A. G. MOHAUPT, Electrical Engineer
American Electrical Association
4511 N. Winchester Ave., Chicago

WRITE
TODAY

Let Us Pay You for Your Spare Hours—

There are thousands of subscriptions for Radio publications taken every day.

RADIO AGE

"The Magazine of the Hour," is placing representatives in every community throughout the country. Why not turn your spare hours into dollars. Experience is not necessary. We show you how. Clip this ad and mail it today.

RADIO AGE

64 WEST RANDOLPH STREET, CHICAGO

Solder Your Connections

for best results. Get the "Wonder," a Self Heating Iron. Use it anywhere without stove. No workshop complete without it. Cheap to operate. Generates own vapor in two minutes. Absolutely safe—a child can operate. Nothing to get out of order. Use it as a blow torch also. Boxed complete with solder, sal-amoniac and full soldering directions. Send No Money—just your name and address on a post card. When the postman delivers, pay him \$2.50.

Dealers—a big seller, write for proposition.
North Shore Radio Works, Dept. B-604
810 Davis Street, Evanston, Ill.

Send \$1.00 to Radio Age, 64 Randolph Street, Chicago, and receive this middle-west radio periodical for six months. Regular subscription price is \$2.50 a year. Thus you will be getting two months free.

therein shall not be transferred in violation of this Act. There shall be no vested property right in the license issued for such station or in the bands of wave length authorized to be used therein, and neither the license nor any right granted thereunder shall be assigned or otherwise transferred in violation of the Act; (b) such licenses shall contain such other conditions not inconsistent with this Act, as the Secretary of Commerce may prescribe.

"F. That any station license granted by the Secretary of Commerce shall be revocable by him for failure to operate service substantially as proposed in the application and as set forth in the license, for violation of or failure to observe any of the restrictions and conditions of this Act or of any regulation of the Secretary of Commerce authorized by this Act or by the provisions of any international radio convention ratified or adhered to by the United States or any regulations thereunder, or whenever the Secretary of Commerce shall deem such revocation to be in the public interest; *Provided*, That no order of revocation shall take effect until thirty days' notice in writing thereof to the parties known by the Secretary to be interested in such license. Any person in interest, aggrieved by said order, may make written application to the Secretary at any time within said thirty days for a hearing upon such order and upon the filing of such written application said order of revocation shall stand suspended until the conclusion of the hearing herein directed. Notice in writing of said hearing shall be given by the Secretary to all the parties known to him to be interested in such license twenty days, prior to the time of said hearing. Said hearing shall be conducted under such rules and in such manner as the Secretary may prescribe. Upon the conclusion thereof the Secretary may affirm, modify, or revoke said orders of revocation.

"Sec. 3. A. That the actual operation of apparatus in any radio station for which a station license is required by this Act shall be carried on only by a person holding an operator's license issued thereunder. No person shall operate any apparatus in such station except under and in accordance with an operator's license issued to him by the Secretary of Commerce.

"B. That the Secretary of Commerce, in his discretion, may grant special temporary operators' licenses to operators of radio apparatus under such regulations, in such form, and upon such conditions as he may prescribe whenever an emergency arises requiring prompt employment of such an operator.

"C. That an operator's license shall be issued by the Secretary of Commerce in response to a written application therefor, addressed to him, which shall set forth (a) the name, age, and address of the applicant; (b) the date and place of birth; (c) the country of which he is a citizen; and if a naturalized citizen of the United States, the date and place of naturalization; (d) the previous experience of the applicant in operating radio apparatus; and (e) such other facts or in-

formation as may be required by the Secretary of Commerce. Every application shall be signed by the applicant under oath or affirmation.

"D. That an operator's license shall be issued only to a person who, in the judgment of the Secretary of Commerce, is proficient in the use and operation of radio apparatus and in the transmission and reception of radiograms by telegraphy and telephony. Except in an emergency found by the Secretary of Commerce to exist, an operator's license shall not be granted to any alien, nor shall such a license be granted to a representative of a foreign government.

"E. That an operator's license shall be in such form as the Secretary of Commerce shall prescribe, and may be suspended by him for a period not exceeding two years upon proof sufficient to satisfy him that the licensee: (a) has violated any provision of any act or treaty which the Secretary of Commerce is authorized by this Act to administer, or of any regulation made by the Secretary under any such Act or treaty; or (b) has failed to compel compliance therewith by any unlicensed person under his supervision; or (c) has failed to carry out the lawful orders of the master of the vessel on which he is employed; or (d) has wilfully damaged or permitted apparatus to be damaged; or (e) has transmitted superfluous signals, or signals containing profane or obscene words or language.

"F. That a license may be revoked by the Secretary of Commerce upon proof sufficient to satisfy him that the licensee was at the date his license was granted to him, or is at the time of revocation, ineligible for a license.

"Sec. 4. A. That after the approval of this Act the construction of a station for which a license is required by this Act shall not be begun, nor shall the construction of a station already begun be continued, until after a permit for its construction has been granted by the Secretary of Commerce upon written application therefor. This application shall set forth such facts as the Secretary of Commerce by regulation may prescribe as to the citizenship, character, and the financial, technical, and other ability of the applicant to construct and operate the station, the ownership and location of the proposed station and of the station or stations with which it is proposed to communicate, the wave or wave lengths desired to be used, the hours of the day or other periods of time during which it is proposed to operate the station, the purpose for which the station is to be used, the type of transmitting apparatus to be used, the power to be used, the date upon which the station is expected to be completed and in operation and such other information as the Secretary of Commerce may require. Such application shall be signed by the applicant under oath or affirmation.

"B. That such permit for construction shall show specifically the earliest and latest dates between which the actual operation of such station is expected to begin and shall provide that said permit will be automatically forfeited if the station is not ready for operation within

3000 OHM SETS, \$4.50

2000 OHM SETS, \$4.00 1000 OHM SETS, \$3.50
 Plus 20c for Postage and Insurance.
 Satisfaction Guaranteed or Money Back.



We mail phones the day your order arrives. Every pair tested, matched, and guaranteed as sensitive as \$8 to \$10 phones. We have no agents or dealers. By ordering direct you save dealer's profits—circular free.

TOWER MFG. CO., Brookline, Mass.
 22 Station St.

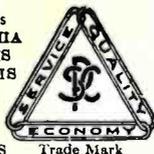
For reliable and up-to-date information on radio read

RADIO AGE

For prompt and efficient service place your order with representatives of the Periodical Sales Co., whose authority and responsibility is assured by credentials in their possession bearing the registered trade-mark of the Periodical Sales Co., facsimile of which is reproduced hereon.

PERIODICAL SALES CO., Inc.
 538 South Dearborn Street, Chicago, Illinois

Branch Offices
 PHILADELPHIA
 MINNEAPOLIS
 INDIANAPOLIS
 DENVER
 NEW YORK
 BUFFALO
 LOS ANGELES



Branch Offices
 MILWAUKEE
 DETROIT
 CLEVELAND
 BOSTON
 NEW ORLEANS
 TORONTO
 CANADA



TRESCO

Sectional **UNIVERSAL** Radio Outfits

Licensed under Armstrong U. S. Patent No. 1,133,149

The Set Consists of Three Units:

Tuner and Detector Unit... \$ 50.00
 Two-Step Amplifier Unit... 35.00
 Unit for holding "A" Battery 9.50
 Top and Bottom, which when added to the three other units, make a complete section all in one. Each, \$5; both 10.00
 Complete Set, Total..... \$104.50
 Ask your dealer; if he cannot supply you, write us, Dept. 803.



the time specified. The rights granted under any such permit shall not be assigned or otherwise transferred to any other person, persons, company, or corporation, without the approval of the Secretary of Commerce: *Provided*, That a permit for construction shall not be required for Government stations to be used exclusively for communication of official business or for private stations as provided for in Section 4, fifteenth regulation, of the Act of August 13, 1912. The granting of this permit to construct a station as herein required shall not be construed to impose any duty or obligation upon the Secretary to issue a license for the operation of such station.

"Sec. 5. That an advisory committee is hereby established to whom the Secretary of Commerce shall refer for examination and report such matters as he may deem proper relating to: (a) the administration or changes in the laws, regulations, and treaties of the United States relating to radio communication; (b) the study of the scientific problems involved in radio communication with the view of furthering its development; (c) the scientific progress in radio communication and use of radio communication.

"The advisory committee shall consist of twelve members, of whom one shall be designated by the Secretary of State, one by the Secretary of War, one by the Secretary of the Navy, one by the Secretary of Agriculture, one by the Postmaster General, and one by the Secretary of Commerce, to represent these departments, respectively, and six members of recognized attainment in radio communication not otherwise employed in the Government service to be designated by the Secretary of Commerce.

"The necessary expenses of the members of the committee in going to, returning from, and while attending meetings of the committee, including clerical expenses and supplies, together with a per diem of \$25 to each of the six members not otherwise employed in the Government service for attendance at the meetings, shall be paid from the appropriation made to the Department of Commerce for this purpose.

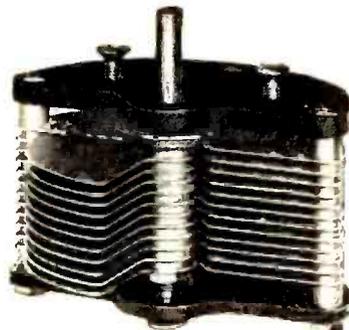
"Sec. 6. That radio telephone stations, the signals of which can interfere with ship communication, are required to keep a licensed radio operator, of a class to be determined by the Secretary of Commerce, listening in on the wave length designated for distress signals during the entire period the transmitter of such station is in operation.

"Sec. 7. That regulation first of Section 4 of said Act of Congress approved August 13, 1912, is amended by striking out the words 'this wave length shall not exceed six hundred meters.'

"Regulations third and fourth of Section 4 Act of Congress approved August 13, 1912, is amended by striking out the words 'provided that they do not exceed six hundred meters or that they do exceed one thousand six hundred meters.'

"Regulations third and fourth of Section 4 of said Act of Congress approved August 13, 1912, are amended by striking out the words 'exceeding two hundred meters' and substituting in lieu thereof

Variable Condensers



Variable condensers to be efficient must be well made. Loose joints or faulty construction soon allow the plates to get out of alignment and decrease their efficiency.

A seasoned organization backed by a half million dollar equipment has placed the United Condensers in the front rank with radio engineers, the country over.

PRICES

43 plate.....\$4.50
 23 plate..... 4.30
 11 plate..... 4.00

without dial or knob.

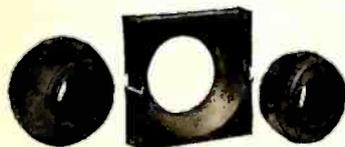
Liberal discounts to jobbers and dealers.

We invite correspondence with Radio Manufacturers who are interested in using our facilities and services for manufacturing Radio Equipment.

United Mfg. and Distributing Co.

536 Lake Shore Drive
 CHICAGO, ILL.

Artistic Variometer Parts



Variocouplers, Rotors, Winding Forms, Stators, in Genuine Mahogany. Quick Deliveries. Write for prices.

Artistic Wood Turning Works
 517 No. Halsted Street, Chicago, Illinois

"I have used Combat batteries in my work and at school for the past 10 years and consider them the highest type of battery constructed. I am now using the Combat Radio in my Radio work"—says Frank D. Pearne, noted Radio authority and teacher.

A Battery Built for Radio Only

CHic c e e a Go—messages like that are the great bane of Radio. They are caused by voltage variation—and the Combat "A" uniform voltage Radio battery corrects voltage variation. The extra-heavy, hand-pasted plates in the Combat Radio deliver a discharge that is slow and uniform, thereby eliminating distorted messages. Made exclusively for Radio work—if you own a vacuum tube set you need it. The Combat



Radio is built into a handsome acid-proof steel case which houses the one-piece hard rubber jar. Special composition between protects against breakage or leakage. Patent vent plug allows escape of gases but no acids. Well in jar insures against spilling while filling or charging. Patented non-corroding terminals keep your connections clean at all times—no short circuiting. Fully guaranteed for 18 months by the manufacturers who enjoy reputation of 14 years' high-grade battery making.

SPECIAL OFFER: 5,000 will be sold direct to users at factory prices in order to introduce. This is an opportunity to save money on the best Radio battery ever produced. Some Combata have given as high as 8 years, continuous service. Great length of life more than makes up for any difference in price. Take advantage of this offer NOW. Act Quick to Buy at These Prices.

Full capacity 6 v., 60 amp.....\$15.25
Full capacity 6 v., 80 amp..... 16.85
F. O. B. Chicago

Send only \$1.00 as good faith and we will ship C. O. D. subject to examination

Territory still open for live dealers.

Commercial Battery Co.
759 BOSTON AVE. Dept. A. CHICAGO

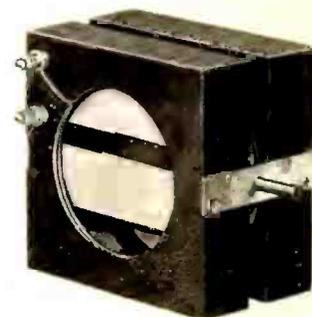
the words 'of not less than one hundred and fifty meters nor more than two hundred and seventy-five meters.'

"Sec. 8. That any person, company, or corporation who shall erect, use, or operate any apparatus for radio communication in violation of this Act, or knowingly aid or abet another person, company, or corporation, in so doing, or knowingly make false oath or affirmation for the purpose of securing a permit or a license, shall incur a penalty not to exceed \$1,000, which may be mitigated or remitted by the Secretary of Commerce, and the permit or license of any person, company, or corporation, who shall violate any of the provisions of this Act, or of any of the regulations of the Secretary of Commerce issued hereunder, or knowingly make any false oath or affirmation for the purpose of securing a permit or license, may be suspended or revoked by the Secretary of Commerce.

"Sec. 9. That the Secretary of Commerce is hereby authorized and directed to charge, and through the imposition of stamp taxes on applications, licenses, or other documents, or in other appropriate manner, to collect, the fees specified in the schedule following. The Secretary shall collect said fees through the collectors of customs or other officers designated by him, and he may make such regulations as may be necessary to carry out the provisions of this section."

"For trans-oceanic radio station license \$300 per annum; for commercial land station license, other than trans-oceanic, one kilowatt transmitter input or less, \$50 per annum; and for each additional kilowatt or fraction thereof, \$5 per annum; for ship station license, \$25 per annum; for experiment station license, \$25 per annum; for technical and training school station license, \$15 per annum; for special amateur station license, \$10 per annum; for general and restricted amateur station license, \$2.50 per annum; for commercial extra first-class operator's license, \$2.50 per annum; for commercial first-class operator's license, \$1.50 per annum; for commercial second-class operator's license, \$1 per annum; for commercial cargo grade operator's license, 50 cents per annum; for experiment and instruction grade operator's license \$1 per annum; for amateur first-grade operator's license, 50 cents per annum; for amateur second-grade operator's license, 50 cents per annum; for commercial extra first-class radio operator's examination for license, \$2.50 for each examination; for commercial first-class radio operator's examination for license, \$2 for each examination; for commercial second-class radio operator's examination for license, \$1.50 for each examination; for commercial cargo grade radio operator's examination for license, \$1 for each examination; for experiment and instruction grade radio operator's examination for license, \$1 for each examination; for amateur first-grade radio operator's examination for license, \$1 for each examination; for amateur second-grade operator's examination for license, 50 cents for each examination.

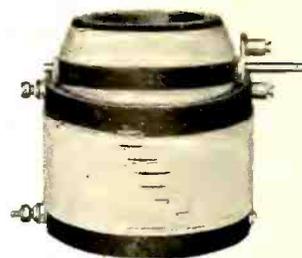
VARIOMETER



\$5.00

Rotor and stator in moulded hard rubber, highly finished, best insulation known. Beautiful design binding posts, eliminating any necessity of soldering. Finished product. Wound with green covered wire; nickel plated hardware. Put up in attractive boxes.

COUPLER



\$4.50

Tube of hard fibre, rotor in moulded hard rubber. Wound with green covered wire. Nickel plated hardware. Special binding posts. No soldering of connections.



The set herewith illustrated is a four tube Radio-frequency set built into a light-weight, portable case with nickel-plated hardware, making a handsome, simple and salable set. Prices on sets range from \$65.00 to \$190.00, including tubes, B Batteries and head phone. These sets can be taken wherever you go, being light and convenient to carry.

VARIABLE CONDENSERS

Aluminum plates, fibre and brass end pieces. Sturdily and well constructed.

11 plates	\$3.00
23 plates	3.50
43 plates	4.50

3-in. Dials and composition sockets of attractive design at 75c each. Rheostats with pointer, \$1.10; with dial.....\$1.50

POSITIVE IMMEDIATE DELIVERY FROM STOCK

We have an interesting proposition for dealers and jobbers

The Reliance Rubber Co.

Dept D 1806 S. Michigan Ave.
PHONE CALUMET 0947
CHICAGO

FREE—With Head Phones

Compact, High-Class Receiving Set

Looks Well and Performs Well

THIS instrument is assembled in a walnut cabinet with a highly polished Bakelite front, all metal parts highly nickeled.

The Crystal Detector is of the very latest pattern, with ball and socket arrangement, so same can be moved up and down, side-wise and forward and back so that the most sensitive point on the Galena can be located.

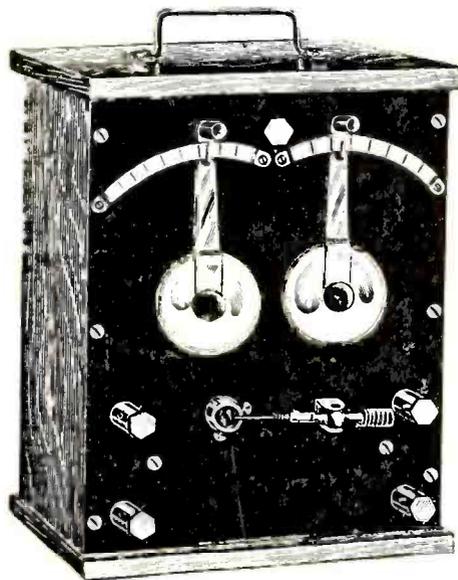
The Galena retainer is of standard size so that all mounted Galenas will fit it.

The size of the set is as follows: Height, 10 inches; width, 8 inches; depth, 6½ inches.

There are two tuning levers on the front. After locating the most sensitive point of the Galena the two levers are moved back and forth until the best result is obtained.

This receiving set **WILL NOT** receive messages from great distances but it works perfectly under favorable conditions from 15 to 25 miles away from the broadcasting station.

Each receiving set is guaranteed to be in perfect condition, being thoroughly tested before accepted from the factory.



You Can Get This Wonderful Radio Receiving Set

FREE

If you are willing to devote a little effort in telling your friends about RADIO AGE. It's as simple as A. B. C. Just write your name and address on the coupon below and we'll send you full particulars by first mail out.

RADIO AGE, Circulation Department
64 West Randolph Street, Chicago

Date.....

I am interested in securing one of your Radio receiving sets which you offer **FREE**. Please send me full particulars by return mail.

Name.....

Street.....

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

RADIO BATTERY

PRICE READY TO SHIP

\$13.00



**REAL RADIO BATTERY BUILT FOR SERVICE
MADE OF BEST MATERIALS OBTAINABLE**

*Box made of A-1 Hard Oak. Jars of Highest Quality
Rubber. Top covers moulded of high grade Rubber.*

Port Orford white cedar separators thoroughly treated.

*Plates are composed of high grade Oxides and built for
Service. All lead parts of 7 per cent Antimony Lead*

CAPACITY: 6 VOLT. 50 AMPERES

*We GUARANTEE the REAL RADIO BATTERY
against all defective workmanship or material for
18 months.*

Prompt shipment. Send Money Order or Certified Check.

BUY THE BEST AND GET GOOD RESULTS

Richl Radio Mfg. & Supply Co.

EVERYTHING IN THE RADIO LINE
FACTORY: ST. LOUIS

OFFICE: 401 CALUMET BUILDING

ST. LOUIS, MO.

DISTRIBUTORS WANTED