

RADIO WORLD

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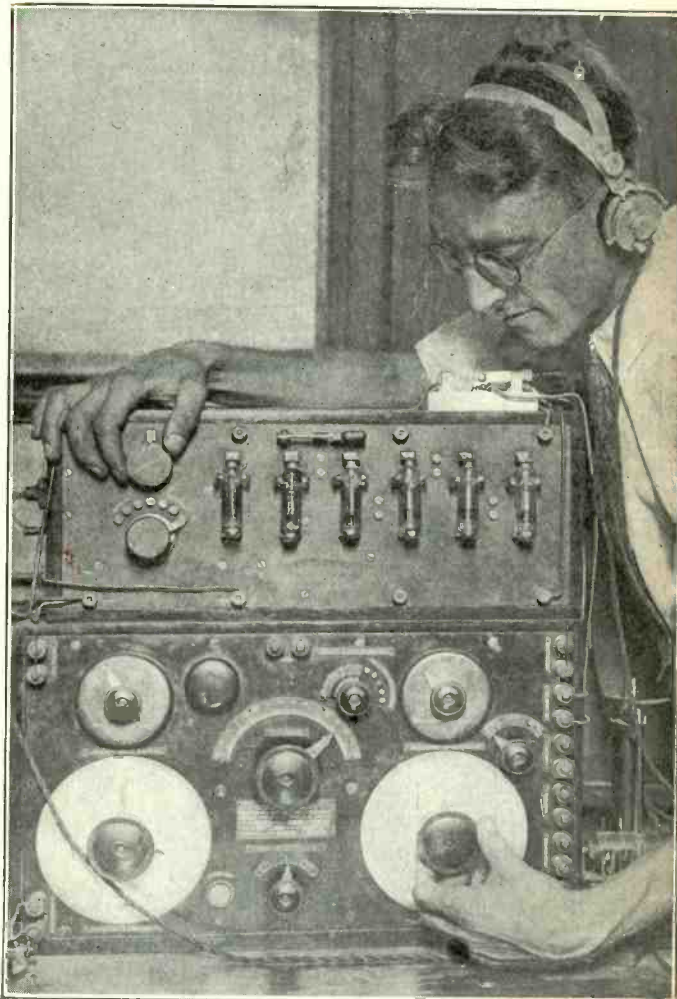
I L L U S T R A T E D

Progress of Vacuum Tube



(Both photos: C Kadel & Herbert News Service)
Four stages in the evolution of the vacuum tube. From left: Fleming valve; De Forest tube; Radiotron; Peanut tube.

Long-distance Navy Receiver



With this arrangement ships in the Mediterranean have been heard in New York City. It is a Navy type receiver with radio frequency and is one of the most powerful in the world.

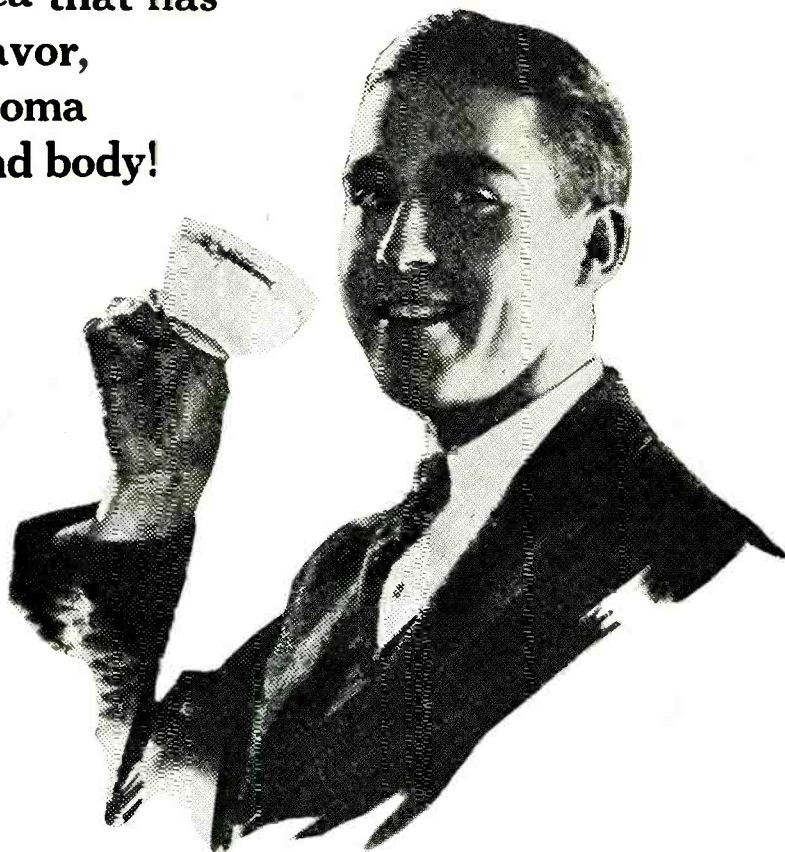
Why Radio Is of Vital Importance to Everybody

See Page 12

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GRAND PRIZE San Diego 1916

RADIO WORLD

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LATE DEVELOPMENTS ASSURE RADIO PERMANENCY

Telephone and Telegraph Officials, Seeing the Handwriting on the Wall, Now Work Hand in Hand in Radio Progress. The Armstrong Circuit, the Marconi Directional Wave, Installation of Municipal Radio Plants, and, Finally, the Linking of Paris and New York by Wireless, Are Big Elements in Stabilizing and Popularizing Radio

RADIO is not only here—it has come to stay. Any idea harbored by the uninformed that radio was a fad, or a craze, has been completely dispelled by the remarkable scientific and commercial developments of the past few weeks.

These include the much discussed Armstrong superregenerative circuit, the Marconi directional finder, the Langmuir tube, the installing by the City of New York of a new municipal broadcasting station, the erection of a new broadcasting station in the heart of New York City—on 42d Street, near Fifth Avenue—and the installing of radiotelephone systems aboard ocean liners.

All of these very important achievements are capped by the permanent linking of France and the United States by the radio engineers of the Centre Radioelectrique de Paris, at Sainte Assise, France, and the Radio Corporation of America.

This latter development is one of far-reaching economic, scientific, and international importance. It joins two great nations by more intimate bonds than ever before in their history.

Some of those who, like telephone and telegraph officials, feared that radio would hurt their business, have discovered that, instead, it will broaden the various fields, make them of greater value to the public and, in the final analysis, be an adjunct of tremendous importance, rather than something that would retard other scientific activities.

The public has shown so remarkable an interest in radio that it can be readily seen that its possibilities in a business and amusement way are absolutely limitless.

Millions of new users of radio-receiving sets are getting ready to install instruments. Manufacturers are making plans to fill this enormous demand, and wholesalers and retailers will be enabled to give the public what it wants at the right time and at the right price.

Radio has reached the point where it must be figured with the general scheme of living. It has a large place in everyday life. The coming autumn and winter will undoubtedly see an additional interest in everything that pertains to radio in

a degree more pronounced than has been evidenced in any other new science that has attracted and held public attention.

No one is going to be so foolish as to say that radio will supplant the telephone, the telegraph or anything else.

But it is very evident now that radio will be just as necessary to humanity as either. Perhaps a greater necessity.

When the telegraph was perfected there were hundreds who said it would supplant the mails—that the poor would be deprived of mail privileges because they would not be able to afford sending telegrams. Instead, postal facilities have been vastly improved and postal fees considerably reduced.

History proves that one method of communication improves another. One system help another as their characteristics enable them to perform the particular work for which they are best fitted. In other words, one system supplements another. Radio will supplement the telegraph and telephone. The three will form the great trinity of quick communication—until a fourth is developed to supplement the combination.

Radio will be the quickest method of communicating over large expanses of territory. In this number of Radio World we publish pictures of a new German station that can hurl a message to America, by radio, in one-twentieth of a second.

In the future—the immediate future—no important event can take place without radio, any more than news can be printed without a newspaper. During the coming elections, watch the part radio will play. "The World," New York, recently printed a foreign dispatch "By French Foreign Office Wireless." The crowds no longer surge about a stock ticker to get a glimpse—if possible—of some event of importance, sent dimly, letter by letter. Instead, they throng the streets surrounding a radio set—and thousands may hear easily what only a few heard before.

From the lone fisherman to the busy merchant, from the humble home in a hamlet to a millionaire's palace—in every walk of life—radio has come and is planting its roots deep—deep—deep.

And it has come to stay as an integral and important factor of all future life.—THE EDITOR.

How to Build a Portable Field Buzzer

By De Witt H. Thompson

WHEN a radio beginner has mastered code sufficiently to copy a part of what some of the slower stations are sending he will, no doubt, begin looking forward to the time when he can transmit and receive with sufficient speed to enable him to procure a license to operate a radio transmitter of his own.

For code practice, he may have tried practicing with a fellow amateur, using a single-buzzer practice set with both the sender and the receiver in the same room. Considerable progress may be made this way in learning the code. However, a better method—as soon as the student is far enough advanced—is to use two-buzzer telegraph sets and a line separating the sets far enough apart so that it is unnecessary to yell back and forth every time one or the other makes a mistake.

In this way one has to depend on carrying on all communication by the signals, and more rapid progress will be made. Calls should be as-

After having tried out various types of buzzer sets, the writer feels that he can recommend the one reproduced in the accompanying illustration (Figure 1), wherein a wiring diagram is shown. It is of simple construction and high efficiency. The set constructed by the writer is arranged in a small box or case. The buzzer, flash-light battery, key, and binding posts for the receivers are inside the case. The line and the ground connections are mounted on the outside. There is also room in the case to carry paper and pencils for copying. For convenience, the battery should be arranged to fit into the case between spring contacts so that when a new battery is required it is necessary only to remove the old one and snap in a new one.

The type of key, the type of buzzer, and the general construction of the set has been left to the builder so that he may use, so far as possible, whatever materials he may happen to have on hand. For receivers, I use a regular radio double-headset.

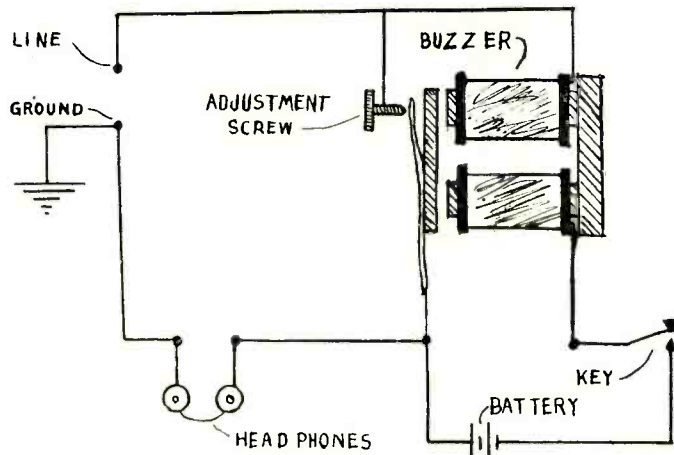


Figure 1. Sketch to show the wiring for the type of buzzer described in this article. Drawn by De Witt H. Thompson.

signed to each set and the regulation method of "calling" and "signing off" should be adhered to at all times. Then, too, the "Q" and other conventional signals should be used whenever possible, and all transmissions carried on in accordance with recognized methods of handling traffic, such as the traffic regulations of the American Radio Relay League. In this way the practice obtained in connection with these sets helps to better fit one for the time when he will be operating a radio transmitter of his own.

For the ground connection any small iron rod about $2\frac{1}{2}$ feet in length, with a sharp point on one end and the ground lead attached to the other end, may be used.

For the line wire, almost any small magnet wire, such as that taken from the secondary winding of a discarded spark-coil, will serve satisfactorily; or, one wire of a wire fence might be used for moderate distances where convenient.

On one occasion, the writer and a friend used two of these sets successfully over nearly a half mile of

When Out of Tune

THE use of undamped oscillations will materially assist in the sharp tuning necessary to prevent interference by the use of standard wave lengths; but neither undamped nor damped oscillations can be relied on to completely eliminate the effects of the vagrant waves and local electrification called "static."

Every lightning discharge produces powerful electric waves which affect conductors at great distances. As thunderstorms—in warm climates and especially, in summer—are almost continuous in the sense of existing somewhere in the area in which they affect detectors, the interference caused by them is almost continuous. The waves created by lightning discharges vary greatly in length, but are highly damped and affect all aerials.

At every radio station, the air at the top and foot of the aerials is at different potentials. The atmospheric potential-gradient at any station varies with the time of the day, the season of the year, and the local weather conditions. It is usually deeper in summer. This difference of potential tends to equalize itself through the aerial. Inductively coupled receivers afford a direct path to ground, so that static charges do not accumulate on the aerial, and the inductive coupling weakens the energy transfer of all induced currents out of tune.

very fine silk insulated wire which was allowed to lie on the ground nearly the entire distance. One ground-rod was placed in a small creek and the other at the base of a small tree. This was during an extremely dry period when there was very little moisture near the surface of the ground. Yet, successful transmission was carried on with the ground rod at the base of the tree forced into the ground only two or three inches. However, the signal strength was somewhat increased by driving this rod deeper into the earth.

On another occasion, we followed the banks of a river, using nearly three-quarters of a mile of about No. 30 enameled copper-wire for the line supported on trees and bushes and the usual earth return. At this distance the signals were practically as loud as when we were only a few rods apart; hence, these sets will undoubtedly work over a much greater distance than we have yet attempted to cover.

In conclusion, the advantage of such a field buzzer-telegraph set constitutes an excellent means for code practice.

Using Two Tubes for Receiving

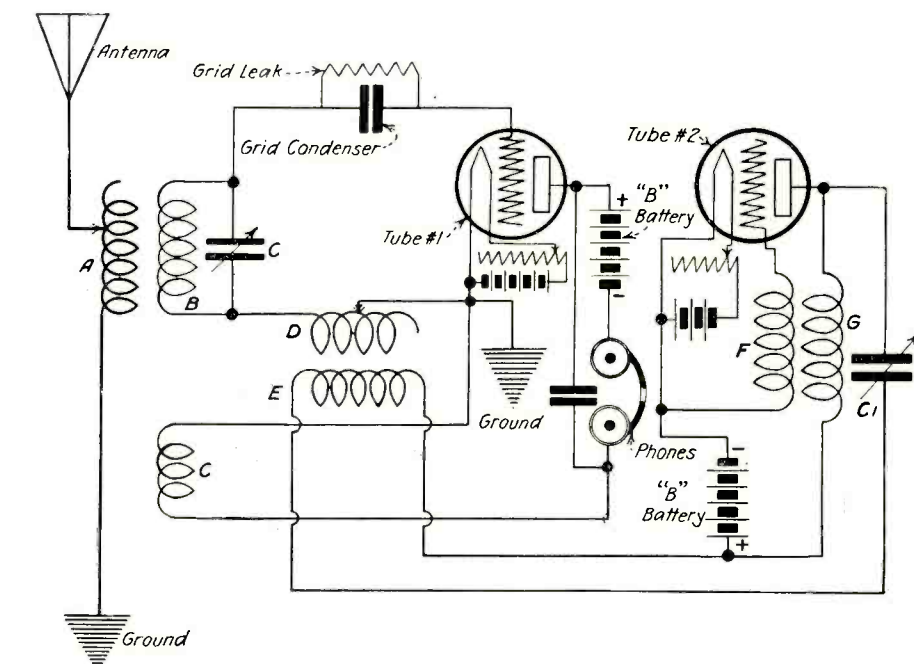
By C. White, Associate A.I.E.E.

WHILE the employment of two tubes in a radio-receiving set is nothing new to the advanced radiotrician, it does present a very decidedly new phase of the subject for the novice. Generally we are so much accustomed to look upon radio receivers as consisting of a single-tube detector with or without several stages of radio or audio-frequency amplification, that the idea of employing more than one tube to detect a signal is unusually interesting.

In the modern regenerative-receiver, the vacuum tube is really made to perform a double function; first, to generate local oscillations, and, second, to detect the incoming wave. Some may rigorously object to the last statement; but it is obviously true that such a condition exists, since we can separate these two functions and still have a receiver. That is to say, any oscillatory generator of high frequencies and any style of detector, crystal or bulb, will perform these two operations independently and yet produce the desired result. But, on the other hand, we all agree with the fact that if one tube is made to perform the double function of generator and detector, flexibility of operation and control must be sacrificed. In this, I do not mean to criticize the regenerative receiver from the standpoint of economy, in which field it is undoubtedly paramount; but I do wish to bring forward the fact that we can not hope to get as much ease of control and efficiency from one tube as from two. One fault, due to the employment of a single tube, lies in the fact that we can not control to the best advantage the amplitude of locally generated oscillations and, at the same time, detect to the best advantage.

To get down to brass tacks, let us study the case of one particular type of heterodyne receiver making use of two vacuum tubes. Such a circuit is illustrated in Figure 1. It is the identical circuit used by Major E. H. Armstrong, for experimental tests, at Columbia University in 1917, and was definitely verified as one of the very best hook-ups for long-distance reception. This receiver is actually superior to any other for its class of work.

In Figure 1 tube No. 2 acts as the generator of the local oscillations and the frequency of the same are practically determined by the value of the inductances *E* and *G*, and the intensity of the mutual coupling between *F* and *G*, together with the value of the capacity *C'*. It is recommended that the coupling between *F* and *G* be kept at a point greater than is ordinarily



Schematic diagram showing the two-tube circuit. This circuit was used by Major Edwin H. Armstrong in experimental tests at Columbia University, and was definitely verified as one of the very best hook-ups for long-distance reception. Suggested by C. White. Drawn by S. Newman & Co.

considered a maximum, so that the local oscillations will not be disturbed when conditions elsewhere in the circuit are changed. The actual amplitude of the local oscillation impressed upon the grid of the detector tube No. 1 can be effectively controlled by varying the coupling between *D* and *E*.

A, *B*, and *C* are tuned to the frequency of the incoming wave; but the coupling between *B* and *C* must be maintained at a very low value in order that the detector tube No. 1 be kept from oscillating. Let it be noted that by properly adjusting the coupling of *B* and *C*, the effective impedance of the tuning circuit may be reduced to almost zero. There-

fore, the current caused to flow in the grid circuit from a weak signal is many hundred times the current that would flow in the ordinary type of receiver. When *A* and *B* have a low resistance and the grid circuit of the detector is well adjusted, the selectivity is extremely sharp and very little power is dissipated in operation.

For those of my readers who wish to construct a receiver built on this principle, I shall endeavor to give a few hints as to the actual size and arrangement of the various parts. The unit *A*, *B*, and *C*, is a vario-coupler with two rotors instead of the customary one; coil *A* is the stator, and *B* and *C* are the rotors. The condenser *C* must have a capacity of .001 mfd., while *D* and *E* is nothing more than an ordinary vario-coupler. *C'* is a 43-plate condenser and *F* and *G* is a vario-coupler. Of course *AB* and *FG* should be of a size to give the desired wave-length reception. Tube No. 1 is a soft detector tube (UV 200), while No. 2 is a hard tube (UV 201 or UV 202).

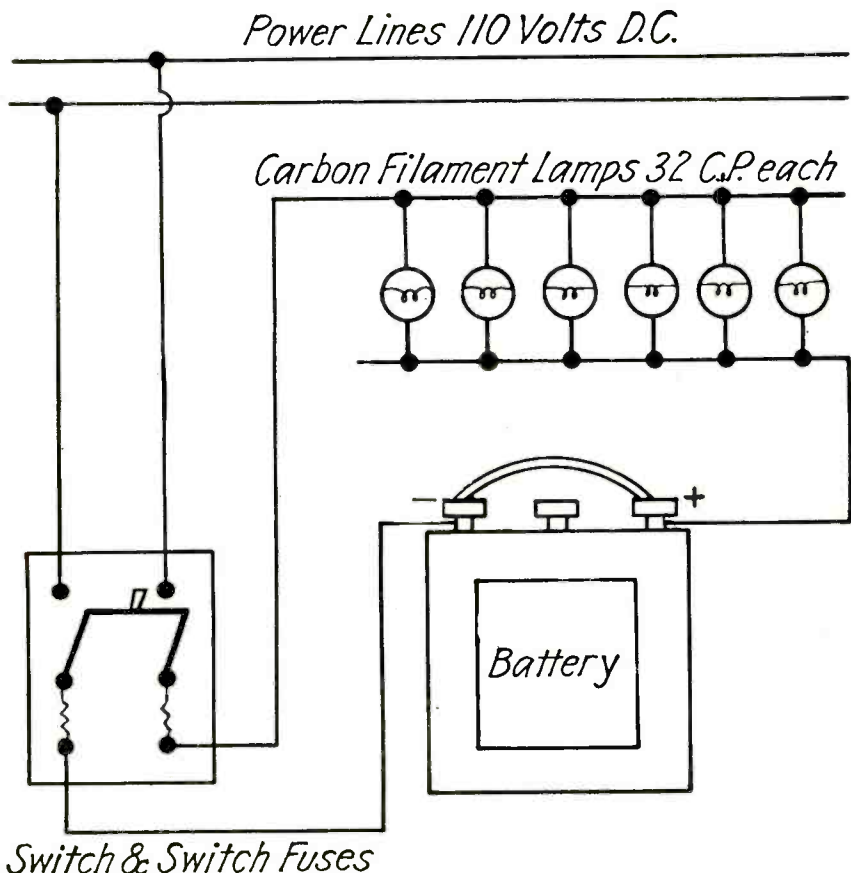
The following facts should be borne in mind: *First*—this receiver is superior only for long-distance work. For short-distance reception, the regenerative and superregenerative circuit is more economical and efficient. *Second*—great care must be taken in the actual construction and operation since the adjustments are many and manifold. This type of receiver is given the name of the superheterodyne.

Filament Regulation

AS a general rule most amateurs and experimenters are tempted to let the filaments of vacuum tubes burn too brightly. Signals are at their best when the brilliancy of the tube is at its lowest. Increasing the filament current beyond this point does not increase the signal strength, but increases the strength of static interference and tends to lessen the life of the tube considerably. It would be well to follow the idea of keeping the filament as low as possible, consistent with good reception. With certain types of tubes the efficiency of the tube is at its best when it is at its lowest temperature.

The Storage Battery as an Important Factor in Radio Reception

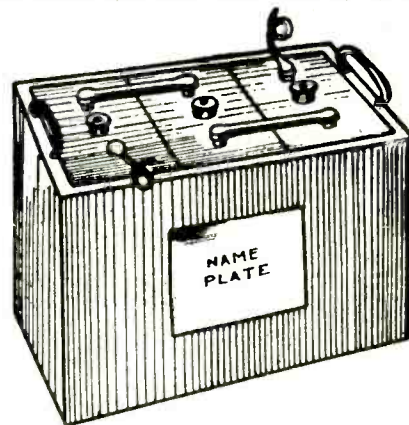
By Donald Van Wyck, R. E.



Switch & Switch Fuses

Schematic circuit showing the charging of a storage battery. Each lamp permits an ampere to pass. Lamps may be carried to suit charging of battery. Suggested by Donald Van Wyck. Drawn by S. Newman & Co.

There are storage batteries especially designed for radio apparatus that have characteristics which differ from the storage battery manufactured for automobiles, telephones, and for other special work. An automobile battery is made up with thin plates and separators in order to enable the battery to give a very high rate of discharge for a short period. This, of course, is necessary when the battery is used for starting purposes; but it must be remembered that while the automobile is running the battery is being charged constantly. One of the first questions the radio amateur must decide is the



Three cells are shown in the make-up of this storage battery. The two end poles are negative and positive poles respectively.

STORAGE batteries for radio work were classified by Dr. Lee de Forest, in the early days of radio, as the A and B battery. The A battery supplying the filament current for the tube, being of a low voltage, high-amperage type, while the B battery, the opposite, being of a high-voltage, low-amperage battery. The B battery is practical—it is of the storage type—but the cost of such batteries is

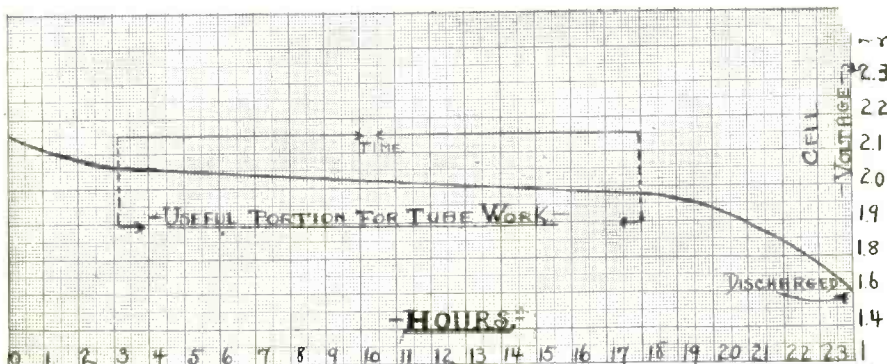
the deciding factor. We are, however, only going in detail here in regard to the A battery.

It has been common practice among amateurs to use almost any type of storage battery, regardless of its capacity and design. Storage batteries, like every other electrical device, in order to function satisfactorily, must be designed with a given purpose in view.

size; and, in this connection, cost is generally the deciding factor. Still there are other considerations that should make cost a secondary matter—rating, weight, life, and internal design.

The radio-storage A battery should never exceed six volts as the vacuum tubes will burn out immediately. If not, they will be very short lived. This means that if six volts should be added, to more voltage of another battery, or a more powerful battery supplant the six-volt battery. Storage batteries are also rated in ampere hours. Ampere hours mean what the battery will deliver in a given time. Thus a forty-hour ampere battery will deliver one ampere for forty hours. Naturally the higher the ampere-hour rating the longer the battery will go without charging. A high ampere-hour battery is extremely heavy, due to the lead plates, solution; and the transporting of such a cell to and from some outside charging-station is very troublesome. A large cell gives a steady discharge. In the operation of vacuum tubes it becomes a very important consideration.

Do not get a battery of less than



This chart shows a measured scale with the radio operator where the proper voltages may be secured when using a storage battery. The most useful part of the battery for tube work is indicated by the space between the dotted lines.

Secretary Hoover's Committee to Pep Up Congress in its Radio Law-Making



(C. Harris & Ewing. From Paul Thompson, N. Y.)

Members of the newly appointed Interdepartmental Advisory Committee on Governmental Radio Broadcasting, photographed in front of the Department of Commerce, after the first meeting. This committee is composed of representatives from ten government departments, together with representatives from the office of the Director of the Budget and the Shipping Board. The chief work of this committee is to urge Congress to get busy and consider the several bills now before that body to regulate and standardize broadcasting and to take some action regarding other important radio matters. It is possible that the scope of the committee's activities may be extended beyond the subject of broadcasting, and that the committee will act in an advisory capacity to the Secretary of Commerce in matters of government radio regulation, and, further, will consider all radio questions of interdepartmental interest. Those in the group (left to right) are: James C. Edgerton, Post Office Department; F. P. Guthrie, Shipping Board; Captain H. P. Perrill, Chief Co-ordinator's Office; Dr. S. W. Stratton, Bureau of Standards; J. C. Gilbert and W. A. Wheeler, Department of Agriculture; A. E. Cook, Labor; L. J. Heath, Treasury.

(Continued from preceding page)
sixty ampere-hours, as such a battery will have to be recharged too often. Dry cells are not at all suited for this work and should not be used, except in cases of emergency. When a number of these tubes are used, a set of dry cells will only last a few hours only to be thrown away or replaced by a new set. An expensive proposition.

As the voltage of a battery changes while in use, frequent adjustments are avoided with the larger type of cells. As a matter of fact, we should only use about 60 per cent. of the theoretical discharge time to avoid changes in the filament current.

Two things are essential to keep battery up to standard:

In the first place, the owner should provide for a home-charging device so the battery can be placed on charge as it gets low. A good rectifier is also handy where D. C. is not available. If D. C. is to be had, then all that is

needed is a bank of lamps, as shown in the accompanying diagram. The rectifiers may be purchased for a reasonable sum, and the amateur who owns a set is, indeed, lucky. With the charger, it simply means that a large capacity-battery may be installed because it need not be moved. About every third or fourth night, the battery may be left on charge all night. Thus it will be seen that there will be no shutdown of the radio set owing to the discharged condition of the battery. This is, by far, the best way to use a battery as it will be kept charged up and in good shape for work.

Secondly, always to keep the battery fully charged, as an idle battery-discharged cell deteriorates within a few weeks. An open circuit test is not a good indication of the state of a charge of a battery. To keep the battery in good shape and working condition, the owner should have a reliable hydrometer. A good one may be purchased

for \$1.50. The best types have devices on the sides to prevent sticking to the sides of the tube because of capillary attraction. If the float sticks, the readings are useless. If the battery is fully charged, the hydrometer should read between 1,280 and 1,300 degrees on the scale. If discharged, it will read about 1,125. The battery should never be allowed to get so low. If it does, it should be immediately placed on charge. Sometimes, while charging, a battery is left too long on charge. Then suddenly the hydrometer shows over 1,300, or what we term an overcharge. This condition is about as bad as an undercharge. Readings should be taken frequently to see that the battery is in good shape. We should remember that a storage battery is a delicate affair, even if it does weigh much, and care must be taken that it does not deteriorate quickly. By keeping distilled water on the plates of a battery, no trouble should arise.

New Radio Record Is Chalked Up by United States Shipping Board:

NOT ONE SHIP LOST IN THREE YEARS!

By Carl Hawes Butman

DUE almost entirely to the use of radio on the Shipping Board's fleet, not a single ship has been lost without trace during the past three years, according to F. P. Guthrie, chief of the radio section. Whatever hard knocks the board may receive, little can be said against its radio equipment and its operation. Practically all Shipping Board vessels are now equipped with audion-tube detectors, which also have been made available for general marine use through the insistence of the board, making for greater safety in sea travel. Ships, human lives, and money have been saved. In general, radio has a fine record in all government services.

Mysterious disappearances at sea are seldom heard of to-day—ships which disappear, or return crewless, as did the "Marie Celeste." Due chiefly to radio, the safeguard enabling ships to converse together freely and communicate with one port or another every day, there are few such disasters. The Naval collier "Cyclops" is practically the only "missing" vessel recorded since the advent of the radio law at sea in 1912, except during the World War.

The Coast Guard, the Navy, and Bureau of Navigation of the Department of Commerce all indorse radio highly, yet no bureau keeps a record of what radio actually does toward life and property saving at sea. Lost ships are recorded to the number of 380, from all causes, for the year 1921; but the number saved, thanks to the SOS, is undetermined. A year ago, the Shipping Board reported that, approximately, 500 vessels in distress or temporarily disabled were reported by radio, and that about 190 were towed to port through arrangements made by radio. This assistance rendered by the radio of Shipping Board vessels, augmented by other radio warnings in all parts of the world, protected many thousands of lives and billions of dollars worth of property, but no adequate estimate can be reached.

The aid radio brings is interesting: Within the past three weeks, the steamer "Wassaic," whose call is KROO, experienced boiler trouble about 350 miles southeast of New York. Her SOS was answered by KEFT, the "City of Eureka," another Shipping Board vessel, which towed her into New York safely. When

WDOO, the "Federal," stripped her turbines and sent out a distress call 200 miles northeast of the Bahamas, the "City of Weatherford" soon steamed alongside and arranged to tow the disabled vessel to Mobile. Another Shipping Board vessel was towed from off St. Nazaire, France, over 2,000 miles, to an American port in response to a radio message to sister ships bound west, thus saving tremendous salvage payment. Without radio she might have awaited assistance for months.

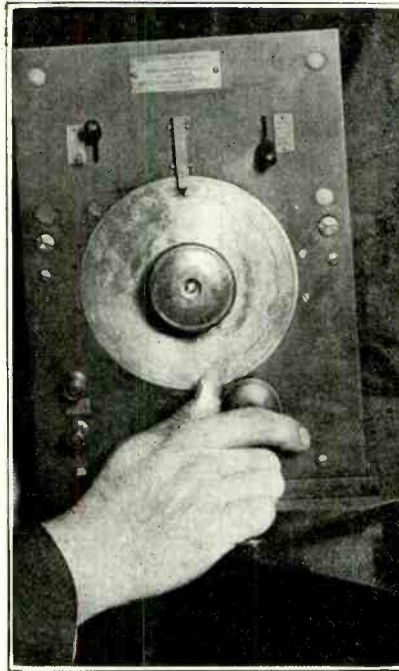
Lack of radio facilities shows its value best. When the radio of the "Western Hero" got out of order on a cruise, she was literally "lost" for two weeks, but "found" when it was repaired. A cargo ship whose radio officer died, sailed without waiting his replacement, and, in endeavoring to pursue the northern transatlantic route without radio, ran into icebergs and damaged herself to the extent of about \$10,000. She could not pick up the Naval Hydrographic Office warnings nor the messages of the Revenue Cutter on ice patrol.

Today, the activities of the Shipping Board are less than a year or two ago, there being only about 400 vessels in commission. Radio maintenance on the many laid-up ships has been reduced materially and a saving of, approximately, \$130,000 achieved by the assumption of the upkeep by the Board and the elimination of repair shops maintained by outside radio contractors in seven ports. For radio messages transmitted, the board collected \$30,000 during the past year.

Business of the board is expedited greatly by the operation of a special radio-station established at London, which, in co-operation with the Naval Communications Service, handles all transatlantic radio messages for London officials direct from Annapolis. Frequently, Mr. Guthrie states, messages filed in Washington at the close of business on one day are answered by the time the Washington office opens on the next. The London radio-supervisor estimates that a saving of over \$11,000 a year is effected by using radio for transatlantic dispatches. Radio messages to Panama, Manila and the Orient are also handled through Naval co-operation, saving almost \$5,000 a year over cable charges.

In technical development, the Shipping Board has experimented with a two-kilowatt arc set installed on the "President Adams," which succeeded in communicating with American stations while the vessel was in the English Channel. The operation of this set is said to be almost entirely automatic, being a new departure in the construction of sets. The "Eastern Admiral" and "President Polk" were also equipped with two-kilowatt arc sets with good results after a direct comparison with spark sets.

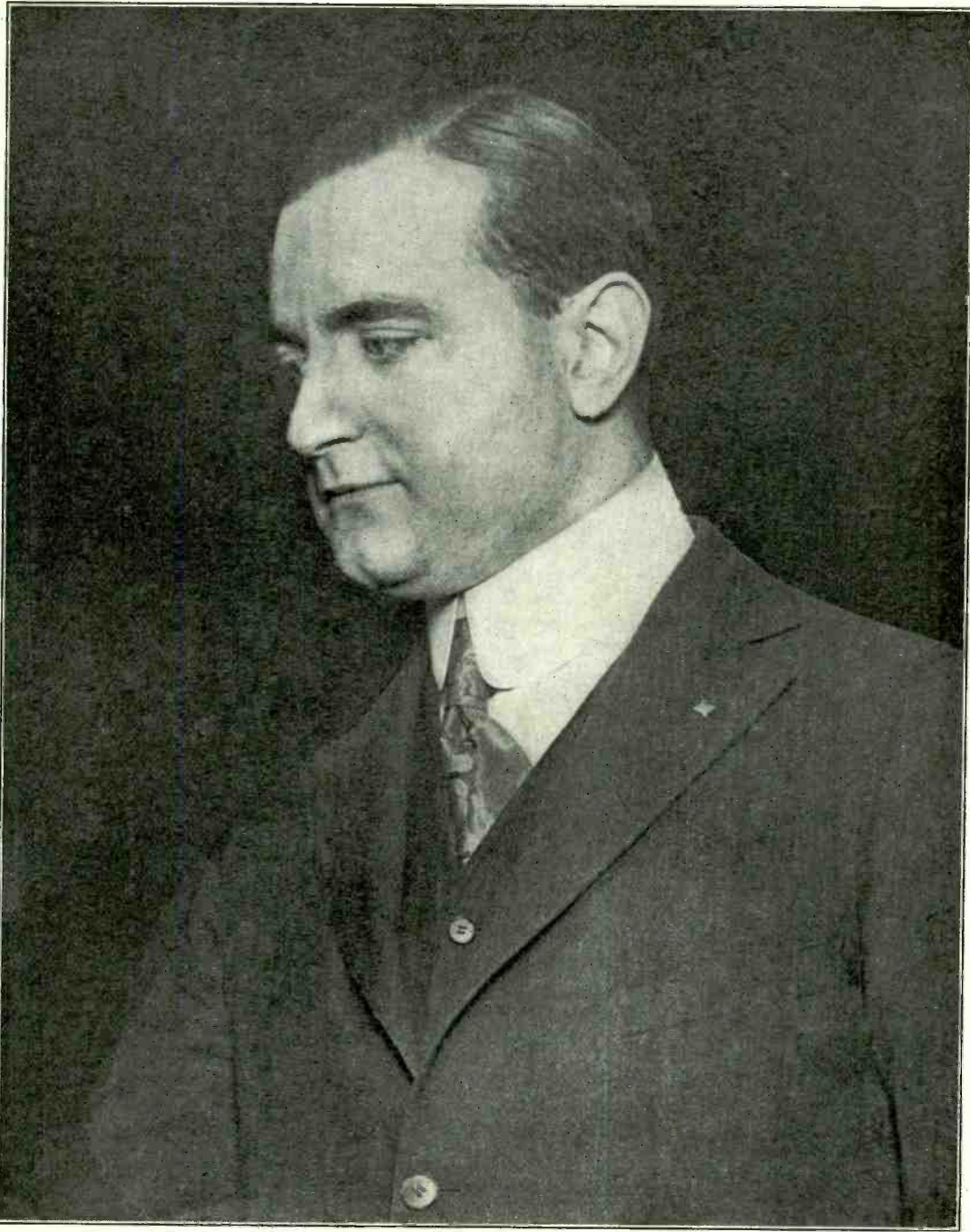
New Uni-Control Receiver



(C. Kadel & Herbert News Photos)

This photograph will interest amateurs who would like to see radio develop to the point where it will only be necessary to "push the button" to hear concerts. It is the new "uni-control" receiver developed some time ago by Dr. Alfred N. Goldsmith of the College of the City of New York. With this receiver one control is used to change wave lengths of antennae and secondary circuits, also altering the tickler coupling at the same time. The wave length of this receiver is from 200 to 3,500 meters. An additional switch is provided to slightly alter the circuits so as to receive continuous waves. A complete detector and two-stage amplifier using "peanut tubes" is included. The small knob is for finer adjustment.

Radio World's Hall of Fame



(C. Kadel & Herbert News Service.)

ALFRED N. GOLDSMITH, Ph. D.

Professor in Charge of Electrical Engineering of the College of the City of New York

Dr. Goldsmith is, also, Director of Research of the Radio Corporation of America, the dominating organization of the radio industry. In this important work he is in closer touch with progress and development of radio communication than any other man in American radio. For many years he has directed the radio laboratories of the College of the City of New York. His interest in radio was born here when but a few advanced scientists had recognized the possibilities of the Hertzian experiments as a means of communication. He set up the first arc radio in the United States. He has heard signals from Germany. Dr. Goldsmith has seen radio grow from modest beginnings to a day when its spread resembles the spirit of success. But, unlike some of his contemporaries, it has not distorted his vision of the future.

United States Submarines to Be Made Effective with Radiotelegraphy

WASHINGTON, D. C.—Radio engineers of the U. S. Navy Department have been so successful in the development of a special radiotelegraphic transmitting and receiving set for submarines, that 59 new sets have been ordered. They will be improvements on the experimental set installed on the S-50 which paid a visit to Washington recently, and was said then to be one of the best equipped submarines in the world. The sets will be constructed on confidential specifications drawn up by the Radio Section of the Bureau of Engineering, based on experimental sets building at the Washington Navy Yard.

Approximately \$300,000 has been saved on paper—not an actual saving because the Navy did not have the money to save. What the radio experts accomplished, however, is a remarkable saving, because practically new and very excellent long-distance sets will be available for all the big "subs" at a very small cost. By re-designing and remodelling old apparatus, barring a few small innovations and parts, the Naval radio experts have built up an entirely new standard submarine radio set, better than that on the S-50.

The results in radius of action, Rear-Admiral Robison, chief of the Bureau of Engineering, says, are twice what the radiomen hoped for when they began the experiments some months ago. In other words, instead of a radius of about 100 miles, the "subs" will have a radius of radio transmission better than two or three times that distance in ordinary day-time communication.

The first set was installed on the R-22, and the resulting experiments proved that an excellent practical submarine set had been evolved by remodelling surplus apparatus and scraps of present equipment. New apparatus manufactured by commercial concerns along the lines of the perfected specifications would have cost the Navy in the neighborhood of \$5,500 per set, instead of \$500, the estimated cost of remodelling and assembly. Fifty-nine times the difference is \$295,000 saved.

Another remarkable feat accomplished by the Navy was the perfection of the details of the set within six months. The original submarine set developed and built by a commercial concern required two and a half years, it is said, or five times as long. When all the subs are equipped, Naval experts believe that these craft of the American Navy will be just a bit better

By J. D. Smith

equipped than those of any other navy in the world.

Very few details of the new sets are revealed, but it is known that they are vacuum-tube sets developed along original American lines. Late during the World War, German submarines floating on the surface succeeded in sending messages during the night as far as 800 or 1000 miles to their bases by using short wave-lengths of about 300 meters. Spark sets were used until the last few months of the war, when vacuum tubes were introduced in sending, although they had been used in receiving for about a year. The German spark was operated on a 500-cycle frequency about two kilowatts capacity. Much of their equipment was held very confidential, and after an unsuccessful engagement they threw the important parts overboard or into the bilges. Although arc-transmitting sets are said to be dangerous for submarine use on account of the gases given off by the many electrical storage batteries, two-kilowatt arc sets were used in British "subs"

successfully. In American submarine practice, a grounded loop is used. This aerial is very efficient and consists of a highly insulated wire grounded at the extremities of the hull and running to a mast amidships. Two down leads of the loop pass through watertight insulators into the hull, where the primary of the circuit is connected in series. The loop is connected with the standard Naval radio equipment by the ordinary means, except that a condenser in series is used when transmitting.

Owing to the ability of the under-sea craft to submerge with the aerial in place, it is possible to receive long-wave signals under water to a depth of about 20 feet, and short-wave signals to a lesser depth. In 1919, a submarine—16 feet under water off New York—picked up signals sent out from Arlington, 200 miles away, and while submerged at eight feet, heard Nauen, Germany, 4,000 miles distant, and, also, San Diego, California.

On underwater transmission little is available for publication, but it is understood that transmission as well as reception is practical.

How Radio Will Help the Air-Mail Service

By Washington R. Service

WHILE the radio work of the Department of Commerce, Public Health Service, and bureau educational services may be more instructive, the plans of the Post Office for aiding its transcontinental-mail pilots by radio, especially in night flying, is by far the most interesting. Fourteen flying fields stretching from Hazel Hurst, Long Island, across the country to San Francisco are already equipped with radiotelegraph and telephone service for broadcasting, and all mail planes will soon be fitted out with radiophone sets capable of transmitting 125 miles. This maximum communication distance is sought in order that a plane may be in contact constantly with at least one field, the fields being, approximately, 250 miles apart.

The safety of the pilots is as essential as the transit of the mail; therefore, when a plane is damaged or delayed, radio advises of the predicament, hastening what aid is needed and the disposition of the mail. In

some instances, the mail is carried only part way across continent, by plane, the railroads acting as relays between flights. By this method at least two days' time has been saved between New York and San Francisco. An experimental letter reached Salt Lake in two days.

Night flying will speed up the mails materially and night flying is planned with the aid of radio. In working out the problem of a light and compact phone transmitting set, Superintendent J. C. Edgerton and Assistant Superintendent Charles I. Stanton, have been testing out a mail plane in Washington, equipped with a Naval SE 1370 transmitting set and a special six-stage amplifier. The DH4 B-plane, so equipped, flew over Washington, maintaining constant communication with the air mail and radio headquarters in the Post Office Tower and Bolling Field. From distances up to about 15 miles the set worked well, and messages were transmitted over a distance of twenty miles, although the words

A Birthday Radiogram that Brought Good Cheer

HELLO! officers and men of the Coast Guard: This is Edward Clifford, speaking, Assistant Secretary of the Treasury, having supervision of the United States Coast Guard, a bureau of the Treasury," said the Assistant Secretary over the Naval Radiophone circuit at Anacostia on the evening of August 4.

"I am sure this is the first time an Assistant Secretary has spoken directly to you through the air," he continued. "The development of the radio has had a tremendous influence upon the work of the Coast Guard, greatly increasing its efficiency and its value to the country. The perfection of the radiophone will doubtless open up even a greater field of usefulness, and in a few years it may be a common practice for the Treasury to talk with an individual ship at sea, or, indeed, the whole service. I am calling you up to congratulate you on this the one hundred and thirty-second birthday of the Coast Guard. I hope that, wherever you may be, you are observing this anniversary of the service. It is a fine thing to belong to an organization that has behind it a record of one hundred and thirty-two years of splendid achievement in peace and in war, and that has ahead of it a great opportunity for constructive work. The history of the Coast Guard goes back to the foundation of our country. On August 4, 1790, George Washington, President of the United States, approved an Act providing for the construction of 10 revenue cutters. * * * The magnitude of the work of the Coast Guard in time of peace may be illustrated by the fact that during the fiscal year ended June 30, 1921, the service saved or rescued from peril 1,621 lives, and the value of the vessels assisted by the Coast Guard, including their cargoes, was over sixty-six million dollars." cargoes, was valued at over sixty-six million dollars."

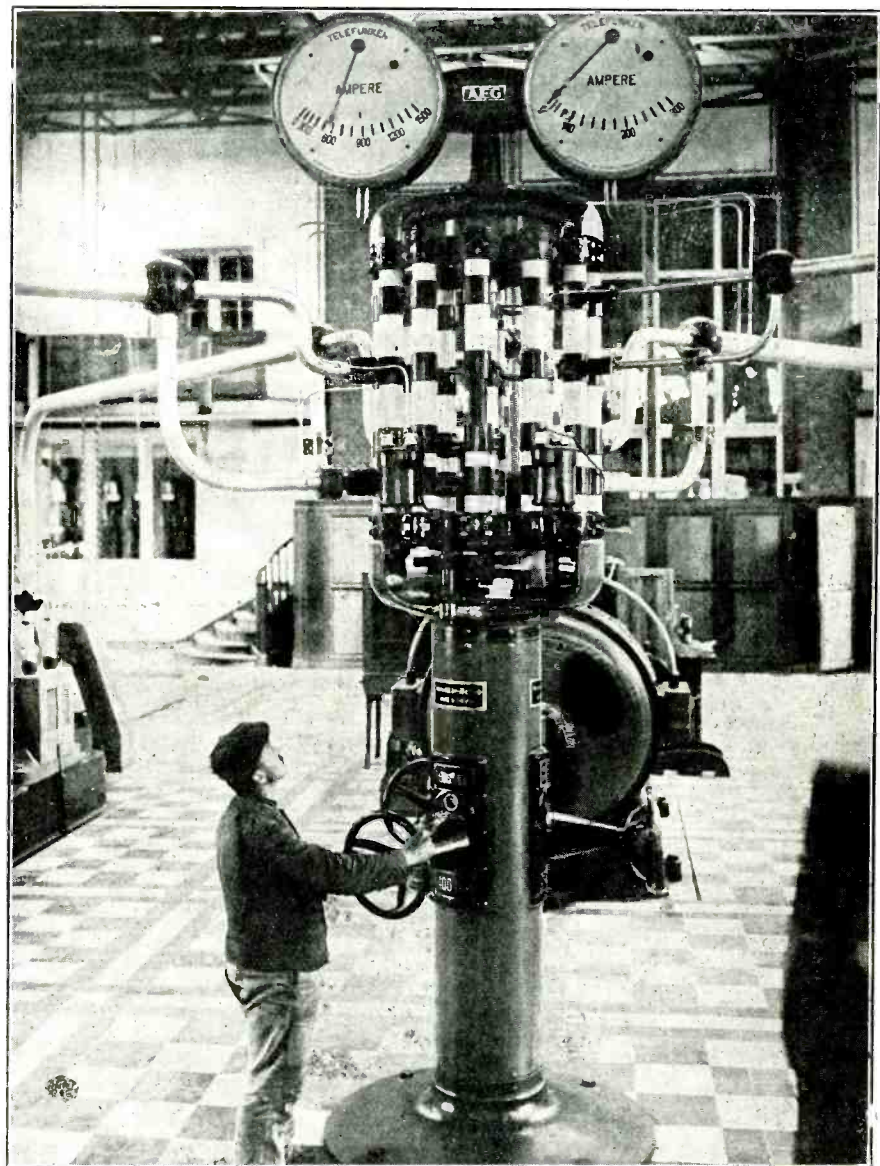
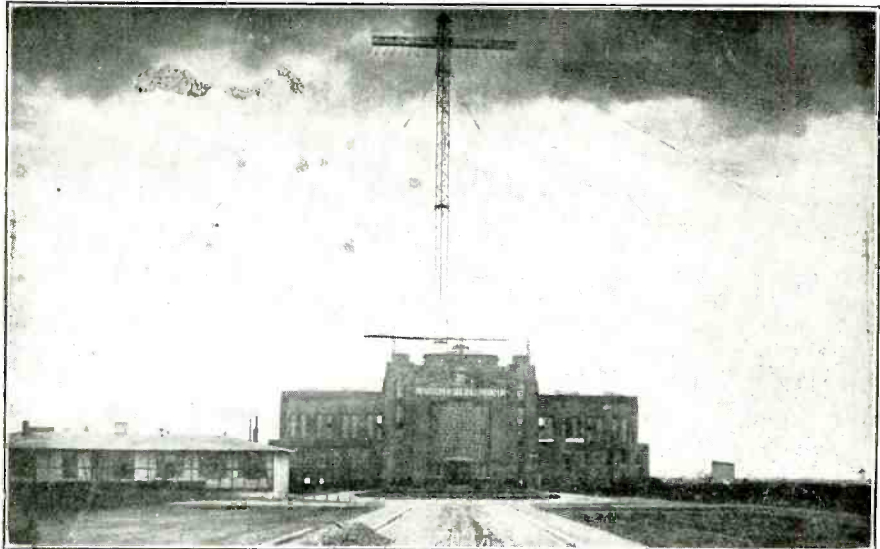
(Continued from Preceding Page)

were barely audible. Improvements are being made which, it is expected, will improve the set and secure an approximate 125 mile radius and cut the weight 100 pounds. The set is capable of tuning to four waves: 507, 600, 800, 975 meters; but to date only 507—the Naval airphone-wave—has been used. The tests are conducted each day from 4 to 5 p. m., in an effort to eliminate "bugs," but new and improved apparatus is being designed on a lighter and simpler basis. When maximum distance and audibility are secured, a number of sets will be built for the long-distance mail planes in use.

When the phones are installed it is expected that a night pilot can get his position from two radio stations, just as a ship at sea gets bearings from radio-compass stations. Radio would also advise the pilot of weather and ground conditions while he was enroute between stations, eliminating the possibility of accidents in landing in fog or on washed-out fields. The radiophone is used so that the pilot need not learn the code and so he can talk directly into a transmitter and not take his hands from the "wheel" to "send." He talks as he drives, so to speak, and hears as well.

From Germany to America in One-twentieth of a Second

(Both Photographs C. International News Reel.)



From Nauen, Germany, to Riverhead, Long Island, in the marvelous time of one-twentieth of a second! This is the flash of time in which a message may be sent by radio across the Atlantic Ocean from the powerful new German station shown in the above photographs. The upper photograph is the exterior of the station with the gigantic directional aerials facing the American continent. The lower photograph shows that part of the apparatus which regulates the flow of current to the transmitter.

Why Radio Is of Vital Importance to Everybody

By *Edward J. Nally*

President, Radio Corporation of America

"Future of Radio Is Assured"—President Nally

CONTRARY to the popular understanding Radio has not come to us suddenly. It has been under development continuously during the past twenty-two years. Commercial radio communication, that is, overseas radio telegraphy, has reached a high state of development and has found its place in the commercial world.

Radiotelephony has been under development during the past fifteen years, and during the World War was successfully used for both one-way and two-way communication.

Popular radio—relatively short-distance radiotelephone broadcasting—is the outcome of the realization of the vast possibilities of one-way transmission of

news matter, vocal and instrumental music, lectures, sermons, etc.

Radiophone transmission from central, organized sources of information and entertainment makes it possible for the citizen to receive this service through the small instrument involved in purchasing a radiophone receiver.

It is not communication in a two-way sense. Radio broadcasting is the employment of a fairly well developed science to a new use. Broadcasting is the recent development—not Radio.

The future of radiotelegraphy, therefore, is assured. It already has a healthy and well-defined field. The future of radiophone broadcasting is another matter, and in this we can speculate with only the imagination limiting.

THIS brief outline of some of the aspects of radio is written from a viewpoint not often presented to the public at large. My purpose is to show it as an auxiliary to commerce rather than to stress the more familiar keynote of the "wonders of wireless," which have been the subject of many articles in the daily press. True it is very baffling, from a scientific "reason why" standpoint; but so is electricity, which no one has yet been able to define.

The fact that radio communication is the one medium capable of placing isolated communities in instant touch with the centers of civilization has a boundless appeal to the imagination. That, too, it has forever ended the vast silences of the sea further adds to its romance. However, until it becomes a general household utility, it will probably remain in the public mind as something very mysterious; a sort of witchcraft, interesting, but making little appeal for intimate acquaintance; and comparatively few people realize that this means of communication has already a fixed place in the world's affairs; that it is, in fact, an economic factor of major importance, and world wide in its applicability.

The underlying reason for the rapid strides it has made is not because of its romantic, intangible or mysterious nature. Its important position in the field of communication is due solely to its utility, in combination with the three essentials of accuracy, speed and economy.

In addition to providing mariners with weather reports, storm signals, and warnings of possible dangers to

navigation, it enables passengers at sea to keep in touch with world affairs and with the movements of commerce and industry. Daily news-bulletins are published on practically all of the ocean-going vessels, and transactions of great magnitude and of momentous importance are being carried on constantly between ship and shore through the medium of radio communication.

In its international application, radio is, to-day, carrying overseas a very material percentage of the world's communications. Radiograms, commercial and social, aggregating millions of words annually, are being sent daily across the Atlantic and Pacific oceans. These are regular paid communications, filed just as cablegrams are, and delivered with the accuracy and speed so essential to the users of long-distance communication. Direct wireless service is maintained, night and day, with Great Britain, France, Germany, Norway, Hawaii, and Japan, at rates which are from four to twenty-four cents per word lower than the cable rates. Economy being the keynote of commerce, the enormous total saving effected by the use of radio in the conduct of international communications makes it a matter of vital interest to everyone, and this interest has manifested itself in the constantly growing number of countries which are adopting radio as a means of communication, and which are constructing wireless stations with which to carry on this communication direct with other countries already thus equipped.

Another great advantage possessed by radio is what might be termed its

universality, with reference to communication with several distant points at the same time. This was illustrated on the occasion of the formal opening of Radio Central, a superpowered station of the Radio Corporation of America, located at a point on Long Island about sixty-five miles distant from New York City. On November 5, 1921, President Harding threw a switch in the White House, and a message which he had prepared for broadcasting to the world ran through a mechanical transmitter and the words, carried by land wire to Radio Central, were flung into space without the intervening agency of a human hand.

The first answer came back instantly. Others followed close upon it. Acknowledgments were received from such widely scattered points as Norway, Germany, France, Italy, England, Belgium, Sweden, Canada, Cuba, Japan, New Zealand, Panama, Columbia, Costa Rica, Nicaragua, Honduras, and Australia.

This fact of the universality of radio has a further application to broadcasting through the medium of stations which are in direct communication with thousands of wireless stations maintained by amateurs in all parts of the country, and in this respect it is of especial value to isolated communities, out of touch otherwise with current happenings and with the world's progress.

This branch of the radio service has awakened a wide interest in all parts of the world, and with the rapid development of the wireless telephone, persons in remote districts, as well as passengers at sea, are privileged to listen to concerts by famous artists in the large musical centers and to hear, not the dots and dashes of the telegraph code, but the exact words of spoken addresses.

When to Be Careful

THE regenerative feature in receiving sets, when properly employed, is of great value; but improperly employed it is not conducive to the best operation. Great care should be taken in the employment of regeneration, otherwise radiotelephone speech and music may become distorted.

With proper regeneration signals should be of loud signal-strength.

The Use of Capacity in a Circuit

By George W. May, R.E.

ONE of the most useful devices in radio is the condenser. But to know the functioning of such a machine, we must first understand its elementary principles. This instrument is used to an enormous extent and comes under the term of capacity. There are thousands of radio fans and novices who do not understand its main function. Capacity is an important factor in radio work, and it is necessary to have a thorough understanding of what capacity is.

In order to be thoroughly cognizant let us take two electrical balls, or conductors, one just twice as large as the other, and charge them with electricity. Put twice as much electricity in the larger ball as you put in the smaller one. Now, if we connect two balls by a wire there will no exchange of electricity. There can be no difference of voltage between them or there would be a transfer of electricity; that is, the two balls have the same voltage. It took twice as much electricity to bring the larger ball to this voltage as it did to bring the smaller ball.

Capacity, then, refers to the ability of a body to hold an electrical charge. If the body has a large capacity it will take a large amount of electricity to raise its voltage. If it has a small capacity, it will take only a small amount of electricity to raise its voltage.

We can produce momentary currents in conductors, whether open or closed, by cutting off the lines of force. The evidences of electrification are most pronounced at the ends of an open conductor; but these disappear as soon as the cutting of lines of force ceases. We find, however, that electrification of amber, glass, silk, and other substances remain after the rubbing has ceased. We can produce static electricity on conductors by insulating them. For instance, if two metal plates separated by a piece of glass are connected, one to the positive, and the other to the negative pole of a source of EMF and then simultaneously separated from it, they will be found to be electrically charged. When two plates oppositely charged are connected through wires leading to a galvanometer, the amount of deflection of the galvanometer needle is a measure of quantity of electricity over each plate. In testing plates of different sizes, shapes, and materials, charged to the same potential by being connected to the poles of the same source of electricity, it is found that different values of the throw of the galvanometer needle are produced. Other conditions being equal, plates having the greatest amount of surface are found to have the largest capacity. The amount of

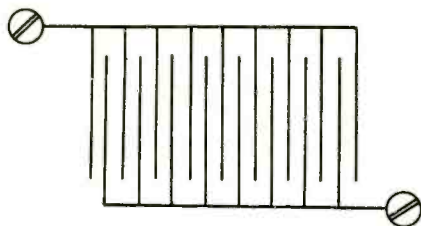


Diagram showing how a few plates would appear in a variable condenser, the white space representing the dielectric, or air.

electricity stored in an electrified body depends on its potential as well as on its capacity.

Capacity is figured in farads. A body has a capacity of one farad if one ampere of current flowing into it for one second, raises its potential one volt. This is too large for radio work, so it is divided into a million parts. Each of these parts is termed a microfarad. We must not get the idea that capacity tells us how much an object holds. This is wrong. It really tells us what potential the capacity will be raised under a given quantity of electricity. Instruments built to give capacity are termed condensers. There are various

kinds of condensers on the market, for various purposes. In using a condenser, be careful not to apply a voltage greater than that for which it is built. If you do, a spark will pass through the non-conductor and between the plates, and will ruin the condenser. A condenser will permit an alternating current to flow in a circuit, but will not permit direct current to flow. A condenser is frequently used in instruments to prevent a direct current from flowing and permitting an alternating current to flow.

Condensers are often made up of interlaced plates, or films, of conducting metal, having between them—for a dielectric—larger pieces of mica, glass, or oiled paper—alternate plates being similarly charged. Condensers are made in which the relative position of the plates and, therefore, the capacity, may be varied at will. These are called variable condensers. Other condensers are of the fixed type, and are used in various forms to make up the circuit. The variable condenser is the most useful instrument, at times, in any receiving set used by the novice. Its main function is to bring two circuits into tune or resonance.

Car Gathers News by Radio



(C. Underwood & Underwood)

How the official press car of the Chicago Pageant of Progress appeared in its radio garb. This car was equipped with a complete radio-receiving set and aerials. It kept in tune with broadcasting stations. When on a tour of the city, the officials in the car were enabled to keep in touch with headquarters and with the various newspaper offices. The radio-equipped press car proved to be both practical and economical. According to all reports it worked perfectly and added another to radio's many triumphs. The radio gear attracted attention wherever it went.

Radiograms

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

WHETHER there is any connection between the centers of electrical disturbances and the centers of storms is the subject of present experimenting by the United States Navy Department and the Weather Bureau. To help out, all radio-compass stations are taking bearings on all static disturbances three times a day.

Radio insurance is now being sold by various insurance companies. Blanket radiophone policies against fire, lighting, burglary, theft, and transportation accidents are being offered by companies in every large city.

Expert bakers baked a loaf of bread by radio at a Muncie, Indiana, food show. Perhaps baking by radio may prevent, in the future, some bolshevist from putting arsenic in pies and prevent another tragedy such as occurred in New York City recently.

German-made radio sets are to be barred in by Great Britain. The Germans, it is reported, are offering apparatus at a price that makes it impossible for the British to compete. The cheapest British-made set sells for \$23 and is guaranteed by the Marconi Company. A German set sells for \$5 with no guarantee. It claims a wave-length from 150 to 800 meters on a broadcasting wave-length of 425 meters.

The Post Office of Great Britain controls the air absolutely. Therefore, British manufacturers complained to the Post Office

Grant Transmitting Tube for Long Distances



(C. Kadel & Herbert)

In the right hand of the young man in the photograph is a 250-watt transmitting tube in his left, an average-sized vacuum tube. The larger tube is the type used by broadcasting stations for long-distance sending.

Department that Germany was about to monopolize the radio market. They claimed that business would slump if the Germans controlled the market. The British cabinet considered the matter and manufacturers were assured that the desired ban would soon be put into effect.

Every motorcycle used by the State police of Michigan will be equipped with radio if experiments now being conducted by the State Department for Safety are successful.

Inmates of the Wyandotte County Jail, Kansas, contributed their 'tobacco money' so they might purchase a radio receiving-set with a loud-speaker.

The Japanese of Los Angeles have succumbed to the radio craze. The publisher of the Japanese Daily News has applied for a broadcasting license to operate from his newspaper office.

Plows to be controlled by radio is the prediction of John Hayes Hammond, Jr. He believes that a number of "gang plows" covering a large territory may be operated by radio from a centrally located town. By this means, work that now takes weeks may be done in days.

Two hours in the daytime and four and one-half on Thursday evenings is the temporary schedule which has been assigned to WBAY, the new broadcasting station of the American Telephone and Telegraph Company. A. W. Drake, general manager, in charge of this station, says that there have been close to 100 applicants for the use of this broadcaster, and he has taken steps to arrange with these applicants to furnish programs. While radio advertising has not as yet been prohibited by laws or regulation, it is considered, in the public interest, that applicants for the use of this station should provide programs of general interest.

C. K. McHarg, supervisor of the Cour d'Alene National Forest, has announced the installation of a high-power radio-receiving station capable of intercepting messages from a distance of 3,000 miles, near Priest River, Idaho, by the United States Forestry Service.

Nicola Tesla is planning a power plant to transmit radio energy for commercial purposes. He believes that the mechanical methods of the transportation of the world will ultimately be changed when radio is more thoroughly developed.

That radio publication are being cut up and articles on radio removed, is the report of the Los Angeles Public Library. While the desire for information on radio is, perhaps, greater than for any other subject, it should not lead to vandalism.

A new radio record was announced when it was reported that for four hours a powerful sending station of the General Electric Company at Schenectady, N. Y., broadcasted a program to the Rock Ridge, California, radio-receiving station of the Atlantic-Pacific Radio Supplies Company. The musical program varied slightly in intensity, due to interference of the great magnetic terrain in the vicinity of Colorado Springs.

A Complete Chronological History of Radio

By C. D. WAGONER

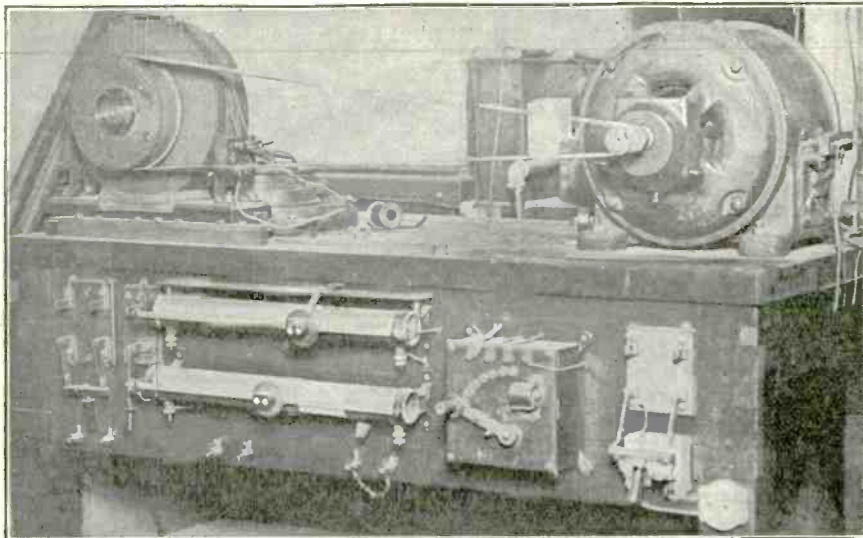
IN NEXT WEEK'S ISSUE OF

RADIO WORLD

NO. 22, DATED AUGUST 26

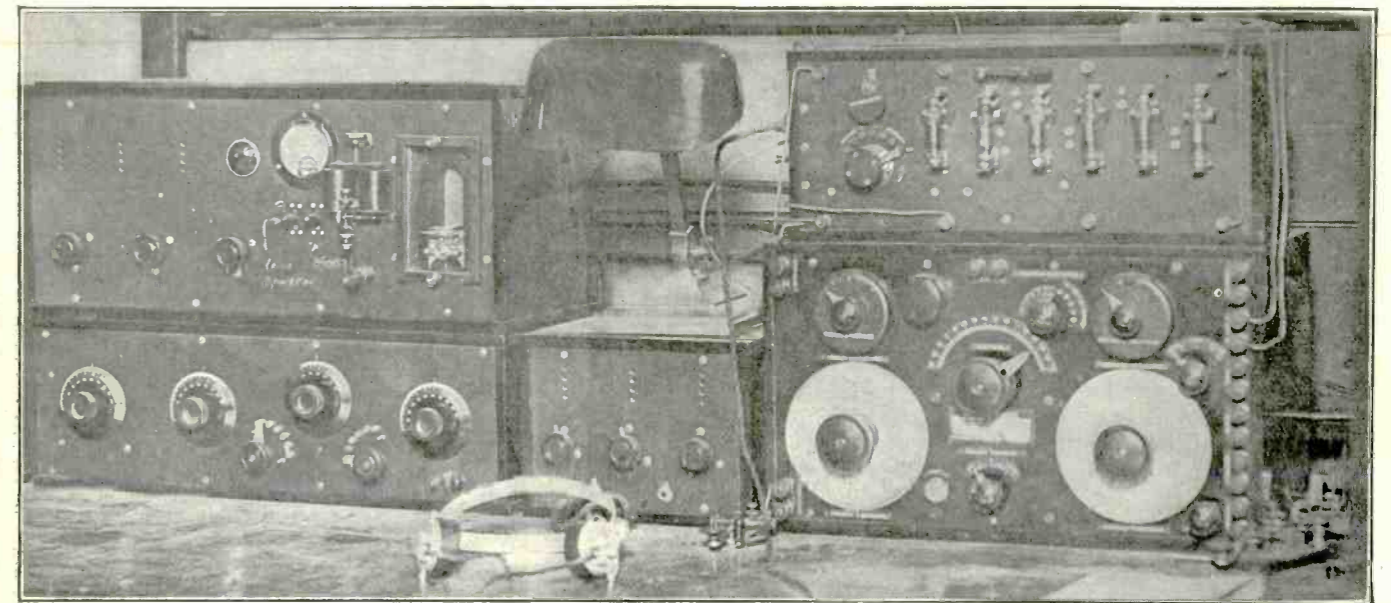
ORDER NOW FROM YOUR NEWSDEALER
ON SALE WEDNESDAY, AUGUST 23

Grave and Gay Sides of Radio as Recorded by This Week's Photographs



(Left) A one-kilowatt Alexanderson high-frequency alternator at the College of the City of New York-Radio Laboratories. Machines similar to this, but much larger in size, are used in the powerful radiotelegraph stations at Radio Central and the other points to send messages across the ocean to Europe. But even these alternators are doomed to disappear and be replaced by the more efficient vacuum tubes.

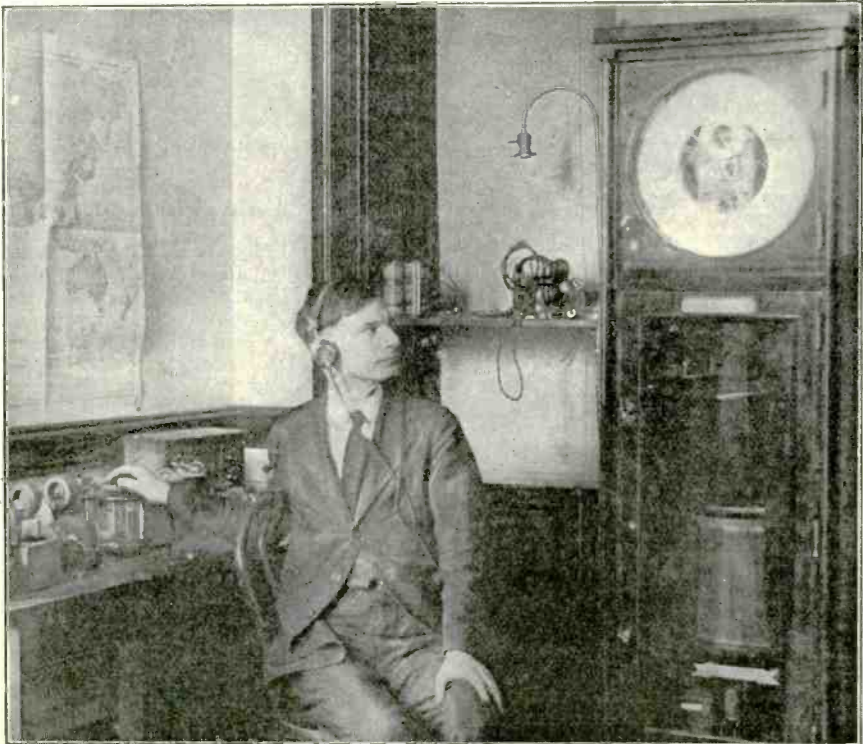
(C. Central News Photo Service)



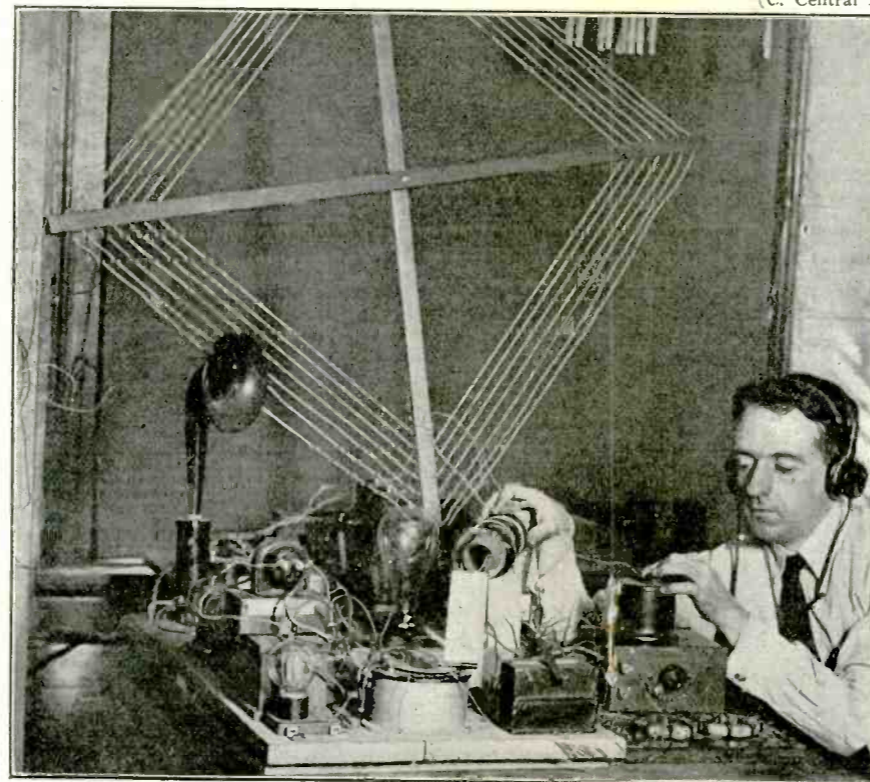
(Left, below) Here, fans, is the man who sends out the correct time every day from the United States Naval Observatory at Washington, D. C. Paul Sollenberger, each day at noon and at 10 p. m. broadcasts the daily signals over the country. The radio stations at Arlington, Annapolis, and Key West as well as the Western Union and Postal Telegraph stations take their time tick from this ambitious clock watcher. Mr. Sollenberger is the only man who is paid to "watch the clock"! The warships and other ocean going vessels are supplied with the correct time. The clock is kept in an even temperature.

(Right) Some of the short-wave receiving apparatus at College of the City of New York Radio Laboratories. At the extreme right is a standard Navy long-distance receiver, and above it is a radio-frequency amplifier employing special English vacuum tubes. To the left are a standard short-wave regenerative receiver and amplifier. Above it is a device for making the received dots and dashes. A three-stage amplifier is shown in center of receivers.

(C. Central News Photo Service)



(C. International News Reel)



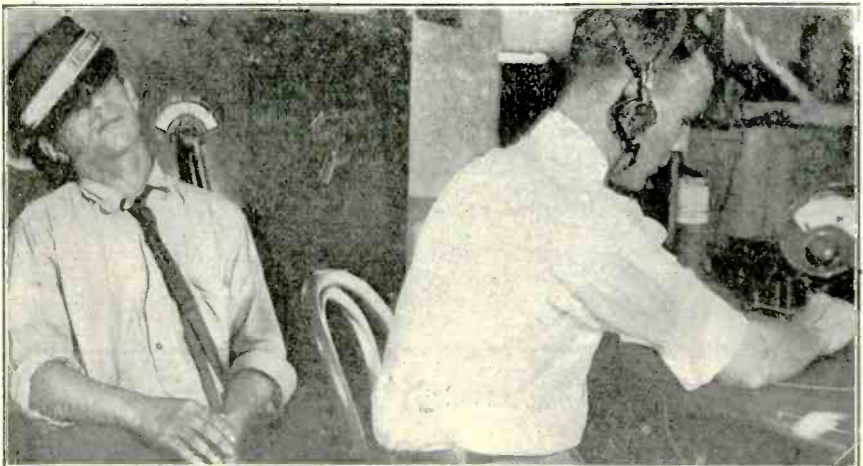
(C. Kadel & Herbert News Service)

(Left) J. C. Acves, one of the staff of electrical engineers of Columbia University, New York, performing an experiment in radio. Like many other universities, Columbia is specializing in radio and boasts one of the finest-equipped laboratories in the country. Eminent electrical engineers are constantly experimenting and inventing new apparatus. It was in this institution that Major Edwin H. Armstrong, eminent radio inventor, discovered the feed-back system and the superregenerative circuit. Mr. Acves is experimenting with a circuit using a loop aerial. His radio gear is one in which various changes may be quickly made. Note the tuning device, or three-coil mount, which he is manipulating with his right hand. Loud-speaker tubes and condensers are available for any change to be made.



(C. Kadel & Herbert News Service)

The United States Navy Band, under the leadership of Lieutenant-Commander J. W. Reeves, Jr., radio officer of the Third Naval District, has been entertaining those who are so fortunate as to possess receiving sets, with some unusually attractive programs. The band is composed of a number of trained musicians who play particularly well for radio transmission. The above photograph was taken at WJZ. The Navy announcer is advising radio fans the name of a selection about to be rendered.



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

(Left) Asleep on the job! No. The job is on the wane, so he sleeps. This picture is prophetic. No more will dazed messenger boys be rudely awakened, or perusal of Nick Carter's deeds interrupted to take important telegrams from one place to another. The Government through its radio service in the Post Office Department has set the pace by using radio instead of telegrams in communications between branches wherever possible. The Post Office has fifteen radio stations in operation. The Washington station handles a thousand messages a month.

(Right) This photograph was taken in the parlor of the McAlpin Hotel, New York, where a number of guests assembled on the night of the Leonard-Tendler fight to hear the report of the affair as received by radio. This was the first time such an event took place at the hotel. The room was crowded, the gentler sex being noticeably in evidence. Our photograph, however, shows only that corner of the room in which the receiving set was placed. The McAlpin is radio-equipped, its service, in this respect, being one of its attractions.



(C. Central News Photo Service)

The Radio Primer

A. B. C. for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

The Beginner's Catechism

By Edward Linwood

FOR what purpose is the series parallel-switch used?

A series parallel-switch is used in connection with honeycomb-coil receivers. Its purpose is to throw the aerial tuning-inductance either in series with the aerial honeycomb coil or in parallel with that coil. It is necessary, when listening to short-wave stations, to have the aerial tuning-condenser in series with the honeycomb coil; when listening to long waves it is necessary to have this condenser in parallel with the coil. Its purpose is to enable a quick change from series to parallel, or vice versa.

* * *

Is there any difference between an open circuit and a closed circuit?

An open circuit and a closed circuit are the oscillating circuits that deal with the high-frequency currents used in receiving and transmitting sets. The open circuit is that part of the circuit comprising the aerial, the aerial tuning-inductance, the aerial condenser, and the ground. The closed circuit is that part of a circuit which consists of an inductance and a condenser shunted across this coil. The frequency that either of these two circuits will oscillate depends on the amount of inductance and capacity in that circuit.

* * *

Why do some manufacturers use sheeting on the rear of the panel? Is this essential, or is it put there for some purpose?

On sets, the copper sheeting between the variometers and on the panel is very essential as it eliminates all body capacity effects and should be used in every set. The sheeting should be grounded and careful attention taken that no part of the sheeting makes electrical contact with any of the wires or any part of the circuit.

* * *

Looking into a storage battery that has a glass case, can any of the plates be determined as positive or negative?

Storage-battery plates may be easily determined in a battery at a glance; that is, provided the plates can be seen. The chocolate-colored plates are positive; the plates that are steel gray in

color, negative. Usually in all batteries the two outside plates are negative while the inner plates are positive. In a battery of this type, every incident of a battery may be noticed. Buckling of plates may be detected; active material that many have fallen out and to the bottom may be seen, and the correct amount of electrolyte kept up to its limit.

* * *

How is wave length calculated?

A wave length, usually, is equal to the speed of the waves divided by the number of times they occur per second, and known as "frequency." Frequency is determined by the number of spark discharges that take place in a spark station, or by the number of vibrations or oscillations in a vacuum-tube sending set. Broadcasting waves having a length of 360 meters must have a frequency of 833,333 per second.

* * *

Would a poor ground-connection have any effect on a set so far as signals are concerned?

If your ground is poor, signals from broadcasting stations cannot be expected to be heard at any great signal strength. Signals may be so weak at times that it will be impossible to hear anything at all, which is very discouraging. When making a ground connection don't wrap the wire around the pipe or radiator. Solder all joints.

Carborundum Is Artificial

Carborundum, unlike most of the other minerals used as detectors, is artificial and is made in the electric furnace. In radio it is usually used under pressure against a piece of carbon instead of the light wire contact as used with galena. Because of the heavy contact and its hard rough surface, carborundum is commonly used by operators, since it cannot be jarred from adjustment as easily as the galena.

Radio World's Revised Radio Dictionary

By Fred. Chas. Ehlert

Selectivity—In radio work, we must maintain the ability of selecting any particular wave length, exclusive from other wave lengths that may be interfering.

Self-induction—The result of the rise and fall of the magnetic field about a coil of wire which has a current flowing through it.

Series Connection—Any number of instruments so connected that current passes successively through them. A circuit having no shunts or parallel connections.

Sharp Tuning. Whenever a marked effect is obtained—when a very slight change has been made of a tuner or in a tuning system—it is termed, sharp tuning. The sharper the tuning the greater effect of selectivity.

Short Wave—Generally referred to as waves with a length of 200 meters or up to 1,500 meters. Some radio sets have a range from 300 meters to 3,000 meters and are called short-wave receivers.

Series Condenser—Used in conjunction with the antenna to adjust the system to a period of oscillation to a wave length less than the natural period of the antenna.

Silicon—A mineral used as detector in a crystal set.

Skin Effect—When high-frequency currents flow in a circuit, they travel on the surface of the conductor and are known as skin effect. This is the reason for Litz wire and stranded wire being so generally used in radio work where high-frequency currents are to be carried.

Spark Gap—A mechanical piece of apparatus that allows for the discharge of a condenser at various intervals; also to stop the flow in order that the condenser may receive a full charge.

Spark Frequency—The number of spark discharges that bridge a gap per second of time.

Specific Gravity—The density or weight of electrolyte in a battery as compared with water.

Stator—The stationary part of a vario-meter or motor.

Spider-Web Coils—A form of a tuning-coil wound similarly to the web of a spider. They are also termed stagger-wound inductances or coils. Very efficient for short-wave regenerative receivers.

Stopping Condenser—A condenser of low voltage generally used in the detector circuit to store up the small impulses of a current in a wave train which, in turn, transmits this energy to the diaphragm of the receiver.

A Correction

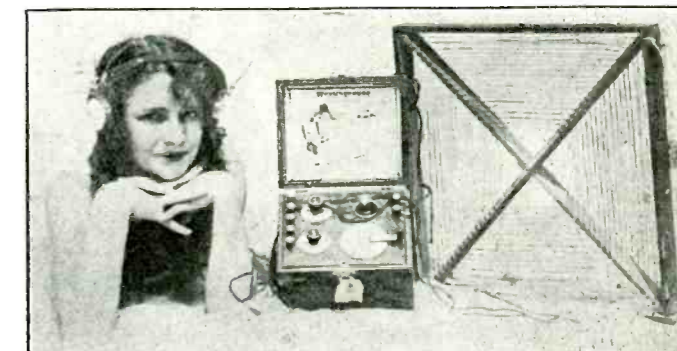
The definition of "Ohm's Law" in RADIO WORLD, No. 19, dated August 5, stated that "the pressure of volts in a circuit is equal to the amperes flowing through a circuit divided by the resistance in ohms." The word *divided* should read *multiplied*.

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

Radio and the Woman

By
Crystal D. Tector

No Sad Sea Waves for Hers



(C. Underwood & Underwood.)

Miss Beryl Williams tired of the old song of the waves that beat against the old Atlantic shore, rigged up her loop aerial and receiving set and heard more entertaining things over the waves of the air.

MRS. GERALD H. HARRISON, an enthusiastic radio-woman, residing in Dallas, Texas, has written me an interesting letter, for which she has my sincere thanks and, in addition, I am certain, she will have the thanks of all other women who may be so lucky as to read what I quote of it and my comments thereon. Mrs. Harrison says: "We have in our home what may be only an ordinary receiving set, yet a friend of the family, who is thoroughly conversant with radio science, told us that it was sufficiently strong in reception possibilities to satisfy any family of our position. It works admirably—save on occasions when a selfish neighbor who has a powerful transmitter—he is a dyed-in-the-battery radio bug—begins to send out his 'program.' Then our peace of mind is utterly put to rout. What can we do? He is such a selfish boor that we dare not molest him, and there seems no way to quell him by law."

* * *

I read the letter aloud to Friend Husband at our Sunday breakfast. That is a particularly long-drawn-out affair with us—a goodly supply of ham and eggs, coffee, and whole-wheat toast—and we have plenty of time to discuss our "matters of State," as we call them. Being a lawyer, I put Mrs. Harrison's case up to him. We discussed it pro and con, and both came to the conclusion that there is nothing our Texas friend can do but exercise those very fine human qualities, patience and diplomacy.

* * *

We advise her to call on the selfish neighbor in person—exhibiting the sweet, womanly charm which, we judge by her letter, she must possess. No doubt, Mrs. Harrison, you will be met by a bully; but let him show just what unfortunate elements Dame Nature has assigned to his makeup. He will tell you there is no way of policing the air; that he is within his rights; that he is a radio scientist while you are but an amateur—and all that sort of thing. Listen to him without showing the slightest touch of temper, then ask him in the politest terms if he won't kindly cease in his broadcasting while you and your family are endeavoring to secure a little pleasure.

* * *

I think the man will be reasonable ultimately. Don't attempt to coerce him in any way. Don't talk about law or personal rights, or utter the woman's curse: "Just like a man!" Let your personality be your power. Write me in a few weeks and let me know how my advice—ably abetted by F. H.—works out.

* * *

I am informed that a number of ambitious young singers are anxious to sing into transmitters and have their voices broadcast. This, because one fair soprano of Pittsburgh secured a very profitable engagement from a theatrical manager who happened to be strolling through Times Square, New York, while her voice was drifting out of a loud-speaker.

* * *

There was a dance aboard one of those big white private yachts anchored off Newport, recently. It was Saturday night, and the moon was so near full that all lights were turned off. The music came over the owners' radio equipment. A hundred couples glided over the deck. Thus a new event in the world of social affairs was recorded. Dancing by moonlight on the deck of a yacht to music furnished by radio! Verily, the times do change and we change with them.

* * *

Those escaped prisoners from some New Jersey county jail caused us all a lot of excitement—I mean we radioists up here summering at Lake Hopatcong. Half a dozen women had their sets tuned in and all—including myself—received the descriptions perfectly. We suddenly felt like so many Sherlock Holmes, and were inspired to get blood hounds and scour the circumjacent. When darkness came on, we all felt a bit "skewpy." Mother told me that I always used that word when a little child and imagined there were ghosts in my bedroom. At any rate, we felt relieved when F. H. came up from the city with the cheering news that they had been rounded up by radio and captured.

The programs are particularly good these nights. Really we have not been troubled much by static. I feel that this bugaboo will be eliminated entirely before another summer rolls around. Radio is certainly fascinating—so fascinating that it must soon become universal. F. H. says that clever minds will work out all that is objectionable, just as they did with other great inventions and things that became necessary to the people.

* * *

Miss Clara Duggan, whose letter bears an Oregon postmark, wants to know if there will "be much of a future in radio for women." Hers is a big question and just how to answer it is puzzling to a degree. From inquiries that I have made, woman will find radio a profitable field. There will be many positions which she will fill to far better advantage than man. Women will be needed in radio factories and in radio operation just as they are an integral part of the telephone service of the country. But like all other things, radio must grow, must become standardized, must emerge from its infant state. No other industry—if I may use the word—was taken up by the people so greedily at its start. But it is developing fast and all the rough edges are being filed away by its untiring experts. There will be a big chance for young women who are prepared—who have a scientific knowledge of radio and its workings.

* * *

From my mail bag:

Mrs. J. U. T., Sandusky, O.—"We would be lost without Radio World. It is the family's Sunday reading."

Miss G. L. P., Memphis, Tenn.—"We are fast becoming a real radio city. The Birmingham station is a dandy. The other night we were entertained with a comic opera sent out from St. Louis."

Miss F. G. R., Toledo, O.—"Radio we bless with our hearts. I am speaking for my family. Six months ago father and my two brothers were forced out of work by the dull times. A long spell of idleness and terrible scrimping was broken by the three of them securing good positions in connection with radio. Now all is serene again and the future very, very bright."

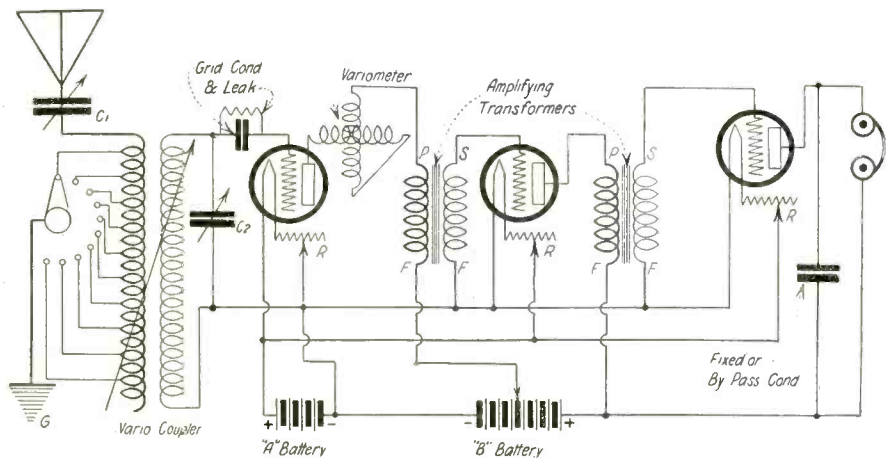
Mrs. D. T. B., Piedmont, California.—"I am writing you from across the continent; but you are responsible for getting me interested in radio. I read your department until I just had to succumb to the fever. I want to tell you now that I am glad. Radio is fascinating. Here in California we have more broadcasting stations than any other State in the Union, and the suspense of listening in as well as being able to operate your own set is truly a wonderful pastime—I'll tell the world!"

How to Make a Detector and One-Stage Amplifier

By Fred. Chas. Ehlert

in Radio World (Next Week) August 26

Answers to Readers



Schematic design of complete regenerative circuit.

I HAVE a complete regenerative variometer set with two-stage amplifier. Trouble is usually encountered, and I would like a diagram so I may look over all connections and see where the trouble may be.—Harold Trowbridge, Canastota, New York.

The schematic diagram published above covers a complete regenerative circuit. Careful attention should be given the batteries and their correct polarities.

* * *

Can I use No. 28 double cotton-covered wire for an aerial?—Louis Hansen, Brooklyn, N. Y.

No. No. 28 wire is too small for aerial or ground leads, although this size wire could be used for laboratory connections.

* * *

How reasonably can I purchase a receiving set that would pick up Washington, D. C., Newark, N. J. and Pittsburgh? I live in a private house, and the nearest broadcasting station is about 50 miles away.—Leon Copeland, Charlotte, N. C.

* * *

Is the cost of installing a set prohibitive?—K. L. Marcy, New London, Conn.

The general advice given by those who have had radio sets for some time, may be misleading in regard to what is required in the way of equipment. The cost may be, apparently, prohibitive. Actually a simple receiving-set which will copy commercial stations from a distance of 500 miles or more is quite small. If all necessary instruments are purchased, the cost should be under \$25. When made by the experimenter himself, the cost of material is less.

Experimenters who are really interested in "What it does and how it does it," find most satisfaction in mastering the details and operation of each instrument as they add to their stations. That is the way of the logical mind and, under cover of providing for real indoor sport, radio work offers to the younger minds valuable development in logical and analytical thinking—more effective than school-book methods since it is accomplished by real entertainment.

* * *

Is there any special reason for using cage antennas?—Morris Siegel, Pasadena, Cal.

Yes. Electrically they handle a given amount of energy with less rise in voltage and, therefore, have less tendency to leak from the ground than any other form. This

advantage comes especially into play when they are used as transmitters. Austin, Miller, and others have proved that trees, poles, and large insulating masses close to a station often absorb energy from a highly charged wire when the charge reverses rapidly.

Mechanical advantages are afforded by the cage antenna in wartime, as a single shot will not bring down a cage antenna because the loops distributed throughout its length separate the wires. The flat-top antenna is not protected in this manner.

* * *

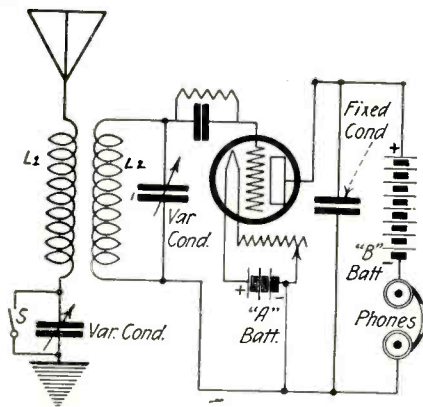
Can I use a King-amplitone-horn with my galena set?—John Morehouse, Schenectady.

You cannot use any horn with a crystal set. Whenever signals are of such volume that you can hear the music—say a foot away from the phones—then use the horn. Would suggest that you use more phones connected in the circuit so more can hear. For loud speakers or horns, tube outfits must be had.

* * *

Where is station 2AXI? Frank Gleason, Kew Gardens, N. Y.

2AXI is the experimental license call of WJZ. This call is used, as a rule, when the station is undergoing an experimental test.



A correct circuit.

Give me the proper circuit using a variocoupler, grid leak, grid condenser, variable condenser, and regular tube equipment.—John Mellinger, Forest Hills, New York.

The accompanying hook-up is self-explanatory. It shows the correct circuit using the equipment you are seeking.



The Summer Camp is made complete by the

MAGNAVOX RADIO—

WHAT wonder that camping parties, clubs, summer schools, hotels and country homes everywhere are enthusiastically taking up Magnavox Radio to solve the inevitable problem—adequate amusement for every member or guest.

It is Magnavox Radio, the reproducer supreme, which makes the receiving set wholly useful and enjoyable.

With the Magnavox Radio you hear every wireless program at its best.



To secure maximum power input for your Magnavox Radio, add Magnavox Power Amplifier Model C (2 or 3-stage) designed especially for power tubes.

No Wireless receiving set is complete without the MAGNAVOX Radio

Any radio dealer will demonstrate, or write us for descriptive booklet and name of nearest dealer.

The Magnavox Co.
Oakland, California
N. Y. Office: 370 Seventh Ave.



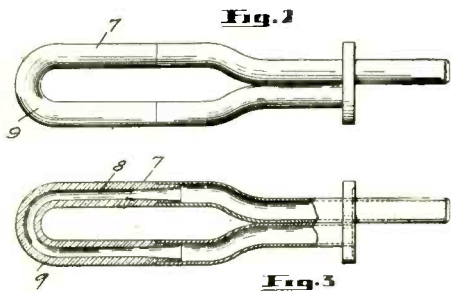
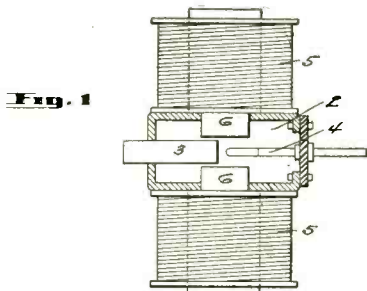
Radio Patents

RECENTLY ISSUED

Oscillator for Radio Transmission

No. 1,424,141. Patented July 25, 1922.
 Patentee: Leonard F. Fuller, Palo Alto, California

MR. FULLER'S invention relates to electrical oscillation generators for use in radio-transmission systems. In oscillation generators of this character, the cathode is carbon and the anode is metal, and during the operation of the generator, when the hydrocarbon atmosphere in which the arc is formed has a high-carbon con-



The three principal parts of Mr. Fuller's oscillator for radio transmission.

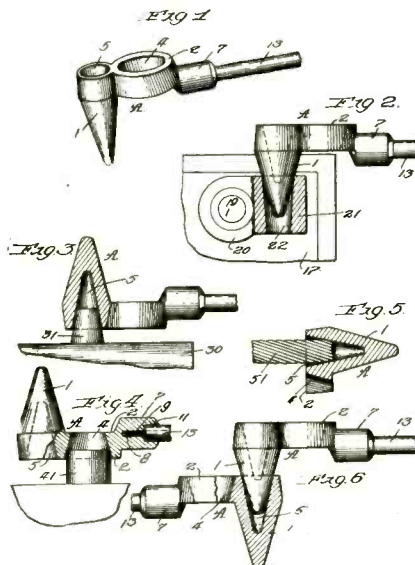
tent, carbon teats occasionally from on the end of the anode, which vary the length of the arc gap and interfere to some extent with the proper operation of the generator. On account of the great heat generated by the arc, the metallic anode is water cooled, and there is a possibility of steam pockets forming in the interior of the anode which would interfere with the proper cooling of the anode tip.

This invention is to provide a cheap, rugged and reliable anode tip for arc converters; also an anode tip which will have a minimum of carbon teats formed thereon. It will also provide a water-cooled anode tip through which the cooling water runs at high velocity close to and in direct thermal contact with the surfaces upon which the arc flame plays.

For Lighting Batteries

No. 1,421,017. Patented June 27, 1922.
 Patentee: Gustave E. Lundberg, Kewanee, Ill.

MR. LUNDBERG'S inventions relates to improvements in battery connectors, and is especially adapted for use at a charging station where automobile starting and lighting batteries of different makes with different kinds of terminals are brought in for charging. One of the features of the



Five principal elements of Mr. Lundberg's invention for lighting batteries.

invention is the provision of a connector that can be easily and cheaply made, that is simple in construction and operation, and that is adapted for universal use with a large variety of battery terminals.

"It is well known that there is a great variety of automobile starting and lighting batteries, such batteries being made of many sizes and designs," says Mr. Lundberg, in his specifications. "It is well known also that the terminals on such batteries are not standardized, such terminals being made in a great variety of shapes and sizes. At a charging station where such batteries are handled in great numbers it is desirable to use a connector that is readily adapted for quick and easy connection to and disconnection from the terminals of such batteries regardless of their design or shape. I have provided such a connector that is adapted for quick and easy connection to and disconnection from a large variety of battery terminals.

"My connector can also be easily and cheaply made; and is simple in construction and operation. My improved battery connector is also adapted to be readily attached to or detached from the end of a wire cable. It is also so constructed that two of such connectors can be attached together. These are valuable features since in connection with the charging of batteries it frequently is necessary in order to get extra length, to attach two or more charging wires together. This can easily be done by taking two or more wires, having one of my improved connectors on each end, and attaching the connectors to each other, thus getting any desired length of wire."

Radioelectron Oscillator

No. 1,424,091. Patented July 25, 1922.
 Patentee: Claude R. Fountain, Macon, Georgia

DESCRIBING his invention, Mr. Fountain says:

My invention relates to radioelectron oscillators, and consists in such an oscillator as affords a double control by means

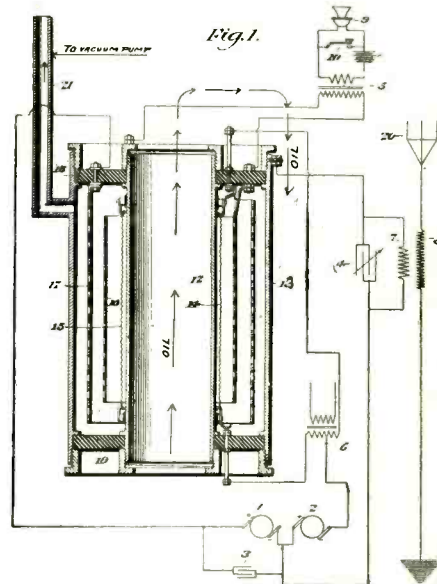
of a medium, preferably a grid, in front and a medium, preferably a cylinder, behind a common source of electrons; both operating in concert to change the speed or direction of the electrons which are being emitted at their common source and are attracted toward other media.

This invention relates especially to that type of electron oscillator wherein secondary electrons are emitted by the impact of rapidly moving electrons upon other media.

The essential elements for this latter type of the invention include a common source of electrons, two control elements, one on either side of this course of electrons, a perforated medium strongly attracting electrons, and another medium capable of liberating electrons under violent electronic impacts.

The number of these liberated, or secondary, electrons determines the amount of current in the oscillating circuit of the ordinary transmitting station.

There are provided also means for insulating the various elements from one another—means for keeping the space between



Mr. Fountain's radioelectron oscillator for handling an unusually large output of energy.

the elements in a highly vacuous state, and means for keeping the device from becoming too hot.

A primary object of this invention is to provide a radioelectron oscillator capable of handling a very large energy output. A further object is to provide a simple means for controlling this energy output.

In the installation of my oscillator, which I denominate a radiotron, there may be used any of the standard methods of combining an oscillator with capacities, inductances, antenna, electric generators, batteries, etc., for the radiation of electromagnetic waves.

It May Be Radio

IN its editorial comment on the death of Alexander Graham Bell, inventor of the telephone, "The World," New York, said:

"Beginning as a novelty, spreading as a convenience or a luxury, the network of wires has permeated the very warp and woof of our social fabric, has grown into it, has grown with it, until there is not a resident of any city in this country who is not enmeshed. If there is ever to be a disentangling, it must come through another invention superseding that of Dr. Bell, perhaps dispensing with wires and even with central operators."

We repeat, it may be radio.

R. A. Heising Perfects Modulator

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

Mr. Heising's photograph was published in "Radio World's Hall of Fame," RADIO WORLD, No. 18, dated August 5.

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

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

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

Radio Big Factor in Gas Consumption

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

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

The Chicago gas plant is operated 24 hours a day in three eight-hour shifts, and is equipped to send out 135,000 cubic feet of gas an hour under peak load conditions. The usual maximum is about 105,000 cubic feet an hour, and at times the output reaches one and a half million cubic feet per day.

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

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

Remington Terminal Indicators

5 CENTS EACH



Type A



Type B

A perfect panel engraving imitation. Fits any binding post. Black japanned, white enameled letters. Supplied in the following: Antenna, Ground, Phones, Grid, Input, Output, A Bat +, A Bat -, B Bat +, B Bat -. Lettering in two positions. Order direct from ad.

Dealers! Write for Discounts!

REMINGTON RADIO CORP., FRANKLIN, MASS.

REMOVAL NOTICE

THE ALLIED RADIO CORP.

Manufacturers of

PANELS

NOW AT

445 SEVENTH AVE.
NEW YORK

FREE

Testing sample of A. R. C. PANEL of hard rubber composition manufactured according to U. S. Navy specification, stands 74,000 ohm resistance, does not warp, drills without a burr. It is highly polished and costs about 1/3 less than other panel material of equal standard. We carry three standard sizes in stock. 7x10x3/16—7x15x3/16—12x14x3/16. Send for your testing sample free and special prices in quantities desired.

SPECIAL INTRODUCTORY

BARGAIN

DICTOGRAPH HEADSET \$9.00

3000 ohms \$12 value

DEALERS WRITE

CENTRAL-KANSAS
RADIO WHOLESALE CO.

LYONS, KANSAS

ADVERTISING SOLICITOR WANTED

High-class advertising man, acquainted with agencies, wanted by successful radio weekly. One with experience on radio or electrical publication preferred. Give full details as to past experience and salary or commission expected. Letters will be held in strictest confidence. Address: Publisher, 30 Fifth Ave., New Rochelle, N. Y.

Advertising Rates, Display, \$5.00 per inch, \$150.00 per page

Radio Merchandising

Classified Quick-Action Advertisements, 5 cents per word

Telephone Bryant 4796

The Demand Is for STANDARD Radio Goods

By Fred S. Clark, Manager Radio World

WHAT are STANDARD goods? Standard goods are goods that are known, that have a name back of them; in short, standard goods are advertised goods. No man can afford to brand and advertise goods that are not right. The profit in advertising is not in the first sale. It is in the repeat business. The pleased, satisfied buyer who "comes back," buys again and recommends the brand to others, is the only buyer in whom there is a REAL profit.

The other day, an advertising solicitor asked me for a position on RADIO WORLD'S advertising staff. Yes, he was still working on a radio trade paper. He went on to prove what a successful solicitor he was by pointing out the large number of advertisements his paper was carrying, due to his efforts.

I asked him if he were doing so well, why change to another paper? This was his answer:

"Every time I sign up a manufacturer to advertise in a dealer publication I feel as though I were robbing him. Even if the advertisement brings orders, stocking the dealer up with 'shelf warmers' doesn't get anybody anywhere but the poorhouse. Just loading up the retailer isn't putting goods into consumption. Dealer publications create no consumer demand.

"When a manufacturer advertises in a 'fan' publication, like RADIO WORLD, then and only then is the manufacturer creating a demand for his goods—he is then talking to the thousands of real buyers—the consumers; he is building up a name, standardizing his brand, and getting somewhere.

"The man who puts an inch advertisement in a 'fan' publication, eventually becomes a page advertiser; but as long as I work on a dealer or trade-radio publication of limited free dealer circulation, I've got to keep looking for new advertisers all the time."

He said just that!

Personally, I think about advertising as the old Kentucky Colonel did about whiskey, i.e.: "All advertising is good, only some is better." The market has been flooded with radio goods thrown together by inexperienced workmen. In the boom and rush of last spring, most anything would "get by." Today it's quite different. The burnt child is twice shy—radio buyers want to know more about the goods they spend their good money for. "Who Made Them?" Tomorrow the buying public will be demanding STANDARD radio goods—goods backed by manufacturers they know, a name they have seen and become familiar with through their continued advertising in the "fan" papers they read. That's why I think you will see a continued increase in the advertising in "fan" radio papers like RADIO WORLD, and a mortality in the dealer, or radio trade papers, whose circulation is necessarily very limited, and mostly given away. The results from FREE circulation has always been poor.

J. H. Cross Co., general advertising agents, of Philadelphia, is as convinced of the value of the consumer argument that they take a page in "Printers' Ink" to say so. Here is the Cross argument:

"We believe in consumer demand. We write copy—founded on a basic sales idea and forcefully expressed—that creates demand. And the sooner the business world forgets about 'consumer acceptance' and freak merchandising stunts, the better, we think, will business become. Sell the consumer—the trade will follow."

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

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

Bell Radio Corporation, 1913 Fifth Ave., N., Birmingham, Alabama.

Radiofone Sales Co., 410 Industrial Bank Bldg., Hartford, Conn.

Premier Equipment Radio Co., 21 East Van Buren St., Chicago, Ill.

Eclipse Radio Co., Geneva, Kane Co., Ill.

New Orleans Radio Electric Shop, 609 Commercial Place, New Orleans, La.

Master Machine & Radio Co., 4205 Third St., Detroit, Mich.

Radio Shop, F. C. Neiman, North Ave. and 35th St., Milwaukee, Wis.

Beaumont Radiofone Co., Inc., 114 North Juniper St., Philadelphia.

The Falls Radiophone Co., 710 Fourth St., Niagara Falls, N. Y.

Acme Radio Supply Co., 8 West Canal St., Cincinnati, O.

Columbus Radio Parts Co., 195 East Long St., Columbus, O.

EssTee Radio Co., 1810 Commerce St., Dallas, Texas.

The Radio Store, First and Howard Sts., Spokane, Wash.

Prima Radio Corp., Del., 50,000 shares preferred stock, \$10 each; 5,000 common, no par value. (G. Klumpp, 185 22d St., Brooklyn, N. Y.)

Meek Radio Mfg. Co., Bronx, \$10,000; M. Goldfarb, M. Etman, (Attorney, A. Chalce, 111 Broadway, N. Y.)

American Radio Phonolamp Corp., New York, manufacture lamps, \$2,200,000. (U. S. Corporation Co., Dover, Del.)

Radio "Sherlock Holmes" Locates Trouble

NED LAWRENCE, writing in the Los Angeles "Herald," tells of the self-imposed detective activities of a radio fan whom one interference too many rendered desperate. He fitted up his automobile with a small antenna on top of the car, adjusted his head-phones, tuned his set to the disturbing signals and started on his way. He circled about in his territory, moving a'ways toward the point where the interference seemed most pronounced. Finally he would locate the signals in a comparatively small area, and then would pursue subsequent investigations until he located the origin of the disturbance.

In these experiments he traced the trouble to a faulty transformer on the electric-power wire, to a high tension wire which had rubbed against the branch of a tree, and in the third instance a small boy's attempt to build binding posts located to conform to the two sets on the adjacent edges of the tuner and detector panels, so that the temporary insertion of radio-frequency amplification is quite simple.

LAST MINUTE RADIO NEWS!

Radio apparatus exported by the United States during the month of May was valued at \$25,000, according to the Bureau of Foreign and Domestic Commerce, Department of Commerce. Ten thousand dollars' worth of American-made apparatus was shipped to Japan. Australia, Canada and New Zealand bought \$5,000 worth each.

Lewis Nixon, naval architect and former chairman of the Public Service Commission of the State of New York, has sailed for England with a radio set which, he asserts, will revolutionize reception. He claims that his set, without an aerial, will equal the best efforts of much larger apparatus.

The first wireless lighthouse has been erected off the east coast of Scotland, on the island of Inchkeith, and its operation during the experimental period indicates that it will remove one of the last terrors from navigation. It is designed on the principle of reflected waves outlined by Guglielmo Marconi. The exception is that the reflector revolves in the same manner as the reflector of an ordinary lighthouse.

E. F. W. Alexanderson, chief engineer, Radio Corporation of America, is visiting his native country, Sweden. In an interview with the Stockholm press, Mr. Alexanderson explained that only an extremely limited number of trans-Atlantic radio stations could be operated successfully without serious interference. He said that various countries already had reserved most of the wave lengths suitable for trans-Atlantic communication, and only a few were left.

The new radio station at Sainte Assise, begun last year by the French Government but taken over and completed by a private company, which will permit the simultaneous sending of from five to six messages to points outside of Europe, is ready for operating. It is for commercial traffic between France and the United States, and at 700 amperes gives an efficiency 50 per cent. greater than that of the Bordeaux station. "Commercial rush" messages will be sent at faster than 100 words a minute, giving an average of more than 30,000 words an hour. It will reach all receivers throughout the world. Ste. Assise has requested that its complementary station in America be the Radio Corporation plant at Marion, Mass.

Telephone communication by radio will be opened across the Chosen Strait the early part of this month. The stations at Fukuoka and Fusan contain the necessary equipment. It is expected that shipping along the coasts of Kiushu and Chosen will take advantage of this service. This particular installation is a unit in the government plan for linking up the various islands of the Japanese Empire by wireless telephone and telegraph.

According to Commercial Attaché Feely, no laws have been passed to govern wireless telephony in Argentina, but a bill is being drafted for presentation to the next Congress to regulate the use of radio sets. There are no regulations in effect at the present time to prevent the sale of broadcasting and receiving sets. The latter are being manufactured to some extent locally, but are of very inferior quality and sell at from 200 to 700 pesos. (The Argentine peso is worth about 96 cents in United States coin.)

de Forest
RADIO
"The Standard of Dependability"
DeFOREST RADIO TEL. & TEL. CO.
JERSEY CITY, N. J.

The Nelson Radio Parts Co.
Manufacturers and Distributors of
RADIO APPARATUS
Write for Catalog.
89 ACADEMY STREET, NEWARK, N. J.
Tel. Market 4066

Buy Your Radio Receiving Set at Manufacturers' Cost
Buy your Radio Supplies at a large discount below the list or retail price. If a saving of \$15.00 to \$140.00 on a Radio Receiving Set or if a saving of 25% to 40% on Radio Supplies interests you, write or telegraph us today.
KING RADIO MFG. COMPANY
521 Penn Ave. Wilkensburg, Pa.

Delaware Now Has a Broadcasting Station

THE first licensed radio transmitting set in the State of Delaware has started operations at the broadcasting station of the Wilmington Electrical Specialty Co., Inc., 705 Adams Street, Wilmington. This is the first station in the State to receive a Federal license and the only station to have a range sufficient to reach Philadelphia and surrounding cities.

One of the largest broadcasting sets in this part of the country is now operated by Willard S. Wilson, president of the company, the above address being his home. He is a licensed operator for the company's station. The set, which was built by the local radio corporation, is equipped with four bulbs for transmission of 50-watt power. This enables the station to have a range of from 75 to 150 miles, varying according to the time of day. At night the maximum distance can be reached, as at that time there is less interference than at any other time.

Following the first program (a concert) the company received telegrams and phone messages from a radius of 100 miles, from people who had heard the test. The program had come in clearly and strong. The present plan is to put on daily a program of home talent, singers, speakers, orchestras, bands, and soloists. A religious program will be given on Sundays.

AGENTS

Wanted in every city and town to sell radio apparatus. Good commissions. A few stocking agencies open to reliable parties.
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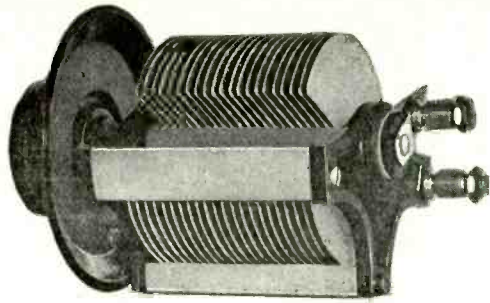
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Packed in strong box
Complete with dial \$4.50
Dials, 1/4 Shafts 75c

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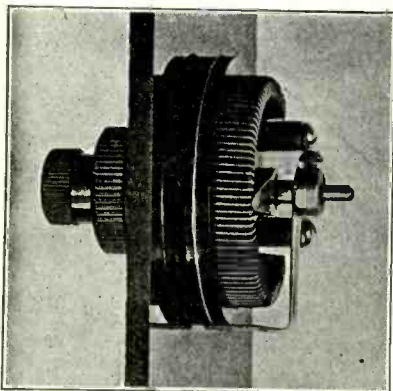
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- WIAN—Chronical & News Pub. Co., Allentown, Pa.
- WIAQ—Chronicle Publishing Co., Marion, Indiana.
- WIAF—Gustav A. DeCortin, New Orleans, La.
- KFBE—Reuben H. Horn, San Luis Obispo, Cal.
- WJAD—Jackson's Radio Engineering Laboratory, Waco, Texas.
- WIAG—Matthews Electric Supply Co., Birmingham, Ala.
- WIAD—Ocean City Yacht Club, Ocean City, N. J.
- WHAW—Pierce Electric Co., Tampa, Florida.
- WIAP—J. A. Rudy & Sons, Paducah, Ky.
- WIAC—School of Engineering of Milwaukee, Wis.
- WIAL—Standard Radio Service Co., Norwood, Ohio.
- WHAV—Wilmington Electric & Specialty Co., Wilmington, Del.
- WIAE—Mrs. Robert E. Zimmerman, Venton, Iowa.
- WJAB—American Radio Co., Lincoln, Nebraska.
- WIAS—Burlington Kawkeye, Home Electric Co., Burlington, Iowa.
- KPAV—Cooke & Chapman, Venice, California.
- KFAW—The Radio Den, Ashford & White, Santa Ana, Cal.
- KFBF—F. H. Smith, Butte, Montana.
- WJAE—Texas Radio Syndicate, San Antonio, Texas.
- WIAU—American Security & Savings Bank, Le Mars, Iowa.
- WJAG—Huse Publishing Co., Norfolk, Nebraska.
- WIAT—Leon T. Noel, Tarkio, Mo.
- WJAC—Rodoll Co., Joplin, Mo.
- WIAW—Saginaw Radio & Electrical Co., Saginaw, Mich.
- WJAJ—Y. M. C. A., Dayton, Ohio.
- WIAX—Capital Radio Co., Lincoln, Neb.
- KFBG—First Presbyterian Church, Tacoma, Wash.
- WIAV—New York Radio Laboratories, Binghamton, N. Y.
- WKAA—H. F. Paar & Republican Times, Cedar Rapids, Iowa.
- WKAC—Star Publishing Co., Lincoln, Neb.
- WJAK—White Radio Laboratory, Stockdale, Ohio.
- WIAZ—Woodward & Lothrop, Washington, D. C.
- WJAM—Central Park Amusement Co., Rockford, Ill.
- WIAZ—Electric Supply Sales Co., Miami, Florida.
- WJAP—Kelly-Duluth Co., Duluth, Minn.
- WKAD—Charles Loeff, East Providence, R. I.
- WJAR—The Outlet Co., Providence, R. I.
- WJAN—Peoria Star & Peoria Radio Sales Co., Peoria, Ill.
- WJAX—D. M. Perham, Cedar Rapids, Iowa.
- KDZT—Seattle Radio Association, Seattle, Wash.
- WJAL—Victor Radio Corp., Portland, Me.
- WKAF—W. S. Radio Supply Co. & Wm. Schack, Wichita Falls, Texas.

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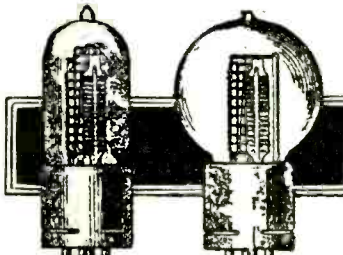
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These are the Tubes for which so many are inquiring and that are still difficult to find anywhere. There being very few of these tubes on the market, and after present supply is exhausted, more will not be available at any price, as they are to be made exclusively for the U. S. government, sure long life.

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Speed of Radio Waves

EVERY amateur or other radio operator, when sending out a message, may rest assured that his signal has reached Mars in a little over four minutes, if the planet happens to be at the nearest point of its circuit or in about twenty minutes if it is at the opposite side of the sun, says "The American," New York. Whether or not there are intelligent beings, conversant with radio, inhabiting the planet, is a question that does not for the moment concern us.

Such speculations are of interest because they bring vividly to mind the fact of the almost unthinkable speed of the electromagnetic waves that convey the radio messages. One way of illustrating this is to compute that the radio waves would go clear round the earth at the equator more than seven times in a second. In the thousandth of a second they reach out to a receiving station 186 miles away. In the hundredth of a second they would compass 1,860 miles—half across the continent.

Meantime sound travels through the air to a distance of only a little over ten feet in the hundredth of a second. And so a curious paradox presents itself. If you were in the broadcasting room, over there in Newark, let us say, listening to a speaker who was talking into the microphone transmitter, the words would not come to your ears until later (by the fraction of a second) than the time when they had been heard by every one of the listeners using radio-receiving telephones within a radius of a hundred miles.

When President Harding delivers an open-air address which is radiophoned from the great transmitting station at Arlington, the persons within actual sound of his voice—those in the audience directly in front of him—are the very last ones to hear what he says.

If he were speaking through a megaphone that would carry one-third of a mile, the members of the audience at that distance would hear his words at just about the same instant when the message reached the man in the moon.

Radio in Department Stores

THE installation of a broadcasting station in a community where as yet no other store or organization has one creates a tremendous amount of prestige and is of exceptional advertising value. It must be understood that, for the present, no direct advertising may be sent through a broadcasting station. The United States Government is issuing licenses for stations sending out only educational and recreational programs. However, in making each announcement on your radio program you are privileged to give the name of your station and its location. It is also possible to have members of your organization, or outside experts, talk on various matters of general interest which, incidentally, tend to bring business to your store. Thus, you can have your fashion expert talk on style, or have your shoe buyer talk on shoes and their effect on health, or in other words develop programs that suggest to the minds of the listener that your store is the logical center for certain lines of merchandise and for others of an associated nature.

To many anxious inquirers. RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

BUY "RITE"

\$5.00 Variometer	\$3.20
\$5.00 Variocoupler	3.20
Flrth S. C. Jack	.58
Rite Rheostat	.75
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CRYSTAL RECEIVER complete—Aerial, Lightning Arrester—Phones, ready to operate	20.00

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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.

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THE PAN-AUDIO Three Step Amplifier was designed by expert radio engineers for those who demand the maximum of high frequency, scientific construction, appearance and workmanship in radio apparatus.

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The PAN-AUDIO is made of solid mahogany, hand rubbed to a furniture finish. The panels are of best grade bakelite, carefully engraved, with nickel-plated binding posts and invisible wiring. May be used with any type of receiving set.

Ask your dealer to show you the PAN-AUDIO today. If he hasn't got it write us direct for illustrated literature and full details.


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BRANCH OFFICES—New York, Chicago, Pittsburgh, Los Angeles, New Orleans, Detroit, Toronto, Philadelphia, Baltimore, Dallas.

Value of Radio in Wartime

THE anniversary of the beginning of the Great War, eight years ago, will suggest to many minds the peculiar problems and difficulties of that period, which could so much more easily have been met with the aid of radio broadcasting; says "The Globe," New York; at least it is quite certain that in any future similar period of agitation a new and effective instrument will be at hand to meet those problems. It will be recalled, for instance, that great internal difficulties were created by the impossibility of imparting neutral facts to millions of our foreign-born population. Many of these could not read English. Others, and with them many Americans, thoroughly distrusted the various news sources, in most cases unjustly, perhaps, but in many cases with all too much reason.

Broadcasting would not, of course, remove all such mistrust, but it would allay a great deal of it if the source of the spoken news were definitely known to be official rather than private. The difficulties due to illiteracy or inability to read English would be overcome to even a greater degree. Broadcasting could supply the means for progressive education, trustworthy information, and finally, if needed, patriotic propaganda among many diverse elements of the population.

It is to be hoped that the uses of the radio will always hereafter be peacetime rather than wartime ones; but in the latter event we may well believe that it will serve to decrease the dissension within and to increase the fighting efficiency at the front.

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.

ANNUAL SHOW OF THE ST. LOUIS RADIO ASSOCIATION, St. Louis, Mo., October 4 to 7, inclusive.

CHICAGO RADIO SHOW, Coliseum, Chicago, Ill., October 4 to 22. U. J. Hermann, managing director, 549 McCormick Building.

INTERNATIONAL RADIO EXPOSITION, Grand Central Palace, New York, December 21 to 30.

KANSAS RADIO EXPOSITION will be held at the Kansas State Fair, Hutchinson, Kansas, September 16 to 22, inclusive. A. L. Sponsler, secretary.

MERCHANTS' COOPERATIVE ADVERTISING AGENCY RADIO SHOW, Robert Treat Hotel, Newark, N. J., October 4 to 7, inclusive.

"RADIO DAY," Pittsburgh, Westview Park, August 24. Under auspices of Radio Engineering Society. C. E. Urban, secretary.

RADIO CLUB OF AMERICA. First autumn meeting will be held the last Friday in September. Renville H. McCann, secretary, Columbia University, New York.

CLEVELAND RADIO AND ELECTRICAL EXPOSITION, Cleveland Public Auditorium, Cleveland, O., August 26 to September 4, inclusive.

CINCINNATI RADIO AND ELECTRICAL EXPOSITION, Music Hall, Cincinnati, O., October 7 to 14, inclusive.

NEW YORK ELECTRICAL AND INDUSTRIAL EXPOSITION, Grand Central Palace, New York City, October 7 to 14, inclusive.

No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.
RADIO WORLD, 1493 Broadway, N. Y.

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

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 4796.)

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TWIN S CRYSTALS—The Super Sensitive Crystal. Sold with a money-back guarantee. Paid, 25c. 500-Mile Regenerative Plan and Catalogue Free. NELSON MFG. CO., Interurban Bldg., Dallas, Texas.

RADIOISTS—Send for literature describing Vosco Tunette. Compact, simple, efficient tuner for radiophone reception. Broadcasts heard hundreds of miles. Panel or table mounting. Price, \$5.00. VOSCO RADIO LABORATORIES, Troy, Penna.

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AMATEURS, ATTENTION! USED APPARATUS!—Audion, complete with bulb and battery, \$10.00; Adams Morgan Variable Condenser, wood case, \$2.50; Murdock Variable Condenser, .001 mfd., \$3.00; Arnold Loose-Coupler, \$10.00; Short Wave Receiver, 200 to 800 meters, fitted for audion bulb, etc., \$15.00; Klitzen Rotary Gap, \$15.00; Half K. W. Packard Transformer, unmounted, \$10.00; Holtzer-Cabot Headset, 2,200 ohm. (new), \$6.00; Swedish-American Headset, 2,200 ohm. (new), \$6.00; 2-inch Spark Coil, \$5.00; Stationary Gap, 50c; Regenerative Tuner, consisting of two variometers and vario-coupler, mounted on handsome brown hard rubber panel in walnut finished case, hand rubbed. This tuner is a beauty in appearance and performance. \$25.00. First money order takes them. Do not delay! L. M. SMITH, Box 66, Salem, Wis.

43 PLATE CONDENSERS, \$3.95; Rheostats, 95c; 7-Strand No. 22 Tinned Antenna Wire, 90c per 100 ft.; Manhattan Head Phones, \$6.00; Tested Galena, 20c, mounted, 30c; Contact Points, 30c per dozen; Complete Crystal Sets, with Aerial Equipment and Manhattan Head Phones, \$12.50. Postage paid to second zone. Write for prices on parts not listed. COLUMBIA RADIO COMPANY, P. O. Box 1720, Washington, D. C.

AUGUST SPECIAL
AUDION RECEIVERS, regular price, \$32.50, reduced to \$25.00 for short time. Wave Length, 200 to 800 meters, Variable Condenser, two Ten Point Switches, Socket, Dials, etc. Mounted on Mahogany Panel in 8 x 9 x 6 Mahogany Finished Cabinet. Shipped prepaid upon receipt of money order. Every set guaranteed. Stamp for descriptive circular. GIBSON & COLLINS, 515 Evergreen Avenue, Brooklyn, N. Y.

PATENTS

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Molded dials, 2, 3 and 4 inch. 30, 40 and 50 cents. Detector tubes, \$4.25. Amplifiers, \$5.00. Get our list. Radio Supply Co., Weedman, Ill.

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A BROADCASTING MAP of the leading broadcasting stations of the country was published on the center page of RADIO WORLD dated May 20. Mailed on receipt of 15c., or send \$3.00 for six months, or \$6.00 for a year, and start your subscription with May 20 issue. RADIO WORLD, 1493 Broadway, New York City.

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Dr. Miller, of Chicago, writes: "My perfectly good variometers and vario-coupler now go into the discard."

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Help Your Broadcaster


IF the radio program from each station does not contain selections sung by famous artists, remember that the broadcaster and the entertainer are giving their time, for your amusement, gratis, and that famous artists are hard to get; that fifty-watt tubes cost \$30 apiece, and are difficult to obtain, and that the costs of running a station are heavy at all times, says "Radio Journal." Entertainers sing for the publicity they get out of singing, and the broadcaster sometimes has a difficult time to get anything but phonograph music. If you know anyone who might want to sing over the radio take him or her to your favorite station and effect an introduction. If your friend really can sing there will doubtless be a place on the program. Be constructive, however—don't kick. Aid your broadcaster.

* * *

A Radio Catastrophe

THE Los Angeles "Times" suggests that the difficulty in procuring good audions these days may be due to the fact that the world's supply of vacuum may be exhausted. This is in line with "Life's" brilliant remark that "after careful investigation, the New York police report that the crime wave is caused by ultra-violet rays."—"Radio Journal."

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THE manner in which the time signals are transmitted from Arlington is as follows: The ticks are reproduced, starting from 9.55, Eastern standard time, every evening. Each second is sent out as a short dash, which is reproduced in the telephones. The tick of the twenty-ninth second of every minute is skipped, leaving quite a distinctive space. At the end of each minute the signals are omitted for several seconds, making a longer pause. At the end of the fifty-ninth minute after 9 o'clock the signals are omitted for ten complete seconds, which, of course, is much more noticeable. This longer pause also permits the operator of the broadcasting station, to announce over the 360 meter wave his famous: "The next dash will be 10 o'clock."

One of the officials of a broadcasting station made the following suggestion:

"A convenient way to check your watch is to follow the second hand during the first part of the signals, thus noting the position of the second hand relative to the end of the minute. The minute hand should be observed during the fifty-ninth minute and checked with the signal for 10 o'clock. In this way you can tell exactly how many minutes and seconds your watch needs to be changed in order to have absolutely correct time."

Defining "Ground"

EDITOR, RADIO WORLD: Looking over your "RADIO WORLD'S Revised Radio Dictionary" by Fred. Chas. Ehlert, I note in the definition of "Ground." It states that "Its main function is with the antenna, or aerial, and acts as a large condenser between the aerial and ground."

While this, in a way, is correct, permit me to suggest this definition:

The aerial and ground comprise a huge condenser with the air between as the insulator or dielectric.

From your definition, one not familiar with radio might get the erroneous idea that the air between the aerial and ground is the condenser while, in truth, it is the dielectric.—H. V. Houyoux, Franklin, N. J.

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Public Health Broadcasts Resumed

THE Public Health Information Service by Radio, the only national education by radio in the world, is again back on the air through NOF, the Naval Radio station at Anacostia, D. C. This service, together with all voice broadcasting through naval stations, was temporarily suspended on April 15, in order to effect a reduction in the existing interference pending decision on a government radiotelephone policy. The development of a radio policy has progressed to a point where it is possible for the Public Health Service broadcasts to be resumed. Since this educational service was suspended, hundreds of letters have been received from operators all over the eastern half of the United States asking that the public health broadcasts be continued.

"While we regret the temporary suspension of this service since April 16," an official of the Public Health Service said to-day, "we realized the necessity for a government radio-policy and appreciated fully the wisdom of suspending service until a government policy could be established and a program for avoiding interference devised. The letters received indicate that the broadcasting of educational material for the consumption of the general public has met with popular approval."

With the resumption of broadcasting public health-messages through NOF, the station through which the Public Health Information originally began, stations co-operating with the Public Health Service in spreading the "gospel of health" will number seven, including WGI, American Radio and Research Corporation station nat Medford Hillside, Mass.; CKAC, "La Presse," Montreal, Canada, relaying in both French and English; KDKA, Westinghouse Electric & Manufacturing Co., East Pittsburgh; WRK, Doron Brothers Electrical Co., Hamilton, Ohio; 7XF, Northwestern Radio Corporation, Portland, Oregon; and KFC, "Post Intelligencer," Seattle, Washington.

These Public Health broadcasts are being released through NOF on Tuesdays and Thursdays at 7:45 p. m., standard time.

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been dubbed a "poor, misguided boob." To-day, we simply shrug our shoulders and remark, "Zat so."

C. Holmes Rapp, a business man of Chautauqua, New York, was sitting in his room at Atlantic City, when he re-

ceived a radio message from his wife on board the French liner "La Savoie" at Ambrose Lightship, twenty-five miles from New York City, that the vessel would dock that same night. Mr. Rapp found that the last train by which he could reach the New York pier in time to greet his wife had left Atlantic City. The only way the journey could be made was by airplane.

Mr. Rapp succeeded in chartering a flying boat, and made the trip, comfortably, in seventy-five minutes. He landed at the foot of Eighty-sixth Street, North River, at 9 o'clock, and went to the French Line pier at the foot of West Fifteenth Street by taxicab, arriving in ample time to welcome Mrs. Rapp at 10:50 P. M.

He said the trip by air was far more comfortable than the usual journey by train. Daylight lasted until the plane neared New York, when a slight mist was encountered.

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Short Cuts in Receiver-Circuit Design, by O. C. Roos.
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AUGUST 5.

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AUGUST 12.

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Radio Spelling Bee Needed!

HAVING read hundreds of letters written to "The Evening Mail Review" by amateurs seeking advice, the young man in charge of the laboratory took a day off and compiled the appended list of mis-spelled names contained in the letters. He explained each name in the spirit induced, apparently, by the spelling:

- Ariel—Wave grabber.
- Lose Cuppel—Method for connecting wave-trains.
- Grownder—Same as water pipe.
- Gleaner—A crystal which collects sounds, and dust.
- Varibel condensor—Plates to hold waves temporarily.
- Switch—Device for trying another set.
- Indoor ariel—Bedspring.
- Roter—Opposite of Stater.
- Arestor—Scheme for leaking lightning away.
- Transformser—Device for changing squeak into howl.
- Howel—Result of Armstrong's discovery.
- Lisense—Scrap of paper issued by Radio Inspector.
- Loding coil—Portable antenna lengthener.
- Honeycome coil—Coil of wire with college education.
- Button—Same as switch point.
- Sodder—Glue for copper wire.
- Reostat—Arrangement to light tubes on six volts.
- Panle—Piece of soap box.
- Multy-Circit jack—Scheme for complicating diagrams.
- Milkrofarrad—Contents of a condenser.
- Hell—Winding the inside of a variometer.
- Raddio Editer—Only person who knows Armstrong's new circuit.
- Dector—Complete gleaner outfit, including cat whisker tickler.

Big Radio Cable Service Planned

IMPORTANT news comes from Australia to the effect that the six States of Australia, combined with Canada and Great Britain will supplement the "All Red" cable line with a highly developed radio service.

The main Australian station will probably be located in New South Wales. According to the Melbourne "Argus," the power used will be about 3,000 kilowatts and the combined cost of the central station and of a feeder station in each of the six Australian States will be \$5,000,000. The plant for the central station will be manufactured in England, but those for the smaller stations will be made in Australia.

The controlling interest in the Amalgamated Wireless is vested in the Commonwealth Government, and of the seven directors the government and the minority stockholders will each have three, the seventh being chosen by vote of the first six. An important clause is that prohibiting the Amalgamated Wireless from combining with any other commercial interest and requiring it to remain always "an independent British concern."

The company is also to develop, manufacture and sell radio apparatus and to furnish service to ships and aircraft. It has been made a party to the general agreement for the interchange of radio patents entered into by the principal radio equipment companies of the world.

New high-power radio stations to communicate with Australia are planned for Great Britain and Canada. The proposed rates for services are about two-thirds of the present cable rates.

Radio-Detector Minerals Now in Use

THERE are a number of minerals used as radio detectors and each crystal has some individual characteristic which must be treated in various ways to make it satisfactory for radio work, says a writer in "The Times," New York. The most widely used of all crystals is galena and carborundum. Perikon, silicon, tellurium, molybednite, zincite, iron pyrite and several other minerals also allow unilateral conductivity. The crystals are generally held firmly in a small metallic cup, clamping device or molded in a bed of easily fusible metal such as Wood's metal. The crystals are either placed under a heavy or light pressure, depending upon the type of mineral employed, or a metallic contact is made by a fine wire resting lightly on the surface of the crystal.

Galena, the most sensitive of crystal detectors, is sulphide of lead mined in several of the Western States. It has

a brilliant metallic luster and a bluish-gray or lead-gray color. The galena detector consists of a small piece of the mineral held in a metallic cup or clamp so an electrical connection is made possible. A fine wire of copper, about size No. 32, rests on the surface of the crystal. The great disadvantage of such a detector is lack of stability or permanent adjustment, since the wire is easily jarred off the sensitive spot best suited for its work.

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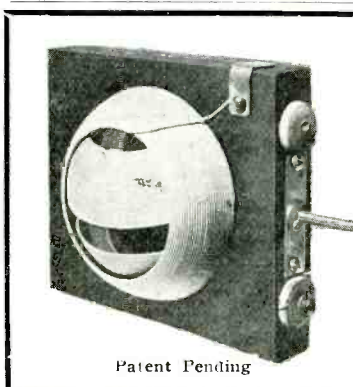
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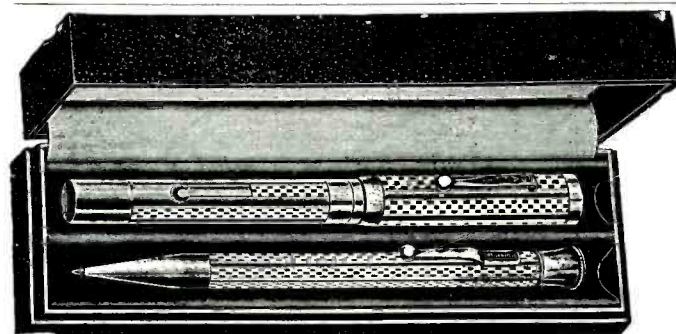
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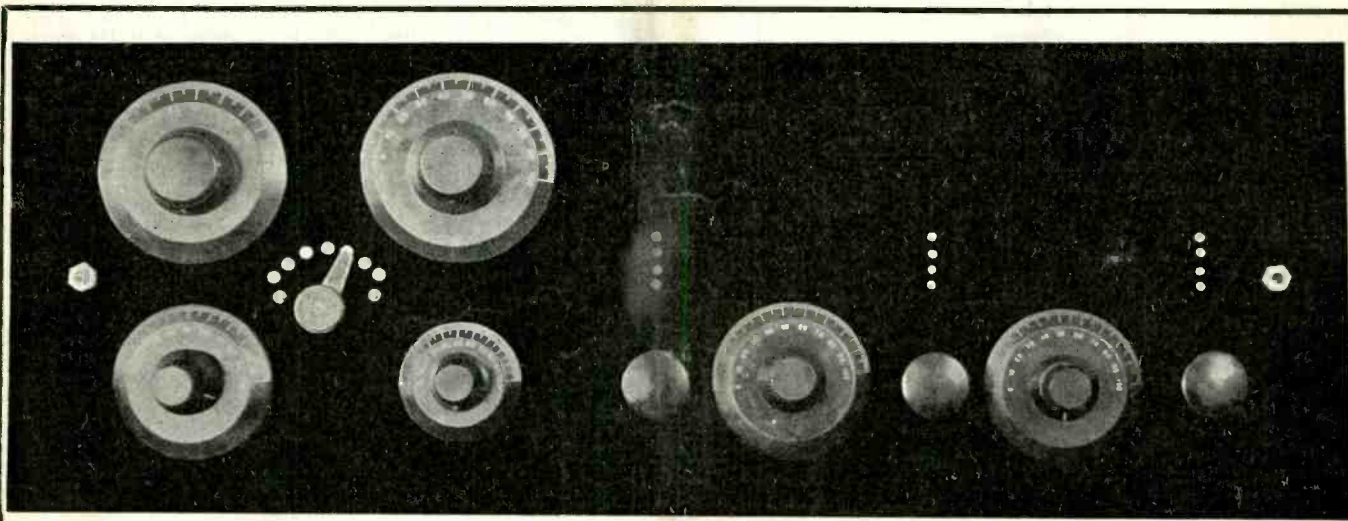
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