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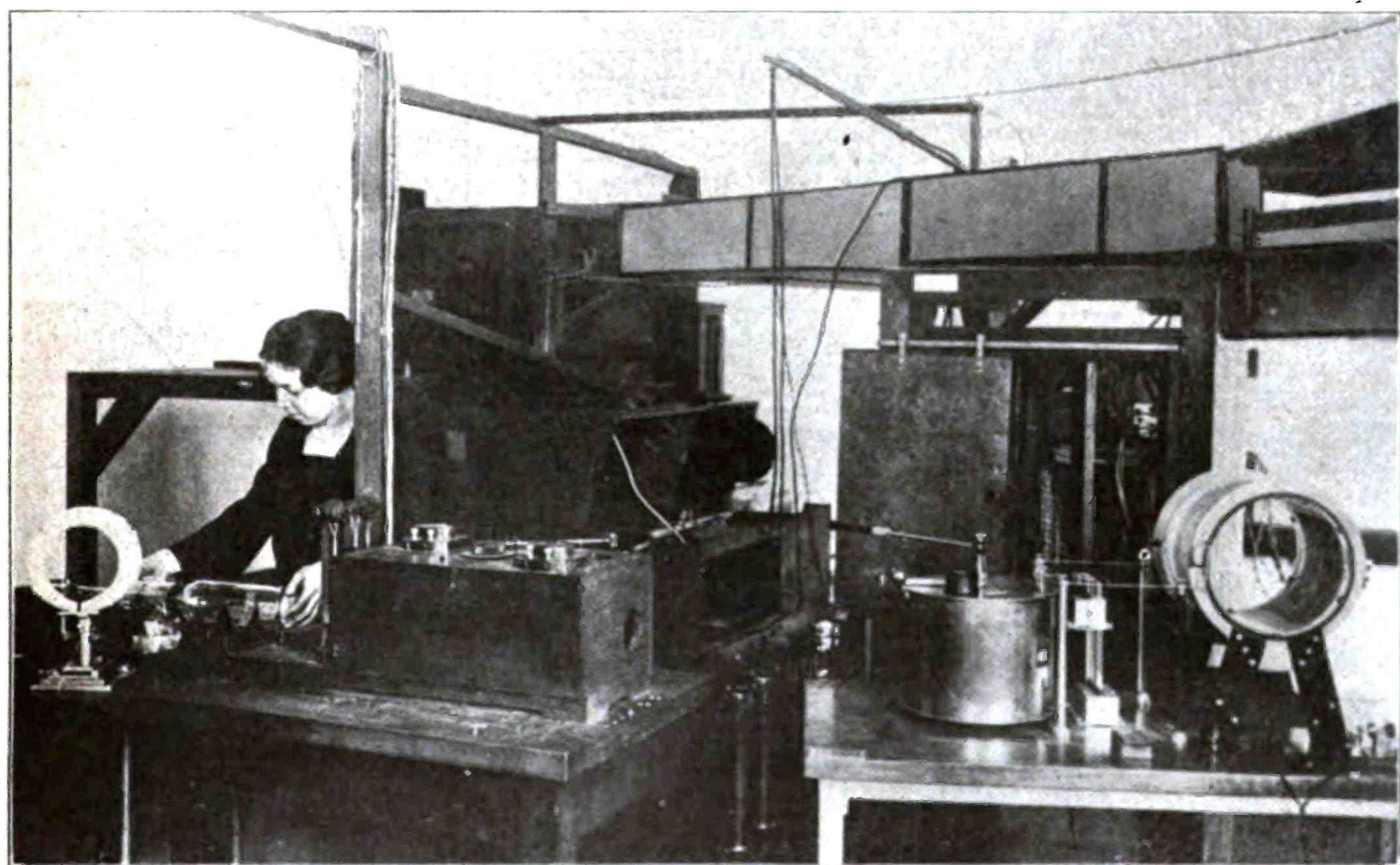
RADIO WORLD

(Title Reg. U. S. Pat. Off.)

ILLUSTRATED

WEEKLY

Bureau of Standards Uses Oscillograph to Measure Wave Length of Transmitters Accurately



(C. Wide World Photo)

The large number of transmitting sets now operating makes it necessary to have a means of accurately measuring the wave length of different stations. This illustration shows an Oscillograph and tuning fork, by which it is possible to photograph the form of an emitted radio wave. It is thus possible to determine the wave length to an amazing degree of accuracy. The Oscillograph is the square box shown in the left center of the picture. This apparatus, which is an American invention, is the most accurate measuring apparatus of its kind in the world, and is used by the Bureau of Standards in Washington.

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Radio Comes to Relief of Snowbound Farmer

FARMERS who were lukewarm to radio or who looked upon it as a diversion for the women and a toy for the children, are today convinced that radio broadcasting is a real utility. New York State, for example, was veritably buried under twenty-six inches of snow. The cities were able to cope with the snow after a fashion, but the country was practically isolated, especially after the wind churned up the snow and drifted roads as rapidly as shovelers and tractors opened them.

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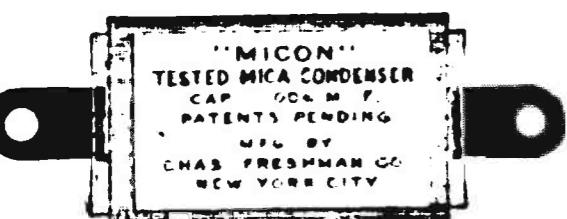
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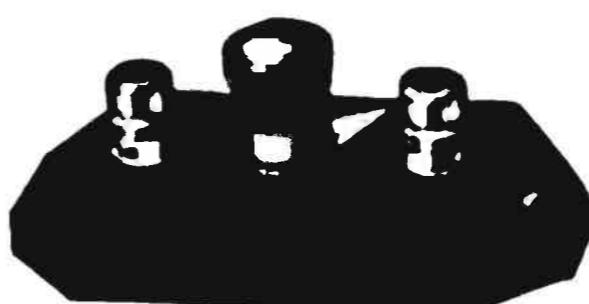
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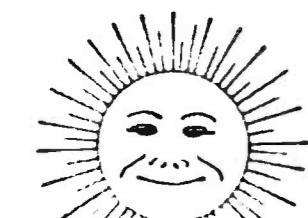


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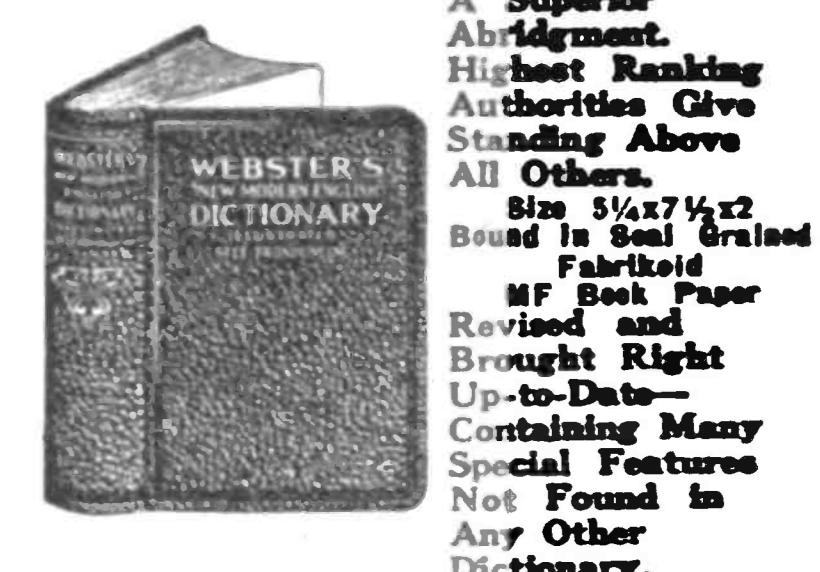
DICTIONARY

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THE COLUMBIA PRINT

1403 Broadway New York City

The farmer was snowed in. Rural mail carriers found it impossible to get through for days. In some cases the telephone lines were temporarily out of commission. Notwithstanding his isolation the farmer with a radio receiving set was able to get the news of the day; he kept in touch with market prices though he was not able to take advantage of favorable quotations and during the evening he and his entire family were entertained with music and speeches.

Action on White Bill

Developments in radio legislation are discouraging in that no action was secured in the House on Wednesday when the White bill was introduced. After an afternoon of debate, chiefly due to uninformed members who propounded questions, some of which indicated that they had not read the bill, the matter was deferred until a later date. The discussion revealed the fact that there were, however, no real objectors to the legislation.

No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

RADIO WORLD, 1403 Broadway, N. Y.

VOLUME TWO OF
RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. II, No. 21. Whole No. 47

February 17, 1923

15c per copy, \$6.00 a year

Canada's Largest Radio Station Broadcasts in Both French and English

By Pierre D'Orsay

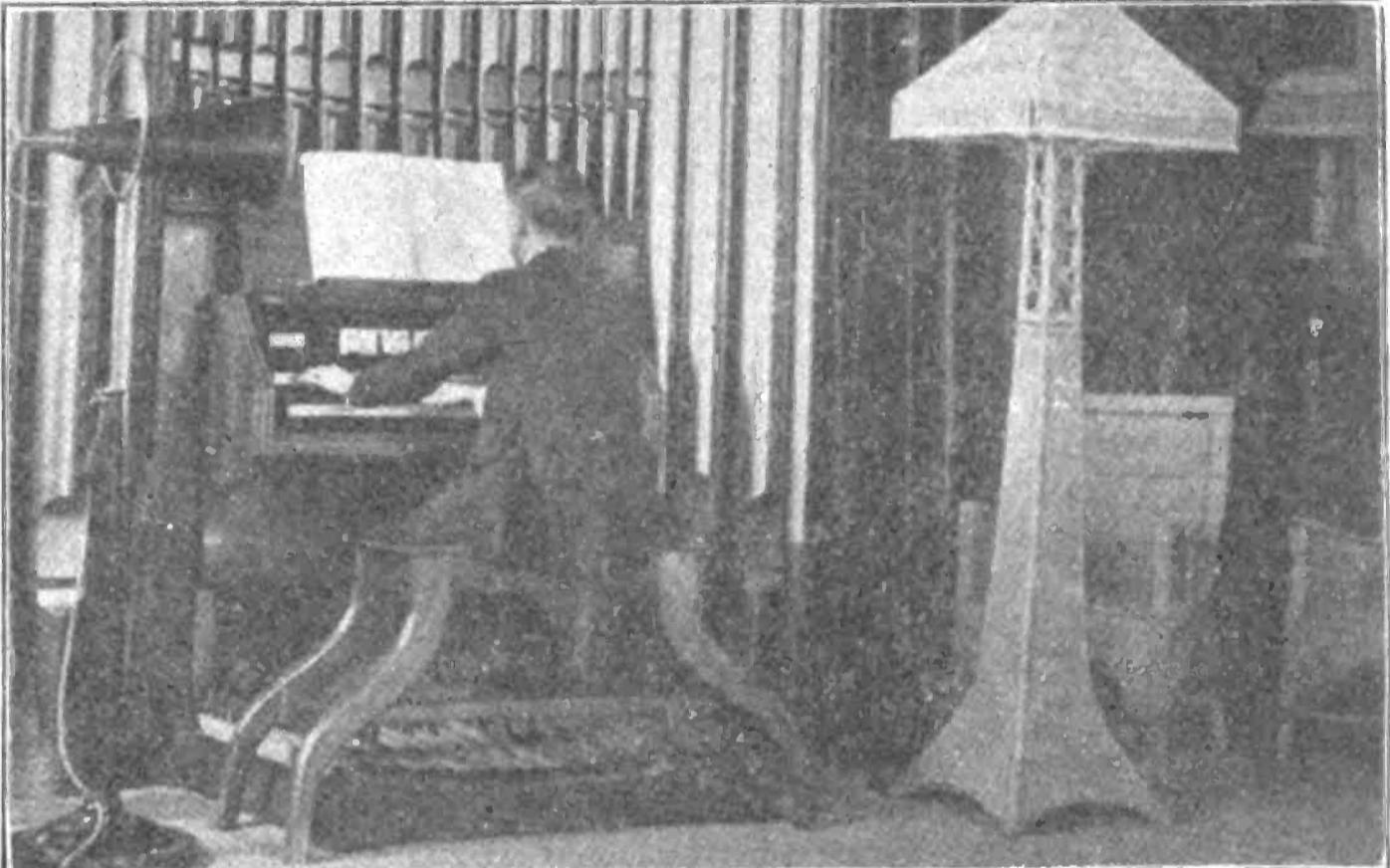
THE most powerful broadcasting station in Canada is located in Montreal, and is operated under the direction of the French newspaper, "La Presse." One of the features of this station is that it is the only broadcasting station that possesses a pipe organ as a part of its installation.

J. N. Cartier, who is announcer, manager and operator, was responsible for many of the unique features embodied in this station. They are absolutely no motor generators used in this station, the alternating current supply from the city being used, and rectified by means of large rectifying tubes.

It is the only station in the world that broadcasts regularly in more than one language, both French and English being used. This is done because of the fact that there are within its range people that speak nothing but French, and therefore it was necessary to enable those people to understand what was being broadcast.

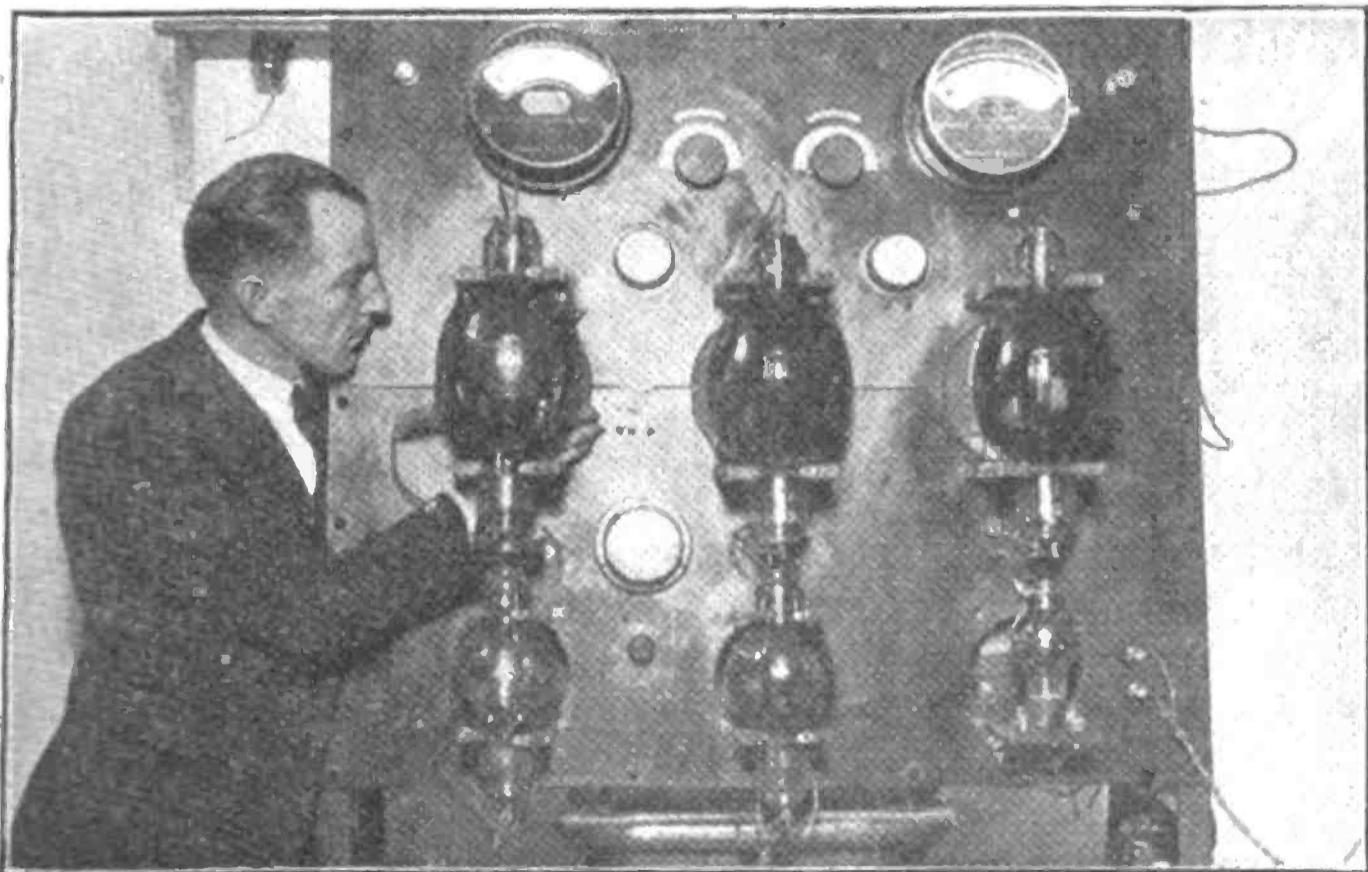
For quality, modulation and distance, this station stands foremost among the stations of Canada, and a great many American amateurs have heard "CKAC."

These accompanying pictures give a very good idea of the station and how it is operated.



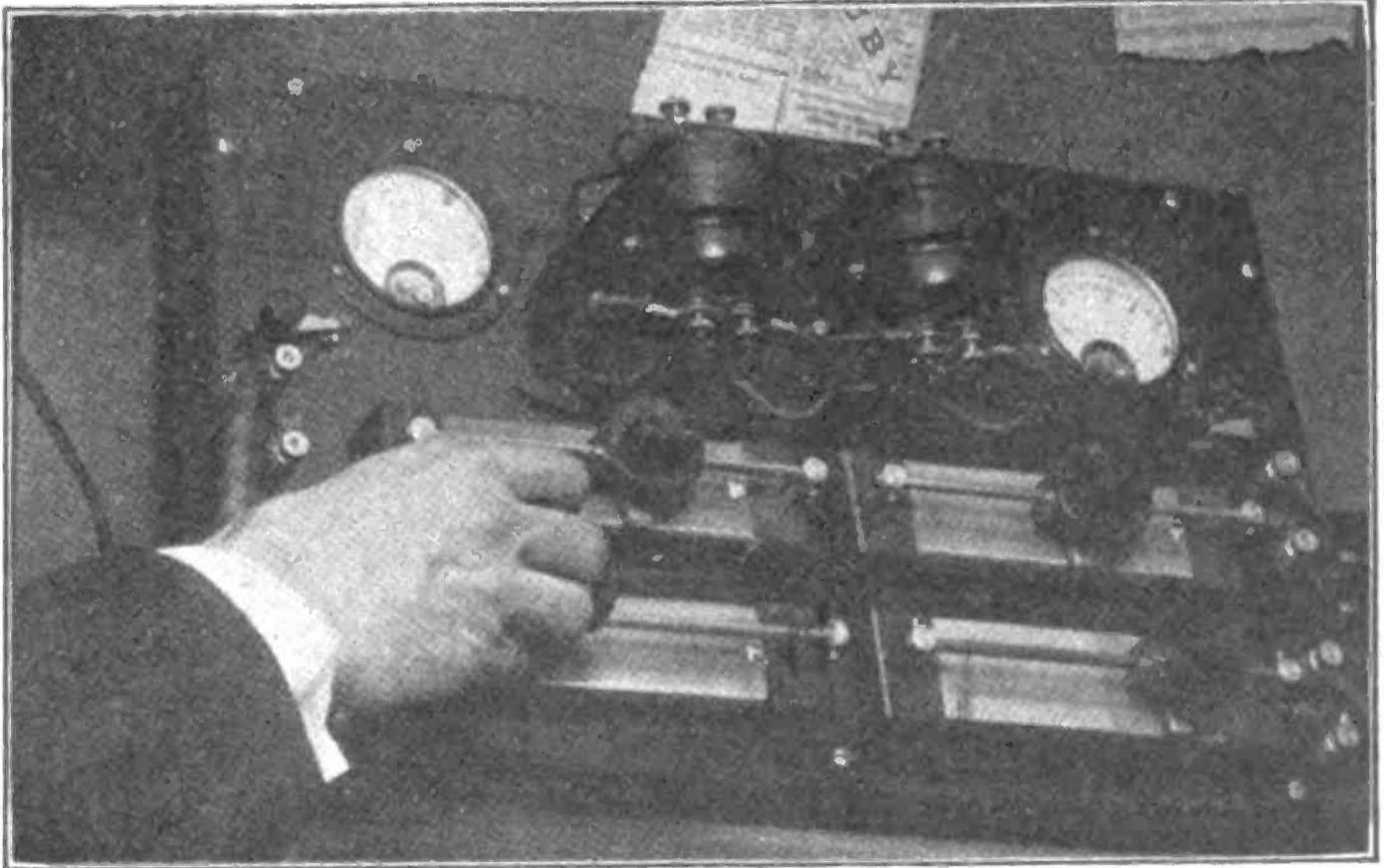
(C. Kadel and Herbert)

The magnificent pipe organ in the studio of the Canadian broadcasting station, CKAC, located at Montreal. This is claimed to be the only broadcasting station in the world that possesses a pipe organ as a part of its regular equipment, and many people have commented upon the wonderful organ recitals that are sent out by this station. The microphone, as can be seen in the picture, is located directly in front of the organ.



(C. Kadel and Herbert)

J. N. Cartier, manager of station CKAC, working on the transmitting panel. The first large tube is an oscillator, while the two next to it on the right hand side are rectifiers used to convert the alternating current to direct. This was done in order to eliminate the motor generators. The first and second tubes underneath are the 1KW modulators, and the next small tube is a speech amplifier. While one of the most powerful of radio stations, it is said to be most simple to operate.



(C. Kadel and Herbert)

The microphone current control used in this station. This device was built by Mr. Cartier and is used to regulate the speech intensity and quality. It is one of the devices that make the station simple in operation. Mr. Cartier, who designed it, is one of the foremost radio men in Canada, and the entire design of the station and of its apparatus was completed under his direct charge. This station has been heard over great distances.

In Next Week's Radio World
The Limitless Possibilities of Radio for the American Farmer,
by Gen. James G. Harbord

Importance of Radio Transmitter on Ships of Many Classes

By B. R. Cummings

A RADIO transmitter is primarily an alternator. Instead of generating the usual commercial frequencies, however, radio transmitters generate frequencies in the order of from 20,000 to 1,000,000 or 2,000,000 cycles. Obviously the usual form of alternator cannot be employed for this purpose, and the system used is usually one which is not dependent on moving mechanical parts.

The function of a radio transmitting equipment is to generate alternating current at these frequencies and transfer its output to the antenna system. The antenna system consisting of aerial wires, inductance units, and a ground system, or counterpoise, forms a series alternating-current circuit, which represents the load on the transmitter. Frequencies of this magnitude (so-called radio frequencies) are essential in order that efficient radiation of energy be obtained from the antenna. Of the total power in the antenna, the percentage that is radiated decreases very rapidly as the frequency is lowered, or (which is the same thing) as the wavelength is increased.

Radio transmitters in order to be applicable for commercial use must usually be capable of generating any one of a number of frequencies, and in many cases must be so designed that the frequency of its output can be changed by throwing a single switch. This requirement is brought about by the fact that, in commercial traffic, it is customary to use one wavelength for calling purposes and then to transfer to a second wavelength for communication, keeping the calling wave free for calling purposes.

When the transmitter is used for telephony, a modulation system is incorporated in the radio transmitter proper. For telephony this modulation or control system consists of a group of radiotrons termed modulators. The function of the modulator is to vary the amplitude of the radio-frequency alternating current in the antenna circuit in such a manner that the envelope of the maximum amplitudes of the radio frequency alterations reproduces the wave form of the voice.

Modern radio transmitters are rated in terms of their output in watts or kilowatts, which is in keeping with the rating of other electrical machinery. For example, when we speak of a "one kilowatt radio transmitter," we mean a transmitter which puts one kilowatt of power into the antenna system. Radio transmitters are built with outputs from as low as one watt or less to as high as several hundred kilowatts. The largest single radio transmitter was built by the United States Navy Department at Bordeaux, France, and has a capacity of 1,200 kilowatts. This station, known as the Lafayette Station, call letters "LY" sends on a wavelength of approximately 23,400 meters, and can be readily heard in the United States.

The proportion of the input into the antenna system which is actually radiated into space depends upon a number of things, chief among which are the wavelengths at which transmission is carried, and the resistance of the antenna system, including the ground or counterpoise.

It is permissible for any one to maintain and operate a radio transmitting station, providing a license is obtained from the United States Department of Commerce for such operation, and providing transmission is carried on in accordance with the rules and regulations of the Department of Commerce, and in accordance with any restriction placed upon the equipment by the manufacturers.

In a previous paper read at the General Electric Co. station, the term "wavelength" was defined. The wavelengths which may be used by Radio Transmitting Stations are assigned by the Department of Commerce. All wavelengths below 600 meters are assigned to commercial work, those below 200 being assigned to so-called "amateur transmission." The wavelengths 360 and 400 meters have been approved by the Department of Commerce for radio broadcasting, although these wavelengths have not as yet been established by law.

All wavelengths between 600 and 1,600 meters are reserved for the exclusive use of the U. S. Government, and are used by the various Government Departments, including the Army and Navy, for radio communication between shore stations, warships of all types and aircraft. The necessity for restricting a band of wavelengths for government use, thereby insuring freedom from interference from commercial radio traffic, is, of course, obvious. Wavelengths above 1,600 meters are available for commercial radio work.

To secure a license for the operation of a radio transmitting station, it is necessary that the applicant be able both to send and receive the Continental Code at a rate depending upon the class of license requested, and to give assurance that he is capable of operating his own apparatus. The restriction that licenses are given only to people capable of receiving the Continental Code is based upon international regulations which require that all transmitting stations cease sending immediately and give absolute priority to any distress signals from a ship at sea. Obviously therefore the operator of any transmitter must be able to receive and identify such distress signals in order that he may comply with this requirement.

Since 1912 it has been required by law that every ship cruising more than 200 miles from shore, and carrying 50 or more persons aboard, including the crew, be equipped with a radio transmitter and receiver capable of communicating a specified distance. Not only must such equipment be installed on all vessels but must be inspected by an inspector of the Department of Commerce each time the vessel puts into port. If the inspector of the Department of Commerce finds that the radio equipment is not, in his opinion, capable of carrying on the required communication and gives indication of unreliability, he reports this condition to the commanding officer of the vessel. Any vessel which sails without remedying this condition is subject to a penalty of \$5000.00

This requirement is, of course, fundamentally intended for the safety of the personnel aboard the vessel, and in this connection it is interesting to note that probably no other piece of electrical or other equipment is so likely to be called upon at any time to be responsible for the safety of hundreds or thousands of people, as the radio transmitter. The most difficult engineering in the building of radio transmitters is not in establishing electrical circuits which will function as required, but in the selection of materials, and in establishing the necessary safety factors, which will insure reliable service under the extremely varying conditions of installation and operation.

From all of which it can be seen that the business of the sea has been vastly affected by the new science of radio.

An Inexpensive Reflex Receiver

By C. White, Consulting Engineer

THE REFLEX type of receiver is here to stay and this fact is clearly demonstrated by the activity that is being shown by both amateurs and manufacturers in its development.

The idea of the reflex receiver is by no means new, for the French made extensive use of it during the recent World War. While the principle has been simple enough in theory, still there has been quite a bit of trouble to get the many different types of circuits simple enough for general construction and use. The trouble has been mainly in getting a reliable form of radio-frequency amplification. Although the tuned-plate type of radio-frequency amplification possessed the desired amount of selectivity, still when more than two stages were employed it was almost next to impossible to hold or get the proper adjustment. Radio-frequency amplifying transformers have been highly developed so that it is possible now to employ as many as five stages with little or no bother in operation since there are no controls on the transformers. For a single tube circuit, such as I shall describe in this article, the tuned-plate is quite superior in that it is not only a cheap but a thoroly reliable method.

In designing the circuit shown in the accompanying illustration, I have kept several points in mind. First, to design a set that would be simple in operation, having as small a number of controls as possible; second, to make its action selective; and, third, to avoid the use of any switchpoints or coil taps. It will be noted that there are only four controls, the two variometers, the "A" battery potentiometer, and the filament rheostat. This means not only that a small panel can be used (about 6x14 inches), but also, that there need be only four holes drilled in the panel. To those who have tried to drill and set switch-points and switch arms exactly true this feature will be greatly appreciated.

The theory and operation of the outfit are just as simple as the construction. The main tuning circuit or the Ant.-Gnd. circuit consists of a fixed mica condenser C-1 of .0005 mfd. capacity, and a variometer. After the incoming signal has been tuned in, the high-frequency waves pass on to the grid and filament, taking the path thru the fixed mica condenser C-3 instead of the secondary of the audio frequency transformer A. T. which forms a path of high impedance to high frequency oscillations.

The capacity of the condenser C-3 should be about .002 mfd. for the average audio-frequency amplifying transformer, but the amateur will do well to try out several sizes, for under some conditions satisfactory operation has been obtained with C-3 omitted completely.

The vacuum tube amplifies the radio-frequency carrier wave and passes it on thru the bypass condenser C-4, which has a capacity of .001 mfd., to the tuned-plate circuit element, consisting of a fixed mica condenser, .0005 mfd. (C-2), and a variometer. The crystal detector picks the voltage from across this variometer and condenser and detects or rectifies it. The rectified portion goes on to the primary of the transformer, and is reproduced amplified in the secondary. Now the audio-frequency waves pass thru the tube to be amplified and in the plate circuit the

phones render them audible. The purpose of the circuit is to make one tube play the dual role of radio- and then audio-frequency amplifier.

The virtues of this set do not end in simple construction and theory, but above all it is the cheapest and most inexpensive to build as well as operate. For comparison with the itemized bill of materials of other receivers I will list

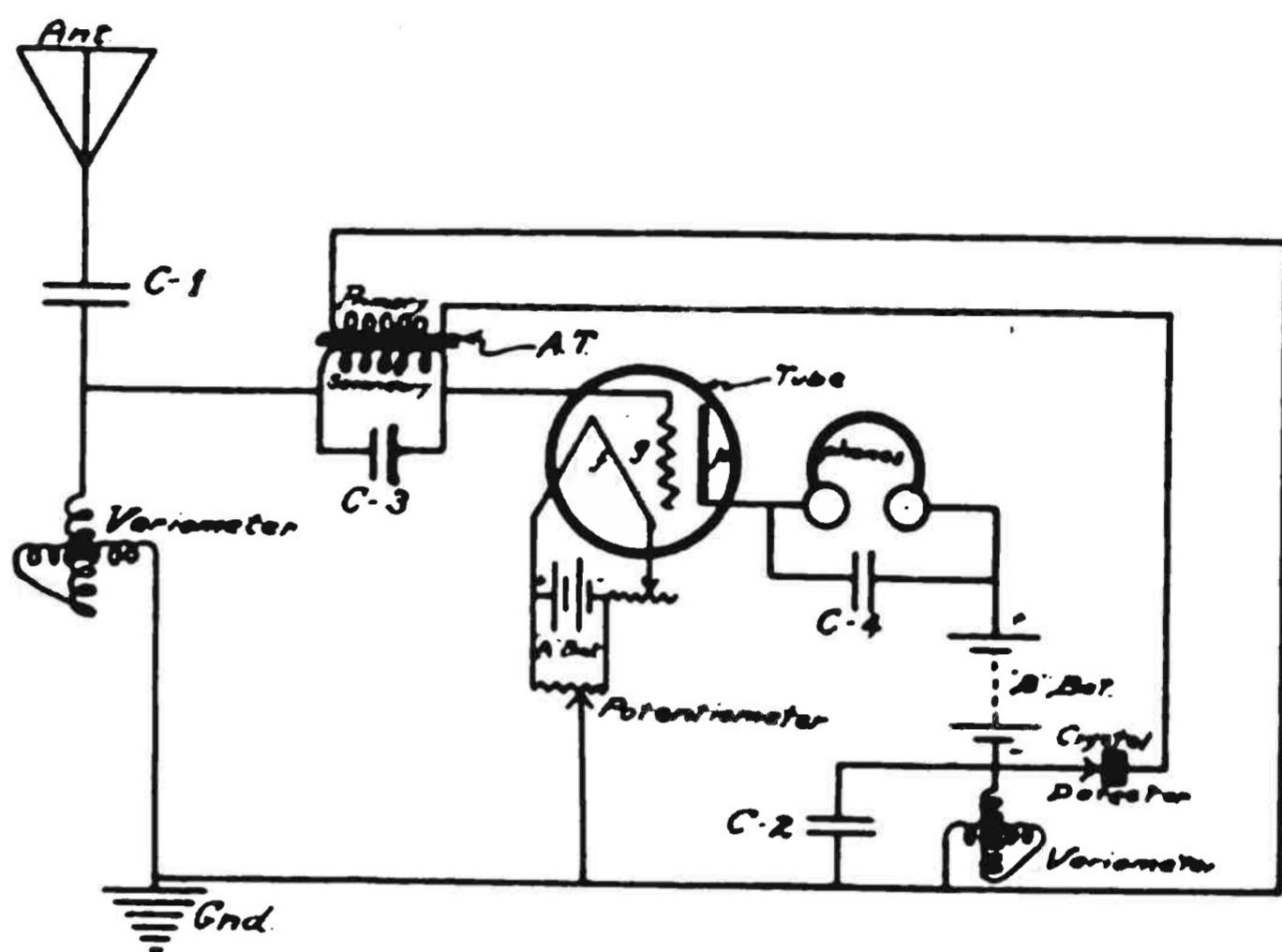


Fig. 1. Schematic wiring diagram of the reflex set described in the accompanying text. The controls on this circuit have been kept down to a minimum. By the use of two variometers, switches are unnecessary. This is a very easily constructed and controlled circuit.

the parts necessary for the construction of the tuner. The following list does not include tube, batteries, or phones:

2 Variometers	\$10.00
1 Audio-frequency transformer	6.00
2 .0005 mfd. mica condensers .....	.80
1 .002 mfd. mica condenser .....	.40
1 .001 mfd mica condenser .....	.40
1 Vacuum tube socket	1.00
1 Filament rheostat	1.20
1 Potentiometer (250 ohms)	1.60
1 Crystal detector	1.40
1 Panel	2.20
Binding posts, wire, etc.	1.00

Total \$26.00

In the foregoing estimate I have given the average cost of the various items, but the total cost should not exceed the total of \$26.00 unless exceptionally expensive apparatus is purchased. Of course, if the price of a good cabinet is to be added the total cost of the set can be approximately placed at \$30.00, which is indeed very reasonable for a high grade receiver for radiophone work. The volume obtained will not be lower and most likely higher than that obtained from the best single tube regenerative outfit, while the quality will be exceptionally excellent, due to the fact that a crystal detector is used.

The receiver is not intended for straight C-W work, but is paramount for radiophone reception on the wave lengths at present employed by broadcasting stations.

Six New Broadcasters

THE following broadcasting licenses have been issued by the Department of Commerce:

KFGB, Loewenthal Brothers, Pueblo, Colorado, 10 watts; WQAF, Sandusky Register, Sandusky, Ohio, 5 watts, 360 meters; WRAM, Lombard

College, Galesburg, Illinois, 100 watts; WOAD, Whitall Electric Co., Waterbury, Connecticut, 10 watts; WSAB, Southeast Missouri State College, Cape Girardeau, Missouri, 100 watts; WQAH, Brock-Anderson Electric Engineering Co., Lexington, Kentucky, 20 watts.

Two-Way Talk By Radio

Broadcasting Station at Rensselaer Polytechnic Institute Exchanges Verbal Communication Between WHAZ at Troy, New York, and CFCN at Calgary, Alberta, Can.

TROY, N. Y., February 4.—For the first time since the discovery of wireless, two-way radio telephone verbal communication more than two thousand miles overland has been accomplished. This feat was performed at the instance of radiophone station WHAZ, the largest college broadcasting station in the world conducted by the Rensselaer Polytechnic Institute at Troy, N. Y. The two-way communication was carried on with absolute success and at the will of the operators with station CFCN at Calgary, Alberta, Canada, a distance of approximately two thousand miles airline, and breaks all previous records for two-way overland radio telephone communication by a wide margin, and it is not believed that this distance has ever been exceeded even over water.

The new radio station at the Rensselaer Polytechnic Institute, although established only at the opening of the college year last fall through a gift of \$50,000 from the Roeblings, engineering graduates of the institute, famous as the builders of the Brooklyn Bridge, has already become well-known as the most versatile as well as the widest in range and one of the most efficient of the Class B installations in the United States. Unlike nearly all of its companion high-power broadcasting equipments, station WHAZ does not confine itself to broadcasting, but enters into all other phases of wireless activity as well.

Regularly Heard Over the Continent

Of course the Troy Polytechnic station, like many others, has been heard over considerably greater distances than that of the two-way test. In fact, station WHAZ announced recently the establishment of a new world's record for long distance broadcasting of concert programs, clear reception of both music and speech having been reported from three communities, Hilo, Wailuku and Haiku in the Hawaiian Islands, a distance of approximately 5,500 miles. Its regular Monday evening concert programs and its monthly international midnight programs have been heard in France as well as throughout the North American continent from coast to coast and from Alaska to Panama. It is not unusual for its broadcasts to be reported heard in all of the forty-eight states of the Union, in every province of Canada, in Mexico, Cuba, Porto Rico and the Panama Canal Zone. Widely scattered instances of these reports have come from a Northwest police officer in Hodgson, Manitoba, a snowbound prospector in Alaska, a sojourner in the eternal summer of Miami, Florida, a Cuban planter, a minister entertaining his little group of parishioners high up in the mountains of Lake County, California, a rancher in Montana, a government official in Mexico City and an engineer in Panama. The point is, however, that such listeners have no way of replying, except by cable, telegraph or letter. This has been true, heretofore, even of the high-power, long-wavelength transmission experiments carried on with England by the large commercial companies.

Many Difficulties Overcome

As all radiophone listeners know, it is one matter to "pick up" a program broadcast from a station, say two thousand miles away, by accident, and an entirely different thing

to "receive" from a particular station at that distance, by design, at a definite time and regardless of all kinds of interference. Yet that is what both stations WHAZ and CFCN did early on the morning of January 13 last.

A previous test, hastily arranged and quite casually after the midnight transcontinental program from station WHAZ at Troy on the second Monday of the month, was a partial failure because of interference from other radiophones near Troy. Work was then hurried on a new super-selective receiving set, which had already been almost completed by the engineering instructors at the Rensselaer Polytechnic Institute, and a more complete test was scheduled for four days later. That time, in spite of very severe local electrical disturbances, communication was established during the pre-arranged period and was maintained as long as desired, actually for more than an hour. The communications of the test were reported heard at many remote points. There was a heavy snowstorm in progress in Troy at the time and the static was extremely bad. Sparks were continually jumping across the antenna series condenser and it was possible to operate a small electro-static motor by connecting it across the antenna and ground wires.

A Powerful Receiving Set

The radio engineers at the Rensselaer Tech describe the new receiving set, which they used in this record-breaking test, as a conventional type of super-heterodyne, employing a maximum of eleven vacuum tubes. Eight were used at the time of the test with Calgary. The 400 meter wave length of the incoming signal is first changed to 3,000 meters; the signal is then amplified by a five-stage radio frequency amplifier and passed on to a detector tube. Additional audio frequency amplifiers are used when it is desired to use a loud speaker. Pacific Coast stations were heard with this receiver on the night its construction was completed. Varied experiments are being carried on now by the Institute engineers with other sets of this type which are less conventional, and the Institute is providing a large amount of equipment and measuring apparatus.

Short-Wave Experimentation

Short-wave telegraph experiments of all kinds are being conducted by the radio staff and Station 2XAP, the chief radio telegraph installation of the Institute, has been reported QSA in Hawaii, France and England and at all points between. This station was one of the first successful contestants in the transatlantic tests last December. A larger telegraph transmitter of a newer type is now nearing completion, and several smaller sets are in operation for short distance work. The two operators at the Institute station state that they will be glad to use both 2XAP and 2CDC in inter-collegiate communication and in American Radio League work as much as their rather limited time permits.

From all this it is apparent that the Monday evening concert programs, with which the radio public of the country is now so familiar, represent but a part of the wireless activities of the Rensselaer Polytechnic Institute's versatile radio station.

Birds, Song, Mystery



(U. S. News and World Report)
At a recent demonstration, three mechanical birds were made to move their heads and sing in the most mysterious manner. The birds sang the Mendelssohn "Spring Song" and moved in a very natural manner.

Makes Deaf Hear



(C. Keystone View Co.)
Geo. Farrar, 12-year-old lad, attending the California School for the Deaf, claims he has perfected a means of enabling the deaf to hear by means of vibrations. Power amplifiers are used in connection with phones whose diaphragms are unusually thin, so that the vibration against the dead ear drums are as strong as possible.

The "Farthest North" Broadcasting Station

By J. L. Wilkie

To amateurs, sitting in nice cozy, warm rooms, with loud speakers and all the newest accessories which make the up-to-date radio set, this article is addressed. Imagine, if you will, that instead of being where you are, you are up in "the farthest north," where the wind is biting cold and where the snow lasts for ten months in the year instead of ten weeks. Add to all this the hardships of working under the most adverse conditions possible, and you will have a slight idea of what the crew of the "World's Farthest North Radio Broadcasting Station" has to contend with.

This broadcasting station in question is the one located on Jan Mayen Island, a tiny cone of an extinct volcano, in the Arctic Ocean, north of Iceland. This station is financed by the Norwegian Government, and is in charge of Akbard Ekerold, an American citizen.

This station was erected by Norway, as a Central Weather Broadcasting Station, because of the fact, well understood by scientists, that all weather, be it good or bad, warm or cold, windy or calm, originates in the Arctic zone. This is the first of three stations that will be erected in the Arctic, and when the three are in operation, it is expected that weather predictions, originating from the chain of stations, will be so accurate that storm warnings can be sent out with amazing accuracy, and many lives and millions of dollars can be saved.

Imagine the captain of a large ocean liner crossing the vast expanse of water. Suddenly, the radio operator picks up the telephone that connects

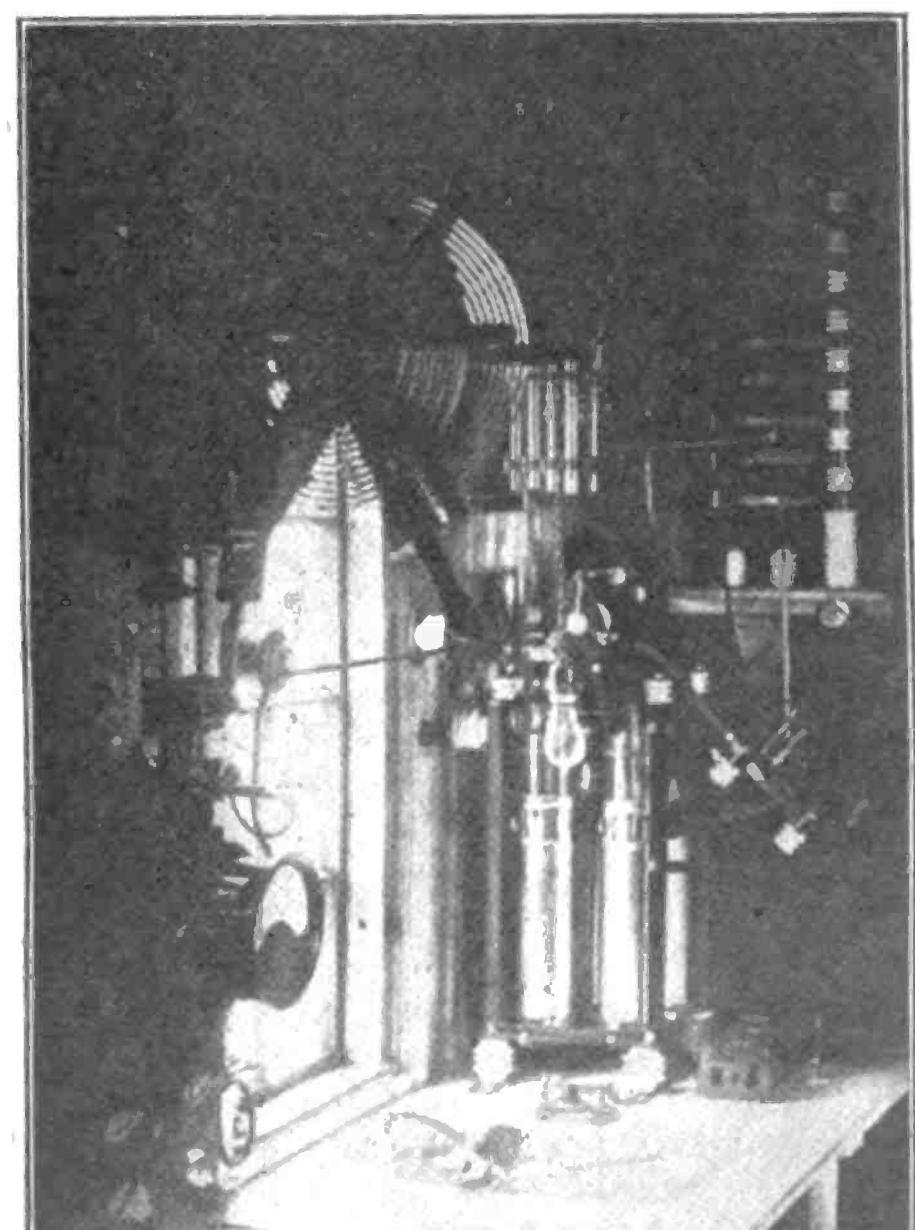


(C. Gilliams Service)

The Ekerold party that established the station. Mr. Elkerold, who is in direct charge of this station, is the second man on the right. The man at his left is chief operator.

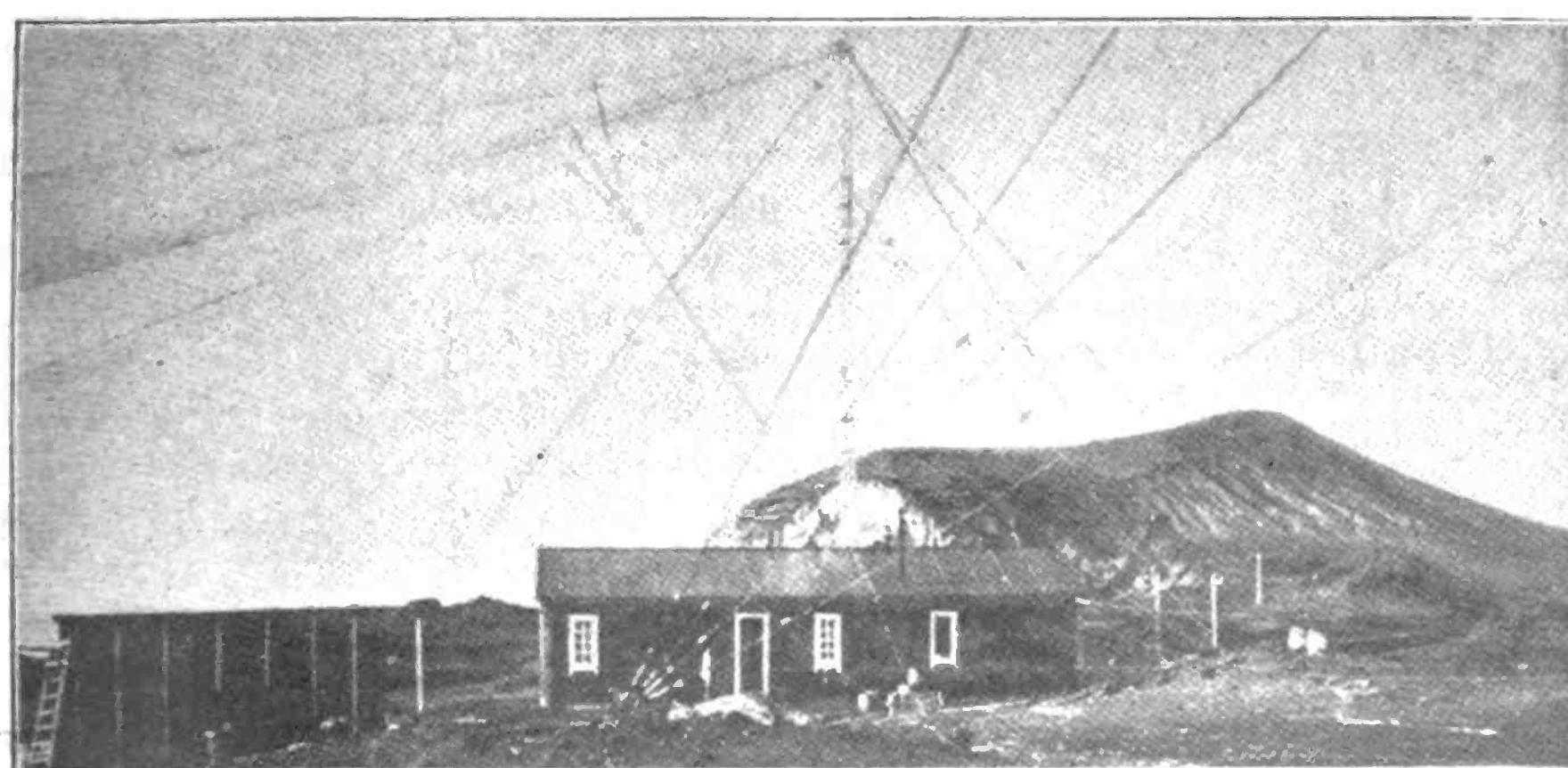
with the bridge. "Yes, sir. Jan Mayen Island just sent out a storm warning of a hurricane originating over latitude —, longitude —, and sweeping rapidly southeastward." The captain, plotting his course, and the course of the hurricane, finds that if he continues on the direct course he is pursuing he will cross the path of the storm in a certain number of hours. Therefore, secure in the knowledge that he possesses he is able to either change his course or make such changes as he thinks necessary for the safety of his passengers.

These daring pioneers of this outpost of "radio communication" are to be commended. The service that they render to the public in general cannot be measured in terms of dollars and cents.



(C. Gilliams Service)

Transmitting apparatus used. As travel is impossible for nearly seven months of the year, it was not thought advisable to install the regular telephone apparatus. Therefore, regular spark transmitting apparatus is used.



(C. Gilliams Service)

The antennae used by the world's "farthest north" broadcasting station, established by the Norwegian Government for the purpose of broadcasting weather forecasts, marks the outpost of civilization. It is located on Jan Mayen Island, in the Arctic Ocean.

Radio Frequency vs: Audio Frequency Amplification

By M. C. Batsel

Radio Engineer, Westinghouse Electric & Manufacturing Company

CONSIDERABLE confusion exists in the minds of the public regarding the functions of radio frequency and audio frequency amplifiers. In this article I shall endeavor to give the distinguishing difference between these two methods of amplification, and to point out the advantages of each.

If music or speech is received by means of a detector tube only, without regeneration or other amplification, the music is not very loud, even when received from a nearby, powerful station. Distant stations, though received distinctly, may be so weak that they are heard with difficulty. When weak stations are heard distinctly, they may be made as loud as desired by using audio frequency amplification. If head phones are to be used, there is little or no advantage in using more than one stage of audio frequency amplification, as experience has shown that if the music or speech cannot be heard distinctly with one efficient stage of amplification and good head phones, they cannot be heard with any amount of audio frequency.

If an efficient loud speaker is used two stages of audio frequency amplification will give about the same strength as an ordinary phonograph, provided the music can be heard distinctly on the detector tube alone, and if sufficient power can be delivered by the last amplifying tube. It is often advisable to use two tubes in parallel in the last stage of amplification unless a much higher plate voltage is provided for this stage than is used for the first stage. Additional stages of audio frequency amplification can be added to make the music or speech as loud as may be desired.

In order to preserve the quality of music and speech, the audio frequency amplifier must be capable of amplifying practically all audible frequencies. All noises due to batteries and tubes are, therefore, amplified to the same extent as the music. For this reason it is necessary to use plate circuit batteries especially designed for use with vacuum tube amplifiers and to have all parts of the circuit well insulated.

Audio frequency amplification is absolutely necessary for satisfactory operation of a loud speaking receiver. Since the advent of radio broadcasting much development work has been done to improve the audio frequency amplifier, and as a result amplifiers have been developed which produce practically no distortion of music or speech, and loud speaking receivers are now available that reproduce music so accurately that it meets the approval of the most exacting critic.

All radio detectors that can be used for the reception of music are least efficient when the received currents are weakest. For this reason radio frequency amplification is desirable.

Radio frequency amplification strengthens the received

currents before they are changed to audio frequency by the detector. Thus by using radio frequency amplification, stations can be heard distinctly which cannot be heard on a simple detector and with any amount of audio frequency amplification.

The most widely used and simplest form of the radio frequency amplifier is the form represented by the Armstrong regenerative circuit. This is also the most efficient means of obtaining radio frequency amplification. No additional tubes are required, the same tube being used as a radio frequency amplifier and a detector. Most all efficient radio frequency amplifiers, that operate on the wave lengths used for broadcasting, function on account of regeneration.

The regenerative detector tube produces about the same amount of amplification as can be obtained by using two stages of radio frequency with transformers. If more amplification is desired than can be had with a regenerative tube it is necessary to use at least three stages.

The benefits accruing from the use of a great amount of radio frequency amplification are: it gives greater sensitivity; smaller antennae or coil antenna may be used; and due to the greater sensitivity very loosely coupled antenna and secondary circuits may be used, resulting in a greater selectivity.

The greatest use of multistage radio frequency amplifiers is where receivers are located in apartment houses or in other locations where an efficient antenna cannot be erected, or when extremely weak stations are to be received. The loud speaking receiver with three stages of radio frequency amplification usually has at least six vacuum tubes. The expense of maintaining the tubes and batteries is, of course, greater in proportion to the number of tubes used.

During the summer months there is a greater freedom from atmospheric disturbances when small antenna or coils are used with the radio frequency amplification. This is due to the fact that the small antenna is less affected by atmospheric disturbances, than is the large antenna, in proportion to the energy received from the transmitting station.

The development of tubes requiring a small amount of filament energy and operating on dry cells should give a considerable impetus to the development of multistage radio frequency amplifiers.

The elimination of the storage battery as a necessary part of the receiving equipment makes it possible for those who desire to operate a radio receiver in a well furnished room to do so without danger of injuring the floor coverings and woodwork. The entire equipment using dry cells may be enclosed in an attractive cabinet and requires no attention except an occasional renewal of dry cells. These can be purchased at any electrical supply house.

Gov. Alfred E. Smith's Noon Hour Address Broadcast

Governor Alfred E. Smith of New York, who appeared before a special noon hour meeting of the New York Board of Trade and Transportation on

Saturday, Feb. 3, outlined his plans and policies toward the big problems that confront him in his second administration. Governor Smith's address was broadcast direct from the clubrooms of the New York Board of Trade and Transportation at 41 Park Row, New York City, on a 360 meter wave length by WJZ. The broadcasting of this address made

it possible for business men in New York State to get the Governor's viewpoint at the same time or perhaps a fraction of a second before the gathering at the clubrooms. Sound waves travel by radio over a million times faster than they travel through the air; namely, 186,000 miles a second by radio and only a thousand feet a second through the air.

Efficient Radio Control of Battleships

By Garrett F. Erskine

ONE of the latest inventions tried out recently by the United States Navy is the control of a battleship by means of radio from an airplane above

fact, everything that is possible with a full crew of men was attempted and successfully carried out.

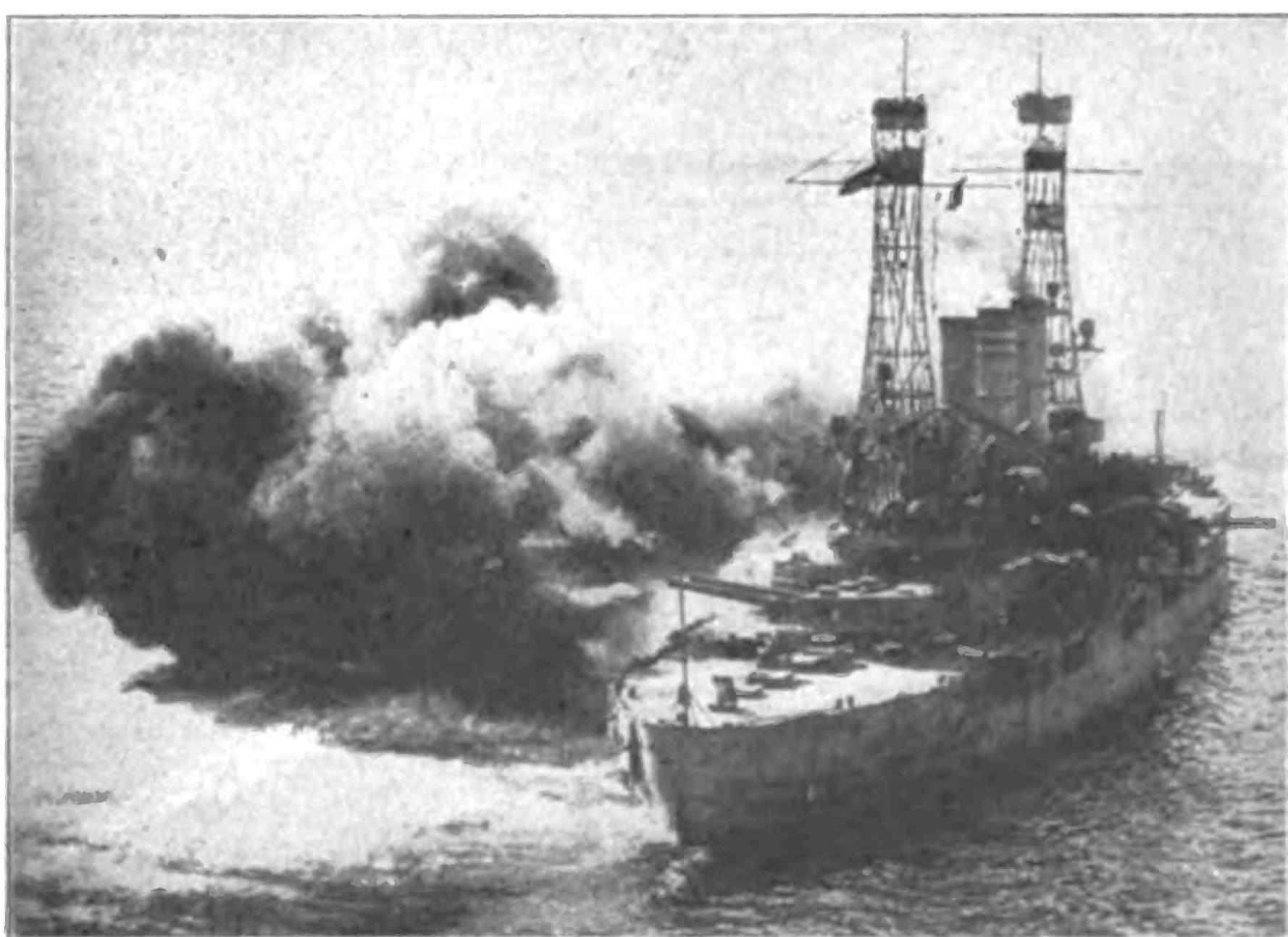
Of course, the principle of radio con-

ever been attempted on such a tremendous scale. While the maneuvering of the ship was in the hands of the operator in the airplane or on the distant ship, there were still enough men aboard the radio-controlled ship to enable the men to take the ship back safely in case any trouble was experienced with the control apparatus.

In this maneuvering of the ship a special wave-length was used to prevent any trouble being caused by interference.

The mechanical details, such as the loading of the guns and the starting of the fires in the boilers, were, of course, impossible by remote control, and were done by the gunners and firemen aboard the ship; but the actual firing of the guns and steering of the ship was independent of the few men aboard.

The United States Government is the first to successfully utilize radio as a means of controlling vessels, and, although many other governments have been attempting it, we are the first to really do it successfully. This, of course, will be of the utmost importance in case of any future trouble necessitating the use of men and battleships. It will mean a great saving of life in case of war, and will also mean that the immense number of men that have heretofore been a necessary part of a ship's complement will be reduced as all the necessary maneuvers can be executed from an airplane above.



(L. News Events)
Broadside salvo of 12-inch guns being fired by means of radio control from an airplane flying above the ship. This is one of the latest inventions tried out by the United States Government, and is a perfect success.

—also from another battleship miles distant. The apparatus installed controlled the speed of the vessel, steering it at the will of the operator on the remote vessel, fired the guns; and, in

trol has been known of for several years, and many small models of both ships and automobiles have been successfully built and worked; but this is the first time that radio control has

Col. E. H. R. Green an Ardent Radio Fan



(C. Fotograms, N. Y.)

Colonel Edward H. R. Green, millionaire son of the late Hetty Green, is a radio fan of the first water. He has built one of the finest radio laboratories in the United States, and some of the most eminent radio experts in the world are working out their ideas in his laboratory, which he has given over to the purpose of improving radio. Col. Green is an ardent experimenter himself, and spends many hours each day working in his laboratory, and the radiophone station at Round Hills, Mass., has been heard at great distances. The photo shows one corner of the laboratory, with Col. Green in the center right-hand side spending a pleasant few moments listening in.

Latest List of Broadcasters Totals 570

By Carl H. Butman

WASHINGTON, D. C.—For the first time since broadcasting began in September, 1921, fewer new stations were licensed during the past month than dropped out, indicating that the field for broadcasting is practically filled. This is not to be wondered at, officials point out, because the "saturation point" has been reached. Many fans say, "Well, there are enough anyway; we don't want any more; let the better ones survive."

Today there are 570 broadcasting stations, 28 of which are in the B Class on 400 meters, the balance being on the more popular 360 meter wave. On January 1 there were 576, showing a loss of six during the month. While there were 28 new stations licensed in January, 34 old ones failed to renew their licenses.

On the first of February last year, there were only 36 stations licensed in the new pastime of broadcasting—today there are almost 16 times that number. Many people believe that this is far too many, particularly since they are not well distributed on the 360 meter wave. The radio bill, however, provides for the distribution of a large number of new waves, which will aid in decreasing the interference. Competition is creeping into the game. The best equipped stations giving the best service to the fans will probably become the permanent ones in the long run, it is believed.

Within the past week, seven new broadcasters were licensed by Mr. Hoover's Radio Section, and two Class A stations were transferred to the B Class, on the 400 meter wave.

List of New Broadcasting Stations

WRAV—Antioch College, Yellow Spring, Ohio, 200 watts.

WQAO—Calvary Baptist Church, New York, N. Y., 100 watts.

WPAZ—Koch, Dr. John R., Charleston, W. Va., 20 watts.

KFCV—Mahaffey, Jr., Fred, Houston, Texas, 50 watts.

WRAJ—Pickering Co., M. H., Pittsburgh, Pa., 500 watts.

WQAR—Press Publishing Co., Muncie, Indiana, 10 watts.

WSAA—Sprague, B. S. Elect. Co., Marietta, Ohio, 25 watts.

Transferred from Class A to Class B Stations on 400 Meters

KFI—Anthony, Earle C., Inc., Los Angeles, Calif., 500 watts.

KPO—Hale Bros., Inc., San Francisco, Calif., 500 watts.

Broadcasters Which Have Stopped

The thirty-four broadcasters which have not renewed licenses and consequently were deleted from the records of the Commerce Department during January follow:

Broadcasting Stations Deleted

WLAD—Anthracite Radio Shop, Scranton, Pa.

KZY—Atlantic-Pacific Radio Supply Co., San Francisco, Calif.

WNAJ—Benson Co., Chicago, Ill.

KFBN—Borch Radio Corp., Oakland, Calif.

WOE—Buckeye Radio Service Co., Akron, Ohio.

KDYO—Carlson & Simpson, San Diego, Calif.

WPE—Central Radio Co., Inc., Kansas City, Mo. (Renewed at Independence, Mo., Jan. 5th.)

KFBM—Cook & Foster, Astoria, Oregon.

WSX—Erie Radio Co., Erie, Pa.

KDZW—Gerdes, Claude W., San Francisco, Calif.
KFAC—Glendale Daily Press, Glendale, Calif.
WDAQ—Hartman-Riker Electric & Machine Co., Brownsville, Pa.

WKAZ—Landau's Music & Jewelry Co., Wilkes-Barre, Pa.

WKAD—Looff, Charles, East Providence, R. I.

WBAJ—Marshall-Gerkin Co., Toledo, Ohio.

KVQ—McClatchy, James, Sacramento, Calif.

WDAV—Muskegee Daily Phoenix, Muskogee, Okla.

KDZP—Newbery Elect. Corp., Los Angeles, Calif.

KFC—Northern Radio & Elect. Co., Seattle, Wash.

WBAB—Potter, Andrew J., Syracuse, N. Y.

WAAX—Radio Service Corp., Crafton, Pa.

KYY—Radio Telephone Shop, San Francisco, Calif.

WNAG—Rathert Radio & Elect. Co., Cresco, Iowa.

WGAS—Ray-Di-Co. Organization, Chicago, Ill.

WFO—Rike Kumler Co., The, Dayton, Ohio.

WPJ—St. Joseph College, Phila., Pa.

KFBQ—Savage Elect. Co., Prescott, Arizona.

WHW—Seeley, Stuart W., East Lansing, Mich.

WSN—Ship Owners Radio Service, Inc., Norfolk, Va.

KJC—Standard Radio Co., Los Angeles, Calif.

WCAQ—Tri-State Radio Mfg. & Supply Co., Defiance, Ohio.

WJAL—Victor Radio Corp., Portland, Me.

WNAH—Wilkes-Barre Radio Repair Shop, Wilkes-Barre, Pa.

WJAU—Yankton College, Yankton, S. D.

First American Aircraft Licenses Issued

By Washington R. Service

WASHINGTON, D. C.—Radio as a safety measure for the protection of pilots and passengers has come into its own in air travel as well as on the sea, where its value was first realized. Seven airplanes and flying boats are now equipped with radio and answer to regular calls.

The first American aircraft, other than those of the Army and Navy, which are all radio-equipped but not licensed, to be licensed as a limited commercial station was one belonging to the Airline Transportation Co. of California.

Aircraft Licensed as Limited Commercial Stations on 525 Meters

KFBI—Airline Arrow, No. 1, Airline Transportation Co., Los Angeles, Calif., Aug., 1922.

KFBY—Balboa, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.

KFBA—Buckeye, Aeromarine Airways, Inc., New York, Dec. 22, 1922.

KFBF—Gov. Cordeaux, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.

KFBJ—Nina, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.

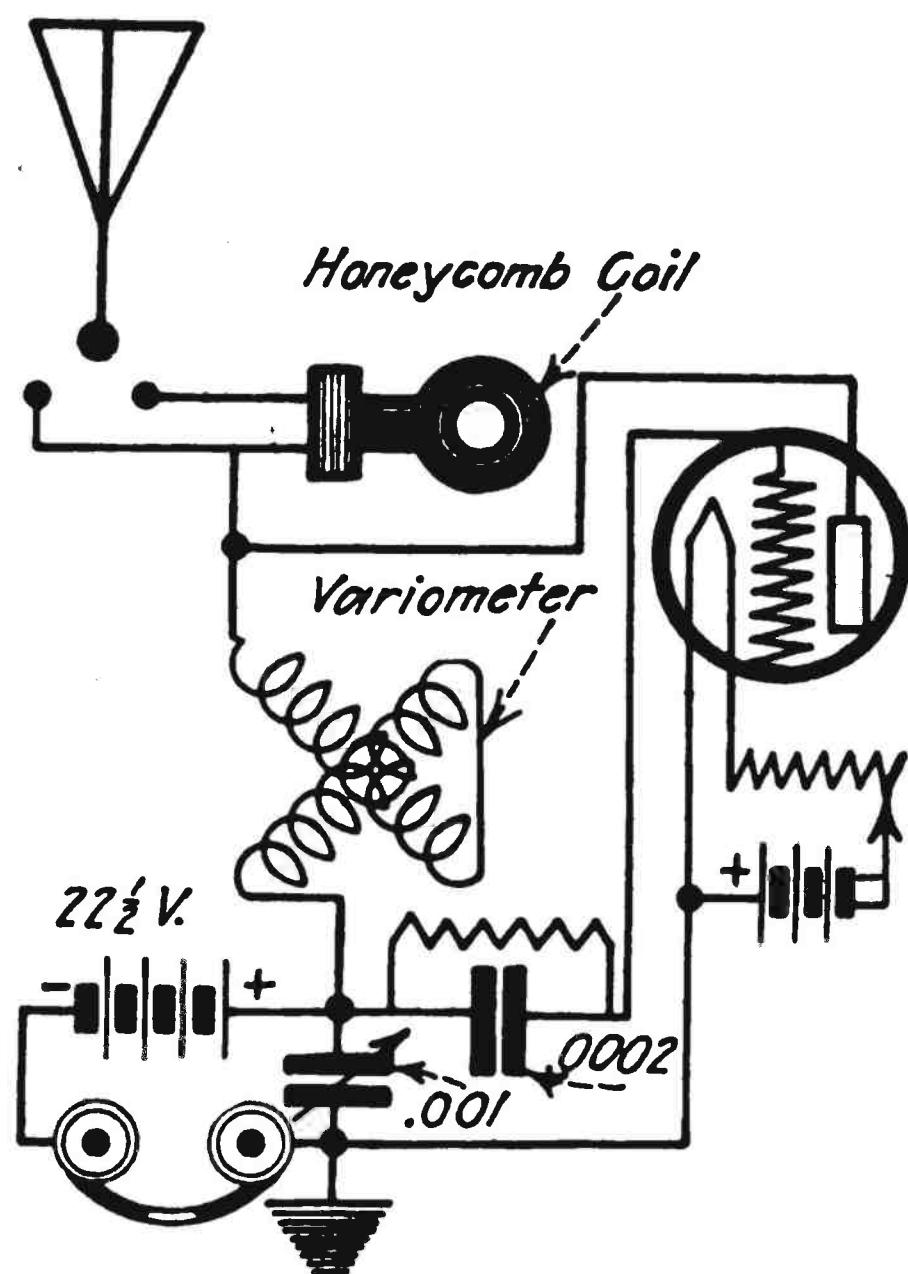
KFBM—Ponce de Leon, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.

KFBZ—Santa Marie, Aeromarine Airways, Inc., New York City, Jan. 18, 1923.

A Hookup That's a Wonder

By George W. May

ONE of the old-time devices used for tuning was the tuning coil having one, two or three sliders. Many are in use since the idea of broadcasting swept the country, probably because they can be constructed quickly



A new single-circuit, one-tube set that will keep the experimenters busy for a while. The grid leak in this set is very critical. By the use of the honeycomb coil, any wave length may be reached. When short waves are desired, the variometer alone is used. Extreme care should be taken in the wiring of this set.

and easily, but their efficiency is not to be compared to the results obtained with variometers, or honeycomb coils.

Several new hookups have appeared from time to time,

but there is shown herewith a hookup that is the "cat's meow" when it comes to breaking in on DX stuff. You don't have to throw everything you have into the paper bag or into the furnace, but just make a list of its parts and look over the ones needed. The parts consist of a variometer, a 22-volt B battery, 43 plate variable condenser, vernier type, a grid condenser and leak, a vacuum tube and its etc., and also a honeycomb coil with switch.

The leak in this hookup is a very critical part of the sketch and most careful attention should be given the tube. Also it permits the amateur, with the use of the honeycomb, to get up on the higher waves and listen to the trans-oceanic stations as well as the shorter ones. It utilizes a simple circuit by carrying a wire back from the plate to the antenna lead so that a honeycomb coil can be used with the variometer. *RADIO WORLD* of Nov. 25 showed the original May circuit—a diagram similar to this. Under ordinary circumstances this would constitute a tickler coil, but in the present case it is only in the apparatus.

The tuner takes in all wave lengths from the amateur to transatlantic by merely shifting coils. It is simple to assemble and admirably serves the purpose of the radio-phone novice. For the beginner or the amateur getting out of the crystal class it is, in my opinion, "the goods."

Never mind the mounting of the parts of the panel. Just take a brief glance at the diagram and proceed to the makeup. A set of coils covering the desired range should include D.L. 75 up to 1500 inclusive.

Using this set and hookup without any coils gives you a range within the broadcast limit. With a D.L. 1500 coil most of the high-powered stations such as POZ, FL, YN, MUU and IDO could be read with ease. Very little difficulty is experienced with the set in tuning or oscillating.

The beginner should make a study of the circuit and proceed easily until he masters it, and he will find that after while he will start to add a two stage amplifier for volume or louder signals.

A Literary Critic for Broadcasting

ALL over the country, KDKA, the radio telephone broadcasting station of the Westinghouse Electric and Manufacturing Company is recognized as having about the best trained announcers of any broadcasting station.

The reason for KDKA's reputation, which is deserved, is because that each announcer is trained carefully preceding each program. A supervisor who acts as a literary critic listens to the reading of each announcement prior to its being broadcasted and corrects any inaccuracies or grammatical errors that may be found.

This voice culture is an important part of the broadcasting plan. Each announcer is chosen because of the quality of his voice, for each broadcasting station is known through its announcers.

Since KDKA was first started three years ago, this constant supervision has been exercised over the men who tell the radio fans what is being done.

At East Pittsburgh is located T. H. Bailey Whipple, Literary Critic of the Publicity Department, who exercises a constant supervision over all those who speak from KDKA, in the broadcasting studio. This supervision has been the cause of KDKA

receiving a great deal of praise for its "voice." Each day any number of letters are received which state that KDKA was heard best at any station because of its good voice. Part of this praise is due to the radio engineers and part of it to the quality of the announcer's voice.

It has been a long time since any error has been broadcasted from the Westinghouse station. Theoretically, there is no reason why any mistakes at all should be sent out, but as it is impossible to read proof on a man's voice, as can be done with print, errors do sometimes occur.

It is astonishing to find how quickly errors are caught and how many people write in about them. It is, of course, entirely possible, that in an audience of several hundred thousands, there are many literary critics, but it seems the radio fan is more critical than any other class of people.

An instance of what a broadcast error will stir up happened many months ago at KDKA. A new announcer, who had been rushed into the breach to fill an unexpected vacancy, unconsciously mispronounced the name of an Italian composer. His slip was slight and hardly noticeable, but within the next few days letters from all parts of the

Union, including those from musical circles, college professors, and other widely divergent paths were received, all calling attention to the fact that KDKA had been in error.

Since that experience, which was painful to the pride of the radio officials, very, very few errors have been allowed to go unnoticed, and the announcer who makes an error always corrects himself immediately or knows that he will hear about it from those "higher up."

It is only by constant supervision and training that a broadcast program can be made perfect, and it is felt that KDKA has set an example for other stations that will tend to make the average broadcasting intellectually higher, and what every critic wants—grammatically correct and elocutionally perfect.

Youmer

Jibbs: "Have you got Davenport yet?"
Fibbs: "No, we decided to get twin beds instead."

Subscribe for *Radio World*, \$6.00 a year, \$3.00 six months, \$1.50 three months.

The Radio Primer

A Weekly A. B. C. of Radio for the Beginner, in which Elementary Facts and Principles Are Fully and Tersely Explained and all Words and Terms Used by Amateurs and Experts Defined

WHAT is the purpose of the radio compass?

By means of the radio compass (direction finder) a person is enabled to determine the location of a transmitting station. In locating stations generally two or three sets are employed, usually some distance apart. By plotting the direction of each of the received signals on a map or chart the exact location of the transmitter can be found.

* * *

Upon what principle does this apparatus operate?

A radio compass, or direction finder, operates upon the principle that, when a coil is turned so that the plane of its windings is perpendicular to the direction of an emitted electric wave, the induced E. M. F. is at a minimum; but when the coil is turned so that the plane of its windings is parallel to the direction in which the waves are traveling the lines of force cutting the coil will be at a maximum, and the signals will be the strongest. In the operation of such a coil (loop antenna) used for direction finding there is what is termed a broad "maximum." By that is meant that there is not a critical position in the rotation of the coil at which the signal intensity in the receiver will be of such intensity as to be readily distinguishable from other

signals originating within a number of degrees on either side of it. This is overcome, however, by rotating the coil so that the plane of it is at right angles to the incoming signals. When this is done a sharp "minimum" signal will be heard, and more accurate bearings may be determined.

* * *

What are some of the advantages of using a loop antenna for receiving sets?

By use of the principle above outlined it is seen that loop antenna lessens interference by providing a directional effect. It is therefore easier to tune out stations that are not desired. Static or atmospheric disturbance is lessened. Inductances are unnecessary, the tuning generally being accomplished by means of a variable condenser in parallel with the loop and changing the plane of the loop in relation to the direction of the signals.

* * *

Can an outside antenna be said to be directional?

It is a generally accepted fact that a straight-wire antenna is more or less directional in the direction of its plane. By this is meant that, if the antenna lies east and west, the signals will be slightly stronger from either the east or west than from the north or south. This slightly different intensity, how-

ever, is not noticeable, as the difference is so slight that it matters little.

* * *

Which antenna is considered to be best for general use?

A one-wire aerial from 60 to 100 feet in length and 40 to 70 feet in height is generally considered to be most efficient for average use.

* * *

In erecting an antenna, what precautions are necessary?

When erecting an antenna it should not be allowed to touch any walls or iron structure. It should be well insulated. It should not cross any power lines. It should not be too long, otherwise trouble will be experienced when short-wave reception is desired. The lead-in should be brought in to the set through an insulating bushing. If more than one wire is used in an antenna the diameter of the lead-in should be approximately the combined diameters of the number of wires used.

* * *

What is the purpose of a "ground switch"?

The purpose of a ground switch is to connect the antenna directly to the ground when it is not in use. According to the new regulation of the Board of Fire Underwriters they are not necessary if a device called the Vacuum Lightning Arrester is used.

An Accidental Discovery

By D. P. Metzgar

AFTER spending considerable time in experimental work, and building all of the popular circuits and a few of my own, I had one of the most puzzling things happen with my outfit that I have ever experienced.

One day I wanted to get a local concert, and not having a suitable circuit at hand, I built the well known vario-

meter circuit. Completing this, I placed it in my cabinet.

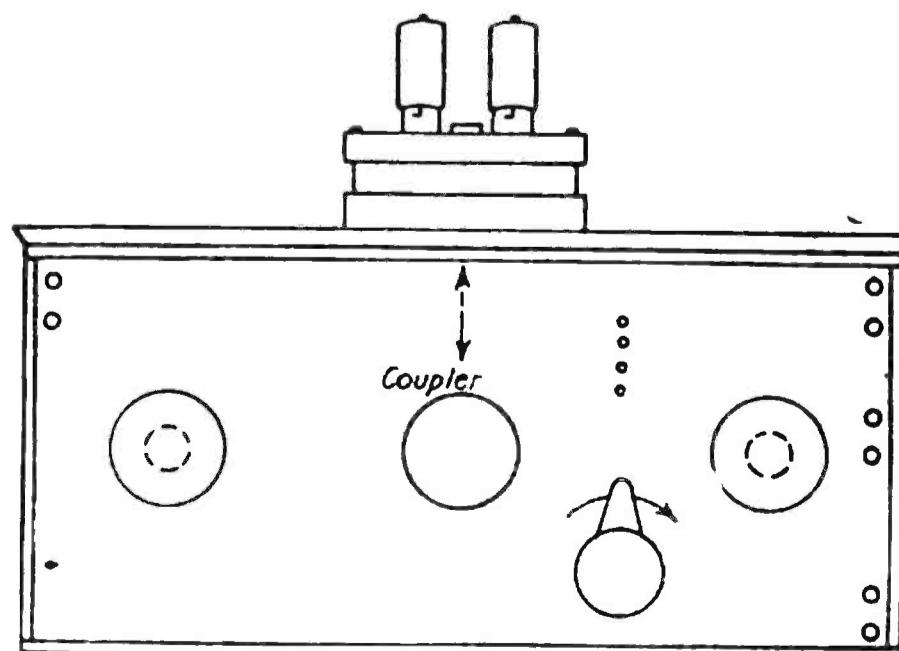
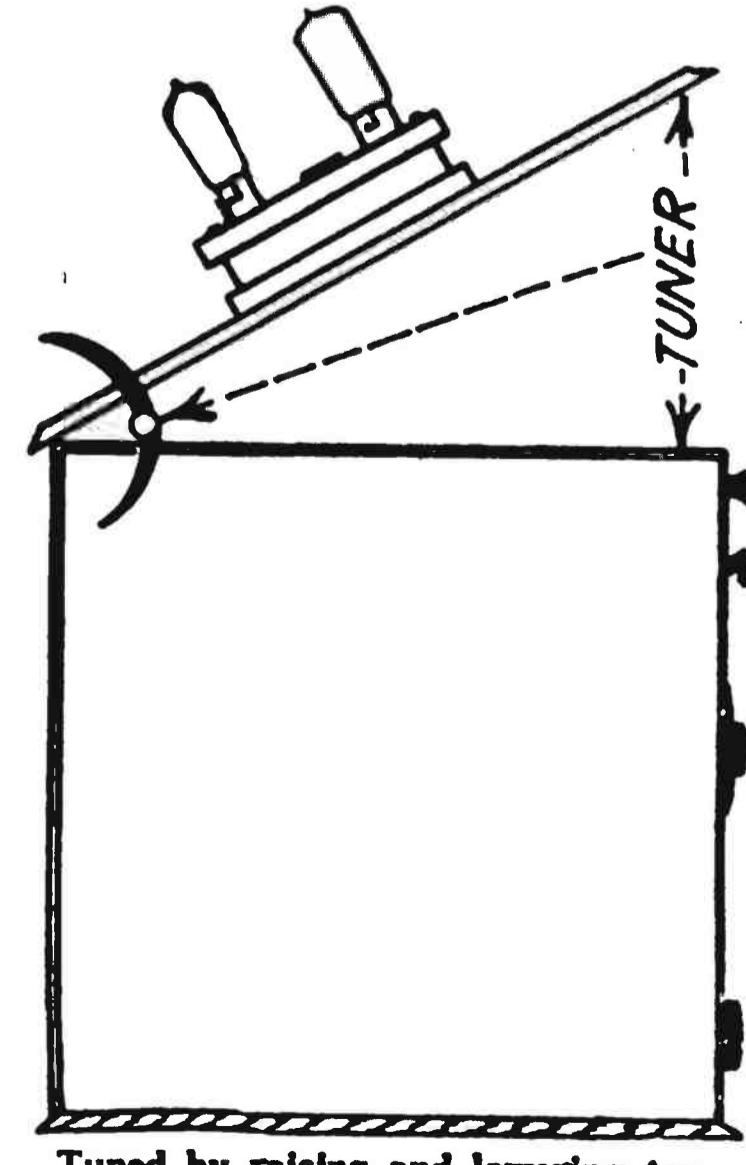
I am using a well known two-step amplifier which is enclosed in a steel, oval-shaped cabinet. I mounted the two-step in the center on the lid of the cabinet and proceeded to replace battery and phone connections. I placed in the grid, a .0005 condenser without a grid leak. After a moment of tuning, I knew that something was wrong. I went over the circuit three times and found things in perfect order.

In one last effort I lighted my tubes, but got no results. I started to raise the lid of my cabinet and immediately "The Star Telegram" came in loud and clear, and within the course of an hour I had copied nine phone stations, including WSB, the Atlanta Journal.

I found that tuning with variometers and with secondary had no effect whatever on the music while I had the lid open at different angles.

Most of you radio fans will know that the induction from the two-step through the lid of the cabinet was the cause of this, yet how many of you can take this little incident and work out a simplified

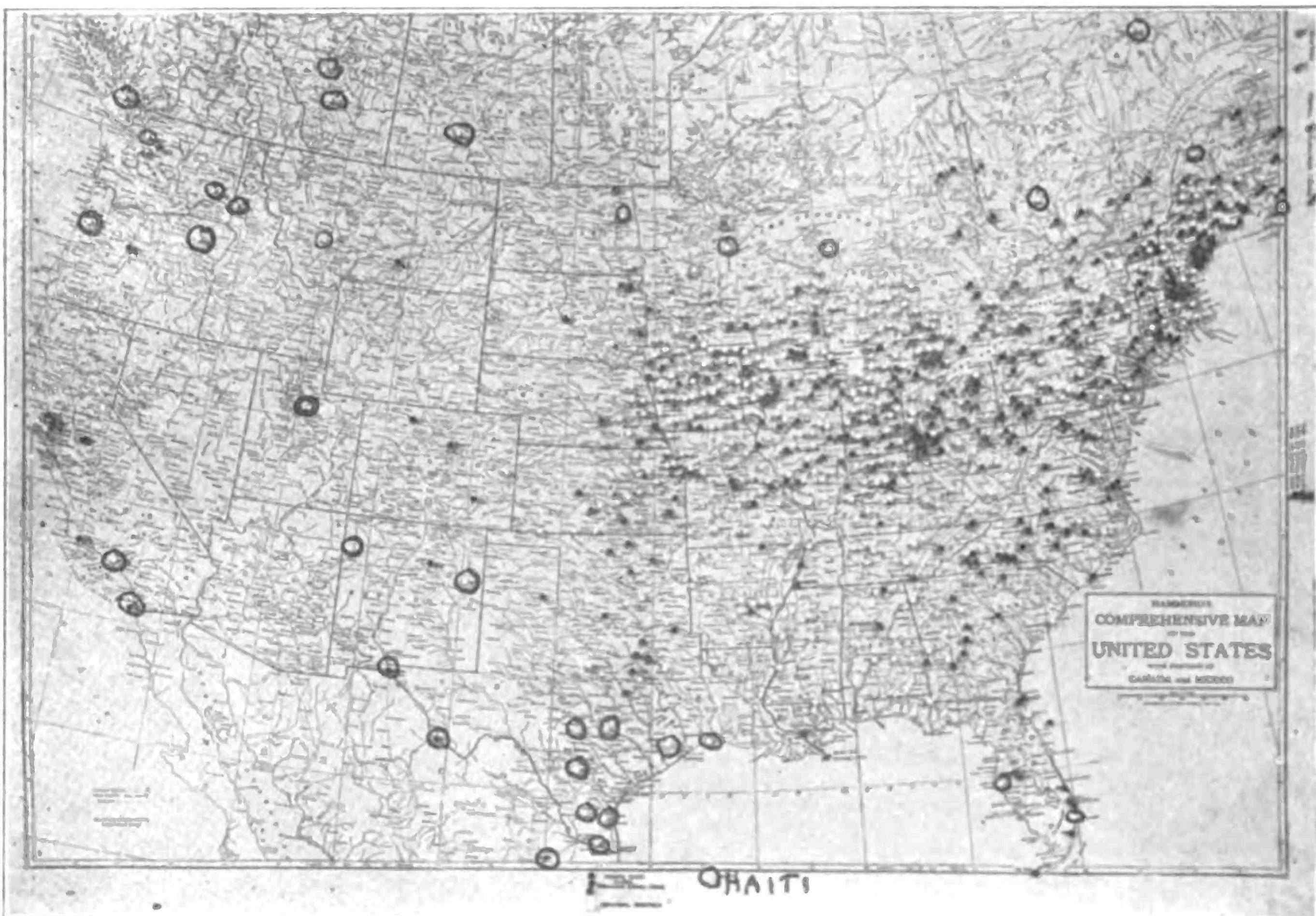
tuning device that may aid the coming radio?



How the amplifiers was mounted.

WJZ Heard from Coast to Coast

By John Kent



Map showing the enormous range of the broadcasting station WJZ at Newark, N. J. The little black circles are pins, which were circled in ink to make them stand out. You will notice that the best reception has been accomplished on the eastern side of the United States, and there is a very well-defined area where they have suddenly dropped off. This is a ready reference for this station, showing where it has been heard.

THE map of WJZ's distance record shows the range of one of the largest eastern broadcasting stations. It is what you would see were you to visit station WJZ, the Westinghouse broadcasting station at Newark, New Jersey. By this method, originated by the operators at the station, when they receive a letter or a telegram from some locality hitherto unheard from, they place a colored pin in the city mentioned. This gives them a ready reference as to where they have been heard.

In all the operators have charted over 188 towns, the furthest west being located in California and Oregon. Fifty reports have been received from England and a number from France, telling of entire programs received, and one ship at sea has heard this station on a crystal detector using

two steps of audio frequency amplification while 1,750 miles out of New York harbor.

This station receives so much mail during the day, that were it to announce the names of letters received over the "air" they would not have any time for the rest of their program, and so they just stick a pin in the map and acknowledge the letter otherwise. This was impressed on the writer on his visit to this station. An enormous pile of mail, from all parts of the continent, and some from foreign countries, was in stacks in a large table, and being read by two girls. It looked like the mail room of a mail order house instead of a broadcasting station, and vividly impressed on our mind the enormous range of this most powerful station.

Has it Ever Happened to You?

YOUR Set is working fine—in other words, "it's the cats!" Your door-bell rings, and your next door neighbor steps in. "I just thought I would invite myself over to hear the set that you have been bragging so much about." "Sure; step right in. Chicago is just on with some fine dance music."

You go into the room, light up your tubes, adjust your phones comfortably, and start tuning. Nothing happens (it never does) and you start to get worried. "Oh, may be he has just shut down for a little while." "Oh, well, I see where they have Senator Glabbout

talking at Newark tonight. Can you reach him?" "Can I reach Newark! Don't make me laugh. It comes in so loud that you can't wear your phones—wait, here is somebody. Hear that squealing noise?" "Yes, who is it?" "Well, I don't know; wait until he talks."

A very faint and weak voice announces, "Senator Glabbout, will now entertain the radio audience with a very interesting talk on 'My Travels Through Washington in a Flivver.'"

"I thought that he was talking at Newark, tonight?"

"Yes, something must be wrong. It never acted this way before."

And then you wonder what your friend thinks of you.

Transmission via Westinghouse

By D. G. Little

Radio Engineer, Westinghouse Electric and Manufacturing Company

SOME very interesting things have been discovered about radio transmission since broadcasting began. The purpose of this talk is to tell you something about the peculiarities of radio transmission, something about the difficulties encountered, and something of the development that is under way to overcome these difficulties.

Consider for a moment some of our distance records: KDKA has been heard on board a ship in the Pacific Ocean a distance of over 5,000 miles from Pittsburgh; also in Chile, South America, a distance of 4,000 miles. Our Newark station "WJZ" is being heard almost nightly in England and France and has been heard on board a ship in the Mediterranean, 200 miles east of Gibraltar. There seems to be almost no limit to the distances the radio waves travel under exceptionally good atmospheric radio conditions—the average range of these stations is of course not nearly so great as that mentioned.

We are in the habit of thinking that radio signals travel incredibly fast, with the speed of light, at approximately 186,000 miles per second. Of course this is fast compared with our fastest automobiles and airplanes, but it is nevertheless a perfectly definite rate of speed. Let us figure out the length of time it took that artist's voice to reach the listener in the Pacific Ocean, 5,000 miles away. The artist probably stood two feet from the microphone in KDKA's studio. It required two-thousandths of a second for the sound wave from the artist's mouth to reach the microphone. Another two-thousandths of a second elapsed while this sound was being turned into electrical vibrations and then placed upon the transmitting antenna. The 5,000 miles was then traveled in twenty-seven thousandths of a second. Another one-thousandth of a second might be required for the electrical vibration to be turned back into sound at the receiver; giving a total elapsed time of thirty-two thousandths of a second. Now since we do not readily think in thousandths of a second this, to use an old familiar illustration of the speed of sound, would be the length of time required to hear the stroke of a hammer if you were standing thirty-five feet away.

One might think offhand that the radio waves originating at the broadcasting station would travel outward with an equal strength in all directions, and that at a certain distance a receiving set would give a signal of whether the receiver was north, south, east or west of the transmitter. One might also think that this signal would be constant in strength whether the season were summer or winter, daylight or dark. The broadcasting listener is learning that this is far from being the case. Distant signals are much stronger in the winter than in summer. Signals are received much louder at night than in the daytime. As to the direction from the transmitter, each broadcasting station seems to cover certain localities much better than others.

Take for example reception in Boston from Station WBZ at Springfield, Mass., 100 miles distant; from WJZ at Newark, 250 miles distant; and from KDKA at Pittsburgh, 550 miles away. On the average KDKA is received better in Boston than either WBZ or WJZ; although it is over twice as far away and in the same general direction. Likewise KQKA is received better at Springfield than in Newark. On the other hand the States of Ohio, Indiana

and Michigan seem to receive Newark better than KDKA, although Newark is twice the distance. In other words, the area covered by each broadcasting station has some dead spots where this station is received but poorly, and likewise some localities where reception is very good.

In addition to the effects just described there are variations in signal strength from night to night which seem to sweep over the country like a cloud. In a certain locality for example, eastern stations may be received well, and western stations will be weak on a certain night, while the next night the reverse may be the case. On a third night, however, both eastern and western stations are loud. This then would be considered an exceptionally good night for radio.

Then there is fading, a name which has been applied to rather rapid changes in signal strength. This effect is noticeable only with stations over 100 miles away. A distant station may be loud for a few seconds and then may die down or be lost altogether for a relatively short space of time. Fading, no doubt, has been noticed by a large number of broadcasting listeners when trying to hear distant stations. To say the least it is rather annoying. Dead spots are generally constant; seasonal variations can be expected, but good and bad nights and fading cannot as yet be predicted. Observations have been made by the United States Bureau of Standards on this fading without anything being proved except that this effect seems to follow no definite laws nor be caused by any particular condition of weather.

Broadcasting difficulties due to the above conditions are more or less beyond the power of the radio engineers to correct. Of course as a general remedy, more power may be used at the broadcasting station, but this may cause trouble due to interference, particularly in congested areas where there are a number of broadcasting stations. The maximum output is now designated by law as 1,000 watts.

The quality of transmission must be improved to the point where the speaker's

voice becomes again a reality at the receiver. Extraneous noises must be kept out of the radio transmitter so that they will not interfere with the speaker's voice. The wave length of the broadcasting station must be kept constant so that the listener may be able to adjust his tuner dial always to the same point to hear a certain station.

Before any improvement in this direction may be noticed however the Government will be obliged to limit the number of stations in use at one time in a given locality, and assign separate wave lengths to those stations that operate at the same time.

You may be interested in some of the precautions taken at Westinghouse stations to insure that grams are not interrupted through failure of apparatus. The most vital part of the broadcasting set is the vacuum tubes which generate the radio frequency carrier wave, and modulate this wave according to the voice frequency. These tubes are exactly similar to the small tubes in your receiving set, except that they are many times larger. Every Westinghouse station carries a complete spare set of nine of these tubes for replacement in case of failure of one or more of those in use. Each station also carries spares of such parts as condensers, inductances, etc., which may fail in time. In addition a large stock of tubes and parts is carried at the East Pittsburgh works ready for immediate shipment to any station.

The studio equipment at Westinghouse station is installed in duplicate, that is, there are two sets of entirely separate sound pick-up and amplifying apparatus. Either set may be used, leaving the other set always in reserve.

It is absolutely essential that we keep on improving or else the listening public will say we are slipping backward. Experimental work is constantly going on at the East Pittsburgh works towards perfecting each part of the rather complex system. With proper government regulation and the co-operation of all broadcasting stations with the listening public radio broadcasting will become the service that it should be.

Electrical Experts Hear First Transatlantic Phone Message



(C. International News Photos)

The foremost electrical experts of the United Kingdom listening in on the first wireless telephone message transmitted between England and the United States by the American Telephone and Telegraph Co. Signor Marconi can be seen seated in the middle of the group.

Radio Transforms Life for the Lighthouse Keeper and Lightship

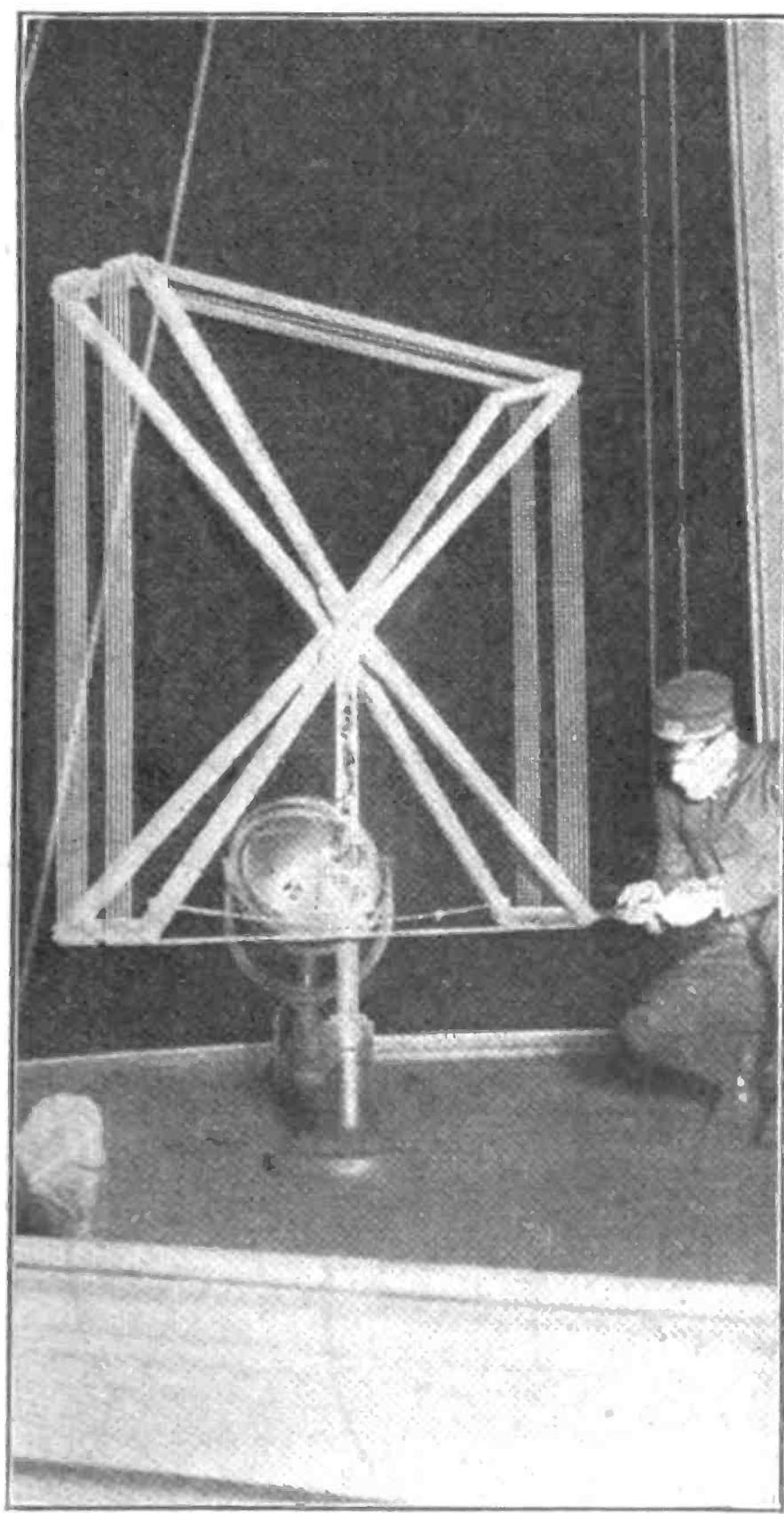
By Albert J. Fieldson

IT is fairly well agreed that where men are called upon to perform rigorous and exacting service there should be some means provided for healthy and needed reaction.

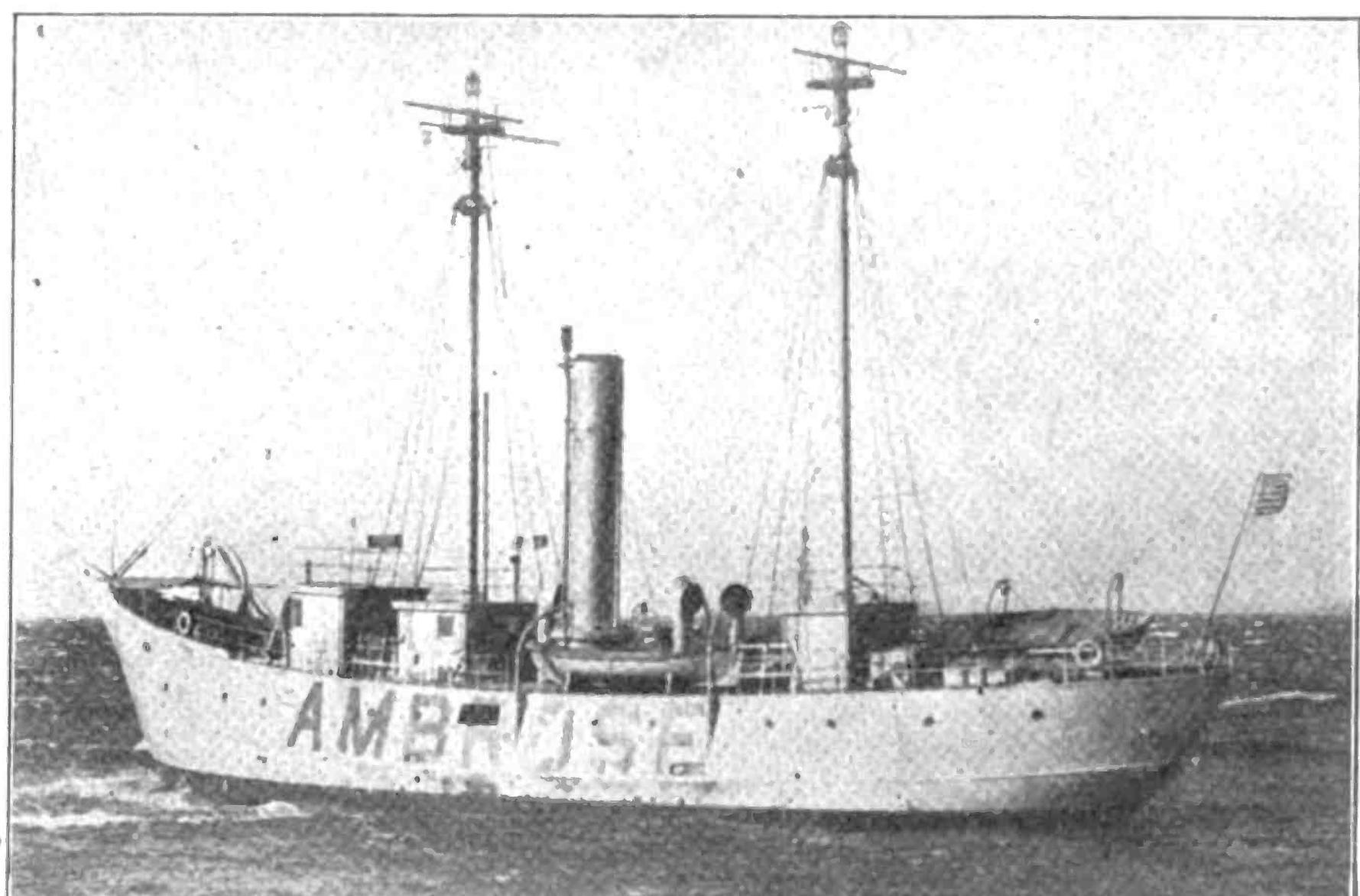
The Lighthouse Service solved one problem by giving the light-tenders along the coast a very liberal amount of shore leave. Until the radiophone came along, however, it could not solve the problem of occasional diversion while the lonely sentinels of the deep were on duty. Now that the radiophone is here with its myriad attractions, the Lighthouse Service has lost no time in bringing it into play, not only for intercommunication between lighthouses and lightships, but also for the entertainment of the man or men on duty.

With this latest addition to their already powerful apparatus, the big lighthouses and lightvessels will have as comprehensive an array of instruments as any station ashore. The Fire Island Lightship outside of New York, for example, has a complete telegraph and telephone transmitter, and an up-to-date regenerative receiver with amplifying unit complete. It has also a radio beacon device, with which it can throw radio waves in one direction much in the same manner as the lamp on its foremast throws out rays of light.

All lightships, however, are not so well equipped as the one guarding the approach to the busiest harbor in the world. To some lightships, the radiophone will come as a boon, and will be the first radio apparatus of any kind to come on board. Think of those lonely old ex-mariners sitting in won-



(C. Kadel and Herbert)
Preparing the loop aerial on the Ambrose Channel Lightship, used in connection with direction-finding service.



(C. Kadel and Herbert)

The Ambrose Lightship, which has just been equipped with the latest radio apparatus to aid ships at sea. It has a complete direction-finding equipment, as well as the most up-to-date receivers and transmitters. This lightship guards one of the channels of New York's harbor.

derment before a radio outfit, and you have one of the most interesting pictures the science can give. The almost continuous concerts coming from broadcasting stations in New York or its vicinity have made life something more than the undying sense of duty so marked in these men.

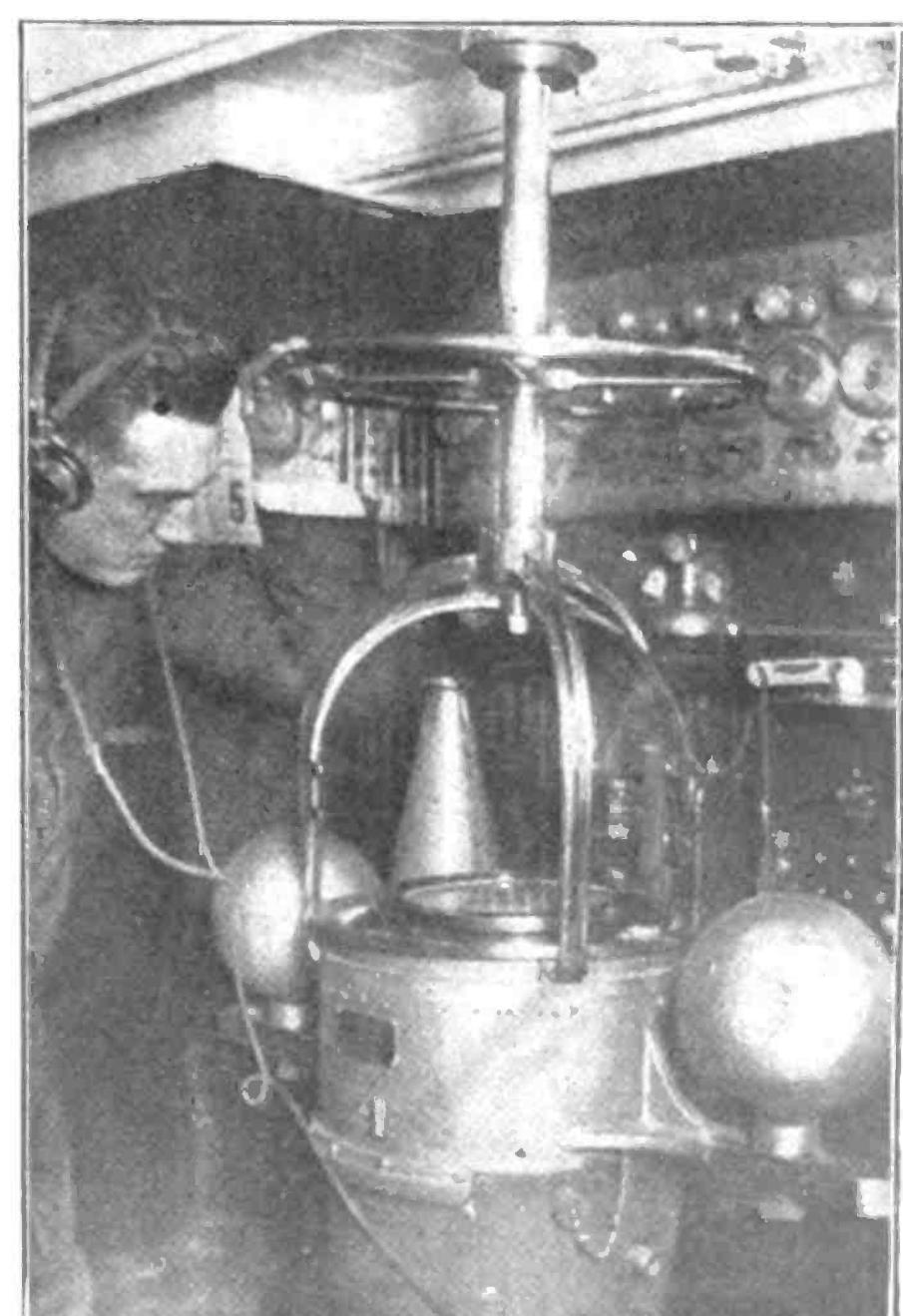
Not only the lighthouses and lightvessels offshore need the radiophone. It often happens that stations situated within sight of land are cut off from the shore for months at a time, while the winter's wind howls and the stormy seas rage. Even the government tenders are unable to reach the near-by station with provisions and other supplies. During these long periods of enforced isolation, the keeper needs a cheering word now and then, and there is no better way to give it to him than by way of the radiophone.

Rather early in the history of radio communication, the value of wireless on board lightvessels was demonstrated by two trial outfits placed on board two lightships in the English Channel. At that time, radio was good for short distances only, thirty-six miles then standing as the record distance. This was in 1898, while Marconi was carrying on his now famous experiments before the Post Office officials in Great Britain.

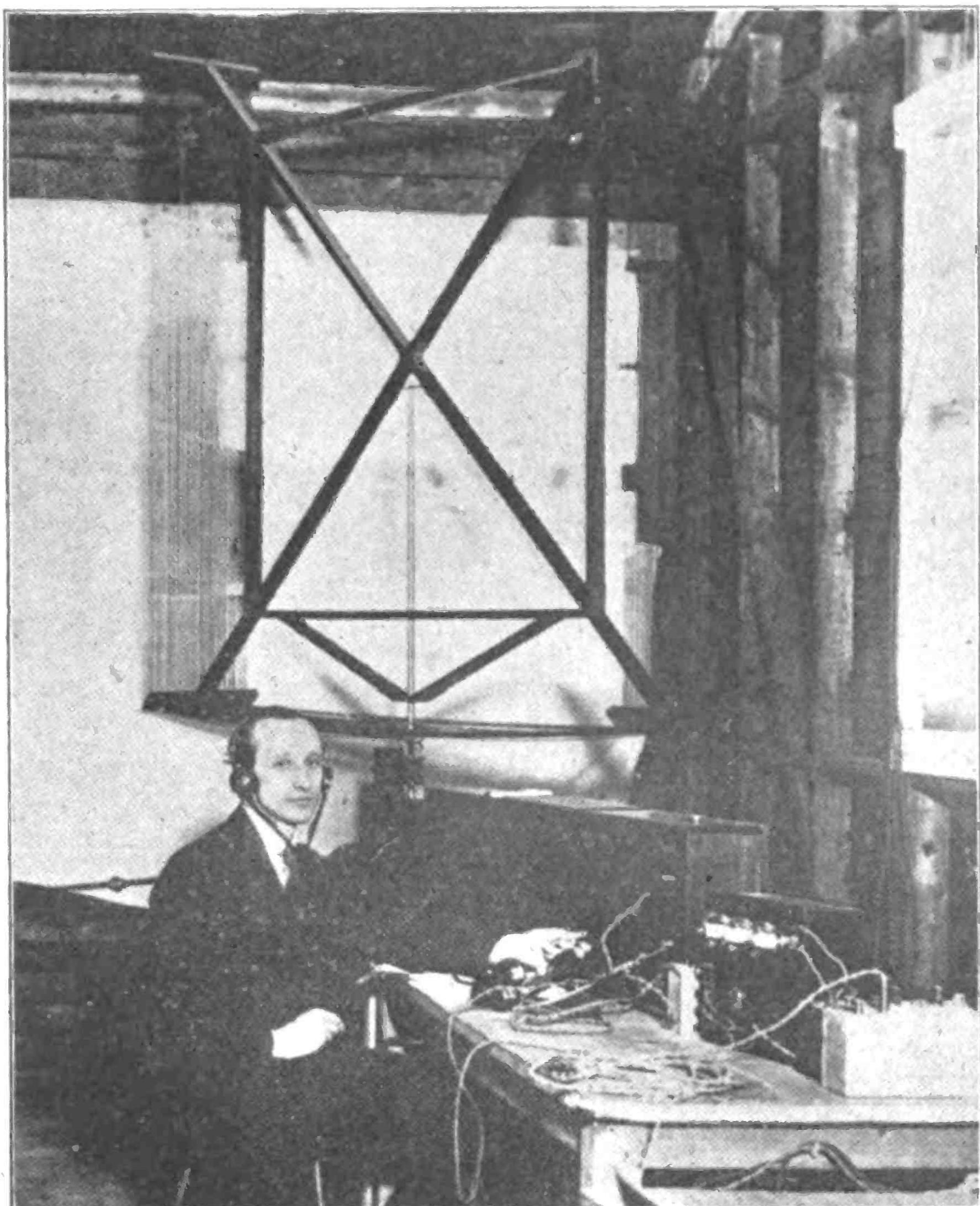
The set at East Goodwin Lightship has not been installed more than sixty days when a heavy sea struck the lightship and tore part of her bulwarks away. The mishap, the first ever to be reported by wireless, was repaired in record time. This was in January, 1899, and as if the incident were not enough fully to demonstrate the value of the radio equipment, the East Goodwin had the misfortune to be run down by the S.S. *R. F. Matthews* on March 3, of the same year. This accident, seriously endangering the lives of the crew, was reported by wireless to the South Foreland Lightship, and lifeboats were promptly dispatched to the rescue.

In the interval, the other radio set, which had been placed on South Foreland, had not

been idle. She had sustained no accidents, but the first message to go across the Straits of Dover was sent from that station, and received in France at Chalet d'Artois, Wimereaux, near Boulogne. It sounds insignificant in the light of present day progress but at that time the spanning of the channel was considered a feat. Although the distance was not greater than the thirty-six mile record, yet it was the connecting of France and England without visible wires and the wonder of the day.

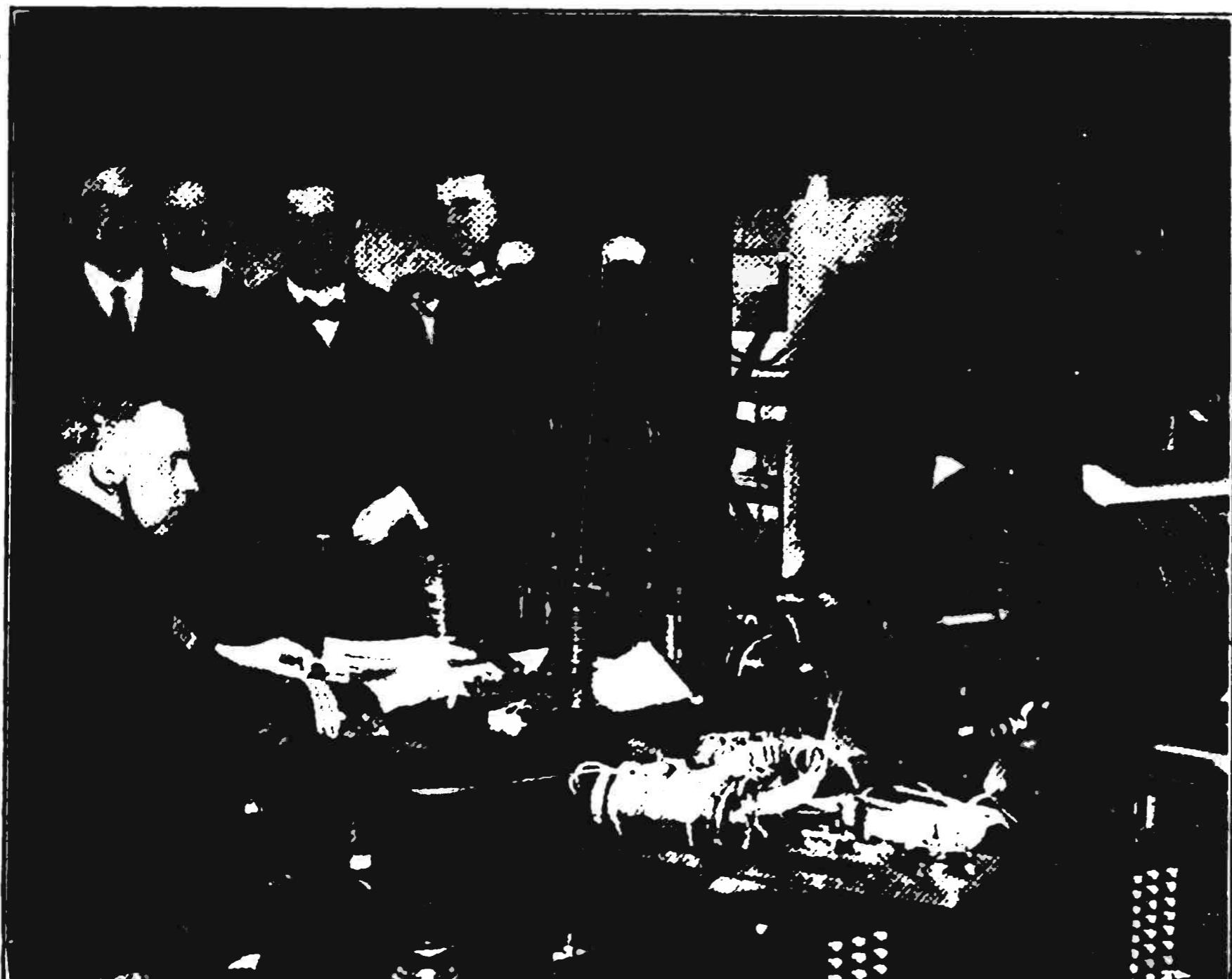


(C. Kadel and Herbert)
First Officer G. H. Peters operating the direction-finding loop on the Ambrose. The receiving set consists of detector and six stages of audio frequency amplification, as seen in the right rear.



(C. Underwood & Underwood)

Receiving station of the Western Electric Co., Southgate, London, which received the first official radiophone message from New York to London. The loop antenna shown in the photo was the only one used in this work, and remarkable reception was reported. J. I. Carty, vice-president of the American Telephone & Telegraph Co., was the first man to enjoy the distinction of talking direct to London by the agency of a radiophone using low wave length. In order to make absolutely sure of good reception, both radio frequency amplification and audio frequency power amplifiers were used. While this is not the first time that radiophone has been used to span the Atlantic, it is the first time that radiophone speech has been heard over such distances on low wave length, using a loop antenna for receiving.



(C. Underwood & Underwood)

Spark transmitter which will be used to keep the police stations of the City of New York in touch with each other. The photograph shows a squad of men being instructed in the use of the transmitter. These men will be later detailed as regular operators in the various stations throughout the city.

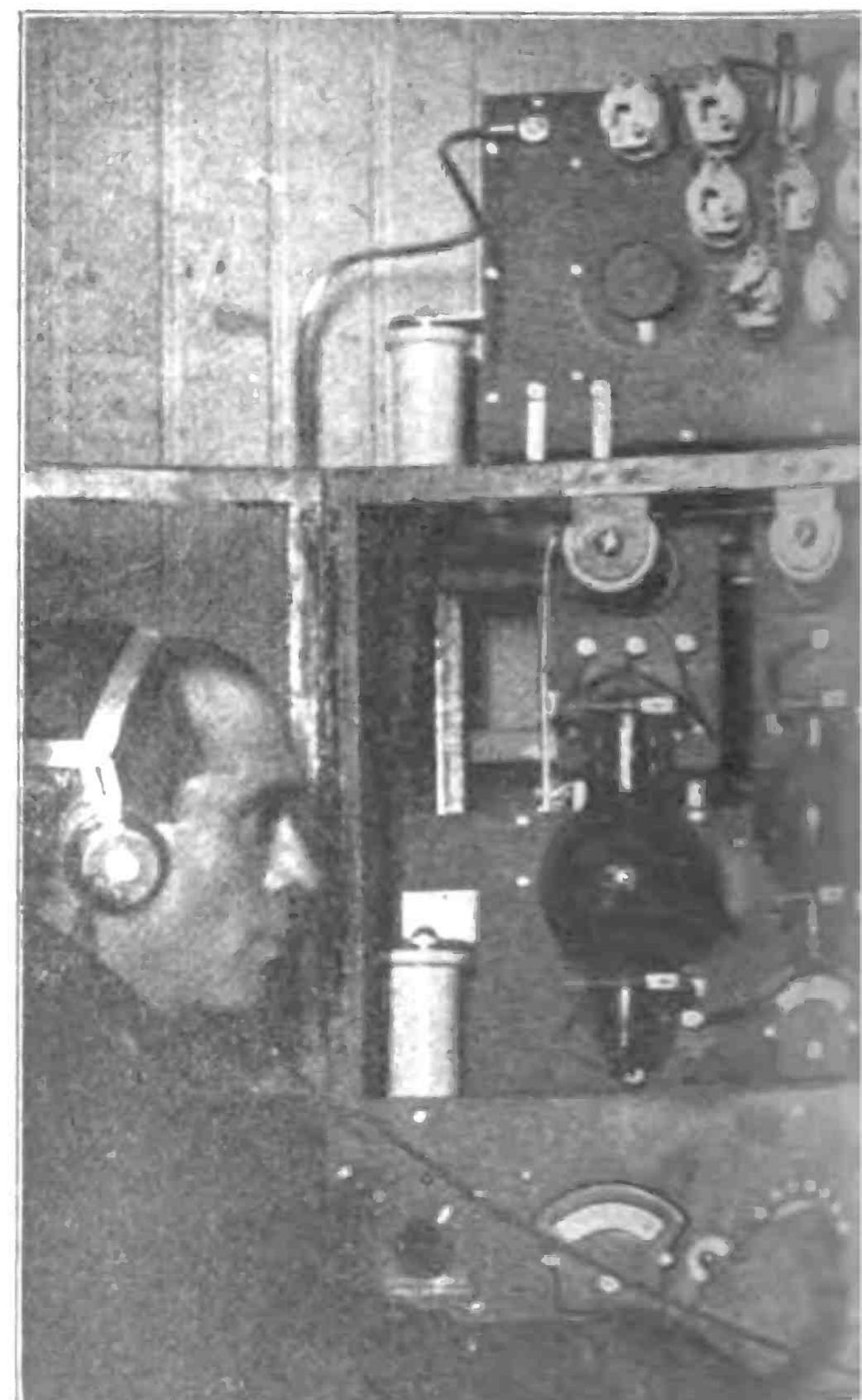
Topical Radio Pictures Caught for Radio World Re-

*Captions by
Robert L. Dougherty*



(C. Harris & Ewing)

William J. Burns, head of the Department of Justice, uses the Secret Service in the apprehension of fugitives. The man, who is well-known, is one of well-known make. Mr. Burns, shown here, is a firm believer in the idea that radio will make the secret service in the United States almost an impossibility. The Department has on record several cases of criminals apprehended by radio.



(C. Photonews, N. Y.)

The new $1\frac{1}{2}$ kilowatt Siemens transmitter recently installed at the S. S. Berengaria. This is the first installation of a transmitter of this type ever made. It is the most powerful in use at the present time, having a reliable range of 1,000 miles. On the left is the oscillator, and the two smaller ones are the modulator and the Wireless Operator L. H. Tamplin, of the S. S. Berengaria, is shown operating the transmitter. By means of this new installation it is possible to maintain continuous communication with land during her long voyage.

OS

rs



(C. International Newsreel Photos)

Constable Woodin, of the Metropolitan Police of London (upper right hand), who is a regular "bobble," and the set he constructed. It's a "regular set." Constable Woodin was one of the first to report American signals heard in London. As will be noticed, radio frequency amplification is used, each amplifier being in a separate cabinet. Constable Woodin constructed the set in his off hours, and with the exception of the tubes and amplifying horn, it was built entirely by himself. As there is five hours' difference in time between New York and London, in order to hear a program broadcast at New York at 9 o'clock P. M. he would have to stay up until 2 A. M., which is considerable, even for a Nite Owl, as the programs are just beginning at that time, and some of the stations do not have their big features on until after 10.



(C. Wide World Photo)

A scene from "The Traveling Salesman" as it was broadcast by the players at the General Electric Company's station at Schenectady, N. Y. This particular scene is laid in a small railroad station and this accounts for the telegraph instrument shown in the photograph. To keep check on how the program is being broadcast, the director is equipped with a pair of padded phones and in this way he is able to hear the play as it is being broadcast.



(C. Wide World Photos)

Broadcasting has become popular in the Far East, as shown in the accompanying illustration on the right. Viscount Shibusawa recently broadcast the address which he made in Hibiya Park, Tokyo, on the occasion of the fourth anniversary of the celebration of the Armistice. The fact that radio has taken such a tremendous hold on all the civilized countries of the world shows the important position it commands among the most use-



Radio and the Woman

By Crystal D. Tector

A FRIEND of mine has written a letter to me and she claims that she has at last solved the problem of assuring herself that everyone that she invites will attend. She writes: "I simply put 'Radio Party and Tea' on the bottom of the card, and then I know that every single soul of them will be there on time. I have never had one person disappoint me, and occasionally the invited guest brings along 'a very good friend of mine.'" Well, what are we going to do when every one of us has a set? Then we will have to find some other way of enticing all the young men and "debs" to attend "our teas."

* * *

LAST week, after reading the radio programs for the evening, we decided that we would listen to a speech by William A. Brady, that eminent producer of Broadway plays, and accordingly tuned in for Newark. Imagine our surprise when we were told that it was impossible for William A. Brady, Senior, to be present, but that his son, Wm. Jr., would come to his father's rescue. He gave a very interesting speech on conditions in the American theatre, and as F. H. said later, "He must be a chip off the old block," but I think that the proverb "Like father like son" more aptly fits the case.

* * *

A FEW of the girls interested in radio, in my town, decided to take a trip through one of the large factories now making radio apparatus. Of course, they left all the details to me, so I wrote a letter to the president of one of the large eastern manufacturers and received a very courteous reply, in which he said that at any time we felt so inclined, we should have no hesitancy about coming "right in." We did go "right in," and I really have not recovered yet. I never, never thought that the radio business was carried on in such a tremendous scale. I couldn't even start explaining it, because I don't know where to begin. All I can say is this one thing: by the number of girls working, winding coils, varnishing coils, soldering, etc., I think that there are more women radio experts than men.

* * *

WE (meaning F. H. and myself) attended a neighborhood "radio dance" given by a well meaning radio enthusiast, the other evening. Instead of dancing to radio music, we had to be content to listen to a phonograph. The main reason being that the program for that evening was made up mostly of vocal selections and classical music. I never met such an apologetic man in

my life. If he apologized once he apologized a dozen times. I know that I listened to about ten of them. "I believe that if he could have had a 'real good cry' that he would have felt much better," sarcastically remarked F. H. on the way home.

* * *

A VERY dear friend of mine, very well acquainted with a girl who is a school chum of a young woman that occasionally sings at little formal teas and gatherings, stopped me on the street the other afternoon, all excited, and in a voice that just shook with emotion, said: "Gene is going to sing at — broadcasting station. Don't you think that terrible! Why, she is lowering herself to the level of a common performer." Well, I never! "Lowering" indeed, I think that she is indeed honored to be allowed to have the hundreds of thousands of radio enthusiasts hear her voice. I notice that the stations never lack entertainers of the very highest type, even going so far as to dip into the ultra-exclusive operatic circles.

* * *

I RECENTLY found out that if while I am wearing the "ear muffs" I put my hand near the variable condenser, shunting the primary of the second step for a few seconds, the signals increase almost 100 per cent, and then fade to normal. I happened to do this the other evening while our neighbor, who is an expert, and consulting engineer for a large radio company, was making a neighborly call. He looked surprised for a few seconds, then called "What circuit are you using?" "Oh, look inside the cabinet and figure it out," Friend Husband very airily told him. Now our neighbor is working feverishly nights, and his wife said that he won't even sleep nights. I wonder if he has discovered something that we have been doing right along, and never took time to find out what caused it. "There goes another chance to make a million, maybe two for all you know," remarked Cousin Kate, "just because this one time you were not inquisitive, and now you won't ride in Rolls-Royce."

* * *

F. H. and myself have started a "Radio Supper Club." We have gathered together all our enthusiastic radio friends, "chipped in," each to the full extent of his or her means, and have bought a real DX set, which is now installed in the drawing room of one of our more fortunate members, who has more room in her home than she can use. Every Friday evening about 10:30 we dance and nibble on a few choice tid-bits, and "a good time is had by all." We find it much more convenient to do our dancing and eating in a radio atmosphere than to endure the unpleasant necessity of having amusement superintended by a police officer or a plain-clothes man.

Radiograms

THE first actual attempt of two amateurs—one George H. Pinney, of South Manchester, Conn., and the other Leon Deloy, of Nice, France—to establish two-way communication between America and France was not entirely successful. Mr. Pinney, while heard in France, could not pick up the French amateur at his station. Mr. Deloy was heard attempting to answer by E. F. Laufer, owner of station 2AQP, located at 699 East 137th Street, New York City. The delay in reporting the French amateur's signals was due to the fact that Mr. Laufer wished to verify the signals before making the story public. It would seem that the French amateurs are paying more attention to their receiving apparatus (which must be really up to date, from all reports) than to their transmitters, but just give them time. That's all they need!

* * *

THE American Legion Show of the S. Rankin Drew Post, which is composed entirely of theatrical and publicity men of this city, will broadcast the entertainment for the benefit of the radio public. The Legion will have the use of the Times Square Theatre through the kindness of the Messrs. Selwyn, and will broadcast by means of relaying the signals over special wires to the broadcasting station.

* * *

BY the aid of radio, the Aeromarine flying boat, "The Buck-eye," was recently called upon to perform an unusual service. Shortly before the eleven-passenger flying boat left for its first scheduled trip from Miami to Nassau, a wireless message was received from Carter De Gregory at Settlement Point, stating that his mother was seriously ill and that he had to be taken immediately from the west end of Grand Bahama Island to Nassau. Mr. De Gregory was instructed to board a ship in the harbor, and the flying boat would come alongside and pick him up, and take him to his destination.

* * *

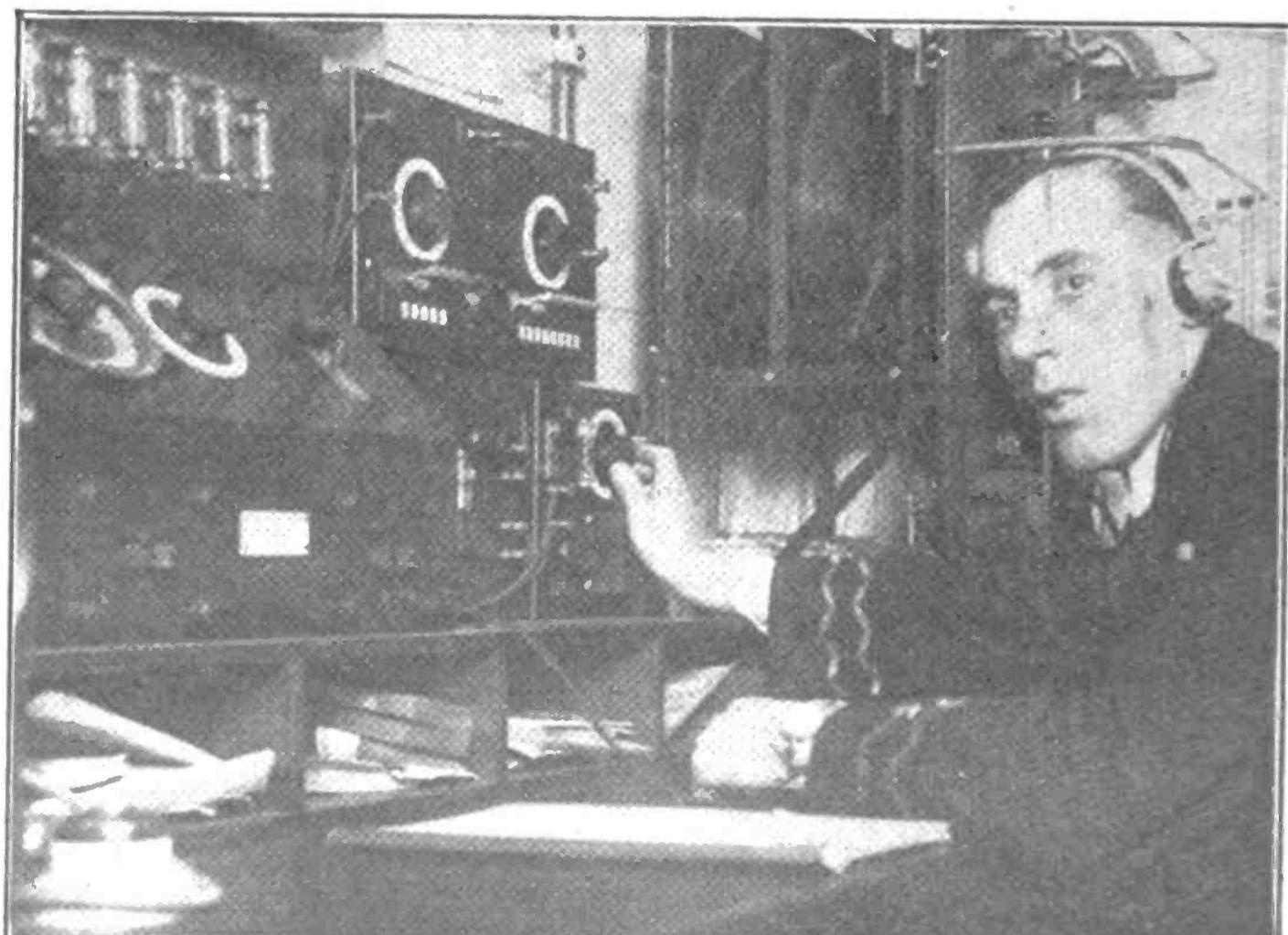
IT has recently been proved that long waves are not necessary for transatlantic communication. During the recent tests, radio communication was established between Europe and America by the

use of short waves, the longest of which was 400 meters. This conclusively proves the fact that it is not necessary to use waves of 15,000 and upwards in order to transmit long distances.

* * *

THE bane of a radio operator's existence may soon be eliminated, if a new call bell system, developed by an officer of the Portuguese army, proves successful. By means of the intended system, it will be unnecessary to continue long watches.

S.S. Empress of Scotland's Radio



(C. Photonews)

The Empress of Scotland has one of the best equipped wireless rooms on trans-atlantic steamers. It is equipped with the new 3,000 meter wave transmitter and direction finder, and has a most complete radio room.

Wm. J. Howlett, Chief Radio Officer, is listening in.

The Week with the DX Nite Owls

All on One Tube

From Marshall Beaman, Sharpsville, Indiana.

I AM a constant reader of RADIO WORLD. In the January 20 issue I see Mr. Sheron has receiver 1,500 miles with his set, which is described as having three tubes. I only use a detector and I have a record of 2,200 miles. January 23 I received KNJ, Roswell, New Mexico. I received Cuba, PWX, several times. My set includes a 23 plate variable condenser, a variocoupler which I constructed, a grid leak and grid condenser, phone condenser, pair of Federal phones 2,200 ohm, one U. V. 200 one socket, 6 volt A battery, 22½ volt B battery, rheostat. My antenna is 125 feet long. Here are some I have heard: WWJ, WCX, KOP, WLK, WOH, WLW, KDKA, WGY, WOC, WBAP, WMU, WHU, WSB, WOR, WAAF

* * *

Henry Is 12 Years Old

From Henry Deibert, 168 South Monroe Street, Columbus, Ohio

LAST night February 2, I heard the following stations with a one-bulb set very clearly: WGY, WMAQ, WWJ, WBF, WOR, KDKA, WLAG, WDAD, WCX, WCAH, WOC, WAAN, WDAP, WJD, WSB, WSY, WJAX, WLW.

I am twelve years old, and I built the set myself, using a regenerative hookup.

I trust you will print this in RADIO WORLD under the DX "Nite Owls." I think I have made a good record for one night, but am hoping for better luck.

* * *

Mr. Keating's Competitor

From Lee Schecter, 1935 Semple Ave., St. Louis, Missouri.

I WAS surprised and interested to note how similar Mr. Keating's and my own results are. I am the owner of a crystal set without amplification. Music and signals from our local station, KSD, can be heard distinctly all over the room, without using the loud-speaker. Mr. Keating believes that his results can be duplicated. They have been. The list of broadcasting stations are as follows: WOC, WCX, WWJ, WDAF, WHB, WDAP, WSB, WGM, KDKA, WBAP, WGY, about a thousand miles distant! My set consists of Western Electric 509W, 2200 ohm phones, a home-made 1-slide tuner 4½ inches long, wound with No. 26 B & S wire; aerial, 2-wire, 85 feet long and 36 feet high. No phone condenser used. These stations have been received with both galena and silicon. There is nothing strange about the hook-up. It is a simple one, known to all amateurs.

Now why don't other owners of crystal sets get the same results? There are many who discredit my reception, too,

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

heard by voice. It must be remembered that I have heard 267 different stations in all. As I am not able to read code I can give you only what was heard by a friend who called one evening, who can do so. He recorded several ships, both from the Atlantic and Pacific, and many stations located in different parts of the United States. I would like to hear from any one using this hook-up.

With a Combination Long and Short Wave Receiver

From William W. Crosby, 1st Lieutenant, F. A., N. Y. N. G., Radio 2CAF, 601 West 135th St., New York City.

I AM enclosing a drawing of a combination long and short wave radio receiver which may be of interest to some of your readers. This set has given me excellent results over a period of 2½ years.

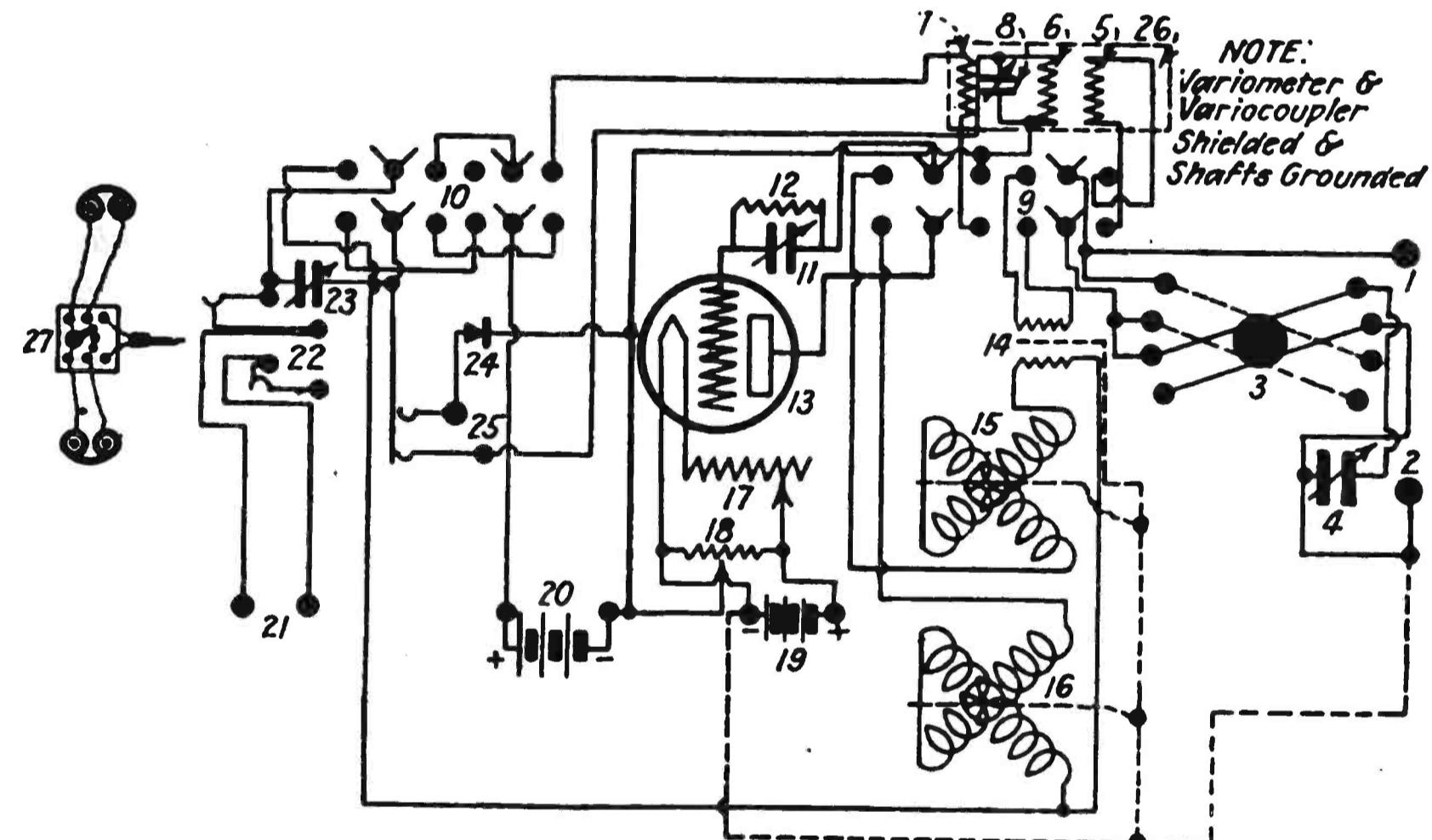
Using one U. V. 200 and Baldwin phones I have copied broadcasting stations in the United States as far west as Denver and from Winnipeg, and amateur signals from every district in the country and parts of Canada.

The short wave part of the set is very efficient. It is possible when using detector and vocaloud to copy nearby stations such as WJZ, WEAF, and WOR,

A Record of 267

From Carlton D. Shultz, Fort Plain, N. Y.

AS you ask me for some of my DX records I wrote you once before and gave you my report, but since then I have built this set to five bulbs and I now



Schematic diagram illustrating the hookup described in William W. Crosby's letter on this page. Change over from long to short waves is accomplished by means of anti-capacity switches.

send you the following: I hear KDYX, Honolulu, quite often, and on one occasion I heard KUG, also Honolulu; WLAY, Fairbanks, Alaska; KDYO, San Diego; KQI, Berkeley; KDZG, San Francisco; KDYQ, Portland, Ore.; PWX, Havana. These are the most distant stations I have

over one and two rooms quite distinctly.

The short wave part of this set is very carefully shielded, all metal parts not in the circuits being grounded.

I should be glad to furnish any further information desired to any of your readers upon receipt of stamped envelope.

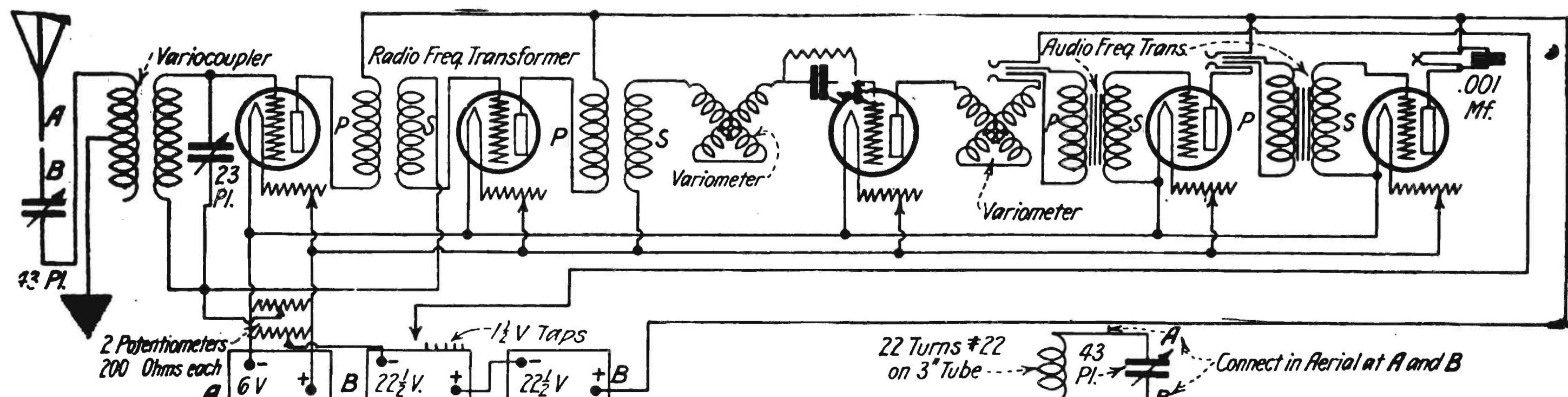


Diagram of the hookup with which Mr. Schults (see letter) has heard 267 stations. The first two tubes are used as radio frequency amplifiers, the last two as audio frequency amplifiers.

Much Experimenting Decided New York City to Establish Municipal Station at Elmhurst, L. I.

By Hon. Grover A. Whalen

Commissioner of Plant and Structures of Greater New York

GROVER A. WHALEN, Commissioner of Plant and Structures of Greater New York, announced a few days ago that the installation of the Municipal Broadcasting Station is to proceed without delay.

This enterprise was authorized by the Board of Estimate and Apportionment on June 2, 1922, but the actual installation of the apparatus was deferred pending the completion of exhaustive tests and experiments conducted with the co-operation of the Western Electric Company, in order to obtain necessary information so as to assure such installation as would be absolutely efficient in operation.

"The result of these experiments," said Commissioner Whalen, "has been of great value to radio science and has necessitated radical changes in plans, which will assure New York City having one of the most effective broadcasting stations in the country.

The studio, reception room and control rooms will be in the Municipal Building, as originally planned, convenient to the City Departments and to the people. The transmitting station will be erected on city property at Elmhurst, L. I. The antenna towers will be 200 feet high and 300 feet apart. The transmitting station will be connected by cable to the studio and main broadcasting station in the Municipal Building.

Perfect Radio Service for New York City

"The location of the station at Elmhurst has been carefully chosen for its electrical advantages in launching the electrical waves into the ether. In addition, it is in the center of that locality from which it is expected from the results of the tests that strong signals will be obtained meeting all conditions of perfect service for the people of the city and for those at large.

"These changes in the original plans had their inception in the desire to locate the transmitting equipment so as to assure the sending of strong signals to all parts of the city for the benefit of the owners of small crystal receiving sets as well as the owners of the more expensive tube sets throughout the country.

"It was realized that the Municipal Building, a steel structure, 580 feet high, set in a nest of tall steel structures, presented certain prima facie difficulties as a site for the location of the transmitting apparatus, and it was decided to determine definitely exactly what these difficulties were—whether they could be overcome or whether the adverse conditions made another location advisable. The officials of the Western Electric Company, which was the low bidder on the contract, agreed cordially that preliminary tests were desirable in order to give assurance of the efficient working of the station, and decided to conduct these tests with the department engineers, supplying all necessary apparatus, without cost to the city.

"The Municipal Building, as far as the launching of radio waves is concerned, has unusual dimensions not calculated from an initial survey to be beneficial, but not precluding failure. It is higher than other buildings used for this purpose, being 580

feet in total height. It has a centrally located tower, above which it would be impossible to locate the antenna and the shielding effect of this tower was feared. It is also surrounded by and is in close proximity to other steel buildings of a massive structure, such as the Woolworth Building, and the absorption, deflection and shielding from this source had to be considered.

Temporary Installation for Test

"In order to make the test, it was decided to install temporarily in the building a 100-watt transmitter, erect a small antenna, using the tower of the building as one of the supports, transmit signals, and actually measure the strength of them, at different points on the circumference of a circle surrounding the building. The measuring instrument used was a specially designed extremely sensitive receiving set, employing what is known as the double detection, intermediate frequency amplification method. Reception was made on a loop antenna and the signal strength recorded on a microvoltmeter. By means of a separate oscillator energy of a known amount enough to produce the same deflection on the scale as that produced by the signal was then sent into the antenna and the electrical characteristics of the antenna being known, the strength of the field produced by the signal in microvoltmeter was then calculated. In this way, it was possible to know exactly what may be expected of a broadcasting station at this location.

"On September 15, 1922, the temporary antenna was erected. It was of the flat top inverted L type, made up of four strands of No. 18 phosphor bronze wire, 75 feet in length. It was supported between the balcony above the 39th floor of the building and the roof of the 25th floor on the north side and the lead-in taken from the lower end to the transmitter on the 25th floor. Testing under an experimental license was begun on September 28, 1922, and continued until December 27, 1922. Lloyd Espencheid, of the American Telephone and Telegraph Co., and R. A. Heising, of the Western Electric Co., had supervision of the test and their experiments were carried out by E. H. Hall and I. C. Crowley, under the direction of S. H. Willard, all of the Western Electric Company, in conjunction with men from the Department of Plant and Structures.

"When the operating conditions had been found giving the best field strength, measurements were made with the measuring set at Atlantic Highlands, N. J., Cliffwood, N. J., Rahway, N. J., Maplewood, N. J., Passaic, N. J., Englewood, N. J., Yonkers, N. Y., New Rochelle, N. Y., Great Neck, L. I., and Lynbrook L. I.

Results Are Most Interesting

"At the same time field strength measurements for comparative purposes were made of the signals of the Western Electric Company's station WEAF, on the same wave lengths, this station being recognized as a very efficient one. The results obtained from this test were most interesting. The curves of field strength for the two sta-

tions were similar in shape. In certain directions, such as Passaic, signals were strong, while in other directions, such as Yonkers, signals were weak. This condition is evidently caused by the absorption and deflection of the waves caused by all of the steel buildings in lower Manhattan taken as a whole, to the contour of the land rivers, valleys, etc., and finally to local receiving conditions at the points where measurements were made. This condition would therefore exist for any station located in lower Manhattan and could not be improved.

"The strength of our signals was, however, much less in practically every direction in comparison to the strength of the signals from station WEAF. This condition we encountered in all of our tests: namely, weak signals on the 360 to 400 meter wave lengths upon which we will be required to operate, and strong signals on the 550 to 600 meter waves which we will not be permitted to use. This effect is attributed to the dimensions of the Municipal Building itself. The building is 580 feet from the curb to the top of the tower or approximately one half of a 400 meter wave length. It persists in oscillating, therefore, at a frequency which causes opposing voltages to exist between the free end of the antenna and the ground. Throughout all of the experiments attempts were made to prevent the building from oscillating by employing various combinations of antenna counterpoise shields and filter circuits placed between counterpoise and ground, etc. Some measure of success was attained, at least enough to justify continued efforts, but not with satisfactory results. Efforts were made to change the oscillating period of the building to one which would strengthen instead of weaken the signals, by the use of resonant and anti-resonant circuits between counterpoise and ground, and between antenna and ground, but with no greater success.

"It was then decided to locate the transmitter in a room on the thirty-fourth floor of the building at a height above the street level of approximately 450 feet. An umbrella type antenna was erected consisting of eight strands of wire extending from above the thirty-ninth floor of the tower to the roof above the twenty-fifth floor on the north and south sides of the building. The tower was completely surrounded by a shield consisting of twelve wires extending its entire length, and counterpoises consisting of six wires each were used above the twenty-fifth floor, on both the north and south sides of the building. On November 28, tests were begun here similar to the ones made on the twenty-fifth floor and better results were obtained, but they were still not what they should be. In this case the antenna was driven from the top down, and it was from this location that the tests for field strength made from different locations on the circumference of a circle surrounding the building previously mentioned were made.

"In the final effort a very novel experiment was tried in which the antenna wires

(Continued on next page)

Commercial Interests May Take Over Naval Radio Stations Closed Recently

SECRETARY of the Navy Denby has directed that four naval radio stations be sold, four others abandoned, and two radio compass stations be closed and dismantled, which proposed action was predicted in RADIO WORLD recently. In carrying out the recent recommendations of the Rodman Board in the interests of increasing fleet efficiency, particularly in communication, the Secretary is disposing of unnecessary radio stations.

The stations at Cape May, N. J., will be closed and abandoned by naval personnel at once. Its work hereafter being handled by the station at Cape Henlopen. At Seattle, another station will be abandoned as soon as the Navy Yard at Puget Sound can take over the traffic. Grande Isle in Louisiana has been ordered closed and abandoned, as has also the station at Navassa Island in the West Indies.

Radio stations at Baltimore, Md., Mobile, Ala., Miami, Fla., and Port Arthur, Texas, will be offered for sale as soon as invitations for bids can be drawn up. It is also planned to dispose of the station at Managua, Nicaragua, when commercial facilities are provided at that place.

The War Department has been asked if it desires to take over any of the ten naval radio stations on the Great Lakes, but it is not likely that the Signal Corps will accept any except those at Buffalo and Cleveland. Such stations as the army does not take over will remain closed, as the navy does not need them and cannot afford to continue

their operation. Three compass stations on the Lakes, however, will probably be opened in the Spring as aids to navigation.

Radio compass stations at Pass a Loutre, La., and St. Petersburg, Fla., will be dismantled and the land vacated by the navy. Several other stations are being held subject to abandonment as soon as the handling of existing traffic is arranged.

In closing the stations, the Navy Department does not desire to interrupt traffic in radio, but, on the other hand, as commercial traffic was only handled when other facilities were lacking, officers are of the opinion that commercial interests may now be induced to open general traffic stations at points previously covered by the navy. The prime purpose of naval shore radio stations is to aid the fleet, and when a station ceases to benefit the fleet, it becomes a liability to the Government instead of an asset.

Can It Be So?

"Pa, what does broadcasting mean?" asked Clarence.

"Telling a secret to a woman, son," replied Pa.—Cincinnati Enquirer.

A Matter of Hair

Now that the White bill has been passed, a lot of amateurs will have to have their "permanent wave" re-hooked, or they will be completely out of style.

necessary to make the tests with precision and thoroughness and this, of course, involved time.

"The idea of a city-owned broadcasting station was promulgated on March 17, 1922, when, at a meeting of the Board of Estimate and Apportionment, a resolution was adopted approving the suggestion of Maurice E. Connolly, President of the Borough of Queens, relative to the establishment of a Municipal Broadcasting Station and recommending the appointment of a committee to conduct a thorough investigation.

"To carry out the purpose of this resolution, Mayor Hylan appointed a committee on which the following gentlemen were asked to serve: Rodman Wanamaker, Philip Berolzheimer, Maurice E. Connolly, Lloyd Espenchief, S. G. Rhodes, Merritt H. Smith, Arthur S. Tuttle, Sanders A. Wertheim and Grover A. Whalen. This committee in its report to the Mayor on May 2, 1922, after having sought the advice of many radio experts and after having gathered considerable data on the subject, stated that it believed it was the duty of the municipality to immediately take steps to erect, under city control, the most modern and best equipped radio broadcasting station in the country, and that the importance of municipal broadcasting was so far-reaching, and its possibilities so limitless, that it felt the city would be derelict in its duty were it not to take the necessary steps at once."

"On June 2, 1922, the Board of Estimate and Apportionment appropriated the sum of \$50,000.00 for the purchase and installation of a complete radio telephone broadcasting station, including antenna structure, power supply and voice amplifying apparatus with loud speaking, receiving and amplifying sets."



No Wireless Receiving set is complete without



WHEN your boy points to the Magnavox trade mark and says "Dad, that's the real reproducer," he sums up pretty much the whole story of Magnavox supremacy and radio enjoyment.

To enjoy all that radio offers in the way of daily concert, lecture and news, ask your dealer for a receiving set equipped with Magnavox Radio, the Reproducer Supreme

R-2 Magnavox Radio with 18-inch horn: this instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc.

R-3 Magnavox Radio with 14-inch horn: the ideal instrument for use in homes, offices, amateur stations, etc.

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio. 2 Stage
3 Stage

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Hoover Loses Test Case

THE District of Columbia Court of Appeals recently overruled Secretary Hoover when he refused to issue a license to broadcast to the Intercity Radio Co., of New York City. The license was withheld, the court was told, because the station interfered with the transmission of government messages from naval and military stations.

Recognizing the fact that interference would be caused, but that this fact was also recognized by Congress, Justice Van Ordsel declared that the law under which all radio licenses are issued embodied provisions for the

minimizing of such interference, and that that was no reason for refusing the license applied for.

The court said in part:

"The only discretionary act is in selecting a wave length within the limitations prescribed in the statute which, in his judgment, will result in the least possible interference. The issuance of a license is not dependent upon the fixing of a wave length. It is merely a restriction entering into the license. The wave length named by the Secretary merely measures the extent of the privileges granted to the licensee."

Heard at the Radio Counter

Episode XIV

"Good morning. Is there anything that I can do for you?"

"Why, yes, I wonder if you could tell me if it is possible for me to purchase a set that does not need an outside wire."

"Certainly. The latest thing in radio sets is a set using a loop, in connection with radio frequency."

"I don't understand anything about that at all. The only thing I know is that my wife wants a set, and the owner of the house refuses to let me put up a wire on the roof. So I thought I would try and get one that didn't need any wire."

"If you will step over here, I will show you several different types that operate on just a small inside loop aerial."

"But I don't want anything that will freeze us all out."

"Freeze you out! I don't understand?"

"Well, don't I have to keep the windows open when I use those things there?"

"Why, of course not. This set will work in a closed vault under the ground."

"Oh, I must be dense, I thought that you had to leave the window open in order to catch the music and talk."

"Absolutely not. Now, here is a nice little set, and it uses only three tubes. Positively the most economical set on the market. Then here is another type that is very popular, but it uses five tubes."

"Well, which is the more efficient? I don't care if it costs a little more. You see, my wife is an invalid, and the best isn't half good enough for her. You just pick out the best one you have in the shop—say, is all that music coming from that little set?"

"Yes, sir. That is, this set over here,

using an extra power amplifier, but that is not necessary, if you want to use it in one room only. In that case, the outfit as you see it is sufficient."

"Well, send it up to my house, and have a man up there tomorrow afternoon, to show us how to work it will you?"

"Most certainly, I will attend to it myself personally. Is this your address?"

"Yes. Will you see that it gets up there soon?"

"Yes, sir. Good day."

Half Million Dollar Order for Westinghouse

BECAUSE of a large increase in traffic, the Long Island Railroad, which handles probably the heaviest suburban traffic in the world, has just purchased from the Westinghouse Electric & Manufacturing Company 40 motor car equipments, 20 trailer car equipments, and four baggage mail car equipments. The baggage cars will be equipped with Westinghouse type 308 D-7 field control motors and Westinghouse electric-pneumatic control. In order to take care of the increase in power demand when this new equipment is put into service, it has been necessary to increase the sub-station capacity of the railroad, and an order has been placed, also with the Westinghouse Company, for one 4000 kw., and one 3000 kw., six phase, 25 cycle, 650 volt, converter with the necessary transformers.

The entire order amounts to over a half a million dollars.

Coming Events

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

SECOND DISTRICT RADIO CONVENTION, Hotel Pennsylvania, New York City, March 1, 2, and 3, 1923.

FIRST UNIVERSAL EXPOSITION OF INVENTIONS AND PATENTS, Grand Central Palace, New York City, February 17 to 21, inclusive, 1923.

New Radio Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given whenever possible.)

Eagle Radio Corp., Manhattan, \$5,000; J. J. Reiss, W. C. Johnstone, L. K. Knowlson. (Attorney, J. E. Kinsley, 120 Broadway, N. Y. C.)

Electric Service Engineering Corp., Manhattan, electric supplies, \$50,000; I. Gottlieb, R. B. Davis. (Attorney, J. E. Ankus, 35 Park Row, N. Y. C.)

Newburgh Radio Shop, Newburgh, N. Y., \$10,000; M. M. and J. H. Hineman, Jr., T. Gray. (Attorney, W. C. Olsen, 30 East 42d St., N. Y. C.)

Nowak Electric Co., Buffalo, general contracting, \$50,000; J. J. Nowak, R. F. Horig, P. Masur. (Attorney, R. W. Werner, Buffalo, N. Y.)

Nelson Electric Corp., Manhattan, \$50,000; J. H. Nelson, W. A. Blue, J. W. Wilford. (Attorney, Subway Electric Shop, Richmond Hill, N. Y.)

Radio Stocks

(Quotations as of February 7, 1923, furnished by Frank T. Stanton & Company, 35 Broad Street, New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi Stamped	5c	20c
Am. Marconi Unstamped...	\$5	\$7
American Tel. & Tel.....	122½	122½
Canadian Marconi	2½	3¼
De Forest Radio	7	10
Dubelier Condenser	6	6¾
English Marconi com.....	11	15
English Marconi pfd.	11½	15½
Federal Tel. Calif.	5½	6
General Electric	187½	188
Mackay Company com.....	105	107
Manhattan Elec. Supply....	54½	55
Marconi Int. Marine.....	8	10
Radio Corporation com.....	3½	3½
Radio Corporation pfd.....	3½	3½
Spanish Marconi	1	3
Western Union	112½	113
Westinghouse E & M.....	62½	63

Western Electric in the East

THE Western Electric Co., whose headquarters were formerly in Chicago, have moved to New York. This change was brought about by the building of a large plant in Kearney, N. J. All department heads, with the exception of C. G. Stoll, will hereafter be located in New York City.

The Recent South Sea Storm

ALL EFFORTS TO REACH SAMOA BY RADIO, after the seismographic observatories throughout the country reported a terrific 'quake in the Pacific, in the region of the Hawaiian Islands, were in vain for several hours. The later reports showed that the earthquake had caused tidal waves in the vicinity, seriously damaging the station, and communication was not possible until the damage was repaired. The reports from the observatories stated that the records showed that the shocks were the worst in years, and had been recorded all over the western hemisphere.

Answers to Readers

I WOULD like to know how to make a good one tube set. Where can I get a description for making one?—Clifford Vesssey, 104 East 16th St., University Place, Neb.

We refer you to RADIO WORLD No. 43, dated Jan. 20, in which you will find an excellent article, with all plans in full working size, and everything minutely described for you, by Ortherus Gordon.

1. What is the best type of receiving apparatus to enable me to receive from 1000 to 1500 miles?

2. Is an inside antenna as efficient as the regular outside antenna?

3. What is the probable cost of such outfit?

4. Where can I get a book, that will explain radio to me?—Thos. Ross, 43 Brooks St., Sanford, Me.

1. We advise either the popular three unit regenerative circuit with one or two steps of audio frequency amplification, or a radio frequency set, with two steps of radio frequency, detector, and one or two steps of audio frequency.

2. If you intend using radio frequency, we advise the inside loop. Otherwise, use the outside antenna.

3. We cannot discuss the various prices of

competitive apparatus through these columns. See advertisements.

4. We refer you to the books sold by The Columbia Print advertised in current issues.

* * *

1. Kindly give me the details of the variocoupler, used by Mr. F. J. Rumford, in his article on the two tube super-regenerative receiver.

2. As the English Government makes all owners of radio sets submit their diagrams, with details of all the receiving circuits and sets, would it be permissible for me to build this set? I understand that this circuit is an American patent.—C. H. G. Crossman, 17 Hougoumont Ave., Waterloo, Liverpool, England.

1. A suitable coupler for this circuit can be made as follows: On a tube $4\frac{1}{2}$ inches in diameter, and 6 inches long, wind 100 turns of No. 22 SSC wire (single covered silk wire), taking taps off the first 10 turns, and then tapping every 10th turn. Do not shellac the winding. Wind the rotor full of the same size wire. The rotor should be $3\frac{1}{2}$ inches in diameter. No taps are taken off the rotor. This coupler will tune to approximately 1000 meters with an ordinary antenna, with a .001 condenser shunting the primary.

2. We do not believe that there is any infringement on a patent in this case, as you are constructing the set for your own use, but we advise you to take the matter up with an English patent attorney, as the laws vary in different countries.

* * *

1. What are the sizes of the primary, secondary and tickler coils used in the hookups published on page nine of RADIO WORLD dated December 30?

2. Will this circuit bring in signals any louder than the regenerative set using the regular 6-volt tubes?

3. Can all three windings be made on the same tube?—William E. Johnson, Wayne, Neb.

1. The construction and arrangement of the coils used in the hookups you mention were fully described in RADIO WORLD, No. 26, dated September 23.

2. If these circuits are carefully hooked up and the directions followed out, remarkable results can be obtained with them.

3. See explanation of how these coils were constructed in issue of September 23.

* * *

1. How can a test be made to determine if there is a broken wire in a transformer?

2. Is the enclosed diagram of one stage of audio frequency correct? I have connected it as in diagram, but cannot get it to work.—L. C. Cornic, Anthony, Kan.

1. The simplest and best test as to whether there is a break in the wire (open connection) is to test the windings separately with a pair of phones and a battery. If, when the current is made and broken, there is a click in the phones the transformer is O. K. If there is no re-



Complete Regenerative BULB SET \$13.45 POSTPAID

Outfit includes 1½ Volt Bulb—Pig Tail Variocoupler with 14 taps—4 steps—23 Plate Variable Condenser—2 Knobs and Dials—Rheostat—Socket—Grid-Leak Condenser—Dry Cell—22½ Volt Plate Battery—7 Binding Posts—Also Drilled Panel—Easy to Assemble.

With Extra Sensitive Standard Double Headset... \$16.70

22.00	Branded Phones	.....	\$2.00
	Fisher Variocoupler	.....	\$2.00
	Fisher Variometer	.....	\$1.50
45	Plate Condensers	.....	\$1.50
23	Plate Condensers	.....	\$1.25
W.D. 12	Transformer	.....	\$4.50
1½	Volt French Tube for Dry Cell,	.....
Guaranteed to Work	.....	.....	\$4.50

MARTIAN BIG FOUR

The Wonderful High Grade Crystal Set. Can be used with 1, 2, 3, or 4 head sets. The whole family listens in.

No Batteries \$6.50 Costs nothing to keep up.

Any one can install and operate the Big Four.

GOODS SENT PROMPTLY ON RECEIPT OF MONEY ORDER OR CERTIFIED CHECK.

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PARTS PRICES SLAUGHTERED

812.00	King Appliance Lead	84.75	43 Plate Variable Condenser	82.75
	Speaker Horns	.....	89.95	1.00 Rheostat	.....	.30
5.00	Vario Couplers	.....	2.50	1.50 Kleenor Variable	.....	1.10
3.75	Vario Couplers	.....	1.75	Rheostat	.....	.45
7.00	All Wave Coupler	.....		1.00 3" Hard Rubber Dial	.....	.60
	3000 Motors	.....	6.95	.60 V. T. Sockets	.....	.60
8.00	Variometers	.....	2.75	1.50 22½ V. Cycloste B.	.....	.75
1.75	3 Plate Variable	.....		Batteries	.....	1.15
	Condenser	.....	1.25			
8.75	23 Plate Variable	1.00	1.75 22½ V. Cycloste B.75
	Condenser		To avoid delays short items and total amount		

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D-X-RADIO COMPANY specializes in Radio instruments designed for DX (Distance) Work. To receive distant stations your instrument must be built with proper equipment. And that means the D-X-Radio Company—particularly since we offer highest quality radio parts at lowest prices.

SPECIAL GENUINE FISCHER 180° VARIOCOUPLER



14 TAPS, SEVEN IN UNITS
SOLDERED LEADS READY TO USE
REGULAR PRICE... \$5.00
SPECIAL PRICE... \$2.25

Remittance must accompany all Orders. Checks or stamps not accepted. Merchandise shipped post paid east of Mississippi.

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123 Liberty Street New York City

sponse there is a break in the winding. Test both the primary winding and secondary windings separately in this manner, and use a very weak current. A single dry cell or flashlight cell is sufficient.

2. Your diagram is correct. Test the transformer as described. See that your tube is making good connection with the lugs in the socket, and that the positive connection of your B battery goes to the plate.

A GILBERT & SULLIVAN opera, "The Pirates of Penzance," will be broadcast by WGY, the General Electric Company station at Schenectady, N. Y., Tuesday evening, February 20. Practically the same group that sang "The Mikado" and "Pimfore" at WGY will be heard in this production, which is put on as a result of many hundreds of requests for more light operas.

BIG MONEY IN

RADIO

See Back Cover
of Feb. 3rd Issue
RADIO WORLD

DASH WITH ORDER PARCEL POST PREPAID	
88.00	Detector Tubes Gm. \$1.00
6.00	Amplifier Tubes 3.50
0.50	Gm. 1½ Volt Tubes (detector and amplifier) 4.00
	W. D. 11 Transformer and for all dry cell tubes 4.50
	Phones, good quality, 2200 ohms 3.75

Ex-President Wilson Has Badge

EX-PRESIDENT WILSON was the first and probably only honorary Chief Radio Inspector of the United States. Although few fans will recall it, President Wilson was presented with the badge of Chief Radio Inspector by Secretary of Commerce Redfield during the Safety Exposition at the National Museum in 1916. At the opening

of the exposition Secretary Redfield, who was waiting to welcome the President to his exhibits of radio and other safety apparatus, "robbed" the Chief Inspector of his badge, so that he might add to the ceremonies by decorating the President. Somewhere among his possessions, it is understood, Mr. Wilson still cherishes this title.

Siffer Lemoine, Radio Engineer of the Royal Swedish Telegraph Board, is in the United States studying the American radio systems and to confer with Government radio officials.

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The Eastern Division of THE RADIO CORPORATION OF AMERICA accept no new or inexperienced applicants in their services as Wireless Operators other than our Graduates. Investigate the advantages offered through taking either our HOME STUDY or RESIDENCE course in Radio.

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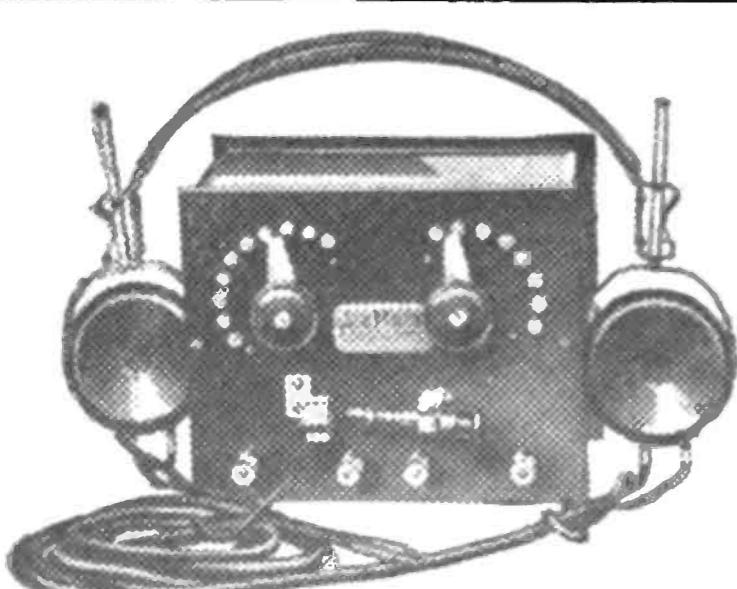
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50% discount in 100 lots

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SIMPLEX SPECIALS

Aerolia Br. Receiver	858.50
Aerolia 2-Step Amplifier	61.20
Baldwin Type "C" Phones	.....	10.15
Grewel Fixed Detectors	.....	1.85
Metro 2600-Ohm Phones	.....	8.95
Dubiller Dual Aerials	.....	1.15
Tungsar Battery Charger	.....	15.00
Dictograph 3600-Ohm Phones	.....	6.40
Kennedy Type 281 Receiver	.....	68.50
Kennedy 521 2-Step Amplifier	.....	49.50
Burgess 22½ V. "B" Batteries	.....	2.85
Grobo CR-5 or CR-9 Receiver	.....	69.50
Grobo RORK 2-Step Amplifier	.....	49.50
Grobo CR-9 Receiver and 2-Step	112.50
West. Elect. Horn and 3-Step	122.50
CASH WITH ORDER	

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AIR-MUSE Receiver. \$6.00
Range 50 to 500 Miles....

The famous AIR-MUSE receiver consists of Oak cabinet, bakelite panel, selective and primary tuning. So simple a child can install and operate it. Broadcasting stations programs heard perfectly. This receiver is absolutely guaranteed or money refunded. Sent post paid anywhere in the U. S. A. on receipt of Express or Post Office Money order.

1000 Ohm double headset.....\$2.00
Set complete as illustrated.....\$12.00
All other radio accessories at manufacturers' prices.

Detroit Radio Company
ONE 34th STREET
NEW YORK Dep't W

Broadcast Bill's Radiolays

By William E. Douglass

MY wife has got a habit, Tuesday nights, of "lissnin' in" when they send out their talk on styles. Of course I can't blame Min but last week when the parson came to make his monthly call she had him listen to the talk. It pleased him??? Not at all. The chap who did the speakin' seemed to me to be right clever but Parson Brown wux horrified. You'd never guess why, never. The talk begun by tellin' how the girls should wear their hair an' then he told the ladies too what they had ought to wear. Now while I'd like to tell you more I haven't got the heart so I'll just quote some extracts so you'll get, at least, the part that Parson Brown objected to. Perhaps he's justified but as fer me an' purty gals I'm always on their side. "The skirts this spring are longer without going to excesses;" "Behind Dame Fashion's last decree regardin' length of dresses the ones with skinny props, of course, are glad enough to hide but for the rest, oh well—you know—let conscience be your guide." I tried to calm the parson, but as soon as I'd begin he'd interrupt me sayin' "It's an instrument of Sin." "What's that?" I sez real peevish like, "You let me have my say. If you had one of these here sets you wouldn't talk that way. Last week I heard four sermons each one from a different place. I tell you Radio's a boon fer all the human race." We both got so excited Min thought there would be a fight, but I convinced the Parson, after while, that I wuz right. He's comin' over Sunday after church to "listen in" an' pick up other services as fast as they begin. I told the boys about it when I met 'em at the store. They thought that it wuz funny an' you'd ought to heard 'em roar. Next Tuesday night the boys are comin' over so's to hear some more about the fashions we expect to have this year. An' if they get too noisy 'bout the sights they'll be denied, I'll tell 'em that the rule still holds "Let conscience be your guide."

Copyright, 1922, Westinghouse Electric & Manufacturing Company.

Rado Club Formed at Colby Academy

Colby Academy Radio Club recently organized at New London, N. H., is announced by the school. Officers have been elected from the student body as follows: V. C. Buhler, president; Roy Knight, chief operator; Albert Laidbought, vice-president; Quinlon Dodge, secretary-treasurer. Meetings are held in Colgate Hall Saturday nights at 6:30.

A Record

According to letters just received by mail from three different communities in the Hawaiian Islands, the radio-phone station WHAZ at the Rensselaer Polytechnic Institute in Troy, the largest station in any educational institution, has established a new world's record for long distance broadcasting of concert programs, clear reception of both music and speech having been established at a distance of approximately 5,500 miles.—N. Y. Mail.

Marion Davies Thru the Air

Marion Davies, the motion picture star, gave a talk over the radio a few nights ago on "How to Make Up for the Movies." The star of Cosmopolitan Productions told how to apply powder or grease paint to achieve just the right effect for the camera. The message was picked up all over the country. It was broadcast from station WEAF, 24 Walker Street, New York.

We'll Say It Is!

Isn't it cheaper to invest in some kind of protective fuse in your filament circuit than to find yourself saying, "And that was such a wonderful detector, too—they don't make 'em like that any more?"

STANDARD MERCHANDISE AT CUT RATE PRICES

	List Price	Our Price
Framingham Plain Rheostats	\$.75	\$.65
Framingham Vernier Rheostats	1.25	1.10
Klesner Vernier Rheostats	1.50	.90
Klesner Vernier with Dial	1.50	1.30
6 Volt Detector Tube	4.00	2.25
6 Volt Amplifier Tube	4.50	2.75
Freshman Variable Grid Leak	1.00	.75

CASH OR MONEY ORDERS WITH ORDER.
RAPCO PAYS ALL PARCELS POST CHARGE.

RADIO PRODUCTS CO.

147 West 23rd Street, New York City, N. Y.

RADIO GOODS AT BARGAIN PRICES

55.50 Detector Tubes	.....	\$3.00
34.50 Amplifier Tubes	.....	\$3.50
36.50 1½-V. Detector or Amplifier (fits standard socket)	.....	35.25
22½-V. Eveready B. Batt. No. 763	\$1.25
22½-V. Cyclone B. Batt.	\$1.00

All Merchandise Guaranteed,

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Bergen Radio Supply Co.

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A B C of Aviation

By CAPT. V. W. PAGE. This book describes the basic principles of aviation, tells how a balloon or dirigible is made and why it floats in the air. Describes how an airplane flies. It shows, in detail, the different parts of an airplane, what they are and what they do. Describes all types of airplanes and how they differ in construction; as well as detailing the advantages and disadvantages of different types of aircraft. It includes a complete dictionary of aviation terms and clear drawings of landing airplanes. The reader will find simple instructions for unpacking, setting up and rigging airplanes. A full description of airplane control principles is given and methods of flying are discussed at length.

This book answers every question one can ask about modern aircraft, their construction and operation. 375 pages, 180 specially made illustrations with 7 plates. Price, \$2.50

THE COLUMBIA PRINT

148 Broadway, New York City

RADIO BROADCASTING MAP

FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.

Everyone who wishes to get the maximum pleasure and enjoyment from Radio should have a Rand McNally Radio Map of United States. It is complete, accurate and up-to-date.

The Rand McNally Radio Map of United States is 22x30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient posted form with cover.

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Government Broadcasts Educational Data Twice a Week

To reach the general public, as well as school workers, with educational information and to spread it promptly, cheaply and widely, the United States Bureau of Education sends out messages twice a week from NAA, the naval aircraft station at Radio, near Arlington, Va., on a wave length of 700 meters, says the *New York Times*. The messages are sent on Monday and Thursday evenings from 6:45 to 7 o'clock.

The first of the radio talks was given on Dec. 7, the subject being the economic loss due to illiteracy. Later messages discussed the money value of education, visual aids to education, the necessity of education in a democracy, the work of the Bureau of Education in Alaska and the shortage of school buildings.

"The Bureau of Education has started this service because it is the duty of the bureau to reach not only technical experts but also the general public," says the announcement of the innovation, "and it is the opinion of Dr. John J. Tigert, United States Commissioner of Education, that the public can be reached more quickly and directly by radio than in any other way."

"Radio has the advantage of intimate contact between speaker and audience, and since the bureau's messages will be sent on a regular schedule, they will have the continuity necessary for informing the public on educational matters. Since public education cannot progress any faster than the state of public opinion about education, the Commissioner believes that the inauguration of the radio is an important step in advance. Newspapers in California and Washington have requested permission to broadcast the bureau's messages to the Pacific Coast States, since the Anacostia radio reaches only to the Mississippi River.

"Such subjects as the combating of illiteracy, the consolidation of rural schools, health work in the schools and Americanization will probably be taken up in future message. Those hearing the talks are urged to write to the Commissioner of Education and to comment on the material presented and upon its form. Tell him whether you derived any benefit."

Reaching 8,000,000 People

CARRYING on educational propaganda among people who are working all day long and cannot attend university classes, is one of the great uses of radio, according to Prof. Michael I. Pupin in New York "Evening Post." Think of the potential audience within listening distance of Columbia University by radio. There are 8,000,000 people within a radius of fifty miles. You can reach them by radio with the simplest and most direct medium of communication, the spoken, the living word!

Think of what it would have meant to St. Paul if he had had such a medium of communication. Then, while he traveled from Jerusalem to Cyprus, Caesarea, Corinth, Ephesus, Philippi, Thessalonica, Athens, and Rome, he could have sent the words of his mouth to all the churches every day. Those marvelous epistles would have been given a most powerful reinforcement.

We need St. Pauls in our universities today—men who will rise up and preach the doctrine of truth and democracy. People who work all day, people who will not leave their homes to attend a lecture course, people who tire of reading the dry printed word, will listen if all they have to do is to use a radio. There are millions of people who are thirsty for knowledge whom we could not reach by the old methods.

The singing of carols in the U. S. was distinctly heard by an Aberystwyth wireless amateur. Nevertheless, nothing daunted, he proposes to continue with his hobby.—Lon-

Pictures and intimate gossip of some of the entertainers you hear via radio.

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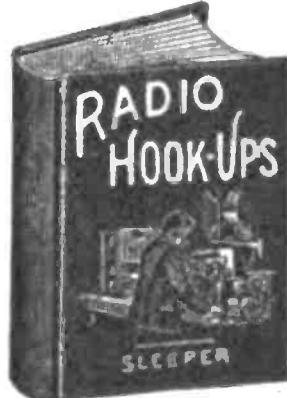
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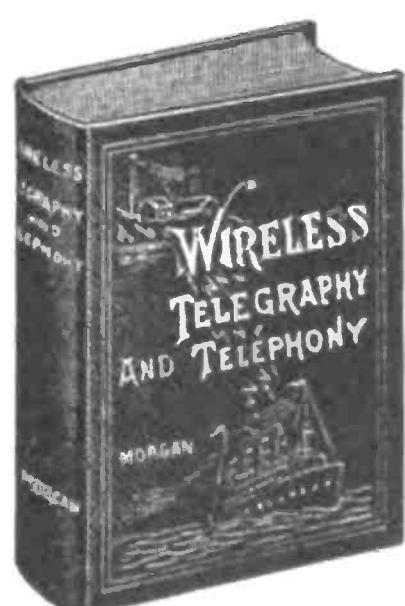
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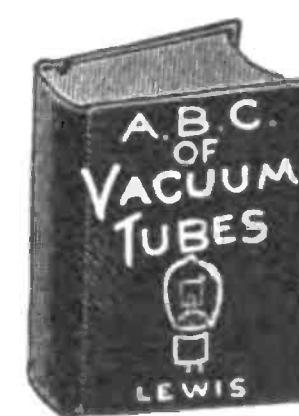


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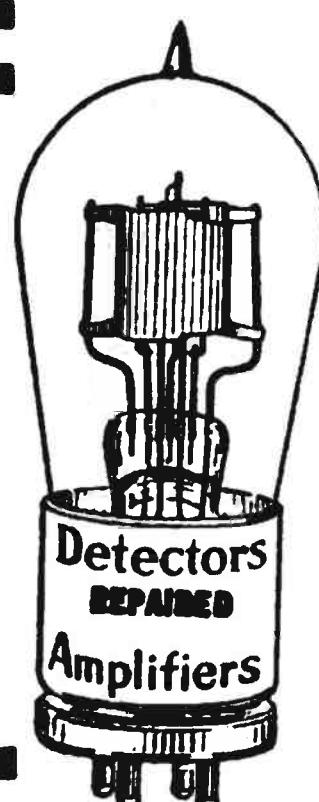
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Banneker Radio Club of Maryland a New One
535 Presstman Street, Baltimore, Md.
January 28, 1923.

Dear Sirs:

I am forwarding you the names of our present officers.

Roland Carrington, president; Clarence Fax, vice-president; Tecumseh Woodland, secretary; Ralph Reckling, treasurer; John Hebron, chairman of executive committee.

Yours truly,
 R. CARRINGTON,
 President.

Manager Keeps Track of Theatre While on Ocean

WHILE S. L. Rothafel, manager of the big Capitol Theatre, New York City, was on the high seas last week, bound for England, he was able to keep in touch with the program at the Capitol Theatre by means of the radio which was installed in his stateroom on board the *Berengaria*. A wireless report from the liner reports that he is receiving the music which is being broadcast direct from the theatre through the American Telephone and Telegraph station, WEAF.

Why Not Try It?

Editor, **RADIO WORLD**:

If somebody wants to try something that will make him so excited he can't sleep nights, let him try the hook-up described in **RADIO WORLD**, page 19 of the issue of December 23, and make the following changes.

Put in a grid leak of about 1 megohm and a condenser of .0005 mf. Then take the phone condenser out and throw it away. Put in a WD-11 tube and a pair of Brandes 2000 ohm phones. Then take the old storage battery and give it to somebody, because you won't need it any more as long as you live. Hook up a dry cell in its place and that's all. Then sit down and turn the rheostat about half way on, twist the variable condenser dial around until you hear something that sounds like the stock yards, adjust the tickler and the rheostat, and oh, boy! Another bug added to the list!—A READER.

Cannot Make It Too Strong

THE minister of our church gave us a little talk the other evening at the meeting of the Ladies' Society, on the way in which radio has helped the human race in general. After the meeting our pastor appealed to me, asking me if he had made his point strong enough or if I thought it was too strong. I thought it was just wonderful, as did all the others. You simply cannot make anything that

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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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AMATEURS—LOOK! Send in 15 cents to RADIO WORLD for issue of January 20 containing panel layout, hookup and full explanatory data on the construction of a D-X receiver, which simply lays the long distance on your table. Or start your sub. with that issue. RADIO WORLD, 1493 Broadway, New York City.

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ATTENTION, Amateurs!! Have you seen the RADIO WORLD'S page of hook-ups in the Oct. 21 issue? 15c a copy or start your subscription with that Number. Many people are writing in for the hook-ups listed here. RADIO WORLD, 1493 Broadway, New York City

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BROADCASTING MAP

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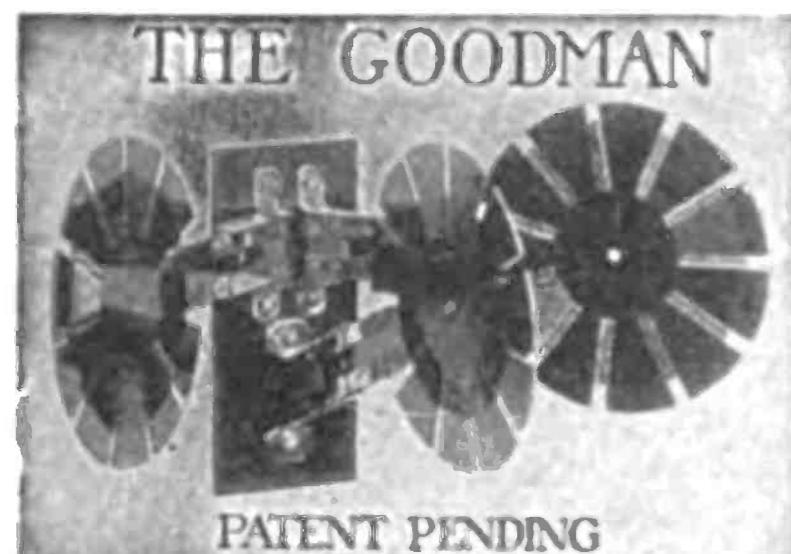
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FROM PUBLICATION OFFICE,
1609 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS CORPORATION

ROLAND BURKE HENNESSY, President
and Editor
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1609 BROADWAY, NEW YORK, N. Y.

TECHNICAL EDITOR
Robert L. Dougherty

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If Your Regenerative Receiver Won't Oscillate

Under the heading "Not in the Text Books," a writer in the New York "Mail" gives the following "tips":

"If your regenerative receiver doesn't oscillate there are several possibilities to investigate. The grid leak should be varied either by the insertion of tubular leaks of various resistances or by the addition or erasure of pencil lines between the grid condenser terminals. The phones or the first amplifying transformer primary should be shunted by a fixed condenser of about .001 mfd. capacity. Tickler leads should be reversed. Also the "A" battery leads should be changed around, as detector tubes sometimes are improved in their operation in this way."

"A leaky socket is a very common cause of this trouble, too. A socket having a few thousand ohms resistance between terminals will prevent a circuit from oscillating. High resistance joints in the circuits through which sufficient current might pass to give fairly good signals will sometimes prevent regeneration. Hence all pressure contacts should be thoroughly cleaned with sandpaper and all other joints soldered."

President Tries It Out

President Harding is said to have tried out his radio set for the first time during his recent illness, without satisfactory results. He succeeded in getting a local station and one in Newark at the same time, but, being unable to disentangle what sounded like a conference report, he gave up.

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High dielectric resistance.	
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5" x 24" 1.25
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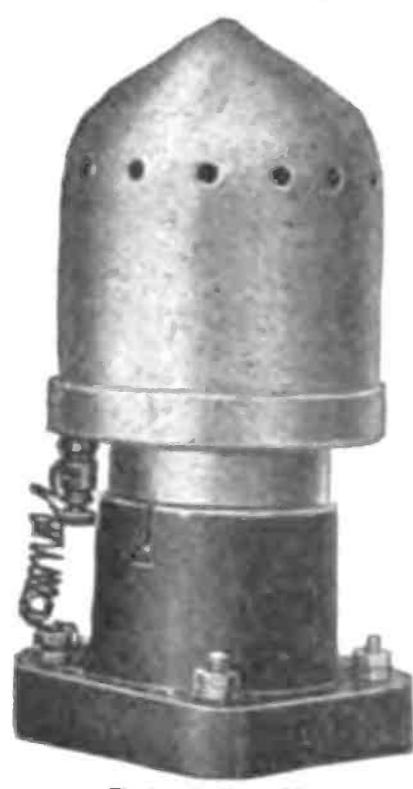
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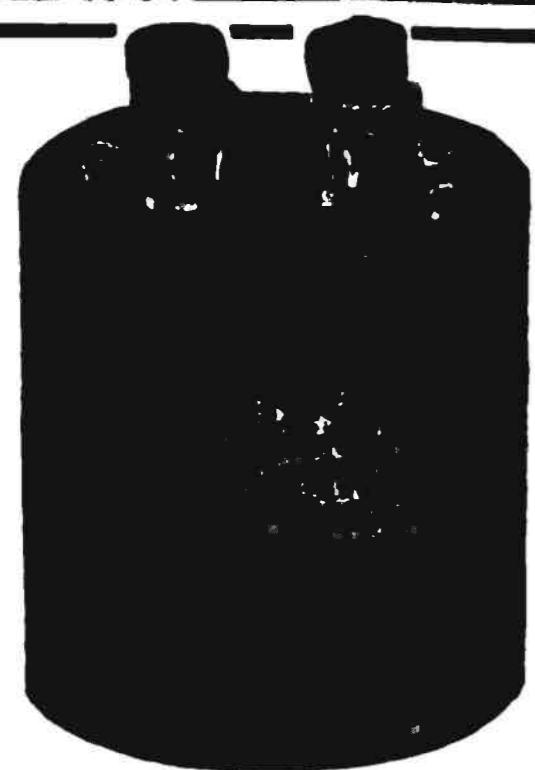
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If your dealer cannot supply you we will ship immediately by mail postpaid on receipt of \$1.00.

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Price, \$4.00. We pay postage.

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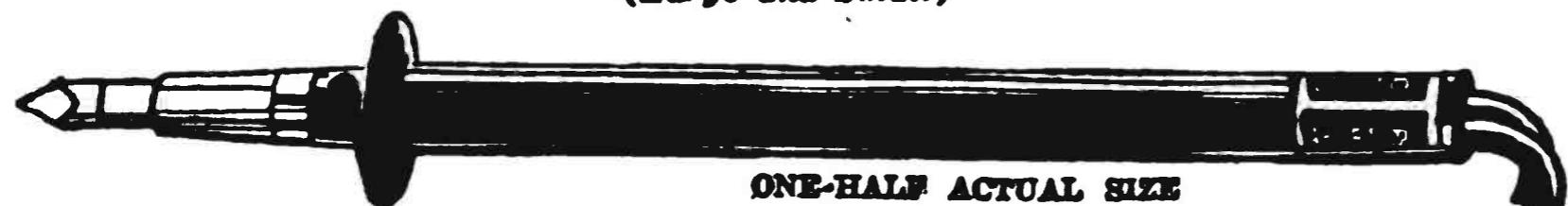
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8 RADIO-WIRE TABLES, BY FREDERICK J. RUMFORD, E.E., R.E.

These tables, showing the number of feet in a pound and fractions of a pound, were published in RADIO WORLD as follows: No. 1—Enamelled Magnet Wire, RADIO WORLD, No. 34, dated Nov. 18. No. 2—Single Cotton-Covered Wire, RADIO WORLD, No. 35, dated Nov. 25. No. 3—Double Cotton-Covered Wire, RADIO WORLD, No. 36, dated Dec. 2. No. 4—Single Silk-Covered Wire, RADIO WORLD, No. 36, Dated Dec. 10. No. 5—Double Silk-Covered Wire, RADIO WORLD, No. 40, dated Dec. 30. Sent to any address postpaid at 15 cents a copy, or the complete set of 5 copies for 75 cents. Or start your subscription with any number. Order now. Every amateur builder should have these tables constantly at hand. The supply of back numbers is limited.

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Difficult for Ordinary Set to Tune in NAA

THE opening of the powerful Arlington station as a broadcasting station should be of considerably more than passing interest to the millions of radio fans, says the New York *Globe*. No broadcasting organization has the facilities or the staff to compete with the government in the operation of a first class station. Whether the results will be on a par with the possibilities will soon be known.

But the opening of this station is at the same time a disappointment to many thousands whose sets will be incapable of reaching up to the wave length of 710 meters on which Arlington transmits. Many sets whose makers or sellers optimistically credited them with an upper wave length limit of 800 meters will just about tune in NAA, but the short wave sets using variometer tuning in the plate circuit are quite certain to be far below the range.

To load up a three circuit regenerative set is a task requiring patience and above all

else a spirit of research. The primary of the average set is well able to reach 710 meters, but the secondary and tickler circuits must be loaded with additional inductances. Compact coils of the honeycomb or duolaterals type are probably best suited for this purpose.

For the average fan to load a circuit means a makeshift set. If the owner of an outfit wishes to tune effectually to 710 meters a triple coil mounting using compact coils is the best arrangement. The usual vario-coupler and variometers are then disconnected and the three coils employed as primary, tickler, and secondary, respectively.

Limitless Possibilities

IT APPEARS not to have been understood by all who have written about this new achievement of General Squier's, that the wire cable is used only to direct the "broadcast" message, as a telephone wire directs ordinary line-radio conversation, says Dr. Henry Smith Williams in his new book, "Practical Radio." The electric-light wire is not functioning as an aerial. It does not catch up signals from the ether, but only conveys messages—lectures, music, or what not—sent directly from a transmitter in the power-house, the transmitting apparatus being connected to a socket, just as is the receiving apparatus at the other end of the line.

It would appear that such use of an electric-light system offers at least one solution of the broadcasting problem. To illustrate: In most village communities, the electric light goes everywhere. Concerts and other entertainments could, of course, be heard by line radio wherever the electric-light system is installed. Half a dozen different programs could be sent at the same time along the wire, by using different frequencies. It would thus be possible for each household to select the particular entertainment that it wished to hear.

It would be possible, apparently, to have different entertainments in various rooms of the same house. Father could listen to the sporting news in his study; mother to a concert in the sitting-room; and the children to some juvenile entertainment in the playroom. Meantime, people whose houses are not supplied with electric lights might gather in various public halls, say school-rooms and churches, to listen to entertainments of various types. The possibilities of the method seem limitless.

The College on the Hearth

"The National Radio Chamber of Commerce is developing a scheme to establish radio extension courses in American colleges and universities."—News note.

I've taken half a year of Greek,

And studied that exacting

Profession, 'til I've learned to speak

Quite casually of acting.

And, all the time, I've never had

To go to school for knowledge;

By radio I am a grad-

uate of Broadcast College.

BEAU BROADWAY—
in New York "Telegraph"

A Matter of Cost

The reason that the super-heterodyne, sometimes called "The Rolls-Royce of Radio," is not more popular is the same as for its big brother—"The upkeep is too high."

Broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 21. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

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A Generous Sample will be sent on request. Address: Ridgways, Inc.,
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GOLD MEDAL San Francisco 1915



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Radio is one year old now! What are its possibilities in another year? Over 1,500,000 Radio Receiving Sets are in daily use. Estimated daily radio audience is 10,000,000. What will the radio audience be, 5, 10, 20 years from to-day?

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\$250.00 Radio Set Free
Six Tube Radio-Audio Frequency Set

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Four Tube Set, Detector and 3 stages Amplification

THIRD PRIZE—

\$100.00 Radio Set Free
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To advertise our business we will give the above prizes to the three persons sending us a list of five or more names of Radio fans and who compose the best slogan or phrase of words we can use for our advertising matter. We are interested in sending our catalogue and price lists to Radio fans.

If you are interested in Radio and in its future possibilities don't overlook this opportunity to get acquainted with us, secure low prices on your purchases and an opportunity to win one of the above prizes free of charge.

In the event of two or more persons submitting the slogan judged the best, second best, or third best, each will receive the full amount of the prize tied for. All entries must be received by us not later than March 31, 1923.

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