

National Radio Week
December 23 to 30 (inclusive)

November 25

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12 Numbers

RADIO WORLD

(Trade Mark)

ILLUSTRATED. WEEKLY

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An Airplane View of the Statue of Liberty and Bedloe's Island, New York Harbor, showing at the left the lofty aerial of WVP, the Fort Wood Radio Station operated by the United States Government.

DX Hook-ups for the Radio Novice, by G.W. May—Page

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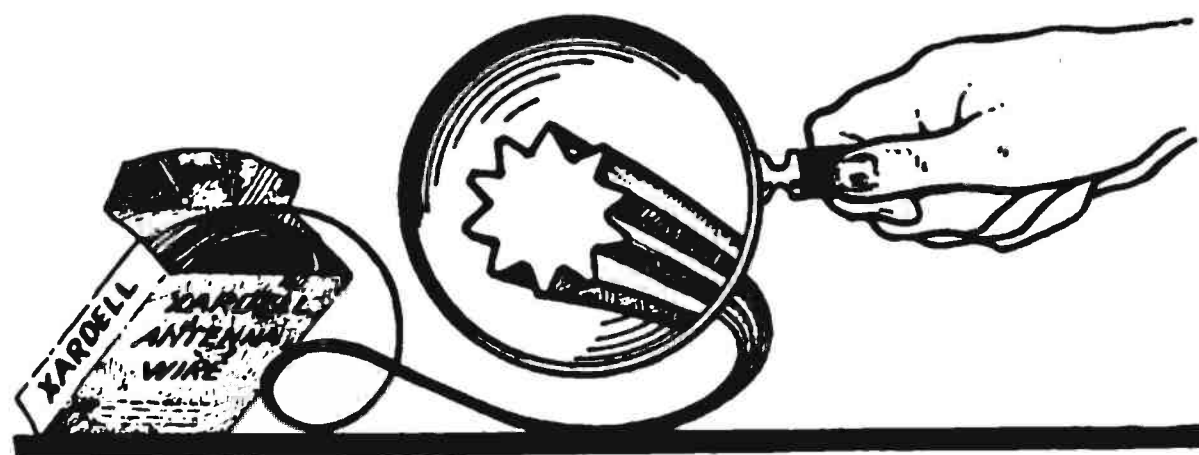
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VOLUME TWO

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.]

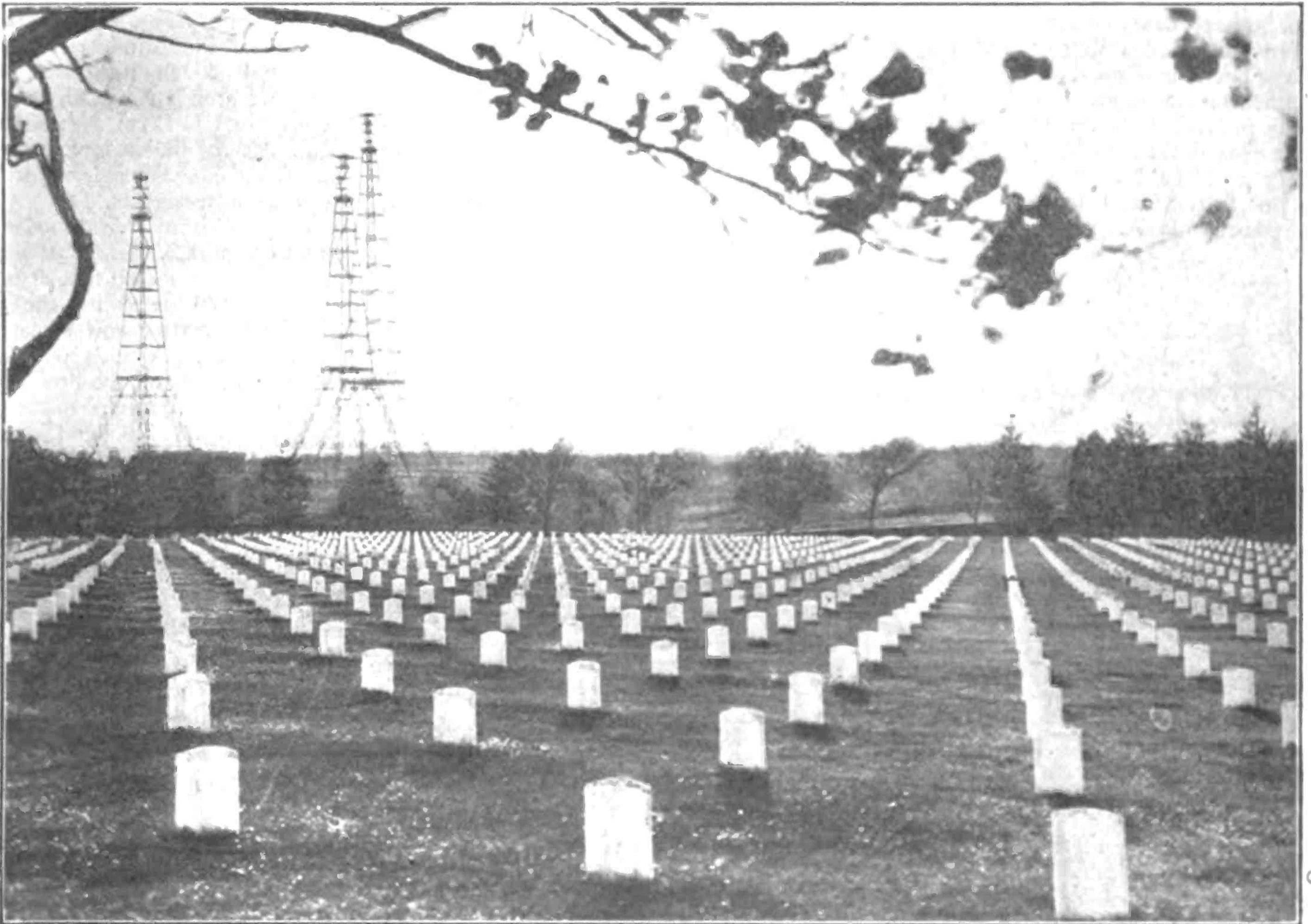
A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4786.

Vol. II, No. 9, Whole No. 35

November 25, 1922

15c. per copy, \$6.00 a year

Where Radio Kept Vigil Armistice Day



(C. Underwood & Underwood, N. Y.)

Washington, the nation's capital, city of "magnificent distances," always athrill with the echoes of the men who made American history, has no more appealing place in all its vast area than Arlington Cemetery, where rest forever the brave men who gave their lives in the cause of liberty—not only for their own native land, but that the rest of the world also might be free. Perhaps there is no more beautiful, peaceful spot on earth than these hallowed acres where sleep the dead of the United States Army and Navy. The rows and rows of modest milestones of the privates and the massive memorials of their officers are, today, a foreground for the gigantic towers that support the aeriads of NAA, the government's radio station at Arlington. Nothing is more silent than these high-pointing towers, nothing marks more specifically the grandeur of science and the mystery of life. So one may be pardoned, if in their steadfast position as transmitters and receivers of all that is wonderful and new in the world, they should be described as the watchers of our soldier dead, particularly as, year by year, Armistice Day becomes a day of reverence. For all time, the President of the United States will be expected to place a wreath on the grave of the Unknown Soldier, on this occasion. Arlington Cemetery with its verdant slopes and sleeping dead on one side, the silent-flowing Potomac River and the busy farms on the other, the great City of Washington to the south, and radio's lofty masts towering over all is a picture no American who loves his country should fail to appreciate.

Using Jacks with Vacuum Tubes

THE use of telephone jacks in a receiving set has become a standard practice. They provide a convenient and rapid means of shifting the receiver from one stage to another. They can be connected so as to cause the insertion of the plug in any stage to light only those filaments required for that stage of

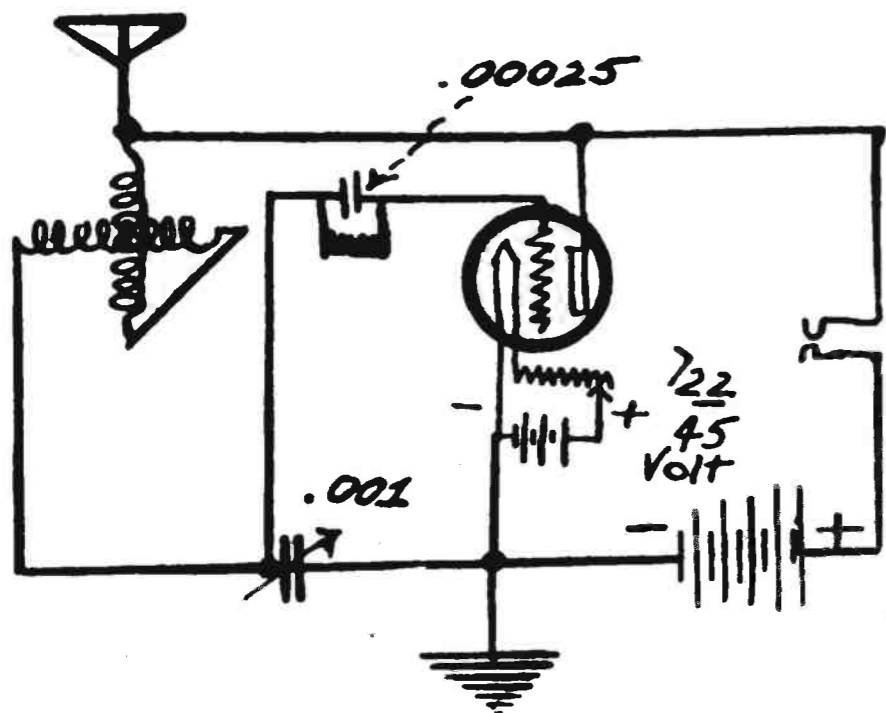
amplification. Removal of the telephone plug can extinguish all filaments and permit their relighting by the mere insertion of the plug without readjustment of the filament rheostats. Because of this completely automatic lighting and extinguishing of the filaments through the use of proper filament-control

jacks, the life of the vacuum tubes is greatly increased and the drain on the filament batteries is reduced to a minimum. It is always a safe proposition when employing vacuum tubes—whether a 6-volt "peanut," or 1½-volt filament—when using the filament jack. In fact, it is the best with a rec

DX Hook-ups for the Radio Novice

By George W. May, R. E.

MANY believe that stations sending out the longer waves may be heard at great distances because of the greater wave-length used. It seems to be fairly well established by experiment that long waves do travel with somewhat less attenuation than short ones, but there is no experimental evidence to show how much better the long waves are propagated than the short ones. Recently low-powered stations sending on 200 meters have been successful, occasionally in transatlantic communication, a result previously thought impossible. The reason that the longer wave stations are heard at greater distances is due to the fact that they are high-powered stations. It is difficult



Schematic Diagram of a simple, compact receiving outfit. A variometer is used as a means of inductance. The plate-battery voltage is 22 volts. Drawn by George W. May.

to send out large amounts of power at the shorter wave-lengths because of the necessarily small antennas used at the short waves.

There is apparently much difference in signal strength at different parts of the season. Sometimes signals—between a pair of stations with the apparatus the same in either station—show the variation in strength as much as four to one, the stronger signals being received in the winter time. It has been suggested that summer foliage absorbs a considerable amount of energy from traveling waves.

There is also a pronounced difference between night and day transmission. Signals generally travel much farther at night than during the day; but transmission at night is likely to be more variable than it is during the day.

It seems that, during the winter months, there is not much static, or disturbance, in the receiver, so that comparatively weak signals should be received. If a broadcasting station is sending out one kilowatt of power a

tube detector, such as is shown in the accompanying sketches, should give readable signals at a distance of several hundred miles. This distance will naturally depend largely on how good an antenna is used at the receiving station and how well the set is grounded.

It will be noted that distances greatly in excess of this are reported, but generally a tube receiver is not used, as shown in the accompanying sketches. By proper coupling of the plate and grid circuits of the tube a regenerative action is obtained which may increase the sensitiveness of the receiver a hundred times in the hands of a skillful operator.

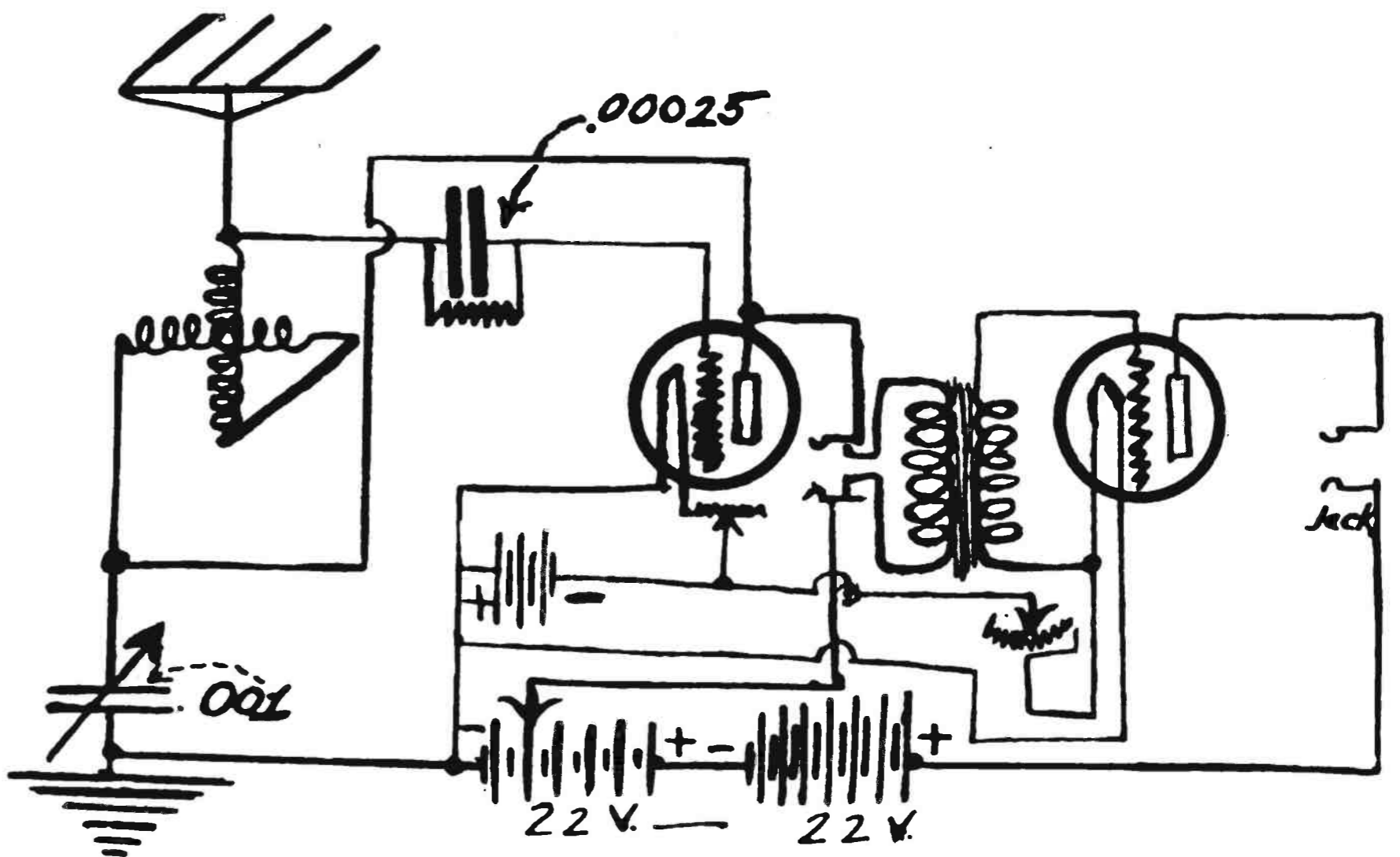
On a number of occasions the writer has copied signals in his laboratory from stations several thousand miles away, using only one tube. Let us consider just what must take place in order to catch the ether waves and make them audible. Some arrangement must be utilized to catch a portion of the waves as they fly through the air. Such an instrument is usually in the form of what we know as an aerial or antenna. As radio waves have definite frequency, or wave length, some means must be employed to tune the receiving set to the incoming waves, or adjust it so the waves in the receiving instruments will oscillate in synchrony, or harmony, with the waves of the transmitter. The instrument of synchronization takes the form of a tuning coil, loose-coupler, variometer, vario-coupler,

variable condenser, or, sometimes, a combination of several of these instruments.

I intend to utilize the variometer as a means of inductance for the 360-meter stations. The circuit is simple enough for any novice to work out. If connected up according to the diagram wonderful results should be obtained. From New York City I may say that I have heard WGY, Schenectady; WSB, and KHJ, also stations in Chicago, Cleveland and Detroit.

The second sketch illustrates the adding a one step of amplification to the circuit. A D-L coil No. 50 can be used in place of the variometer, but I recommend the variometer in order to have some adjustments.

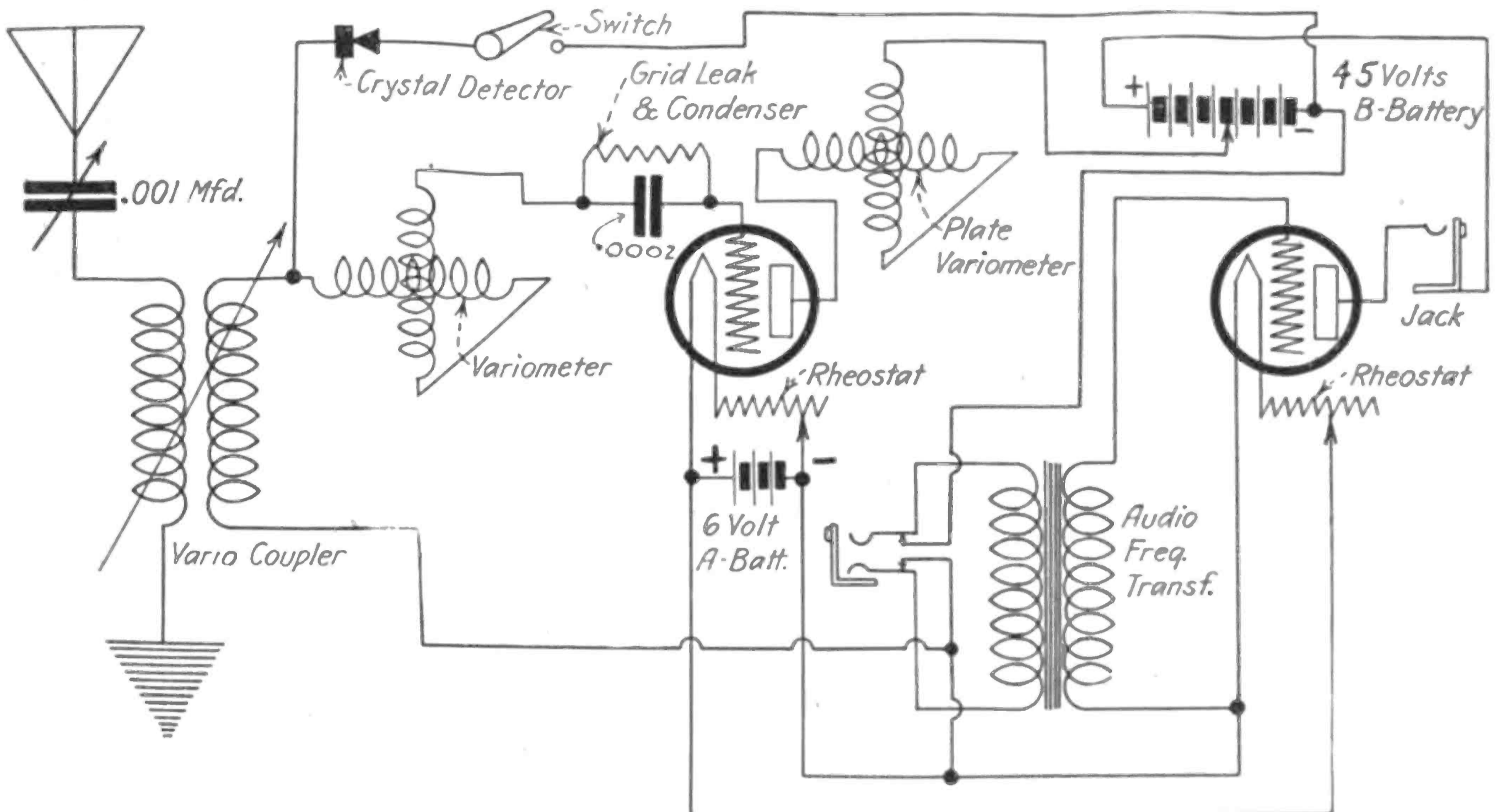
The sets and circuits described are simple and comparatively inexpensive; but it must be remembered that crystal detectors cannot be used for the results I claim no matter how sensitive the crystal may be. Crystals are good for twenty-five miles on the broadcast material, although greater distances can be had under favorable conditions. Code messages may be received over hundreds of miles with crystals. In using this circuit I would recommend using the W-D-11 vacuum tube, known as the dry-cell tube, operating on one dry cell. Believe me, these are the tubes for receiving! They are new on the market. If connections are made properly there is no reason why signals cannot be copied for some distance, provided the aerial is at least 100 feet long.



The amateur wishing to try out the circuit described by Mr. May in the accompanying article will secure satisfactory results by following the above hook-up. Note that a one-stage amplifier is used, which adds to the audibility of loud signals. The instrument of synchronization takes the form of a tuning coil, variometer, loose-coupler, variable condenser or, sometimes, a combination of several of these instruments. Any novice can easily work out this circuit, as it is very simple. Connect it up carefully according to the diagram. A duolateral coil may be used in place of the variometer, but Mr. May recommends the variometer because of the adjustments. Drawn by George W. May.

Combination Hook-up of Detectors

By Fred. Chas. Ehlert



Complete schematic diagram of a vacuum-tube detector outfit with one-step amplification as described by Fred. Chas. Ehlert in the accompanying article.

ONE of the most important parts of a receiving set is the detector. It is important in this respect: The human ear cannot receive signals above 10,000 cycles of frequency. In radio work the frequency sometimes runs as high as a million cycles, so means must be provided for making such high-frequency signals audible to the human ear. The detector does this. Therefore it is necessary to get the best results from detectors.

There are a number of detectors in use at the present time. They are the crystal, the magnetic, the Fleming valve, and the audion- or vacuum-tube. Crystal detectors are of different types: they are manufactured of various minerals. Galena is one of the minerals used mostly by amateurs. The

operation and assembly of a galena detector is simple. Crystals must be kept clean in order to retain their sensitiveness. Washing with a little alcohol greatly improves them if they have been left standing, or have been handled, for a long time.

The accompanying diagram illustrates the complete schematic diagram of a vacuum-tube detector outfit with a one step of amplification. A crystal detector is included also in the circuit. The amateur should try out both detectors separately. The hook-up shows both detectors in the circuit. When using the vacuum tube as a detector, care must be taken that the switch in line with the crystal detector is open. If the crystal is to be used, merely close the switch, shut off the rheostat on the

detector tube and adjust the crystal. With the aid of the one-stage amplifier, it will make possible the amplification of signals. Many amateurs would rather use a crystal detector than a vacuum tube because there is less battery noise and distortion. Others, however, prefer the vacuum tube as a detector; so, for these amateurs, the vacuum tube may be placed in action and the detector crystal eliminated. With the aid of an extra stage of amplification, signals will be amplified to a certain degree of sensitivity.

A novel effect would result if both detectors were lined and each one tested out separately. This would give an idea as to what both detectors do. It is an interesting experiment for amateurs.

Over 600,000 Hear "Aida" by Radio

Verdi's Great Work Is Broadcast Successfully With Metropolitan Singers and Orchestra

By Patrick Nichols

"AIDA," Verdi's grand opera, was heard by radio, on Armistice Day, it is estimated, by over 600,000 people within a radius of a thousand miles. The performance was given by members of the Metropolitan Opera Company and the Metropolitan Opera House orchestra, in oratorio form, in the Kingsbridge Armory, New York, the largest armory in the world, where over 15,000 persons

assembled to hear the performance. While the rendition marked a high spot as the program of the Armistice Day Festival in the Bronx, New York City, it will go down in history as one of the most important radio events of the year. Those who tuned their receivers on the 450-meter wave-length of WEA, the huge broadcasting station of the American Telephone and Telegraph Company, will be proud, in years to come, to tell about this first "radio performance" of one of the most popular grand operas ever written. Voices and instruments were heard with remarkable beauty and clearness.

No effort was spared by the broadcasters to ensure reproduction of the opera by wireless without distortion.

Engineers of the American Telephone and Telegraph Company spent a week in the armory making tests. They were handicapped by their inability to hold a rehearsal, but, as an alternative they personally sang in different parts of the huge armory to assure themselves that the average human voice could be reproduced with fidelity. They also experimented with a half dozen canaries to make sure that the amplifiers would catch even the finest phrasing of the Metropolitan singers.

Commenting on this remarkable achievement, "The American," New York, says: "Such glorious broadcasting successfully accomplished, it looks as if popular musical pleasure and general musical culture were really 'in sight.'"

With the Ossiphone Even the Very Deaf May Hear Radio

By Ortherus Gordon

RADIO is wonderful to all who can hear, but what about the poor fellow who is deaf and can't hear a sound of the concerts which flood our ears? Does he think radio so fascinating? Ordinarily not; but with a little instrument, the "ossiphone," even the totally deaf who have not heard a sound for scores of years, may listen in at the radiophone. The ossiphone may be the means of bringing a chest of gold to those who formerly had not even a penny.

It is a simple instrument, in-

vented by Mr. S. G. Brown, of London. It is not a means of amplifying sound so as to overcome all degrees up to total deafness; nor does it translate sound into some other medium of communication, like motion or color. It conveys sound to the brain without the aid of ears, eyes, tongue, or touch; but it does enlist the aid of the bones. It is just what the word says—a bonaphone; "ossi" is Latin for bone.

In appearance, the ossiphone is a small ebony box, possibly 1 inch high and 4 inches long. From a slot in one end protrudes a metal vibrator with a knob, so that the entire instrument looks like an enclosed telegraph-key. Double wires leading from the other end heighten the similarity. The resemblance disappears, however, when the cover is off. The vibrator is seen to pass between the poles of a horseshoe magnet which have been wound with wire so that the ossiphone is made to resemble the inside of a telephone receiver with a bar vibrator instead of the usual diaphragm.

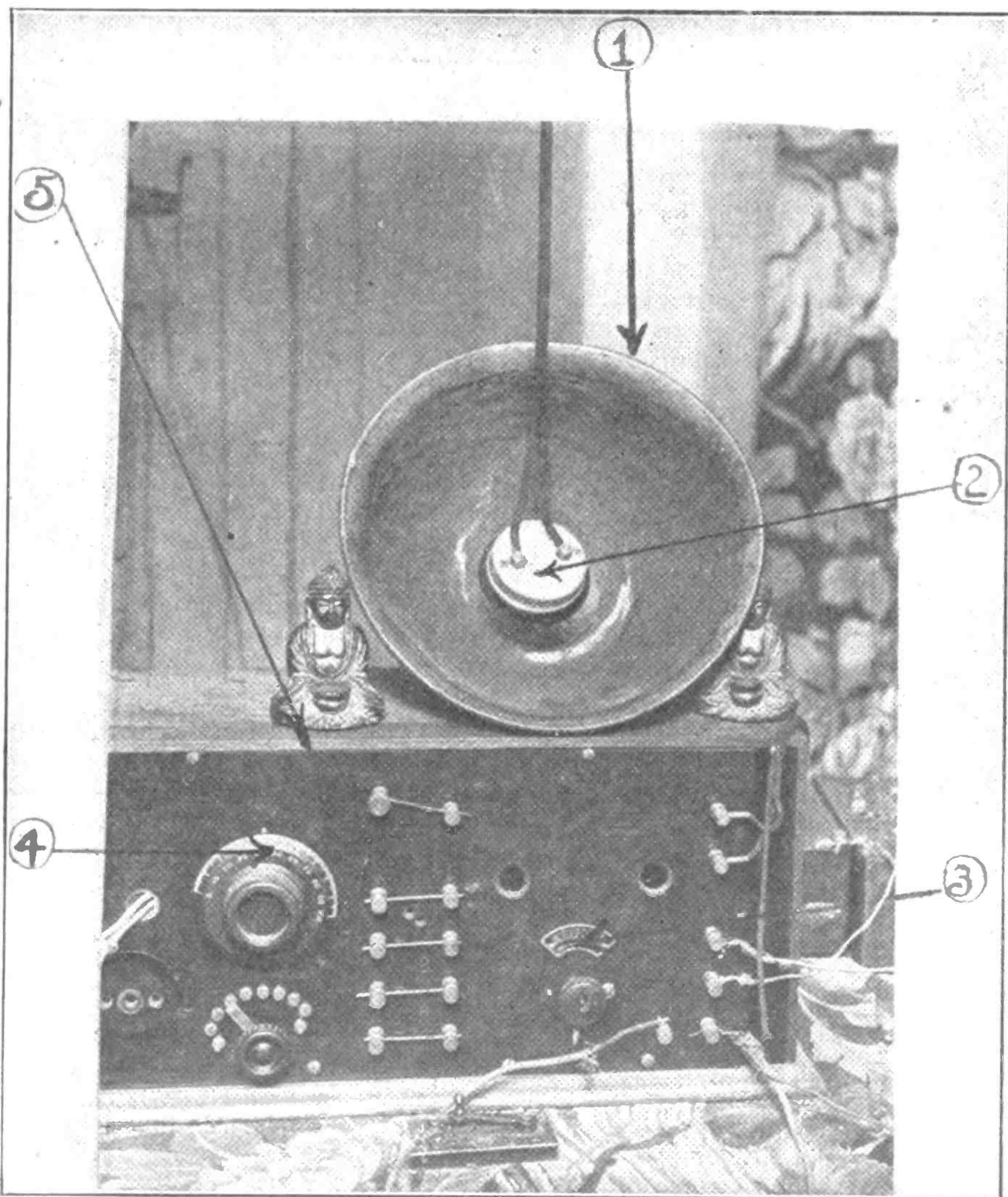
For use with a radiophone, the wires of this useful device are connected to a radio receiving set in place of the headphones. A deaf person, perhaps, may not be able to operate a radio set, for he must hold his ossiphone in one hand while he presses its knob against a finger knuckle of the other. Strange as it may seem, he hears exactly the same sounds as a listener-in, who can hear, with a headset. The difference is this: he hears through his bones; the other hears with his ears.

Remarkable tests made in London demonstrate that a person with normal hearing can actually hear better over the radiophone by use of the ossiphone than by use of the ordinary headset. It is claimed that the bones make better ears than the ears themselves!

In explanation of this, it seems that sound is not a product of the ear alone but the effect of the ear's vibrations on the brain. The aural nerves are the ones that do the trick. If vibrations could be transmitted to these aural nerves by any means whatever, hearing would result. In an event of this kind, the ears would be merely passive appendages.

This strange condition has actually been brought about by the ossiphone. That instrument utilizes the bone as a medium through which to transmit sound vibrations to the aural nerves and thence to the brain. The use of the ossiphone is neither nerve racking nor unpleasant. The bones themselves do not tingle—the vibrations of the ossiphone are too delicate for that. The only sensation to a deaf person is the joyous one of perfect hearing.

Plain Dish as Loud-Speaker Distributor



The lowly china, or earthenware, dish, such as may be found in any home kitchen, makes a surprisingly good distributor for a loud-speaker. Take one earpiece from your headset and suspend it in front of and facing the dish after it has been put end upwards on wood or some resonant material. By careful testing you can find the exact spot where the sound is the loudest, then the phone may be permanently suspended or fastened, as is shown in the photograph. Surprising mellowness will result. The experiment is well worth trying when you are picking up loud stations. In the photograph, 1 shows the disc, or plate, in position; 2 is the telephone earpiece; 3 is the rheostat to increase the brilliancy of the vacuum tubes; 4 is the dial that governs the tuning qualities; 5 is the receiver complete.

Merchant-Marine Officers of Future Must Know Radio

By S. S. Smith

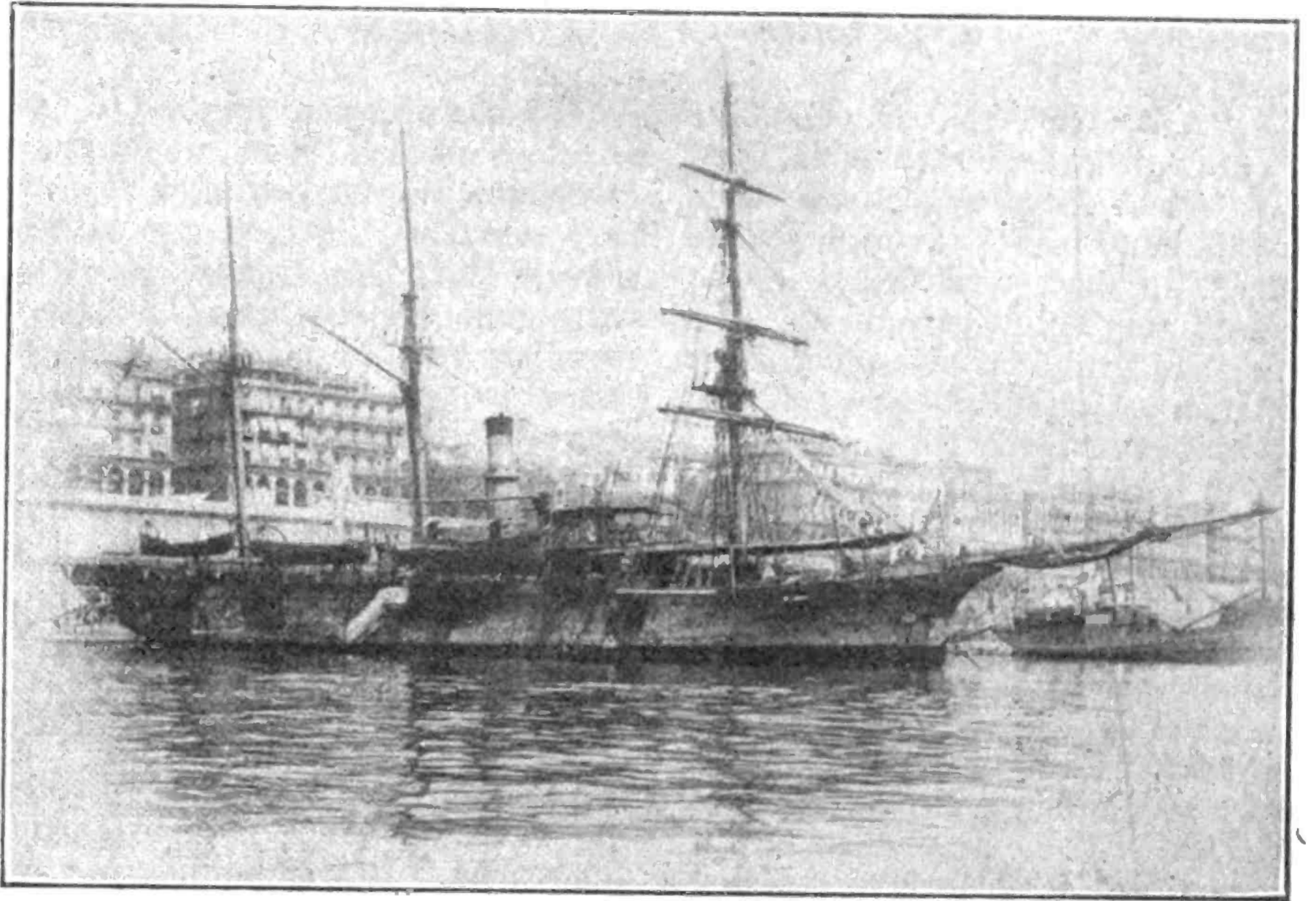
IT has been decreed by the State of Massachusetts that the education of a merchant-marine officer is not complete without a knowledge of radio. Accordingly, the Massachusetts' State Nautical School, the steamship "Nantucket," is offering to cadets, this winter, a complete course in radio operating and engineering. This is a departure from the ordinary curriculum; for during past winters, at North End Park, Boston, the education of prospective merchant-marine officers has been limited to navigation by the sextant, the log, lead, and compass, fair winds and the grace of heaven.

Now, for the first time, merchant officers in the making are being fortified against storms, currents, and fogs at sea by timely instruction in the use and operation of all kinds of radio apparatus. The importance of this instruction may be judged by the fact that there are at present only two training ships supplying our merchant ships with officers of American parentage: the "Nantucket" of Massachusetts, and the "Newport" of New York.

There is a special instructor on the "Nantucket" whose duty is to teach the cadets the Continental Code and to explain radio navigating. Fascinated youngsters are learning that there are other ways of obtaining a position at sea than those given in the nautical lore and navigational tables of Bowditch. Study of the radio compass is stressed, as that instrument is of greater value to the seafarer than any other.

During the winter lay-up at the dock, the theory of the science will be taught. In the summer, when the "Nantucket" goes on her annual cruise halfway around the world, the cadets will get actual practice in the radio room of the ship. In this period, they will have demonstrated to them the possibilities of radio navigating—not as it is practiced now but as it may be practiced in the future.

This is the first step ever taken to weld the deck and the radio department of merchant ships. Heretofore, there has been jealousy and ill-feeling—old-timers have felt that radio is an encroachment on their methods. They have balked at using radio. The Navy long ago



The Massachusetts State Nautical Schoolship "Nantucket," photographed at Algiers, aboard which students are given a complete course in radio operating and engineering.

brought radio within the control of the navigator; but then radio, as a means of battle signaling, was far more important on war vessels than on cargo and passenger carriers. Some time may pass before radio as

taught aboard the Massachusetts' school ship will have a visible effect on merchant marine, but the fact remains that future officers are being prepared for radio dominance on the sea.

Radio-Wire Tables

By Frederick J. Rumford, E.E., R.E.

No. 2—Single Cotton-Covered Wire

Showing the Number of Feet in a Pound and Fractions of a Pound

APPENDED is the second of a series of five tables which the radio amateur will find useful for many purposes. The succeeding tables—"Double Cotton-Covered Wire," "Single Silk-Covered Wire" and "Double Silk-Covered Wire"—will be published in early numbers of RADIO WORLD.

Size	1/8 lb.	1/4 lb.	3/8 lb.	1/2 lb.	3/4 lb.	1 lb.
20	38	76	152	228	311	311
21	48	96	192	288	380	380
22	61	122	244	366	491	491
23	78	156	312	468	624	624
24	97	194	388	582	778	778
25	119	238	476	714	958	958
26	148	296	592	888	1188	1188
27	191	382	764	1146	1533	1533
28	247	494	988	1482	1963	1963
29	307	614	1228	1842	2461	2461
30	381	722	1444	2166	2893	2893
31	435	870	1740	2610	3483	3483
32	551	1102	2204	3306	4414	4414
33	711	1422	2844	4266	5688	5688
34	809	1600	3200	4800	6400	6400
35	1049	2098	4196	6294	8393	8393
36	1230	2460	4920	7380	9846	9846
37	1454	2908	5816	8724	11636	11636
38	1731	3462	6924	10386	13848	13848
39	2258	4570	9140	13710	18286	18286
40	3047	6094	12188	18282	24381	24381

This table can be used for a variety of purposes.

Radio Waves Penetrate Earth

Experiments in Mine Indicate That Radio May Be Used for Communication

By Carl H. Butman

WASHINGTON, D. C.—The well-known signals KDKA, East Pittsburgh, have been heard in many places throughout the country, but it is doubtful if it was heard 100 feet below ground and at a distance of eighteen miles from the station, until the Bureau of Mines experts heard it recently in a test made in a mine at Bruceton, Pennsylvania.

Although the tests were hurried, only short continuous waves being used and no attempt made to modify the apparatus so as to try out longer waves, the experimenters found evidence that electromagnetic waves may be made to travel through solid earth.

Reporting to the Bureau of Mines, C. L. Colburn, C. M. Bouton, and H. B. Freeman, jr., say that, in response to many requests for a device permitting the use of radio in mines in the interest of safety, especially following disasters which frequently break mine telephone systems, they recently undertook an unusual experiment, in co-operation with three engineers of the Westinghouse Electric Company.

In their official conclusions they state:

"The present preliminary experiments, while unsuccessful in indi-

cating any practical method of using wireless waves for underground communications, nevertheless indicate clearly that electromagnetic waves may be made to travel through solid strata. The 'absorption,' or loss, of intensity with distance is very great for the short wave-lengths used in these experiments. Longer wave-lengths are known to suffer less absorption and may possibly be found practically effective under certain conditions."

The preliminary experiments consisted, first, in receiving signals from without the mine at Bruceton by means of a receiver located inside; and, second, both sending and receiving messages underground through the strata. It was found that with a receiving instrument set at a point 100 feet underground, signals from KDKA could be heard distinctly. About fifty feet from the receiving station used in this test was a six-inch bore-hole from the surface, lined with iron pipe and containing electric light wires which extended therefrom throughout the mine. The presence of these wires evidently assisted greatly in the reception, they report, for, when the receiving set was carried to another point removed from wires and tracks, the signals were barely audible through

fifty feet of cover. "The fact that signals were detected, however, even though faintly, is sufficient evidence of transmission through the ground to encourage further experimenting," they state.

In sending waves underground, the Westinghouse 20-watt vacuum-tube transmitter was used in such a manner as to send out continuous waves from 200 to 300 meters length; but they say that additional experiments with waves of increased length are much to be desired. It was found that although signals could be heard distinctly through fifty feet of coal strata, the audibility fell off rapidly as this distance was increased.

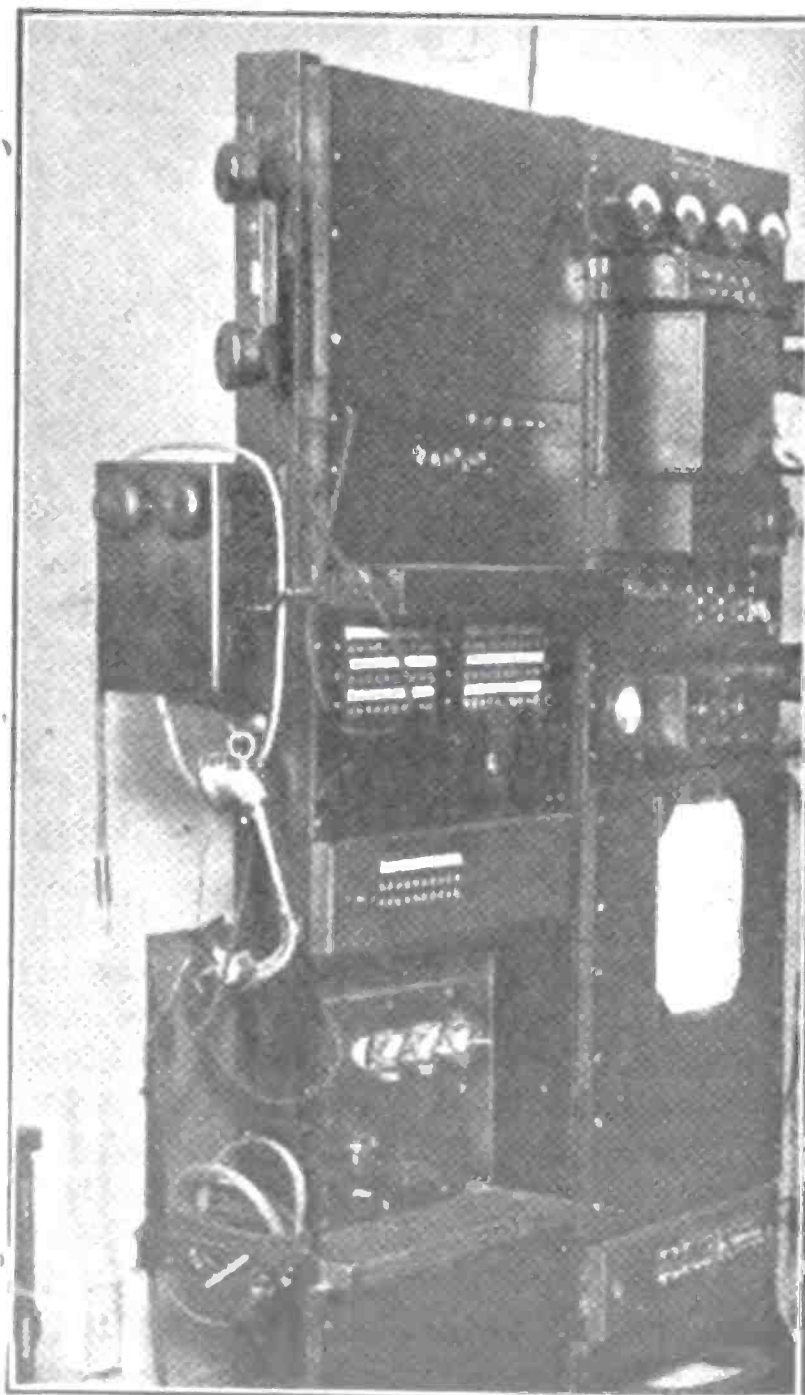
In all experiments, the vertical antennae was found to give the better results, the horizontal antennae giving practically no reception. A loop of a single turn was used, however, with fair results. All these experiments were tried with a wave-length from 200 to 300 meters, except the reception from KDKA which was 360 meters. The strata at the experimental mine lie almost horizontal, and may have had some influence on the transmission of radio waves; but the present experiments gave no conclusive evidence on this point. They seem to agree that the degree of wetness of the strata influenced the transmission of radio waves. The mine was a comparatively dry mine, but the overburden of soil and soft shale is damp, and a small stream of water is continually flowing from the mine. The underground workings of the Experimental mine follow a horizontal five-foot vein of bituminous coal, and the transmission and reception inside the mine followed the course of this vein.

In order to gain a quantitative idea of the transmission of the radiated energy, a milliammeter was inserted in the plate circuit of the receiving apparatus. This normally read 1.6 milliamperes, but the flow of radiant energy from the receiving antenna produced more or less depression of the current according to the intensity of the signals. This then made possible a comparison of the intensity of the reception at different points. The milliammeter was graduated in tenths of a milliamperes, and tenths of a division could be estimated by eye. Signals could be clearly heard when the inflowing energy was too low to be indicated by the meter; that is, the clearly distinguished words from KDKA gave no appreciable depression of the plate current.

New Voice Amplifier at WEAF

New York's newest radio-broadcasting station, WEAF, operated by the American Telephone and Telegraph Company, uses a "voice amplifier," as shown in the photograph at the right. This is necessary because the music studio and the broadcasting station are a quarter of a mile apart. The new amplifier is a masterpiece of delicate mechanism that will pick up the notes of a bird and start them on their journey over the air without losing the most intricate trill. WEAF was the station through which the opera, "Aida," was broadcast on Armistice Day—a radio event that marked a new era in science and music, for it proved to the world that, because of price or distance, the masterpieces of music may now be given to everyone by voices accompanied by an orchestra that only a few have had the great pleasure of hearing. Without the voice amplifier, the success of such an undertaking would be questionable; but this new device is able to convey, without losing even the fraction of a sound, music and the human voice—from any place where they may be produced—to the broadcasting apparatus. Every week records some startling new addition to radio's remarkable equipment that makes it more and more of a great service to the people.

(Berbert)



Why Radio Transmission Is Superior to Wire Transmission

By *B. R. Cummings*

Radio Engineer. General Electric Company

RADIO may be defined as: "A system of communication whereby intelligence is transmitted with the speed of light in all directions, for any desired distance, without the aid of any artificial medium, by the propagation and detection of electrical disturbances in space."

An analysis of this definition will indicate the unique inherent characteristics of radio which make it serviceable where other systems of communication cannot be applied.

While the speed of transmission in radio is no greater than that of wire-communication systems, it is equal to it. A radio message travels at the rate of 186,000 miles per second—more than one million times the speed of sound. A radio message, for example, which is transmitted in New York is received at San Francisco in *less than two one-hundredths of a second!*

A radio transmitter will radiate its message in all directions, a characteristic which has made broadcasting possible. A broadcast message can be heard by airplanes, by ships at sea, by submarines submerged in the sea, and in mines or other points under the surface of the earth.

So far as we know radio communication can be effected over any desired distance. Radio stations have already transmitted completely around the world, and, since the medium which transmits light to us from stars and planets is the same medium which transmits radio communications, it is reasonable to believe that a radio message may be propagated through space for a distance depending only on the amount of power which is put behind it.

The third inherent characteristic of radio—that is, its ability to transmit intelligence without the aid of any artificial medium—places it in a field absolutely its own. Not only does this permit communication with points otherwise inaccessible, such as, for example, aircraft, with ships, and to inaccessible spots on land, but it eliminates the need of securing rights of way for transmission lines and their construction and maintenance. A radio system is therefore rendered more positive than wired systems in that it is not subject to the failures which frequently occur during the winter months in wire lines.

While the means utilized in radio differ entirely from those used in other forms of communication, it is possible to connect a radio system to a wire system so that a telephone subscriber, sitting in his home, may talk by a wire line to a radio station, where his voice is transferred to a radio transmitter, transmitted by radio and again transferred to a wire system. This fact makes it possible to extend the range of wire-telephone systems over areas which were heretofore considered impassable by including in the wire-telephone line a radio link which bridges the previously impassable section.

While a radio communication is broadcast in all directions, it would be desirable for some classes of work to be able to transmit only in one direction.

Senatore Marconi, during his recent visit to the United States, made a plea for further investigation into the possibilities of directive radio-transmission whereby the message would be transmitted in one direction only. He pointed out that, in his early experiments, he had succeeded in transmitting directly over short distances by using a reflector at the transmitting station whereby the propagated waves were reflected and concentrated in one direction similar to a beam of light from a searchlight.

It should be remembered that it is

not intended that radio communication shall replace the wire-telephone system. Its use will be restricted to communication between points where wire communication is not possible or applicable. This is due primarily to the fact that the number of radio communications which can be carried on simultaneously in a given area is limited, whereas in wire telephony the number of simultaneous communications which can be carried on is unlimited.

While directional radio-communication is needed in commercial radio work in order that radio may be made to approximate more nearly the directiveness of a wired system, such development will be intended not to replace wired systems, but to eliminate unnecessary interference in areas not lying between transmitting and receiving stations and to effect power economies in the transmitter itself. It should be remembered that, while broadcasting by radio is serviceable in communicating with moving stations and for broadcasting work, commercial radio traffic is usually handled between fixed stations—that it would be desirable to be able to transmit from one to the other without having the message broadcast.

The foregoing has referred briefly to the characteristics of radio-communication without touching upon the functioning of the apparatus itself. Many people witnessing for the first time a radio transmitter in operation are disappointed, for there is no visible motion in any of its parts. It is noiseless, and there is no evidence whatever of the phenomena occurring in its various circuits.

Its operation, however, includes a consideration of both the infinite and the infinitesimal; infinitesimal units of electricity so small that they cannot reflect light, and, therefore, can never be seen, moving under perfect and complete control of the operator; amplifying the human voice millions of times without distortion and transmitting it through space with almost infinite speed. In analyzing the phenomena involved and the almost unbelievable future for this method of communication we may probably be forgiven for modifying Morse's memorable message: "What Hath God Wrought?" to "What Hath God Not Wrought?"

Eleven New Broadcasters

ADDITIONAL broadcasters licensed during the week ending November 11, as limited commercial broadcasting stations, on 360 meters, are as follows:

KFED—Billings Polytechnic Institute, Polytechnic, Montana.

WNAQ—Charleston Radio Elect. Co., Charleston, S. C.

KFCK—Colorado Springs Radio Co., Colorado Springs, Colo.

WNAX—Dakota Radio Apparatus Co., Yankton, S. D.

WOAJ—Ervin's Electrical Co., Parsons, Kansas.

WNAW—Henry Kunzmann, Fortress Monroe, Va.

WBAQ—Lyradion Mfg. Co., Mishawaka, Indiana.

WNAV—People's Tel. & Tel. Co., Knoxville, Tenn.

WRAY—Radio Sales Corporation, Scranton, Pa.

WPAL—Superior Radio & Tel. Equipt. Co., Columbus, Ohio.

WOAF—Tyler Commercial College, Tyler, Texas.

The Radio Primer

*For Thousands of Beginners Who
Are Coming into Radio Circles*

Weekly A B C of Radio Facts and Principles Fully and Tersely Explained

By Lynn Brooks

D OES everything, or certain things only, contain electricity?

Everything contains electricity. And everything means just everything—your shirt, your pencil, your shoes, your hat, yourself! This is similar to the fact that most everything contains water. Take apples and peaches, for instance. If the water is evaporated we have dried apples or dried peaches. If we could withdraw the electricity from an object there is no doubt that the object would change in some way.

* * *

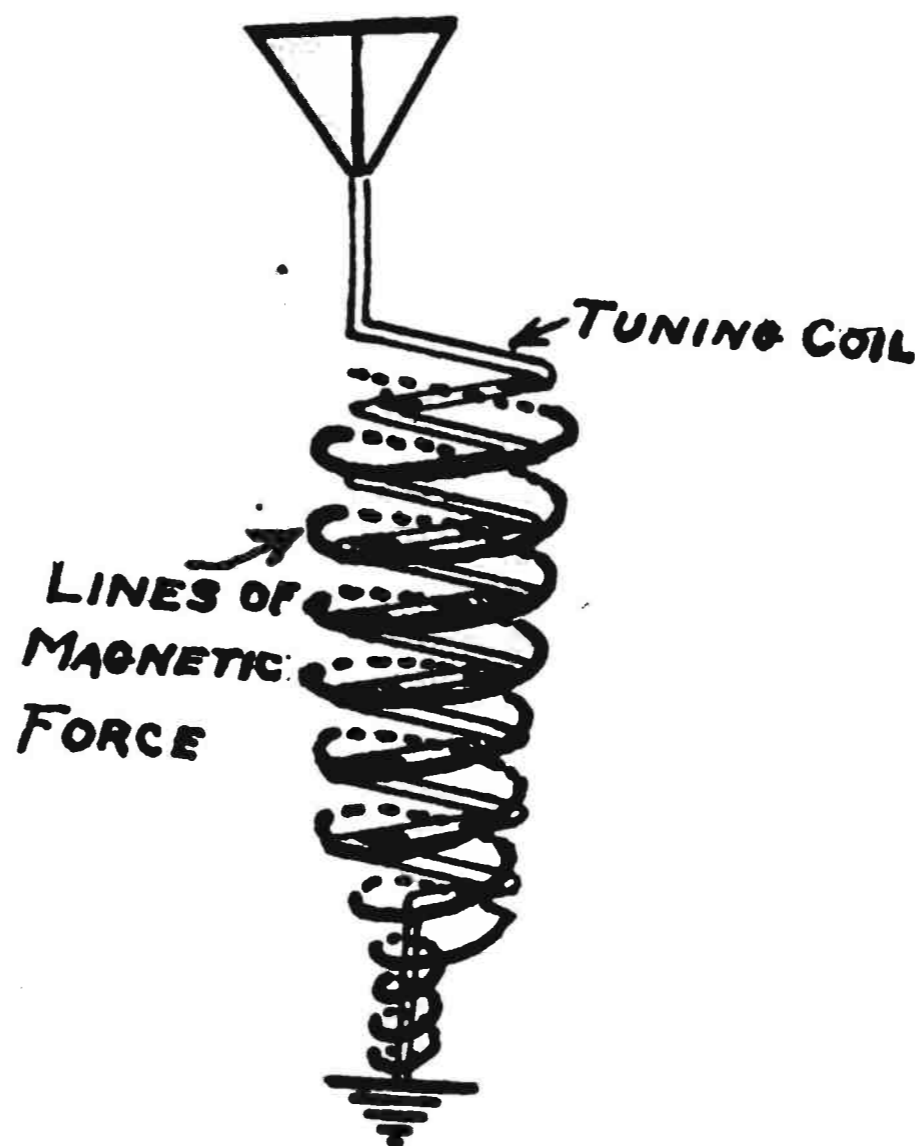
How about the movement of electricity?

Electricity makes itself known only when it is in motion, or when there is more than usual, or less than usual, of it in an object. This is exactly what air does. If air moves we have wind. We speak of electricity in motion as a current of electricity just as we speak of a current of air or a current of water.

* * *

Are there any polarities to electricity?

In order to answer this question let us consider what happens when we comb our hair and hear a crackling sound, or the fact that the hair is attracted toward the comb when it is near it but not touching it. This is due to the presence of more than the usual amount, or less than the usual amount, of electricity. In order to more clearly understand this try the following experiment: Take a piece of cork about the size and shape of a pea and cover it with a layer of tinfoil. It will then be shaped like a ball. Fasten this to the end of a silk thread about eight inches long and hang it up. Take a piece of hard rubber—a rod is best, but a comb will do—and a piece of cat's fur, or flannel, and rub the rod with the fur. This should be done in a room containing dry air, as damp air lets the electricity leak away. Any room that is heated will answer. The rod now contains more than the usual amount of electricity. It is electrified. You electrified it when you rubbed it with the fur. When a body contains more than its usual amount of electricity it is said to have a negative, or minus (—), charge. The fur, which had a



When a current is passed through a coil of wire, millions of lines of magnetism radiate from each wire, winding and twisting about the coil.

less amount, is positive, or plus (+).

* * *

What can be said of the positive and negative charges in regard to attraction?

Positive electricity repels positive electricity; negative electricity repels negative electricity; positive attracts negative electricity. In other words, like poles repel; unlike poles attract.

* * *

Will electricity flow through any material?

Charge a large ball with positive electricity and another large ball with negative electricity. Take a silk thread and extend it from one ball to the other. Then test the two balls to see if they are charged. You will find that there is no change in them. Both still have their charges. Instead of using the silk thread use copper wire. Test the two balls and you will find that neither is charged. When we used the silk nothing happened.

* * *

What is the explanation of this?

What happened is this: The excess electricity on the negatively charged body went through the wire to the positively charged ball, which, you must remember, had less than the usual amount. In other words, we had the electricity moving along the wire, forming an electric current. The wire permitted electricity, but the silk

How to Put Up Your Aerial

A SIMPLE way to raise an aerial is to plant a shorter staff about one-third of the length of the main aerial-mast close to the base of it, and raise the larger mast by means of block and tackle. Guy ropes should be slung from the mast about two-thirds the way up, to permit of guiding.

It is customary to make the aerial of more than two spans of wire so that a greater conducting-surface will be presented. For stations up to one kilowatt in size, an aerial should have at least six wires spaced not less than two feet apart nor more than three feet apart. It has been found that nothing is gained by placing the separate spans closer together than two feet; for fairly large aerials, three feet is good spacing.

Other things being equal, the greater the height of the aerial the greater its range either in transmission or receiving; but the range is largely influenced by the number of strands in the aerials. Where the height is limited, the aerial may be extended so that it covers a considerable area.

It must be kept in mind that as more wires are connected parallel to the aerial, it will tend to give it greater activity. The capacity inherent in it is also directly increased. The aerial must not be made too large for the transmitting set or there will be a decrease instead of an increase in the range.

thread did not. Then the wire is a conductor of electricity and the silk a non-conductor. An object that will not conduct electricity is known as: 1—non-conductor (not a conductor), 2—di-electric (not electric), 3—insulator (to shut off).

* * *

Are conductors needed for electricity?

A conductor is absolutely needed for a current of electricity; so is the object to which it is connected. In order to explain further my example of an electric current: We rubbed the hard rubber rod with the fur, and this rubbed some of the electricity of the fur into the rod. The electricity that we rubbed on the rod is not something new or unknown. It is electricity that simply moved from the fur to the rod in very small parts, called electrons. These electrons have been measured, weighed, and are able to show themselves. It is these moving electrons which makes a current. Of course, to have a continuous current we must keep them moving.

No Interference Between 360 and 400 Meters

By *Washington R. Service*

FOR some time the Department of Commerce Radio Section has insisted that there was no actual interference between the broadcasting stations using a 360-meter and a 400-meter wave, if good sets were used and properly tuned, and this contention recently has been proven. The radio inspector at San Francisco has submitted a report to the Radio Section of the Department of Commerce, which, it is believed, will be of interest to the radio public. Because of numerous complaints in California that serious interference was experienced by listeners-in while two neighboring stations were transmitting simultaneously, one on 360 meters and one on 400 meters, the radio inspector conducted a personal test which he describes as follows:

"I arranged a test with a single-coil tuner and also two inductive tuners located at a point midway between both transmitting stations. These stations, which were about a mile apart, were then requested to transmit at exactly the same time. It was found that with the single-coil tuner it was impracticable to separate the two waves. However,

by using an inductive tuner, a change of six degrees either way, would tune out either one of the stations. This corresponded to a change of about six meters on either side of the transmitting wave.

As the receiving station was located on almost a direct line between the two stations mentioned, it seemed to demonstrate, beyond any possible doubt, that, with a selective tuner, it would be entirely feasible to receive from either station at will without interference from the other.

No doubt there will be much complaint from single-coil receivers and from other stations having very large aerials; but it is thought the interference will result in the ultimate improvement of receiving apparatus throughout the district. A campaign of education is being instituted by the Broadcasters Association; and it is intended that an inexpensive form of resonance trap is to be placed upon the market, for installation in conjunction with single-coil receiving stations, which will enable operators to reject unwanted signals, within the range of 300 to 600 meters.

Radio from Two Important New Angles

By *Arthur G. Shirt*

THERE is danger to the politician in radio—a danger that, apparently, he does not see. It loses votes faster than it gains them.

The correspondent of a New York paper, during the recent gubernatorial campaign, struck the idea right when he wrote:

When a voter can sit at his home without the influence of the crowd, and calmly analyze the speech of a political candidate as it is delivered, I am inclined to believe that it is very disadvantageous to the speaker. Candidate _____'s talk, as it came in over the radio, was a fine example of pure, unadulterated "bunk," and when I heard the band play and the crowd cheer, I then realized how easily the average voter is beguiled into believing that he has heard some concrete important statement that means something, when he is really only being

influenced by the general effect of the meeting.

Radio is extremely impersonal—it is neither coerced nor influenced by any personality, good or bad. It strips everybody and everything to the same level—forces them to substitute real genius and honest arguments for fake cleverness and "hot air." With this analytical coldness in its favor, it is a wonder that radio has not been used in courts of justice where the emotions of juries are too frequently played on by designing lawyers to gain ends not always coincident with the ends of justice.

Of course, it sometimes happens that the human element in the case before the jury for trial must temper the decision and alleviate the

National Radio Week
Dec. 23 to 30, Inclusive

CANADA is anxious to join the United States in celebrating National Radio Week. Harry Lewis, editor of "Radio News," Toronto, has written to Major J. Andrew White, chairman of the Executive Committee, 326, Broadway, New York, that his country is willing and ready to affiliate. He believes that the concerted action of both countries would have a good effect on radio in general. Every effort will be made to bring the Canadian fans and amateurs in line.

Dr. Alfred N. Goldsmith, eminent radioist, inventor, and chief of the radio department of the College of the City of New York, has been appointed chairman of the Committee on Radio Engineers.

"The Evening Mail," New York, says editorially:

A MOVEMENT is on foot to organize a "National Radio Week." This is good and commendable and deserves the support of everyone interested in or connected with the radio industry. If the idea develops into more than a threat and is actually carried out it will do much toward stimulating business.

Incidentally The Evening Mail suggested a similar plan in these very columns last August that should show The Mail's attitude pretty closely.

If the sponsors of the present movement can show some interesting action, they can rest assured that the columns of this paper are at their disposal.

There is another movement on foot to raise \$50,000 among the manufacturers to advertise radio on a national scale. All these movements are good, but they should have been planned months ago. Instead manufacturers sat and waited until the last minute for something to happen, confidently expecting that radio was so good that it would sell itself to the public with practically no effort on their part. This theory has been exploded and now we have desperate last minute methods, which are always more or less haphazard, to revive the industry.

The best thing in the world needs selling power behind it and radio is no exception. We have a market before us as big as all outdoors.

If the manufacturers do raise \$50,000 for an advertising campaign, let us hope that it will be spent wisely. If half of this sum was expended on programs and the other half on advertising the programs, no doubt the radio industry would receive a much needed impetus.

punishment. More often, however, is it necessary to administer stern and impartial judgment. If the jury does not see the prisoner or the lawyers, but hears testimony and arguments by means of a radiophone, will it have a better chance of rendering a fairer decision than otherwise possible? Here is a question that may puzzle the minds of economists, thinkers, jurists, and criminologists for some time to come.

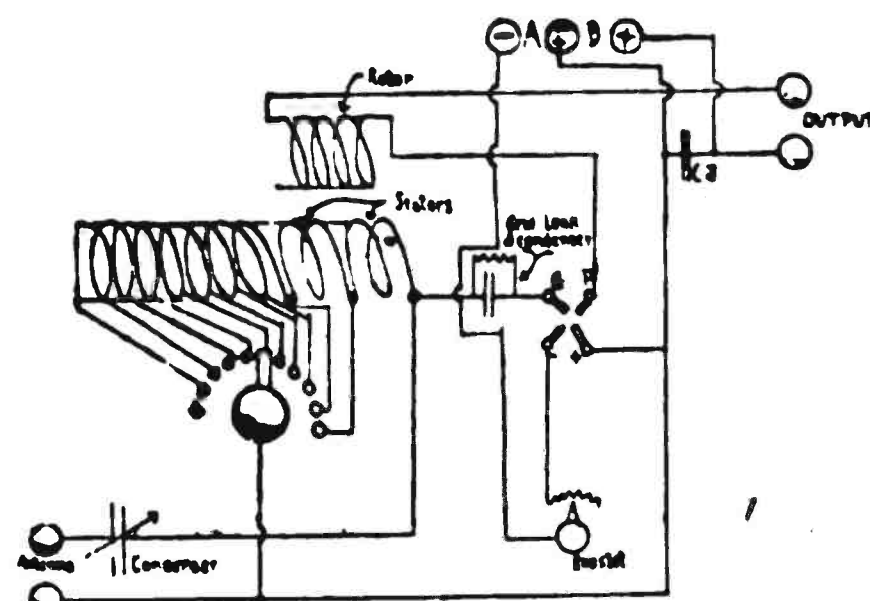
Whatever value this suggestion may have, the use of radio as a relentless mirror will warn politicians and others who use it for their own ends that the radiophone is a dangerous toy for them to play with.

How to Make an Intermediate-Wave Regenerative Receiver with a Wave Length from 150 to 3,000 Meters

By Joseph Schuck

THE panel is 18 inches long and $6\frac{1}{2}$ inches high. It may be bakelite or hard rubber. The shielding in front of the condenser and inductance may be copper or aluminum. It is connected to the ground terminal of the set. Care must be taken in shielding the panel as the plates must not touch the shaft of the variometer or any metal parts of variometer or condenser.

The condenser is a 43-plate .001 mfd. and is inserted in the antenna. The variometer must have a rotor ball measuring $3\frac{1}{2}$ inches over all. A cardboard tube is used measuring 4 inches inside and 4 inches long. It should be given a number of coats of shellac to prevent it from shrinking after it is wound. The winding is bank wound, 3 layers, 87 turns to a layer started $\frac{1}{4}$



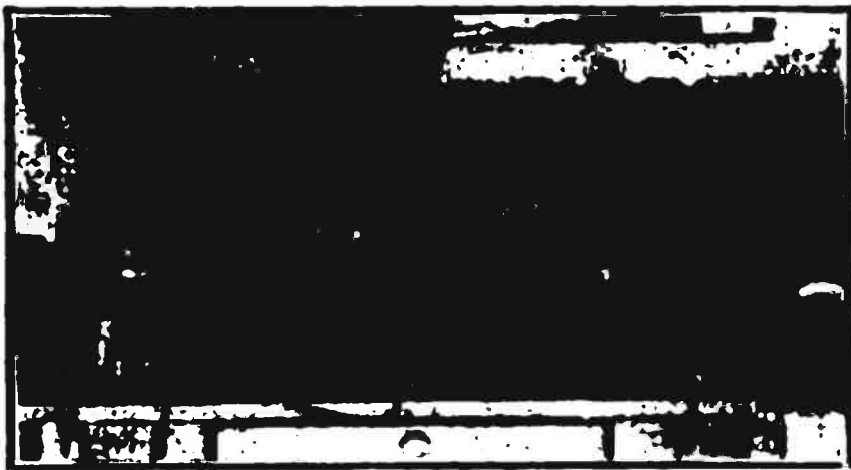
Hook-up for the regenerative receiver, 150 to 3,000 meters, as described in the accompanying article.

inch from the end and 11 taps taken off the first tap at 3, the second tap at 5 and 8 thereafter. Two taps are taken off the variometer at the stators as seen

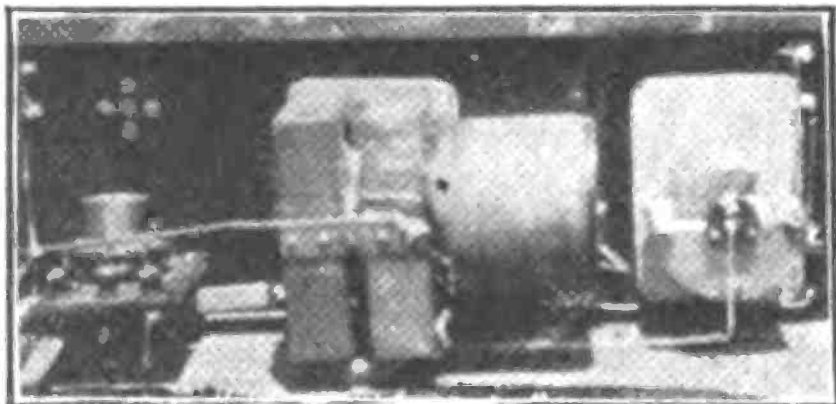
by the drawing. The inductance is then mounted on the variometer by means of two small V brackets. Care should be taken when mounting. The winding of the inductance must run in the same direction as the variometer winding. The rotor of the variometer must also be able to pass freely when turning at the inductance.

The audion socket is to be mounted on a shelf by means of set of V brackets. The shelf is of hard rubber, or bakelite, $4\frac{1}{2}$ inches long and 3 inches wide. Three battery posts are also mounted on this shelf. The rheostat is mounted directly under the socket shelf, thus saving space and giving the set a better appearance.

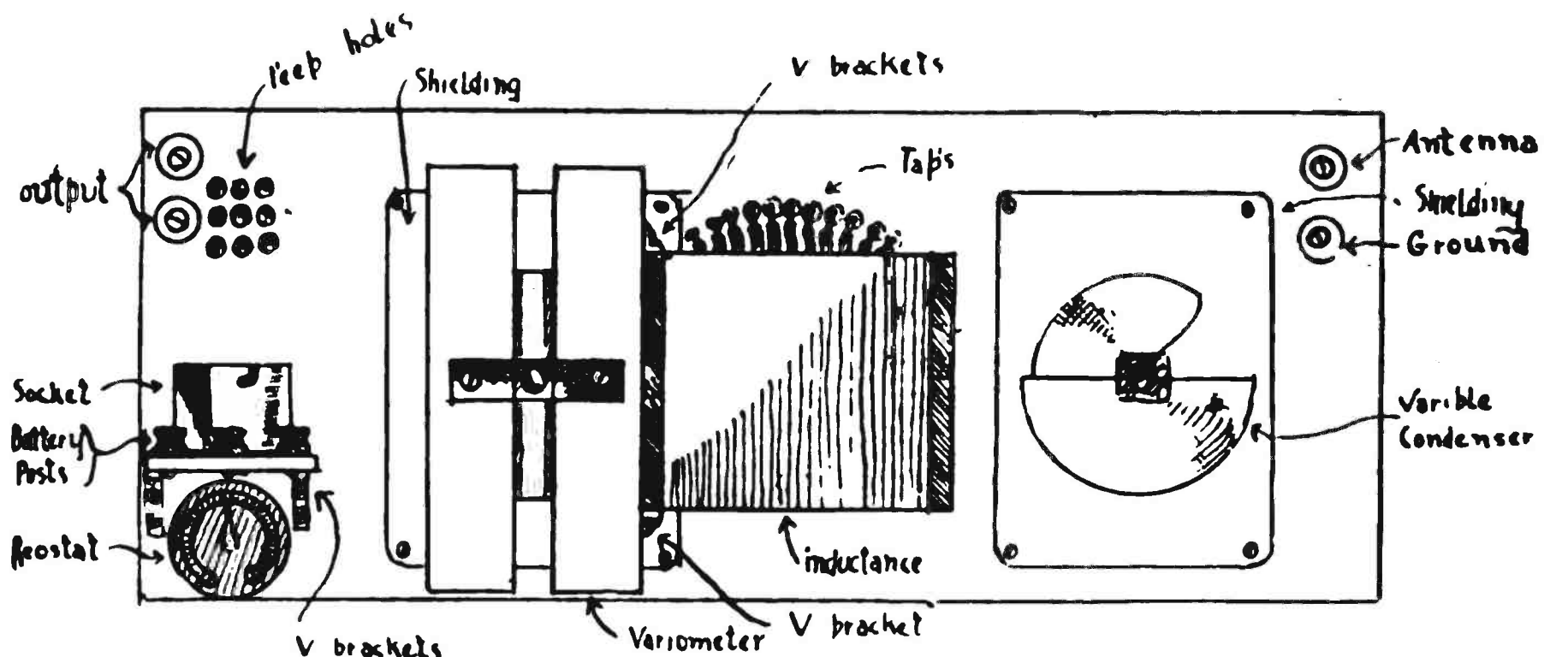
The phone condenser, C 3, is an .0025 mfd. The grid leak and condenser is combination type, .0005 mfd.



Front view of set showing wave-meter at right



Rear view of set, explained in diagram at the right.



Schematic design of the rear view of Mr. Schuck's circuit, as shown in the lower photograph at left. The bank-winding system, Mr. Schuck believes, should be welcome to all amateurs. This receiving set has a true wave-length from 150 to 3000 meters. In a test of its range bringing in broadcasting stations, the results were as follows: WJZ, WGI, WGY, WOR, WEA, WVP, and KDKA—quite a string. In code stations, Mr. Schuck claims, there is no limit to its distance. It has brought in eight district stations, clear as a bell. Its furthest distances, so far, are Stations NAO and NAP, located in Florida. Mr. Schuck's station is in New York City.

The Meaning of Potential

By Harold Day

THE word "voltage" has been used to indicate electrical pressure. Other terms are used, and it will help us in our understanding of electricity and in reading scientific books if we have some knowledge of these terms. We speak of an "electrical potential" and "difference of potential." "Difference of potential" is the same as "voltage." Potential is the voltage (difference of potential) between any body and the earth.

The earth is such a large body that its electrical potential is always con-

stant. It is a fairly good conductor, and any loss, or excess, of electrons on its surface is quickly equalized. Thus we can use it as a reference point from which to make measurements. Its potential is always zero. "Potential" is to electricity what "level" is to water. The zero point for measuring water is, of course, the sea level. If one tank of water is 180 feet above sea level, and another tank 160 feet above sea level, their difference would be 20 feet.

In other words, there would be a

20-foot head of water in order to make the water flow from one tank to the other. In this same way we speak of an object as having a potential of 180 volts compared with the earth. Another object may have a potential of 160 volts compared with the earth. Their difference in potential would be, as stated, 180 minus 160, or 20 volts. There would be 20 volts pressure to make the electrons flow from one object to the other. This difference in potential, or voltage, is known as electromotive force—Emf.

GREAT ADVERTISING MEDIUM

RADIO WORLD's special issue, "Holiday Radio Gifts Number," issued on December 9. Copy received up to November 29. RADIO WORLD, 1493 Broadway, New York.

The Vacuum Tube

Its Action and Proper Use. Correct Method of Caring For It

By Donald Van Wyck

TO understand the action of a vacuum tube it is necessary to know the following facts:

A current of electricity is simply a flow of electrons. The electrons flow in one direction, forming a current which is said to flow in the opposite direction.

Electrons are small charges of negative electricity.

All materials contain electricity—positive and negative.

It has been discovered that metals, if heated, will throw off into space some of the electrons which the metals contain; that the hotter the metal up to a certain degree of heat the more electrons it discharges. Electrons travel at a high rate of speed. If air or any other gas is present in the space around the metal the electrons strike the minute particles of the air, or gas, and are soon stopped.

The above facts are applied to the vacuum tube. The air is pumped from the tube—hence the name "vacuum"—so that the passage of the electrons will not be stopped. The filament marked F in a tube is heated so that it becomes red or white hot. This is usually done by an electric current furnished by a storage battery. G represents the grid, and P the plate.

The vacuum tube is the only part of the more common radio receiving-set which requires replacement. It is therefore important that the amateur have a correct understanding regarding its use. A detector, or amplifying tube, is nothing more than a highly evacuated incandescent lamp containing a plate, grid, and filament. Thomas A. Edison made his first tube by inserting a wire in the top of an ordinary electric-lamp. The principles which apply to the care of lighting lamps apply equally as well to the tubes.

Only after scrapping a tube or two does the amateur realize that he has a delicate instrument with which to contend. It is certainly a delicate instrument, for a very slight increase in filament current may prove fatal. The difficulty is introduced by the necessity of operating the tube so near its danger point. Very few people realize this.

By a slight turn of the filament knob the fine tungsten-wire is brought to a glow, or, as we say, a brilliancy. The melting point of tungsten is 3350 degrees centigrade. This is higher than any other substance except carbon. Iron melts at 1550 degrees centi-

grade. Melting of the filament occurs when the battery is fully charged. When six or more volts are impressed across the terminals of the filament of the tube a rush of current passes to the filament, taking the chance of burning it out. To eliminate this some type of resistance is used in series with the filament and battery. Some of the more common type of vacuum tubes are designed and made to take less voltage.

There are several types of rheostats which may be used with the vacuum tube. One of these types is the wire-wound rheostat. This has been widely used, but has many defects. Few amateurs understand its proper use. Sometimes when the broadcast doesn't seem to come in just loud enough he will force the rheostat up a peg or two. He does not realize that a very slight increase in current decreases the life of the tube, and the chances are that it will burn out.

Another defect of the wire-wound rheostat is the method of bringing the filament to its proper operating-temperature. This is done by gradually increasing the current until it reaches the required luminosity. Contrary to popular conception, this is not the proper method of turning on a vacuum tube or any other tungsten-lamp. A tungsten-lamp should be turned on so

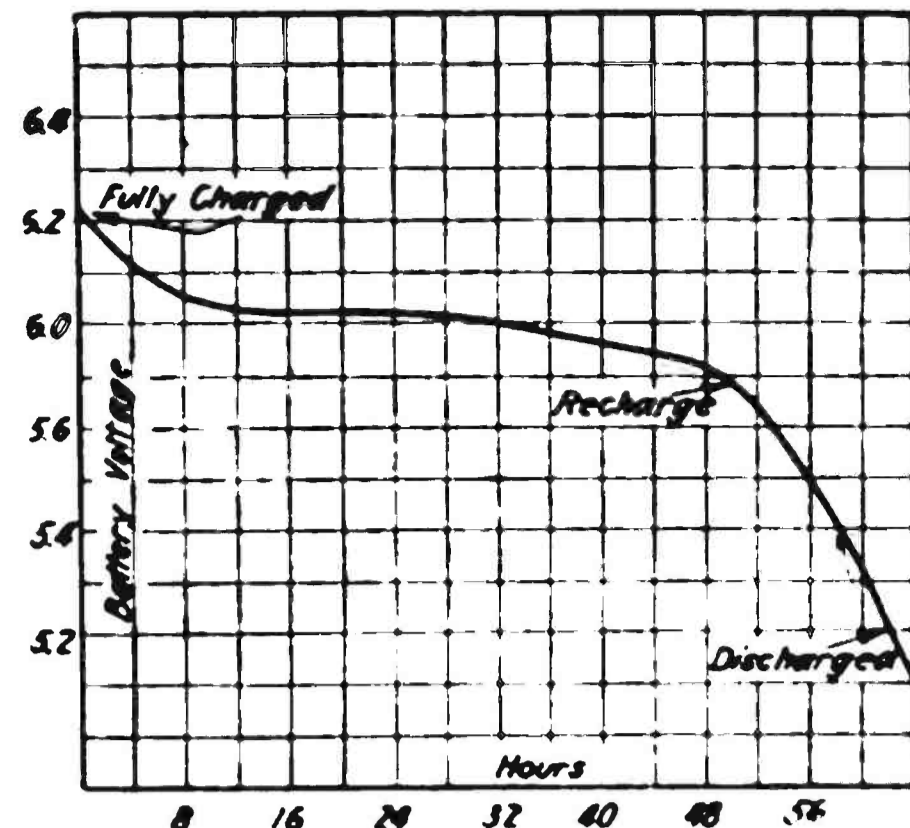
How Mica Is Mined

MICA for diaphragms comes almost exclusively from the Far East. India contributes the most of it, but some is mined in Africa. It is found far under the ground, frequently enclosed by granite or other hard rocks.

When a mica rock is discovered, natives build a fire on it and continue it until the rock is thoroughly heated. Water is then thrown on the heated mass and the sudden temperature change opens up cracks along the "grain" of the rock. Crude wedges are then driven into these cracks and the rocks split apart. The pieces are loaded into native baskets and hauled and dragged to the surface.

Only a small proportion of the mined mica is satisfactory for diaphragms. Sometimes less than one-tenth of one per cent. can be used. To be a success in reproducing sound waves the mica sheets must pass laboratory tests for elasticity, toughness, resistance to heat, high electric strength and transparency.

Mica in itself is not magnetic, in fact its insulating properties are of a high order. To be successful as a diaphragm the mica must be aided by a flat disc of soft iron fastened firmly to the mica at the exact center spot over the magnets.



Schematic chart showing the graph of a battery after the tube has been in operation. Note the difference of the battery voltage as compared to the hours of power consumption. Suggested by Donald Van Wyck. Drawn by S. Newman.

that it instantly flashes to its operating temperature—but not above it! Burning the lamp below this temperature causes the filament to crystallize and break when subjected to slight vibration.

Tungsten, if examined under a microscope, would appear to the eye as a structure similar to a bundle of wires. Tungsten must have that structure in order to make it ductile and strong.

Regarding the amplifier. If you will study investigations you will find page after page about the structure of tungsten and the intricate method of obtaining that ductile structure. You will learn also how the proper structure is lost if the filament is used improperly. Heating the filament to a temperature of 200 degrees centigrade below the proper operating temperature changes the fiber structure of the metal to a block structure. The filament, if examined under a high microscope, will look as if it contained a small train of cubes. The comparison is like the old story of the strength of a bundle of twigs compared to a single stick.

Fortunately we need not worry about all of these changes in the tungsten in our ordinary lamps every time we turn on the light. The question is asked: "Could we use this same idea for lighting the vacuum tubes?"

The problem is a little different. The device used in the power-house is expensive and bulky. But a more simple device is made which bids fair to fulfill the requirements of the radio novice, especially for radio work. The automatic current adjuster dampens the current when it tends to increase, and vice versa. It also permits flashing of the tubes to their proper operating temperature, thus causing the prevailing crystallization of the filament. In other words, it is designed to operate the tubes under proper conditions, irrespective of the condition of the battery or tubes.

With the DX Night Owls

From a Non-Radio-Frequency User

EDITOR, RADIO WORLD: In **RADIO WORLD**, No. 31, dated October 28, I noticed a letter concerning an evening record of reception, by Mr. J. A. Merklein, 7513 Third avenue, Brooklyn, New York, in which his greatest distance was about 800 miles.

I beg to submit for favorable comparison the following record for one evening, most of which was made over an Aeriola Senior set, using an aerial 196 feet, including lead-in, single wire, hung 50 feet in the air, ground on water pipe. Part of this was made on a double circuit, regenerative tickler, using one-stage amplification. A home-made set.

PWX, Havana, Cuba, 820 miles; then followed, in order, WLAG, Minneapolis, 825 miles; WGY, Schenectady, N. Y., 1,026 miles; WGI, Medford Hillside, Mass., 1,090 miles; and at 10.10 p. m., Central Time, I closed with station KDYS, located at Great Falls, Montana, 1,667 miles. I have logged 54 stations, all over 250 miles from Birmingham, and would be glad to compare this record with any other amateur, who is *not* using radio-frequency.

Come on you amateurs, step up and get your feet wet.—Kenneth F. Smith, 133 Francis St., Birmingham, Alabama.

* * *

16 Stations on 80 Degrees of Dial

EDITOR RADIO WORLD: The records I have made in receiving no doubt have been equaled by others with half the radio or audio-amplification; but I doubt if many can equal what I am doing with one detector-tube without any amplification. I built my apparatus, and although I have two steps of audio-amplification which I use with a loud-speaker when I wish to entertain friends, I have been experimenting for some time to see just what can be accomplished with one tube only. Many fans refuse to believe the results of my work, but I have proved it to others who have visited me.

While experimenting on my home-made receiver, I have heard, in the past few months, concerts from over a hundred different stations located in 30 different States of the Union, also Canada and Cuba, 2,250 miles air-line to California, 1,350 miles air-line to Denver, where I get two stations quite regularly. I have heard three stations in Texas—Dallas, Houston and Fort Worth—also WBPA regularly, about 1,150 miles air-line. I get PWX, Havana, Cuba, most every Wednesday and Saturday night, about 1,250 miles air-line. I get all southern and western stations regularly.

All of this has been accomplished on a detector tube without amplification. I have even listened to WOC, Davenport, Iowa—about 575 miles air-line—without amplification or antenna. My apparatus is so finely adjusted that, on a test, (with others present) when weather conditions were good, I made the following record:

In about 20 minutes time, I tuned 5 different stations at 400 meters, 5 different stations at 360 meters and 6 stations between 360 and 400 meters, clean and clear, without any interference. One would hardly think that stations supposed to be at 400 and 360 would vary

that much; but they do according to how I check them up. I got 400 meters at from 20 to 22 degrees, and 360 meters at 14 to 16 degrees, on the wave-length dial of my receiver. It is almost impossible to turn the dial sufficiently by hand, so I use the rubber at the end of a lead pencil to lower the edge of the dial, by twisting the pencil. By this method, I can turn the dial to a hair.

In this 16-station test, after the receiver was adjusted and set for reception of first station, all I had to change for the stations following was the wave-length dial or secondary condenser. Result: 16 stations on 80 degrees of dial.

The foundation of my apparatus is the 3-circuit honeycomb-coil design with some important changes in various places. However, I get results.

At present, I am the official eastern outpost testing station for WSB, Atlanta, Georgia, and we have been of mutual benefit to each other. WSB is one of the best on the air and about the correct distance—550 miles air-line—for good testing. I have used their broadcasting for a standard to build a machine of which I am very proud.—H. S. Rahiser, Box 43, Crafton Station, Pittsburgh, Pa.

* * *

Something to Brag About

EDITOR, RADIO WORLD: The following is of no small moment, and will be of interest to other radio fans, especially those who have broadcast their success through your columns:

I have an MR-6 De Forest, two stages of amplification, a Magnavox, 2-strand antenna 75 feet long and about 25 feet high. Thursday morning, November 9, I received a letter from Harry Davis, playing at the Lyric Theatre, Atlanta, Georgia, asking me to tune in at 400 meters for WBS, Atlanta "Journal," Thursday night November 9, at 11.55, when there would be broadcast a message to me at my home in Hollis, Long Island, and that he would also warble a song for me. If I succeeded in tuning in for WBS the Atlanta "Journal" wanted me to take down the program and immediately telegraph them of my reception. After playing around an hour with local high-powered stations and many long-distance stations, among which were Louisville, St. Louis, Chicago, Detroit, Cincinnati, Indianapolis, Davenport, Milwaukee, Minneapolis, Pittsburgh, Buffalo, Washington, Fort Worth, and many others, finally, at 12:05, I got WBS loud and distinct, but feared it was too late to receive the message that was to be broadcast to me. However, I hung on and, at 12:45 the message came, and the song followed, the program concluding at 1:10 a. m. I immediately sent a night lettergram diagnosing the program and messages broadcast to Panama, Kansas City, and other places, as proof of my fine reception and, the following night, the result was broadcast by radio and published in the press.

Saturday night, November 4, I received, loud and distinct, a program from PWX, Cuba. Have had several stations in Texas several times. My set is most sensitive. I have received the voice 3,000 miles and have had France and Germany on code. With the additions I am making, I fully expect to receive the human voice from across the ocean in the near future. One advantage I have, I am able to tune out all static. I did this during the summer. I am able to tune out

all nearby high-powered stations for the reception of long-distance programs.—L. R. Ault, Seminole Avenue, Hollis, Long Island, New York.

* * *

Hears Denver in Maine

EDITOR, RADIO WORLD: Sometime last May, I forget the exact date, a local amateur operating a Westinghouse R-C set picked up part of a concert broadcast from the Reynolds Radio Company, Denver, Colorado. I consider this quite a record as the conditions were only normal and the transmitter was not of very high power.—Maxwell K. Murphy, 2 Orange Street, Eastport, Maine.

* * *

DX without Antenna

EDITOR, RADIO WORLD: I state herewith what I believe is a record for long-distance receiving, without using some form of antenna.

On the evening of November 2 while listening to a fine number from WBAP, rendered by the Oil City Jazz Band, I had considerable interference and decided to close the station for the evening. Not thinking, I disconnected my antenna before cutting off the battery circuit. I was somewhat surprised to find that WBAP's program then came in exceptionally good. This brought on some experimenting and I found that I could easily tune in stations WHB, KSB, WGM, and WBAP.

On the evening of November 3, the experiment was repeated and I tuned in the following stations, WGM, WDAF, WWJ, KDKA, WSB, WHB, WOC, WHAS, KSB, and WOS.

My set is a simple home-made affair with U-V 200 detector and two stages of audio-frequency amplification.

This information is positive and I am ready at any time to produce my witnesses or repeat the experiment.

In order to ascertain whether or not the set was in any way connected with the antenna, I disconnected all wires, moved the set ten feet from any outside wires and the results were the same.

I would be glad to have your opinion on this matter, and will also be glad to hear from any other station that can duplicate the feat.—E. M. Pace, 423 Farmer Street, Vicksburg, Mississippi.

* * *

A First-Night Record

EDITOR, RADIO WORLD: With the hook-up suggested by Mr. W. Miller, as published in **RADIO WORLD**, I have received, very clearly, KDKA, WEA, and all the Philadelphia stations. This has been accomplished with a hurried hook-up without soldered joints. Also, I have had no trouble tuning out stations from 360 to 400. I think that with using a vernier condenser, I will get much better results. I accomplished the above the first day I hooked-up, using only old material I had around.—R. L. Jones, jr., Lanerch, Pennsylvania.

* * *

On Detector and One-Step

EDITOR, RADIO WORLD:—I have noticed Mr. Merklein's claim of a record for receiving. On a detector and 1-step of my own make, I have received such stations as KDKA, Pittsburgh; Louisville, Kentucky; WOC, Davenport, Iowa; the Sweeney Auto School, Kansas City, Missouri; KYW, Chicago; WSB, Atlanta, and, also, on October 29, at 10.30, I heard a station call letters ending with X, Havana, Cuba.—E. Garbutt, 56 Clark Street, Stapleton, Staten Island, New York.

Radio and the Woman

By
Crystal D. Tector

"DON'T be late with your 'copy' for our issue of November 25th," the editor of RADIO WORLD wrote me the other day, and as I looked at the date on his missive, I was somewhat startled. "That means that Christmas is only a month away," I said to myself.

Only a month away—just thirty days more and the glad season with all its blessings and happy burdens will be at the peak of its celebration. And I must frankly admit that I haven't made a single thing—either with knitting needle or sewing machine—things that women usually start early in fall and seldom finish—and I am not worrying.

The popular slogan, "This is a radio Christmas," I have nailed to my door. There is going to be a big surprise in store for Friend Husband, however. Heretofore, I have given him cigars and neckties; but, this year, I intend to present him with a new radio set—because I want another set so very badly myself! When he sees it in his stocking, he will frown and say a few things under his breath; but when I explain that I need this new set because I am intending that my present layout shall be used exclusively in a little country bungalow we are fitting up for summer, he is going to be perfectly satisfied and congratulate himself on having so clever a wife.

At any rate, I say to all mothers—and all fathers, too—if you do not know what to give your boys and girls this Christmas, do not overlook radio. Get them interested. It will keep them home. It will educate them. It will bring them the proper sort of friends. It will fascinate them. And a radio set is something that is not played with for a few days or weeks. It is something that one will grow more interested in as time passes—something one will want to improve and study and make a part of his very life.

I have already helped a number of mothers who are planning radio sets or parts as Christmas gifts—and I cheerfully offer my services to any others who may be in need of information regarding prices, just what to buy, the why and wherefore of different radio elements, why certain things are needed for certain sets—and so on. I have made a very thorough study of all things pertaining to radio, of all the different goods on the markets; and I have even read about every book on radio that has come from the press. So, I feel, I am in a position to help you this Christmas—and I offer my services cheerfully.

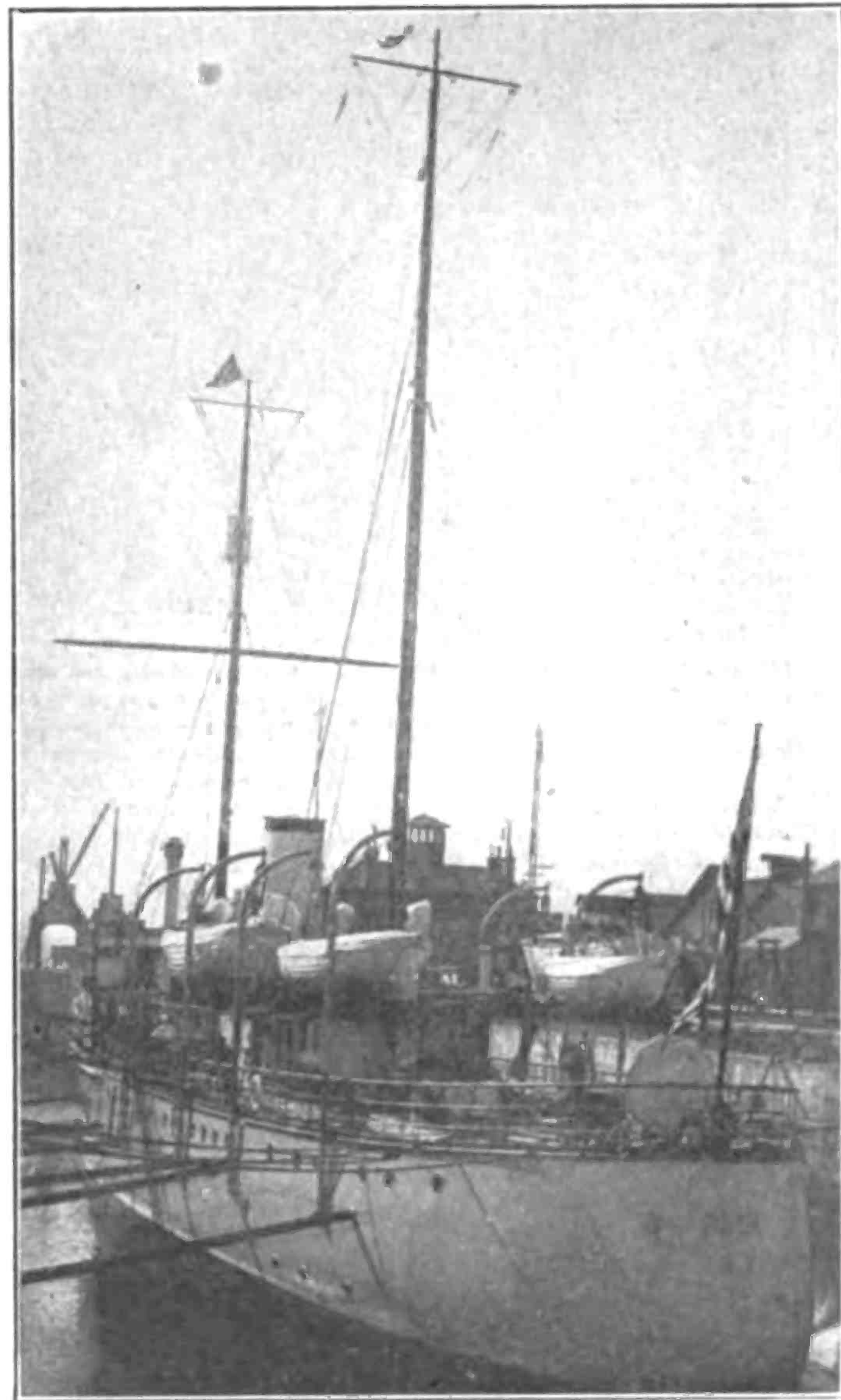
Whoever thought of the slogan, "This is a radio Christmas," hit on a happy idea; but I would rather have said, "This is to be the first radio Christmas." You will find that the Christmas of 1923 and the Christmas of 1924 and every Christmas thereafter will be even more radio in atmosphere. Next year will be more remarkable from a radio point of view than this year. And radio will continue to grow and grow until it becomes so much a part of our lives that we will not be without it under any circumstances. When grand opera and baseball and football and every big public event is as accessible by radio as it is through the daily press, only the people who are behind the times will be without it.

And I want to tell you all that I heard the broadcast of "Aida," by the Metropolitan Opera Company and orchestra. All I can say is that if I had shut my eyes, I would have imagined myself in the "golden horseshoe" of that favored place. The rendition lost none of its beauty coming over the ether. In fact, it seemed to me that it was particularly beautiful. Everything—from the deep diapason of the bass instruments to the thrills of the soprani and the birdlike notes of the flutes—came through with wonderful charm. A woman friend whom I had invited to listen in, who had never heard a grand opera in her life, was thrilled almost to tears. She never could have afforded the price of an admission, and for the first time in her life, her deep-rooted love of music was partly satisfied.

Miss Mary T. Jackson, of New Orleans, writes me to advise her regarding C batteries for radio-frequency. After reading her letter carefully, I will ask her to read my answer herewith just as carefully.

Do not interfere with the set that is giving you such good results unless it is to add another stage of radio-frequency. The 201 tubes should be used for the amplifying circuits and the 200 tube only in the detector. C batteries are not used in radio-frequency, as the job of putting a negative potential

"Ara," Most Elaborate Radio-Equipped Vessel Afloat



(C. Kadel & Herbert, N. Y.)

The "Ara" played her part in the World War in the French navy. Later she was purchased by Mr. W. K. Vanderbilt, of New York, refitted from stern to stern, and is now ready for a long cruise in the South Pacific Ocean. Perhaps the most important part of her equipment, however, is the elaborate radio apparatus which Mr. Vanderbilt installed regardless of cost. This yacht, now flying the American flag, is more thoroughly equipped for radio transmission and reception, it is claimed, than any other vessel afloat—meroon, even, than Senator Marconi's famous "Electra."

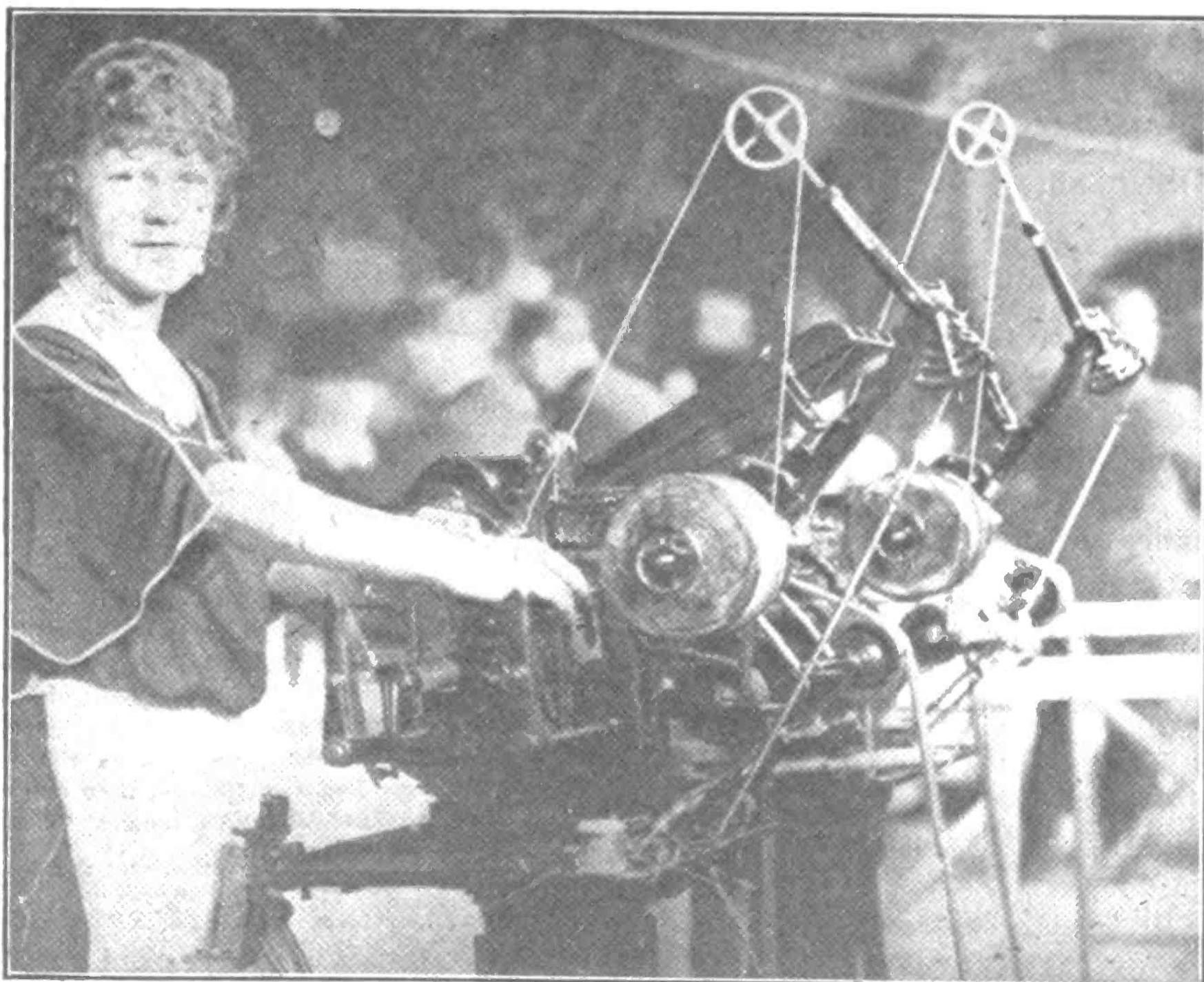
on the grid of the amplifying tube is taken care of by the potentiometer across the A battery. In radio-frequency amplification there is no step-up ratio in the transformer. The primary and secondary are of the same number of windings. The transformer merely passes along the amplified output of one tube to the next tube of the further amplification.

Whisper! The editors let me have a peek at the Christmas cover for RADIO WORLD, the other day. It is a beauty—and cheering and full of the radio-Christmas spirit. You will not miss it. The big Christmas number will be published December 9.



(C. International News Reel)

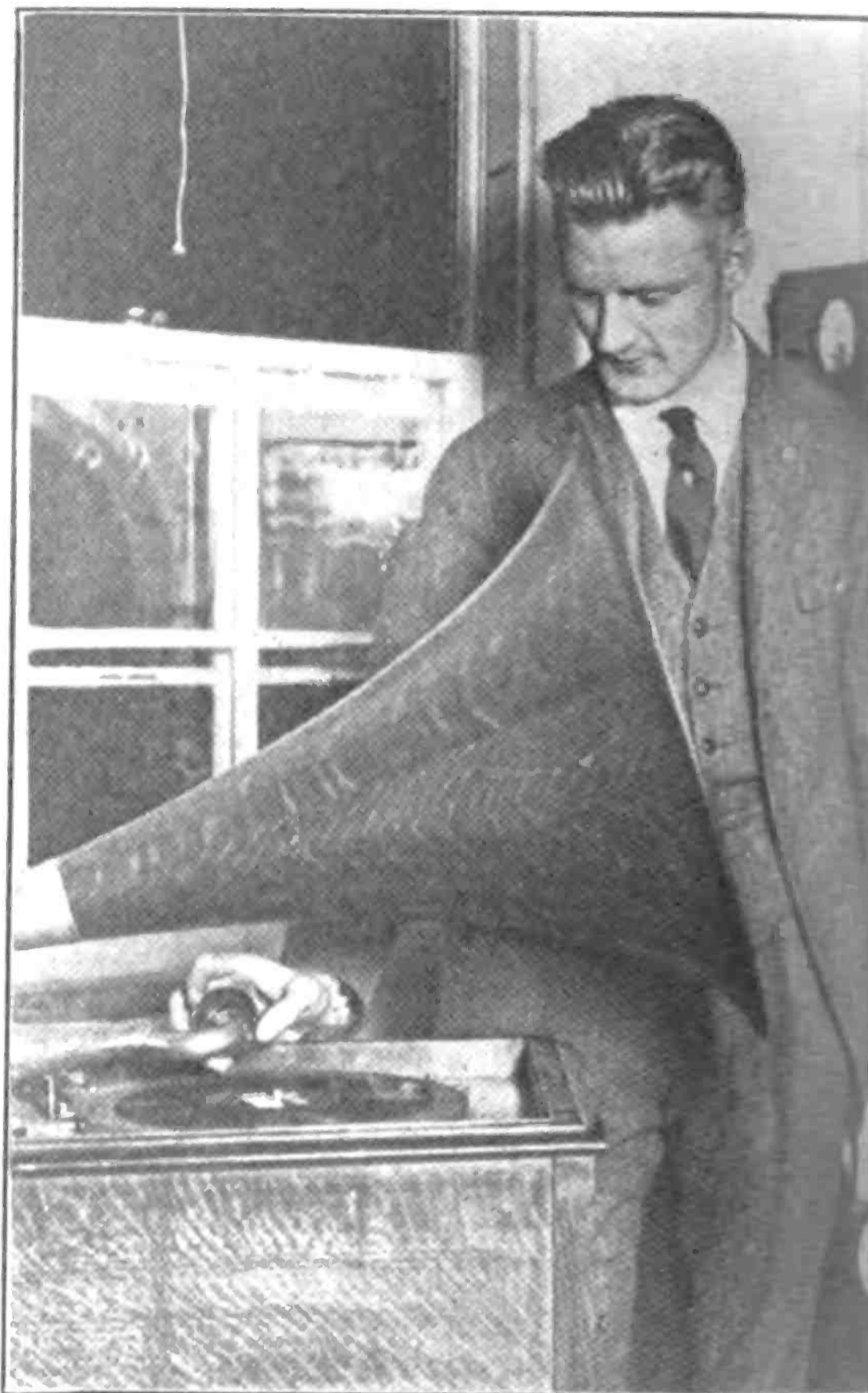
(Above) With no provision made for tuning, a receiving set must, perforce, be of a low order of efficiency. Furthermore, all signals come in at the same time, if several transmitters are working in the immediate vicinity. Such receivers are possible, but are never brought into practical use, due to the fact that they have no means of controlling wave-length. Usually the beginner starts off with an arrangement of this sort. In the accompanying illustration, a receiving set of this type is shown, built on a rubber heel. It employs a mineral detector, with outdoor antenna and water pipe as ground. It was constructed by George E. Johnson, of Minneapolis, Minnesota, at a cost of \$1.35, exclusive of the receiver. Mr. Johnson claims that he can receive with this make-up within a range of about ten miles.



(C. International News Reel)

(Above) One of the most important elements in radio is the inductance coil and the transformer. These instruments make it possible for us to hear the long-distance transmitting stations. Due to the many fine wires in the transformer, it is necessary that they be wound with absolute correctness. By hand would be a tedious and tiresome job. In the photograph, a machine is shown by which Miss Alma Stark winds the transformer or inductance coils. In the foreground, two spools of wire at the right of the machine. These spools of magnet wire are of two sizes—one is of a coarse size, which makes up the primary winding; the other is of a fine size, used on the secondary. Transformers, due to their peculiar winding, must be given the most care in their manufacture, as one error in winding will cause them to function in an unsatisfactory manner.

Latest News-P Week



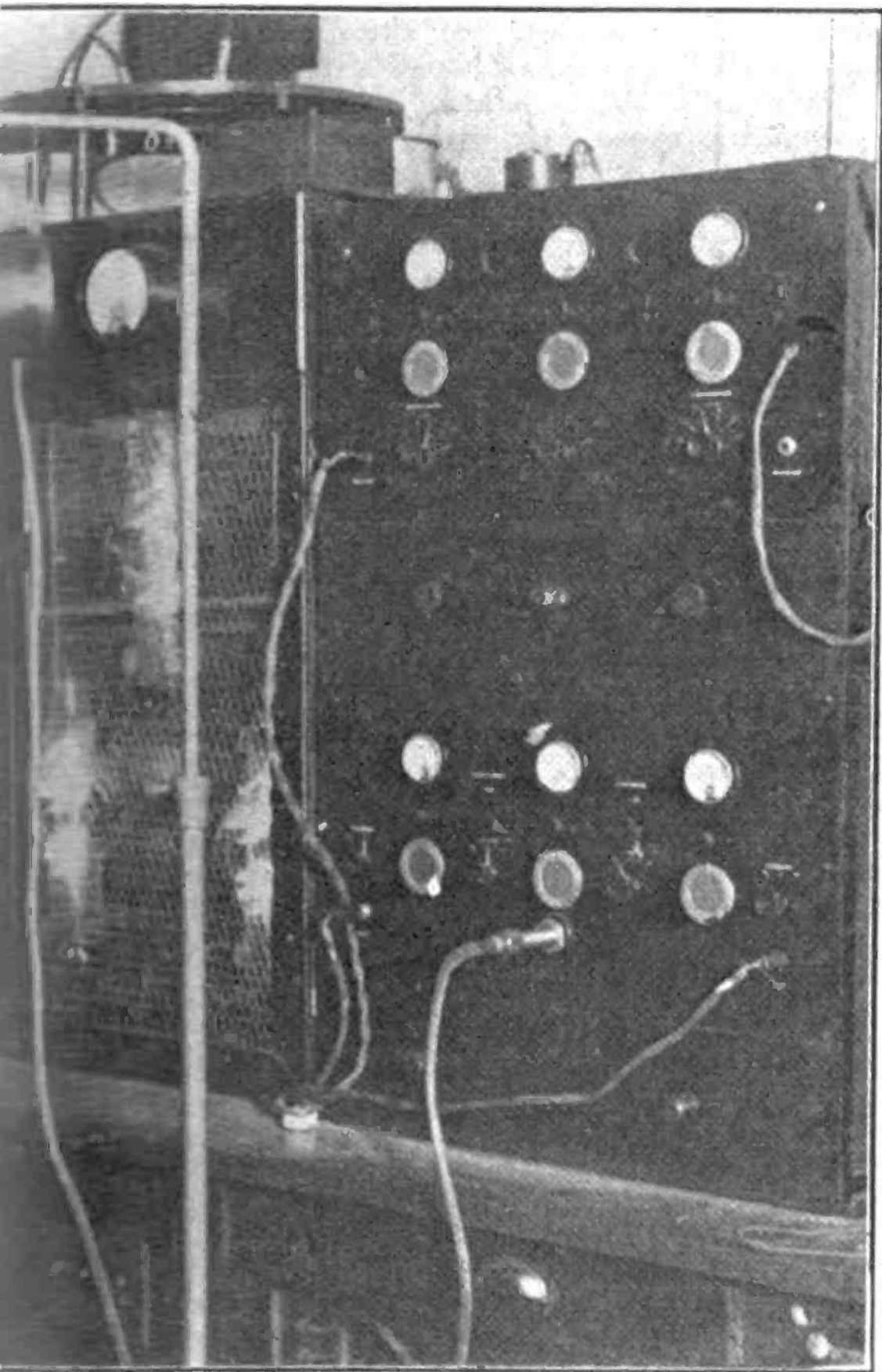
(C. Kadel & Herbert)



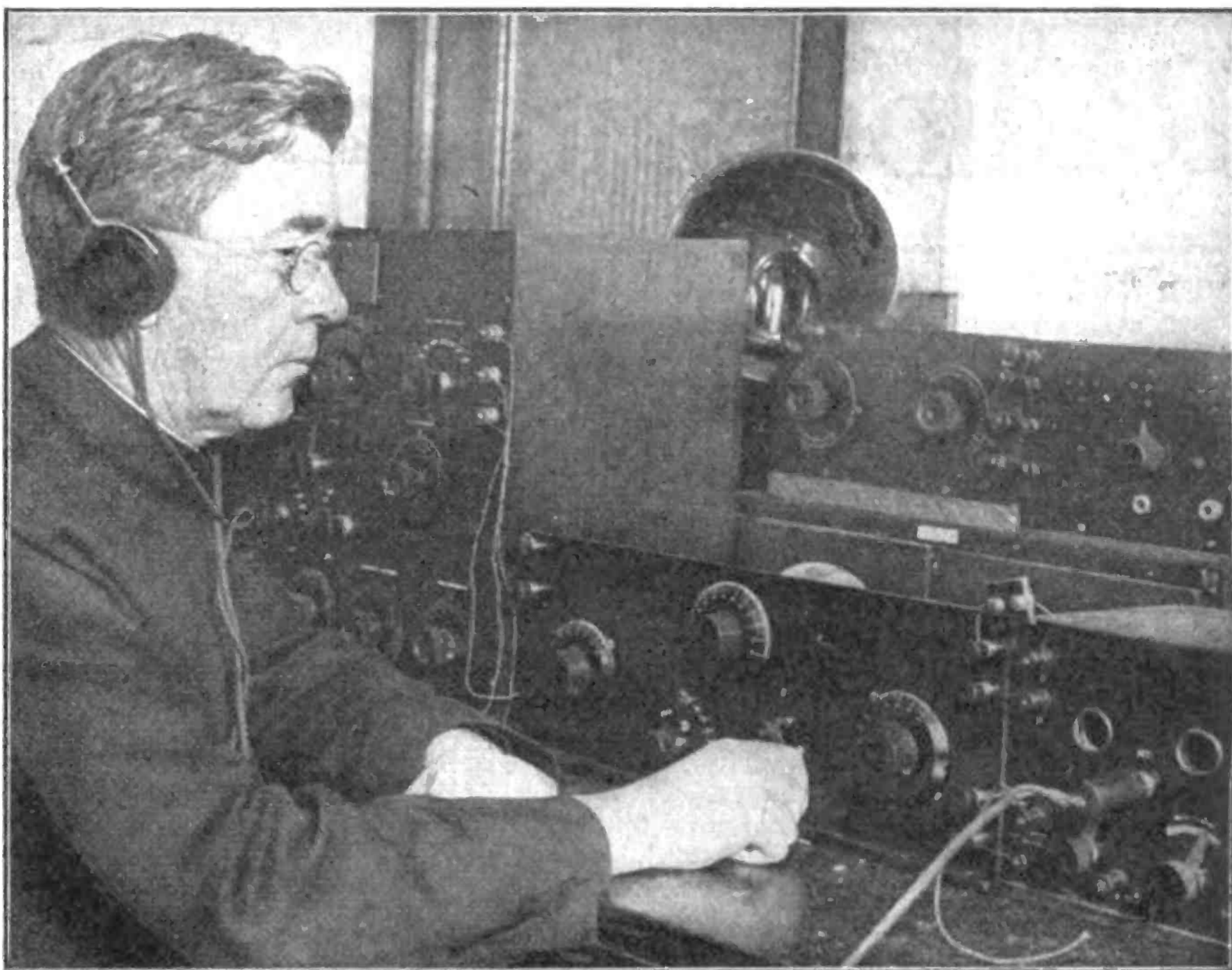
(C. P. & A. Photos)

(Above) Dr. Royal S. Copeland, who, on March 4, 1923, became State Senator from New York, is a radio enthusiast. He is in the photograph giving his son, Royal S. Copeland, Jr., a lesson in radio.

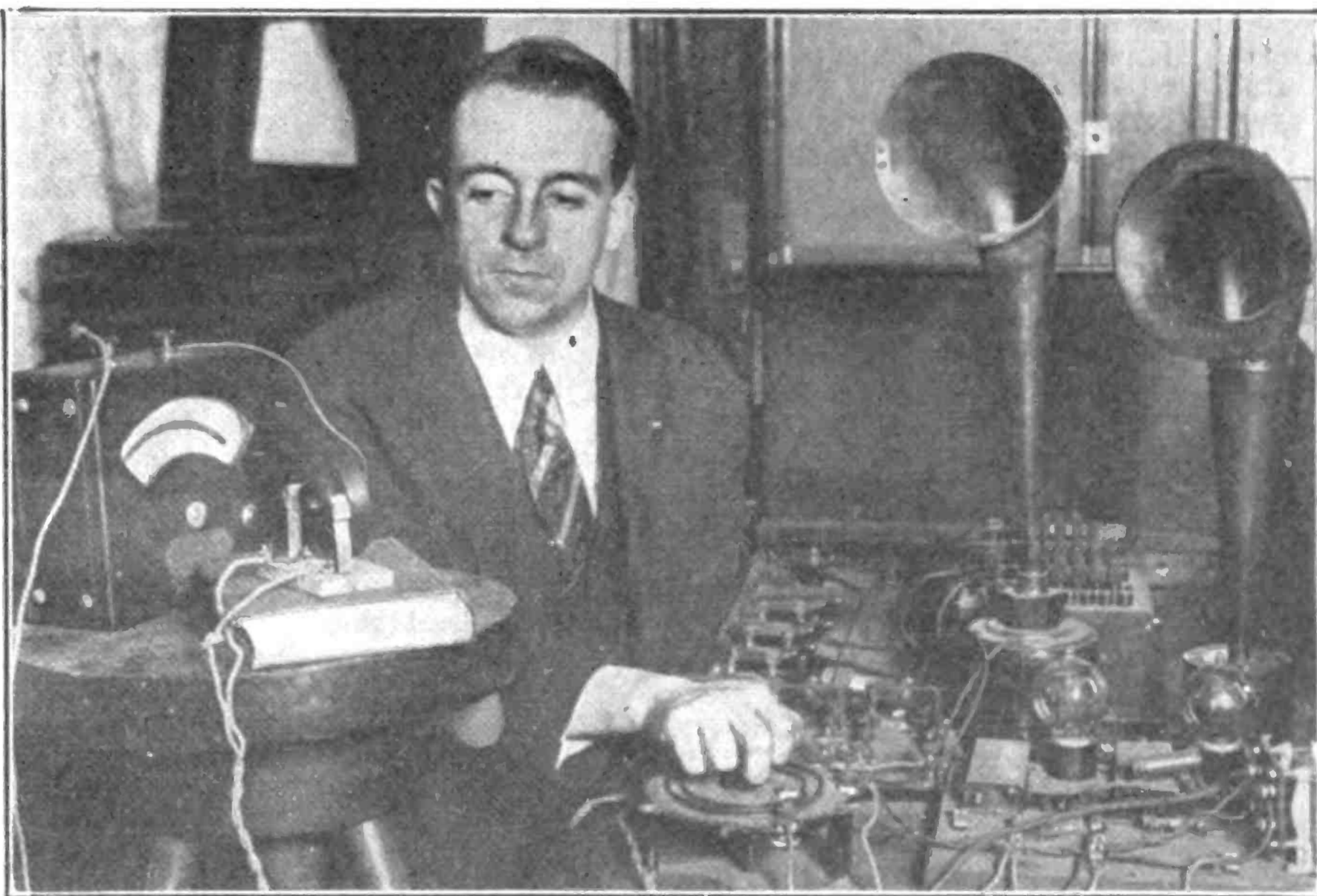
Photos of a Busy Radio



(Above) This photograph shows how phonograph music is picked up and broadcast by microphones and broadcast. It is part of the radio equipment of station WJZ, Newark, New Jersey. This equipment, together with the skill of the operators there, is responsible for the great distances it covers and the quality of its transmissions. This photograph shows operator George E. Oliver broadcasting a phonograph selection and gives a good idea just how it is accomplished. The sound leaving the phonograph horn is picked up by the microphone, then carrying it into the modulator, shown on the right. From there it goes into the speech amplifier, shown on left of modulator, and thence to the aeriola.



(C. Kadel & Herbert)
 (Above) Reverend Francis Duffy O'Laughlin, of Fordham University, New York, is one of the original radio fans of the United States. He believes that the future of radio is unlimited. He early saw the great possibilities of the new science and it is largely due to his efforts that Fordham University possesses so elaborate and perfect a radio equipment. It was one of the first universities to use radio in broadcasting and receiving, particularly athletic events. During the football season, it has proved that radio is the long-looked-for necessity in disseminating news of important games. The photograph shows Reverend O'Laughlin seated at the Fordham radio-receiving station.



(C. Kadel & Herbert)

(Above) Testing the quality of loud speakers by means of the latest equipment, that photographs defects. To test the quality of loud speakers an elaborate layout of scientific apparatus is necessary. The photograph shows how this testing is done at Columbia University, New York. J. G. Aceves, research engineer, is testing the quality of various loud-speakers for manufacturers. The sounds produced by loud-speakers is picked up by the small special-type microphone shown, then the microphone passes these sounds on to the oscillograph, where these loud waves are photographed. The slightest distortion or any other defects will be shown.



(Left) Former service men become radio experts at free radio school. The radio school of the Knights of Columbus, New York, has over a hundred students, the majority of whom are ex-service men. The photograph shows one of the radio classes receiving instruction in wiring a Marconi receiver. The men are taught how to

Radiograms

Latest Important News of Radio Garnered from the World Over, and Reduced to Short Wave-Lengths for the Busy Reader.

OVER fifty stations have qualified in the final tests between this country and Great Britain beginning December 12. When reports from the outlying districts have been received over a hundred contestants will be enrolled. A number of stations have already been logged by British amateurs, confirmation reports having been made on stations 2 HJ, Harold Hasbrouck, Port Chester, N. Y., and 2 ZK, George Cannon, New Rochelle, N. Y., and it is expected that many others will be confirmed. From the results obtained so far, and from the interest shown in the preliminaries, it is certain that the coming tests will comprise the greatest amateur event in radio.

A lighthouse station on the Maine coast reported to the district office by telephone that a large can buoy had broken adrift and was moving away. A radiogram was sent to the tender working on buoys, a few miles away. The buoy was recovered and returned to its place before sunset. Radio saved the buoy and probably a day's steaming of the tender. It also safeguarded shipping by promptly replacing the buoy on station.

Dr. Charles P. Steinmetz, research engineer of the General Electrical Company, running for engineer and surveyor of the State of New York, on the Socialist and Farmer-Labor tickets, polled a surprisingly large vote in the recent election. In the midst of a Democratic landslide, supposed to be unfavorable to "scratched" tickets, he polled 207,000 votes, 144,000 more than the candidate of his own party for governor. Dr. Steinmetz did not leave his laboratory to make a campaign. He spent no money. He lost the election, but the large number of votes he received indicates the value placed by men and women on sheer ability. He is one of the most distinguished inventors, scientists, engineers and radioists in the world.

Dr. S. W. Stratton, for twenty-one years the director of the Bureau of Standards, has been elected president of the Massachusetts Institute of Technology, in Boston. This institution will give a four-year course in radio engineering, and is the first college in the country to inaugurate such a course in that branch of engineering.

WGY will tell the story of the Harvard-Yale game, at New Haven, by means of a telephone line running from the press section of the Yale bowl to the transmitting equipment of WGY. Mr. William McGeehan, sporting editor of "The New York Herald," will describe the game. You will hear his voice and his description will be literally on the heels of the runner, his voice will be on the ball as closely as the eyes of the players. In addition to the speaking microphone into which Mr. McGeehan will pour his story, one microphone will be placed in front of the Crimson cheering section and another in front of the blue. At intervals during the game, the cheering section microphone circuits will be switched on and the radio audience will get the atmosphere of the big game.

Radio's Big Place in World

Dr. Lee De Forest Says It Is Now an Absolute Necessity in the Home.

ALL radio enthusiasts may well take pride in the fact that the present tendency in the radio field is away from the amateur experimental stage," said Dr. Lee De Forest in his greeting to the Boston Radio Exposition. "The reason for this is plain. In the short period of less than one year since radio has taken hold of the American public, we have seen a most remarkable acceptance of radio as a means of communication. This acceptance on the part of the American public is nothing short of marvelous. Science has again demonstrated in radio that it can perform miracles for the benefit of the human race.

"Radio has enriched the lives of countless thousands who are not in a position to attend concerts and operas in the leading centers of the country. Radio,

however, has gone far beyond the province of the amusement stage and will, I venture to say, go down in history as one of the few revolutionary devices bringing happiness and joy to countless millions in the way of educational instruction, entertainment and as a means of distributing the news of the world to the people in their home."

Marvelous Developments Include Radio

Navy Communication Service Handled 3,750,000 Words by Radio Last Year.

AERONAUTICS and the radiotelephone are, perhaps, the most marvelous developments of a marvelous age," said Rear Admiral William A. Moffett, chief of the Naval Bureau of Aeronautics, U. S. N., speaking over the radiophone from NAA, Arlington.

Admiral R. E. Coontz, chief of operations, who broadcast a speech in the

"The New York Herald" radio reports of the Harvard-Princeton, Yale-Princeton football games, as broadcast through the General Electric Company's WGY station, were heard clearly and greatly enjoyed by radio fans over a wide area in the East. The "Herald" received a number of congratulatory telegrams from a wide range of territory. The Brompton Pulp & Paper Co., Sherbrook, Quebec, wired: "Details of game very much appreciated."

* * *

Perfection of apparatus for insuring the secrecy of radiotelephone and radiotelegraph messages was claimed recently for a French electrical engineer, Edouard Belin. The apparatus is called "radio-cryptotele-stereographe," or "crypto-telestereographe," according to whether it is used for radio or the ordinary telegraph. The instrument is different from Marconi's to direct waves to a given point. It resembles a safety-lock. Sending and receiving instruments, each of which consists of six concentric disks, are perfectly synchronized. The disks each contain a notch and may be moved at an angle in relation to each other. A lever falling into the disks causes rotation of the cylinder and valves a given space between the notches to reproduce the message, which is received according to a code analogous to Morse's, but is reproduced in letters and figures. To keep listeners-in from deciphering the values used between stations, a simple arrangement is added whereby false signals, which do not affect the cylinders, but which cannot be distinguished by outsiders from real messages, are being constantly sent when the instrument is not in use.

* * *

The Chicago Opera Company has decided to broadcast its productions.

* * *

Leading scientists of Norway propose to install a series of radio observation stations around the North Pole so that the air currents from the polar regions may be followed and the centres of conflict with the warm southern currents determined. Such polar outposts would be of great importance when a regular daily weather forecast becomes necessary for the North Atlantic in connection with aviation service from Europe and America.

* * *

Radio messages were sent by automatic machinery at a rate of between 80 and 100 words a minute by the White Star liner Majestic to the station of the Radio Corporation of America, at Chatham, Massachusetts. This speed is about four times as fast as ordinary operators can send and receive, while the greatest speed made by the most expert senders is about thirty-five words a minute. The speed is nearly as fast as that at which messages may be sent by wire, and may open a vast new field for usefulness. The value of radio in handling transcontinental and transatlantic news has been reduced by the slow pace at which messages could be sent, but this new device, it is expected, will obviate this.

interests of the Marine Exposition in New York, said that among its activities the Navy Communication Service handled 3,750,000 words by radio for the American Merchant Marine in the past year.

"During the winter months," he said, "the Naval Communication Service handles on an average of thirty SOS distress calls a month, or one a day." That the value of this service to the American public as a whole, and to shipping interests in particular, cannot be over-estimated, he insisted.

He also mentioned the developments of the radio compass, or direction finder, and stated that the Navy has established stations equipped with this apparatus at various points along both coasts of the United States near the entrance to harbors. When a ship is approaching one of these harbors in a dense fog and is uncertain of her position, all that is necessary for her now to do is to ask two or more radio compass stations for her bearings.

Latest Radio Patents

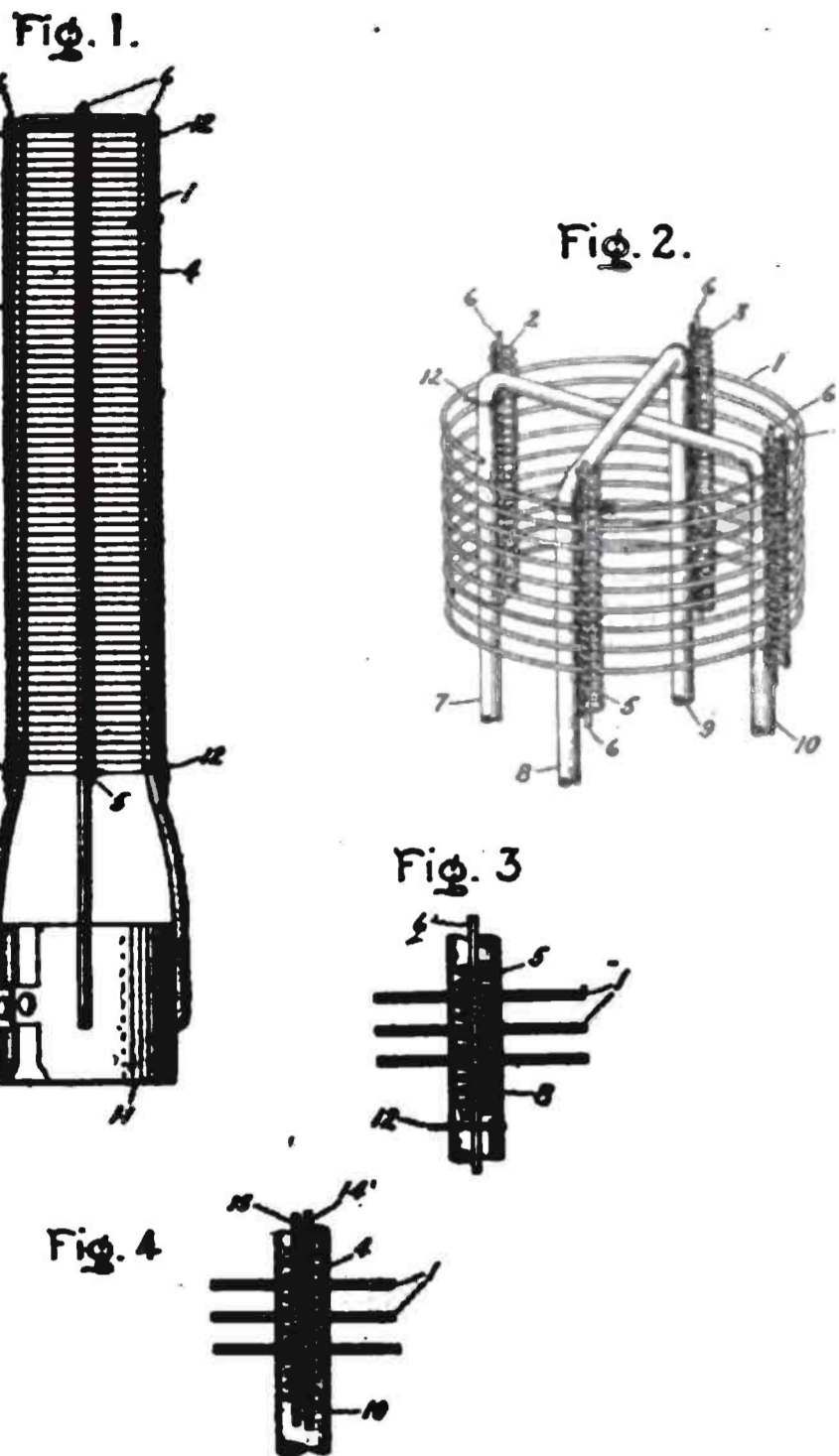


Figure 1 is an elevation of a complete grid electrode of the invention of Mr. John H. Payne; Figure 2 is an enlarged perspective on one end thereof; Figure 3 is a still further enlarged detail view of a small portion; Figure 4 is a detail view of a modification.

Grid Electrode Structure

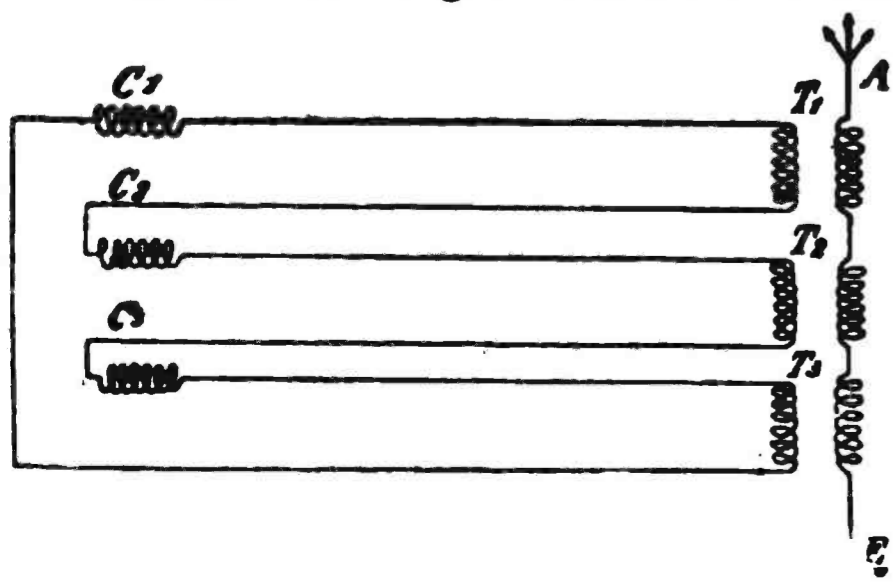
No. 1,432,411. Patented: October 17, 1922. Patentee: John H. Payne, Schenectady, N. Y.

MR. PAYNE'S invention is, in simple terms, a structure for a grid electrode made of a large number of turns of wire of small diameter which will be self-supporting, and which will be so arranged that adjacent turns of the wire will be maintained in desired spaced relation to one another. In such a structure there will be no necessity for welded joints between the different elements for maintaining them in their proper spaced relation.

Radiotelegraph Coupling

No. 1,432,438. Patented: October 17, 1922. Patentee: Joseph Bethenod, Paris, France.

MR. BETHENOD'S invention relates to an improved system of coupling between radiotelegraphic communication and a high-frequency alternating-current generator of the type of those susceptible of furnishing directly a current necessary for feeding the antenna. This station comprises in combination a high-frequency alternator in which the armature winding is divided into sev-



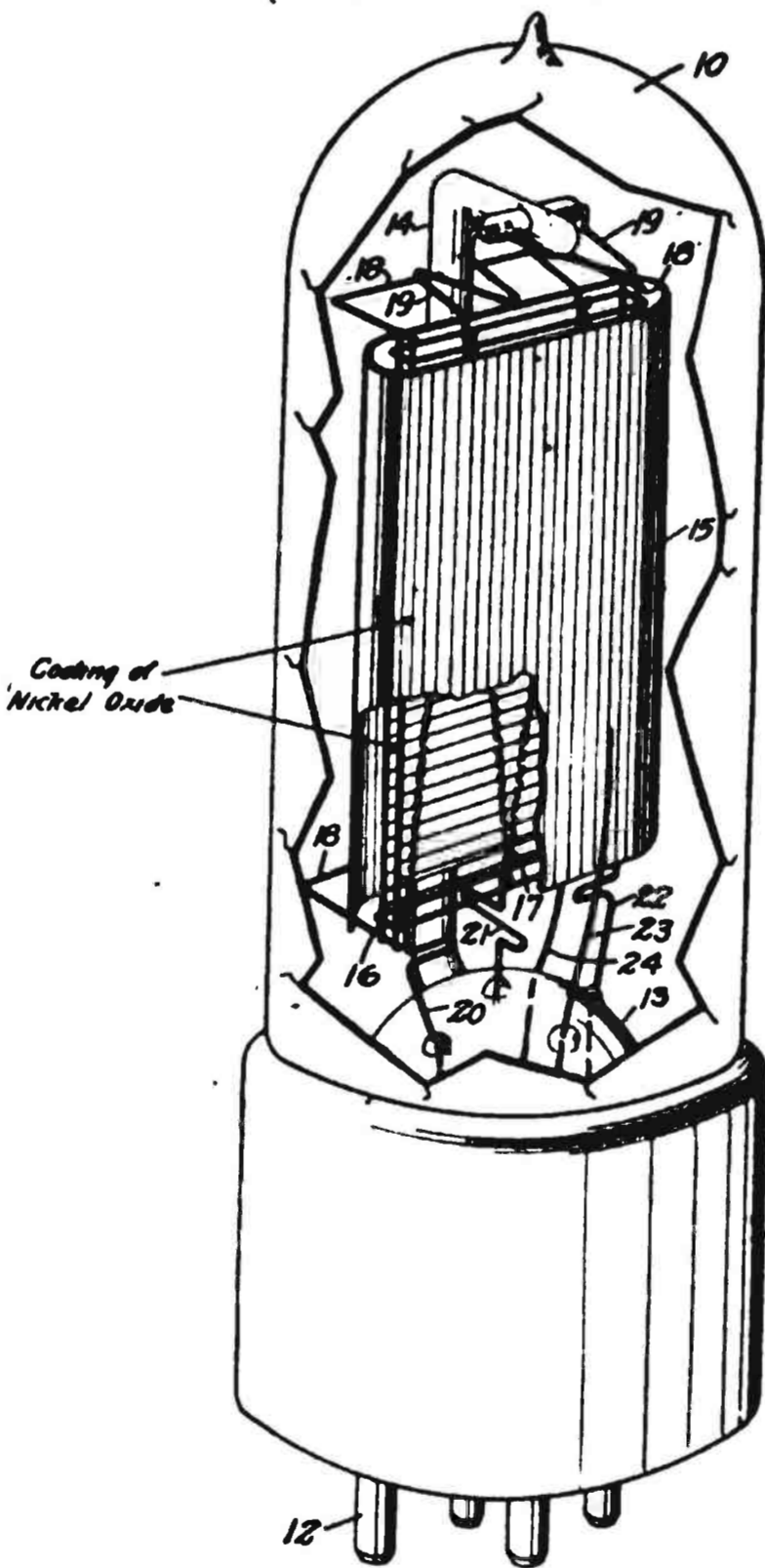
Schematic diagram of Mr. Bethenod's radiotelegraph coupling.

eral Sections not comprising any direct electric-connection between them, and a complex of transformers magnetically independent of one another; the number of transformers being equal to that of the sections of the armature. The primary windings of the transformers are inserted in series in a circuit alternately with the sections of the armature, and the secondary windings of these transformers are connected to the transmitting antenna in a suitable manner.

To Increase Discharge

No. 1,432,867. Patented, October 24, 1922. Patentee, Mervin J. Kelly, New York, N. Y.

MR. KELLY'S invention is to increase the amount of power which may be applied to an electron discharge device while still keeping within the safe limits of temperature under which the electrodes can function; to eliminate the objectionable effect which is sometimes produced in electron-discharge devices, namely "blocking," which is caused partly, at least, by undesirable secondary emission from the grid; and to eliminate the effects upon the operation of



Mr. Kelly's invention comprises a preferably evacuated bulb to which the usual base portion is attached. This base portion provides a support for suitable terminals.

electron discharge devices which the lodgment of particles of the filament coating upon the grid have caused.

An important feature of this invention comprises the provision of a black coating on the electrodes of electron-discharge devices, particularly the plate and grid.

Electron discharge devices have been deficient in their operation in one respect because only a limited amount of power could be handled by them without heating the electrodes beyond a safe temperature. By increasing the capacity of the electrodes to radiate heat faster, we can increase the power applied and still keep the temperature within safe limits.

No Wireless Receiving Set is complete without



MAGNAVOX products are designed in our own laboratories and manufactured in our own factory—greatly extended in size during the past few months.

The Magnavox Power Amplifier has been designed for use especially in connection with the Magnavox Radio, and its use greatly increases your range and signal strength.

Every owner of a Magnavox Radio should also add the Power Amplifier Model C if he has not already done so.

R-2
Magnavox Radio
with 18-inch Horn

FOR those who wish the utmost in amplifying power; for large audiences, dance halls, etc. Requires only .6 of an ampere for the field.
Price, \$85.00

Type R-3
Magnavox Radio
with 14-inch Horn

THE same in principle and construction throughout as Type R-2, and is ideal for use in homes, offices, amateur stations, etc.
Price, \$45.00

Magnavox
Power Amplifier
Model C

INSURES getting the largest possible power input for the Magnavox Radio. Can be used with any "B" battery voltage which the power tube may require for best amplification.
AC-2-C, 2-Stage.....\$80.00
AC-3-C, 3-Stage.....110.00

Magnavox Products may be had of good dealers everywhere.

The Magnavox Company
Oakland, California
New York Office: 378 Seventh Ave.

Radio brings it
MAGNAVOX tells it

Answer to Readers

CAN a small dry-cell tube be used as an amplifier. If so, will the regular amplifying-transformer function with it? Can such a tube be used in the Armstrong super circuit?—Joseph Mulacaha, Omaha, Neb.

This tube is called the aeriotron dry-cell vacuum tube and may be used as an audio-frequency amplifier; but it cannot be used with radio-frequency or the Armstrong super circuit. In employing this tube for audio-frequency amplification, the regular standard amplifying transformers may be employed. This tube will stand up under a plate voltage of 45 volts. Its filament operates on a single dry-cell, such as is used in an ordinary door-bell.

In a two-wire antenna, how far apart should wires be separated by the spreaders at each end. Are they joined at each end or only at the lead-in end? Can radio- or audio-transformers be put into a crystal circuit with satisfactory results?—Jacob Murs, Bayonne, N. J.

About two or three feet is the correct spacing for the wires. They should be joined only at the lead-in. Radio- or audio-frequency amplifying transformers are useless in a crystal circuit.

What is the best pair of phones to be had at a price not exceeding ten dollars? Can a pair of 2,000-ohm phones be used with any set?—Albert Murphy, Philadelphia.

It is impossible for this department to discuss the relative merit of the various competitive makes of radio instruments.

Is a loop aerial all right for a crystal set? Will it prevent interference? Which condenser is best for receiving, 43-plate or 23-plate?—Arthur Horn, Philadelphia.

The loop antenna will not give satisfactory results on a crystal set unless the set is located near a broadcasting station. Loop aerials, when used with vacuum tubes, have the marked advantage of eliminating interference. Either the 43-plate or the 23-plate condenser may be used, although the latter will permit of finer tuning. The 43-plate condenser has the greater capacity.

Will you advise me what to do with my variometer set? I cannot get any signals, only a lot of screeching and howling. Enclosed you will find my hook-up?—Anxious.

The only change that may be suggested is to place the rheostat in the positive side of the A battery and join both negatives of the A and B batteries to the return lead from the secondary of the vario-coupler. In order to make this change, all that is necessary is to simply change the connections of your storage battery, leaving the set wired as it is. If you have the set wired up, exactly, according to your diagram, with this one exception, there is no reason why you should not hear signals. Are you sure you have the positive terminal of the "B" battery jointed to the plate of the vacuum tube?

If a radio-frequency transformer is enclosed in a metal covering which is grounded, would it prevent induction received from the transformers of the set and the coils used?—Harry Starr, Duluth, Minnesota.

In a case where a radio-frequency transformer has an iron core, it should not be necessary to shield it in the manner you suggest. If an air-core transformer is employed there are no steps must either be very wide or some shielding arrangement should, however, must

be perfect, or it will possess undesirable capacity effect.

Is the enclosed hook-up of a 2 variometer, 1 vario-coupler set correct? What would be the wave-length range and receiving range of such a set? Are the 23-plate or the 43-plate condensers better? Would it be all right to hook a loading coil in series with the antenna of such a set; or, is it necessary to load the secondary also? Can a 3step amplifier be later connected to the set?—Julius Hemmer, Albany, New York.

The hook-up is correct; but as you do not give us details as to the windings, we cannot tell you the wave-length range. However, such sets usually tune to about 600 or 800 meters with the average antenna. It is impossible to tell the receiving range of any outfit. The smaller the variable condenser, the more accurate the possible tuning; although, in your case, we would recommend a 43-plate condenser in the primary circuit and no condensers in the secondary circuit. You must load both primary and secondary simultaneously; but loading is not satisfactory with this type of set. An amplifier may be connected later to the phone terminals.

Where may I obtain a list of calls of the various stations?—Austin Foote, Tenafly, N. J.

Write the Government Printing Office, Washington, D. C., enclosing a money order for 15 cents.

I have a two-stage regenerative set with

His First Concert



(C. Photopress, N. Y.)

a hundred-foot aerial. I was receiving WOR wonderfully. By disconnecting the tuner and replacing it in its original position, previous signals were not so loud. What is the reason for this?—Grenville Moller, Tonawanda, N. Y.

This is the old story of fading. It is a condition which cannot be controlled. It generally happens when signals are loud. This paralyzes the tubes, making the signals weak. Shut down the set, allowing the tubes to recover, and experiment again.

If U-V 201 bulbs are used on the super-regenerative set, what adjustments are required?—Joe Poli, Kew Gardens, N. Y.

If you use U-V 201 tubes in place of the 202 tubes, it will be necessary for you to cut down the necessary amount of plate voltage. In this event, we suggest that 80 volts be used on the plate circuit of the first two tubes, and 120 volts on the plate circuit of the second tube. No other change is necessary.

With reference to the Armstrong super-regenerative circuit, how many coils of wire are used on the vario-coupler primary for 360 meters? How many on the secondary of the coupler? How does the loop connect itself to the coupler?—Paul Remmeler, Poughkeepsie, N. Y.

Any standard vario-coupler with a wave length from 150 to 500 meters will answer the question. The only difference being that you will have to put twice as much wire on the secondary. The two leads from the loop aerial should be fixed to each end of the vario-coupler. The tuning of the loop is then obtained by means of varying the condenser, which is placed across the loop and the vario-coupler; and, also, if necessary, by placing the attaching clip on the lead at different points along the outside wire.

Is a loop aerial all right for a crystal set? Will it tend to prevent interference? Which condenser is best for receiving sets—the 43-plate or the 23-plate?—Kenneth Kiefer, Mineola, L. I.

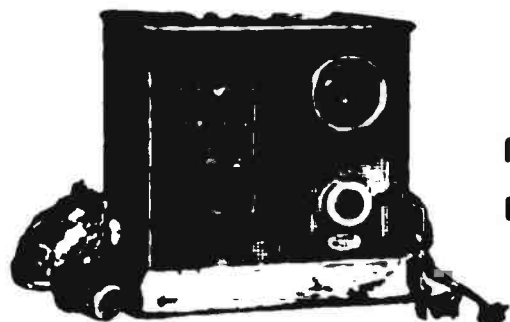
The loop antenna will not give satisfactory results on a set employing the crystal, unless you are very close to a broadcasting station. The loop antenna will eliminate much of the interference. Either the 43-plate or the 23-plate may be used, although the latter will permit fine tuning when placed across secondary of vario-coupler. The 43-plate is used in series with antenna.

Iwish to construct a crystal receiving set employing a double-slide tuning coil, a variable condenser in the aerial lead-in with a fixed phone-condenser. It is desirable that the coil be as short as possible, but long enough to insure the reception of 400 meters. Assuming a properly installed aerial, 100 feet long with a 30-foot lead-in, what should be the diameter of the coil and how long the winding? Would a coil wound on a solid wooden block be as efficient as one wound on the regulation cardboard tube? If so, would a coil wound on a flat wooden block of equal circumference be equally as efficient?—John Matthews, Huntington, N. Y.

Your coil should be about 2½ inches in diameter and wound for 3 inches of its length with No. 22 wire. A solid core is not as efficient as a hollow core, as solid cores cause dielectric losses. A coil is almost efficient when it is round and, therefore, a flat wooden block is much less efficient than a round one.

Is it possible to use a very small coil with a condenser to increase its wave length? Why is this not done more frequently?—George F. Rye, New Bedford, Mass.

In receiving work, it is advisable to have a preponderance of inductance, as a maximum of efficiency is obtained when the voltage is greatest; and the greatest voltage is obtained across a coil rather than across a condenser. Therefore, it is advisable to use as little capacity as possible.



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L. W. GOODMAN
DREXEL HILL, PA.

Major _____, Halifax, N. S., writes: Delighted. Received Schenckaday clearly on one tube first time I tried the GOODMAN. Would have saved trouble and money by buying months ago.

MO, New Radio Craft
Test of New Radio-Equipped Naval "Spotting" Plane Made At Cleveland.

A NEW Naval "spotting" plane equipped with a recently perfected radiotelegraph set was tested officially before a board of Naval officers at Cleveland, Ohio, November 15. The plane is a three-seater, designed for observing and reporting to ships in action the fall of shells and their distance from the enemy ship or target. It is the first of several newly developed spotting planes designed for Naval work and was built by the Glenn Martin Company.

One of the most important features of the "MO," as the craft is designated, is its radio equipment, which is said to especially meet the requirements of instantaneous and constant communication by radiotelegraph between the spotters and the flagship, where the fleet gunnery officers and the admiral control the fire, or to individual ship's gunnery officers if the fire is controlled separately.

Only general information regarding the Navy's spotting radio sets is available, but it is known that the sets so designated are modern tube telegraph sets operating on continuous wave, and having excellent characteristics for range and reliability. They are especially rugged in their construction and guaranteed to "stand up" better than the ordinary radioplane sets. Power and range are withheld, but it is understood that they will transmit 300 or 400 miles. Satisfactory communication is assured, even though a great number of planes are sending messages at the same time.

The power is generated by a wind-driven generator with a self-regulatory fan giving constant revolutions at all air speeds, so as to furnish the tubes with a steady voltage.

Progress in Electricity
From Data Compiled by the Society for Electrical Development

GENERATING CAPACITY OF CENTRAL STATIONS	
Year	Horsepower
1902	4,000,000
1907	9,000,000
1912	17,000,000
1917	30,000,000
1920	47,000,000
CENTRAL STATION REVENUE	
1914	\$336,980,000
1915	360,000,000
1916	436,000,000
1917	526,886,408
1918	664,850,000
1919	773,650,000
1920	922,300,000
1921	931,000,000

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RADIO WORLD

RADIO WORLD

1493 Broadway, New York City.

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One Year (12 issues).....	6.00
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with the endorsement of the

NATIONAL RADIO CHAMBER of COMMERCE

and sanction of the Radio Apparatus Section of the

ASSOCIATED MANUFACTURERS of ELECTRICAL SUPPLIES

Grand Central Palace
New York

December 21st to 30th

(Sunday excepted but Christmas Day included)

This first really comprehensive Exposition to be staged in a manner worthy of a great industry includes such representative exhibitors as:

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- National Carbon Company
- C. Brandes, Inc.
- Sierper Radio Company
- General Insulate Company
- Executive Radio Council
- Coto-Cell Company
- Western Electrical Instrument Co.
- American Radio Relay League
- Stromberg-Carlson Mfg. Co.
- Haltzer-Cahot Company
- Clapp-Ratham Company
- Dubilier Condenser Company
- DeForest Radio Telephone & Telegraph Co.

All of the above and other leading manufacturers have contracted for space and many more are at present negotiating for representation. The opportunity to display Radio products to thousands of buyers during the holiday season is an unusual one. The exposition will be one of New York's big features in connection with National Radio Week.

For further particulars write or wire

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Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word

Telephone Bryant 4796

Coming Events

The editors of RADIO WORLD will gladly publish news items of all contemplated radio shows and expositions. Keep us posted by mailing full information.

SECOND NATIONAL RADIO EXPOSITION, direction International Trade Exposition Co., Chicago, January 13 to 20, inclusive, 1923, George A. King, director of publicity, 417 South Dearborn Street, Chicago, Ill.

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

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, December 21 to 31. Colwell & Korbell, Fisk Building, New York City, directors of publicity.

INTERNATIONAL RADIO SHOW, Madison Square Garden, New York City, November 20 to 25, inclusive. E. C. Buchignani, director of publicity.

SOUTHEASTERN RADIO EXPOSITION, Auditorium Armory, Atlanta, Georgia, December 4 to 9, inclusive. Co-operative Radio Sales Assn., 285 Peachtree St.

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

A Loud-Speaker Crystal Set

THE Steinmetz Wireless Manufacturing Co., of Pittsburgh, claims to have perfected an amplifier for crystal receiving sets which possesses the added advantage of requiring no storage battery. This amplifier may be used on any crystal set. It is sold in convenient units so that one, two, or three stages of amplification may be added when necessary. These units use a "peanut" tube requiring only a single dry-cell instead of the usual storage battery.

To insure against interruption in the operation due to cat's whisker not being on sensitive point, the manufacturer provides an ultrasensitive crystal which, he claims, makes interruption almost impossible.

Eisemann Magneto Line

THE Eisemann Magneto Corporation announces a line of radio parts designed to suit the most critical. Each part has points of originality that separate it from all other products now on the market. Ready for delivery are vario-couplers, variometers, variable condensers with vernier, audio-transformers, sockets, and phones, each made to the highest standards.

A feature of the panel parts is the concave bridge-dial which eliminates all protruding knobs, and acts as a shield. Switch points and levers are eliminated with the vario-coupler. All molded parts are of genuine bakelite highly polished.

This line may be had through Clark & Tilson, 1 East 42nd street, New York City, who are prepared to supply descriptive matter for each part. The prestige of the Eisemann Magneto Corporation is guarantee that its articles are the standard of quality.

Outcasts!

THE radio manufacturer of lesser magnitude who would succeed should advertise—after he has assured himself that he has a product worth advertising, says "The Mail," New York. The last two months of merchandising experience has shown that the buying public is insisting upon the products of the better known manufacturers. *The product without a name is rapidly becoming an outcast.* All of the big department stores are carrying only apparatus that has established itself in the mind of the public.

This is a very healthy indication. It shows that the radio industry is fast reaching rock bottom. It is actually starting to gather the prestige that it

deserves. In another six months' time, many of its ills and sores will be cured.

During the past few months, capital has flowed out of the radio field almost as fast as it flowed in last spring. That is also a good indication, for the get-rich-quick artists have been shown that radio is more than a match for their wits.

U. of I. Gets Busy

THE University of Illinois has opened its fall season with broadcasts on Monday and Thursday nights from 8.30 to 9.15. Its station, WRM, is operated by the electric engineering department.

New Firms and Corporations

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

Wilmac Electric Corp., Queens, \$5,000; J. J. McFarlane, Mr. Williams, A. Schichowsky. (Attorney, M. Friedberg, 116 Nassau St., New York.)

Fremont Radio Sales Co., Manhattan, \$5,000; E. and S. and H. Nagker. (Attorney, J. D. Nussbaum, 84 Rivington St., New York.)

Educational Radio Corp., Del., 3,000 shares common stock, no par value. (Representative, D. Freeman, 342 Madison Ave., New York.)

Let Radio World Test Your Goods

MANUFACTURERS, send a sample of your goods to our Technical Editor, Fred Charles Ehlert, 9006 Pleasant Street, Queens, Long Island, New York. It will be carefully tested. If your goods satisfy our experts, RADIO WORLD'S endorsement will be published in our merchandise department without charge or obligation of any kind on your part. When the radio purchaser sees a published test in RADIO WORLD with the seal accompanying this editorial attached, he will know that the product stands for perfection and has the guarantee of RADIO WORLD. RADIO WORLD is rendering a service through its testing department that is prompt, accurate and produces results. All goods will be returned to manufacturers, after testing, provided stamps are sent for that purpose.



Remember "This Is a Radio Christmas"

and that millions of dollars will be spent during the holiday time for radio gifts.

Be sure to get your share of this business by advertising in the issue of RADIO WORLD of December 9, which will be

RADIO WORLD'S CHRISTMAS NUMBER

Thru this medium you can reach thousands of readers, who are not only interested in radio themselves, and want new equipment, but who also will give presents to others whom they wish to make radio fans.

ADVERTISING RATES:

Regular advertising rates in force for RADIO WORLD'S

HOLIDAY RADIO GIFT (CHRISTMAS) NUMBER, as follows:

\$150 a page, \$5 an inch. Discount, 10% four times, 15% thirteen times.

Last form closes November 30, A. M.

Take advantage not only of RADIO WORLD'S circulation, but also its cash-thru-the-mail pulling power.

Be represented in RADIO WORLD'S Holiday Radio Gift Number, and reach the many thousands who actually want your goods and are ready and willing to pay for them.

Preferred Positions Must Be Booked Immediately.

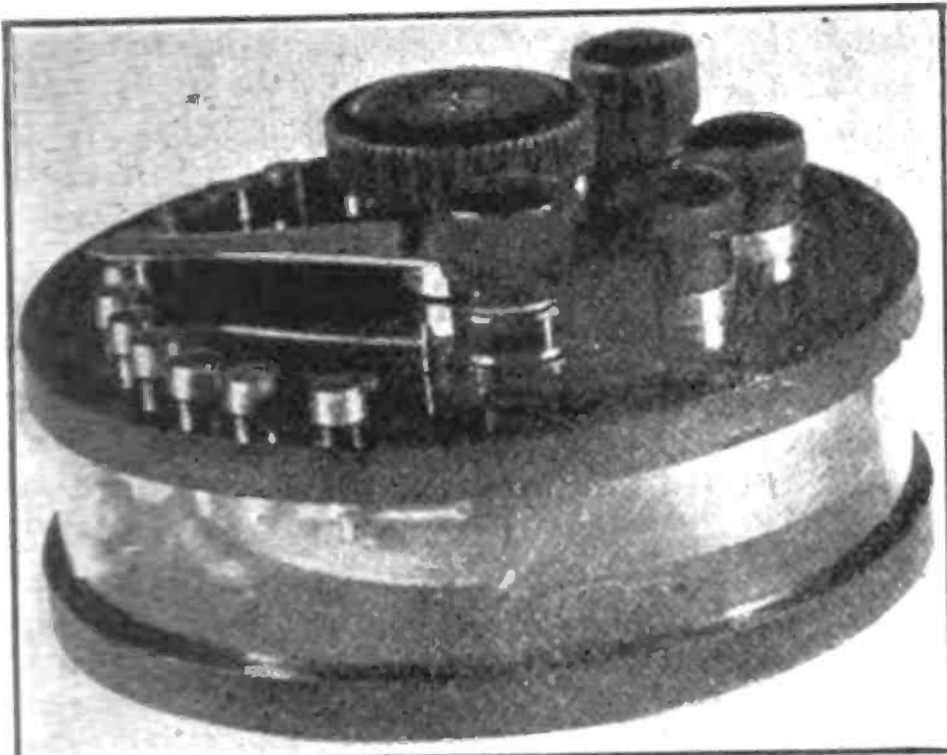
Copy for run-of-paper position will be received up to November 30, A. M.

RADIO WORLD, 1493 Broadway, New York

My Emergency Radio Receiver at 2 AAR

By George Steier

2AAR, 584 East 139th Street, The Bronx, New York, N. Y.



Mr. Steier's receiver employs a new circuit designed after careful research—a crystal detector mounted inside and adjusted by a set screw at the bottom. Its wave length is from 150 to 750 meters. The selective tuning is by means of a 15-point switch. The actual size of the receiver is 3 inches by 2 inches.

HOW many times during a year are radio amateurs using tube sets, forced to give their phones or loud-speaker an involuntary rest due to a rundown battery. The writer, being no exception, found it annoying to shut down for a few days and determined that an emergency set that required no "juice" was the necessary thing. But, alas, no spare space was available for a rather cumbersome crystal set. The writer began a battle of wits with his radio knowledge, and, after some research work, designed the set shown in the accompanying photograph which requires the small space of 3 inches by 2 inches.

A number of pocket, or small, receiving sets have been described from time to time. I make no claim to first honors. However, most of these sets are of a freakish nature, more or less. My emergency set may be depended on during all sorts of trying weather conditions. The circuit employed is one of my own and was especially designed for long-dis-

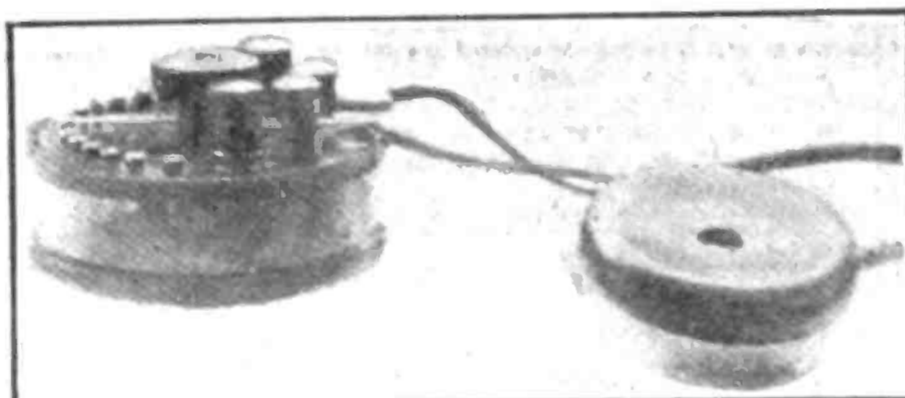
In response to RADIO WORLD'S request for any interesting constructive work in radio that might have been perfected by its readers, Mr. George Steier, 584 East 139th street, The Bronx, New York, sends the following account of an emergency receiving set which, he claims, may be depended on in all sorts of weather.



George Steier

tance reception. As a broadcasting receiver, the results equal that of a one-bulb set. WGY, Schenectady, and a host of other stations at quite a distance are heard every night.

The set has had a more or less interesting career, having been adjudged the second best receiver for use by the New York City Police Department. In a pocket-receiver contest of over sixty entrants, this receiver was nosed out of first place by the small margin of five points. It was considered by the judges a most ingenious piece of radio work. The set is, also, very satisfactory for amateur reception. Government stations on 600 meters can be heard pounding in, five feet from the phones.



The pocket radio-receiving set invented by George Steier (shown at left) compared with a single head-phone (shown at right), and fully described in the accompanying article

Brooklyn Man Wins Code Honors

J. C. Smyth, 2 CKB, Declared World's Champion After Taking Three Contests.

JOSEPH C. SMYTH, 2 CKB, 269 Eighty-Sixth Street, Brooklyn, holds the World's radio championship. The title was awarded him at the New England Amateur Convention held at Boston.

Competing against Mr. Smyth were Theodore R. McElroy, former world's champion, and Walter Vetromile, both of Boston. There were three separate code contests: "jamming," cipher code, and straight press, the stipulation being that the contestant showing to best advantage in the three contests would be



(C. Sport-Commercial)

Joseph C. Smyth at the "speed key"

awarded the silver cup and the title; Mr. Smyth won all three.

In the jamming contest two transmitters were sending simultaneously into the phones, and the contestants were required to ignore the signals from one transmitter, and copy the other, a rather difficult assignment. Mr. Smyth won this at a speed of thirty-five words per minute without error.

The cipher code consisted of ten-letter code words secretly prepared, and transmitted by a Wheatstone transmitter. This contest was won by Mr. Smyth who again made a perfect copy and broke the world's record for speed in cipher-code receiving by copying the difficult words at a speed of forty-four words per minute.

The straight-press contest presented the closest race of all, as both Smyth and McElroy made perfect copies at a speed of forty-five words per minute, and again at a speed of fifty words. However, at fifty-five words per minute McElroy made six errors, while Smyth made five, thereby winning the world's title in all three.

Free Radio Instruction at Mass. Inst. of Tech.

THE Massachusetts Institute of Technology, Cambridge, offers a free course in radio to extension students, this winter. The first care of this elementary course will be to give students an idea of what really constitutes radio and to supply the necessary theory for the intelligent handling of a receiving set. No previous knowledge of electricity is required. Classes are held at 7.30 p. m., in room 275 of Tech Building No. 10, on Tuesdays and Thursdays. M. T. Dow and E. L. Bowles, both of the Institute, are instructors.

Show Will Be Exclusively for Fans

THE Council of the Second Radio District has decided that the annual show to be held next year, (March 1, 2, and 3) at Hotel Pennsylvania tentatively, will be open exclusively for amateurs. This re-

striction has been made, it is said, because at the show held at the same hotel last year, the crowds were so large that radio amateurs were prevented from approaching the exhibition booths to see what manufacturers had to display.

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AND THE GENERAL PUBLIC**

Are Looking Forward to

NATIONAL RADIO WEEK

DECEMBER 23 TO 30, INCLUSIVE

All Interested in Radio Should Help to Make This Event a Smashing Success.

If you want to know more about it address:

NATIONAL RADIO WEEK EXECUTIVE COMMITTEE
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AGENTS

Our established quality rewards your effort with liberal commissions even on large orders. "Triple-test" multimount crystals and "Triple-tone" special gold alloy cat-whiskers are today the best sellers to jobbers and retailers. High priced but unequalled in quality and sales help. Repeat orders assured. State territory you want. **FOOTE MINERAL CO., Inc., 107 N. 19th Street Philadelphia, Pa. :: Established 47 years**

Did you see our ad in **RADIO WORLD** of Nov. 18, Page 27?

Watch for future announcements.

Sidbenel

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Dept. "B," 1698 JEROME AVE.
NEW YORK, N. Y.

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Let **remagnetize it. Guaranteed, in one day good as new.** **\$1.50**

Per Set

I rewind for higher ohmage. All radio telephone repairing at moderate prices. Mail orders attended to. Dealers write.

ROYS, 101 West 42nd St., N. Y.

Thordarson Transformers \$3.25

Dictograph Phones, \$6.50
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Amateurs:—We Pay Postage.

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RADIO WORLD

TELEPHONE, BRYANT 4700
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF EACH WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS CORPORATION

ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary

ROLAND BURKE HENNESSY, Editor,
1493 Broadway, New York
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1493 Broadway, New York

ASSOCIATE EDITORS:

Robert Mackay Fred Chap. Elliot

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Advertising rates on request.

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One inch, one time—\$5.00. Per space line, \$0.40.

On four consecutive issues, 10% discount.

On thirteen consecutive issues, 15% discount.

Cover and preferred-position rates made known on application.

Terms: 30 days Net. 5% 10 days.

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Entered as second-class matter, March 22, 1933, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

New Broadcasting Map

THE Radio Section of the Department of Commerce has found it necessary to use a larger broadcasting map, the old one having become too small for practical use in locating the 564 broadcasting stations now in existence. The new map, which is 5 by 7 feet in size, is divided into radio districts, and each station is located in its approximate position.

The Difference Between Audio- and Radio-Frequency

WHAT is the distinction between "audio" and "radio" frequency amplification? ask Howard Allen Duncan in "The Globe," New York. And Mr. Duncan replies: The first is named "audio" frequency because it amplifies oscillations that vibrate within audible limits. This limit is usually reckoned to be between 16 and 20,000, this last being the upper limit for the human ear. For radio frequency, however, the oscillations may vibrate hundreds of thousands and even millions of times per second, and the detector must bring them down to audible limits, so that they will actuate the telephone receivers, or other recording devices connected in the circuit.

Radio- and audio-frequency amplifications are entirely distinctive, and they both fulfil different and separate functions. One cannot take the place of the other, and one may not produce the same results as the other.

Radio-frequency amplifiers should not be used to obtain loud signals, or when it is desired to have volume. This work will be better performed by the audio-frequency amplifier. However, when it is desired or necessary to amplify weak signals, so that they can be made to actuate the detector, the radio amplifier is the one used.

In distinction to the audio-frequency amplifier, which is hooked on after the detector in the receiving circuit, the radio-frequency amplifier comes first, and then is followed by the detector. This is an advantage, for it permits the use of any type of rectifier, and allows the addition of audio-frequency amplifiers after the detector, so that the amplified signals can be made still louder by its means.

Thus, radio-frequency amplification magnifies signals so that they are much stronger when they reach the detector. This has the same effect as though the transmitting station were moved much nearer the receiving set. Any number of amplifying radio frequency steps, or stages can be used in a receiving circuit. There is, of course, a practical limit, and that is considered to be about four stages, for beyond that point the operation of the set becomes so critical and unstable as to make it difficult to tune it and get good results.

Argentina Organizing in Radio

ARGENTINA has just organized a radio association in the City of Rosario, with forty members, according to a report from Consul Bonney, to the Department of Commerce. The organization intends to obtain board-of-trade quotations from Buenos Aires by radio. Adolfo Elias, J. Torres, Lorenzo Aguerreberry, Alfredo Muzzio, C. J. Todman and G. O. Caesar are the organizing committee. Experimental receiving radio sets are made in Rosario by C. E. Smith, of Smith & Kirkwood, and sell for about \$38; but difficulty is anticipated due to the fact that the radio patents are controlled by a company in Buenos Aires and patent interference is anticipated.

Radio World, 52 issues, \$6.00.

Subscribe direct or through your news dealer. **\$6.00 a year, \$3.00 six months, \$1.50 three months.** Radio World, 1493 Broadway, N. Y. C.

Spirola

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LOUD SPEAKERS

Do not be deceived by our prices. SPIROLAS are not cheap instruments—they are a remarkable development made possible by the invention of the SPIRAL tone chamber (pat. pend.), which not only allows us to market a cabinet speaker of established high grade at an almost sensational price but gives many exclusive advantages over even the usual cabinet type, which is nothing but an ordinary horn enclosed in a cabinet—extreme compactness for a full-sized tone chamber and really complete elimination of metallic "horn" noises. SPIROLAS are made for music lovers who appreciate absolutely pure, natural tone.

We make a complete line—of equally high-class construction throughout, with fine, hand-rubbed finishes. ALL SPIROLAS ARE SOLD UNDER ABSOLUTE MONEY-BACK GUARANTEE—price immediately refunded if returned in ten days.

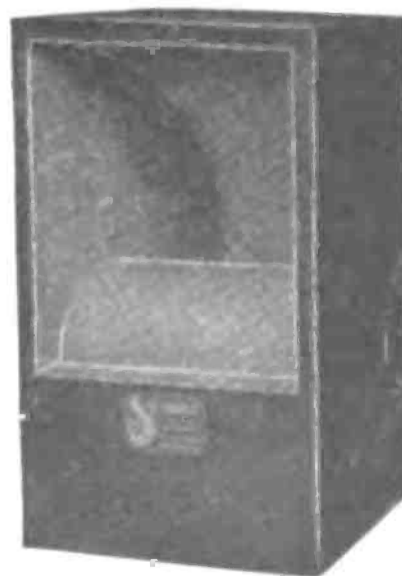
SPIROLA CONCERT—complete with special powerful built-in unit and cord ready to hook up like phones, beautiful oak (Model CO) or mahogany (CM) finish bronzed throat. **\$12.50**

SPIROLA DUPLEX—improved type for use with your headset, two complete speakers in one, eliminating usual interference between phones, oak (DO) or mahogany (DM) finish, bronzed throat. **\$4.85**

Satin black finish all over (DB) **\$3.85**
SPIROLA SIMPLEX—for use with Baldwin or other loud speaker unit, oak (SO) or mahogany (SM) finish, bronzed throat. **\$4.85**

Satin black finish all over (SB) **\$3.85**
At dealers or postpaid, carefully packed (C. O. D. if preferred).

L. H. DONNELL MFG. CO., Dept. B, Box 70, Ann Arbor, Mich.



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“BECO”
RADIO FREQUENCY SET
 175 to 500 Meters
3 Radio Frequency
3 Audio Frequency and Detector
 All on 4 Tubes
Bissell Engineering Company
 161-167 W. 64th STREET, NEW YORK

INSU-LITE
PANELS
 1/8" —.01 per sq. in.
 3/16" —.015 per sq. in.
 1/4" —.02 per sq. in.
DEALERS: Write for discount.
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CRYSTAL SET \$4
“THE LITTLE WONDER”
 \$2.50 UNMOUNTED
 Wonder in name and a wonder in performance. Cannot be equalled for the price. Catches distinctly everything broadcasted within 30 miles.
 Send for FREE catalog, describing our “Little Wonder” set and listing radio supplies.
GUARANTEED, TESTED CRYSTALS
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Radi-O-Plate Panels. All sizes cut to order.
Holloway Electric Supply Co., Inc.
 226 Third Avenue New York City

GITHENS TRUTONE RADIO HORN—LOUD SPEAKER
 First one to sell on ten day trial Money back Guarantee

Retail Price \$21.00
Includes Loud Speaker
 Trutone has been pronounced the best on the market by experts. It has a clear true tone. Every radio fan should try Trutone and compare it with others.
 If YOU don't find Trutone the best, your money will be refunded. It is sold on a ten-day trial money-back guarantee. If not carried by your dealer write us.
Distributors and Dealers, write!
AUTO PARTS MFG. CO.
 1615 Trombly Ave., Detroit, Mich.

Future of Electricity
In Next Seven Years It Must Accomplish as Much as It Has in Its History

BETWEEN now and 1930, the electrical industry will be called upon to accomplish as much as it has already accomplished so far during its entire history, and between the years 1930 and 1937 it will have to do four times as much, declares Guy E. Tripp, chairman of the Westinghouse Electric and Manufacturing Company in an article on the “Future of the Electrical Industry” in the current issue of the “Magazine of Wall Street.”

Until recently, the electrical industry, like most industries, says Mr. Tripp, developed haphazardly and grew by blindly following lines of least resistance. In its early days, no one could estimate its possibilities—or rather, those who did foresee the immense development that has actually taken place, were derided as visionaries. To-day, the chief factors governing electrical progress are known with a reasonable degree of accuracy; and provided that no radical industrial or economic changes take place during the next fifty years, the electrical industry will, during this period, in all probability develop along well defined lines.

One of the established facts is that the United States can use to advantage practically all of the electrical energy that can be generated within its borders. Everyone concedes the superiority of electricity for lighting; for driving industrial and mining machinery; for producing heat for industrial processes; for the manufacture of many chemical compounds, such as abrasives and fertilizers; for supplying power on the farm; for cooking, heating and operating a variety of labor-saving devices in the home; and for limitation need not worry the present generation, or the next. We have available in the United States about fifty million horsepower of water power, of which only about eight millions are now in use. It will be many years before all of this power is developed; and, when it is, it will be utilized in conjunction with huge steam plants that will produce power from about one pound of coal per kilowatt hour. Though our fuel supplies are undoubtedly diminishing, it will be centuries before they are exhausted at this economical rate; and by that time some of the newer forces, with which our physicians are busy, may be at our disposal.

The real limitation to electrical development is set by finance. The nation's present annual income is figured at about seventy billion dollars, of which the average surplus available for permanent investment, after providing for the needs and pleasures of our people, is about ten per cent. From this surplus must come the funds for all permanent improvements of every kind—every addition to our railways, mines, factories, farms, homes and highways.

OUR NEW
Dry Cell Socket, made on a novel principle, sells for only
60c.
LINCOLN RADIO CORP.
 116 W. 65th Street N. Y. City

WELCOME! COME IN AND HEAR THE CORACO RADIO CONCERT
 Daily, 9 A. M. to 5 P. M. 10th Floor, 220 W. 42nd St., next to Amsterdam Theatre
 The Coraco Super-Radiophone is the latest and greatest improvement in radio. It has no outside connections—no installations expense—is as simple to operate as a phonograph. If you cannot call, write for full information.
THE CORACO COMPANY, INC.
 220 West 42nd Street New York

NOVO
“B”
BATTERIES FOR RADIO
 22½-45 & 105 VOLTS

NOISELESS DEPENDABLE GUARANTEED
ASK YOUR DEALER
NOVO MANUFACTURING CO.
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PRICES SMASHED
 Each sale has created new friends and customers with the result that we now announce drastic reductions in our quality lines. All goods prepaid. Send card for complete price list. You'll be surprised. You'll tell your friends. A sample saving follows:

COMPLETE REGENERATIVE VACUUM TUBE SET		
	Our Price	Others
Panel—Bakelite—7"x12" drilled.	\$1.65	\$2.40
Cabinet of 3-ply wood to fit panel.	1.50	2.50
Two dials—each 3 1/2".	.70	1.40
Sixteen switch points with set.		
Each 1c.	.16	.48
Four switch stops with nut.		
Each 1c.	.04	.12
Eight binding posts. Nickel plated @ 3c.	.24	.48
Two switch levers @ 25c.	.50	.90
1 filament rheostat. Highest grade.	.85	1.10
1 vario coupler. Fourteen taps.	2.25	4.00
1 22 plate variable condenser.	1.95	3.00
1 tube socket—Moulded.	.45	.65
1 grid condenser and leak.	.10	.20
1 phone condenser.	.10	.25
1 tube socket support.	.15	.25
12 feet spaghetti tubing @ 4c.	.48	.54
15 feet tinned copper connecting wire.	.30	.48
Blueprints showing details to assemble.	.10	.25
	\$11.32	\$20.02

Other articles taken at random from our late price list are—

Detector tubes—Cunningham—NOT rebuilt.	\$3.95	\$5.00
Crystal detector of closed type.	.60	1.00
Transformer—Audio frequency.	2.95	4.50
Double slide tuner—knocked down.		
Cell wound.	2.50
Loose coupler—knocked down. Cells wound.	3.75
Loose coupler—assembled.	7.50	12.50
Variometer—Hardwood stators 4 1/2". Assembled.	2.25	4.00
Frost Fan—2000 ohms.	3.95	5.00
Kellogg—2400 ohms.	8.75	12.00
Western Electric 2200 ohms.	9.25	12.00
Blueprints giving detail of 2 step amplifier.	.10	.25
Two step amplifier—knocked down. Panel drilled.	12.95	23.80
Two step amplifier assembled. In cabinet.	18.95	35.00
Vacuum tube set in cabinet 7"x12". Wired.	17.95	35.00

Send for list today or order direct from above. Goods sold subject to return for rebates or exchange. YOU MUST BE PLEASED.
Radio Parts Manufacturing Co.
 15 Park Place West Detroit, Mich.

“TUNING IN”
 TO THE RIGHT TUNE IS VERY SIMPLE WHEN YOUR CONNECTIONS ARE SOLDERED WITH THE NEW
“POST SOLDERING IRON”
 (The Iron with the Platinum Heating Unit). Removable Soldering Tip

 1/2 Actual Size
LIST \$6.00
 Designed especially to cover every requirement for delicate work. The smallest practical, efficient instrument on the market. Attaches to any socket. Universal current. Fully guaranteed. From your dealer, jobber or write
POST ELECTRIC COMPANY
 39 EAST 42ND STREET, Div. 509 NEW YORK

5 Instruction Books of the RADIO READING COURSE \$1.97

Learn how to design, construct, install, operate and maintain all kinds of radio apparatus. No tedious study. A complete radio education. Course edited and approved by Prof. J. H. Mercereff. Up-to-date, accurate, complete. SEND NO MONEY. Just send your name and address and pay postman only \$1.97 and you own this five-book Radio Library. Write today, Dept. RW4.

RADIO COURSES, Inc., 552 7th Ave., New York



Loud Speaker for Any Crystal Set by Using the Steinmetz Amplifier \$3.50

No Storage Battery Required Amplifying unit uses Westinghouse Tube and requires a single dry battery in place of a storage battery. Tube and Batteries for this unit \$7.95. This makes the unit complete for operation.

For a two Stage Amplifier use two of these units.

STEINMETZ PHONES are of exceptional merit. 2000 Ohms \$5.00—3000 Ohms \$6.50. Equal to any \$10.00 or \$12.00 phones made. Send 5c. for Catalogue.

Steinmetz Wireless Mfg. Co., Inc., 5706 Penn Avenue Pittsburgh, Pa.

V. T. TUBES

Guaranteed, Detector	... \$2.50
Amplifier 2.75
1-1/2 Volt Tube 5.75
Socket for Same75
Suneco Adapter 1.20
Genuine V. T. I. 5.45

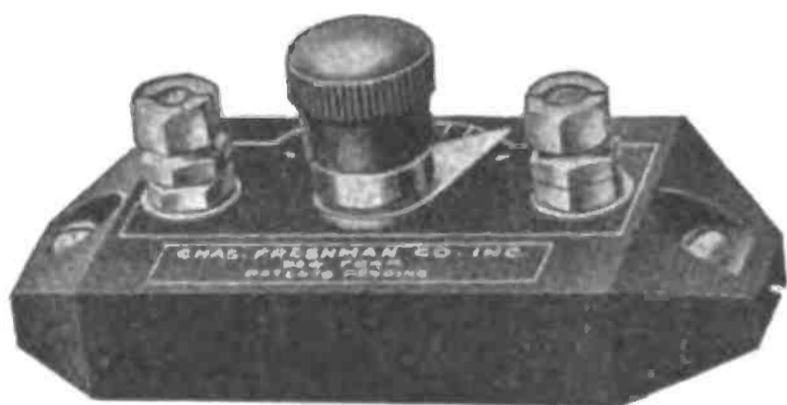
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Variable Grid Leak and Micon Condenser (Combined)

Obtainable in an unbroken range from zero to 5 megohms—all intermediate points. Fixed capacity—.00025 M. F. Improves your set wonderfully by

Clarifying Signals
Lowering Filament Current
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Price Only \$1.00

At your dealers—otherwise send us purchase price and you will be supplied without further charge.

Manufactured by

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Home of Micon & Antenella

"HOLIDAY RADIO GIFTS NUMBER" of RADIO WORLD will be issued December 9. Last copy will be accepted on this number

Broadcast Bill's Radiolays

By William E. Douglass

THANKSGIVIN' DAY at our house is a big event each year, when our folks get together, don't let nothin' interfere. There's me an' Min an' little Bill, an' Sister Jennie too, and my Aunt Soph from Goose Grease Creek an' also Uncle Lew. Then there's my brother Charley who works in a jewelry store down east in "Little Ol' New York." You know, he makes me sore the way he acts since he's been East with all his city tricks an' makin' fun of all of us—refers to all of us as "hicks." His wife, she ain't much better, puts on dog an' carries on, gets up about nine-thirty after all the work is done. Of course, there's Jim, our hired man, dressed in his Sunday best, with bran' new yaller button shoes an' fancy cross cut vest. Maw an' Paw live here with us; Maw helped Min with the dinner an' when them two start workin' they kin sure produce a winner. We had turkey, squash an' cranberries, spuds an' cabbage slaw, pickles an' homemade preserves, the best you ever saw. Maw mixed up some biscuits—Boy! they'd melt right in yer mouth, she says she learned to make 'em when she lived away down South. But when it comes dessert time, there's where my wife takes the prize. There aint no one kin beat her makin' mince and pun-kin pies. The dinner started off with grace then each one had to tell what he



had to be thankful fer besides just bein' well. Dad said that he wuz thankful he could have his children here so they could be together fer at least one day each year. Charley's wife said she was glad she had her "darling pet,"—my Dad just give her one good look, she aint fergot it yet. Aunt Soph and Min an' Jennie, Little Bill an' all the rest gave thanks fer all the favors with which each one had been blessed. An' when it came to my turn to speak I guess most of them thought I'd say how thankful I wuz for the crops this year has brought, but that's right where I fooled them fer I'm thankful I know because a feller called on me about a year ago an' handed me some happiness I never will forget. You've guessed it right—for that wuz when I bought my wireless set.

(Copyright 1922, Westinghouse Electric & Manufacturing Company.)

"Radio Golf!" Next?

SILENT periods between broadcast programs have been instituted in Boston by Radio Inspector C. C. Kolster, so that fans may have a chance of tuning in long-distance stations without experiencing local interference. They can now play "radio golf," as it is called, when trying to

Big Show Getting in Shape

Space for American Radio Exposition Being Taken Up by Leading Firms

THAT the American Radio Exposition, to be held in Grand Central Palace, New York City, December 21 to 30, inclusive, promises to be a success, is emphasized by the large companies exhibiting that have pledged their co-operation. The exposition has the support of the National Radio Chamber of Commerce and, also, is sanctioned by the Radio Apparatus Section of the Associated Manufacturers of Electrical Supplies.

It will be one of New York's big features. The slogan, "This is a Radio Christmas," has caught on. Many firms connected with the wholesale and retail ends of the business feel that the combined movement will result in a remarkable trade stimulus.

The exposition to be held in the Palace will be the first of a series of annual shows national in scope and analogous to such expositions as the annual Automobile Show, Motor Boat Show, Silk Show, and the Flower Show. All of these expositions have been a big incentive to buyers in their respective industries. Dealers from many parts of the country visit them, as well as the consumer public.

The show at the Palace is primarily a manufacturers' official exhibit, but dealers and jobbers representing manufacturers will also display. Special morning hours will be arranged for dealers in the morning. During these periods the public will not be admitted.

With the exposition enjoying the support of such exhibitors as the Radio Corporation of America, De Forest Telephone & Telegraph Company, Western Electric Company, National Carbon Company and others, the attractiveness of the various exhibits is assured.

Frank Hitchcock, former post-master general, is head of the American Exposition Company. Walter Gordon Clark is vice-president, and Harold Bolster, secretary and treasurer. The offices are at 120 Broadway, New York City, where L. S. Byers, executive secretary, is in charge.

Some of the prominent manufacturing corporations that have engaged space at the exposition include:

Western Electric Company, Radio Corporation of America, C. Brandes, Inc., National Carbon Company, Novo Battery Company, Sleeper Radio Company, General Insulate Company, Sound Wave Corporation, Pacent Electric Company, Stromberg-Carlson Manufacturing Company, Holtzer-Cabot Company, National Airphone Corporation, Clapp-Eastham Company, Hutchison Radio Company, Henry Hyman & Co., De Forest Radio, Dubilier Condenser Co., Inc., Coto Coil Company, A. H. Grebe & Co., Weston Electrical Instrument Company, American Radio Relay League, Executive Radio Council, Burgess Battery Co.

To Germany on Telefunken Sale

ALFRED FRANKENTHALER, a lawyer of 120 Broadway, took passage on the Cunarder "Aquitania" for a hurried trip to the Continent to represent many Germans whose property here was seized by the Alien Property Custodian. He said that the sale of the Telefunken wireless concern by the Custodian "for a nominal consideration," had led him to urge upon Washington an amicable adjustment for his clients and that satisfactory progress was being made. He believed the Winslow resolution providing for the return by the United States to Germans of sums upto \$10,000 would soon become law.

Radio in a Talking-Movie

THE General Electric Company through its radio broadcasting station, WGY, Schenectady, New York, recently told thousands of people listening to the program that a new device, other than the phonograph, was being used to "talk" into the radio transmitter. But no particulars were given of the device used.

Then came Thomas A. Edison to the Schenectady plant. He had not been there in twenty-five years and there was much to show him. Being the inventor of the first device to record speech so that it could be reproduced, he was intensely interested in this new machine.

So he was taken to C. A. Hoxie's experimental room in the General Laboratory, where the pallo-photo-phone, invented by Mr. Hoxie, was shown and demonstrated. Here a film, which looked in every respect like a motion-picture film, was run through a machine with a powerful light thrown against it—just as in the motion-picture projection machine—and from a loud-speaker and head phones the voice was heard, full and strong, with all its variations of tone, all its stops and hesitations, all its vital quality inherent in its reproduction.

Edison marveled, "What next?" he asked.

There are two great possibilities to this machine. First it makes possible the

talking movie, for on a film of the normal width can be the picture and voice, absolutely synchronized. The picture and voice must work together at all times for both are a part of the same film. Secondly, it means a boon to radio broadcasting studios. From a central studio, say in New York City where most of the great artists are located, the artist can sing, play some instruments or talk, into this machine which produces the film. Copies of the film

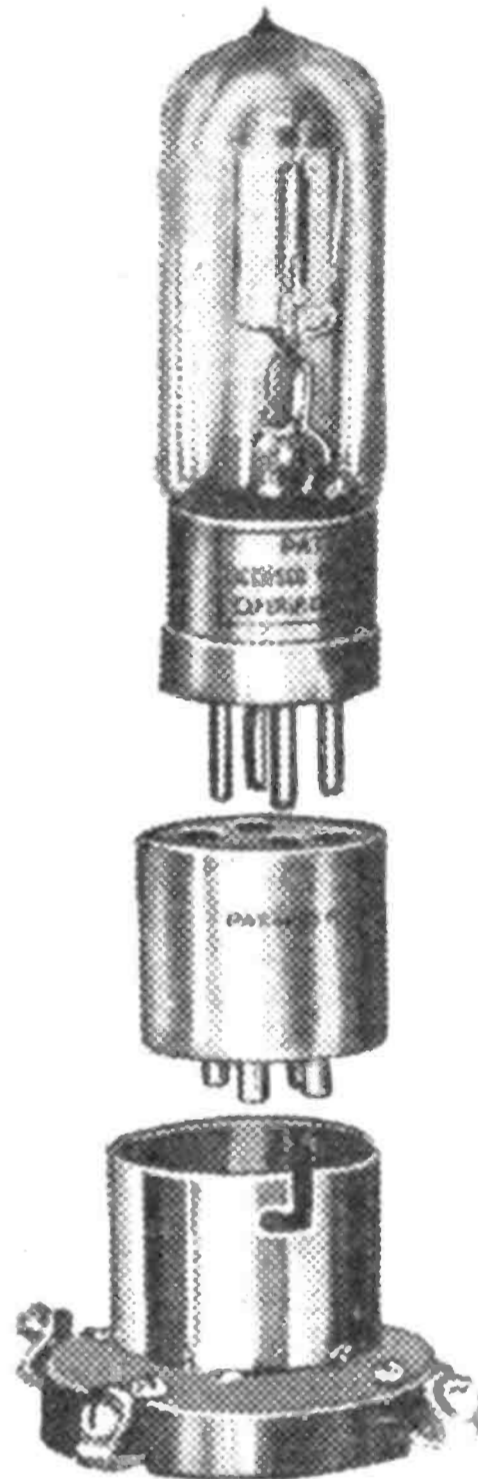
L. T. Robinson, engineer in charge of the General Engineering Laboratory in which this machine was designed, explains its operation:

"This is a device for the purpose of recording sounds upon a photographic film so that the sound may afterwards be reproduced in ordinary telephones or loud-speakers. The record is made by causing the sound waves to produce vibrations on an exceedingly minute and very delicate mirror. A beam of light reflected by this mirror strikes a photographic film which is kept in continuous motion. The film, when developed, shows a band of white with delicate markings on the edges which correspond to the sound which has been reproduced. On account of the exceedingly small size of the mirror, its low inertia, it is possible, by this means, to produce a sound record which includes the very delicate 'overtones' which give quality to speech and musical sounds. This has not been so successfully accomplished by any other method of recording sound waves.

"The reproduction of the sound from the film is accomplished by moving the film in front of an exceedingly delicate electrical device which produces an electromotive force which varies with the amount of light which falls upon it. In the past, attempts have been made to produce these results by means of selenium cells; but a selenium cell, though it responds to the changes in the amount of light which it receives, does not respond with sufficient promptness to produce good results. There is a sluggishness in the response which seriously interferes with the quality of sound which is produced.

"By an ingenious combination of vacuum tubes, there has been produced an apparatus which responds to variations in the light falling on it with a speed of light itself, or with the speed of propagation of wireless waves into space. Therefore, when this film is moved continuously in front of such a device, the device produces an electric current which corresponds very accurately to the original sound wave. This electric current may be used to actuate a telephone or loud-speaker. It has been used at the General Electric radio broadcasting station. The voice of the announcer was recorded on a phonographic film and sent out with such accuracy that it was impossible to distinguish it from the voice as directly transmitted from the station."

THIS IS the "SUNECO" TUBE ADAPTER



Eliminates the Storage Battery

The "Suneco" Adapter allows the use of the Aeriotron WD-11 dry cell vacuum tube in any standard socket.

Minimum dielectric loss.
Minimum induction effects.
No soldering to corrode.

If your dealer cannot supply you send money order or cash to Dept. W.

Price \$1.50 each

Jobbers and dealers write for proposition W.

Sun Equipment Co.

67 Exchange Place, New York

Law Storage Battery
Constant voltage, large amperage. Will run two months without recharging.
Attractive Dealers' Discounts
Write for Details
WILLIAM LAW COMPANY
Aborn and Sakin Streets, Providence, R. I.

RADIO GOODS AS GIFTS

Be sure to be represented in "Holiday Radio Gifts Number," out December 9, Copy for this issue accepted up to November 30, RADIO WORLD, 149 Broadway, New York.

FOR CHRISTMAS
"The Little Wonder"
CRYSTAL SET \$4
\$2.50 UNMOUNTED
Just the gift for your boy or girl. Sent prepaid. Free catalog on request.
GUARANTEED, Galena and
TESTED CRYSTALS Radiocite... 20c.
Radi-O-Plate Panels. All sizes cut to order.
Holloway Electric Supply Co., Inc.
238 Third Avenue New York City

RADIO FINDS A BETTER CONDENSER

Bayley's 23-0005 and 43 Plate .0011 Variable Condenser is what Radio has found.
Its plates spaced close give it the finest tuning qualities.
The plates are assembled as a solid integral part of the whole by the die cast process. It is impossible for any plates to loosen in service.
Each condenser has our money-back guarantee.
Price, 23 Plates \$3.25 each
43 Plates \$3.75 each
TO JOBBERS AND DEALERS
A SPLENDID PROPOSITION
Bayley, C... G...



Agents

LARGE MANUFACTURERS OF SHIRTS want Agents to sell complete line of shirts direct to wearer. Exclusive patterns. Big values. No capital or experience required. Write for free samples.

MADISON SHIRT MILLS
507 Broadway New York, N. Y.

RADIO MAILING LISTS

9570 Retail Radio Dealers, United States per list, \$7.50
1184 Radio Manufacturers per list, 10.00
1320 Radio Supply Jobbers per list, 12.50
257 Radio manufacturers of complete sets per list, 4.00
200 Radio Stations per list, 4.00
14000 Radio Amateurs and Managers of Radio Stations per list, 7.50
Neatly typewritten and ready to send you on receipt of remittance covering the amount.
TRADE CIRCULAR ADDRESSING CO.
100 W ADAMS STREET CHICAGO, ILL.



Those Broken and Burned-Out
Vacuum Tubes Can Be Repaired

and Guaranteed Tool
If your dealer does not know, send direct to us.

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Tubes returned P.P., C.O.D.

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Nearly 100 Manufacturers
Now Exhibiting

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GEM
\$1.25
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We also make 6 other styles
That List \$2.50 up

Jobbers—Dealers—Agents
Write for Discounts

Jewell Radio Sales Co.
90 W. 4th Street
New York City
or 1035

Big Tubes for Trans-Atlantic Radio

Messages Flashed from New York to Nauen, Germany, at the Rate of Fifty Words a Minute

POWERFUL electron-tubes developed in the research laboratory of the General Electric Company and applied to wireless telegraphy by G-E engineers working in cooperation with the engineering staff of the Radio Corporation of America have successfully bridged the Atlantic Ocean. On October 14, for a period of sixteen hours, the regular commercial traffic of the Radio Corporation was handled by a tube set between the Broad Street transmitting office of the Radio Corporation, New York, and Nauen, Germany. The tubes replaced the alternator, and traffic was handled so efficiently that the operators at the German station were not aware that they were participating in a revolutionary and epoch-making change in radio transmission.

A week later, Saturday, October 21, a second demonstration of tube transmission was made for E. W. Rice, jr., honorary chairman of the board of directors of the General Electric Company, and A. G. Davis, vice president. In this test, traffic was handled for a period of ten hours between this country and the Canarvon station, Wales. The receiving operators knew that tubes were being used. Messages were sent at the rate of fifty words a minute.

The set installed at Radio Central, Long Island, consists of three 50-kilowatt, 15,000 volt, water-cooled, metal vacuum-tubes, known in the engineering world as "kenetrons," and used as rectifiers and six 15,000 volt, 20-kilowatt, water-cooled metal pliotrons used as oscillators. For the demonstration with the tube set, a mile-and-a-half long antennae suspended from six towers, 420 feet high, was used.

The 20-kilowatt, water-cooled tubes are similar to those shown Senator Marconi on his visit to Schenectady. The tubes were developed by W. C. White and H. J. Nolte of the research laboratory and are constructed on the principles discovered by Dr. Irving Langmuir. Both Mr. White and Mr. Nolte worked with W. R. G. Baker, of the radio engineering department of the General Electric Company, in the installation of the tube set at Radio Central. With Mr. Baker, who had charge of the work for the General Electric Company, were Irvn Weir and August Schmidt, Jr., and C. W. Hansel, representative of the Radio Corporation of America.

It is not expected that the tubes will immediately supersede the alternators but the General Electric Company has convincingly proved that it is possible to build a tube equipment that will handle commercial traffic efficiently and economically. It is further claimed for the tubes that high-speed transmission may be easily obtained. The tubes may be run in parallel with the alternators, or separately.

This is not the first time that transatlantic wireless telegraph has been accomplished but on previous occasions the British used fifty-two tubes.

Transatlantic wireless telephony is now believed a matter of a very short time as the tubes are especially efficient for this system of communication.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

PATENT
Your Radio Ideas.
Call or Write
FREE ADVICE



Triple Mounted SHAMROCK CRYSTALS

Triple mounting of the three crystals—Galena, Silicon and Iron Pyrites.
Sold under a replacement guarantee; at all dealers or by mail direct on receipt of

PRICE, 50c

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ROOM 42, 9 CHURCH ST., NEW YORK CITY
Manufacturers, Jobbers, Dealers write for prices.

"WEB" CRYSTALS

Best Crystal Yet. Single Mounting of Galena, Silicon & Iron Pyrites
Sold under a replacement guarantee; at all dealers or by mail direct on receipt of

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INCREASE YOUR CRYSTAL RANGE

BY USING A "PT" ULTRA-SENSITIVE CONTACT IN YOUR CRYSTAL DETECTOR

1. It adjusts in a second.
2. Secures more sensitive results.
3. Is almost impossible to jar out.

Price twenty-five cents silver.

"PT" CRYSTAL CONTACT CO.

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BOSTON 8, MASS.

Do You Like Clear Tone—Sharp and Distinct? If so try

MARSH'S

Vernier Variable Condenser
AT LAST

Made in Three Styles. Dial Knob and Screws Complete. Fully Guaranteed.

27-Plate \$5.50
23-Plate \$4.75
11-Plate \$4.25

Mail orders promptly filled.

F. P. Marsh, 145 Nicoll St.
NEW HAVEN, CONN.

Quality, Design + Workmanship +
Material = RELIABILITY



Simple to Use

Just plug in at any 110 v. A. C. lamp socket—attach clips to battery—turn on current and you have your own charging plant.

A compact portable Recharging unit that will fully charge a 100 AH battery overnight for 5c. to 10c.

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1081 Fillmore Avenue

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Slip out the metal disc and slip in the MICA-PHONE. Result—Clearer, better tone, all noises eliminated. Write for circular. Discounts to dealers and jobbers. MICA-PHONES sell fast.
Radio Mica Products Co., 156 E. 43rd St., New York

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 5 Units in 3

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- F. R. S. Molded Bank Windings... \$3.00

Bank Windings are interchangeable for direct mounting on either Variometer or Variocoupler.

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A Complete

Two-Stage Long Range Receiver



Set includes two Federal Transformers, Condenser, two-molded variometers, molded variocoupler, three V. T. sockets, filament rheostats, dials. Read 'Em binding posts, switch points; in attractive cabinet and drilled panel; complete, ready to hook up. **\$40**
 A \$125 Radio for.....

F. R. S. Radio Corporation

449-D East Fort St. Detroit, Mich.

WE NEED RADIO WORLD, dated April 22 and August 5. If you have copies you don't require, mail to this office and current issues will be sent you for them. RADIO WORLD, 1493 Broadway, New York.

Tropical Radio Company
 Gets Miami Naval
 Station

THE lease of the Naval Radio Station at Miami Beach, Florida, was awarded to the Tropical Radio Company of Boston, the highest bidder in the recent call for bids. This company, which is connected with the United Fruit Company, offered to take the station for eighteen months at an annual rental of \$3,600, with permission to extend the lease an additional year. The Radio Corporation of America, and Cutting & Washington of New York, also filed bids.

According to the terms of the lease, the Tropical Radio Company must replace the old rotary-spark set with modern equipment which will reduce the objectional noise to a minimum.

With the enactment of necessary legislation, it is understood that the Navy will ultimately offer the station for sale.

Radio Aids Einstein Tests

SPECIAL radio time-signals sent from NASS, Annapolis, for the benefit of scientists in the Indian Ocean working on a test of the Einstein theory of relativity during the recent solar eclipse, were nearly twice as audible as those of a commercial station, the United States Navy has been advised. At least their time signals reached Paris satisfactorily. A radio station there reports that a comparison of the time signals sent out by the Navy with those transmitted from Rocky Point, Long Island, showed that the audibility of the Navy signals was 158.3 compared with 87.5 for Rocky Point on the audibility scale. Reports from Australia and the Indian Ocean have not yet been received. Naval signals were sent out on 17,145 meters and those of the commercial station on 19,000.



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PATENTS

To the Man with an Idea

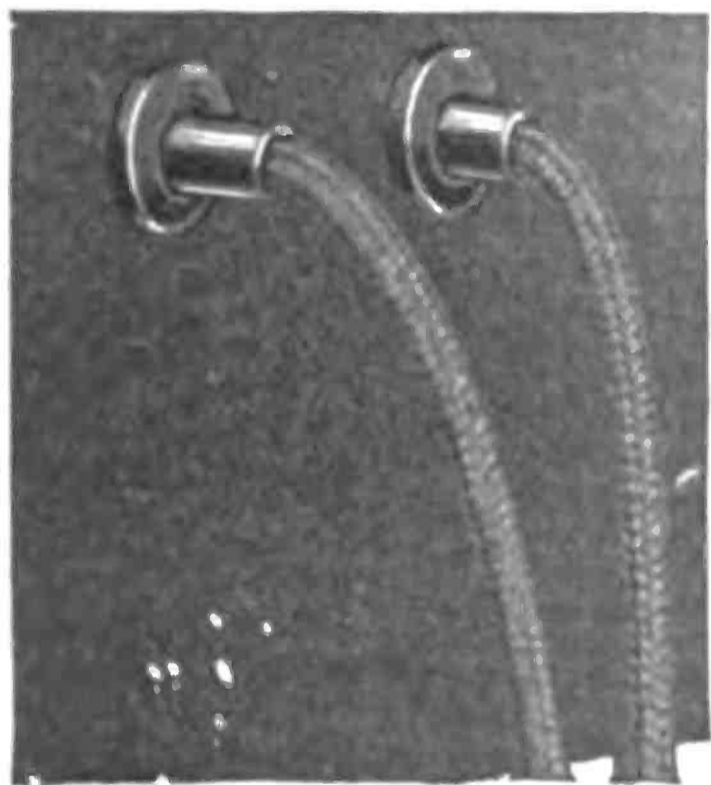
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RICHARD B. OWEN, Patent Lawyer
 32 Owen Building, Washington, D. C.
 2276-P Woolworth Bldg., New York City



FRONT (Outside) VIEW

7/64 drill, insert the bushing, and screw on the lock nut which holds the combination tension spring and soldering lug in place.

The tip when inserted is firmly held. And a good electrical connection is assured at all times. These Jacks eliminate the buying of an expensive telephone plug and Jack.

Ideal for experimental circuits or in any part of a set where quick changes are needed. They accommodate wire up to the thickness of telephone tips.

25c. A PAIR

We also manufacture complete receiving sets, 2 step amplifiers, variable condensers, receiving vacuum tube receptacles, condensite dials, etc. Our catalog M, "Radio Apparatus," sent on request.

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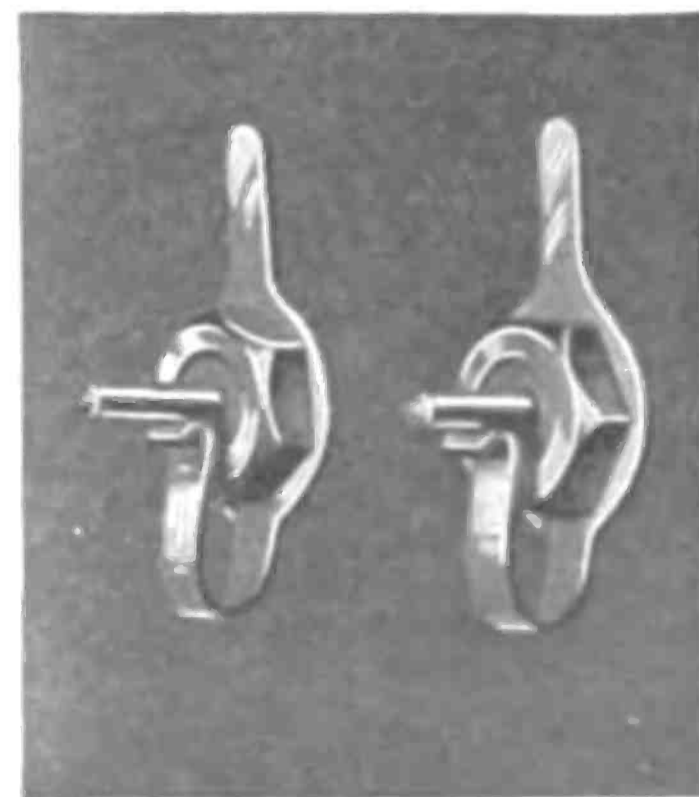
PHONE TIP JACKS

(Patent Applied For)

They are valuable wherever head phones are to be used. Especially convenient in connection with CW circuits. Countless uses have been found for them.

The use of binding posts to connect phone tips has always been unsatisfactory. It is difficult to keep the tips from falling out of the binding posts.

These Union Radio Jacks will accommodate any telephone cord-tips manufactured. To mount them on any panel, just drill a hole, using a



REAR (Inside) VIEW

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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 advs., if copy is received at this office ten days before publication, RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4794.)

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PATENTS

Protect your invention today. Write for 1922 Illustrated Book Free. Radio, Electrical, Chemical and Mechanical experts. Over 30 years' experience. A. M. Wilson, Inc. (Radio 3 ARH), 310-18 Victor Building, Washington, D. C. (Successors to business established 1891 by A. M. Wilson.)

Manufacturers of Rogers Radio Receivers and Rogers Receiving Radiometers. Rogers Radio Company, 5133 Woodworth Street, Pittsburgh, Pa.

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EDISON B. BATTERY UNITS—One positive and one negative plate for 10c. 18 sets will make a 24-volt battery. Wilkinsburg Wireless Shop, 711 Penn Avenue, Wilkinsburg, Pa.

RADIO HOSPITAL. Radio sets repaired by practical radiotician, and experimentations under customer's supervision. Mail orders filled **MELCO RADIO**, 37-A Bedford Street, New York City.

Are you familiar with all the radio symbols used in the various hook-ups published in Radio World? If not, secure a copy of Radio World No. 26, dated Sept. 23. In this issue was a complete table of all important symbols used in radio construction and testing. Send 15 cents for a copy, or \$6.00 per year, and have subscription start with that issue. **RADIO WORLD, 1493 Broadway, New York City, N. Y.**

HOOKUPS—Over 100 blueprints to select from at 10c. each. Send dollar for trial order. Radio Supply Co., Box 292, Pueblo, Colo.

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BROADCASTING MAP

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SALESMEN that have been or are calling on electric or radio trade, see Mr. Rice, 6311 N. Clark St., Chicago.

Static in the Tropics

Only a Radio Operator Who Has Worked There Can Fully Appreciate It

EVEN during the winter months static is very noticeable," says Charles A. Reberger, chief radio operator of the steamer "Atlantic," in "The Morning News," Dallas, Texas. "All day long it is a continuous roaring, grinding and crashing in the receivers. During the

hours of the night it is worse—far worse. Nine times out of ten the crashes will entirely blot out all signals.

"It is very difficult to work through heavy static. Let me give you an idea. One evening we attempted to establish communication with a station in the Canal Zone, which was about two hundred miles away from us, and failed. It was absolutely impossible to even hear his signals, due to the heavy atmospheric conditions. A vessel only ninety miles north of us could not read our signals, although we were then getting twelve amperes radiation and had a fine, clear musical spark. Radio engineers claim a musical spark is easily read through static interference.

"A few nights later, I had the pleasure of listening to Swan Island working a United States fruit liner. After this station had sent each letter twenty times, the vessel informed him that it could not distinguish his characters. Only an hour before he had forwarded his 'TR' to Swan Island and was no more than two hundred miles south of this land station.

"If one should 'listen in' during one of those ugly tropical thunderstorms I guarantee you would think you were at

Attention, Newsdealers

You should keep a good supply of back numbers of RADIO WORLD on hand all the time. It has been the experience of many dealers that a purchaser of RADIO WORLD for the first time will almost immediately want the back numbers, some of which are already out of print and some of which are difficult to get. **THE PUBLISHER WILL FURNISH BACK NUMBERS TO DEALERS DIRECT OR THROUGH THE AMERICAN NEWS CO. AND ITS BRANCHES.** Dealers should hold their unsold copies for a reasonable length of time. RADIO WORLD of October 28 contained a full page of contents of back numbers to that date. 15 cents per copy; any seven numbers for \$1.00. RADIO WORLD, 1493 Broadway, New York.

That Armstrong Circuit

So much interest has been displayed in the special article, "TESTED INVENTION OF MAJOR ARMSTRONG AMPLIFIER SET 100,000 TIMES," by John Kent, that appeared in RADIO WORLD No. 13, dated June 24, 1922, the publisher decided to put aside a number of copies for those who were not able to get this issue when published. Copies will be sent, postpaid, on receipt of 15c. or send in your subscription, \$6.00, for one year (52 issues), \$3.00 six months, or \$1.50 three months, and subscription will be started with the issue containing the article about Major Armstrong's Amplifier.—RADIO WORLD, 1493 Broadway.

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Every detail of workmanship and finish is of the very highest grade. There is nothing finer at any price. Well known radio engineers have tested it

thoroughly, and marvel at its simplicity and efficiency.

The Type SK is a complete regenerative tuner, with detector and two stage audio frequency amplifier. Its output goes direct to phones or will operate any good loud speaker. Being designed for the usual broadcasting wave lengths (150 to 450 meters) it is very highly selective in this complete range, and delivers a clear, pure signal, remarkably free from the usual distortion or tube noises.

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To the Trade:

The discriminating purchaser instantly recognizes the Type SK as an exceptionally fine instrument. Dealers handling it usually select it for their own store demonstrator. Jobbers and Retailers find it a ready seller, and their customers report unusual satisfaction. Our terms give the purchaser exceptional value and also provide a fair profit for the trade. Write or wire for particulars.