

RADIO AGE

PACIFIC
OCEAN

INDIAN
OCEAN

The Magazine of the Hour

JUNE, 1922

25c A COPY

IN THIS NUMBER

Read Pearne's Articles on the Simplified Home Radio

Professor Frank D. Pearne tells beginners each month about construction and operation. Prof. Pearne is chief instructor in electricity at Lane Technical High School, Chicago. Exclusive in Radio Age.

Government Radio Control New Rules for All Radio Fans

First complete publication of final official conference report on sending and receiving. This radio article vitally important. It's your working handbook.

Questions and Answers Illustrated by an Expert

Here is a magazine whose technical editor, Frank D. Pearne, knows how to get radio instruction over in simplest terms.

GOOD MAGAZINE FOR EVERYBODY

BETTER ON EACH APPEARANCE

BEST ALWAYS FOR BEGINNERS

Don't Say Radio Magazine—Say RADIO AGE

It Is the Magazine of the Hour

Acknowledgment

To—

Newsdealers, who are reporting phenomenal sales of Radio Age;

Subscribers, whose names already are in our card files—hundreds of names with more in each mail;

Advertisers, who have let us broadcast their business messages to many thousands who were waiting for those messages.

From—

The Publisher, who has faith in the Rotarian slogan: "He Profits Most Who Serves Best."

RADIO AGE

The Magazine of the Hour

Volume 1

Number 2

CONTENTS FOR JUNE, 1922

	PAGE
Frontispiece — Portrait of Dr. S. W. Stratton.....	2
How the Government Will Control Radio.....	3
<i>By</i> FREDERICK SMITH	
Shows Introducing Radio to American Throngs.....	5-6
How to Make a Receiving Transformer.....	7
<i>By</i> FRANK D. PEARNE	
Navy's Radio Shatters Distance.....	9
High School Wins Radio Fame.....	11
<i>By</i> EDWARD L. TAYLOR	
"Aerials" Under Ground and Under Water.....	13
Electric Light Wire as Auxiliaries to Radio.....	13
New Stuff by Our Boy Readers.....	14
In Radio Shops and Factories.....	15
Thought Waves from the Editorial Tower.....	17-18
The Radio Club of Illinois.....	19
<i>By</i> BARRATT O'HARA	
Questions and Answers.....	20
Conducted and Illustrated by FRANK D. PEARNE	
Radio News from Coast to Coast.....	23-24

RADIO AGE is published monthly by
The M. B. Smith Publishing Co.,
Garrick Building, Chicago, Ill.

FREDERICK SMITH, *Editor*
FRANK D. PEARNE, *Technical Editor*
M. B. SMITH, *Publisher and 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 5th of the Month
Preceding Date of Issue.

Issued monthly. Vol. I, No. 2. Publication Office: Garrick Building, 64 West Randolph Street, Chicago. Subscription price \$2.50 a year. Entry as second-class matter applied for at the postoffice at Chicago, Ill., under the Act of March 3, 1879.

Registration of Title Applied for in U. S. Patent Office.
Copyright, 1922, Republication of Original Matter Prohibited

What is in Store for RADIO AGE Readers

The acquisition of Frank D. Pearne as Technical Editor on the staff of RADIO AGE insures authoritative interesting material for our magazine. Mr. Pearne is chief instructor in electricity at Lane Technical High School and knows how to discuss radio technique with beginners.

Mr. Pearne will not only write and illustrate a helpful article each month but he will conduct the questions and answers, always a popular feature in publications dealing with wireless.

There are to be three big radio shows in Chicago and several others in the "Chicago Territory" before August and some of these will be attended by important conferences at which radio history will be made.

It is the privilege of the editor to be associated in an advisory capacity with three of these approaching expositions and our readers may be sure of getting complete information of them.

This number contains the complete report in the recent Department of Commerce conference on radio regulation. The report is voluminous but we are so sure of the interest in this subject, among big manufacturers as well as among dealers, expert operators and amateurs, that we have arranged for other comprehensive articles of a similar nature.

In the July number we are to have a most interesting story by a man who made his own receiving set for \$3.85 and went on from there until he—but read his own story.

Nothing would please the editor more than to receive letters from our readers. Criticism is invited. News forwarded to us will be used where practicable and unused manuscripts will be returned if stamped and addressed envelopes are supplied.

Who's Who in Radio



S. W.
STRATTON

Dr. Samuel W. Stratton, Chief of the Government Bureau of Standards, was chairman of the Department of Commerce conference called by Secretary Hoover to recommend laws governing radio communication. Dr. Stratton formerly was professor of physics at the University of Chicago and has been director of the Bureau of Standards for more than twenty years. He is an Illinois man.

RADIO AGE

"The Magazine of the Hour"

M. B. SMITH
PUBLISHER

PUBLISHED MONTHLY GARRICK BLDG CHGO.

FREDERICK SMITH
EDITOR

How the Government Will Control Radio

By FREDERICK SMITH

AT LAST the radio wise men of the United States have agreed upon a definite comprehensive plan whereby users of radio telephones and the radio telegraph may know how, where and when they may use the magic electro magnetic waves as a means of communication.

Just before going to press we are in receipt of the complete official text of the report made by the Department of Commerce conference on radio telephony, which adjourned its second session on April 19. The report is published in full in this number because it is the most important document of the day, interesting alike the small boy with his home-made receiving outfit and the million dollar corporation with its powerful transmitting station.

A mere glance at the report will convince the public that the conference had a giant task to perform. Since the installation of broadcasting stations started several years ago the number of stations has increased to such an extent that chaotic confusion has resulted. Government broadcasting, public broadcasting, private broadcasting and toll broadcasting have overlapped and clashed until it seemed that it was impossible to straighten out the tangle.

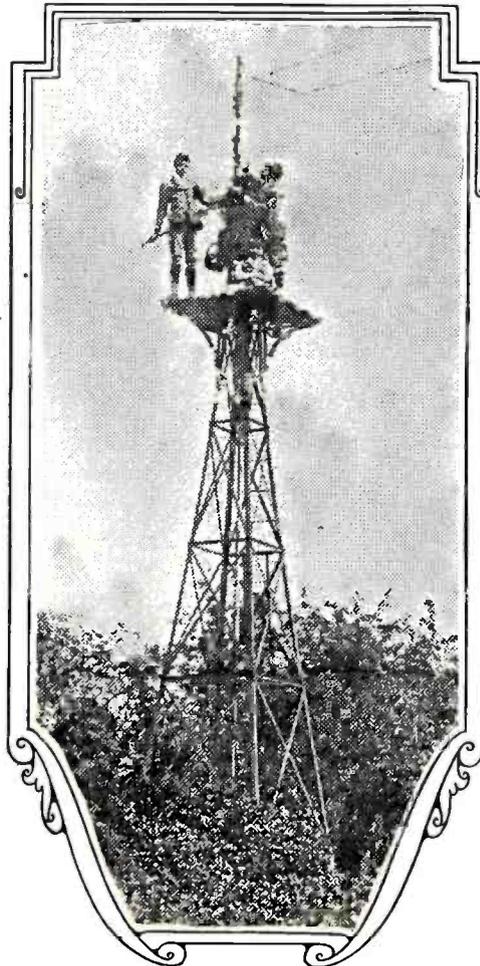
Marine radio service was sadly hindered by operators outside the government service along the coasts. Public and private broadcasts destroyed the value on one another until the radio telephone listener was frantic over repeated disappointment. Probably most important of all was the status of the amateur who was trying to advance his knowledge of the science by practicing it and thus make himself a valuable unit in the vast system of radio telephony which is soon to be one of our most important national assets. His broadcasting very often jammed up the music, speeches, baseball scores, weather

predictions and market information that thousands of persons were trying to pick up with their receivers. But the amateur had to be taken care of, nevertheless. Under the new reg-

ulation the basis for congressional legislation. The bill being drafted by Representative Wallace H. White, Jr., of Maine, will put the recommendations into the form of a law and this will be the first adequate legislation on the subject in the last decade.

Radio laws will be so amended as to give the Secretary of Commerce (Mr. Hoover) authority to control the establishment of all radio transmitting stations except amateur, experimental and government stations. He also will be authorized to control the OPERATION of non-governmental radio transmitting stations. How this federal control is to be established is explained in part in the following conference recommendation, one of the most interesting in the report:

It is recommended that for the purposes of self-policing among the amateurs, Amateur Deputy Radio Inspectors be created, elected from their number of the amateurs of each locality; that upon receipt of notice of such election the Radio Inspector in charge of the district in which such amateurs are located shall appoint the person chosen a Deputy Radio Inspector, serving without compensation or for the sum of one dollar per year if compensation is legally required; that the duty of such Amateur Deputy Inspector shall be to endeavor to the best of his ability to accomplish, under the direction of the District Radio Inspector, observance of the Radio Communication Laws and the Regulations of the United States and the observance of such local co-operative measures as are agreed to in each community for the minimization of interference between the various groups of the public interested in radio; that such amateur Deputy



Radio has caught the boys in England, too. The boys at an elementary school at Haslemere, England, have transformed this old windmill into an aerial tower. Kadel & Herbert Photo

ulations he will have his place in the ether.

The recommendations made by the Washington conference will be made

Radio Inspectors be clothed with whatever authority may be necessary in the opinion of the District Radio Inspector.

That means the young traffic cop of the air will be listening in for those reckless and inconsiderate despoilers of the air and will report them to headquarters. The transmitting station will be extremely careful not to commit any evils which may lead to the revocation of its precious sending license.

Direct advertising is explicitly prohibited in the recommendations of the conference. Radio is termed a public utility in which the mass of the people is most vitally interested and it is the aim of the proposed legislation to gain the most good for the greatest number.

For this reason the conference resolved "that the types of radio apparatus most effective in reducing interference should be made freely available to the public without restriction."

The conference adjourned its first session on March 2 to give the radio public opportunity to discuss and criticise the plans for regulation. The report as finally adopted and here published in full is therefore the consensus of that tremendous army of radio enthusiasts which is gaining recruits to the number of many thousands each month.

The complete conference report follows:

DEPARTMENT OF COMMERCE Washington

This conference was called by Secretary Hoover to consider general questions concerning the regulation of radio communication.

The following were invited to serve as members of the Conference, the representatives of the Government departments being selected by their several departments:

Dr. S. W. Stratton, Chairman (Director of Bureau of Standards).

Mr. Edwin H. Armstrong, Columbia University, New York, N. Y.

Capt. Samuel W. Bryant, U. S. N., Navy Department.

Mr. D. B. Carson, Commissioner of Navigation, Department of Commerce.

Mr. J. C. Edgerton, Supt., Radio Service, Post Office Department.

Dr. Alfred N. Goldsmith, Secretary, Institute of Radio Engineers, New York, N. Y.

Mr. R. B. Howell, Metropolitan Utilities District, Omaha, Nebr.

Prof. C. M. Jansky, Jr., University of Minnesota.

Senator Frank B. Kellogg of Minnesota.

Mr. Hiram Percy Maxim, President, American Radio Relay League, Hartford, Conn.

Major General George O. Squier, War Department.

Representative Wallace H. White, Jr., of Maine.

Mr. W. A. Wheeler, Bureau of Markets

Final Allocation of Wave Lengths

Use	Wave Frequency	
	Wave Length Meters	Kilocycles per sec.
(1) Transoceanic radio telephone experiments, non-exclusive. (See Note 3).....	6,000	50.
(2) Fixed service radio telephony, non-exclusive. (See Note 4).....	5,000	60.
(3) Mobile service radio telephony, non-exclusive.....	3,300	90.9
(4) Government broadcasting, non-exclusive. (See Note 1).....	2,850	105.2
(5) Fixed station radio telephony, non-exclusive. (See Note 5).....	2,650	113.2
(6) Aircraft radio telephony and telegraphy, exclusive.....	2,500	120.
(7) Government and public broadcasting, non-exclusive.....	2,050	146.
(8) Radio beacons, exclusive. (See Note 6).....	1,850	162.
(9) Aircraft radio telephony and telegraphy, exclusive.....	1,650	181.8
(10) Radio compass service, exclusive. (See Note 7).....	1,550	193.5
(11) Government and public broadcasting, 200 miles or more from the seacoast, exclusive.....	1,550	193.5
(12) Government and public broadcasting, 400 miles or more from the seacoast, exclusive.....	1,500	200.
(13) Marine radio telephony, non-exclusive. (See Note 8).....	1,500	200.
(14) Aircraft radio telephony and telegraphy, exclusive. (See Note 8).....	1,050	285.7
(15) Government and public broadcasting, exclusive.....	1,050	285.7
(16) Private and toll broadcasting. (See Note 9).....	950	316.
(17) Restricted special amateur radio telegraphy, non-exclusive. (See Note 10).....	850	353.
(18) City and state public safety broadcasting, exclusive. (See Note 11).....	850	353.
(19) Technical and training schools (shared with amateur). (See Note 12).....	750	400.
(20) Amateur telegraphy and telephony (exclusive, 150 to 200 meters). (Shared with technical and training schools, 200 to 275 meters). (See Note 13).....	750	400.
(21) Private and toll broadcasting, exclusive.....	700	428.
(22) Reserved.....	700	428.
	650	462.
	750	400.
	650	462.
	525	572.
	500	600.
	495	606.
	485	618.
	485	618.
	285	1,052.
	310	968.
	285	1,052.
	275	1,091.
	275	1,091.
	200	1,500.
	275	1,091.
	150	2,000.
	150	2,000.
	100	3,000.
	below 100	above 3,000

and Crop Estimates, Department of Agriculture.

The conference was in session from February 27 to March 2, at the end of which time a Tentative Report was prepared. This report was sent to all persons who requested it, and to representatives of various interests, which in the judgment of the Department of Commerce were interested. A large number of suggestions and comments were received. The Conference had subsequent sessions on April 17, 18 and 19. All comments were considered, the general effect of the comments being to approve the substance of the preliminary report with a very few exceptions. The report as finally amended and adopted is given herewith.

In addition to preparing a report on technical matters, the Conference made recommendations as to essential points required in legislation to give the Secretary power to make and enforce regulations.

General Resolutions

Resolved that the Conference on Radio Telephony recommend that the radio laws be amended so as to give the Secretary of Commerce adequate legal authority for the effective control of:

(1) the establishment of all radio transmitting stations except amateur, experimental and Government stations.

(2) the operation of non-Governmental radio transmitting stations.*

Resolved that it is the sense of the Conference that radio communication is a public utility and as such should be regulated and controlled by the Federal Government in the public interest.

Resolved that the types of radio apparatus most effective in reducing interference should be made freely available to the public without restriction.

I. Allocation of Wave Bands

A. It is recommended that waves for radio telephony be assigned in bands, according to the class of service, as given in the accompanying table.

Throughout this report, both wave lengths and wave frequency are given. Wave length in meters is 300,000,000 divided by wave frequency in kilocycles per second.

Wave bands marked exclusive can be used for no other type of service; those marked non-exclusive are available for other types of radio communication, subject to regulation.

*It was the desire of the Conference that the present authority of the Secretary of Commerce over the operation of radio transmitting stations be extended and that the Secretary of Commerce be granted authority to control the erection or establishment of certain classes of radio stations.

(Continued on page 25)

Shows Introducing Radio to Throngs

Middle West Fans Await Milwaukee, Toledo and Chicago Expositions

RADIO showmen appear to have no difficulty in convincing manufacturers and dealers that the radio show is the thing to get the business. This is not surprising when we look over the thousands of enthusiasts who have been crowding these exhibitions. Each demonstration of a radio outfit has an unmistakable kick of thrilling interest in it. The shows have become a means of giving many thousands of persons their first dip into the ether waves. Also the exhibits have intensely interested those fans who are beyond the first stage of radio learning and want to see the newest and most improved equipment.

Shows are supplying additional proof of the momentum the industry has accumulated. One year ago a radio show on a big scale failed to deliver a profit. This year the fans have been mobbing the entrances.

New York had one big show in the Pennsylvania Hotel and will have several others before next winter, the first of which was announced for the Seventy-First Regiment Armory, May 22 to 29, inclusive. Boston, Newark and Brooklyn have dropped into line with big

exhibitions. Toledo's first show is being held during the week of May 29.

Milwaukee Leads the Way

The Wisconsin Section of the American Radio Relay League will

convention will meet in the same building in which the show is held. Popular and technical talks by nationally known speakers are being arranged for the convention program.

Spearman Lewis, managing director of the Allied Bazaar, the most successful show ever staged in the Coliseum, Chicago (net cash profits, \$535,000), is managing director of the Wisconsin Radio Show. His headquarters are at the Plankinton Hotel, Milwaukee. Selling exhibitors' space has been largely a question of installing enough telephones at show headquarters to get the incoming calls and inquiries.

Milwaukee claims the finest exposition building in America—the Auditorium—and every indication points to tremendous attendance and unusually interesting exhibits. The famous "K Y W" of Chicago will be represented as a compliment to Mr. Lewis, who arranged the first Mary Garden-Edith Mason grand

opera demonstration over "KYW" last November.

The First Chicago Show

For the purpose of discovering the young Edisons of wireless and to



This bear cub, only a month old, may be listening to somebody's broadcasting station, but she more likely is just hearing the old call of the wild. Science seems to bore her. Her name is Marion and she lives in Seattle, Wash. International News Reel Photo

meet in its first state convention in Milwaukee on dates concurrent with the Wisconsin Radio and Electrical Show, to be held in the Auditorium, Milwaukee, June 21 to 25, inc. The

help make Chicago the radio center of the world the committee in charge of the prizes to be awarded in the various contests at the National Radio Exposition to be held in Chicago June 26th to July 1st, in the Leiter building, have announced the prizes that will be awarded. The committee includes J. C. Hail, in charge of radio station WBU, City Hall, chairman; Prof. R. R. Hughes, Evanston High School, and F. D. Pearne, of the Department of Electricity, Lane Technical High School.

The prize awards are classed as follows:

Grade Schools—For making the best Crystal Detector set—170 to 600 meters: 1st prize, \$25; 2nd, \$15; 3rd, \$10.

High Schools and Manual Training Schools—For making the best regenerative Detector, two-stage amplifier set—175 to 600 meters: 1st prize, \$50; 2nd, \$30; 3rd, \$20; boys under high school age are eligible, but they must be in school.

Contest Open to Anyone under 21 years old—For making the smallest set for receiving code and of practical use: 1st prize, \$50; 2nd, \$30; 3rd, \$20.

Contest Open to Anyone—For making Loud Speaker of own design throughout; one grand prize of \$100.

Contest Open to Anyone—For making the greatest radio novelty: one grand prize of \$100.

All the devices entered in the various contests must be the headquarters of the National Radio Exposition, 417 S. Dearborn Street, Room 401, by 8 o'clock Friday evening, June 23rd. The contestant must appear in person before that time, when he will be given a ticket of admission to the show and will be told the day on which the awards will be made in his particular contest.

Not a Dull Hour Here

An advisory committee of experts is arranging the general details of the exposition. This committee consists of J. Elliott Jenkins, chairman; J. C. Hail, W. S. Hedges, radio editor, Chicago Daily News; Prof. R. E. Hughes; G. H. Jaspert; F. D. Pearne. E. C. Rayner, Editor Radio Digest; L. R. Schmidt; Frederick Smith, editor, Radio Age; Alfred Thomas, Jr., district manager of the Radio Corporation of America; Norman E. Wunderlich, Radio Topics. At the first meeting of this committee it was decided to provide an educational program that will give the visitor to the exposition a liberal education in radio. This program, held in a conference room, will be in

the nature of open forum discussions, with a prominent speaker at each meeting, one at 10 o'clock in the morning and the other at 2 o'clock in the afternoon daily. Days will be set aside for dealers and manufacturers, doctors and hospital people, ministers, golfers.

In addition to the exhibits of manufacturers and dealers there will be many features and demonstrations. A broadcasting outfit will be installed by the Westinghouse station, in charge of G. H. Jaspert, where everything that is in the air will be received and can be heard by the visitors to the exposition. The technical schools of Chicago will have exhibits of their handicraft. The students not only will display what radio parts and outfits they have made in their schools, but they will actually manufacture them at the exposition. Some of the instructors and students at these schools not only have invented improvements in radio devices, for which they have obtained patents, but they have made outfits that rival the commercial outfits.

The advisory committee decided to turn over space to the Army, Navy, Department of Commerce, Weather Bureau, Boy Scouts, Girl Scouts, Sea Scouts and Campfire Girls for radio displays.

Pageant of Progress Show

One of the great radio shows of the year in the United States will be a feature—almost surely the foremost feature of the second annual International Pageant of Progress Exposition which opens on July 29th and closes August 14th, 1922. It is predicted that a million and a half persons will see this exhibition of wireless products.

A preliminary meeting of the radio directors of the Pageant of Progress was held in the Gray Room of the Hotel Sherman, on the evening of May 2. Mayor William Hale Thompson was present and delivered a speech which positively identified His Honor as one of us. The Mayor spoke eloquently of the future of radio.

Dr. John Dill Robertson, president of the exposition, introduced George B. Foster, of the Commonwealth Edison Company, as the chairman of the meeting. Mr. Foster called on several speakers, including former Lieutenant Governor Barratt O'Hara, District Inspector L. R. Schmitt, Secretary Tansey of the Radio Club of Illinois, Spearman Lewis, Milo E. Westbrooke, U. J. Herrmann and George E. Carlson,

Chicago Commissioner of Electricity.

The speakers all expressed confidence in the belief that Chicago had the opportunity to become the center of radio in this country. Mr. Foster, in his interesting and instructive address, said he was informed there would be five Chicago shows this year.

The interest displayed at this dinner indicates that those who fail to attend the Pageant of Progress radio show or neglect the opportunity to exhibit radio wares there will overlook a choice opportunity.

Offices of the Pageant of Progress are at 7 West Madison street.

The October Show

The Chicago Radio Show to be held at the Coliseum, October 14th to 22nd, is rapidly assuming not only definite proportions, but promises to be of unusual interest to the Radio trade in general. The Coliseum being recognized internationally as the center of trade expositions, gives any exposition held there, prominence throughout the country.

U. J. Herrmann, the managing director, has opened permanent offices in Suite 549 McCormick Bldg., and has appointed James F. Kerr, Manager of the Exposition. Many novel features in the arrangement of floor space are being worked out, to make the Exposition of equal interest to manufacturers and the public in general. Applications are coming in from all corners and the first foreign application was received from Paris, France, this week.

Manufacturers have a most optimistic view of market conditions bettering themselves during the summer months, as much of the patent litigation will be exhausted, thus leaving the manufacturing field in a more settled and stable condition.

Reassuring the Dailies

J. C. McQuiston, former president of the Association of National Advertisers and now manager of Westinghouse publicity, addressed the advertising association in Chicago recently.

"Radio cannot replace the newspaper," he said. "Radio will be a supplemental agency and will develop more reading of the newspapers for news, as radio broadcasting of bulletins will create the desire for further details and for confirmation. After all, the printed word is necessary to give the final touch of authority."

How to Make a Receiving Transformer

By FRANK D. PEARNE

Chief Instructor in Electricity at Lane Technical High School, Chicago

THE American boy is always anxious to make things with his own hands, and it can truthfully be said that more real pleasure can be obtained from something which he makes himself, than from something which he buys.

For the benefit of those so inclined I am going to describe an easily made receiving transformer which when completed and wired as shown in the diagram Figure 4 of this issue, will give excellent results. Figure 1 shows the complete coil and if the maker will follow the instructions closely, he will have a transformer that will look as well as any which he might purchase.

The first thing to do is to get some hard wood to use in the construction of the base and the ends for the coils. Mahogany is the best, as it can be given a fine finish, but this is usually hard for the average boy to obtain. If this cannot be secured, oak will do, and if this is outside of his reach, he may go to the grocery store and get a hard wood packing case and use the good parts of it for this work.

The base is made of a good clear piece of wood 16 by 10 inches and $\frac{3}{4}$ of an inch thick. After this has been made, go over it well with sandpaper, give it a good coat of varnish, and put it away to dry. Figure 2 shows the details of the ends for the primary coil. The primary end "A" is $5\frac{1}{4}$ inches high, $4\frac{3}{4}$ inches wide, and $\frac{5}{8}$ inches thick. A hole $4\frac{1}{4}$ inches in diameter is cut from this piece, taking as the center, a point $2\frac{3}{8}$ inches from the bottom and $2\frac{3}{8}$ inches from the side. This should be carefully done with a jig saw. A slot is then cut from the front to the back. This should be $\frac{1}{4}$ inch deep and $\frac{1}{4}$ inch wide. Sandpaper this, varnish, and

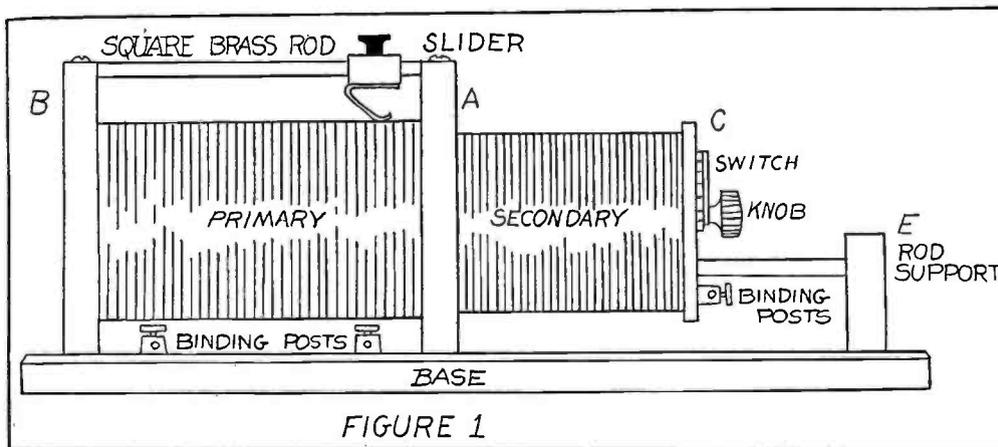
Care in Measurement

The primary end "B" is made the same size as "A" but do not cut hole

through this end. Instead of cutting this one out, cut out a circular piece of wood 4 inches in diameter and $\frac{1}{4}$ inch thick and glue it on to the end "B" as shown in the drawing. Care must be taken to see that the center of this round piece comes at exactly $2\frac{3}{8}$ inches from the bottom, and the

first piece is $4\frac{3}{8}$ inches in diameter and $\frac{1}{4}$ of an inch in thickness. Another round piece is cut $3\frac{3}{8}$ inches in diameter and $\frac{1}{4}$ of an inch thick, and glued fast to the first piece as shown in the side view of the secondary end "C" Figure 2. If this is made with the saw, the large piece will

have to be very carefully sand-papered to make it look like a real job. A $\frac{3}{16}$ inch hole is drilled through the center for mounting the switch lever later. Fifteen holes are then drilled around in a circle with a $\frac{1}{8}$ inch drill for mounting the switch



same distance from the sides. Drill two $\frac{1}{4}$ inch holes $\frac{1}{2}$ inch deep at the points indicated in the side view of primary end "B" Figure 2. Cut a $\frac{1}{4}$ inch slot across the top similar to the one made in the end "A" as shown, sandpaper, varnish and set it aside to dry.

The next thing in order is to make the secondary end "C". If possible this should be turned out in one piece on a lathe, as it makes a very neat job when completed, but as the average boy does not have a lathe at his disposal he can make it of two pieces cut out with the jig saw. The

two binding posts in the location shown in the back view of the secondary end "C" Figure 2. When this is finished it should be varnished and put away to dry.

The Rod Support

Now saw out the secondary end "D" Figure 3. This can be made of any kind of wood and should be $3\frac{3}{8}$ inches in diameter and $\frac{1}{2}$ inch thick. Drill two $\frac{1}{4}$ inch holes 1 inch from each of the center lines as shown, to be used for the supporting rods. This should also be varnished to prevent warping. Next cut out an oblong piece of hard wood for the rod support "E" as shown on Figure 3. This is to be 3 inches long and 2 inches wide, and $\frac{5}{8}$ of an inch in thickness. Two holes are to be drilled $\frac{1}{2}$ inch deep in one side in the location shown on the drawing. These holes should be $\frac{1}{4}$ inch in diameter, and great care should be used so that the drill does not go all the way through, as this would spoil the appearance of the coil, when finished. This like the other pieces, should be carefully sandpapered and varnished.

This completes the wood work, and the next thing to take up will be the winding of the coils.

Winding the Coils

Procure a pasteboard tube 6 inches long $4\frac{1}{4}$ inches in diameter on the

USUALLY the first radio receiving set with which the amateur comes in contact is one which uses the double slide tuning coil for making the adjustments to receive waves of different lengths. These serve their purpose during the elementary period of the beginner's experience, and then he looks about him for something a little better, which will give sharper tuning and which will also enable him to pick up stations which he could not get before. This he finds in the loose coupler, or receiving transformer, by which the receiving set is inductively coupled to the aerial and ground. With this idea in view, we publish in this issue, the complete instructions for the making of a receiving transformer.

outside and 4 inches in diameter on the inside. If this is hard to get use an oatmeal box and cut it off the proper length. The tube on the model coil from which these specifications are taken was made from an oatmeal box. Cut the ends of this tube nice and square all around, and punch two holes through it with a small awl, $\frac{3}{4}$ of an inch from the end. Now punch 2 more holes $\frac{1}{8}$ inch from the other end, exactly opposite from the first two. These holes are to accommodate the ends of the wires and should be about $\frac{1}{2}$ inch apart. As the wires are to come out on the same side of the tube it is necessary that the holes be on the same side. Use No. 22 enamel insulated wire for this coil.

Put about 12 inches of this wire down through one of the holes, and bring it up again through the hole next to it and begin the winding. This winding will begin $\frac{3}{4}$ inch from the end of the tube and continue to within $\frac{1}{8}$ inch of the other end, which should bring it directly up to the holes punched in that end. Anchor the final end of the winding by threading it through the two holes as you did on the starting end. When this is done, give the coil a coat of shellac varnish and let it dry. Now there will be a $\frac{3}{4}$ of an inch of the tube on one end which is not covered with wire. This should be set into the hole in the primary end "A" Figure 2 and glued fast. There will then be $\frac{1}{8}$ of an inch of the bare tube

showing between this end and the winding. Glue the other end of the tube over the projection on the primary end "B" as shown in the side view Figure 1. Before gluing the tube fast, be sure to see that the terminals of the coil are set so that they will come out at the bottom, so that they may easily be threaded through holes in the base.

Now get another tube, $5\frac{3}{8}$ inches long, $3\frac{3}{8}$ inches outside diameter, and $3\frac{1}{8}$ inches inside diameter. Punch one hole in the end of this tube, as you did in the other. This should be $\frac{1}{8}$ of an inch from the end. Use No. 24 single cotton insulated wire for this coil. Put about 12 inches of the wire down through

(Continued on page 22)

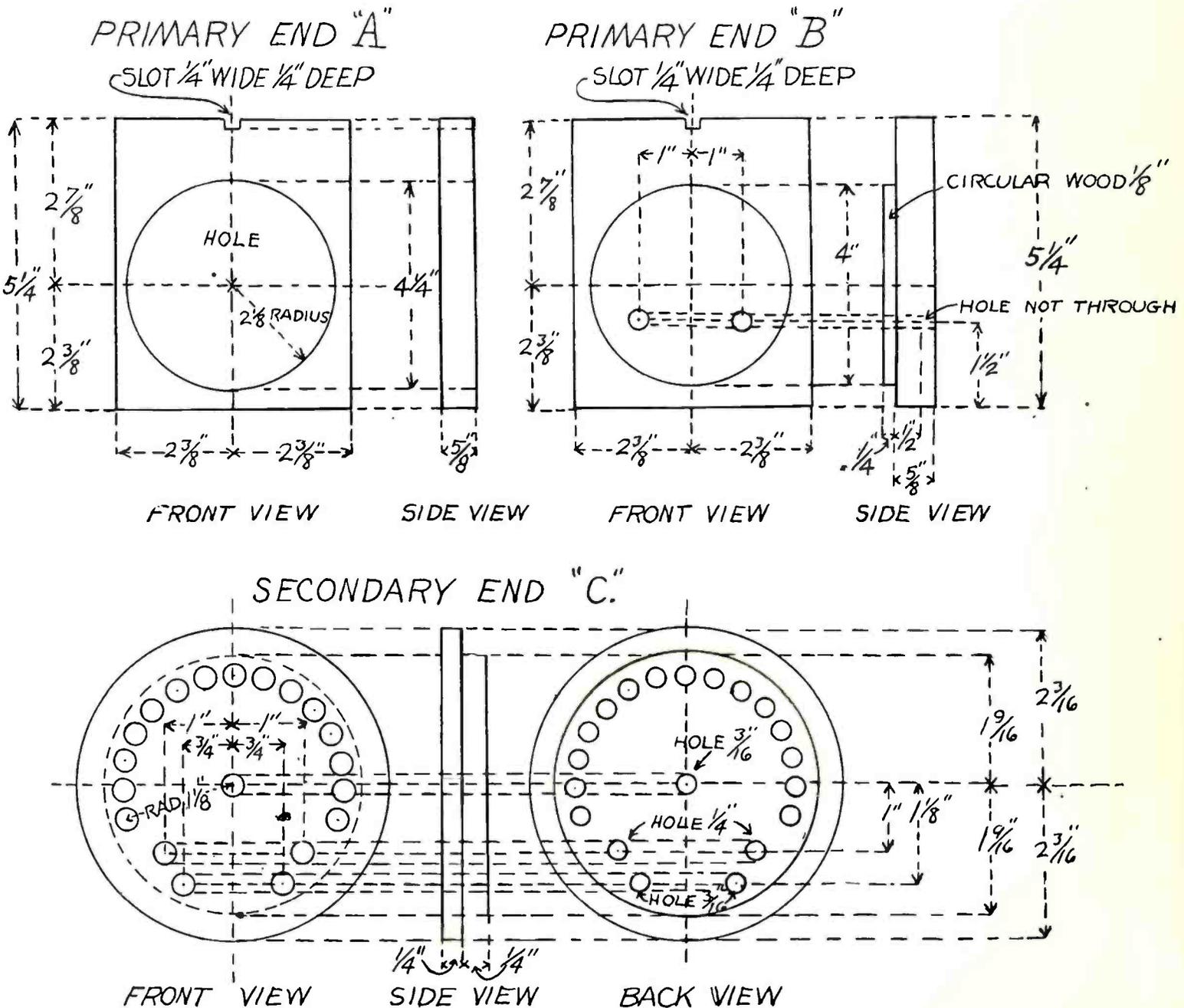


FIGURE 2.

Navy's Radio Shatters Distance

United States Stations Circle the Earth and Make It Seem Small

"HOW far is Paris—London—Berlin?"

"The man in the street and the geography class answer in miles today," says a bulletin issued from the Washington, D. C., headquarters of the National Geographic Society, "but in a year, or even a few months, the answers may come in quarter-turns of a little black knob."

"For radio is affecting geography as it is affecting many other fields. If you can hear voices and music, and perhaps even the hum of traffic in the streets of a distant city, that city must straightway lose much of its remoteness." The bulletin continues:

"Event today, when radio telephony is in its infancy and radio telegraphy is merely a slightly older brother, our own country seems to be shrinking rapidly, and nations seem to be gravitating closer together. It is as though Europe and America, and presently the other continents, were being towed toward one another by tightening hawsers of ether waves. The capstan points for these ethereal cables—the great radio telegraph stations—take on a new geographic interest.

Cavite in the Philippines has been placed on the map by its radio station.

Wave lengths are not an infallible index to the power of a radio station nor to its sending range, but they indicate comparative strength at least roughly. The station which of all

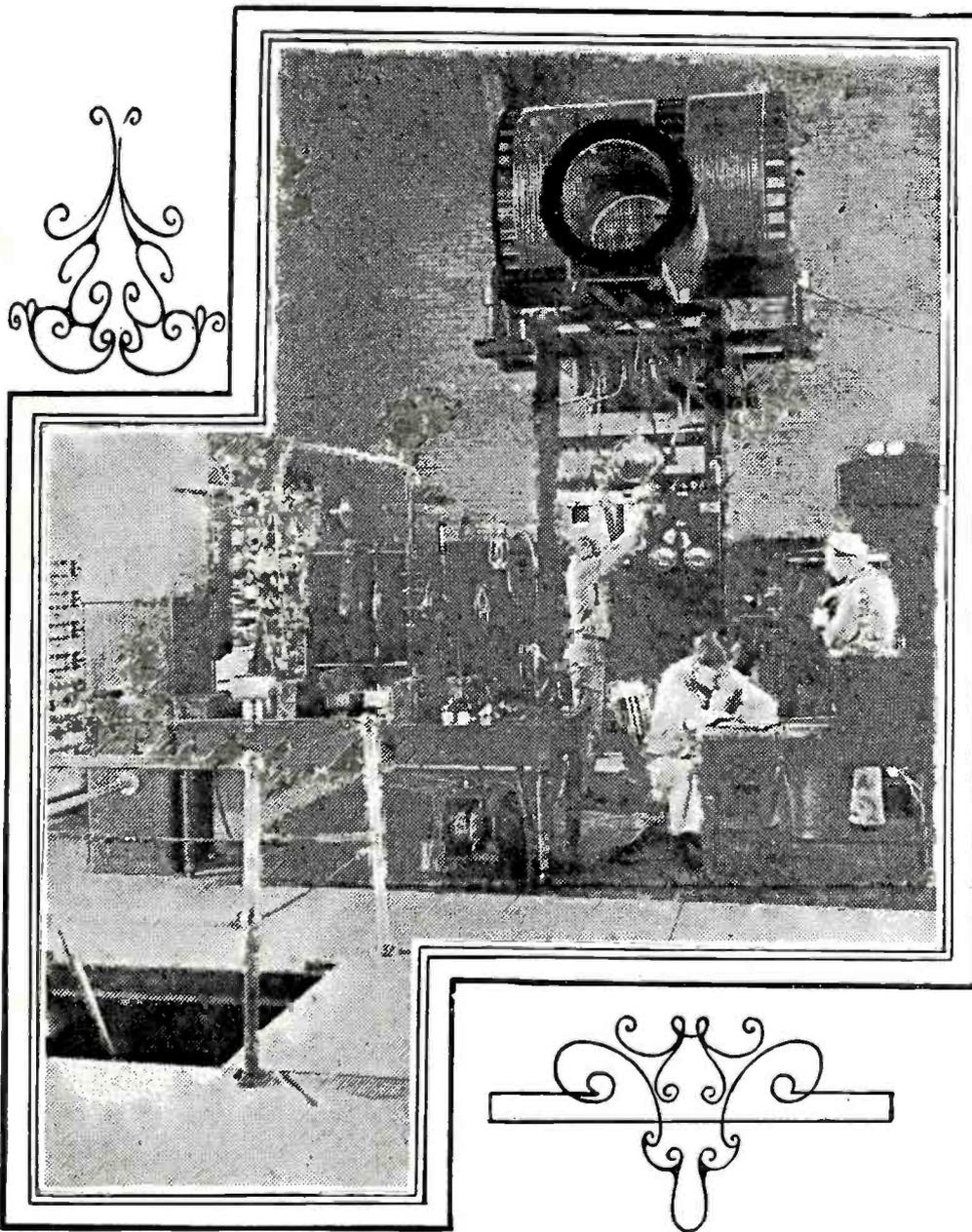
challenged as the world's most powerful station, sends its telegraphic messages with ease—and practically instantaneously, of course—over the 4,000 miles of water and land that separate Bordeaux from Washington; and it has been heard occasionally in French Indo-China, 6,000 miles to the east.

Lafayette's title to first place is now challenged by a commercial station recently opened on Long Island, which, if it is not yet more powerful, will be when additional units are added. This station sends on the second longest wave in use, 19,000 metres, or nearly twelve miles, and is employed for transmitting messages to Germany, about 4,000 miles away.

Although the United States Navy's station at Annapolis, Md., is assigned a wave of 17,145 metres (roughly 10½ miles), the third longest in use, it is easily one of the world's

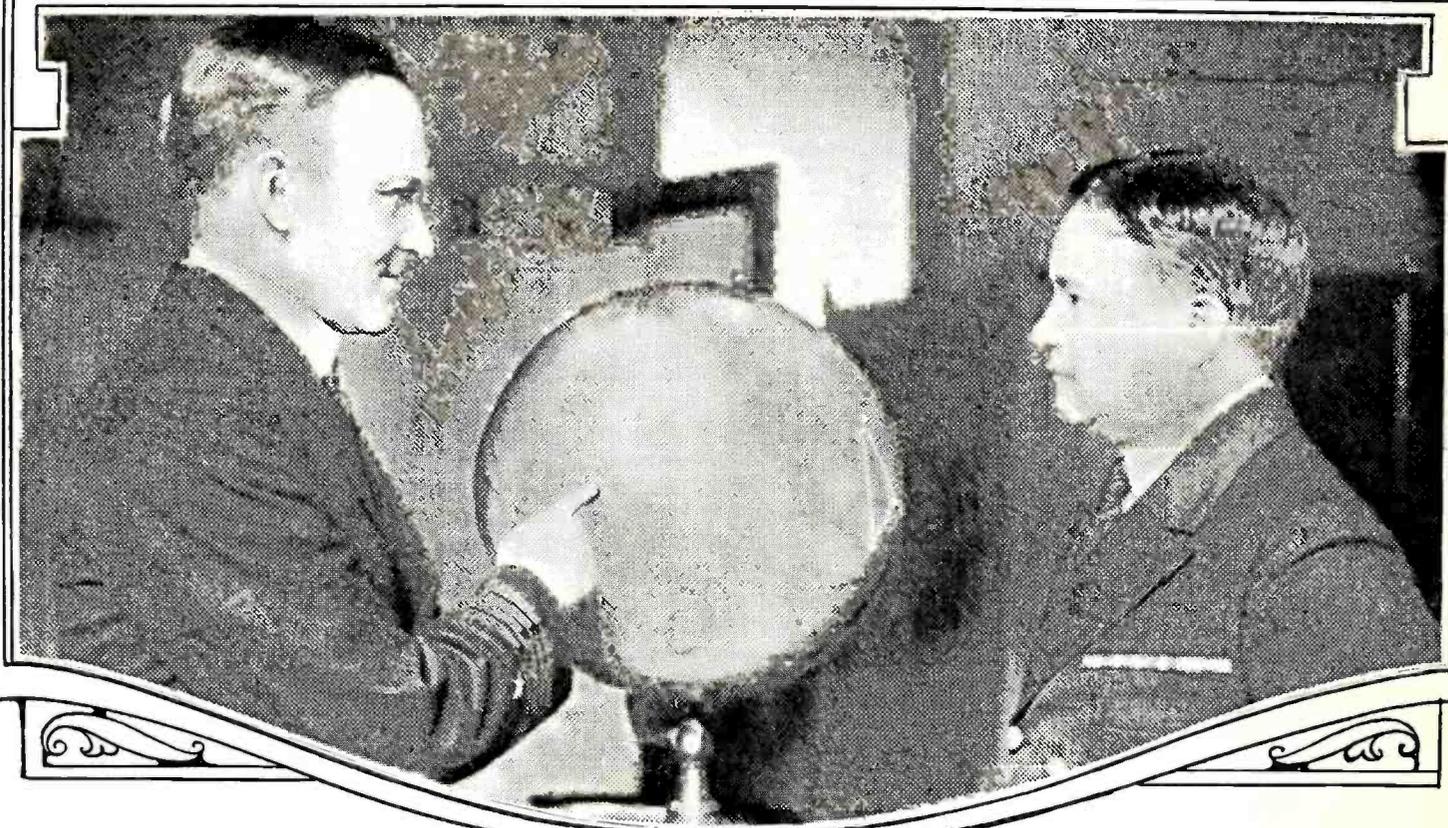
most powerful stations. For that matter, so is the navy station at Cavite, Philippine Islands, operating on 13,900 metres.

The navy depends on the Annapolis station—which is operated, incidentally, by remote control by means of keys in the Navy Building in Washington—to transmit mes-



All amateurs know the naval radio station at Arlington. Here's a view of the interior of the powerful station

those in the world now regularly uses the longest waves—23,000 metres, or approximately 14 miles—is near Bordeaux, France. It is the Lafayette Station, built by the United States Navy to facilitate America's part in the World War, and since sold to France. This station, which until recently was un-



The navy can flash a radio message to any part of the world at a moment's notice. Capt. S. W. Bryant, left, explaining the working of the chart globe to Commander D. C. Bingham, who has succeeded Capt. Bryant as director of naval communications. International News Reel Photo

sages day in and day out over a radius of about 5,500 miles. This range includes the extreme end of the Mediterranean Sea, and the same territory can also be reached from the opposite direction by the Philippine station.

The United States Navy has the most complete system of high power land stations for radio telegraphy of all naval establishments. Southward of the great Annapolis station it has among its larger units the sending plant at Cayey, Porto Rico, using a 10,510 metre wave, and another at Balboa, Canal Zone, sending on 10,110 metres. The eastern portion of the Pacific is covered from the continent by a station at San Diego, Cal., and another on Puget Sound. The former uses waves of 9,800 metres and the latter of 7,100. In the Hawaiian Islands the navy has two sending stations, one using 11,500 metres and the other 8,875.

On Guam is a naval station which sends on 9,145 metres; and finally, in the Philippines is the 13,900-metre station which completes the navy's band of radio stations around the world. In practically no place where its ships are likely to cruise will they be out of range of dots and dashes

from one or more of the navy's sending stations.

The British Navy does not maintain a system of land stations of its own but uses those of the British Post Office. These postal stations practically encircle the earth, but they do so in much smaller "jumps" than those of the United States Navy, and therefore use less powerful stations.

Other Long Senders

Of the twelve longest wave stations which follow Annapolis, seven are in the United States or its territories. They are commercial stations at Barnegat, N. J., 16,800 metres; St. James, L. I., 16,465; Kohoku, Hawaiian Islands, 16,300, and Tuckerton, N. J., 15,900; the navy station at Cavite, P. I., and commercial stations at New Brunswick, N. J., 13,600 metres, and Bolinas, Cal., 13,310 metres. The five foreign stations in this group are British stations at Leaffield, near Oxford, England, 15,600 metres, and Carnarvon, Wales, 14,400 metres; a Dutch station in Java, 15,000 metres; a Japanese station at Iwaki, 15,000 metres, and a French station at Nantes, France, 18,800 metres.

There are only seven other impor-

tant long distance stations using waves of 11,000 metres or more. They are Abu Zabal, near Cairo, Egypt, 13,300 metres; Nauen, Germany, 12,600; Lyons, France, 12,500; Stavenger, Norway, 12,000; Marion, Mass., 28,600; a station on the West Coast of India, 11,200, and Rome, 11,000.

The United States Army has numerous sending stations at its forts and posts scattered over the United States, which operate on wave lengths from a few hundred to 10,000 metres. The Post Office Department at its several stations sends on waves for the most part between 1,000 and 4,000 metres long.

Service for Seamen

The Hydrographic Office and the Naval Communication Service collect and distribute hydrographic information by naval radio. The cooperation of owners, operators, radio companies controlling installations on board vessels, and masters is necessary to make this new undertaking a success. In return greater protection is afforded mariners than ever before.

High School Wins Radio Fame

By EDWARD I. TAYOR

One of the Boys in Chicago's Lane "Tech."

NOT far from the crowded loop district, yet situated ideally in the midst of Chicago's manufacturing center is the Lane Technical High School. Situated ideally, is the term used, for a school of this type where everything from aircraft drafting to the radio department assumes business-like proportions, becomes properly a part of the modern factories and business houses which surround it.

We will deal today with the radio department and electrical shops as space is limited and the story of this school would cover a thick volume. In the first place, Lane has been gifted with extraordinary talent both in its faculty and in its students. This in a way has helped to accomplish the results which are apparent on every hand, but something far more important is that of the feeling of school spirit which pervades the air and is quite contagious.

There is no issuing of sharp commands and orders by the teachers. Everything is well ordered and the

students work with a zest which can only emanate from the interest each has in the work. It is the chief aim of every pupil to build a complete re-

ceiver for himself and learn the code in the radio class. It is not hard to imagine what a boy is apt to do under these circumstances.

If you have been fortunate enough

to have gone through this school, you will remember your surprise in your first sight of the radio apparatus. There it stood on a table, resplendent in beautiful nickel plate, polished ebony, and rubbed mahogany. Perhaps you were one of the many who asked your guide what was the make of apparatus. When he told you that it was made, every bit, at Lane, you of course were surprised. And to prove his assertions your guide undoubtedly led you to the shops where construction of other receivers was under way. There you saw the boys winding the vario-meters and vario-couplers, drilling panels, making the cabinets, wiring the sets, and putting the finishing licks to outfits that could stand up alongside the best manufactured set on the market today.

The regenerative receiver made at Lane is a

piece of apparatus which is modern and efficient in every respect. Beveled dials control the two variometers and the vario-coupler. A

(Continued on page 27)



Lane Technical High School held its annual military review the other day and conducted all the maneuvers through its student radio service. Major E. S. Pearsall gave orders in his office at the school by means of a sending set direct to the field of battle and the orders were relayed to the field officers by megaphone

"Aerials" Under Ground and Under Water

Wartime inventor knocks out some theories about towers and static

THE latest advance in radio receiving was accomplished in April in the presence of four witnesses, when, with a coil antenna completely buried beneath the surface of the ground, vocal and instrumental music was clearly heard on a transmitted wave length of 360 meters over a distance of 220 miles. This successful experiment was accomplished in the field laboratory of Dr. J. Harris Rogers in Hyattsville, Md. The instruments used were a three-stage radio frequency amplifier and a loop antenna.

The far-reaching effect of this experiment will be the elimination of huge aerial towers for the reception of radio telephone or telegraph messages. As a climax to successful experiments which have assured the reception of long radio telegraph waves on underground antenna, the test just performed demonstrates the possibility of regular radiophone communication without areial wires above or on the surface of the ground. This removes the present limit of underground radio receiving systems, namely, the reception of short wave lengths which today represent the bulk of commercial short distance radio traffic.

Eliminates Static

Not only the message from KDKA and WJZ were clear and distinct in themselves, but in the presence of severe static, street car and train lines less than 200 yards distant, none of these disturbances interfered with the perfect reception of the transmitted messages. This means that in mines, dense forests, in arid wastes and under severe static conditions present in extreme north or south latitudes, a hole in the ground will suffice to contain the antenna necessary to receive messages transmitted thousands of miles away and at wave lengths heretofore not approached.

J. Harris Rogers, Civil War veteran, inventor of the printing telegraphs, synchronous motors and other devices, is the discoverer of the underground aerial receiving system.

In 1916, during the war period Secretary of the Navy Daniels immediately facilitated the securing of patents which protected the discovery of



Postmaster General Work is shown in his office listening to radio reports. He insists on having a receiving outfit in his own office.

Dr. Rogers and established stations at Great Lakes, New Orleans and Belmar, N. J., for experimenting with and developing the Rogers system. Meanwhile in Hyattsville, Md., Dr. Rogers and Government officials listened in from the little hut named Mount Hooper in honor of Admiral Hooper, U. S. N., situated three miles in the woods beyond Dr. Rogers' home.

Messages from France

Trenches were dug and wires buried in all directions and at varying depths, the effect being similar to the spokes of a wheel offset from the center.

A wire 4,000 feet long encased in a tile pipe three feet below the surface of the earth was stretched in a westerly direction. Communications between German army units on the European battle front were clearly heard. The apparatus consisted of a large tuning coil, a variable condenser, one step audion amplifier, and two pairs of Baldwin head phones.

With this equipment and underground aerial the officials heard regularly Nauen, Germany; Eiffel Tower, Paris, and all United States stations on long waves. Not only were these stations copied regularly but simultaneously stations employing the Rogers system at Belmar, N. J., and Great Lakes maintained continuous trans-Atlantic receiving service.

"Aerials" Under Water

The Belmar, N. J., station was in operation twenty-four hours a day; not a single word was lost during the transmission of thousands of messages. A submarine submerged eight feet off the Atlantic coast heard Nauen, Germany; twenty-one feet submerged it heard distant stations on 12,000 meters wave length. A transmitting station operating with forty-eight amperes antenna current 600 feet away from a receiving station, using the Rogers underground aerial system, did not interfere with Nauen being picked up on 12,600 meters and New Orleans on 5,000 meters. No interference and no static. Aerials far under water were used to receive Cavite, Philippine Islands, 8,100 miles distant, on its regular 11 a. m. and 5 p. m. schedules.

Transmitting experiments with the Rogers system have been successful over a distance of seven miles; longer transmission is as yet not fully developed because it is found that insulation material now used will not stand the excessive currents used in transmission, says the Washington Herald. But today radio telegraph and radio telephone messages may be received over long distances and over very low or very long wave length ranges with antenna buried beneath the ground or submerged beneath the seas.

Electric Light Wires as Auxiliary to Radio

THE B battery heretofore so essential to every radiophone-receiving set for maintaining the plate potential will no longer be needed when an arrangement made by the Bureau of Standards becomes generally practicable. The new development makes direct connection to the electric light socket possible. By special modes of connection, the lighting wire may also be used as an antenna.

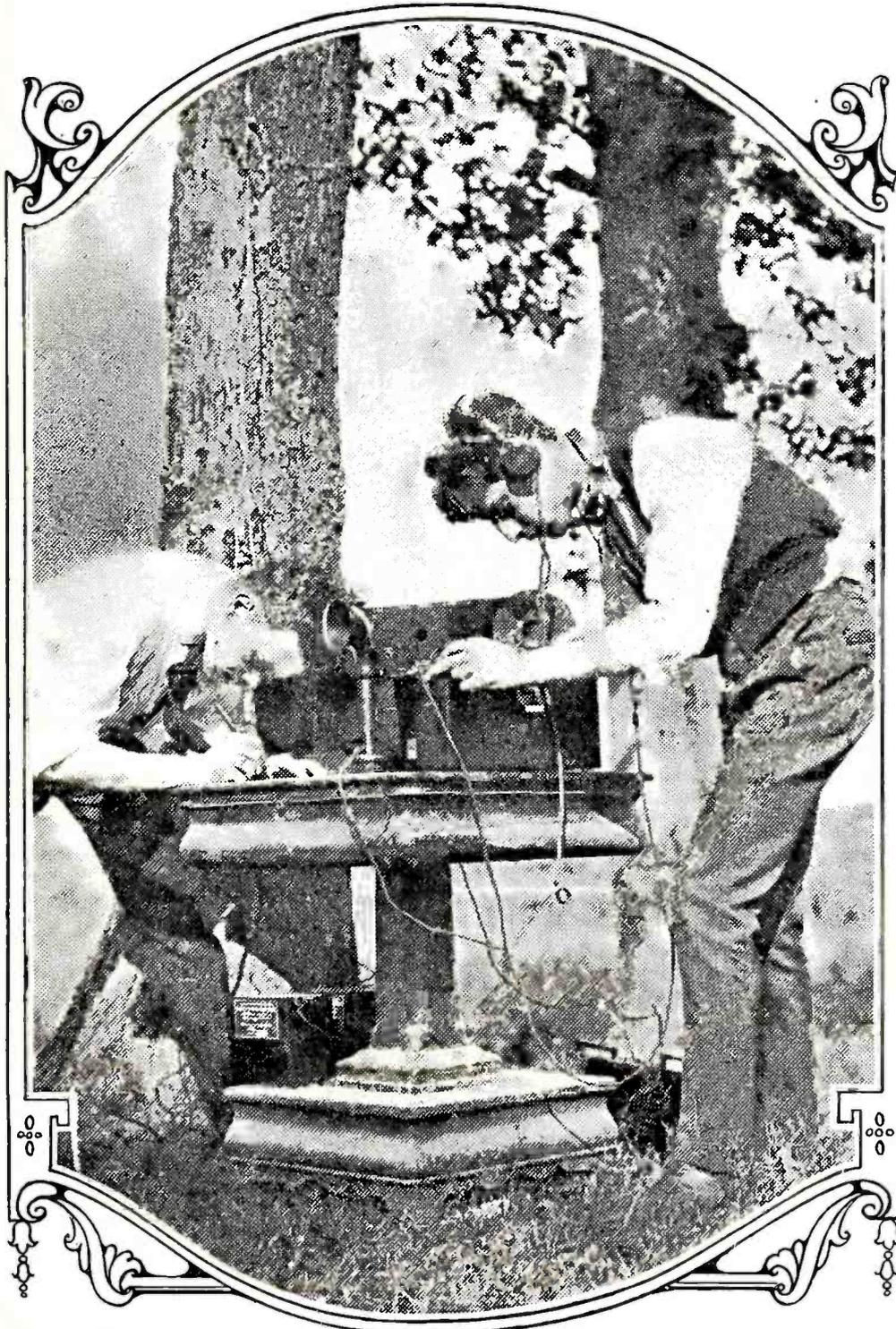
The warning given some weeks ago when this method of reception was suggested in connection with the work of Maj. Gen. Squier is repeated: Novices should not attempt any meddling with lighting circuits, hoping to avoid the erection of an antenna or eliminating the storage battery. The new development is practicable only with the proper plug equipment and some knowledge of the principles involved.

The receiving set consists essentially of an amplifier with minor auxiliary parts. This is described in a paper which has been prepared by the Bureau of Standards. A few details of the amplifier, which utilizes 60-cycle cur-

rent supply for both filaments and plates of the electron tubes, are as follows: This amplifier has three radio-frequency stages and two audio-frequency stages, and uses a crystal detector. The 60-cycle current when used in an ordinary amplifier circuit introduces a strong 60-cycle

note which offers serious interference. This has been practically eliminated by balancing resistances, grid condensers and special grid leaks of comparatively low resistance, telephone transformer in the output circuit and crystal detector, instead of electron tube detector.

In the final form of the amplifier there is only a slight residual hum which is not objectionable. The amplification obtained with a. c. supply was as good as that obtained with the same amplifier used with d. c. supply. The complete unit is light, compact and portable. For the reception of damped waves, the amplifier as constructed operated most satisfactorily for wave lengths from 200 to 750 meters. This range was determined by the working range of the radio-frequency transformers used. By using suitable radio-frequency transformers it is expected that the amplifier will be effective for the reception of damped waves and undamped waves as long as 10,000 meters. For the reception of undamped waves a separate heterodyne should be employed, the paper says.



During the war experiments proved that it is possible to use trees instead of the usual antennae for wireless receiving outfits. These two Atlantic coast boys are giving the trees a chance to speak. Press Illustrating Service Photo

New Stuff by Boy Readers

By Edwin Nielsen

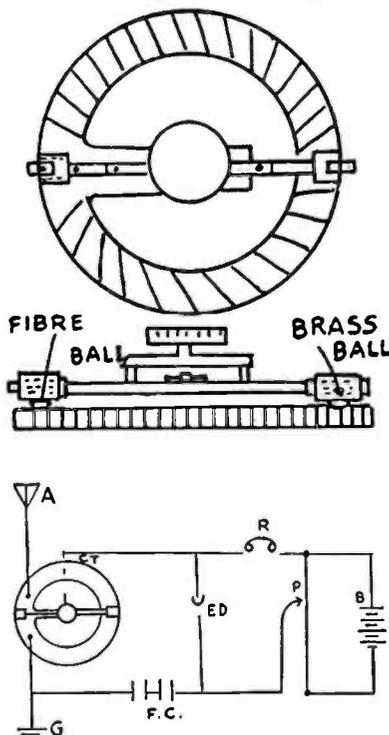
DO YOU have trouble in getting loud signals on your crystal detector set? Why not use a crystal amplifier in one or two stages simply by connecting one or two crystal detectors in series with your original crystal detector, using an amplifying transformer and a 22-volt B battery as shown in the illustration. This will enable you to get loud signals where only weak ones were formerly heard, will greatly increase your receiving range and will enable you to use a loud speaker horn instead of your phones, thus allowing the whole family to listen in, where before only one could listen at a time.

This idea had its origin in the brain of a South American amateur, who has organized the first if not the only Radio club in that part of the world. And I have tried this type of amplifier and had the signals far exceed my hopes in loudness and clearness of tone.

To get good results it will be necessary to get very sensitive crystals and place the catwhisker wire on the most sensitive place that can be found, the crystals can be tested by connecting a buzzer, battery, a key and a coil of about 10 turns together, as shown in the illustration; this coil is placed as close as possible to the tuning coil of the receiving coil and the key is pressed. This sets up miniature radio waves which are caught by the receiving coil and carried over to the detector where the crystal to be tested is mounted. The catwhisker is moved around until the best spot is found. The other crystals can be tested in the same way. If no buzzing is heard in the receivers while the crystal is being tested another crystal must be used.

Beginners Need This

A number of requests have come to the editor asking how the reader could secure the plans of a homemade receiving set published by the Bureau of Standards in Washington. The editor is in receipt of a letter from that department saying that, owing to the great demand, the department is unable to furnish any more free copies of the lessons, but will publish them as Bureau of Standards Circular No. 120, which may be secured by writing the Superintendent of Documents, Government Printing Office, Washington, D. C., and giving the number of the docu-



ment as above. This article with illustrations was a feature of the May issue of Radio Age. Copies of that issue will be mailed on receipt of 25c in stamps by Radio Age.

Red Cross Radio

The American Red Cross is considering the use of radio as an aid in its emergency work. At the radio exhibition in Boston a radio set with a receiving radius of 2,000 miles was in operation for the reception of first aid calls, which were answered by nurses in attendance at the Red Cross booth in the exposition hall.

By Joseph Stelzer, East St. Louis, Ill.

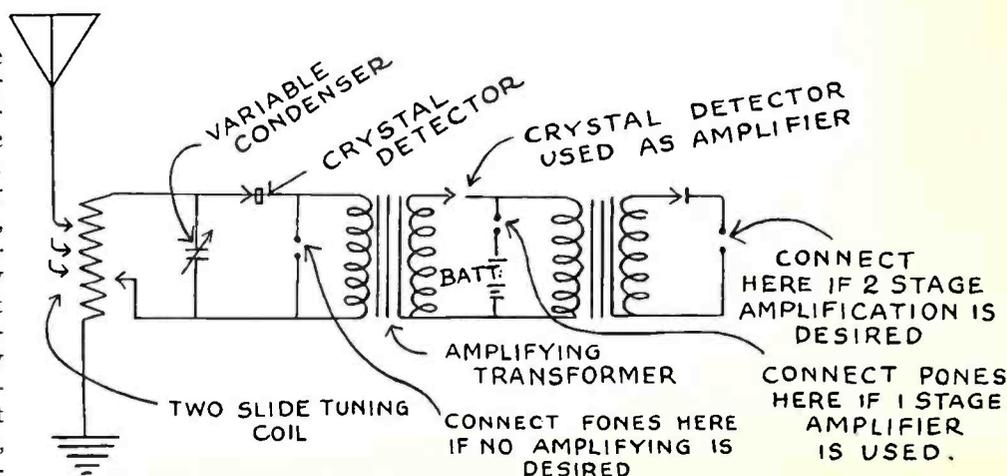
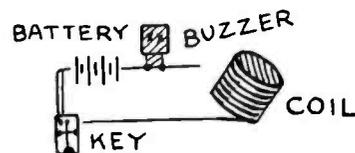
THE rotary tuning coil shown in the one-column sketch gives the complete wiring diagram. The circle is cut from 3/4-inch stock, 1 inch wide, and well covered with insulation. It is then wound with No. 24 single cotton-covered wire so that the coils will lie flat.

All of the arms are 1/4-inch square and are of brass. The supports are smaller in section. Slides are mounted on the ends of the long arms and are kept in place by set screws. The insulation on the wires is removed with a small piece of sandpaper pasted on a block of wood.

This should be temporarily fastened to the revolving lever at the point where the contact is wanted; then the lever is turned until the insulation is removed. The wiring diagram shows the location of the tuning coil in the line.

Trying the Voice

In an address before the Chicago Rotary Club, Morgan L. Eastman, with the aid of pictures and radio apparatus, showed how the voices of singers are tested before they are used for broadcasting purposes. Mr. Eastman devised a microphone, which was worked out by Westinghouse engineers, so arranged that a listener may determine whether a singer in an adjoining room has a voice of the proper carrying quality. Mr. Eastman is in charge of the Westinghouse broadcasting station KYW on the Commonwealth Edison building, Chicago.



In Radio Shops and Factories

ASSOCIATIONS of manufacturers and merchants in the radio trade are becoming the order of the day. The solid element in the business recognizes that it is necessary to mobilize against the wildcat promoters who are in radio purely for stock-rigging purposes or who are in it to shove off a lot of rotten equipment while demand is feverish and prices are tempting.

While the sheep are being separated from the goats it is advisable for the public to step warily, dealing with established firms who have sufficient business standing to insure their handling good merchandise. At present the demand far exceeds the supply and the fellow who is in the business for a "flyer" is occasionally doing about as well as the fellow who is in business because he means business.

It was stated by one of the speakers at a recent important Chicago radio conference in Hotel Sherman that the supply situation was being straightened out rapidly and that within sixty days the "sold out" signs would have to be taken down. When that time comes the merchant and manufacturer who have been selling honest goods and exploiting their name and their wares and building a future will still be there making money. The other man will have nothing but ap ast.

Among the new organizations is the National Radio Chamber of Commerce, with headquarters in New York City and district office in Chicago. Alexander Eisemann of the Freed-Eisemann Radio Corporation is president. Mr. Eisemann says:

"The object of the association is to remedy certain conditions which have arisen in the radio industry as a result of its tremendous growth within the last few months; and to group together manufacturers whose radio products are of such dependable character as to maintain favorable public opinion toward the radio industry.

"All radio manufacturers, whether large or small, will be eligible for membership. Our original group consisted of about fifteen manufac-

turers. To those have been added, by invitation, about twenty additional concerns whose business standing and whose products are known to be of high order. New concerns will be eligible only after their apparatus has been passed upon by a board of five members.

"It is planned to exclude from membership various concerns which have been organized purely for stock jobbing purposes, and to exclude also manufacturers who are now turning out radio apparatus which has been found to be untrustworthy and which will eventually bring radio into disfavor on the part of purchasers of

facturers be requested to standardize the efficiency of their various receiving sets and plainly mark on each instrument the receiving radius under average atmospheric conditions."

* * *

The manufacture of radio apparatus in Washington, D. C., has grown to extraordinary proportions. The Radio Instrument Company and the Washington Radio Corporation have completed arrangements for building factories immediately.

* * *

Officials of two leading electrical companies in Chicago estimate that from 2,000 to 3,000 dealers have gone into the radio business in Chicago during the last two months.

* * *

Charles T. Powner, bookseller, has a radio department in his shop at 177 West Madison street.

* * *

Among other big Chicago concerns that may soon be on the list of makers or sellers of radio devices are Lyon & Healy, Sears - Roebuck and Brunswick - Balke. Hundreds of drug stores, furniture shops and department stores are laying in radio stocks.

* * *

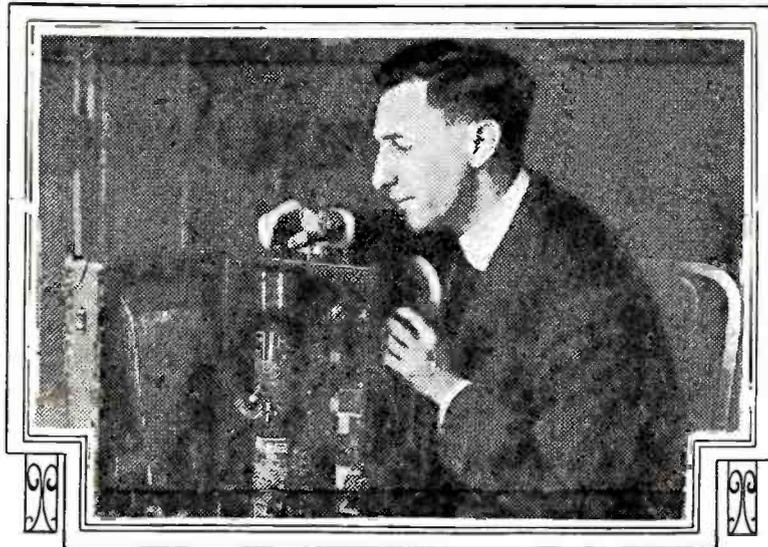
The Scientific American says there is a widespread opinion that the radio business will outstrip the phonograph business, which has been in excess of 400,000,000

per year.

* * *

It is estimated that the monthly production of vacuum tubes is about 100,000.

All through the Mississippi Valley an interesting phenomenon is being observed. Otherwise modest and humble citizens appear on the street with their chin in the air and a proud glint in their eye. There is nothing wrong with these fellows. They merely have succeeded in getting Schenectady for the first time. How can they be expected to remain in the same social stratum with the plodder who has picked up stuff from no greater distance than Detroit or Indianapolis?



F. W. Dunmore, of the radio laboratory of the U. S. Bureau of Standards, brought a "singing valise" to the Drake Hotel in Chicago on April 20. He had a radio receiving set in the grip, with a folding loud speaker. As he walked about the lobby, music and news reports came from the valise. His ground and aerial wires were cleverly concealed and gave him a limited radius of travel with his magic grip.

such undependable apparatus.

"A credit bureau will also be organized shortly for the interchange of credit information."

Other officers of the organization are Charles Keator of the De Forest Radio Telephone and Telegraph Company, William Dubilier of the Dubilier Condenser Company and Frank Hinners of the Home Radio Company.

* * *

The investigating committee of the Radio Conference of the National Retail Drygoods Association, in session in New York, considered the quality and efficiency of radio apparatus and the possibility of service in the distribution of such merchandise.

As its first recommendation the Investigating Committee adopted a resolution, "That all responsible manu-

Summer Static and How to Meet It

SAY "static" to a radio enthusiast and listen to what he says, or else cover your ears. His opinion of the greatest nuisance which besets radio telegraphy and telephony will no doubt be fervent if he is an experienced operator. If he is an amateur, it will be despairing.

When a radio fan talks of "static" he means the small charges of positive electricity which infest the atmosphere, forever seeking an outlet to the negative earth. They are in effect miniature bolts of lightning which have not the force to strike under their own power. Hence they seek assistance, which is unwittingly extended to them by the aerial of the radio apparatus. By means of this they find a ready passage to the ground, where they cease to be troublesome.

But woe to the amateur whose aerial is not well "grounded." Balked of their goal, static charges have been known to start fires. Even greater is the danger during a thunderstorm, unless a good ground wire is provided. Any ground installation which complies with the underwriters' requirements will furnish adequate protection, however, against this. It is always advisable to stay away from wireless apparatus during a storm.

Commencing with the next few weeks, radio operators and amateurs will encounter static with increasing frequency due to the approach of warm weather. Static is more abundant in summer than at any other time of the year, making it extremely difficult for the average radio enthusiast to operate his set.

The cause of this trouble is sometimes in the use of an aerial that is too lengthy. No aerial for receiving broadcasts should be more than 150 feet in length. Where a two-wire type is used, the length, including the lead-in wire should not exceed sixty-five feet.

Where a station is located near a broadcasting center, indoor aerials will be found superior in summer. These may be made in the form of a grid or coil, either mounted on an insulated stand, or attached to porcelain insulators fixed in the beams of the attic of the house. This device is only for use in houses where metal roofing is not employed. All wires must be kept as far as possible from the lighting system wires of the house. Vacuum tubes are imperative in using this type of aerial, but their expense is offset by the resultant freedom from static.

THE WIRELESS CODE

1. A dash is equal to three dots.
2. The space between parts of the same letter is equal to one dot.
3. The space between two letters is equal to three dots.
4. The space between two words is equal to five dots

A	• —	N	— •
B	— • • •	O	— — —
C	— • — •	P	• — — •
D	— • •	Q	— — • —
E	•	R	• — •
F	• • — •	S	• • •
G	— — •	T	—
H	• • • •	U	• • —
I	• •	V	• • • —
J	— — — —	W	— — —
K	— • — —	X	— • • —
L	— • • •	Y	— • — — —
M	— — —	Z	— — • •
1	— — — — —	Ä (German)	• • — — —
2	• • — — —	Á or Å (Spanish-Scandinavian)	• — — — •
3	• • • — —	CH (German-Spanish)	— — — — —
4	• • • • —	É (French)	• • — • •
5	• • • • •	Ñ (Spanish)	— — — • — —
6	— • • • •	Ö (German)	— — — — •
7	— — • • •	Ü (German)	• • — — —
8	— — — • •		
9	— — — — •		
0	— — — — —		

Period	• • • •
Semicolon	— • — • —
Comma	• • • • —
Colon	— — — • •
Interrogation	• • — • •
Exclamation point	— — • • —
Apostrophe	• — — — •
Hyphen	— • • • •
Bar indicating fraction	• • • • •
Parenthesis	— • — — —
Inverted commas	• • • • •
Underline	• • — — —
Double dash	— • • • —
Distress Call	• • — — — • • • •
Attention call to precede every transmission	• • — • —
General inquiry call	• • • • — — —
From (de)	• • •
Invitation to transmit (go ahead)	• • —
Warning—high power	— • • • — —
Question (please repeat after)—interrupting long messages	• • — — — • • • •
Wait	• • • • •
Break (Bk.) (double dash)	— • • • —
Understand	• • • — •
Error	• • • • • • •
Received (O. K.)	• • • •
Position report (to precede all position messages)	— • • • —
End of each message (cross)	• • — • •
Transmission finished (end of work) (conclusion of correspondence)	• • — • • —

The curious fact that so-called "airpockets," impenetrable to wireless telegraph or telephone waves, exist in the atmosphere was commented on recently by F. B. Chambers, a Philadelphia authority on radio matters.

"There are three well-known 'pockets' here in the east," said Mr. Chambers. "One is near Pittsburgh, another somewhat north of New York city, and the third in the gulf of Mexico.

"The Pittsburgh one covers an area about a mile and a half square. The New York one is the largest, being fifty miles in extent. Many theories are offered to account for these strange phenomena. The most plausible one is that there are certain strata of minerals underlying them which deflect the wireless waves off at a large angle. The question of their origin, though, has never been satisfactorily solved."—Philadelphia No. American.

National observers say that new radio factories have helped take the edge off the unemployment situation.

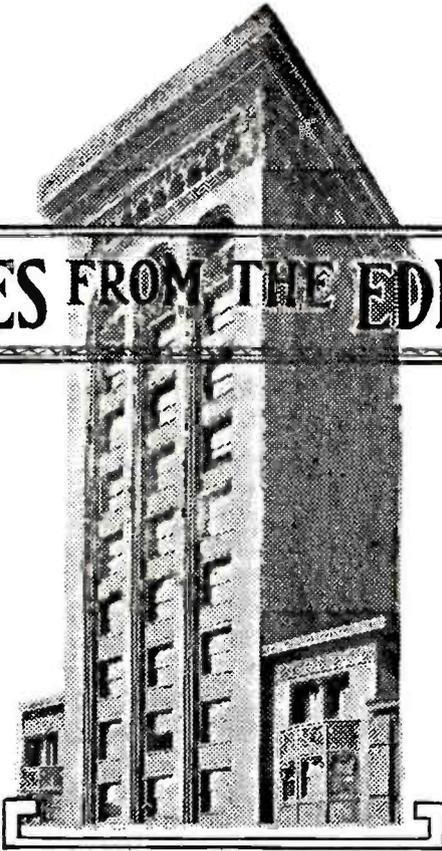
Learning the Code

A practical method devised for mastering the code at home is to be found in the set of six Victor-Marconi records which reproduce on the phonograph the international Morse Code characters exactly as they are heard by wireless. There are twelve lessons, which carry one from the novice to the expert stage.

River Affects Waves

Fletcher H. Hiles of Cincinnati, a steward on the Big Four limited, running between Cincinnati and Cleveland, is perfecting a system of intercommunication between trains by means of radio telephony. He has been picking up concerts, also, while the trains are at top speed. At points where the track parallels a river the receiving is fine, but goes dead when the tracks are at right angles with the river.

THOUGHT WAVES FROM THE EDITORIAL TOWER



STRANGE, indeed, that people should still be asking the question "Is radio merely a passing fancy?" Only the other day the International News Reel Corporation dug up from musty records in England papers showing how a receiving set had been made in 1879 with detector, condenser and all the fundamentals of the "newly discovered devices" now engaging the fascinated attention of at least one and one-half millions of persons in America alone. Not only that, but the receiving plant itself was found with the papers and the interesting display has been placed on exhibition in a British museum.

Marconi was doing his wireless stunts before the boy radio enthusiasts of today were born. DeForest and Fleming and Edison were making the Hertzian waves perform practical service for the world a decade or longer ago.

Well, then, why the sudden towering wave of interest in radio? Simply this, that broadcasting stations have been established which send forth to the uttermost corners of the earth not only messages in the wireless telegraph code, but music, speeches, market reports, weather predictions, baseball scores and news of the present hour.

It is the broadcasting station and the development of the vacuum tube for detecting wave lengths and clarifying the vibrations in the phone diaphragms that have made the radiophone an implement of universal entertainment and utility.

Men, women and children who took only a fleeting interest in a device which enabled them to hear unintelligible Morse code signals are aroused to intense and permanent enthusiasm over an inexpensive and simple device that brings the great outside world to their dining room tables and to the cosy corners of their living rooms.

That is why radio has become so suddenly "popular," and that is why the present interest is surely the forerunner of continued developments in radio. These developments will

bring radio to every-day uses which eventually will effect a peaceful reorganization of our social and business life. Radio is rapidly moving forward to new uses which even the alert imagination of Edward Bellamy could not reach in his famous story, "Looking Backward."

Dissemination of news by radio is going to be systematized to such an extent that it will make a great difference in the status of the daily press. It is perhaps true that some of our great daily journals look with apprehension at the advancement of this science and its adaptability to broadcasting news facts to the millions. That may explain why some of them are giving the radiophone the most indifferent attention.

One great newspaper, so substantial that one might almost be tempted to describe it as "solid," said the other day that a layman might wind a tuning coil, but that the operation would require extreme patience and that he would find it to be a "man's job." Rather amusing when you and I know scores of neighborhood boys who can wind a tuner in fifteen minutes!

They have harnessed Niagara, but they are never going to stop the headlong rush of radio into universal popularity and utility. And it is going to be a giant task to make it a privately controlled public utility. Millions upon millions of dollars have already been invested in this

new industry and no man can keep account of the new manufacturing and merchandising organizations that are springing up each day.

In a few days we shall have the golf player getting his market and sporting news between games, sitting comfortably in his country club chair. Hotel lobbies, flats, apartments, automobiles, trains, aeroplanes, farm houses, garages, school-rooms, lighthouses, ships, newspaper offices, police stations, police call boxes, prisons, hospitals, churches, theaters, restaurants, department stores, factories, fishing camps, hunting lodges—they are coming into line more rapidly than you or I realize.

It is the hour of radio. If it is a passing hour it is a passing hour that is advancing to yet another hour which shall be more electric with surprises, more fruitful of progress for the human race, more annihilating to geographical distances, and more effective in weaving all peoples into a closer association. That promises the ultimate in civilization.

Radio is neither a fad nor a craze. It is a stupendous social revolution.

EVERY breeze that blows brings some new tale of extravagant success or impending disaster in the radio industry. After sifting the product of the rumor mills we have come to the conclusion that the radio business is merely stabilizing itself, as every new industry must do.

Undoubtedly there are unscrupulous manufacturers and dealers in the game. They are trying to get a quick dollar and make a quick withdrawal before their sins of misstatement and of inferior merchandise overtake them. But there are many, many more manufacturers and dealers who are sincerely trying to establish a permanent, solid radio business on merit.

Undoubtedly there are large interests which would eagerly assume control of radio production and sales. Undoubtedly there are some interests which would gladly adopt the

threadbare method of restricting supply in order to maintain exorbitant prices. But there are too many enthusiastic, wideawake American men and boys watching the situation to make it discreet for even a giant to get in the way of the steam roller.

It would be best for radio fans and best for the radio "big four" to insist upon and get an early threshing out of that charge by Representative Brittain of Illinois to the effect that the combine is restricting by some mysterious influence the placing of millions of dollars worth of tubes on the open market. Mr. Brittain insists these supplies should be sold to the public inasmuch as the government holds a sufficient supply to last the army and navy "several hundred years."

Whatever are the facts, they will become public in due time. Meanwhile there is no need to leap at conclusions.

Another tale that comes into the editorial sanctum relates to a plan by which a large manufacturer will establish broadcasting which shall be so "scrambled" that it will be impossible for any person not owning a receiving set sold by that manufacturer to get the stuff and unscramble it. That is, the receiving apparatus will be so adjusted that it will form a complement to the sending apparatus.

The story seems absurd on its face, but intelligent radioites are seriously discussing it. The majority of them seem to believe that any such attempt at monopoly of a public utility would be defeated promptly by an honest government.

We also hear of a large concern that is sending out letters to prospective buyers of expensive equipment advising them to hold off a few months, as there is something new coming into the market that will make all present receiving equipment out of date and useless. More power to invention! Let the wave wave on!

And then our friends drop in and tell us with long faces that summer weather is not conducive to good radio transmission. Therefore look out for that slump! Good old slump, the bogey man of the radio trade! It might be well to stop and consider that hot weather does not, as a matter of simple fact, seriously interfere with reception of radio waves at ordinary distances. The boys who are getting messages and concerts from broadcasting stations in their vicinity today will be getting the same results on August 1. Of course, for those who want to hear messages from Germany or Hawaii, warm

weather will cause disappointment, but the mass of radio enthusiasts will scarcely detect any difference in their ordinary radio pursuits.

Merchants who have been stocking up with large consignments are supposed to be frightened by these hot weather stories, just as are the sea bathers by the annual yarns about sea serpents and sharks.

Finally, let us be optimists. Those radio merchants and manufacturers and those radio publications which are trying their best to get solid business on solid business principles are going to achieve their just reward. Anybody who is afraid of shadows has no business in the field. Roosevelt's advice is as good now as it was when he uttered it: "Speak softly and carry a big stick."

* * *

Since going to press on our previous edition we have been solemnly assured by the newspaper scientists that they have discovered that cockroaches flash radio messages to one another. We also learn that the lightning bug's lightning and the glowworm's glow and the ant's antennae are all a part of the radio game. We should not be surprised if these scientists had proved by the time of our next issue that the mosquito, in thrusting its rapier into our skin is merely looking for a ground. Also that the office boys who whistle into our ears as we pass along the busy streets are involuntary and unconscious broadcasters; that the porcupine is a perfect detector and the house cat makes a loud speaker when hooked into the receiving system. When the Milwaukee broadcasting stations are particularly active, it is said that near-beer is transformed into the five-per cent stuff, due to the extreme sensitiveness of malt liquor to anything that has waves in it. We agree also that girls who still have hair enough to harbor hairpins may just as well as not use a hairpin for an aerial and false teeth for a receiving Ain't science wonderful?

* * *

We know a youth who made a receiving set from the directions printed in the May number of Radio Age. He paid \$3.85 for materials and dug up an old telephone head-set and from the first day was able to get the baseball and market reports and the concerts. Within ten days he had expended \$105 for additional parts to make his outfit a regular humdinger. That's the way this radio gets 'em. After listening to the home broadcasting station a few days they want to listen to coolie conversations from Wuhu, China.

Railroad Radio

OFFICIALS of the New York Central Railroad and of the research department of the American Telephone and Telegraph Company are studying conditions with a view to using radio in the handling of trains and of the railroad tugs and other craft that ply about the New York harbor.

According to the Central's program the wireless telephone service would be used in train service not only for communication between the head and rear ends of 50 to 100 car freight trains, but also between moving trains and dispatchers' offices or other fixed stations.

"Such use would be valuable in the operation of the railroads," says the current issue of the company's magazine in announcing the plan, "especially for communication between the front and rear of freight trains, some of which are now a mile long. In the event of anything getting out of order on such a train while it is running, the ability of the conductor to communicate almost instantly with the engineer would be a most valuable adjunct to the present methods. In handling the New York Central fleet of tugs and other boats—this carrier's fleet numbers 306 units—the use of the radio telephone would be particularly worth while in time of heavy fog or other emergencies."

In course of time, officials believe, a passenger will be able to go to the observation or club car on the Twentieth Century Limited and put in a call, while riding over the lines, for his office at New York to issue orders regarding business transactions; or for his residence, perhaps, to tell his wife that he forgot some of his wardrobe and have it forwarded on the next train.

* * *

The Pere Marquette railroad has under consideration the equipment of fifty miles of its road with a new system of wireless train control, which has been invented by a Detroit man.

* * *

The Lackawanna operated a special train from Ithaca, N. Y., to New York City, on April 5, the train having been equipped with both sending and receiving apparatus. The passengers were Corsell students. During the entire run communication was maintained with several amateur stations and special programs were received from two broadcasting stations.

* * *

The Chicago, Milwaukee & St. Paul road has installed receiving sets on the Pioneer Limited.

The Radio Club of Illinois

By BARRATT O'HARA

One of the Directors of the Club and Former Lieutenant Governor of Illinois.

CHICAGO is out to lead the world in radio. From early summer until late autumn the metropolis on the lake is to be turned over to the pioneers in what Mayor William Hale Thompson declares is an industry that will surpass in magnitude anything the world has ever known. The mayor, the city council and the leading business and professional men of the city have united in putting Chicago in the race to become the world's radio capital.

"No one can even dream how rapidly the radio industry will grow," said Mayor Thompson. "Chicago is now the third largest city in the world. If we can center the radio interests here, within five years Chicago will be the largest city in the world. So far from believing that radio is a temporary fad, we in Chicago are so convinced of its permanency and importance that we are willing to let our dreams of leading the cities of the universe in population rise or fall with the radio industry."

The first step in Chicago's campaign was the organization of the Radio Club of Illinois. Starting with a \$125,000 club house at 4220 Sheridan Road, in the finest section of the city, the Radio Club of Illinois almost overnight took its place among the best of many magnificent social club organizations of Chicago.

Mr. Schmitt Is President

It was fortunate in its selection of a president, Lawrence B. Schmitt, the government inspector for radio in the thirteen middle western states, being unanimously elected to head the club during the first year of its existence. Mr. Schmitt is a young man of thirty, full of pep and enthusiasm and one of the best authorities on the wireless in the country. He is extremely popular among radioists throughout the extensive district that he serves. Col. John P. Tansey was made secretary of the club. Among the directors elected was Alfred Thomas, Chicago manager for the Radio Corporation of America. All persons interested in the wireless are eligible in membership, the aim of the club being to furnish the technical, professional, commercial and amateur radioists a common meeting place, with extensive privileges and conveniences usual with first-class clubs. The club is the center of the radio activities of Chicago, and its

influence in the crystalization of sentiment back of needed radio legislation is probably destined to be second to no organization or group.

The club is in charge of an international radio congress to be held in

the Mexican delegation. Invitations have been sent to the governors of all the states to attend as the chairmen of their respective state delegations, and it is not unlikely that most of them will accept.

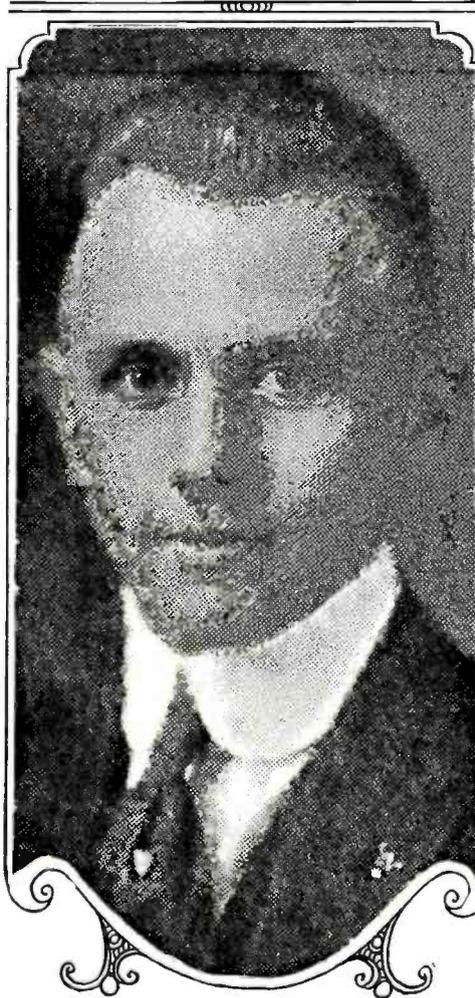
An interesting feature of the congress will be sessions devoted to the boy radioists. This will be presided over by one of their own number, possibly the young son of Secretary of Commerce Hoover. It is reported from Washington, on authority that seems to be reliable, that Mr. Secretary Hoover's final arbiter on all delicate radio questions is his son. The boy knows radio from start to finish. He is called into every conference on radio held in the official offices at Washington. He will attend the congress with his distinguished father, and it is more than likely that the boy radioists will call upon him to preside over them.

Mayor William Hale Thompson and Dr. John Dill Robertson, president of the Pageant of Progress, are naturally taking a keen interest in the success of the congress. They are ex-officio members of the executive committee of the congress, consisting of City Electrician George E. Carlson, chairman; Col. John P. Tansey, secretary; George B. Foster, vice-president of the Commonwealth Edison Company; Lawrence B. Schmitt, U. J. Herrmann, Dr. W. A. Evans and Barratt O'Hara. This committee will meet weekly on Monday evenings at the offices of the Pageant of Progress, 7 West Madison Street.

Personnel of Committees

Radioists with suggestions to make for the success of the congress will be welcome at any of the meetings of the committee. Barratt O'Hara was made chairman of the publicity committee, the other members of which are Frederick Smith, editor of Radio Age; W. G. Wunderlich, editor of Radio Topics; G. H. Jaspert, in charge of radio in the Chicago office of the Westinghouse company; W. S. Hedges, radio editor of the Chicago Daily News; Charles Sloan, radio editor of the Chicago Daily Tribune, and William J. Clark, radio editor of the Chicago American.

Interesting programs have already been outlined for radio meetings that will mold radio history.



Inspector L. R. Schmitt

Chicago during the first week in August in connection with the Pageant of Progress. Delegates from every state in the union and many foreign countries will participate in the Congress, at which subjects of vital interest in the industry will be discussed by such authorities as Steinmetz, Armstrong and Secretary of Commerce Hoover.

Mexican President Coming?

As indicating the widespread interest in the congress outside of Chicago it may be mentioned that President Obregon, of Mexico, who is a great radio fan, has intimated his intention of attending as the head of

Questions and Answers

Conducted by FRANK D. PEARNE

C. H. N., Belleville, Ill.

Question: Am making a radio set according to the lesson prepared by the U. S. Bureau of Standards, and am puzzled in putting up the antenna. The only way I can run a 75-foot wire is by erecting a support, which I do not wish to do if there is another way. Can I run the wire around the four corners of the roof or can I run several wires parallel to each other, and how far apart should the wires be? Do you think a loop will work satisfactory, and how is it made?

Answer: It is not so much a question of whether the aerial will work or not, but how well it will work. Almost any kind of an aerial will work, and you must remember that you are trying to work with a crystal detector set, which, at the best, is not very strong, so the only way you can make up for this weakness is to use the best possible aerial. A single wire 150 feet long would be the best. You can run several wires in parallel as you suggest, but make them as long as possible and space them two or three feet apart. You can also run the wire around the roof if you wish, but such aerials are not considered very good on account of the water spouts, etc., which run down to the ground, causing a leakage.

J. L. G., St. Louis Mo.

Question: I am now constructing a crystal detector set as described in your May number, and would like a little information. Would a fixed condenser, or a variable condenser, or both, increase the efficiency of this set? If so, how would I wire the condensers to the set? I am just a beginner at this game, and would appreciate any information you can give me as to how to make these condensers and wire them to my set. In Figure 4 of your April number, page 13, in drawing of completed set, it shows two short pieces of wire between your ground and antenna. Should these short pieces be touching, or a gap in between? What purpose does this accomplish?

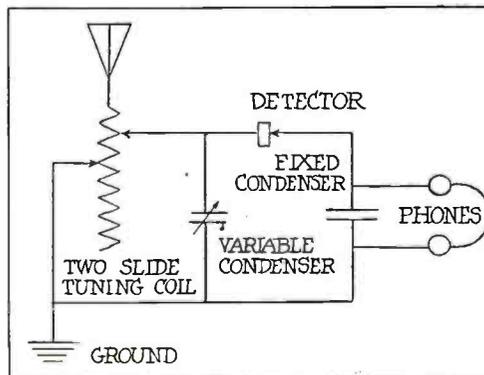
Answer: Yes. Connect the fixed condenser across the two binding posts, to which the head phones are connected, and connect the variable condenser across the aerial and ground binding posts. It would not pay to make these condensers, as the fixed condenser can be purchased for about 50 cents, and the variable requires too much skill, and too many special tools. The two short pieces of

wire which you mention should not touch, but should be spaced about $\frac{1}{8}$ of an inch apart. They act as a safety discharge gap for charges which may accumulate on the aerial during an electrical storm.

W. R. N., Maywood, Ill.

Question: Can my set be improved by using a variable condenser, and how much farther will I be able to receive radio messages if I use one in my set? I am enclosing a diagram showing how I have it connected up. Will you kindly make a sketch telling me how to connect it in my set? Is an antenna 75 feet long with 4 wires all right for this outfit? One end is fastened to a tree. Will this make any difference?

Answer: No doubt the addition of a variable condenser will help your set, but it would be hard to say how much it would increase the range. You will find that on certain nights you can hear much farther than on others. This is due to atmospheric conditions, and you should not blame it on to your receiver. Your aerial is good if it is high enough. It should be at least 35 feet in height. The tree will not interfere with it. Diagram showing the connection for the variable condenser follows:



R. D. M., St. Louis, Mo.

Question: I am contemplating building a radio set described on page 7 of your May issue, but wish to build the tuning coil on a cylinder $2\frac{3}{4}$ inches in diameter instead of 4 inches. Can I use the same number of turns and taps as on the 4-inch coil? If not, what do you advise?

Answer: Yes, you may use the same number of taps and turns. The only difference will be a slight reduction in the wave length on account of the decreased inductive effect.

V. B., Evanston, Ill.

Question: Please tell me how to hook up a vacuum tube with the terminals marked +, -, G and W. Will a sal ammoniac or battery work on

a vacuum tube? If they will, how many will it take?

Answer: I do not understand your first question. The terminals on a vacuum tube should be marked F, F, G and P, in which F means filament, G means grid, and P means plate. If you are speaking of the marking on the panel, it would be necessary for you to send in a drawing of the circuit of your set. The batteries which you mention will not do, as the sal ammoniac cells would polarize in a few minutes, and the current from the gravity battery is not strong enough.

N. E. C., Chicago, Ill.

Question: Where can I buy the parts for making a radio set which will receive messages from all the stations east of here? What kind of a radiophone will be required, and how much will it cost?

Answer: There are numerous radio supply houses in Chicago, and most of them advertise in the magazines and papers. You will need an audion detector set and a two-stage amplifier for this work, and if you are going to construct it yourself, I should judge that it would cost you fifty or sixty dollars. With this outfit you should be able to receive messages from a distance of 1,000 miles or more.

C. B., Chicago, Ill.

Question: What causes the crackling noise in my phones? Some nights I can hear Detroit and Pittsburgh just fine, and then on another night I don't get them at all. I have looked over all the connections and they seem to be all right. Do you think it could be in my batteries? I have changed them once and it did not seem to make any difference. The nearest trolley line is three blocks away; could this make the noise and if so, why don't I hear it all the time, as the cars run day and night?

Answer: Your trouble is no doubt due to static. This is a condition which occurs quite often, and especially so in the summer time. There is no remedy for it that I know of, and if you are sure that all your connections are good and your batteries are all right you can not do anything more.

B. J. E., Janesville, Wis.

Question: The boys of our club are building a radiophone sending station and we would like to know whether or not we will have to get a license for sending before we can use

Questions and Answers

Conducted by FRANK D. PEARNE

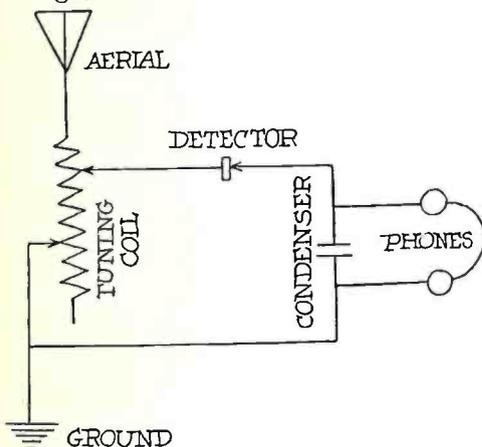
it. We only expect to use one 5-watt tube, but might possibly get another one if necessary.

Answer: You must procure a license from the Government inspector in charge of your district, or you will be in trouble as soon as you begin to use it. This will cost you nothing, but you will have to show that you understand what you are doing before a license will be granted. You will also have to be able to send and receive the required number of words per minute, and keep your wave length down to 200 meters.

W. B. F., Lincoln, Ill.

Question: I have a radio outfit which is made up of a two-slide tuning coil, crystal detector, condenser, and a pair of 2,000 ohm receivers. I have tried to connect them every possible way, but the best I can get out of it is a humming noise. Will you please tell me what is the matter, and draw a picture showing just how it should be hooked up so that I can hear something besides a hum?

Answer: The two diagrams which you enclosed are wrong. Connect the set as shown in the following diagram:



The humming noise which you hear sounds as though you were pretty close to some electric power line. If this is true, change your aerial so that it will be at right angles to this line.

R. J. Z., Fort Wayne, Ind.

Question: If it will not be imposing too much upon your good nature I should like to have you answer a few questions for me, as I am in great trouble. Will an aerial which is 6 feet above the roof attract lightning? My landlord says that it will and insists that I take down my antenna or move out. I understand that it is really a protection, rather than a

hazard, but he says the insurance company will raise his insurance unless it is removed.

Answer: Your landlord is mistaken. If you protect your aerial with the proper kind of a lightning arrester and switch, the building is safer than it would be if the aerial were not there. I think the question of insurance is a bluff, because the insurance companies as a rule know that a properly protected aerial is really a safeguard against lightning. C. C. C., South Bend, Ind.

Question: Does it make any difference which way the battery is hooked up to my audion set. I was told that it made no difference which way it was wired. It seems to work much better when the red wire is connected to the receivers, but when I connect it this way the bulb gets blue inside after I use it a few minutes.

Answer: By all means connect the positive to the plate, otherwise no current will flow through the tube and the receivers. This is probably the red wire which you speak of, as you say it works best this way. The blue appearance of the bulb is caused by too high a voltage on the plate. Try cutting it down and see if this don't stop it.

E. L., Muscatine, Iowa.

Question: My crystal detector set is an Amrad. How far should I be able to hear music with this set? I have never been able to hear KYW at Chicago, although I can hear Davenport quite well at times. Please let me know as soon as possible, as I understand the Chicago music is good.

detector set is about 50 miles.

Answer: The range of a crystal detector set is about 50 miles.

Inside Aerials Safer?

Ben F. Clark, chief electrical inspector for the city of Detroit, is telling radio fans of safeguards against the hazards of lightning and high frequency surges from electrical power lines.

"Outside aerials can not be made absolutely safe," Mr. Clark says. "The utmost precautions known to electrical engineers can only minimize the danger from lightning and high frequency surges.

"The inside loop or aerial can be made absolutely safe, and inside installation is just as effective as outside installation for receiving from

all ranges, and with all kinds of equipment.

"The city bureau of electrical inspection urgently recommends inside aerials without exception. Fire insurance companies are joining us in this recommendation. All radio enthusiasts who insist on using outside aerials should arrange for the bureau of electrical inspection to supervise the installation. The city electrical engineers will be glad to do this in every case."

Newspapers and Radio

ONE after another the newspapers of the country are adding a radio department to their news sections. Many of them are producing really comprehensive, instructive material on construction and operation. Almost all of them in the neighborhood of the larger broadcasting stations are publishing the daily programs.

The Chicago Herald and Examiner, which has one of the best radio departments in the country, edited by "Tom" Coates, publishes programs of eight stations in as many widely distant cities. The Herald and Examiner wisely gives the Chicago time of the commencement of these programs, relieving the reader of much trouble in trying to adjust geographical differences and in sorting out those cities that differ in their daylight saving ideas.

The Chicago American also has a useful radio section. The American is a pioneer in this field. The Chicago Daily News not only has a daily radio department, but issues a special radio section on Saturdays. The Daily News has established a radio service to be broadcast through the Fair radio station. Meanwhile it is using the KYW station.

The Detroit Daily News has attracted country-wide attention with its powerful transmitting station and its alert radio news department. The News has a booklet on the press which it will mail free to all who send their names and addresses and ask for a copy.

A radio broadcasting station has been opened in the building of the San Francisco Examiner.

The Kansas City Star has installed a 500-Watt, Western Electric broadcasting station similar to the Detroit News equipment. The new station already has stimulated radio interest in Missouri, Kansas and Nebraska.

Making a Transformer

(Continued from page 8)

the hole and begin winding. After 12 turns have been wound punch another hole in the tube and twist the wire into a long loop about 12 inches long, which is threaded down into the tube through the hole and then continue with the winding until another 12 turns are wound, when another hole is punched, and another loop is made and put down into the tube.

This process is continued until 15 coils of 12 turns each have been wound, and the final end of the winding is brought down through the last hole. There should now be 14 loops and 2 single ends of the wire which have been put down into the tube, and the winding on the outside should be perfectly smooth. As these ends and loops begin to bother while winding, they can be temporarily folded back inside of the tube to keep them out of the way. This coil should now be varnished with shellac and allowed to dry.

Making the Switch

The switch should now be constructed. The best way to make this is to purchase the contact points and the switch lever with a hard rubber handle already mounted on it, from some electrical supply dealer. Any store that deals in radio apparatus can supply this, but if it is not convenient to do this make the switch contacts out of 6-32 brass machine screws. These are put through the holes shown in the front view of secondary end "C" Figure 2 and fastened on the other side with a brass nut. The switch lever "L" as shown in Figure 3 is made of spring brass $\frac{1}{16}$ of an inch thick and turnover about $\frac{1}{16}$ inch on the end, so that it will make a good contact on the contacts. An 8-32 brass machine screw holds this in place on the secondary end "C" Figure 2. A brass washer is first placed on the screw, then the switch lever, another washer, and the screw is then put down through the hole in the center of "C" and clamped fast with a nut on the other side. Before this is fastened however, some kind of a knob should be pinned fast to the switch lever as shown in Figure 1. Fasten 2 binding posts with screws through the 2 bottom holes shown on "C" and you are now ready to wire the switch.

All the loops and ends are all brought out of one end of the tube. As the end of the tube from which the wires now project is to be forced over the projection on "C" and glued fast, the connections will have to be

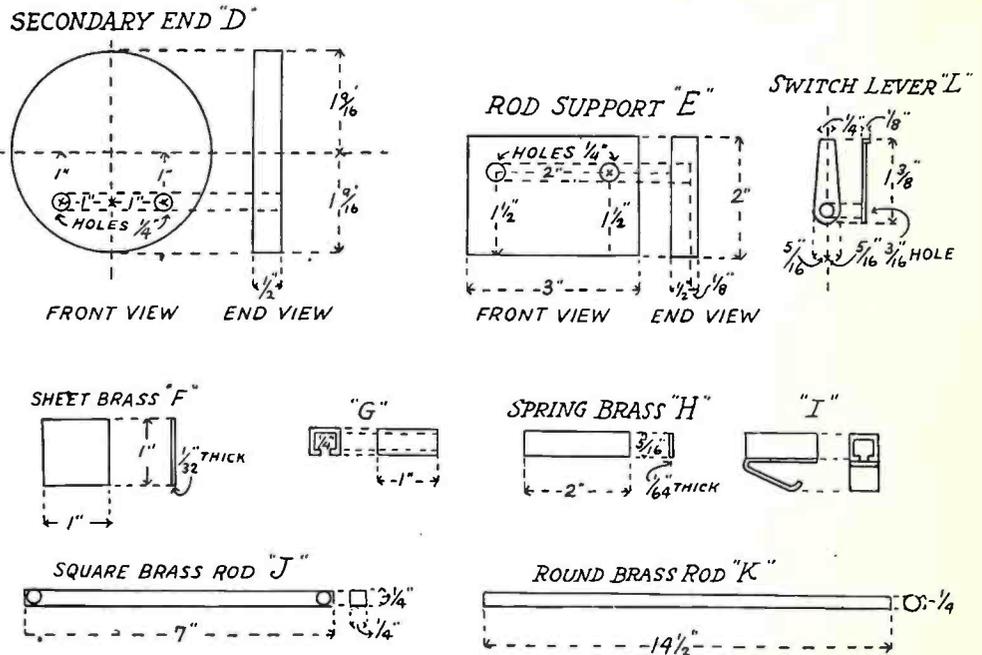


FIGURE 3.

made with plenty of slack in the wires, so that they can be pushed back into the tube after they are soldered to the switch contacts. Begin by soldering the wire from the distant end of the coil, to the last contact and the loop next to it, to the next contact etc., until they are all connected, except the last single wire which is connected to one of the binding posts. The screw which holds the switch arm, is then connected to the other binding post. Now push the tube over the projection on "C" and glue it fast.

Assembling the Coil

The secondary end "D" Figure 3 is now glued into the other end of the tube, being careful to see that the $\frac{1}{4}$ inch holes for the supporting rods line up right. Next, the 2 brass supporting rods "K" Figure 3 are put through the holes in both secondary ends, and the coil is assembled and mounted on the base, as shown in Figure 1. One end of the brass supporting rods is held in place by the holes in the primary end "B", and the other by means of the holes in rod support "E" Figure 3. When all the parts are mounted as shown in Figure 1, the secondary should slide in and out of the primary without touching it at any point. Now procure a piece of square brass rod $\frac{1}{4}$ inch square and 7 inches long and drill a $\frac{1}{8}$ inch hole at a distance of $\frac{1}{16}$ of an inch from each end, as shown as "J" Figure 3.

A piece of soft brass 1 inch square and $\frac{1}{32}$ inch thick, "F" Figure 3 is bent so that it will fit around the brass rod, as shown at "G" in Figure 3. A piece of thin spring brass "H"

is soldered fast to the bottom of "G" as shown at "I" and is bent into the proper shape to press on the wires of the primary, when placed on the rod and mounted as shown in Figure 1. A hard rubber or wooden knob can be fastened to the slider.

The square brass rod is placed in the slots in the top of the primary ends and fastened with brass wood screws.

Carefully clean off the insulation from the wire on the primary in a straight line under the slider, so that the slider spring will make a good electrical contact with the wires, as it slides back and forth. Connect a wire from the slider rod to one of the binding posts on the base, and connect one end of the primary coil to the other binding post, leaving the other end of the primary coil dead, and not connected to anything.

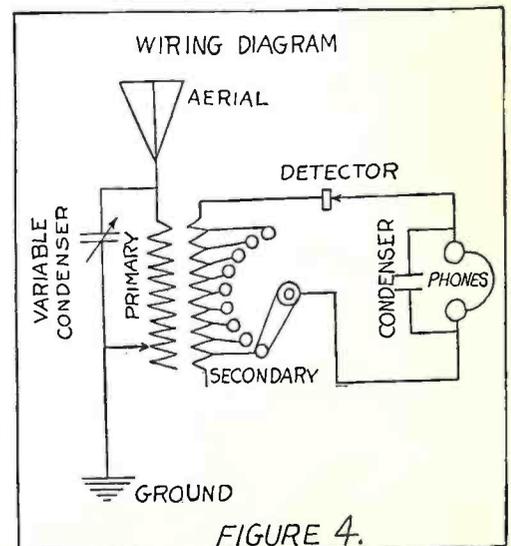


FIGURE 4.

Radio News from Coast to Coast

Readers who have reason to be proud of achievements in Radio in their own localities have a place in this department of Radio Age to tell the rest of the country about it. Contributions will be welcomed.

Arkansas

RADIO fans cannot be classed as nuisances, according to a court decision in Little Rock. It was objected that operators of wireless equipment were making "buzzing noises" between the hours of 9 p. m. and 7 a. m. The court held that wireless inconveniences must be tolerated just as we have to tolerate the blowing of whistles and the rattle of street cars.

Citizens of Pine Bluff are buying a fine receiving outfit for the State's Industrial School for Boys.

California

San Francisco police say they have nipped a system of tapping news of stock market operations. The wireless tappers are said to wear a hidden belt supplied with power sufficient to transmit messages. Even if true, the police fail to explain how any law is violated.

Amateurs' interference prevented the clear receipt of a telephone message sent from the Westinghouse station in Newark, N. J., to the Rockridge station at Oakland. Another test will be made. Newark stations report having heard conversation from San Francisco, but not during official tests.

Church of the Open Door at Los Angeles claims to be the first church to install a transmitting station. It will operate Sunday mornings and evenings and Wednesday evenings.

Mr. and Mrs. Charles Adair of Los Angeles started on an automobile trip to New York April 21. Their car is equipped with a radio phone.

Colorado

The Northeastern Colorado Radio Club has been organized at Sterling. H. T. Van Valkenburgh is president.

Indiana

Radio phone has been purchased by Paul O. Moyer Post, American Legion, at Hartford City. Public concerts and market reports for farmers will be featured.

Mrs. Harriet Steele, 68 years old, listened to songs by her daughter, Miss Floss Steele, transmitted from Chicago to LaPorte while a 55-mile storm was raging.

Iowa

Davenport's transmitting station is located in the Palmer School. It sends out educational talks between 3:30 and 4 p. m. Concerts are broadcast between 7 and 8 evenings.

The radio phone at the Auto Supply Co. at Estherville has become the most popular thing in that part of Iowa.

The Times-Record Co. of Aledo has installed a radio outfit.

Charles G. Pelton of Waterloo, 21 years old, has been a radio student for seven years. He formerly was in charge of wireless work for the Government in Samoa and at Honolulu. He was the only white resident on one little Pacific island for 17 months.

Davenport Y. M. C. A. will not only install radio equipment but will start a radio school.

Iowa Radio Convention was held in Boone April 28 and 29 under direction of

Iowa State College, and attracted visitors from all over the state.

Dyersville has a station that picks up Newark on the east and Denver on the west.

Frank Allen, 117 Marshall street, Boone, sent a message that was heard in Christobal, Panama, 2,500 miles distant.

Kansas

Hutchinson and Wichita are installing radio equipment for police communication



Alan N. Cormack's motor launch "Spoonbill," of San Francisco, is completely equipped with radio apparatus. When tired of navigating, he listens to concerts and news reports. International News Reel Photo.

concerning pursuit of escaped criminals and automobile thieves.

It is reported that the American Telegraph and Telephone Co. is contemplating installing a broadcasting station at Hutchinson. The announcement was made by H. J. Bamford, radio specialist, connected with the Hutchinson Grain Radio Club, Inc.

Louisiana

M. M. Mandot, superintendent of the Columbia Light and Power plant at Columbia, is back of a plan to install a transmitting station at Columbia.

Mr. Edward T. Jones, formerly radio supervisor Gulf Division, U. S. Shipping Board, and at one time associate editor Radio News of New York, radio editor, experimental science of Washington, D. C., has resigned from the board to accept a position in the capacity of manager radio department of the Electric Supply Co., 324 Camp street, New Orleans. The Electric Supply Co. has been appointed a RCOA distributor.

The Louisiana Fire Prevention Bureau warns radio users not to ignore fire laws and insurance regulations in installing outfits. It offers to inspect outfits on request.

Massachusetts

Boston experts are interested in devices designed to not only automatically register S O S calls from ships but have such calls accompanied by an alarm device that will attract the attention of any person in or near the station.

It is announced in Boston that the International Radio Corporation will have a string of 100 retail stores in the principal cities of the country.

Hundreds of New England amateurs heard the remarkable tests carried on 1,600 miles between the steamship America and several land stations. The America was equipped with two distinct aeriels, one for transmission and one for receiving.

A radio constructor and adviser sued for his pay and when he tried to explain technical radio to a jury in Everett the veniremen asked that he repeat it all. Then they took a recess to rest their brains.

Carl E. Berg, 8 Douglas street, East Lynn, a radio specialist, induced the announcer at the Medford Hillside one night recently and asked that a message be broadcast saying that he was tied up on an installation job and could not be home for dinner. Mrs. Berg was listening in at the psychological moment and got the message. Thirty thousand other homes got Berg's message, but Berg said he didn't care if the whole world listened in. He didn't want his wife to worry. And there you are.

The Massachusetts State Police Patrol has instituted a radio phone service. A transmitting station will be installed at Framingham as the first unit in the system.

Michigan

Detroit reports that radio youths have stolen large numbers of telephone sets from apartment and office buildings.

The "Schoolhouse on Beech Road" at Moore put on a district school radio show. The entertainment was followed by a chicken dinner. That beats the old time spelling bee.

Henry Ford is to jazz things up in his plants by introducing radio stuff. He is licensed to install transmitting equipment.

Congressman Vincent M. Brennan of

Michigan introduced a bill providing for the installation of a transmitting station on the floor of the house. Thereby hoping to scoop the congressional record, perhaps.

The Marinette Electrical corporation has begun to manufacture radio equipment. Fifty persons will be employed.

So many residents of Alpena attended the Detroit Radio Show that the Alpena Radio club called off its weekly meeting.

Battle Creek has a growing radio club.

Governor Grosbeck spoke from the Detroit News transmitting station calling attention of radio phone listeners all over the state to the advantages of living and working in Michigan.

Nebraska

T. J. Bolger, of Chadron, has been listening in on Denver and Toledo. Valentine, Alliance, Rushville, Harrison and Hot Springs are receiving messages from all over the country.

A Norfolk operator heard a Western Union radio message recently and telephoned it to the person for whom it was intended. He beat the Western Union delivery.

New Jersey

An Elizabeth boy, with an umbrella as an aerial and a screwdriver thrust into the ground as a ground connection, hears messages with an outfit about the size of a loaf of sugar. He has been studying radio 10 years.

Thus far the New York Signal Corps station has been unable to pick up the United States Army Signal Corps' new

Mrs. William Randolph Hurst addressed many thousands in the interest of the Free Milk Fund for Babies. Her talk was transmitted by WJZ station at Newark.

New York

The American Telephone and Telegraph Co. will build a broadcasting station on the roof of its 24-story building in New York City. Steel towers, supporting the antennae will be 100 feet high.

New York's east side has seized upon radio as a diversion and as many of the instruments have amplifiers the result in that congested district is something like Bedlam at times.

The fourth annual aviators' ball featured dancing by radio. It was held at the Astor Hotel.

station at the Presidio Reservation, San Francisco. The Pacific coast station is one of the most powerful in the service.

Ohio

Disabled former service men are to be entertained by radio at Cincinnati's Altamont hospital. Women of a ladies' auxiliary are raising the funds to install equipment.

East Liverpool has imposed a fee of \$2 to be paid by all owners of radio outfits in that city. It is an annual tax. The revenue is to be expended for inspection by the fire bureau.

Sandusky believes that a mineral deposit is preventing that city from hearing Chicago. Broadcasters in Chicago have been trying to solve the mystery.

Pennsylvania

The Pennsylvania Federation of Music Clubs in session at the Wanamaker Store in Philadelphia declared radio represents one of the best means of disseminating good music.

South Dakota

When Elk Point was cut off from telegraphic and telephone communication with the outside world by a storm recently radio was resorted to. Sioux Falls established radio communication with Elk Point and directed the work of repairing wrecked buildings, tangled wires and broken poles. Supplies were ordered from Sioux Falls by wireless.

Tennessee

The Knoxville Radio Co. of Knoxville is the first Tennessee concern to receive a charter exclusively for the manufacture of radio apparatus. It is incorporated at \$50,000.

Texas

Mrs. O. R. Garrett is the first woman in Texas to hold a first grade amateur radio license. She is also a first-class land line operator. Her husband is president of the Fort Worth Radio Club.

A radio auditorium that will seat several hundred persons is announced for the White House, an El Paso establishment.

Clarence Wortham, an outdoor showman, is taking radio phones with him on this season's itinerary. He starts from Dallas.

Texas farmers in the vicinity of Lancaster are to receive weather bulletins through a new receiving station to be established for the purpose. Several farmers have their own sets in their homes.

A radio shop has been opened at Amarillo by Raymond A. Pittman.

Denison has organized a radio club. There will be facilities for public entertainment.

Five candidates for commercial radio licenses were recently examined in Dallas.

Two radio receiving sets for concert purposes have been installed by the Adolphus hotel at Dallas.

West Virginia

The Wheeling Baptist Temple held a special radio service, receiving the complete Sunday program of a Pittsburgh station.

Wisconsin

All Wisconsin is awaiting the Milwaukee Radio Show, June 21 to 25, inclusive.

The Milwaukee Real Estate Board expects to get radio reports of the national convention of realtors in San Francisco in June. Milwaukee considers it possible that radio may supplant conventions altogether in the future.

Instructive ten-minute features are included in programs outlined for the University of Wisconsin broadcasting stations.

Fire stations everywhere take to radio. Oshkosh firemen have their own receiving apparatus. It beats rummy and old jokes on dull days.

Fond du Lac boys are buying all obtainable radio supplies. Their interest has been stimulated by the broadcasting service at Madison.

Wyoming

Radio outfits will be installed in out of the way spots in Wyoming for the dissemination of religious appeals. Bishop Nathaniel S. Thomas, Episcopal missionary bishop of Wyoming, is promoting the plan. He says mission stations are few and far between in his state and the church finds it impossible to reach some of the people oftener than once a month. Hence the radio plan.

How the Government Will Control Radio

(Continued from page 4)

"BROADCASTING" signifies transmission intended for an unlimited number of receiving stations without charge at the receiving end. It includes:

- (1) Government broadcasting signifying broadcasting by departments of the Federal Government;
- (2) Public broadcasting signifying broadcasting by public institutions, including state governments, political subdivisions thereof, and universities and such others as may be licensed for the purpose of disseminating informational and educational service;
- (3) Private broadcasting signifying broadcasting without charge, by the owner of a station, as a communication company, a store, a newspaper, or such other private news, entertainment and other service; and
- (4) Toll broadcasting signifying broadcasting where a charge is made for the use of the transmitting station.

Note 2. A station carrying on two or more of the broadcasting services specified in classes 2, 3, and 4 must be licensed for each class of service.

Note 3. When transoceanic radio telephone experiments are to be conducted the Department of Commerce should endeavor to arrange with other countries for the use of the wave band 5,000 to 6,000 meters assigned for this purpose.

Note 4. The wave band from 2,850 to 3,300 meters may be used for fixed service radio telephony only provided it does not interfere with service using continuous wave telegraphy.

Note 5. The wave band from 1,550 to 1,650 meters is for use of radio telephone communication over natural barriers, but is not exclusive of other services.

The Marine Service

Note 6. Radio beacons are radio transmitting stations which transmit signals from which a mobile direction finding station may determine its bearing or position.

Note 7. Radio compass service is here used to signify a direction finding service in which a mobile station transmits to one or more fixed stations which in turn transmit back the bearing or position of the mobile station.

Note 8. The wave band from 525 to 650 meters is reserved for marine radio telegraphy, exclusive.

Note 9. Assignment of waves in band 16 will, in general, involve keeping the zones from 285 to 315 and from 425 to 475 meters open in coastal regions. Furthermore, in border regions, account should be taken of the wave lengths used in neighboring countries, and these should be suitably protected by a locally unused band of adjacent wave lengths.

Note 10. The restricted special amateur wave of 310 meters is for use by a limited number of inland stations and only where it is necessary to bridge large, sparsely populated areas or to overcome natural barriers.

Note 11. City and state public safety broadcasting should in small cities be conducted by interrupting the broadcast service of classes 2, 3, or 4 in case of emergency. In large cities this service will ordinarily have its own stations and will use the wave band, 275 to 285 meters, assigned to such service. Private detective agencies desiring to operate radio telephone broadcasting service should be required to co-operate with municipal or

state services in the use of the wave band 275 to 285 meters, assigned to the latter service.

Note 12. By "technical and training school" in this report, is meant a school which in the judgment of the Secretary of Commerce is carrying on sufficient instruction of the proper character for training men for the radio profession to warrant the granting of a station license for that purpose.

Note 13. An amateur is one who operates a radio station, transmitting, receiving, or both, without pay or commercial gain, merely for personal interest or in connection with an organization of like interest.

Note 14. The Conference is of the opinion that broadcast transmitting stations should not in coastal regions be permitted on wave lengths closely adjacent to those



Harry Levison, Cincinnati, made a receiving set in a watch

assigned in the marine traffic and believe that its recommendations provide for adequate protection of such marine traffic. The Conference recommends the assignment of wave lengths adjacent to those used in the marine traffic to inland stations under such conditions as to avoid interference with the marine traffic.

B. It is recommended that the Secretary of Commerce assign a specific wave length to each radio telephone broadcasting station (except Government and amateur stations), this of course being within the band pertaining to the particular service of that station.

C. It is recommended that the wave band assigned to amateurs, 150 to 275 meters, be divided into bands according to the method of transmission, damped wave stations being assigned the band of lowest wave lengths, interrupted or modulated continuous wave radio telegraph stations the next band, radio telephone stations the next band, and finally unmodulated continuous wave radio telegraph stations the band of highest wave lengths. It is recommended that amateurs be permitted to carry on broadcasting within

the wave length band assigned by the Secretary of Commerce to amateur radio telephony.

Some Definitions

A damped wave is one composed of successive trains in which the amplitude of the oscillation after having reached its maximum decreases gradually. This refers to waves from spark transmitters or other types of transmitters having characteristic decrement similar to spark transmitters. Transmitters employing continuous wave oscillators in which the variation in frequency or amplitude is abrupt, (as with the use of a chopper), are classed as damped wave transmitters.

An interrupted or modulated continuous wave is one in which the amplitude or the frequency is varied according to a simple periodic law of audible frequency. (This is commonly referred to as the interrupted continuous waves, or I. C. W.) A continuous wave transmitter employing a rectified plate voltage which is not a substantially constant direct voltage is classed as an interrupted or modulated continuous wave transmitter. Note: This included transmitters in which the variation in amplitude or frequency is effected in a gradual way only. (For abrupt variation see damped wave.)

An unmodulated continuous wave is one in which the permanent state is periodic and has substantially constant amplitude and frequency. (This includes waves in which the amplitude variation is effected simply by the manipulation of a key. This is commonly referred to as a continuous wave, or C. W.)

D. It is recommended that the present regulations governing experimental station remain in effect. An experimental station is one operated exclusively for technical or scientific investigations.

E. 1. The Conference experienced the greatest difficulty in providing even partly for the generally demanded services. The Conference therefore disapproved of the elimination of essential services by the introduction of direct advertising which might be expected to require extensive assignment of wave bands if permitted at all.

2. Many services for which radio telephony might otherwise be desirable can not practically be conducted by this means on account of the interference which such use would cause with other services of a more essential nature or for which there is great public demand.

3. In view of the demand for broadcast service by the general public, it is not desirable to disseminate information over wide areas for purposes of point-to-point communication except where that communication cannot be effectively maintained by other means.

The "Multiple Telegram"

4. A radio service in which a message is addressed or intended for a prescribed number of particular stations is not a broadcast service and is to be classed as a "multiple telegram" or "multiple telephone service." It was not thought advisable to use the much demanded short wave bands for communications of this nature as they would serve a relatively small number. The available wave lengths for such multiple service messages are bands 2 and 5.

5. The Conference is of the opinion that the use of radio communication for "point-to-point" communication over land in most cases constitutes an uneconomic

use of the available wave bands and it is recommended that at the present state of the art such communication should be carried on by other means, in so far as possible.

6. The Conference very carefully considered the proximity of wave bands assigned to amateurs and broadcast services but deemed it essential to utilize all of the available wave bands.

7. It was felt that waves longer than 275 meters should not be assigned to technical and training school stations because of the needs of broadcast services greatly desired by a large portion of the public in that zone, and because the extension of amateur wave lengths and the organization of their use will enable their effective employment by the technical and training school stations.

vschoock b

II. Power Distribution and Hours

A. It is recommended that the Secretary of Commerce assign to each radio telephone broadcasting station a permissible power based on the normal range of the station, such normal ranges for the different classes of service to have the following average values, larger or smaller values being discretionary where conditions warrant.

Government broadcasting stations, 600 (land) miles.

Public broadcasting stations, 250 miles.

Private and toll broadcasting stations, 50 miles.

Normal range is the average reliable daytime ranges over which satisfactory communication can be obtained with good available receiving apparatus.

Rule Is Elastic

The Conference recommends that broadcasting stations should not be allowed to use unlimited power because of the fact that this will limit the number of services which can be rendered within a given area to an undesirable extent.

(NOTE: The Bureau of Standards of the Department of Commerce should make a study of the relation between the normal reliable range of a station and the antenna power on the basis of the use of good available receiving apparatus. It is recognized that this relation may change with the development of the radio art.)

B. It is recommended that the same wave (or overlapping wave bands) not be assigned to stations within the following distances from one another, except that these distances may be lowered if the normal ranges of the stations are correspondingly lowered.

For Government broadcasting stations, 1,500 miles.

For public broadcasting stations, 750 miles.

For private and toll broadcasting stations, 150 miles.

(NOTE: The Bureau of Standards should make a study of the width of wave band (expressed in cycles per second) required for satisfactory radio telephony. It is recognized that this width depends on the methods of transmission and reception employed.)

C. It is recommended that the Secretary of Commerce cause an immediate study to be made of the best geographical distribution of broadcasting stations with the view of attaining the best service with a minimum of interference.

D. It is recommended that in cases where congestion of radio telephone broadcasting traffic exists, or threatens to exist, the Secretary of Commerce assign suitable hours of operation to existing or

proposed radio telephone broadcasting stations.

III. Granting Licenses

A. It is recommended that in the case of conflict between radio communication services first consideration be given to the public not reached, or not so readily reached, by other communication services.

B. It is recommended that subject to public interest and to the reasonable requirements of each type of service the order of priority of the services be Government, Public, Private, Toll.

C. It is recommended that the degree of public interest attaching to a private or toll broadcasting service be considered in determining its priority in the granting of licenses, in the assignment of wave frequencies, and in the assignment of permissible power and operating time, within the general regulations for these classes of service.

D. It is recommended that toll broadcasting service be permitted to develop naturally under close observation, with the understanding that its character, quality and value to the public will be considered in determining its privileges under future regulations.

E. It is recommended that direct advertising in radio broadcasting service be absolutely prohibited and that indirect advertising be limited to a statement of the call letters of the station and of the name of the concern responsible for the matter broadcasted, subject to such regulations as the Secretary of Commerce may impose.

F. It is recommended that when all available wave frequencies in any geographical region are already assigned, no further licenses for broadcasting be granted in that region until cause arises for the revocation of existing licenses.

G. It is recommended that private or toll broadcasting stations transmitting time signals shall transmit only official time signals and with authorization from and under conditions approved by the Secretary of Commerce.

H. It is recommended that the transmission of signals of such character or wave length as to deliberately interfere with the reception of official time signals constitutes grounds for the revocation or suspension of the transmitting station or operator's license.

I. It is recommended that license requirements for the operator of a radio telephone transmitting station include a knowledge of radio transmitting and receiving apparatus and of the International Morse Code, sufficient to receive at a rate of not less than 10 words per minute.

J. It is recommended that the establishment at any later date of any commercial transmitting stations having more than 1 k.w. input to the antenna may, at the discretion of the Secretary of Commerce, be prohibited within 25 land miles of a Government or commercial station or in regions where congestion of radio traffic shall warrant such prohibition.

K. It is recommended that the sharpness of the emitted wave of the transmitting station affect the privileges extended to such station.

IV. The Amateur

A. It is recommended that the status of the amateur be established by law and that the limits of the wave band allotted to the amateur as given above in section I be specified in the law.

B. It is recommended that the amateur continue to be under the jurisdiction of the Department of Commerce.

C. It is recommended that for the pur-

poses of self-policing among the amateurs, amateur Deputy Radio Inspectors be created, elected from their number of the amateurs of each locality; that upon receipt of notice of such election the Radio Inspector in charge of the district in which such amateurs are located shall appoint the person chosen a Deputy Radio Inspector, serving without compensation or for the sum of one dollar per year if compensation is legally required; that the duty of such amateur Deputy Inspector shall be to endeavor to the best of his ability to accomplish, under the direction of the District Radio Inspector, observance of the Radio Communication Laws and the Regulations of the United States and the observance of such local cooperative measures as are agreed to in each community for the minimization of interference between the various groups of the public interested in radio; that such Amateur Deputy Inspectors be clothed with whatever authority may be necessary in the opinion of the District Radio Inspector.

V. Reduction of Interference

A. It is recommended that the Secretary of Commerce at his discretion prohibit at any time the use of existing radio transmitting apparatus and methods which result in unnecessary interference, provided that such action should not be taken unless more satisfactory apparatus and methods are commercially available at reasonable prices and until an adequate time interval is allowed for the substitution of the more satisfactory apparatus.

B. It is recommended that the Secretary of Commerce at his discretion prohibit at any time the use of existing radio receiving apparatus which cause the radiation of energy, provided that such action should not be taken unless more satisfactory apparatus and methods are commercially available at reasonable prices and until an adequate time interval is allowed for the substitution of the more satisfactory apparatus.

Note: "Certain forms of oscillating receivers cause the feeble radiation of continuous waves and may therefore be a source of local interference."

C. It is recommended that the Bureau of Standards make a study of the technical methods for the reduction of interference, with a view to publishing their findings, giving special attention to the following:

(1) The reduction of the rate of building up (increment) of oscillations in radiating systems. (This rapid building up of oscillations occurs in damped wave and interrupted continuous-wave transmitters, and may, of course, be eliminated by the substitution of other types of transmitters. It may, however, be reduced in these types by proper circuit arrangements.)

(2) The reduction of harmonics in continuous wave transmitters and of irregularities of oscillation. ("Mush" in arc transmitters and "swinging" of the frequency in some continuous wave transmitters not employing a master oscillator.) "Mush" signifies small sudden irregularities occurring in the antenna current of arc transmitters. Swinging signifies relatively slow changes in the frequency of a transmitted wave.

A harmonic of a wave is a wave whose frequency is a multiple of that of the given wave. (The wave length of a harmonic is thus a sub-multiple of the wave length of the given wave.) It is often convenient to include as harmonics frequencies which are dependent on the frequency of the transmitter but which are not exact multiples.

(3) The comparison of the variable amplitude method with the variable fre-

quency method of continuous wave telegraphy.

(4) The preferable methods of telephone modulation to avoid changes in the frequency of oscillation.

(5) The proper circuit arrangements of regenerative (including oscillating) receivers to avoid radiation of energy (as by the use of a radio-frequency amplifier with an untuned antenna or with a coil aerial).

(6) The use of highly selective receiving apparatus, including a list of approved forms. Note: A selective receiver is one which enables the user to hear a desired signal and to exclude the undesired signals. The more perfectly this is accomplished, the more highly selective is the receiver.

(7) The use of receiving coil aerials instead of antennae, with special reference to high selectivity.

(8) The reduction of interference with radio communication of other electrical processes, such as the operation of x-ray apparatus and electrical precipitation.

(9) The study and standardization of wavemeters. Note: A wavemeter is an instrument for measuring wave frequency or wave length.

At a subsequent meeting of the full conference called by Secretary Hoover on April 17, 18, and 19, 1922, it was agreed to add to Section 1 C the provision that the operation of Government stations be conducted in such a manner as not to interfere with the commercial traffic and broadcasting, and that whenever Government-owned stations are used for the transmission of commercial traffic and broadcasting, they shall conform to the regulations established by the Secretary of Commerce.

It was agreed to add a provision for the appointment by the President of an Advisory Committee to the Secretary of Commerce to consist of not more than twelve members, half of whom shall be from the Government and half from outside the Government.

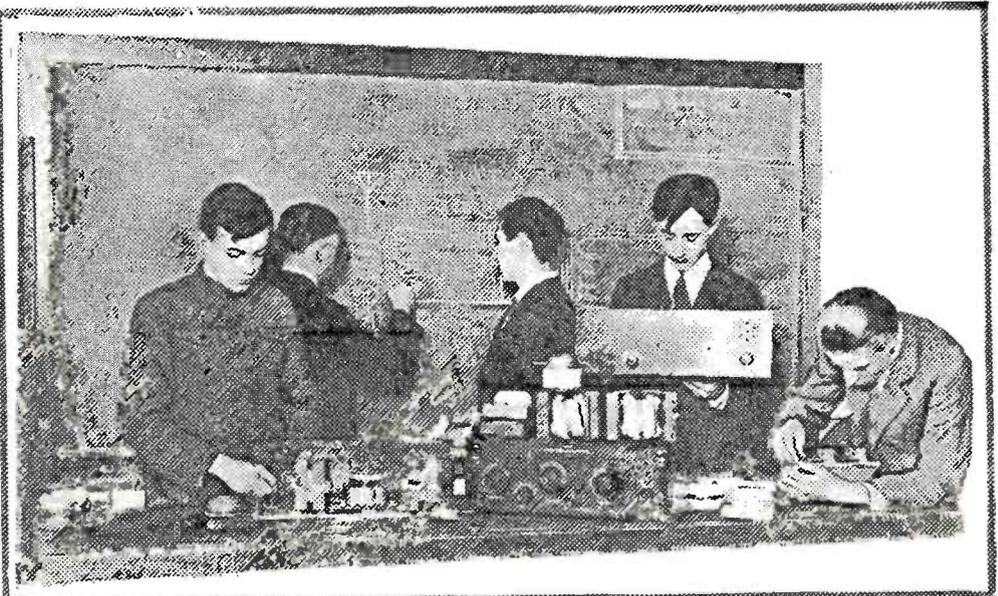
Exhibition Features

In an auditorium opening off the west end of the exposition hall at the Detroit Show, the Detroit News, by moving pictures, stereopticon slides and lectures, revealed, in fascinating detail, the operation of the broadcasting station WWJ, one of the most powerful in America and the pioneer of all newspaper broadcasting stations.

A feature of the Detroit Show entertainment was the operation, by the Lyradion Sales & Engineering Co., of a receiving set seven feet high and four feet wide, designed for concert work in large halls.

Polishing Panels

If you desire to dress the surface of bakelite or formica to prevent finger marks from showing and to give your job a better appearance, sandpaper the surface, using first a medium paper and then a fine grade. Make all strokes the full length of the panel. Finish by polishing with a cloth moistened with linseed oil.



Students and instructors at work in the radio department of Lane Technical High School. These students have built many instruments which will be exhibited at the Pageant of Progress in July

High School Radio

(Continued from page 11)

convenient switch, which runs over taps taken from the vario-coupler, increases or decreases the wave length of the set. The amplifier unit is enclosed in another cabinet and can be placed on top or alongside the regenerator. It consists of two stages of audio-frequency amplification which when operated in conjunction with the detector in the regenerator gives the set a receiving range of over 1,200 miles. Not so bad for the boys, eh?

Possibly you will ask the question, "of what educational value is this to the young man of today?" The answer could not be simpler. When a boy builds his own outfit he must know something about it. The result is that he studies the subject and in this way gets the theory while at school he has also the practical experience. When he gets out into the world he will find that what he has learned at school will provide a life vocation for him if he is so minded to follow it up.

There is another branch of the radio department worthy of mention. The code class is a group of young men who meet at certain periods each day to practice the code and also the theory of the radio. All of these students are practicing the code and about half of them have obtained operator licenses from the government. The other half are struggling hard and will have their licenses before the end of the season or know the reason why.

The two men responsible for the radio department at Lane are Mr.

A. G. Bauersfeld, Supervisor of Technical Education in the Chicago high schools, and Mr. William J. Bogan, Principal of the Lane Technical High School. Both of these men are ardent radio enthusiasts and have given the necessary impetus to carry Lane to the front in this field.

Universal Amplifier

Secretary Denby announces that the Bureau of Engineering of the Navy Department has finally arrived at a successful design of a universal amplifier for radio communication.

The multiplying qualities of the three electrode vacuum tubes have been known for a considerable time, but the amplification was only possible over a limited band of wave lengths. For use in the navy, apparatus must be serviceable over a wide range and equally efficient over several variations of wave lengths.

As a result of the research work of Dr. J. M. Miller of the Navy's Radio Research Laboratory in Washington, a six stage amplifier has been constructed. The range of this amplifier is from a few hundred to 2,000 meters.

In a Lighter Current

Little Joe had completed his crystal receiving set and had made it "work." His astonished and proud mother said to him, "Wasn't it very hard to do all this?"

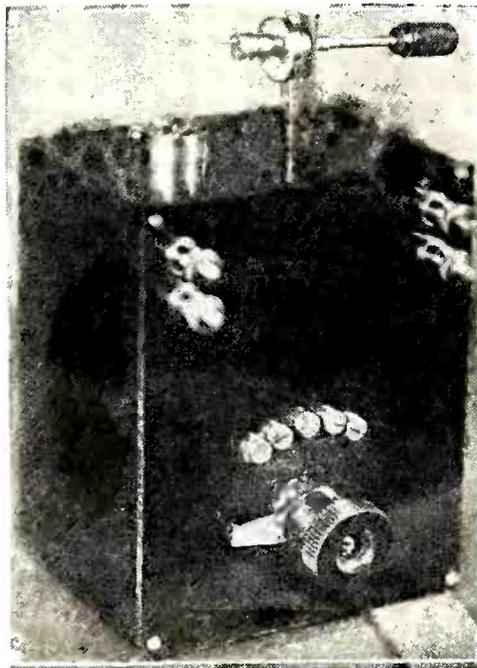
"Naw," said Joe; "most of it was easy as anything."

"What was the hardest part of it?" she asked.

"Gettin' eight plunks out of pa," said Joe.

Here's a Compact Radio Receiving Set FREE to Our Readers

This instrument will enable you to hear all concerts, baseball, market and other news reports from 15 to 25 miles from any broadcasting station in your own home. It is equal to any \$15 device and it is fully guaranteed. No mechanical knowledge is necessary to install or operate. Full instructions are included with each set.



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. Let'er go!

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

Wireless Weather

Weather forecasts are broadcast twice daily 1,000 miles in every direction by the Great Lakes Naval Radio station, co-operating with the local United States weather bureau office, under the direction of H. J. Cox, meteorologist.

E. B. Calvert, chief of the forecasting division of the United States weather bureau, is aiding in perfecting arrangements for broadcasting weather reports for aviation and marine interests. In addition to forecasting for the states west of Illinois and Wisconsin to Wyoming and Montana, and south including Kansas and Missouri, the Chicago office will forecast the weather and issue storm warnings for all the Great Lakes and Michigan and Indiana.

This enlarging of activities of the local office will be cared for with the present staff, Mr. Cox and his assistant forecaster, E. H. Haines, taking turns alternate months in forecasting.

Arrangements are also being made to send out forecasts for the neighboring states and Lake Michigan by the radiophone operated by the Westinghouse company in the Edison building.

"We hope to install a powerful radio sending station in the Federal building," said Mr. Cox, "but for the present we will send our reports to the Great Lakes Naval Radio station via the Municipal pier radio, where they will be broadcast at 11 o'clock in the morning and 10:30 o'clock each night, to aviation forecast zones number four (including the Great Lakes, Michigan and Wisconsin), eight (including Iowa, Indiana, Illinois, Missouri, Kansas and Nebraska), seven (including Minnesota, North and South Dakota), and ten (including Wyoming and Montana).

"For the special benefit of aviators and shipmasters, bulletins based on the reports from twenty-eight regular weather bureau stations in this country and Canada, and reports from seven aerological stations, together with a general weather synopsis and wind and weather forecasts, will be broadcast twice daily."

ARTISTIC VARIOMETER PARTS

Manufacturers of Variometer Parts in
GENUINE MAHOGANY

We are selling these parts in complete sets—each set consisting of 4 Stators, 2 Rotors and 1 Variocoupler. Prices on the above in 100 sets or more, also on separate parts, will be sent upon request.

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

"Fading" Explained

Radio fans are advised to spend the coming summer at the seashore if they would obtain the best results. And even there the radio wave sometimes will refuse to work, just like a prima donna. "Fading" is to blame.

Down by the sea this phenomenon is not as disturbing as it is inland. But, any place, "fading" is most apparent at night. The Bureau of Standards recently completed an investigation of "fading," and describes it as "the rapid variation of intensity of the signals received from a given transmitting station."

Every radio fan has experienced the nuisance. At first he thought his set as simple to operate as a phonograph, until he tried to listen-in on his favorite pastor, and failed. Then he realized that the radiophone is as finicky as a limousine. But the set was all right. The fan simply did not know that "fading" may be violently apparent to some receiving stations and not so apparent to others at the same time, all depending upon the distance over which the radio signal must travel, the time of day and a few other highly scientific things.

Three kinds of "fading" are common, according to Dellinger and Whittemore, the bureau experts who conducted the investigation: 1. Fading, or swinging, lasting one second or less. 2. One minute; and 3, in spells of one hour.

The cause of "fading" is hardly known. Experts do know that the troubles lies between the earth's surface and the "heavyside surface"—the roof of the earth's atmosphere about six miles in the air. But the trouble is caused by something that exists either below the ground or above the earth's atmosphere.

During the day, radio waves have a habit of traveling close to the ground. During the night, especially at great distances, they travel along the "heavyside surface"—six miles in the air. But these two extremes do not remove the nuisance of "fading." Day waves are absorbed by the earth and therefore fade in spells of a second, a minute or an hour. Night waves are absorbed by varying conditions in the uppermost level of the atmosphere, and this is even worse.

Commercial radio stations are not bothered with fading to the same degree as the amateur. Most amateurs do their receiving at night, when fading is at its worst. But, it is pointed out, the commercial radio man now finds himself obliged to investigate this disturbance because it

is interfering with the success of his broadcasting. And broadcasting is the attractive feature of radio, the feature largely responsible for the sets in 1,000,000 American homes.

Nations Discuss Radio

RADIO has reached the stage of international conferences. Representatives of the United States have been meeting with delegates of England, France and Germany in an attempt to standardize world-wide traffic in wireless communication. The conference has temporarily adjourned, but the conferees, who represent the Radio Corporation of America, the British Marconi Company, Telefunken Company of Germany and Radio-France of France, will meet in another session in London about the 24th of this month.

The sessions of the last meeting, which lasted for five days, and was held in Paris, were secret. It is understood, however, that the discussion turned chiefly about the matter of regulating the wave lengths to be used by different countries in international communication, in order to avoid interference. Other matters discussed were the advisability of licensing American as well as European radio operators, methods of lowering the cost of radio apparatus sufficiently to make it possible to bring it within the reach of every home.

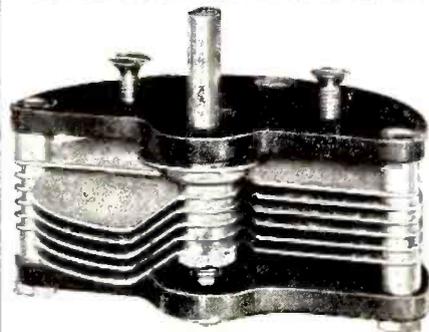
Another conference of experts will meet in Berlin in June, it is said, to present complete findings of a group of engineers who have been studying conditions in South America with a mind to the standardization of technical apparatus, the conservation of wave channels, and point control of stations by the four principal countries of the world. A preliminary report of the findings of these experts was made at the Paris conference, and it is expected that the final version will be ready for presentation by June.

Edward J. Nally, president of the Radio Corporation of America, declined to disclose the results of the conference, but admitted that Germany, France and England were sending experts to the United States to study distribution methods here.

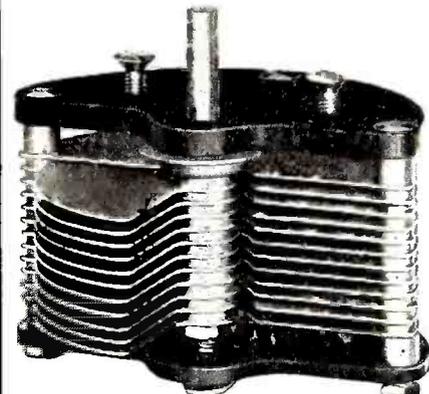
For the Beginner

The most practical and clearest article on how to make a simple receiving set is the one issued by the Bureau of Standards and published in Radio Age last month. Back copies available for those who missed it. Send 25 cents in stamps to Radio Age, Garrick Building, Chicago.

Variable Condensers



11 PLATE



23 PLATE



43 PLATE

The Choice of Experts
**UNITED
RADIO PARTS
AND
APPARATUS**

To Jobbers and
Manufacturers Only

UNITED MFG. & DISTRIBUTING CO.
FACTORY: 536 Lake Shore Drive, CHICAGO
PHONE: SUPERIOR 8433

Radio Life Saving

Commander W. E. Reynolds, chief of the Coast Guard Service, says perfection of the radio in life saving and in preventing ship disasters at sea is one of the wonders of the age.

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

How to Make a Home Radio Set

To cost from \$5.00 to \$20.00. Contains complete instructions for the construction of a practical home receiving station at small cost.

The book every boy wants. Price 50c post paid.
 THE UNIVERSAL PRESS McClurg Building, Chicago
 AGENTS WANTED

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

Trade Mark

Fire Escape Aerial

A reader of the New York Globe has found a way to fool the landlord. He writes:

One point I would like to bring out here—for the benefit of your many readers—a point that will interest most every radio enthusiast who resides in an apartment house and has been unable to erect an aerial for receiving purposes, and that is that the average fire escape makes an excellent aerial for receiving purposes when a regenerative set is used. Dandy results were obtained with a crystal.

I have tried out my set on two different fire escapes here in the upper part of the Bronx and received the broadcasting splendidly in each case.

Just clean a portion of one of the bars on the fire escape and attach the aerial wire—make the ground on the radiator or cold-water pipe.

I read a few days ago where a fellow wanted to sell, at a loss, a good regenerative set because his landlord would not permit him to erect an aerial.

Why worry about the landlord, fellows? Get busy with the fire escape, and when you are through using it at night just unhook the aerial wire and take it into the house.

Why Laws Are Needed

Interference with unscheduled radio transmission while the regular broadcasting programs are being sent out, seriously interferes—not with the broadcasting station—but with the radio public, the receivers. Here is a typical complaint, received

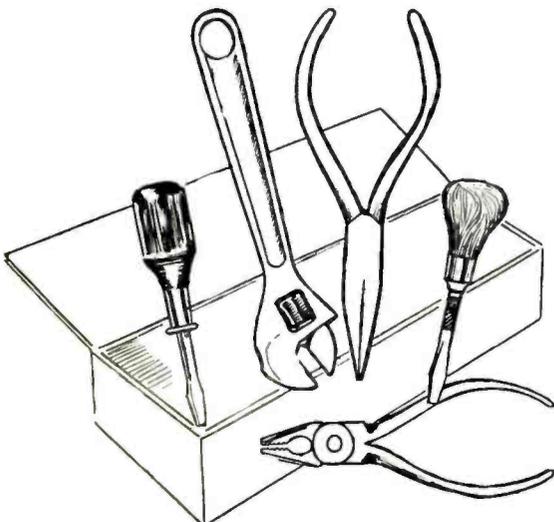
by Municipal station WBU from S. Anderson, 2329 Kimball avenue: "I appreciate very much the broadcasting of lectures by station WBU, but I must tell you that some nights I cannot understand one word of the lecture due to interference by other stations. While I am writing this card I am trying to get what the doctor is saying, but right now I hear two stations. Since I am unable to read the code I cannot report who they are, but the only remedy I have to suggest is to change your wave length. It is now ten minutes after 9 and the only part of your broadcasting I have heard was the station announcement."

Government Publications

The Superintendent of Documents, Government Printing Office, Washington, D. C., issues three pamphlets of especial interest to the new station owner—(a) "Amateur Radio Stations of the United States," complete listings of all licensed amateur stations, giving owners' names, addresses and call letters. (b) "Commercial and Government Radio Stations of the United States," complete listing of American ship, shore and land stations. (c) "Radio Communication Laws of the United States," explains how radio stations may be licensed, and gives other information. Pamphlets are 15c each (remit currency, not stamps), and are mailed postpaid. For those interested in the technical side of radio, the Government issues "The Principles Underlying Radio Communications," 55c currency.

you can't build a watch with a monkey wrench

To build a good radio set you need the right tools



A radiophone, like a watch, is a delicate instrument, which might easily be ruined with clumsy, unadaptable tools.

The Radio Tool Kit is a selection of necessary instruments, chosen by a well-known radio authority as essential in the construction of any radio equipment. Every tool in the kit is guaranteed to be of the finest workmanship and of carefully selected materials.

It is composed of a pair of long nose pliers, for delicate construction work; a pair of blunt nosed pliers and wire cutters, for wiring purposes; a radio wrench enough

for use in practically any place it might be required; one large screw driver, heavy enough for any work required, and one small screw driver for brass screws.

The set will be mailed for \$3.50 to any place in the United States. Either send a post office money order with your order, or fill out the following coupon and it will be mailed, C. O. D., parcel post.

Radio Tool Kit Co.
 411 South Sangamon St., Chicago, Ill.

Please send me, C. O. D., the Radio Tool Kit, as represented in this advertisement, for which I agree to pay \$3.50 on delivery.

Name.....
 Address..... (RA)

ANNOUNCING
The Annual
National Radio Exposition

To Be Held in the

LEITER BUILDING

In the Heart of the Loop Shopping District

Chicago, June 26th to July 1st

INCLUSIVE

The Most Comprehensive Exhibit

OF
Every Type of Wireless
Apparatus Ever Shown

Such Rapid Strides Have Been Made in the Perfection of Wireless Devices That Every Exhibit in the Big Exposition Building Will Display Something New and Interesting to the Radio Fans.

For Further Particulars Address

NATIONAL RADIO EXPOSITION

417 South Dearborn Street, Chicago, Illinois

Lighthouse Concerts

RADIOPHONE concerts for the lighthouse keeper—holder of the world's solitary confinement record—are seen by government officials as the latest possibility of the new art in conjunction with radio fog signal stations now in course of construction.

Already several lightships have turned their wireless telegraph outfits to good use through the long evenings, and enthusiastic reports have reached Lighthouse Commissioner Putnam from lightship captains who listen-in regularly on concerts from Pittsburgh from their anchorage off the Middle Atlantic Coast.

As yet, probably not more than a score of the 16,000 lighthouse keepers have installed radio receiving sets, but the opening of the San Francisco light vessel fog-signal service May 1 is expected to mark the beginning of the "radioizing" of Pacific Coast lighthouses and ships, just as the three signal stations in the vicinity of New York, now in operation a year, marked the "radioizing" of the Atlantic coast beacons.

Scheme Entirely Possible

Wherever there are radio telegraph outfits, radiophones are possible, and, according to Commissioner Putnam, "the Lighthouse Service purposes, as means are available and needs are developed, to install similar groups or single radio fog-signal stations in the vicinity of important entrances on the Atlantic and Pacific coasts and on the Great Lakes, as well as on some of the principal intermediate capes and light vessels."

Lighthouse officials say they can readily see the introduction of radiophone receiving sets in many an isolated station, but the concerts made

available to the keepers must be of the highest character, because "lighthouse keepers are usually old men of the sea, delighted with the security of their present stations, given to thinking serious thoughts, and very often highly educated through the slow process of years.

"The keeper of Tillamook Rock station, fifteen miles off the Oregon coast, on rocks so steep and in a sea so heavy that he must come and go by means of a basket swung far out from the ledge; and the keeper of Minot's Ledge, standing alone in the heavy sea, off the Massachusetts coast—on duty eight months of the year and off four months; and those keepers up in Alaska on duty three years running out of every four, would certainly enjoy sermons or concerts by radio.

Will Warn Vessels

"The proposed radio fog-signal service would operate in connection with the radio compass on ships at sea. By this means ships in heavy fog are accurately warned of the approach of other vessels. Fixed stations along the coast send certain fixed radio signals, such as a series of double dashes for 30 seconds and silent 30 seconds, as in the case of the San Francisco service about to be opened. By means of a chart, the captain of a fog-bound vessel is able to locate the source of these signals and thereby get his bearings.

As this service develops, all radio stations used therein will be built by the government and will be consequently powerful—using the long distance 1,000-meter wave length. Such stations would be able to receive concerts from a great distance. But the isolated lighthouse keeper, for the present at least, will have to rig up his own set out of his own pocket.

Steinmetz's Views

Two startling announcements—for those who could understand him—were contained in a lecture by Dr. Charles P. Steinmetz, electric scientist, delivered from a broadcasting station in New York recently.

They were: First, that radio waves and light are the same thing; second, that the theory of "ether" must be abandoned as unsound and unreasonable.

The only difference between radio and light, Dr. Steinmetz declared, is in the wave length. The wave over which he spoke to wireless fans, he explained, had a length of 360 meters. The wave length of a beam of light is only one twenty-thousandth of a centimeter. The wave length of the X-ray is 100 times shorter and, on the other hand, the electromagnetic wave of long-distance transmission lines has a length of 5,500,000 meters.

"A radio wave passes through a brick wall," he said, "because the thickness of the wall is only a small fraction of the wave length, while a light wave is stopped by a thin sheet of metal because the thickness of even the thinnest sheet of metal is many times the wave length of a light wave."

Passing on to the question of ether, Dr. Steinmetz declared that "the belief in ether must be abandoned as being contradicted by Einstein's Theory of Relativity, which is now receiving general acceptance."

"For a long time we have believed," he said, "that light is a wave motion of some hypothetical thing, called the ether. This theory never was satisfactory, because it required that the ether must be so extremely thin that the earth and all bodies move through it with terrific speed—100,000 feet a second—without any trace of friction. And at the same time the ether must be a solid body of high rigidity. This is unreasonable."

Dr. Steinmetz explained the production of electro-magnetic waves which, "if they alternate about a million times a second are radio waves, and which, if they alternate nearly a hundred million of million times a second, form a beam of light.

"There is no such thing as the ether," he concluded, "and if in an attempt to be progressive we talk about ether waves and ether telegraphy, we are just the opposite—behind time."

GET IN on This Special Short Term Subscription Offer

RADIO AGE

Five Months For A Dollar

Brimful of everything the Radio fan should know. Each issue a liberal education. Surely you will want the coming five numbers of RADIO AGE. It's 25 cents on the newsstands—\$2.50 a year by subscription. Just pin a dollar (currency, check or money order) to this blank—mail today and we'll enter you for a five months' subscription—really ONE NUMBER FREE. Come on in.

RADIO AGE, Circulation Department, 64 West Randolph Street, CHICAGO

NAME.....STREET.....

CITY.....STATE.....

A Showmen's Show in an Exposition Palace!

First Big Show in the Chicago-Northwest Field!

Will Operate Its Own Broadcasting Station for Exhibitors!

WISCONSIN RADIO SHOW

AND ELECTRICAL EXPOSITION

**Auditorium, Milwaukee, Wis.
June 21st to 25th, Inc.**

In Same Building on Same Dates

State Convention American Radio Relay League

Exhibitors Attention!

Milwaukee has just opened its first broadcasting station. Marquette University (Milwaukee) is set to go, and newspaper publishers are galloping about the East trying to buy broadcasting equipment.

In Wisconsin, one of the most prosperous states in the U. S., there are but 2,000 receiving sets! Michigan, 80 miles across the Lake, has 60,000!

By Show dates (June 21 to 25) Wisconsin will be at Radio Fever Heat. The local trade has been ultra-conservative, with the public clamoring for **more sets** and **more radio** information.

**Who is to get the cream of the
radio business in this great state?**

The answer is written in the list of exhibitors who have signed for the Wisconsin Radio Show. If you are not in, wire for space and prices.

Our own broadcasting station in continuous operation assures every exhibitor opportunity for continuous demonstrations right in his booth. No magnavox annoyance. They must operate on schedule and for limited periods. Oceans of publicity, and guest tickets for your buyers.

WISCONSIN RADIO SHOW

Executive Headquarters, Plankinton Hotel, Milwaukee, Wisconsin

SPEARMAN LEWIS
Managing Director

A. L. BARBOUR
Secretary

A. R. SHAFFER
Treasurer

Good Morning, Postman!

Mail from Montreal and mail from Amarillo, Texas. Letters from boys asking about crystal detectors, and delicately scented and tinted missives from matrons asking where they may buy radio receiving sets placed in good-looking cabinets for their comfy living rooms.

Letters from manufacturers asking where they can get bakelite. Letters from dealers asking for names of jobbers. Letters from amateur radio operators asking about new broadcasting stations and their call signals.

Letters from everybody about anything. All because Radio Age has been judiciously distributed over a carefully selected radio field. And because Radio Age is a quality magazine, costing 25 cents on the news stands. People do not buy a radio magazine at 25 cents unless they mean business.

Circulation is doubled on this June number. If so many hundreds of radio students and radio wise folk have taken what appears to be a permanent interest in Radio Age why shouldn't you give it a little serious attention, whether it is an instructive radio publication or simply an advertising medium you are after?

Just tell our postman.

RADIO AGE

The Magazine of the Hour
Garrick Building, Chicago