

# Radio Digest

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TRADE-MARK

Vol. 1. No. 6

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E. C. Rayner

CHICAGO, ILL., SATURDAY, MAY 20, 1922

PRICE TEN CENTS

## NO BATTERY NEEDED

### RADIO CHAMBER OF COMMERCE FORMED

MANUFACTURERS MEET IN EAST TO ORGANIZE

All Apparatus Will Need Official O. K. of This Body

Special to RADIO DIGEST

NEW YORK—One of the latest steps taken in Radio activities was the forming of the National Radio Chamber of Commerce with headquarters in New York City and district offices in Chicago.

Alexander Eisemann is president of the new organization. The purpose of this association is to remedy certain conditions that have arisen in the Radio industry as a result of its tremendous growth in such a short space of time. All manufacturers of Radio apparatus are eligible to membership. The original group consisted of about 15 manufacturers. About twenty additional members have been added by invitation. New members will be eligible only after their apparatus has been passed upon by a board of five members.

Concerns who have been organized purely for the purpose of stock jobbing will be excluded. A credit bureau will also be organized for the exchange of credit information.

### Here Is Chance to Work for the U. S.

Civil Service Commission to Hold Examination for Radio Clerk of Bureau of Navigation

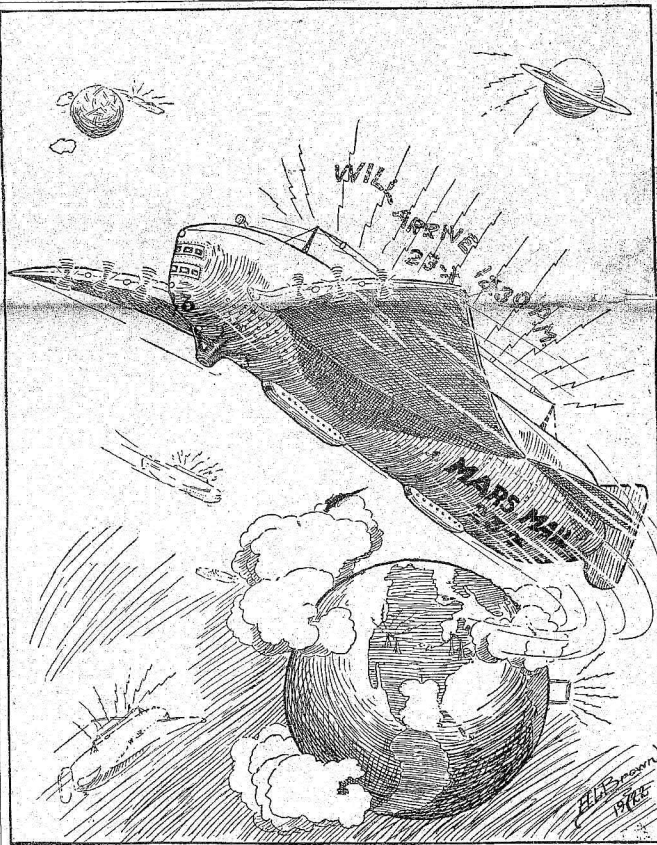
Special to RADIO DIGEST

WASHINGTON, D. C.—The United States Civil Service Commission is announcing an examination to be held on June 7 for a Radio clerk for the Bureau of Navigation, Department of Commerce, at a salary of \$1200 a year.

The applicants must hold a first grade Radio operator's license and be able to use a typewriter. The credits on the various subjects as given by the Civil Service Commission are as follows: Spelling, 15 per cent; arithmetic, 15 per cent; letter-writing, 15 per cent; penmanship, 15 per cent; copying from plain copy, 15 per cent; experience on the typewriter and Radio, 25 per cent.

### CLEVELAND MAKES INSTALLATION FEE \$2

CLEVELAND, OHIO—A fee of \$2 must be paid to the city for an installation permit of a receiving set if the ordinance introduced becomes a law. The ordinance provides for inspection of all present stations. They must also conform to rules of the city electrician. Violation of the ordinance carries a fine of \$25 to \$500.



### WAVE MUSIC CALMS PATIENT OF DENTIST

Tooth Extraction Is Made Easy by Symphony

COLUMBUS, OHIO.—The composer, Charles Gilbert Spress, had a tooth that called for some attention. While in a dentist chair he had the unusual experience of hearing by Radio one of his own songs sung by Miss Anna Case. It soothed him while the dentist drilled. The dentist claimed that it was easy for a patient to take gas to the strains of Italian opera or a Brahms lullaby. It helped a lot, too, during the process of completing crowns when the Radiophone rendered "Look for the Silver Lining."

Music Firm Opens Radio Sales  
CHICAGO—Lyon & Healy, music dealers, Chicago, have installed a Radiophone department.

### Corporation Will Put Airphones in Homes

Bungalow Buyers to Get Receiving Sets

CHICAGO.—The "own your home" crusade is given some impetus by the Mutual Home Building Corporation which will install free of charge a complete Radio outfit in every bungalow, flat and apartment and home which it builds or finances. The plan offered is to issue a building contract on 10 or 15 per cent of the cash cost of the building as a first payment. The purchaser takes possession of the building as soon as completed and pays for it at the rate of 1 per cent a month on the unpaid balance. This includes both the payment on the principal and interest.

So good was the Radio connection between a flying airplane and a racing automobile recently that the pilot's teeth were heard chattering.

### TEST SHOWS NEW CIRCUIT PRACTICAL

B. F. Miessner of Chicago After Three Years' Work Perfects Revolutionar...

Formerly Naval Expert

"A" Batteries Will No Longer Trouble Fans — Ordinary Lighting Current Used

Perfect reception without the use of storage batteries was accomplished last week at the home of Benjamin F. Miessner, noted Radio research scientist of Chicago. The test demonstration, made before a group of Radio engineers and representatives of the newspapers, was the culmination of three years' work by Mr. Miessner. In the set used by him, a flexible cord with plug was attached to an ordinary electric light socket, entirely replacing the cumbersome storage cell formerly necessary in the use of vacuum tube receiving outfits.

The invention of Mr. Miessner means that the receiving set of the novice will no longer require a storage battery but will have instead an extension cord and socket. No longer will the beginner need to worry whether or not his lighting battery is properly charged, for this cumbersome accessory is eliminated.

KYW Comes Through Clear  
"This is KYW, Westinghouse station," came the announcer's voice clear and loud. Then followed music and the regular program. Everyone present was surprised at the distinctness and audibility with which the Chicago station broadcasts were received.

The set used is of a new and entirely original type, far remote from the "toy" receiving apparatus so much in evidence at the present time. The set not only receives clearly for a considerable distance but is of a fool-proof design, easily operated, and is compactly built into a relatively small space. Its commercial possibilities are immense. In this sense alone, it does away with one vacuum tube as well as the lighting or "A" battery, making it possible to build a superior set at a lesser cost than any now on the market.

(Continued on page 2)

### BALLET UNIQUE DANCE ROLE "RADIO SPRITE"

CHICAGO—Miss Nancy Hayes of the Gladys High studio appeared as the "Radio Sprite" in a group of the Ballet Unique at the Studebaker Theater. Two hundred dancers participated, including Eleanor and Hugo Bendel, Gloria Thayer, Dorothy Myers and other well known dancers.

ELIMINATES BATTERY

(Continued from page 1) How the improvement is accomplished is not yet ready for publication. Mr. Miessner demonstrated and proved that the circuit was entirely practical, but asked that the method be kept confidential for the present.

Mr. Miessner, it will be remembered by RADIO DIGEST readers, is at the present time writing a series of articles for this publication, four of which have already appeared, his subject being "Characteristics of Vacuum Tube Amplifiers."

Was Naval Radio Expert

At one time Mr. Miessner was Radio expert for the U. S. Navy Department, and also for two years was associated with John Hayes Hammond, Jr., in the perfection of the Radio device which is now used to control the movement of torpedoes from ship or shore.

He is a member of the Institute of Radio Engineers, and the American Physical Society, as well as other clubs and associations. He is an alumnus of Purdue University where he was a member of the Sigma Pi Fraternity, and is also author of "Radio Dynamics," a book on the subject of Radio-control and calculations, published by Van Nostrand Co.

WOMEN'S PARTY TO RADIO PROGRAM

Will Broadcast Sunday, May 21, from Naval Radio Station at Anacostia, D. C.

Special to RADIO DIGEST

WASHINGTON, D. C.—Probably the most interesting broadcasting program yet attempted is scheduled for Sunday afternoon, May 21, when the Naval Radio Station at Anacostia, D. C., will transmit practically the whole program of the open-air meeting and entertainment of the National Women's Party.

The program will be broadcast from 2 P. M. Sunday afternoon around 412 meters. You can probably pick up NOF and hear an exceedingly interesting entertainment over an hour. The program will also have a message read over the Radiophone. The program also includes music by the Marine Band, and addresses, choruses, and brief speeches by Senator Curtis and Representative Pess.

To tune to a station, move the coils either out or in until the desired volume is created. This mounting allows a wide variation of tuning.

A. T. & T. CO. BUILDING STATION IN NEW YORK

Will Sublet to Private Individuals According to Plans

NEW YORK.—The American Telephone and Telegraph company, which controls the important patents on Radio telephone broadcasting equipment for commercial and general public use, is establishing a new and up-to-date Radio broadcasting station on the roof of the Walker-Lispender Building for general use at specific rates.

Being in the manufacturing business, the company does not care to broadcast itself, but is willing to test out the public demand by providing facilities for those desiring to use a station. In this manner the true attitude of the public, they believe, will be ascertained, as it is obvious that broadcasting must be put on a sound basis if it is to remain a valuable service.

How to Make Movie

The impatient boy may now go to the movie and see on the screen how to make a Radio receiving set. Under the supervision of the Bureau of Standards at Washington there was a film made on "Make It Yourself." This picture is the first of its kind. In the motion picture you can watch step by step the actual making of a receiving set.

National Exposition Is Looking For Young "Edison" in Schools

Exposition to Be Held in Chicago June 26th to July 1st Announcing Novel Contest—Contestants Must Appear in Person by July 23d

For the purpose of discovering the young Edisons of Radio the committee in charge of the prizes to be awarded in the various contests at the National Radio exposition to be held in Chicago June 26th to July 1st in the Leiter building, announced today the prizes that will be awarded and the conditions that will be imposed.

Grade Schools—For making the best crystal detector set—170 to 600 meters; 1st prize, \$25.00; 2nd, \$15.00; 3rd, \$10.00.

High Schools and Manual Training Schools—For making the best regenerative detector, two stage amplifier set—175 to 600 meters, 1st prize, \$50.00; 2nd, \$30.00; 3rd, \$20.00; boys under high school age are eligible, but they must be in school.

Contest open to anyone under 21 years old—For making the smallest set for receiving code and of practical use; 1st prize, \$50.00; 2nd, \$30.00; 3rd, \$20.00.

Contest open to anyone—For making loud speaker of own design throughout; one grand prize of \$100.00.

Contest open to anyone—For making the greatest Radio novelty; one grand prize of \$100.00.

With the idea in view that an inventor that may out-Armstrong Armstrong may be found in the schools in and about Chicago, the committee decided to offer inducements that would stimulate the youth who is interested in Radio to greater efforts. For the grade school students an opportunity will be given to make a crystal detector set of 170 to 600 meters. It will be judged upon its workmanship, design and practicability. The prizes will be first, \$25.00; second, \$15.00; third, \$10.00. A more difficult proposition will be offered to the students in the high schools and manual training schools. They will be asked to make a regenerative detector, two stage amplifier set, 175 to 600 meters wave length; for this three prizes will be given; first, \$50.00; second, \$30.00; third, \$20.00.

To give young men outside of the schools an opportunity prizes will be offered to all

Tips on Farming Come by Airphone

Clubs "Listen In" to Get Agricultural Information on Weather and Crops

Special to RADIO DIGEST

WASHINGTON, D. C.—"Listening in" on a country telephone may have its thrills, but members of boys' and girls' clubs who "listen in" on the conversation of the world with their Radio receiving sets have an interest which comes not from neighborhood gossip, but from getting the morning report of the risks out of the business of farming. They post this information in conspicuous places so that neighbors may make use of it. The work demonstrates the usefulness of the Radio as a piece of farm equipment.

Counties in New Jersey, Montana and Colorado have clubs that received Radio messages last season. In Kentucky, Nebraska and several other States organization is under way. The expansion of the Radio has been limited because of lack of simple printed instructions, but the recent distribution of circulars by the Department of Agriculture on the making of receiving sets has been held out to the boys and girls. Through members of pig, dairy, corn and other clubs who are receiving daily market information and the estimated crop production, the entire family and the community as well may be benefited.

WHAT TO KNOW ABOUT SOLDERING

When soldering while constructing your set use as little solder as possible to get a good connection. It is wise to hold the wire in place with a pair of pliers where the connections are short, as burns may result from conducted heat.

Avoid unnecessary wires. If a wire is to be soldered to a certain terminal that already has a connection on it, make the connection to the wire rather than to the terminal. This will shorten the leads in many places.

When the wiring is completed check it carefully with the hook up. See that no wires have been bent so as to make a short circuit. Shake the various wires so that any faulty soldering may be found. The apparatus will then be ready for testing.

under 21 years of age. This contest will be for the making of the smallest set for receiving code and of practical use—the set occupying the smallest space. For this the prizes will be first, \$50.00; second, \$30.00; third, \$20.00. One grand prize of \$100.00 will be offered for the best loud speaker of the maker's own design throughout. This contest is open to anyone. Another \$100.00 prize will be given for the greatest Radio novelty. This also is open to everyone.

All the devices entered in the various contests must be at the headquarters of the National Radio exposition, 417 S. Dearborn Street, room 401, by eight o'clock Friday evening, June 23rd. The contestant must appear in person before that time when he will be given a ticket of admission to the show and will be told the day on which the awards will be made in his particular contest. Another committee is working on a speed contest to find the fastest operator receiving continental code.

BOSTON PLAYS TO NOVICES AT SHOW

LECTURES TO AMATEURS GIVEN IN SIMPLE TERMS

Model House Equipped with Receiving Sets Received Much Attention from Visitors

Special to RADIO DIGEST

BOSTON, MASS.—In the recent Radio show held here there were certain periods of time devoted to the benefit of the men and women to whom Radio was comparatively new. The talks to amateurs were delivered in simple terms and by men who have risen from an amateur interest in Radio to a place in the professional Radio world.

There were a series of educational booths in which the principles of the Radiophone were shown in a graphic manner to the visitors. These booths were placed on a "one-way street" in which the spectator passed from one booth to another without confusion and seeing the exhibit in proper order.

There was a Radio equipped home which proved of great value to every person at the show. The model house was equipped with Radio according to the newly promulgated regulations of the National Board of Fire Underwriters. These regulations have been changed recently in several important details and every Radio user must get in line in his own interests, if not at the dictation of fire insurance policy users. The model house showed just what protection of the market is now required in the installation of receiving and sending sets.

Corporation Sells Its Radio Holdings

The American Telephone and Telegraph Company Disposes of Its Stock

The American Telephone and Telegraph Co. has disposed of its holdings of Radio Corporation of America stock, according to a report that was current in the financial district recently. It is the policy of the company to hold permanently only the securities of its associated companies in the Bell system. It was explained, that accounting for the sale of Radio shares, which had been purchased in 1920.

There is probably more public interest in Radio Corporation of America stocks than in any other curb security. That is shown by the heavy buying of the stock in large and small lots, buyers believing that the present radio craze will prove bonanza for the company. The company has 3,955,974 preferred shares of \$5 par outstanding, which becomes cumulative as to 7 per cent dividends after December 31, 1923. There are 5,732,000 shares of common, some 3,590,000 being owned by General Electric, American Telephone, Westinghouse and United Fruit companies. Earnings last year aggregated slightly better than 2 per cent on the preferred, all such earnings set aside for patent amortization.

The air service of the United States needs 200 men and to get them they are using the Radiophone transmitting station at Mitchell Field, Garden City, B.M.5. The message reads as follows: "Opportunity in the form of enlistment is knocking at your door and the door of many men tonight through the Radiophone."

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How to Make, a page devoted to the construction of Radio parts. Contributions from amateurs.
Broadcasting Station List—Growing every issue—corrected weekly.
Illustrations and Stories of Famous Broadcasting Stations.

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## CONDENSERS NEEDED TO USE LIGHT WIRE

AVOIDS SHORT CIRCUITS AND BLOWING OF FUSES

General Squires Cautions Experimenters on Power Line Broadcasting Over Electric Lights

Special to RADIO DIGEST

WASHINGTON, D. C.—If you do any experimenting in power-line broadcasting, as explained recently by Major General Geo. O. Squires, don't try to connect up with the electric light lines without using condensers. If you do, you will short circuit the lights, blow out fuses and perhaps ruin your instruments. Referring to his recent demonstration of wired-wireless broadcasting locally over a city's electric light system, General Squires pointed out the necessity of using condensers to avoid short circuiting. He explained to the writer that an ordinary transmitter and receiver are used, connections being made by a suitable plug in a light socket, and may be connected to the power line in various ways, but the preferred method provides for the installation of condensers between the mains acting as by passers for the high-frequency currents only, permitting the power current, direct or alternating but of low frequency, to flow along. For the Radio, the two mains are connected in parallel and used as one conductor, the ground being a return. Good results may be obtained by connecting the transmitter and receivers between the mains suitably protected by condensers to keep the large power current from passing through the Radio apparatus, he says.

The advantage of using line Radio for local broadcasting on light wires saves the erection of aerials, leaves the ether open for long distance communication, eliminates interference and permits an unlimited number of messages to be sent on different wave lengths.

"It is hard to realize the vast possibilities of this method of broadcasting," the General said, "but judging from the universal interest in the preliminary announcement, it is fair to suppose that the system will come into general use quickly."

## PAY YOUR PENNY TAKE YOUR CHOICE

Propose "Nickel in the Slot" Radio Receiving Stations Next

With Radio telephony in its present stage, it only remains for some enterprising person to open public Radiophone booths, wherein any citizen may drop a coin and "listen in." He could choose his entertainment from the daily schedules, which need by no means be limited to music but might include press dispatches, baseball bulletins, prize fights by rounds, and election returns. Those who have no home radio receivers will undoubtedly soon have the privilege of renting one temporarily when desirous of "hearing" what is in the air. It is an opportunity for some genius to combine a nickel-in-the-slot machine with Radio receiving set.

Rumor has it that certain Chicagoans are organizing a company for the manufacture of "nickel-in-the-slot" Radiophone receivers. It is planned to install the sets in drug and confectionery stores and other gathering places. One can get baseball reports, market reports or concerts by dropping a coin in the slot and placing the receivers to the ears.

VIENNA—There will be soon a direct Radio service with America. It will be established by the Austrian Radio company at Vienna. This company is taking over and perfecting the Austrian government's Radio stations.

## BLIND CHARGES TO "SEE" BY AIR WAVES

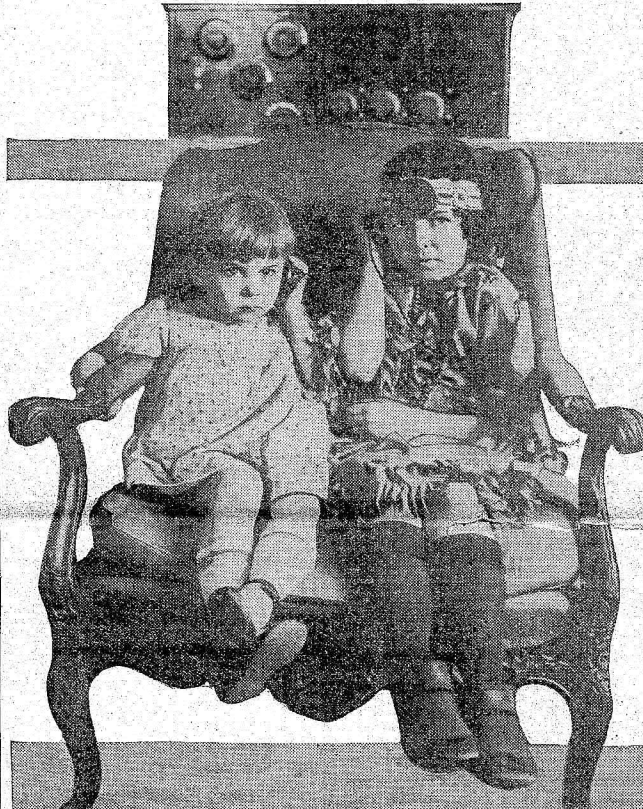
SAGINAW, MICH.—The inmates of the Michigan employment institution for the blind here will soon have a new source of music, philosophy and knowledge of current events through the Radiophone. The work of preparing and installing Radio for the blind citizens of the state has been undertaken by Lieut. Leon Seeley. It is planned to install amplifiers in the main auditorium and in the women's and men's dormitories. In this manner all who may wish to hear the messages and the concerts will be able to do so without inconvenience.

## CONVENTION IS RUN BY RADIO RULINGS

NEW YORK, N. Y.—For the first time in history, two meetings of electrical men were called to order recently by Radio. Walter Neumuller, secretary of the New York Edison company, talked before members of the New York electrical league at the Hotel Astor and the New York electrical society at the new Hell Gate station of the United Electric Light and Power company.

He called the meeting to order at noon, and after a short opening address, introduced several opera stars, who rendered selections over the Radio.

## THE LITTLE CHILDREN OF THE FILMS LISTEN IN WITH CURIOSITY TO BROADCAST MUSIC



Peaches Jackson and Muriel MacCormack well-known kiddies of the Paramount Studios enjoy Airphone Concerts

## AIRPHONE IS ORCHESTRA

Broadcasts Give Women's Clubs Musical Program

NEW YORK.—The Astor hotel has become the mecca of women's clubs throughout the city. The clubs listen to music broadcasted from Newark instead of engaging orchestras for the musical entertainments of their meetings.

## AIRPHONE WOMAN'S PAGE

WHN Broadcasts Two Hour Program for Women Only

RIDGEWOOD, N. J.—One broadcasting station at least has seen fit to put on a two-hour program "for women only," giving us the first aerial woman's page. Local station, WHN, transmits "listen in," the first complete Radio newspaper of the air.

## AIR WAVES USED TO GUARD VESSELS

BROADCASTING TO HELP IN PROTECTION ON SEA

Government Finds Airphones Save Time of Members of Lighthouse Service

WASHINGTON, D. C.—Improved service to shipping and better living conditions for members of the U. S. Lighthouse Service have resulted from the use of the Radio, according to the Department of Commerce.

Formerly, a tender would be dispatched from a lighthouse depot to repair or replace a buoy. After a round trip of perhaps several hundred miles it would often be necessary to repeat a journey to take care of a buoy in the same general locality. The Radio is eliminating this waste of time, money and materials as the vessels can now be kept informed wherever they are located.

Last month the Department of Commerce authorized small additions to the Radio equipment of several of its larger sea-going tenders to enable the crews to receive the Radio broadcasting services for instruction and entertainment purposes, and consideration is now being given to making some similar use of the Radio equipment placed on many of the lightships during the war, but not used since the armistice, as well as on the principal outside lightships where a regular Radio service is now maintained. These latter, such as Nantuxek and Diamond Shoals lightships, are the outpost Radio stations on our coasts, reporting incoming ships, forwarding messages, and sending word of vessels in distress.

With the cooperation of the navy, Radio telephones have recently been installed at several of the remote lightships in Alaska.

Some of the lightships are also equipped as Radio fog-signal stations, with the new Department of Commerce system, used continuously during foggy weather to furnish accurate bearings to ships possessing the Radio compass.

According to George R. Putnam, Commissioner of Lighthouses, Radio should be a great boon in relieving the lonely and monotonous life of the faithful keepers at isolated stations, both in lightships and at lighthouses. The keepers of Alaska lightships are the only ones who are required to remain at their posts for three years on a stretch. They have been without mail for ten months. At Tillamook Rock Light, off the Pacific Coast, bad weather has prevented direct communication with the shore for periods of seven weeks at a time. On the offshore lightships supplies are received usually only once a month, and the tenders often work in remote localities. Relaxation at these stations depends chiefly upon libraries furnished by the government and donated magazines with an occasional phonograph presented by a thoughtful friend.

## Believe Radio Crystals Are Found in the West

DENVER, COLO.—A mineral discovery recently made in the Burns mine, San Juan County, Colorado, is expected to result in the establishment of a new industry in Colorado, the production of Radio crystals.

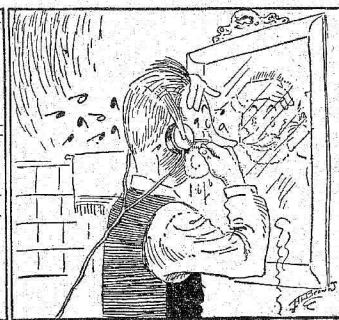
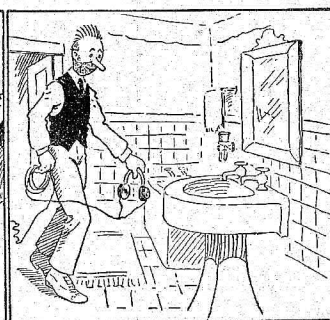
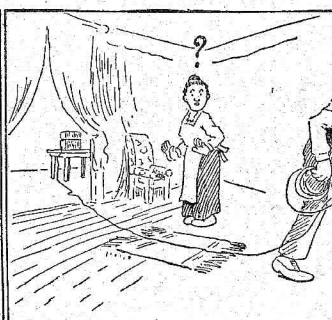
The profits of such an enterprise would far exceed those in mining of gold and silver. Quite recently a streak of steel-galena was encountered in the Broadgaunge tunnel, which was projected to penetrate Jones Mountain to a depth of 8,000 feet. This ore was very much different in appearance than other galena ores.

In a test made at the United Radio Corporation it was found that the crystals were equal to, and in many ways superior to any crystal detector.

## THE ANTENNA BROTHERS

Spir L. and Lew P.

## COMFORT



# SHOWS OPERATION OF RECEIVING SET

THE DIAGRAM ON PAGE FIVE GIVES FULL DIRECTIONS

Fourth Illustrations of Series Indicates Aerial, Ground Connections and How to Tune

The receiving set shown is the Amrad Detector 2-Stage Amplifier 2834 and Short Wave Tuner 2596 with range of from 150 meters up, depending on the loadings coils and condensers used. As pictured on page five, the set is connected for short wave reception. The set is made up of two units, one, the tuner, consisting of two variometers with vernier adjustments and a vario coupler. The primary of the latter is tapped with two switches, one for single turn and the other for groups of turns control.

**Description of Detector and Connections**  
The detector and amplifier unit consists of one detector tube and filament control rheostat, two amplifier tubes and one rheostat controlling the two amplifier filaments, two audio frequency transformers, a grid leak and condenser for the detector tube, a potentiometer control for "B" battery and a jack switch to cut off all power, cut in detector unit only, or cut in detector and both stages of amplification.

Connections are shown in the rear view of the two units (lower right hand page 5). The binding post marked "FIL+" is attached to the positive terminal and the binding post marked "FIL-" is attached to the negative terminal of a 6-volt storage battery. A "B" or high voltage battery, arranged so that taps can be taken off at 18 and 60 volts, is necessary. The binding post marked "-" below and to the right of the one marked "A+", is connected to the negative terminal of the high voltage battery. The binding post marked "A+" goes to the 60-volt positive tap of the same battery, while the post marked "D+" is connected to the 18-volt, positive tap of the battery.

The terminals of the filament rheostat are connected to the binding posts marked "DET. FIL." and "TEL. I.S." respectively. This completes the connections to the detector unit.

### Aerial and Ground Connections

The only connections to be made to the tuner unit of the Amrad set for short wave work are those of aerial and ground. The aerial is connected to post on the back of the unit marked "A" and the ground to the post marked "G". Care should be taken not to reverse these connections as the effect of the sliding plate on the inside of the tuner would be lost.

When properly connected the rear of the two units should look just like the picture of the rear given on page five. The short connectors or "jumpers" furnished with the two units should be in their proper places according to the photo diagram. The connections when completed make the set a short wave tuner and vacuum tube detector with two stages of audio frequency amplification.

The receiving antenna or aerial should be from 75 to 150 feet long, single wire, preferably at least 40 feet from the ground, and with connections well soldered. The ground may be made satisfactorily by clamping a wire to a water (preferably), or steam pipe.

### How to Tune

After having made the described connections, the set is ready for reception. First set dial marked "DET. FIL." at 0, then snap the control jack to the position marked "DET.". Turn dial "DET. FIL." and dial "POTENTIOMETER" to about 50 or until tube hisses or sings. The filament of the detector tube should be burning bright, but not too bright. Decrease reading on "POTENTIOMETER" dial till hissing or singing is eliminated.

Advancing dials on the tuner (lower unit) in every case, increases the wave length. The two switches ("L.S." and "S.S.") when up, give the longest wave length possible. On the dial controlling the coupling (marked "COUPLER") 0 represents the closest coupling, and 50 the highest degree of loose coupling attainable. The two knobs marked "VERNIER" are fine adjustments for the large dials closest to them, the "GRID" and "GRIDLOAD" variometers. In this circuit, the "GRID-

LOAD" dial and its "VERNIER" adjustment can be disregarded entirely, as they are shunted or cut out and are not in use.

### Amplifier Now Cut In

After manipulating the dials marked "COUPLER," "GRID" and "VERNIER," and the switches marked "S.S." and "L.S.," all the signals being received come in the loudest without interference from other stations' signals, throw the jack (mentioned before) to right (toward "AMP."). Be sure it is all the way over to the right. Now adjust the current (or brightness) of the two amplifier tube filaments by means of dial at upper right of set, marked "AMP. FIL." A larger reading on the "POTENTIOMETER" dial may be necessary before the signals being received come in at their best.

### Tuning Details Explained

In tuning this circuit, the dial marked "GRID" should be at 0 to start. The "COUPLER" dial should also be at 0, and the switches at either side as far down as they will go. Tuning is accomplished by first turning the right hand switch up one tap, then advancing the left switch up tap by tap till it reaches the top. If desired, signals have not been picked up, the left switch is again rotated to the lowest tap. The right switch is advanced another tap and the foregoing is repeated. Leave switches where signals come in best and increase "GRID" dial to position where signals are increased in loudness most. "VERNIER" knob is used for very fine adjustment. Next, turn "COUPLER" dial to point where interference of other stations' signals, if any, are obliterated.

Finer adjustments on the detector and amplifier unit (upper panel) are now made.

The set can be used for many other circuits and for long wave reception when changes of jumpers on back are made, load inductances and condensers inserted, etc., in accordance with directions accompanying the set. The method of catching the 360 meter broadcasts, however, is that described in this article.

## DUBILIER MERGES THREE COMPANIES

Well Known Figure in Radio Heads New Corporation

NEW YORK.—William Dubilier, inventor of condensers widely used in Radio and several fields, is sponsor for a merger of the Dubilier Condenser Co., The Federal Electric Co. and the Cambridge Manufacturing Co. under the name of Dubilier Condenser and Radio Co.

The new company will continue to manufacture Radio condensers which are well known to the Radio world and will also manufacture larger condensers for electric machinery. It is planned to manufacture all classes of Radio accessories in the near future.

Mr. Dubilier is well known in the Radio field, having invented many accessories which are widely used. Mr. Dubilier has been eminently successful in all of his business ventures.

### TU-WAY

New design plug, jacks, variable condenser, V. T. socket, rheostat & head sets. If your jobber is unable to supply, write us



## Uses Radio in His Oil Business

Makes Filling Station Popular by Giving Customers "Air" Concerts

Special to RADIO DIGEST  
MALONE, TEXAS.—When R. T. Walling's proprietor of the Malone Filling Station here, took up the study of Radio several weeks ago and installed a receiving plant in the rest room of the station, he had no idea that the innovation might prove profitable to his business. In connection with the sale of gasoline and oils he handles automobile accessories. It was not until the Radio station of the University of Texas began broadcasting the markets each day for the State Department of Agriculture that Mr. Walling saw the possibilities of serving the people of his community and thereby placing his business in closer touch with them. He tuned up his receiving apparatus and each day between 3 p. m. and 5 p. m. there comes to him the markets of the various products of the State. This is usually preceded or followed by a musical program. He soon found that the people of the town and the farmers for miles around were deeply interested in the market quotations and the musical entertainment. Scores of people drive up to the station each day to hear the market report as it is delivered through the amplifier. Many of the farmers and townspeople purchase gasoline, oil and accessories while listening to the Radio phone. All in all, Walling's station is by far the most popular place in town. His fame has spread throughout the rural community for miles around. Mr. Walling gives free information as to market prices of products.

## Large Norway Station To Operate by June 1

Will Communicate with America and England

With a new and powerful Radio telegraph apparatus being installed on Rundemanden, a 2,500 foot mountain at Bergen, Norway, it is believed that direct communication with America will be possible. The Radio-telegraph will have a 3,000 kilometer radius and a 300 kilometer radius Radiophone for communication with England and Continental Europe will also be established. The improvements represent an investment of about \$25,000, and are expected to be completed by June 1, according to Consul George Nicolas of Bergen.

Headquarters for  
**Radio Supplies and Equipment**  
Radio Department  
**COMMONWEALTH EDISON ELECTRIC SHOPS**  
72 West Adams Street  
Chicago, Ill.

# Radio Apparatus

Immediate Shipment

- 43—Plate Variable Condenser ..... \$4.00
- 23—Plate Variable Condenser ..... 3.75

These condensers are of the very highest quality, fully guaranteed.

- Head Phones**
- Frost—2,000 ohm ..... \$5.00
  - Frost—3,000 ohm ..... 6.00
  - Western Electric—2,400 ohm ..... 15.00
  - Dictograph—3,000 ohm ..... 12.00
  - Kellogg—2,400 ohm ..... 12.00

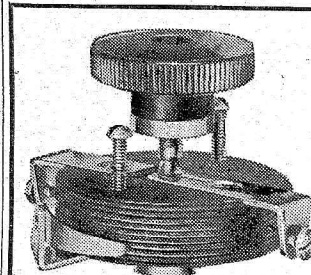
- Estru Variometers and Vario-Couplers**
- Variometer ..... \$5.00
  - Vario-Coupler ..... 4.50

These are of the lattice type, are small, compact instruments, with no unnecessary frame work, which makes them most easily wired. Maximum efficiency—sharp tuning. Ideal for portable sets and for those who assemble their own because of easy accessibility.

- 3 inch Bakelite Dials**
- Figures 0 to 100 ..... \$1.00

- Keystone Lightning Arresters**
- Type A—Having wire leads ..... \$2.00
  - Type B—Having binding posts ..... 2.00
  - Pipe Cap for Type A or B ..... .90
  - Pipe Point for Type A or B ..... .90

Dealers Write for Our Proposition  
**Northern Radio Supply Corporation**  
542 W. Washington, Chicago, Ill.  
MAIN 2230-2276



IN the reception of Radio signals of all classes, especially continuous wave and distant signals, the closest possible control of the detector tube filament temperature is extremely necessary. A compact and serviceable

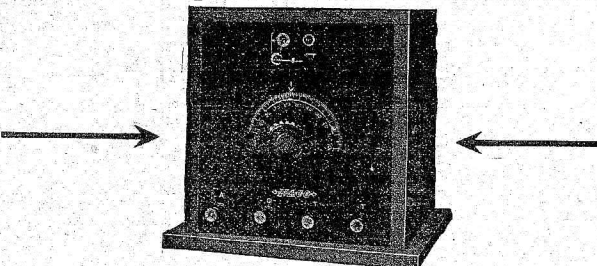
## RHEOSTAT

which gives this control has just been placed on the market.

The picture shows this rheostat mounted on a panel. As can be seen, the non-inductive drum is threaded, and in this thread is wound the required length of and the polished, non-corrosive resistance wire. When the knob is turned, the arm is rotated. This arm carries on its end a pivoted phosphor bronze contact tongue, the end of which follows the thread and consequently the resistance wire. In six revolutions of the knob, the tongue travels from one end of the point throughout its entire length. This gives the number of adjustments which is absolutely unlimited, and changes of one thousandth of an ohm are possible. In order to do away with the unnecessary turning of the knob, a simple cut-off is embodied in the rheostat. Adjacent to the point where the shaft makes contact with the lead-in arm, the shaft is grooved. When the knob is pushed in  $\frac{3}{4}$ " the circuit is broken. When the knob is pulled out again (away from the panel), the circuit is made. In other words, the tube may be turned on or off without changing the setting of the rheostat. This lends great convenience in its operation.

**J. E. JENKINS**  
59 East Van Buren Street Room 605  
CHICAGO, ILLINOIS

## Naco Radio Receiving Sets \$20 Complete Without Condenser



For clear hearing and pleasing tone use a NACO set

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STATE MANAGERS WANTED

"We are building our radio business for the future, not only for today. Courtesy and discretionate prices prevail"

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1446-1448 Woolworth Building, NEW YORK CITY

**RADIO SUPPLIES STORES**  
Prompt Service—Quality Goods—Priced Right  
Radio Division  
**TELEPHONE MAINTENANCE CO.**  
29 S. Wells St. Franklin 3986  
5206 W. Madison, Austin 7041, 1122 E. 47th St.  
Look for the TELMACO Sign

# Radio Receiving Sets

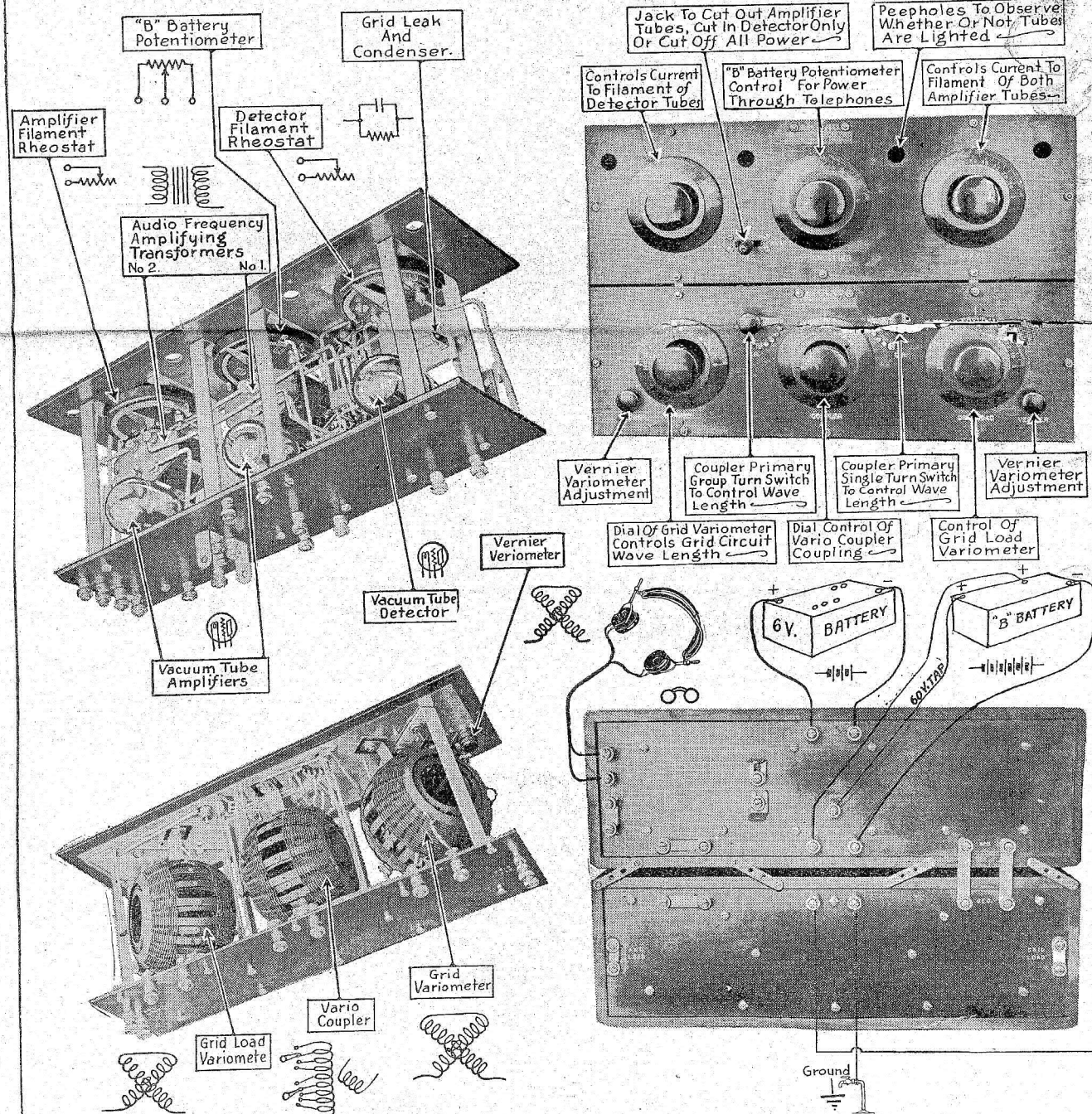
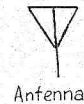
## The What and Why of Amrad Receiver

To give the Radio beginner every possible help in obtaining the best results from his investment in apparatus, RADIO DIGEST gives here the fourth chart on standard receiving sets. On page four, first column, will be found the explanation of the operation of the set here described.

The front, back and interior views of the Amrad short wave tuner 2596 and detector 2-stage amplifier 2634 are given below. The

set is manufactured by the American Radio & Research Corporation, Medford Hillside, Mass.

Although the beginner may not possess the particular make of set shown, it will undoubtedly pay him to read this page carefully. Points explained in the following chart and in the article on page four are applicable to many other types of receivers. An understanding of one type of set will aid the novice in understanding sets of other makes.



# WRW, KYG AND WDZ ALL FAMOUS

**Station WRW Has Been Heard  
in Over Thirty-six States  
Since Last January**

**WDZ Posts Grain Men**

**Portland's KYG Well Known on  
Western Coast; Heard  
in Hawaii**

A dyed-in-the-wool amateur broadcast station that has been heard in over thirty-six states! That is the record of 2BAK (commercial license, WRW), located at Tarrytown, New York, and owned and

not unusual on the program. Programs are given on Tuesdays, Thursdays and Saturdays at 10:05 p. m., Eastern Standard daylight saving time, and on Sundays at 10:30 a. m., 2:00 p. m., and 10:05 p. m.

Thousands of novices with only crystal detector sets and who are located near Tarrytown are practically dependent upon the broadcasts of this station for what little reception they are able to do with such limited sets.

#### Eight Tubes Used

While the photograph below (lower left) shows only four transmitting tubes, eight tubes are now in use, four having been added since the taking of the picture. WRW is equipped with both an arc and a tube continuous wave transmitter. In the photograph the panel second from the left houses the arc transmitter which is one built for U. S. Shipping Board motor boats during the war by the Sperry Gyroscope Company. In addition the panel, below the arc gap, contains a short wave

Hawley, Jr., Portland, Oregon, has been heard in the Hawaiian Islands, near Honolulu, a distance of 2,500 miles, although only 100 watts are used in the oscillating tube circuit. A range of 500 miles is a feat in the vicinity of the Columbia River are entertained regularly by the Radio-phone broadcasts of KYG.

The station is very well equipped and has excellent antennae. The large operating room, constructed of concrete, is steam-heated and has a large fireplace. On entering the room, one sees many large, genuine Navajo Indian rugs covering the floor.

A large model, electrically driven talking machine equipped with a Magnavox tone arm is used for transmitting phonograph music, while a grand piano with a specially constructed spruce tone chamber furnishes the accompaniment to all vocal and instrumental music broadcasts.

#### Two Antennae Employed

The transmitting and short wave receiver

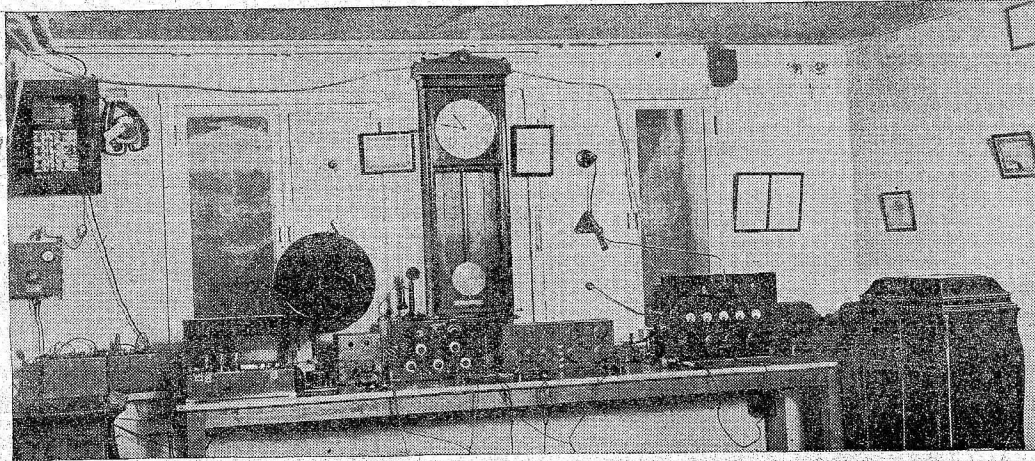
Colpitts oscillatory and the Heising modulation circuits are now used. It is planned to install a 250-watt tube transmitter, using a 250-watt tube as oscillator, a 250-watt tube as modulator, and a 50-watt tube as a speech amplifier.

For receiving, a short wave regenerative receiver suffices to catch practically all low wave length stations in the Northwest, and many stations a greater distance away. This receiver consists of a grid variometer, plate variometer, variocoupler, primary inductance and a primary condenser.

#### Has 600-20,000 Meter Receiver

Long wave stations are caught on a 600-20,000 meter long wave receiver in connection with a two stage amplifier. In both long and short wave reception, a large Magnavox with three stages of power amplification, is used.

In addition to the receiving equipment which is being built now is an Armstrong superheterodyne Radio frequency receiver. This will have four steps of Radio frequency amplification in addition to two



The operating room of KYG, Portland, Oregon, is as comfortable as a bungalow. On the floor are many genuine Navajo Indian rugs. A large fireplace helps make the large room a veritable den. Two one-piece, one hundred foot turned wooden masts support the antenna.

most interest. A part of the history of the station is that Mr. Koenig became interested in Radio only last January when his son, Nicholas, built a loose coupler from a description furnished by the Boy Scouts' Manual.

In so short a time, Mr. Koenig and his brother, assisted by Joseph B. Slavin, operator, have developed a station that has become known from coast to coast. Stations in the eighth and ninth districts have heard the signals of WRW very loud and distinct, both on phone and interrupted continuous wave telegraph. An area embraced by a 1,500 mile radius is covered well by the waves emanating from the Tarrytown plant.

#### Station Aids Business

The station has been a great aid in the sale of transmitting and receiving apparatus and Radio supplies by the Tarrytown Radio Research Laboratories, the business name by which WRW and its owners have become known. A regular schedule of operation is followed and special features are

receiver.

To the left of this panel (the upper and lower panels at the extreme left of picture) is the vacuum tube continuous wave transmitter, employing the Heising-Colpitts circuit for phone or buzzer or the Colpitts circuit for continuous wave or interrupted continuous wave. Using four five-watt tubes with 500 volts, 200 milli-ampere space current, a radiation of 0.9 ampere for Radiophony is obtained.

To the right of the arc gap panel is the control panel and contains the voltmeters for the exciter and generator and a four pole switch for supplying power to either the arc or tube transmitter. The right upper panel contains a Radio-audio frequency amplifier using the Armstrong super heterodyne circuit.

**KYG, Portland, Oregon, Heard in Hawaii**  
The voice of KYG, also known as Station TXG, owned and operated by Willard P.

ing aerial is 40 feet long and 70 feet high, "T" type, and consists of four wires equally spaced on ten foot spruce spreaders. A long wave receiving aerial is used for the higher wave length stations and is essentially a single wire made from seven strands of No. 20 phosphor bronze wire and stretched a length of 350 feet with an average height of 70 feet.

The two poles supporting the flat top of the transmitting antenna are seventy feet apart and 100 feet long. These are tuned in one piece, tapering from 22 inches in diameter at the base to 8 inches at the top. Each pole weighs three and one-half tons and is bolted to a concrete saddle at its base. No guy wires are used.

**Transmitting Apparatus Well Designed**  
The excellently designed transmitting apparatus of KYG consists of four 50-watt radiotron power tubes, two being used as oscillators and two as modulators. The

stages of audio frequency amplification and the three stages of power amplification used with the Magnavox. The total will be four stages of Radio and five of audio frequency amplification.

#### WDZ Posts Grain Dealers

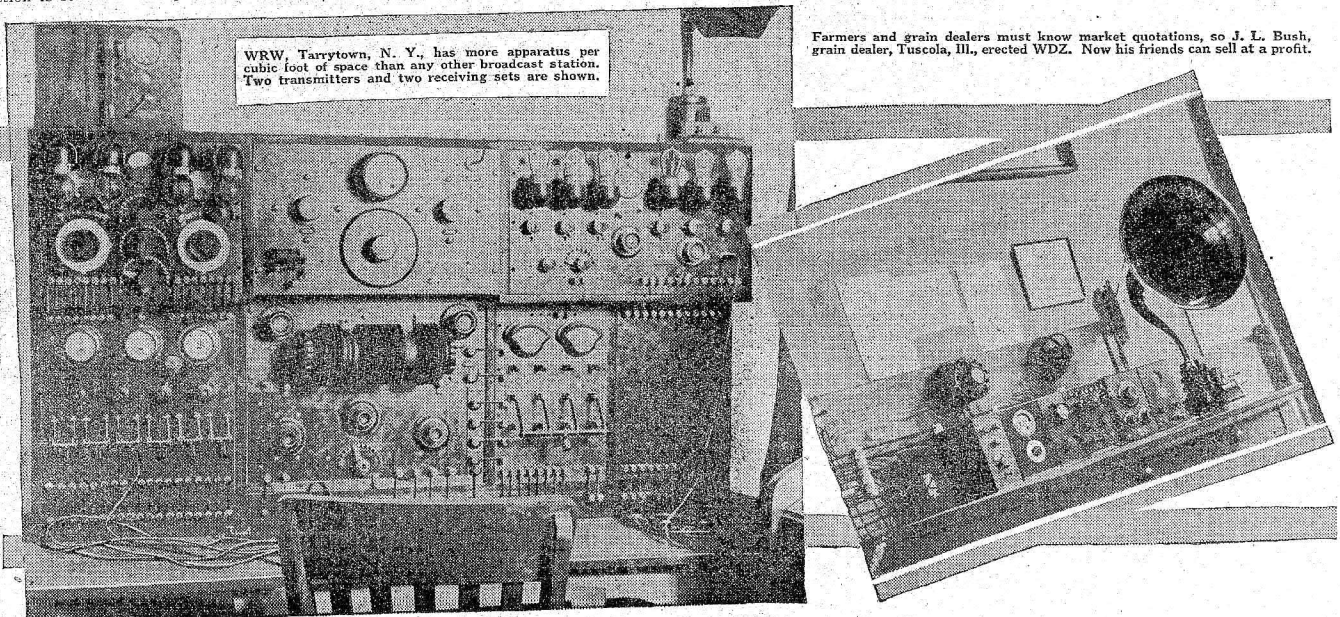
Lack of good methods of keeping the country grain dealers posted on market changes was the underlying reason for the establishment of Station WDZ at Tuscola, Illinois, by James L. Bush, grain dealer. Starting on September 31, 1921, the Tuscola plant has kept farmers, grain dealers, and country grain elevators within a 100-mile radius informed daily as to changes in the market situation.

Every morning at 8:30 a. m. (Central Standard time) and every half hour thereafter until 12:15 p. m., quotations direct from the Chicago Board of Trade are broadcast by WDZ. On Tuesday and Friday evenings from 7:00 to 8:00 p. m., special entertaining features break up the business-like schedule of the station. The power used by the station is 350 watts.

(Continued on page 9)

WRW, Tarrytown, N. Y., has more apparatus per cubic foot of space than any other broadcast station. Two transmitters and two receiving sets are shown.

Farmers and grain dealers must know market quotations, so J. L. Bush, grain dealer, Tuscola, Ill., erected WDZ. Now his friends can sell at a profit.



# HAWAII GETS U.S. AMATEUR OVER 6ZAC

Code Slinging Enjoyed for a Period of an Hour With 6ZQ

50 Watt Tube Used QSA

Cliff Dow of Wailuku, Maui, Talks with L. F. Wisner of Berkeley, California

Special to RADIO DIGEST

WAILUKU, MAUI, HAWAII.—On April 13th the first amateur communication ever to be accomplished across the Pacific to Hawaii was effected by 6ZAC with 6ZQ, F. L. Wisner, of Berkeley. Messages were exchanged and code-slinging enjoyed for a period of over one hour. Since that night, communication has been maintained nightly, except a few nights that 6ZAC was out of commission, owing to a defective tube. Communication is now being maintained with one 50-watt tube at 6ZAC, the reports from the mainland indicating a signal almost as QSA as the two tubes previously used.

Recent date, 17 messages have been sent to various mainland stations from 6ZAC, and six have been received here. This is aside from the numerous messages that were previously received at 6ZAC when no transmitter was available to QSL. These were all sent broadcast, on schedule.

Among stations worked so far are 6ZQ, Berkeley, 6ZL, Oakland, 6ZAF, Berkeley, 6ZF, Reedley, Calif., and 7YA, Boise, Idaho. The exact great circle distance between Berkeley and Wailuku is 4,355 miles, and between Boise and Wailuku is 2,845 miles. Boise was worked the second night 6ZAC was in commission with a transmitter, the signals being QSA at 7YA. Greetings were exchanged, and a msg sent direct from 7YA to 6ZAC without outside assistance.

When more tubes are available so that 6ZAC may be worked at maximum power and efficiently again, it is expected that communication will be effected with many stations on the Pacific and in the middle west, and it is not considered impossible to work from Wailuku direct to New York. Signals have been copied at 6ZAC from stations in every part of the United States, and from several Canadian stations among which Canadian 4CB stands out prominently as having accomplished a distance of more than three thousand miles on 15 watts of AC CW. He is regularly and readably heard here on 200 meters. United States stations include 1XMM, XP-1, NMW, NOF, 4BQ, 5XU, 5ZA, 5ZZ, a host of 8's, a host of 7's, 8BFX, 8UK, 8AGZ, 9AMB, 9AJA, 9DWJ, 9HW, 9WD, 9NXG, 9XAB, and 9ZAF. Of these most of them are CW, but it is worthy of comment that the 1 KW spark station at 9MC has been heard also, a distance close to 4,000 miles.

It would take a small history book to chronicle all the stations heard here, but that will give an idea of the limitless scope of reception of 6ZAC. And the way his 3 ampers of AC CW, using one tube, are pounding in on the mainland, it is to be expected that next fall and winter at least will bring forth some wonderful new records for low-power short-wave communication.

The mast at 6ZAC is 38 feet high. The aerial is a four wire cage, fundamental wave-length 300 meters, approximately. The counterpoise consists of seven wires in the form of a flat-top aerial, swung 55 feet below the aerial on the same mast. Of course there are a great many improvements that may be made before the very best is to be attained with this station, including an enlargement of the counterpoise.

The receiving set is a home-made single circuit regenerator, which tunes with equal efficiency from 150 to 30,000 meters, and I think the results will speak for themselves in the face of any argument that may be seen fit to be pitted against this type of receiver. The hook-up is the same. Fundamentally as that used in the grebe CR-5, but the entire receiver with its flexible wave length controls simply handled takes up less space than the Grebe does.

April 21.—Sent 10 msgs to 6ZL. NOF sent a msg via 6ZF in less'n 5 minutes. NOF QSA here all evening. Distance 4,800 miles, or 2,400 each peg of relay. No pre arranged schedule. Also worked 6FX and 6XM, latter using one 5-watt tube. QSA here. At 7:16 p. m. heard 6ZA's voice and heard him whistling into transmitter.

Station 6ZAC is located at Wailuku, Maui, Hawaii and is owned by Cliff Dow.

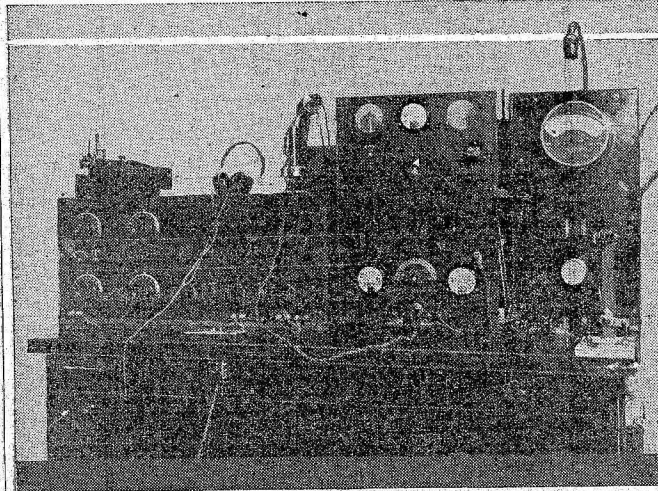
## FOLLOWERS OF ROAD CARRY SET ON HIKE

NEW YORK.—A novel method of testing the reaction of people throughout the country to Radio broadcasting has been undertaken by Jean Murray Bangs, a young writer who is starting on a 3,000-mile hike from New York to the Pacific coast. Mrs. Bang and her husband plan to carry a portable outfit with them and to listen in on many curious happenings on the way.

## VACATION BOATS TO ENTERTAIN BY RADIO

DETROIT, MICH.—Many of the lake steamers will be provided with Radio receiving sets for the entertainment of vacationists this summer. Sets that are equipped with loud speakers especially designed for concerts have been placed on boats that make special vacation trips around the lakes during the summer. Boats on the lakes can receive from either Detroit or Chicago, which makes a form

## 5 Z A BREAKS WORLD'S RECORD



Amateur station of Louis Falconi at Roswell, New Mexico. Has output of 50 watts. Voice reported 35 states. Longest distance reached was Patterson, N. J.

## Two Way Airphone Over 5ZA and NOF

Conversation Carried on Over Sixteen Hundred Miles. Beating World's Record

Special to RADIO DIGEST

ROSWELL, NEW MEXICO.—On April 22, 12:30 a. m., Radio 5ZA made radiophone connection with Radio NOF, Washington, D. C., and carried on a two way Radiophone conversation for several minutes. Operation was not carried on any longer due to a schedule which NOF had with 6ZAC. Reception was perfect at both ends. The distance is at least 1,600 miles and the feat is a world's record for two way Radiophone connection.

Radio 5ZA has an output of 50 watts. Voice has been reported from 28 states. The longest distance reported is Patterson, N. J. Also heard in Mexico City, Stenon, Saskatchewan, Canada. Actual conversation has been maintained with Reedley, Calif., Los Angeles, Calif., Owensboro, Ky., Memphis, Tenn., Billings, Mont., Indianapolis, Ind., Madison, Wis., etc. The record with NOF, Washington, D. C., was not planned but connection was made by calling with CW and then changing to phone.

Station 5ZA is located at Roswell, New Mexico, and owned by Louis Falconi.

## AIRPHONES TO BRING CHURCH TO GOLF FAN

Will Hear Sermon While "Topping" a Drive

There need be no question now whether to go to church or play golf. You can do both. The charm of the clubhouse veranda on Sunday morning has had a lure for the tired business man. With his feet comfortably elevated somewhere and his hat cocked over his nose he has meditated on the sorridness of the world and the exactness of business. Forsaking the parson for golf has become a part of the Sunday curriculum.

It has been decided at some of the golf clubs to introduce the Radio at the clubhouse. When it is time for the meeting to begin the weary golfers will be able to enjoy the singing and sermon without constricting to wear gospel raiment and to sit in high-backed pews. They will even be invited to join with the choir in the singing of the hymns. The possibilities of Radio are just beginning to be understood.

## BATTLESHIP TARGET CONTROLLED BY AIR

There will be a battle take place on the high seas soon. The enemy ship, Iowa, will be the target. This old battleship has been undergoing some changes and the last word in Radio reception devices are being installed. When the times comes for this battleship to steam out into mid-ocean there will not be a human being on its decks. The entire ship will be maneuvered by Radio. It will be started, stopped and steered by Radio.

The controlling transmitting stations will be on the destroyer Dickerson, at a location many miles away. The battleship is supposed to act as if manned by humans.

It will be quite impossible for the Iowa to escape for it could not stand the onslaughts of the large fleet. Before it sinks, however, it will demonstrate to the world the wonderful possibilities of Radio in controlling ships.

## VACUUM TUBE A B C FOR THE BEGINNER

BOOK PUBLISHERS OFFER MANY NEW EDITIONS

"How to Make Commercial Type Radio Apparatus" a Popular Seller

**Radiophone Receiving.** A practical book for everybody. By nine specialists: Michael I. Pupin, Alfred N. Goldsmith, Erich Hausmann, Frank E. Canavaci, John H. Morecroft, Robert D. Gibson, Paul C. Hoernel, Louis A. Hazeltine, and John V. L. Hogan. This book presents the fascinating story of Radio interestingly, in a manner easily understood by the beginner and yet accurate enough for the trained expert. Price, \$1.50.

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**How to Make Commercial Type Radio Apparatus.** By M. B. Sleeper. A guide book for those who desire to make their equipment equal in appearance as well as performance the commercial type of apparatus. It gives a world of data on how to make efficient radio stations. The illustrations more than the descriptions show the niceties of design developed by the commercial companies. Price, 75 cents.

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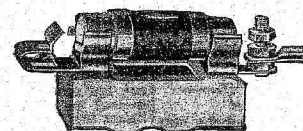
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INLAND ELECTRIC CO.

14-16 North Franklin Street, Chicago, Illinois

You Needn't Throw a Switch to Guard Against Lightning When You Install a

## Brach Vacuum Lightning Arrester



The most positive, the most sensitive safeguard for your radio against lightning and static. Operates automatically. Needs no attention.

Cannot become grounded. Cannot give trouble. No moisture, dirt or bugs can get into sealed chamber — No weak or lost signals.

Approved by National Board of Fire Underwriters. Electrical No. 3962

**WARNING!** Insurance Companies, Fire Underwriters and Local Inspectors demand that an approved type of Lightning Arrester be used. Insist on Approved Instruments Only That Bear Listing Number.

Carried in Stock by All Dealers and Distributed by Leading Radio and Electrical Jobbers

L. S. BRACH MFG. CO., Newark, N. J.

16 Years Specialists in Lightning Protective Apparatus

# Radiophone Broadcasting Stations

Corrected Every Week.

State and City	Call	Wave Lengths	Miles Range
<b>Alabama:</b>			
Birmingham	WSY	360	
Montgomery	WGH	360	1,000
<b>Arkansas:</b>			
Fort Smith	WCAC	360	
Little Rock	WSV	360	
Pine Bluff	WOK	360	1,000
<b>California:</b>			
Altadena	KGO	360	
Bakersfield	KYI	360	
Berkeley	KFB	360	
Berkeley	KQI	360	
Bl Monte	KUY	360	
Eureka	KNI	360	
Fresno	KFM	360	
Gridley	KFU	360	500
Hollywood	KGC	360	300
Long Beach	KSS	360	
Los Altos	KLP	360	1,500
Los Angeles	KNX	360	
Los Angeles	KJC	360	
Los Angeles	KNR	360	
Los Angeles	KOL	360	
Los Angeles	KON	360	
Los Angeles	KUS	360	
Los Angeles	KWH	360	
Los Angeles	KZL	360	
Los Angeles	KJL	360	
Los Angeles	KOG	360	
Los Angeles	KQL	360	
Los Angeles	KYJ	360	1,000
Los Angeles	KZC	360	
Los Angeles	KFL	360	
Los Angeles	KHJ	360	
Los Angeles	KNN	360	
Modesto	KQQ	360	
Modesto	KKK	360	
Monterey	KLN	360	150
Oakland	KLX	360	
Oakland	KLS	360	150
Oakland	KLH	360	1,500
Oakland	KZY	360	300
Pasadena	KLE	360	150
Pomona	KGF	360	
Readley	KVQ	360	
Sacramento	KDPT	360	
San Diego	KYF	360	50
San Francisco	AGI	360; 485	250
San Francisco	KDN	360	
San Francisco	KGB	360	
San Francisco	KSL	360	50
San Francisco	KQL	360	1,500
San Francisco	KUO	360	500
San Jose	KQW	360	
San Jose	KSC	360	
Stockton	KTA	360	500
Sunnyvale	WA RUDS	360	
<b>Colorado:</b>			
Colorado Springs	KHD	360	
Denver	SWD	235	
Denver	DD	360	1,500
Denver	KLZ	360; 485	1,000
Denver	KOA	485	
<b>Connecticut:</b>			
Greenwich	WAAQ	360	
New Haven	WCJ	360	
<b>District of Columbia:</b>			
Washington	WMV	360	
Washington	WDM	360	
Washington	WDC	360	250
Washington	WJH	360	600
Washington	WWX	1,160	
Washington	3YN	360	
Washington	WFM	360	
Washington	WIL	360	
<b>Georgia:</b>			
Atlanta	WGM	360	1,000
Atlanta	WSB	360	
Atlanta	4CD	200; 375	
Atlanta	WAAS	360	
<b>Illinois:</b>			
Chicago	WGU	360	
Chicago	KYW	360; 485	1,000
Chicago	WBU	360	
Chicago	WAAE	360; 485	
Decatur	WBAO	360	
Peoria	WBE	360	70
Tuscola	WDZ	360	
Urbana	WRM	360	
<b>Indiana:</b>			
Anderson	WMA	360	
Indianapolis	WLK	360	
Indianapolis	WOH	360	700
Richmond	WBOZ	485	300
South Bend	WBAQ	360	
West Lafayette	WBAA	370	100
<b>Iowa:</b>			
Ames	WOC	360; 485	
Davenport	WGP	360	
Des Moines	WGF	360	
Iowa City	WYA	360	

State and City	Call	Wave Lengths	Miles Range
<b>Kansas:</b>			
Eldorado	WAH	485	
Emporia	WAAZ	360	100
Manhattan	WTFG	360; 485	
St. Anthony	WBL	360	
Wichita	WHL	360	
Wichita	WAAP	360	
<b>Kentucky:</b>			
Louisville	9ARU	200	200
<b>Louisiana:</b>			
New Orleans	WCAG	360	
New Orleans	WGH	360	
New Orleans	WGV	360	
New Orleans	WBAM	360	
New Orleans	WAAC	360	
New Orleans	WAH	360	
Shreveport	WAAQ	360	
<b>Maine:</b>			
Auburn	WMB	360	
<b>Maryland:</b>			
Baltimore	WKC	360	
<b>Massachusetts:</b>			
Boston	WAAJ	360	
Medford Hillside	WGI	360	500
Springfield	WPH	360	300
Worcester	WCN	360	
<b>Michigan:</b>			
Bay City	WTP	360	
Dearborn	WWI	360	
Detroit	WWJ	360; 485	1,000
Detroit	KPO	360	
Detroit	WCX	360	
East Lansing	WHW	485	150
<b>Minnesota:</b>			
Minneapolis	WAAL	360	
Minneapolis	WLB	360; 485	
Minneapolis	WBH	360	
Minneapolis	WBD	360	
Minneapolis	WCE	360	
St. Paul	WAAH	360	200
<b>Missouri:</b>			
Columbia	WAAN	360	
Jefferson City	WOS	485	
Kansas City	WOQ	360; 485	300
Kansas City	WPI	360	
St. Louis	KSD	360	1,000
St. Louis	WAAE	360	
St. Louis	WCK	360	50
St. Louis	WFB	360	
St. Louis	WEW	485	100
<b>Nebraska:</b>			
Lincoln	3YV	375	300
Omaha	WOU	360; 485	
Omaha	WOW	360	
Omaha	WAAW	360; 485	
<b>New Jersey:</b>			
Camden	WPR	360	
Deal Beach	2XJ	360	
Jersey City	WNO	360	500
Jersey City	WJP	360	70
Moorestown	WBAF	360	
Newark	WAAV	360	
Newark	WJX	360	
Newark	2SAI	360	
Newark	WOR	360	
Newark	WJZ	360	2,000
Newark	WBS	360	
Patterson	WBAE	360	
Roselle Park	WDY	360	
<b>New Mexico:</b>			
Roswell	KNJ	360	300
State College	KOB	360	
<b>Nevada:</b>			
Reno	KOJ	360	
<b>New York:</b>			
Albany	WNJ	360	60
Buffalo	WWT	360	
Canton	WCAD	485	
Newburgh	WCAB	360	
New York	WBAV	360	
New York	KDOW	360	1,000
New York	WUP	360; 1,450	
New York	WWZ	360	200
New York	WDT	360	
New York	WYCB	1,450	
Rochester	WHQ	360; 485	
Ridgewood	WHN	360	50
Schenectady	WGY	360	1,000
Scenectady	WRL	360	800
Syracuse	WBAE	360	
Tarrytown	WRW	360	1,500
Utica	WSL	360	
<b>North Carolina:</b>			
Charlotte	WBT	360	

State and City	Call	Wave Lengths	Miles Range
<b>Ohio:</b>			
Akron	WAE	360	
Athens	WAAV	360	
Canton	WVB	360	50
Cincinnati	WLV	360	1,200
Cincinnati	WMI	360; 485	1,000
Cincinnati	WHK	360	130
Cleveland	WIZ	360	
Columbus	WBAY	360	
Columbus	8YO	275	
Dayton	WFO	360; 485	300
Dayton	WA-1	360	
Fairfield	WP-2	360	
Granville	WJD	360	
Hamilton	WBAU	360	
Hamilton	WRK	360	1,000
Lebanon	WCB	360	
Marietta	WBAW	360	
Toledo	WHU	360	
Toledo	WJK	360	300
Toledo	WCAJ	360; 485	
Youngstown	WMC	360	
Youngstown	WAAV	360	
Zanesville	WPL	360	
<b>Oklahoma:</b>			
Oklahoma City	WKY	360; 485	500
Oklahoma City	5XT	360	
Tulsa	WEH	360	
<b>Oregon:</b>			
Hood River	KQP	360	
Portland	KQY	360	50
Portland	KYG	360	500
Portland	KGW	360	200
Portland	KGE	360	500
Portland	KGN	360	50
<b>Pennsylvania:</b>			
Bridgeport	WBAG	360	
Clearfield	WPI	360	
Eric	WSP	360	
Eric	WTA	360	
Harrisburg	WBAK	360	
McKeesport	WIK	360	500
Philadelphia	WFB	360	
Philadelphia	WTP	360	
Philadelphia	WGL	360	2,000
Philadelphia	WOO	360	
Philadelphia	WFP	360	
Pittsburgh	WCAE	360	
Pittsburgh	KDKA	360	1,000
Pittsburgh	KQV	360	750
Pittsburgh	WJAX	360	
Pittsburgh	WFB	360	
Wilkes-Barre	WBAX	360	
<b>Rhode Island:</b>			
Pawtucket	JOJ	200	
Pawtucket	LOAD	200	
<b>Tennessee:</b>			
Memphis	WKN	360; 485	
Memphis	WPO	360	
<b>Texas:</b>			
Austin	WCM	360	
Dallas	WRR	360; 485	200
Fort Worth	WBAP	360	
Fort Worth	WB	360; 485	500
Houston	WEV	360	
Paris	WTK	360	
<b>Utah:</b>			
Salt Lake City	KZN	360	
<b>Virginia:</b>			
Norfolk	WSN	360	
Richmond	WBAZ	360	
<b>Washington:</b>			
Aberdeen	KNT	360	
Lacey	KGY	360	
Seattle	KFC	360	700
Seattle	KIQ	360	
Seattle	KJR	360	200
Seattle	KTW	360	
Seattle	KZ	360	
Spokane	KPZ	360	250
Spokane	KOB	360	
Tacoma	WAAQ	360	
Tacoma	KMO	360	
Wenatchee	KVZ	360	
Yakima	KEV	360	
Yakima	KQT	360	
<b>West Virginia:</b>			
Charleston	WAAO	360	
Huntington	WAAE	360	
Morgantown	WHD	360	
<b>Wisconsin:</b>			
Milwaukee	WAAK	360	
Madison	WFA	360; 485	800
<b>Canada:</b>			
Montreal	CKAC	1,200	200
Toronto		1,200	
Toronto		1,200	
<b>Hawaii:</b>			
Honolulu	Waikiki	KGU	360

### Your Directory—

To aid the beginner and to help him realize full benefits from his receiving station, RADIO DIGEST has compiled the accompanying list of radiophone broadcasting stations. To use the "radiophone directory" to its maximum advantage, the reader should note the broadcasting stations nearest, and attempt to tune them in at the wave lengths given.

Broadcasting stations with regular schedules of operating hours, are given below. Doubtless a few stations have been omitted inasmuch as their schedules have not been reported to RADIO DIGEST. These will be added as reported. The kind of program broadcast by a station during its various operating hours is also given.

In fact, the reader, by means of RADIO

DIGEST's radiophone directory, can pick out his favorite program, the station he desires, or the time which he prefers to listen in. Time, in the following list of stations having schedules, is always given in the time used in the city in which the station is located, as for example "KYW, Chicago, Illinois," indicates that the schedule of KYW is given in Central Standard time, the time which is in use in Chicago.

The stations are listed alphabetically by call letters. The list, therefore, acts as an index to the foregoing table:

### Station Schedule

**AG1**, Presidio of San Francisco, Cal. Signal Corps, U. S. Sun, 7-9 pm, instruction. Pacific time.

**DD5**, Denver, Colo. Fitzsimmons General

Hospital. Daily ex Sun, 8:15 pm, weather, news, concert. Thurs, 8:15-8:30 pm, special concert, speech. Mountain time.

**KDKA**, Pittsburgh, Pa. Westinghouse Elec. Mfg. Co. Daily ex Sun, 10-10:15 am, 12:30-1 pm, 2-2:20, 4-4:20, music; 7:30, bedtime story; 7:45, news; 8:30-9:30, music, news. Sat, 3-4 pm, concert. Sun, 10:45 am, 3 pm and 7:30, church service. Eastern time.

**KDN**, San Francisco, Cal. Leo J. Meybers Co. Daily ex Sun, 11-12 am, 1-2 pm, 4:30-5:30, concert; 7-7:15, weather; 8:30-9, concert. Sat, nothing after 5:30 pm. Sun, 10-11 am, sacred concert. Pacific time.

**KFC**, Seattle, Wash. Northern Radio & Electric Co. Daily, eight hours, miscellaneous. Pacific time.

**KFU**, Gridley, Cal. Precision Shop. Mon-Thurs, Sun, 8-9 pm, concert. Sun, 3-4 pm, concert. Pacific time.

**KGG**, Hollywood, Cal. Elec. Lighting Supply Co. Tues, Thurs, Sat, 7:45-8:



### Who Hears Broadcasting Stations Farthest?

TO STIMULATE long distance receiving, RADIO DIGEST ILLUSTRATED has started a receiving record contest. If you can hear one of the broadcasting stations at a distance you consider remarkable, send in the evidence to this publication, care of the Broadcast Editor.

The receiving station hearing a given broadcasting station at the greatest distance, will, if ample evidence is submitted, be listed as the record holder. When another receiving station breaks the record listed, it will supersede the listing of the first station.

A number of amateurs have sent in their records already. Get yours in NOW for the listing will be started in the May 27 issue! Be sure to state the number of miles distance from your station to the station you have heard.

—Broadcast Editor.

Works. Daily, 12-1 pm, weather, markets, news; 2 pm, concert, Pacific time.

**KLP**, Los Altos, Cal. Colin B. Kennedy Co. Mon, 7:30-8:30 pm, industrial news, concert. Thurs, 8:30-9 pm, concert. Sun, 4-5 pm, concert. Pacific time.

**KLS**, Oakland, Cal. Warner Bros. Daily, 12-1 pm, concert. Sat, 7:30-8:15 pm, concert. Pacific time.

**KLW**, Denver, Colo. Reynolds Radio Co. Daily ex Sun, 7:30 pm on, news, markets, bedtime story, concert. Sun, 8-9 pm, church service. Mountain time.

**KND**, Roswell, N. Mex. National Public Service Co. Daily, ex Sun, 7-9 pm, weather, financial markets, news. Sun, 7-9 pm, church service. Mountain time.

**KOA**, Denver, Colo. J. S. Smith & Y. M. C. A. Daily, 9:55-10:25 pm, time, weather reports. (Telephone only.) Mountain time.

**KQV**, Pittsburgh, Pa. Doubleday-Hill Elec. Co. Daily ex Sat and Sun, 4:30-5 pm, concert. Mon, Wed, Fri, 9:30-10:30 pm, concert. Sun, 1-1:30 pm and 4-5, concert. Eastern time.

**KQW**, San Jose, Cal. Chas. D. Herrold. Wed, 7:30-8:15 pm, concert. Sun, 5-6 pm, concert. Pacific time.

**KRE**, Berkeley, Cal. Maxwell Elec. Co. Sun, 1-2 pm, 6-7 pm, concert. Pacific time.

**KSD**, St. Louis, Mo. St. Louis Post-Dispatch. Daily ex Sun, 4-5 pm, news, markets, news, concert; 7:45 pm, concert, lecture. Central time.

**KSS**, San Francisco, Cal. The Emporium. Daily ex Sun, 11-12 pm, concert, news; 2-3 pm, concert, educational talk. Sun, 2-3 pm, concert and educational talk. Pacific time.

**KUO**, San Francisco, Cal. San Francisco Examiner. Daily ex Sun, 3-3:30 pm, and 5:30-6:45, news, etc. Sun, 5-6 pm, news, etc. Pacific time.

**KVQ**, Sacramento, Cal. J. C. Hobrecht (Sacramento Bee). Daily ex Sun, 5:30-6:30 pm, concert, news. Wed and Sat, 8-9, concert. Eastern time.

**KWG**, Stockton, Cal. Portable Wireless Telephone Co. Daily ex Sun, 4-5 pm, news, concert, markets. Tues and Fri, 8-9 pm, concert. Sun, 2-3 pm, concert. Pacific time.

**KYJ**, Los Angeles, Cal. Leo J. Meyberg Co. Daily ex Sun, 4-5 pm, concert, markets, weather, news. Mon, Thurs, Sat, 8-9 pm, same program. Pacific time.

**KYW**, Chicago, Ill. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 9:35 am-12:30 pm, market quotations, news, 7:30-8:15 pm, news, markets; 3, baseball; 4:15 and 6:30, news, final markets and stocks; 7:30, baseball, bedtime story; 7:45, feature; 8-9, concert. 9 pm, church service. Central time, daylight saving.

**KZO**, Los Angeles, Cal. Western Radio Elec. Co. Daily ex Sun, 5-5:30 pm, news, concert. Pacific time.

**KZM**, Oakland, Cal. Preston D. Allen. Daily ex Sun, 7:15-7:30 pm, news. Tues, 7:30-8:15 pm, concert. Wed, 8:15-9 pm, concert. Pacific time.

**KZY**, Oakland, Cal. Atlantic Pacific Radio Supplies Co. Daily ex Sun, 9:30-10:30 pm, concert; 6:45-7 pm, news; 7:30-8:15 pm, concert. Sat, 8:15-9 pm, concert. Sun, 11-12:15 pm, church service; 3-4 pm, concert. Pacific time.

**WAAT**, Jersey City, N. J. Jersey Review. Wed, 7-8 pm, concert, lecture. Sun, 7-8, church service, concert. Eastern time.

**WAIZ**, Emporia, Kan. Hollister-Miller Motor Co. Daily ex Sun, 7:15-8:15 pm, market quotations every half hr, 7-8 pm, concert, weather. Central time.

**WBE**, Springfield, Mass. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 7-8 pm, children's hour; 7:45, markets, weather, lecture; 8-9, concert. Sun, 3 and 8, church service. Eastern time.

**WCE**, St. Louis, Mo. St. Louis Star & Grand Leader. Mon, Wed, Fri, 6:15-8 pm, concert, lecture, bedtime story. Central time.

**WDM**, Washington, D. C. Church of the Covenant. Sun, 10:30 am, church service; 3 pm, lecture; 7:30, church service. Eastern time.

**WDZ**, Tusculum, Ill. James L. Bush. Daily ex Sun, every half hr, 8:30 am-12:15, Chicago Board of Trade quotations. Tues, Fri, 7-8 pm, concert, entertainment. Central time.

**WEW**, St. Louis, Mo. St. Louis University. Daily ex Sun, 10 am, weather, opening grain and live stock markets; 2 pm, closing of markets. Sat, 2 pm program at 1 pm. Central time.

**WFO**, Dayton, O. Rike-Kumler Co. Daily ex Sun, 8-9:30 am, concert, news; 11-12 and 4-5 pm, concert, news; 7-8 pm, news, weather. Mon, Wed, Fri, 8 pm, concert, lecture. Sun, 11-12 am, church service. Central time.

**WGH**, Montgomery, Ala. Montgomery Light & Water Power Co. Tues, Thurs, Sat, 11 am, weather; 4 pm, storm warn-

ings; 8:30-9:30, concert, agricultural. Sun, 8:30-9:30, church service. Central time.

**WGI**, Medford Hillside, Mass. Am. Radio & Research Corp. Daily ex Sun, 2:55 pm, music; 3, news; 7:30, baseball, news; 7:45 pm, police reports. Mon, Thurs, Thurs, 7:30 and 7:45 pm programs at 7:45 and 7:55 pm, respectively. Sun, 8 am, church service; 8:45 am, sacred concert. Special features, week nights, 7:30-9 pm. Eastern time.

**WGL**, Philadelphia, Pa. Thos. F. J. Howlett. Tues, Thurs, Sat, 7:45-11:30 pm, concert. Eastern time.

**WGY**, Schenectady, N. Y. General Electric Co. Daily ex Sat and Sun, 7 pm, markets. Tues, Thurs, Fri, 7:45-9 pm, concert, address. Eastern time.

**WHA**, Madison, Wis. Univ. of Wis. Daily ex Sun, 12:30-1 pm, weather, markets. Tues, Thurs, Fri, Sat, 12-1 pm, weather, markets, time. Tues, 8-9 pm, concert. Fri, 8-9:15 pm, news, concert. Sat, 11-12 pm, instruction. Central time.

**WHK**, Cleveland, O. Warren R. Cox (The Review). Daily ex Sun, 12:15 pm, 3:30-4 pm, miscellaneous. Tues, Thurs, Sun, 8-9:30 pm, concert. Eastern time.

**WRO**, Rochester, N. Y. Times-Union. Daily ex Sun, 12-12:15 pm, news, concert; 7:30-8, markets, bedtime story, lecture; 8-8:30, concert. Sun, 3 and 7:30 pm, church service. Eastern time.

**WHW**, East Lansing, Mich. Stuart Wm. Seeley. Daily ex Sun, 11:30 am and 12:30 pm, weather and markets. Eastern time.

**WIM**, McKeesport, Pa. K. & L. Elec. Co. Daily ex Sun, 6:30-7 pm. Tues, Thurs, 9:30-10:30 pm. Sun, 1:30-2:30 pm and 6:30-7 pm. Eastern time.

**WJW**, Washington, D. C. White & Boyer Co. Tues, 7:30-10 pm, concert, address, lecture. Eastern time.

**WJS**, Toledo, O. Service Radio Equipment Co. Daily ex Sun, 8-9 pm, concert, lecture, etc. Sun, 7:30-9 pm, church service, concert. Eastern time.

**WJW**, Newark, N. J. Westinghouse Elec. & Mfg. Co. Daily ex Sun, hourly 11 am, 6 pm, music; 11 am, 12 m, 5 pm, weather; 2:05 pm (ex Sat), shipping news; 4 m, 6 pm, agricultural; 9:52 pm, time signals. Tues, Thurs, Sat, Sun, 8:20-10 pm, concert. Sun, 3 pm, church service. Eastern time.

**WKY**, Oklahoma City, Okla. Oklahoma Radio Shop. (Daily Oklahoma) Daily, 12 m, weather; 7-7:30 pm, baseball. News; 8:30-9:30, 9:30-10:30, weather, news. Sun, 3:30-4:30 pm, concert. Central time.

**WLL**, Indianapolis, Ind. Hamilton Mfg. Co. Daily ex Sun, 8-8:55 pm, vaudeville, news. Thurs, 8-8:55 pm, concert, lecture, news. Sun, 8-8:55 pm, sacred concert. Central time.

**WLV**, Cincinnati, O. Coxley Mfg. Co. Tues, Thurs, Fri, 8 pm, concert, lecture, news. Sun, 8 pm, church service. Central time.

**WME**, Cincinnati, O. Precision Equipment Co. Daily ex Sun, 11 am and 4 pm, weather, markets. Mon, Wed, Sat, 8-12:12, concert, lecture, vaudeville, news. Central time.

**WNO**, Jersey City, N. J. Wireless Tel. Co. of Hudson Cy. Daily, 10 pm, news, concert, Eastern time.

**WNJ**, Albany, N. Y. Shotton Radio Mfg. Co. Mon, Wed, Sat, 8-9:30 pm, music, entertainment. Eastern time, daylight saving.

**WOC**, Davenport, Ia. Palmer School of Chiropractic. Daily ex Sun, 12-12:15 pm, markets, weather, concert; 3:30-4, lecture; 5:45-6 and 7:30, concert. Sat, 8-8:15, business review. Sun, 9-10 and 5:30-6 pm, sacred concert. Central time.

**WHI**, Indianapolis, Ind. Hatfield Elec. Co. Daily ex Sat and Sun, 10-11 am and 4-5 pm, financial, concert. Mon, Wed, 8:30-10 pm, concert. Sat, 10-11 am and 12-1 pm, financial music. Sun, 10-11 am, concert. Central time.

**WOK**, Pine Bluff, Ark. Arkansas Light and Power Co. Daily, 7:30 pm, baseball, markets, weather. Sun, 9-10 and 9:30-10 pm, concert. Sun, 11 am and 7:45 pm, church service. Central time.

**WOO**, Kansas City, Mo. Western Radio Co. Daily ex Sun, 9-10 pm, hour 9:30-1:15 pm, markets; 11:30 am, 2 pm, 7:30, markets, weather, road conditions; 7:45-8, concert, vaudeville. Sun, 7 pm, church service. Central time.

**WOZ**, Richmond, Ind. Richmond Palladium. Daily ex Sun, 12-12:15 pm, markets; 4-5, concert, news, markets; 8:30 pm, concert, news, weather, lecture. Central time.

**WPA**, Fort Worth, Tex. Fort Worth Record. Daily, 11:30 am, weather; 7:30 pm, baseball, concert; 9:30, news; 9:50, weather. Central time.

**WPE**, Kansas City, Mo. Central Radio Co. Mon, Fri, Sun, 7:45 pm, concert. Sun, 11:15 pm, markets. Daily, afternoon, baseball scores. Central time.

**WPM**, Washington, D. C. Thos. J. Williams, Inc. (Washington Daily News). Daily ex Sun, 2:30 pm, news. Mon, 8 pm, concert. Eastern time.

**WEL**, Hamilton, O. Doron Bros. Elec. Co. Mon, Wed, Sat, 8:30-10:30 pm, concert, news. Fri, 8:30-9:30, concert. Sun, 10:45 am and 7:30 pm, church service. Central time.

**WUN**, Schenectady, N. Y. Union College. Sun, 9:30 pm, sacred concert, speeches, etc. Irregular miscellaneous weekday program. Eastern time.

**WEX**, Dallas, Tex. City of Dallas. Daily, 8:30-9:30, concert. Sun, 11 am and 7:30 pm, church service. Central time.

**WFT**, Tarrytown, N. Y. Tarrytown Radio Research Lab. Tues, Thurs, Sat, 10:05 pm. Sun, 10:30 am, 2 pm, 10:05. Eastern time, daylight saving.

**WES**, Atlanta, Ga. Atlanta Journal. Daily, 10:20-11 am, 4-5 pm, news, etc.; 7-8 pm, concert. Eastern time.

**WWD**, Detroit, Mich. Detroit News. Daily ex Sun, 9:30-10:30 am, concert; 12:05-12:45 pm, news, sports, 3-3:30, markets, weather; 5, sports, news; 7, concert, lecture, vaudeville, etc. Sun, 11 am, 8:30 pm, 7:45, church service. Eastern time.

**WXC**, Washington, D. C. Post Office Dept. Daily ex Sun, 10 am, weather;

10:30, markets; 5 pm, 7:30, 8, markets; 8:50, weather. Eastern time.

**XYN**, Washington, D. C. Nat'l Radio Inst. Daily, 6:30-7:30 pm, instruction. Eastern time.

**9ALBU**, Asheville, Ky. Darrell A. Doward. Mon, Wed, 8 pm, police news, concert. Central time.

**9WD**, Denver, Colo. W. D. Pyle. Sat, 8-9:30 pm, concert. Sun, 5:30-7:00 concert. Mountain time.

**9XY**, Lincoln, Nebr. Univ. of Nebr. Daily ex Sun, 10:10 am, stock and grain markets, weather; 7:30 pm (irregular), concert. Central time.

**Montreal, Canada.** Marconi Telegraph Co. of Canada, Ltd. Tues, 8-9:30 pm, concert, news. Eastern time.

## Fans Anxious for U. S. Regulations

### Besiege Bureau of Standards for Bulletins Which Have Not Been Issued

Special to RADIO DIGEST

WASHINGTON, D. C., May 8.—The Superintendent of Documents of the government printing office has been so overrun with requests for a special bulletin which was supposed to have been issued by the Bureau of Standards regarding Radio receiving sets that he has been forced to issue a specially prepared letter stating that no such bulletin has been issued. His letter is as follows:

"We have received your recent inquiry concerning a publication of the Bureau of Standards describing a Radio receiving set using an amplifier, which requires no storage battery and uses for power supply only 60-cycle alternating current such as may be obtained by connecting to an ordinary electric lamp socket.

"We regret to inform you that the Bureau of Standards has not issued such a publication, and does not expect to do so. Notices have appeared in various newspapers stating that the Bureau expected to issue such a publication, but this information is not correct.

"P. D. Lowell of the staff of Radio laboratory of the Bureau of Standards has prepared a paper entitled 'Note on the Development of an Electron Tube Amplifier Using 60-cycle Alternating Current to Supply Power for the Filaments and Plates.' It is expected that this paper will appear in the course of a few months in one of the American electrical periodicals."

### To Open Australian Service

SYDNEY, N. S. W.—With the signing of the agreement between the Commonwealth government and the Amalgamated Wireless Company there is nothing to prevent the immediate organization of a direct Radio service to the United Kingdom and the United States.

The Commonwealth will be placed in close touch with parts of the world to which it has been impossible heretofore to lay cables. The service will open up portions of the interior which have otherwise been untouched. The main sending station, the most powerful in the world, will be at the station at Melbourne or Sidney. The rates will be two-thirds of the cable charges.

### ALL FAMOUS

(Continued on page 6)  
Solves Problem of Service

When the station first opened, difficulties were encountered in the obtaining of simple and efficient receiving sets for the use of such persons as would be benefited by the market quotation broadcasts. Clyde E. Wiley, who is working with Mr. Bush says in this regard:

"Almost immediately we found ourselves in trouble; for it was next to impossible to find a receiver that could be manipulated satisfactorily by people who are absolutely unfamiliar with either theoretical or practical Radiotelephony. Several nationally advertised receivers were tried out with varying successes until nearly this year the Westinghouse Electric & Manufacturing Co. came on the market with a receiver that combined simplicity with efficiency in a way that met with our ideas as to what constituted the class of service we desired to render.

"Much of our success was made possible by the enthusiastic cooperation of Morris & Stone at Coles, and of Seaman & Morris Grain Co., at Doran, Ill., who installed our first receivers. Previous to the time they installed their receivers we had been broadcasting only the closing markets; but started at this time to putting out the opening, a market every thirty minutes thereafter, and the close.

"We have continued this practice to date, and much interest has been caused in the territory which resulted in our installing sets at several other elevators and mills in this section, notably among whom are: The Big Four Elevator Co., Mattoon; The J. S. Ashbrook Grain Co., Mattoon, Ill., and the Farmers Grain Co. at Metcalf, Ill. Several up-to-date farmers have also installed our service."

## NEW RELAY DEVICE COPIES MESSAGES

### ELIMINATES A CONSTANT WATCH AT STATIONS

Code Received on Tape with Telephone Receivers Transmitted by Radio Frequency Currents

Special to RADIO DIGEST

WASHINGTON.—The necessity of an experienced Radio operator to receive code messages may be eliminated by the recent development of a Radio relay recorder at the Bureau of Standards by F. W. DuMore. Applications of the new device include the recording of Radio telegraph code messages on a tape at fairly high speed, so they can be read by an average operator visually instead of audibly. The elimination of a Radio relay operator may be effected by the installation of a call system, and in line-radio telegraphy a sponder may be operated from a signal transmitted by Radio frequency currents, making its unnecessary for the Morse operator to use a telephone receiver.

Wire telephone recording instruments have been employed for many years, but will be recalled, but it is only within the past few years that they have been applied to Radio telegraphy, on account of the fact that the exceedingly small amount of energy found in an incoming Radio signal—usually only a few microwatts—made it difficult to construct a Relay recorder. Such devices as had been developed required such sensitiveness and so careful an adjustment, besides being very delicate and expensive, that they hardly proved practical.

Reports on this recording relay, which is more rugged than devices hitherto developed and using larger currents of the nature of 5 milliamperes or more, indicate that any form of mechanism may be operated by Radio for remote control of moving bodies, such as automobiles, boat or airplanes. The simultaneous records of two messages received on the same antenna may also be secured by means of two recorders of this type connected in series, it is said.

Currents of 5 milliamperes or more are obtained, according to experts of the Bureau of Standards, by increasing the Radio signals received through the use of the electron tube amplifier. The amplifier consists of a vacuum tube which is being received, is employed. The operation of the newly developed relay has been made possible by the development of the electron tube amplifier as a reliable instrument for engineering practice. With a current of five milliamperes or more, a strong and positive action is obtainable, and it is possible to use an ordinary telegraph relay of rugged construction which does not require careful and repeated adjustment in operation, it is explained.

The Radio relay is constructed so that the electron tube circuits can be operated on 110 volt, 60 cycle alternating current from lighting circuits, or the relay can also be operated by batteries properly connected.

After amplification, the received Radio signal is delivered thru a tuned audio-frequency transformer to the plate circuit of an electron tube in which is connected the windings of a high-resistance telegraph relay. A condenser with a capacity of about 1 microfarad is shunted across the relay windings. The movement of the armature of the relay may be made to operate any desired mechanism, such as the ordinary ink-tape register, telegraph apparatus, or for the remote control of boats and vehicles.

The selectivity in this apparatus is greatly increased by the use of audio-frequency tuning of the secondary circuit on the input transformer, making duplex operation possible. Interference from strays is also reduced somewhat.

## GOOD AERIAL MADE OF CLOTHES LINE

### Attaches Radiophone to Back Yard Washday Outfit

LOS ANGELES, CALIF.—A dispatch received in this city from Santa Monica reveals the information of a clothes line aerial from which good radio results have been received.

Mr. D. G. Lee, an employee of the Santa Monica Bay Home Telephone Company has installed an aerial-less on antenna-less radiophone in his home and from which fine results have been obtained for the past several weeks.

Before erecting his aerial Mr. Lee attached his outfit to the clothes line to try it out and as the results were pleasing Mr. Lee has decided to continue to "pick" the waves from the air through the regular family clothes line for some time to come. The Lees have not only received the lectures and musical programs that are broadcasted from this city, but have also received the radio programs from as far north as San Francisco in the North.

# Radio Digest Illustrated

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In a new scientific field where many writers are contributing articles there will arise some controversy over the expressions of opinions and statements made from time to time. Some of these controversies may be taken into the courts for settlement. The priority of inventions may be claimed as well as the merits of some part entering into the construction of the radio apparatus. The Radio Digest is an outlet for these expressions and the publisher disclaims any responsibility for opinions or statements made in connection with radio apparatus. The news will be printed as it comes to us.

Vol. I Chicago, Saturday, May 20, 1922 No. 6

## The Politicians Will Use Radiophones

National Political Parties to Install Radiophone Broadcasting Stations

WE have heard a great deal about campaigning by Radio and recently there was a controversy over sending out speeches from the government broadcasting stations, ending in the closing of navy stations to all of the political parties. Plans are now being perfected so that each party will have their own broadcasting station at headquarters.

A Washington dispatch says that the control of the next congress will lie largely in ether. It is learned that both house and senate, eager to help matters along, are ready to go ahead with bills giving Herbert Hoover control of air currents.

Efforts are being made to obtain an exclusive wave length for stations to be installed in the offices of the government or state at Washington.

The Democratic national committee is also looking around for funds to establish a similar outfit.

So it appears that, whether we like it or not, we are to have politics in the air. We have too much politics already. Nearly ninety per cent of the Radio enthusiasts listening in on a political tirade are going to tune out the communication or throw their Radio equipment out the window.

## Airphones for the Vacationist

Take Along with You a Radio Set for Entertainment  
VACATIONERS are soon to be with us and each person has an idea of just the right kind of a pastime while resting up for the coming fall business. The vacationist may travel by boat, automobile or train, but he usually takes with him some one of his hobbies most dear to him. In recent years almost every one going on a vacation included in the baggage a phonograph, so they might have music during the evenings after a day's play. But now the vacationists have Radiophony with music first hand, and a receiving set will displace the phonograph, when the old trunk is packed.

The tired business man will not want to keep in touch with the worries of business while on a vacation. A little entertainment, however, is much to be desired. The Airphone will furnish him this. He can tune out the business part of the messages.

## Talking Around World by Radio

The Ether Extends Around the Globe. Why not Talk with It?

A LADDIN, with his fabled lamp, could never accomplish the miracle of modern Radiophony, yet Radio is still in its infancy. The human voice may now be flashed through the air, across the ocean to another hemisphere, and in another hemisphere it is caught and brought back to audible hearing.

The airplane soaring high and invisible in space may converse with the ground or ships at sea. Very soon the passenger in the commercial carrying passenger plane may call any subscriber in a city over which he is passing.

The time is fast approaching when we will talk around the world. Utilizing the equipment the United States possesses it is possible for London to talk with Cape Town, with Calcutta, with Hong Kong and Peking. The time is fast coming when the British premier will be able to hold daily conversations with the premiers of Canada and Australia, and the viceroy of India. These connections will be made as easily and even more rapidly than is now taken to call up a country house in Long Island from New York.

With the solution of two-day conversation by Radio and the design of apparatus which has made signalling and connection of Radio equipment with the ordinary telephone exchange possible, there is nothing left to conquer in the field except to build more powerful apparatus capable of transmitting over long distances.

## The Wonders of the Radiophone

The Wonderful Speed of Radiophones Astounds Us

MANY times we have heard the expression, "As free as the air we breathe," but how about it now? All of our lawmakers at Washington are trying to find some way to control this air. At no great distance in the future we will begin to feel as if we were taxed for the air, but we are thankful it is only for that part called ether. The News (Plazewell, Va.) speaks in this manner:

"The flying machine, the latest of the new wonders, must now give place to another equally wonderful. We have become accustomed to seeing airships, and only in country districts is notice taken of them. Now comes the Radiophone, which enables one to hear from everywhere. A concert, lecture or sermon, given in Cincinnati or New York, can be heard distinctly. Churches are installing the necessary appliances, which are simple and cheap, in order that the sermon may be heard hundreds of miles away. Railroad trains are installing Radiophones. Passengers may receive messages and hear the news. It is wonderful! But this, too, will be followed and superseded by something else still more wonderful."

A little light seems to be breaking here and there as to what we may expect for the future of Radiophones. Every day from one corner or another of the earth comes new developments in such a wonderful way that we stand aghast for the time, and the things that seem impossible break into the everyday humdrum of life and we awaken like Rip Van Winkle and ask if we have been sleeping for these long twenty years. The Post (Boston, Mass.) speaks of growing plants to be heard by Radiophone as follows:

"The time will come when by means of the Radiophone we will be able to hear a plant growing, a bud bursting into bloom; when the kick of a fly's hind leg will sound like a clap of thunder and the inhabitants of this mad Radio-sphere will listen to sounds never before detected by human ears."

It has not been so very long ago that the drudgery of the household was unbearable unless quite a number of servants were at hand. Now there are so many electrical devices to assist the person doing the household duties that it seems impossible to find work for all of them. As an addition to the household electrical devices the Courier (Elgin, Ill.) says:

"The Radiophone today took its place in the list of household conveniences along with the electric iron and the vacuum cleaner. A new invention of the bureau of standards at the department of commerce permits Radio fans to attach their apparatus to the electric light socket and eliminate the cumbersome and not always convenient battery. This will enable Radiophone fans to operate their machines with the ease and comfort of any other electrically attached device."

Short skirts, bobbed hair, pull-your-teeth-to-cure-your-corns, jazz jewelry and the rest of them, are simply not in the running nowadays. The wonderful craze of Radio has swept the country, then used a vacuum cleaner. However, in milder tones the Michigan Press states it this way:

"This is only the first hectic flush that always accompanies the introduction of something new under the sun. Something like this existed when the phonograph was introduced; everybody dealt in them and artists contributed their services gratis just for the advertising. At the present time singers, musicians and actors at broadcasting stations are said to be working gratis, but it is expected that this will soon pass. Soon this business will stabilize itself and Radio outfits will be sold by four classes of stores: sporting goods, department stores, electrical and musical stores."

If we are not boys, or have passed that age, we are still "overgrown boys" and we play as children, many times. Have you ever noticed how quick a child tires of most of his playthings and casts them aside for the new ones? Well, it has been such with the overgrown youth with the bicycle and phonograph. The Tribune (Oceola, Iowa) speaks of the interest lost in fads as follows:

"We make rapid strides in this country, and as soon as one stride is completed we start off on another. A year or two ago the airplane was the whole thing. Now it is but an incident in our daily life. It has ceased to thrill. The all absorbing topic is the Radiophone. You know all about it, how you can place an instrument in the house, stick an aerial up in a tree and then sit back and listen to concerts or market reports that are given a thousand miles away. You may even dance to the latest popular pieces if you desire, or you can listen to a sermon instead of going to church. It is a great stunt. What will the next one be?"

The passing of the saloon has eliminated to most of us the chance of getting a thrill when we see things that are not real. Many a fellow was capable of seeing a whole managerie soon after a glass or two, but now by Radiophone you can hear whole manageries without seeing them. In a humorous way the Gazette (Springfield, Ill.) tells of the Radiophone:

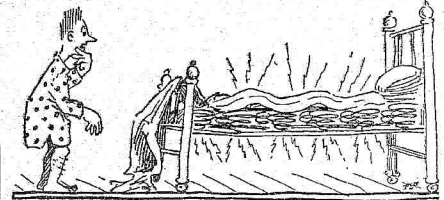
"Thrills that used to come out of a bottle are now coming out of the Radiophone. As outfits get cheaper, the Radio room will become the poor man's club. Even the near deaf will not be barred from membership. It is claimed they are able to hear Radio by the vacuumphone. This device magnifies Radio waves to fit the needs of variously deficient ear drums. The next step may be Radio artificial ear drums."

## RADIO INDI-GEST

### Those Bed Springs Aerials Again

Declaring "this wireless business has got to stop," E. C. Beck of Chillicothe, Ill., said that he has not been able to sleep for two weeks because of hearing voices and music in the air and because of shocks he gets when he goes to bed.

One night, he said, he awakened as in the grasp of a phantom. He says music, lectures, market reports, and voices break the silence of his bedroom each night, and



he blames it all on a huge Radiophone sending set at Bradley College, Ill.

Beck has no Radio-receiving set; but Radio operators say his bed springs, an ideal wireless aerial, may attract the signals.

Is some one trying to spoof us? Or did Mr. Beck use regenerative bed springs?

At any rate, why not let us have a wiring diagram?

### Where Can You Purchase Meters?

"My set will receive only 200 meters. Where can I buy another 180 meters to receive the broadcasting stations?"

### Expressman Wanted for Loading Coils

"The salesman in an electric store told me to add loading coils to my set. I have tried all the expressmen but none of them will take on Radio work."

### Can You Tell This Fan Where to Get New Wave Lengths?

The following letter recently came in to this department:

"My receiving set, after working well for several months, is now getting worse. I can only hear signals, and even they are weak. My friends tell me that my wave lengths are worn out. Where can I get new wave lengths, and what kind should I get? How much do they cost?"

### The Radio Takes the Breath Out of the Phonograph

One virtue of the Radiophone that appeals to us with the most force is, after you have shut down the windows, you can tune it so as to hear something far more pleasing than the phonograph next door.

### Business and Pleasure

Our prominent business men do not have to pass up a baseball game just because of that pressing engagement. No, siree; they merely step into the next room and turn on their Radio. Simple!

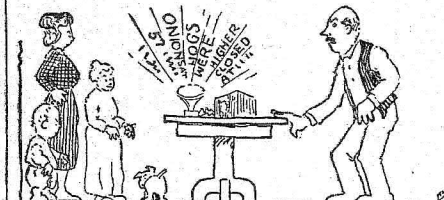
### Not All Ivory, Some Vacuum

Smart Guy—"Oh! Yes, I have a vacuum bulb on my Radio set."

Backwoodsman—"Yes! And you have got one on your shoulders, too, have you not?"

### The Markets Is All You Hear

When the static acts erratic  
And your signals come in faint;  
With a grinding and a crunching in your ear—  
When your tuning starts no crooning  
And the patience of a saint  
Would be tested quite severely, one can fear—



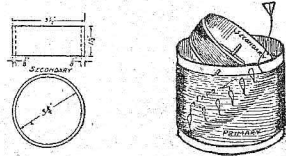
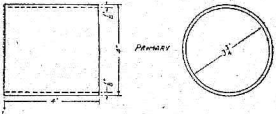
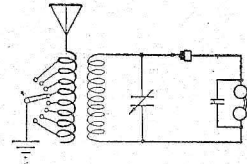
When your groping and your hoping but evokes discordant sound,  
Tho' you're fervent as you turn the tiny knobs—  
You examine both the batteries and you reinforce the ground,  
You inspect all your connections and the table top you pound,  
You swing your little meters in a crazy circle 'round,  
Your mumbling and your grumbling all the family folk astound,  
'Til relief o'erspreads your visage when the proper spot you've found—  
And "The Market Price on Onions" is the subject quite profound,  
Being flashed to many thousands on the country-side around—  
IT'S A GREAT FEELING—EH, WHAT?  
—Illinois State Journal.

# How to Make Receiving Set Cheaply

## Three Dollars Is the Only Cost of This Set

The receiving set illustrated uses an aerial about seventy-five feet long and seventy-five feet high, and the whole thing will cost about three dollars. The following is a list of materials needed: one detector, one-half pound of wire, one knob and dial, ten switch points, one switch lever and some tinfoil.

The shape of the tuning coil is like a variocoupler and the stationary coil, or primary, is made of a tube four inches in di-



After and four inches long. Start the winding within one-half inch of the top and take out a tap every ten turns until a total of ten taps are made. You will then have one hundred turns of wire on the primary. Each tap is lead to a switch point. The secondary consists of a tube three and one-half inches in diameter and one and one-half inches wide. This has thirty-eight turns of No. 26 gauge wire single cotton covered wire the same size as is used on the primary. A space of about one-quarter inch is left in the center for a brass shaft. A knob and dial may be attached to this shaft when the outfit is mounted on a panel.

The fixed condenser used with this outfit consists of two sheets of tinfoil three by four inches, separated with a sheet of paraffin paper. The detector used is a small one with a piece of galena.

The builder of this set can mount it as he desires, but it is best to place it in a box with the detector on top.

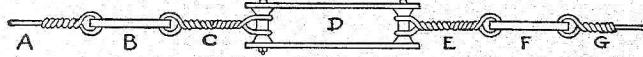
With the hookup as shown this set will tune up to about 600 meters.

## INSULATORS FOR AERIAL

The amateurs are speedily putting up all kinds of antennae to catch the messages sent out from the broadcasting stations. If one has plenty of money this is an easy matter, but to the boy who must make

as in Fig. 2. This also should be shellacked.

Either of these insulators may be used as shown in Fig. 3. A simple copper wire antenna, A, 100 to 150 feet long is con-



every penny count the cost of proper insulators is quite an item.

Good insulation is essential to obtain proper results and good insulators can be

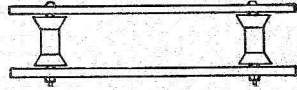


FIG. 1

easily made by bolting two strips of wood together with two empty thread spools and galvanized iron bolts as shown in Fig. 1 and then giving the entire surface a good coat of shellac.

Another way is to use a piece of broom handle drilled and grooved at each end

connected to a one-half portion of an electrician's cleat, B, which is used for wiring a house, then a short length of wire, C, connects the cleat to the homemade insulator. Another piece of galvanized wire, E, connects another cleat, F, and last a length of galvanized wire, G, which goes

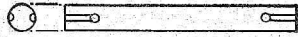


FIG. 2

to a screw eye in the roof, tree or other object to which the aerial is fastened.

An aerial put up and insulated at each end as described will give good results for the reception of music, or other broadcasting, as well as telegraphic communications.

For sending, another type of antenna is advisable.

## Radio Kinks

RADIO DIGEST is interested in any of those little kinks that every amateur discovers in his workshop. Sometimes it's a How to Make Article, or a little tip in operation of the set; how to use parts that are not thought of, perhaps some new hook-ups that haven't been published yet.

Send them in, with full details, sketches and diagrams if necessary. One Dollar will be paid for every one published. If a self-addressed, stamped envelope is included, rejected copy will be returned. Work must be original, however, and not copy from others.

RADIO KINKS DEPARTMENT, RADIO DIGEST  
123 West Madison St., Chicago, Ill.

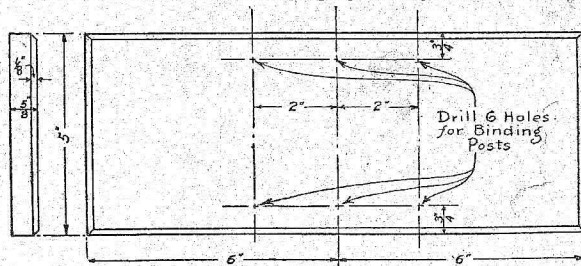
### WAVELENGTH DATA

Why blame it all on "static"?

If the weather is fair, humidity low and temperature cool, interference from static is at its lowest. But if you cannot get results in spite of good weather conditions, look for something else. Maybe in putting up your aerial you ran it parallel to nearby telephone or telegraph wires. That reduces the efficiency of the aerial and will interfere with reception. Crossed or coiled wires in the receiving set will create induced currents and noise in the phones. Care in installing the apparatus leads to best possible efficiency in the set.

### Storage Battery Notes

A shielded panel is advisable in a number of ways, chief among which is the

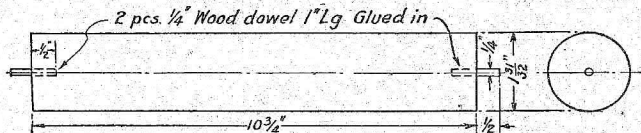


### Wood-One Required

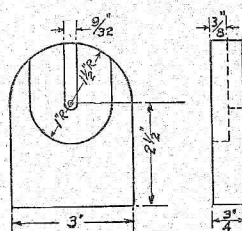
elimination of capacity effects from the operator's hands while manipulating the controls.

It is not an expensive or difficult job to properly shield the rear of an amateur receiving set panel, unless you are considering using a copper plate shield.

ing all surplus aluminum sheets. All holes are drilled in the panel, and where they come through on the other side the leaf is scraped away so as not to form contact with any part of the circuits. The coating is grounded at the ground post of the set.



### Wood-One Required



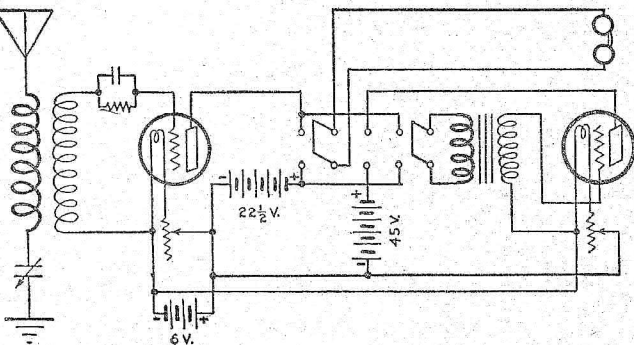
### Wood Two Required

## SWITCHES USED IN PLACE OF TELEPHONE JACKS ON AUDION SET WITH AMPLIFICATION

Where an audion set with one or more stages of amplification are to be used, switches may be substituted for the telephone jacks as shown in the illustration. Two switches are necessary, one a double pole, double throw switch. The arms of this switch are connected to the phones. The other switch being a double pole single throw type is connected to the first amplifying transformer primary leads, as shown. This throws the one or more stages of amplification into circuit simultaneously.

To operate, the single throw switch is open, the double throw switch being thrown into the left points. In this position the phones are connected in the plate circuit of the detector only.

To throw on the amplifiers the double throw switch is turned into the right point and the single throw switch is closed. In this position the phones are connected in the plate circuit of the last amplifying tube. The use of these switches is more adaptable to table mounting than to the panel type.



# Radio Telephony for Amateurs and Beginners

## The Electric Magneto Waves and the Ether

By Peter J. M. Clute

### Part 1

The "ether" has been defined as a hypothetical medium of extreme tenuity and elasticity, believed by scientists to be diffused not only throughout all space but among the molecules of which solid bodies are composed and to be the medium of transmission of heat, light, and electromagnetic waves by the frequency of the oscillations. If the frequency is high, the wavelength will be low, and vice versa. For example, if the frequency of the oscillations is 882,300 cycles per second, the wave length will be 300,000,000 divided by 882,300, or 340 meters, where 300,000,000 is the velocity of the waves in meters per second. On the other hand, if the wave length is given, the frequency may be determined by simply dividing the velocity of the electromagnetic waves by the length of the wave.

Light waves pass through interstellar space and through the most perfect artificial vacua that can be produced. If there are light waves, they must be in some medium which extends throughout space as far as the most distant stars from which light is received; it must fill all vacua and permeate all bodies through which light can pass. And yet no resistance to the motion of the earth or planets through this medium has ever been detected.

Independent evidence for the existence of the ether is obtained from the study of electricity and magnetism. Electromagnetic waves have been proven to exist and they are found to travel with the same velocity as light and heat waves. There is, therefore, a medium in which waves may exist and travel with the velocity of light. And since the velocity of a wave depends both upon the properties of the medium and upon the kind of wave motion, it is highly probable that the vibrations of electric and light waves are exactly the same. All ether waves travel with the same velocity, whether they are light, heat, or electromagnetic waves, such as those whereby Radio signals are propagated. The velocity of transmission of all three is the same, namely, 300,000,000 meters or 186,000 miles per second.

No doubt, everyone is quite familiar with the propagation of wave motion across the surface of a small pond when a disturbance is created, such as a pebble thrown into it. The disturbance causes ripples or waves to radiate in all directions from the location where the pebble entered the water. Essentially, the same condition exists in Radio, where the electromagnetic waves are propagated through the ether.

The statement that a wave is directly sent from the transmitter to the receiver is entirely erroneous. Most of this misunderstanding is caused by an imperfect knowledge of what a meter is and of what wave length is, coupled to the fact that the transmitting range of a station is dependent primarily on the power used, and incidentally on weather conditions, location of the transmitting station, and the sensitiveness of the receiving equipment.

The distance between the crests of two successive waves (Figure 1) where the energy is at a maximum or a minimum, is termed the "wave length." Also, it may properly be taken as the distance between successive troughs in a wave motion. It is easily apparent that this distance is not concerned directly with the distance the actual wave will carry. The unit which has been universally adopted to measure the length of the electromagnetic wave radiated out from the transmitting antenna is the "meter," the unit length in the metric system. The meter corresponds to 39.37 inches.

Different kinds of ether waves have different frequencies. Heat and light waves have higher frequencies than electric waves. The ether waves of the lowest frequency are the electromagnetic Radio waves. The velocity of propagation of ether waves is the same regardless of their frequencies.

Referring again to Figure 1, a wave is said to have passed through a cycle, each time a point on the surface of the wave goes through a complete set of motions

and starts to repeat those motions. The number of times that, passing a given point in a second or, in other words, the number of complete cycles the wave goes through in one second is called the "frequency." The number of waves sent out is equal to the frequency of the oscillations in the antenna circuit. Hence, the length of a single wave may be determined by dividing the velocity of the electromagnetic waves by the frequency of the oscillations. If the frequency is high, the wavelength will be low, and vice versa. For example, if the frequency of the oscillations is 882,300 cycles per second, the wave length will be 300,000,000 divided by 882,300, or 340 meters, where 300,000,000 is the velocity of the waves in meters per second. On the other hand, if the wave length is given, the frequency may be determined by simply dividing the velocity of the electromagnetic waves by the length of the wave.

The above discussion may be conveniently summed up in the equation:

$$\text{Wave length (meters)} = \frac{\text{Velocity of waves (meters per second)}}{\text{Frequency (cycles per second)}}$$

The following table gives a list of some of the commonly used wave lengths, with their corresponding frequencies of oscillation:

Wave length (meters)	Frequency (cycles per sec.)
50	6,000,000
150	2,000,000
200	1,500,000
250	1,200,000
300	1,000,000

### Peter J. M. Clute—

FOR several years has contributed technical articles to various periodicals and is well known in electrical engineering circles. A graduate of Union college with a degree of Bachelor of Science in Electrical Engineering, Mr. Clute is now connected with the engineering department of the General Electric company.

Realizing the importance of giving the new Radio fans a comprehensive knowledge of electrical fundamentals necessary to secure a reasonable understanding of Radio, Mr. Clute has prepared a series of articles especially adapted to the novice.

The articles to be published in the RADIO DIGEST in ensuing numbers include:

- II. RADIO TRANSMITTING STATIONS.
- III. THE AERIAL AND THE GROUND.
- IV. CONDENSERS.
- V. TUNERS AND TUNING.
- VI. DETECTORS: CRYSTAL AND VACUUM TUBE.
- V. THE BATTERIES.
- VI. RECEIVERS AND LOUD SPEAKERS
- VII. CRYSTAL DETECTOR RECEIVING SETS.
- VII. VACUUM TUBE RECEIVING SETS
- VIII. AMPLIFIERS.
- IX. USEFUL INFORMATION.

260	833,300
375	800,000
400	750,000
600	500,000
800	375,000
1,200	250,000
2,000	150,000
2,500	120,000

An electromagnetic wave generated by a spark discharge in a Radio transmitter circuit has a decreasing amplitude, the rate of decrease being limited in order to

interference results. The logarithmic decrement is limited to a maximum of 0.2 for each complete cycle. A minimum of twenty-three complete oscillations should be radiated for every spark discharge in the closed circuit.

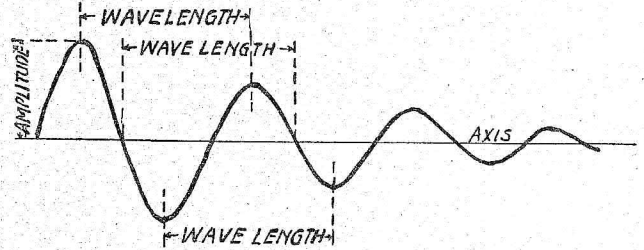


FIG. 2 TRAIN OF DAMPED OSCILLATIONS OR WAVES

In continuous wave, or C. W., transmission there is generated a perfectly uniform wave of constant amplitude, which travels through the ether without losing its form.

the older spark type receiving installations; or it may be modulated by the voice for Radiophone transmission.

The large majority of amateur Radio transmitting stations use only a small amount of power for transmitting; conse-

quently their range is small. There are organizations of amateurs which include primarily those who are interested in the relaying of messages from one station to another, and during the cooler months of the year when their air is clear of static, it is frequently possible to relay messages through such stations clear across the country within a remarkably short time. Inasmuch as many of the leading amateur stations forming this relay system employ C. W. tube transmission, obtaining excellent results, it is not uncommon for a range of these tube stations to exceed 1,000 miles. During the warm months of the year, when there is considerable disturbance from atmospheric electricity due to thunderstorms, repeated tests have proved that tube transmitters can work successfully through heavy static caused by thunder-showers, while spark stations of the same power could not be heard.

One of the problems of amateur activities is that of interference between stations. This is largely the result of the use of spark transmitters which radiate their energy over a wide band of wave lengths. In the case of C. W. transmission, the energy is radiated on substantially one wave length, thereby eliminating to a great degree the objectionable interference caused by spark stations. The character of transmitted energy is such that the effect at the distant receiver is much greater, power for power, than a spark set, principally for the reason that the undamped wave transmitter permits the use of highly refined and efficient methods of reception.

Radio waves that pass through the ground and through water, as well as the air, are a well-founded possibility in the light of unusual performances of lower power transmitting stations in sending messages to surprising distances. Under favorable conditions it may be easier for electromagnetic waves to course through the earth than through the ether. Submarines already have sent Radio messages successfully while submerged, thus substantiating this theory. If Radiation through the earth does take place, however, it will be wholly according to known electrical laws. Circumstances are such that the sending antenna and the receiving set are both connected to ground, and the earth, in this instance, might act as a return circuit for the current.

Marconi, when asked if rainfall could be drawn by Radio, said that there was possibility of this being done. Many people caught out in a summer shower have experienced a downpour immediately after a bolt of lightning. "Efforts have been made by Radio on a large scale to produce the same results," says Marconi. "But I found that my plans were received with skepticism. We undoubtedly will accomplish this wonder some day and then we will become the lords and masters of life on this planet. We will be able then to obtain any amount of power almost without effort. All the work will be done by the sun, man will merely press the button. The development of water power and of the Radio transmission of electrical energy produced by water power will become exporters of electrical energy to less fortunately situated countries."

### Predicts Radio Will Soon Control the Rain

Search by Radio for \$100,000 Gems  
New York.—Mrs. Mitchell Harrison, wife of a sugar refiner, is directing by Radio the search for the \$100,000 in gems she lost in a sleeping car before she sailed for Europe a few days ago. A detective company representing London Lloyds said Mrs. Harrison lost the gems en route to this city from Nokesville, Ky.

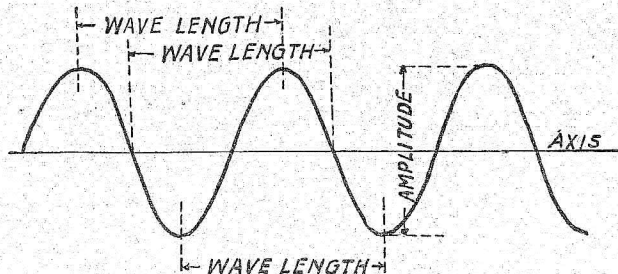


FIG. 1 TRAIN OF UN DAMPED OR CONTINUOUS WAVES

prevent interference with other stations. The train of "damped" oscillations, so called because the amplitude decreases at each successive oscillation due to energy losses in the circuit, is illustrated in Figure 2. If the amplitudes of a train of "damped" oscillations decrease too rapidly

and starts to repeat those motions. The number of times that, passing a given point in a second or, in other words, the number of complete cycles the wave goes through in one second is called the "frequency." The number of waves sent out is equal to the frequency of the oscillations in the antenna circuit. Hence, the length of a single wave may be determined by dividing the velocity of the electromagnetic waves by the frequency of the oscillations. If the frequency is high, the wavelength will be low, and vice versa. For example, if the frequency of the oscillations is 882,300 cycles per second, the wave length will be 300,000,000 divided by 882,300, or 340 meters, where 300,000,000 is the velocity of the waves in meters per second. On the other hand, if the wave length is given, the frequency may be determined by simply dividing the velocity of the electromagnetic waves by the length of the wave.

The most popular method of propagating C. W. is through the use of the oscillating vacuum tube. The glowing incandescent filament of the tube generate a continuous supply of Radio-frequency oscillations through the simple means of controlling the flow of electrons between the filament and a positively charged plate.

The "damped" or discontinuous wave is produced by the spark type of transmitter and, as its name implies, the wave train is not continuous in its passage through the ether and the amplitude of its oscillations is not constant. As has been shown in Figure 2, the waves gradually fall lower and lower in amplitude until they are completely damped out. The next stroke of transmitter energy causes the waves to rise again, and so on indefinitely. Being dependent on the energy back of them, these damped waves travel through the ether until exhausted.

C. W., when intercepted by a receiving station antenna, is so sharp and constant in character that the receiver must be tuned exactly to its wave; otherwise it will not affect the instrument. This sharpness of tuning is a factor in eliminating interference between stations.

Radio telephony is a combination of both damped and undamped waves. A Radiophone transmitter is normally radiating C. W. or undamped oscillations at Radio frequencies, and when speech takes place in the telephone transmitter or microphone, the oscillations are modulated by the voice characteristics. The changes cause a superimposed rising and falling amplitude in the wave.

C. W. may be used in its natural wave form for long-distance Radio telegraphy; it may be modified as in damped wave transmission, to meet the requirements of

# Simple Instructions for the Beginner

By Harry J. Marx

## Explaining Uses of Transformers

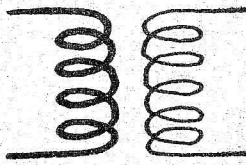


FIG. 1  
Hollow Core Type Convention

The term transformer is a broad one, and the instrument is seen in a number of different forms. It is used in a variety of ways. Primarily, however, the transformer is an electrical device used for transforming or converting a flow of current with a given voltage and amperage to a flow with other relative values for voltage and amperage. It consists of two coils of wire, each a separate circuit and made up of turns of an insulated conductor wound on a spool or magnetic core, depending upon the purpose it is to be used for. The two coils are known as the PRIMARY and SECONDARY. Naturally, as most people already know, the transformer works through induction. When a current is sent through the primary coil, it creates magnetic lines of force. If the current is alternating, then the magnetic lines are continually reversing. In doing this a constant alternating flow of current is being induced in the secondary winding. If the windings are both alike the current induced in the secondary is the same as the original in the primary, with the exception of the slight losses that are always found in any mechanical or electrical conversion. But if the secondary winding has ten times as many turns as the primary, then the induced current will have ten times the voltage of the original current in the primary.

Likewise if the primary has ten times the turns that the secondary has, then the transformer will be of the "step-down"

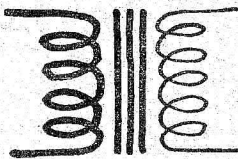


FIG. 2  
Iron Core Type Convention

type, or in other words, the induced current will have one-tenth the voltage of the primary current. This feature then is the explanation of the value of the transformer. It converts a current from one form to another.

### The Use of Transformers in Radio

While the transformer is well known in other fields than Radio, we are, however, only interested in its use for Radiotelephony. In transmitting, which we will just give passing mention, we find transformers used to adapt the usual power current to that required for the operation of our sending apparatus. Then in addition we use a transformer to increase the low voltage of

the sending apparatus to the high frequency alternating current used for transmitting through the ether over long distances.

Over ninety percent of the interest at the present time, however, is in the receiving apparatus that catches the popular broadcasts. For this reason we will go more into detail of the use of the transformer in receiving units. We often find transformers used to convert the house lighting current of 110 volts into 6 volt current for bell ringing purposes. This type of transformer is often used for lighting the filament in the vacuum tube, its use, however, is not recommended as even when rectified, it will cause a humming sound in the receivers. The next use is in the familiar form of the loose coupler and vario coupler, although many do not realize that they are but another form of transformer. Amateurs will persistently ask what is the difference between the loose coupler, vario coupler and receiving transformer. The next form that we find of the transformer in Radio is for amplifying. We have the Radio and audio frequency transformer as used for the amplification of the reception current.

### Radio and Audio Frequency

In order to more fully understand the use of the transformer in both Radio and

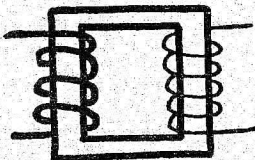


FIG. 3  
Closed Iron Core Type

audio frequency, it is advisable that we go into a little more detail in this subject, as the number of questions that are being continuously asked indicate that the subject is not thoroughly understood by many.

The sound waves of the human voice run from 15 to about 15,000 vibrations per second. Vibrations above 10,000 are scarcely audible in the human ear. When these sound waves act upon the transmitting apparatus, they are converted into an electrical current, and this current is alternating. Alternating current can be considered in the form of vibrations, although we term them cycles. The sending apparatus, however, converts this into an alternating current of about 1,000,000 cycles per second (300 meter wavelength). This is what is called a Radio frequency alternating current. This high frequency is necessary for transmission through the ether.

The receiving apparatus has one main function to perform, that is to convert this high frequency current into sound waves audible to the ear. That calls for one intermediate step, in order to operate the phone receivers, the current must be rectified—that is, it can not be used as alternating but must be changed to flow in one direction. The vacuum tube is the instrument that has made this possible. We find, however, that the conversion into sound waves does not result in very loud tones through the receiver. Our detector tube has converted the Radio frequency alternating current into a rectified current of lower frequency. Then by means of a transformer and an amplifying tube we amplify this

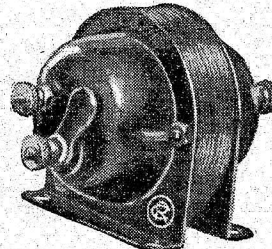


FIG. 4  
Commercial Type

current before sending it to the receiver for conversion into sound waves.

The question is occasionally asked: "But if the current has been rectified and is no longer alternating, how can we get induction?" When we say that the current has been rectified, we mean that it now flows all in one direction, but its value rises and falls from maximum to zero value. At the zero value we have no magnetic field, so the magnetic lines have been broken. Since they are always in the same direction, however, our induced current also has a rectified form rising from maximum to zero.

If we are receiving over long distance, we will find that the Radio frequency alternating current is too weak to be rectified by the vacuum tube. In this case we use Radio frequency amplification, that is to say we amplify the high frequency current before it is rectified, by means of an amplifier tube and a Radio frequency transformer. This then is called Radio Frequency Amplification. Therefore the Radio frequency amplification is before the detector tube, while the audio frequency amplification is after the detector tube.

The diagram shown on Figure 1 is the convention of the hollow core type of transformer, such as the loose coupler and vario coupler. Figure 2 is the iron core type, while Figure 3 is what is called the closed iron core type. These are the amplifiers and in stepping down lighting current.

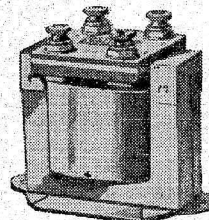


FIG. 5  
Commercial Type

Figures 4 and 5 show the commercial type of transformer used for amplifying.

Figure 6 is a popular type of hook-up with two steps of Radio frequency amplification, detector and two steps of audio frequency amplification. Note how the Radio Frequency Amplification comes before the Detector Tube, in order to amplify the Radio Frequency Alternating Current. Likewise the Audio Frequency comes after the Detector Tube and amplifies the rectified current.

## Important Points on the Armstrong Circuit

Many persons are puzzled why there are so many Radio parts sold rather than the complete sets for Radio reception, especially using a hookup called the Armstrong Regenerative circuit. This class of circuit is fully covered by patents gotten out by Mr. Armstrong and since sold to the Westinghouse company. For this reason, persons manufacturing receiving instruments for sale are required to pay royalty on the use of the Armstrong circuit. Only a limited number of manufacturers have been allowed the right to manufacture these sets and these are licensed by the Westinghouse company.

An individual, however, can construct any patented device for his own use. For this reason many persons prefer to buy the parts to a Radio set and assemble the apparatus themselves. Parts are not very expensive compared to the complete licensed sets, and a small knowledge of Radio is generally sufficient to allow any person to make a receiving outfit, certainly if he can get a little help and advice from someone who knows something about it. One great advantage connected with construction of Radio sets is that the constructor gets interested in the science and learns a lot more than he possibly could by operating an instrument enclosed in a cabinet, where a few dials are turned and without any apparent reason, different stations are tuned in. Anyone wanting an instrument from the standpoint of results, only should by all means buy a complete outfit and have it installed by an expert.

Some small concerns are manufacturing instruments that should be licensed under the patent. This will continue for a while but as a rule the apparatus is poorly made and does not last long. The innocent buyer often learns by our old Mother Experience that he has been stung. Apparatus that has been licensed under the proper patent will have the fact printed on a plate fastened to the set and as a rule its quality will prove it.

This explanation is to acquaint the reader with the facts concerning one of the most important Radio patents and stop him from wondering why the high prices on complete sets and why the lower price on apparatus parts.

## Single Wire Antenna Best for Crystal Set

Remember that an indoor aerial will not work efficiently for any distance with a crystal set, so do not try it. A single wire about 100 feet long and as high as possible is the best aerial that can be used for receiving. Three and four strand aeriels, the cage aerial and other types will not help in receiving. Save your money and time by erecting a single wire aerial only.

Galena comes in as many different grades as it is possible to imagine. Beginners who cannot hear any signals will do well to purchase several pieces of this mineral before complaining. Sometimes by simply changing the mineral a set that has been a failure will at once become a wonderful success.

Don't try to set your galena in soldering lead, it kills its sensitivity.

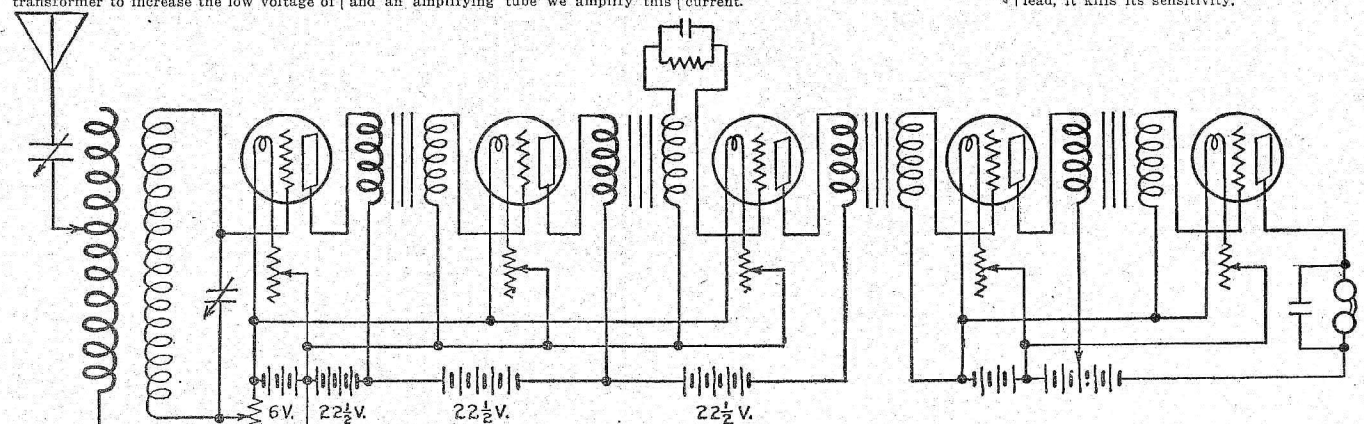
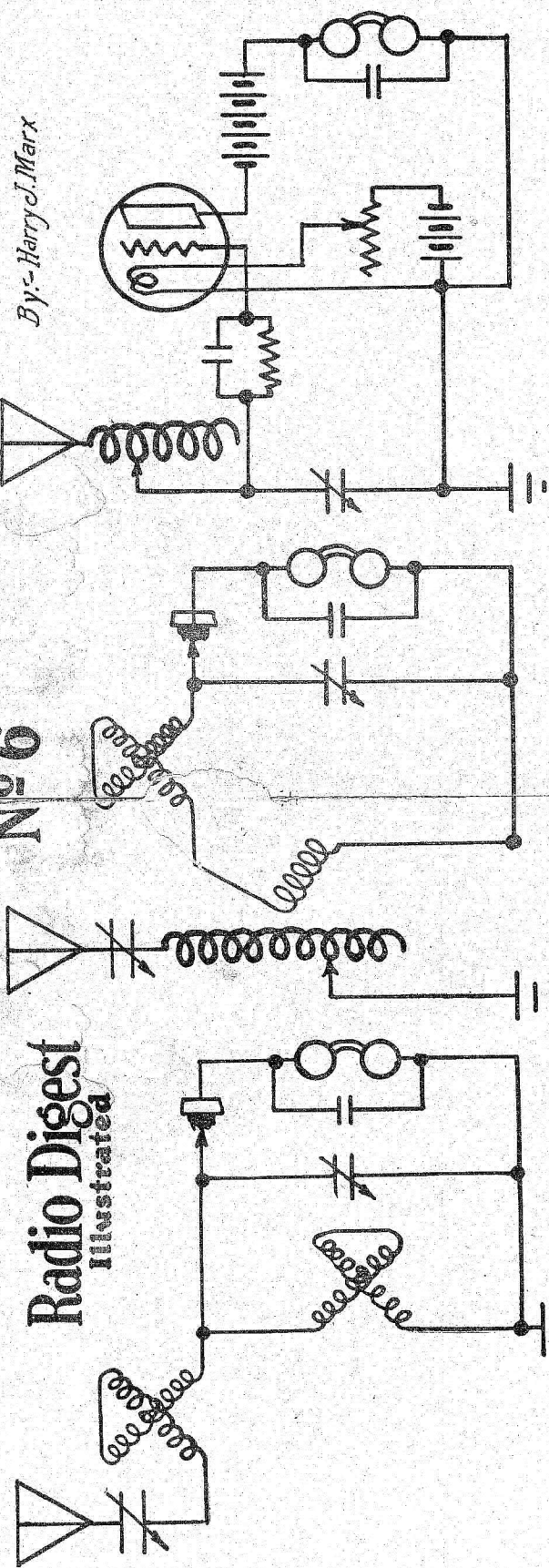


FIG. 6

By: Harry C. Marx

No 6

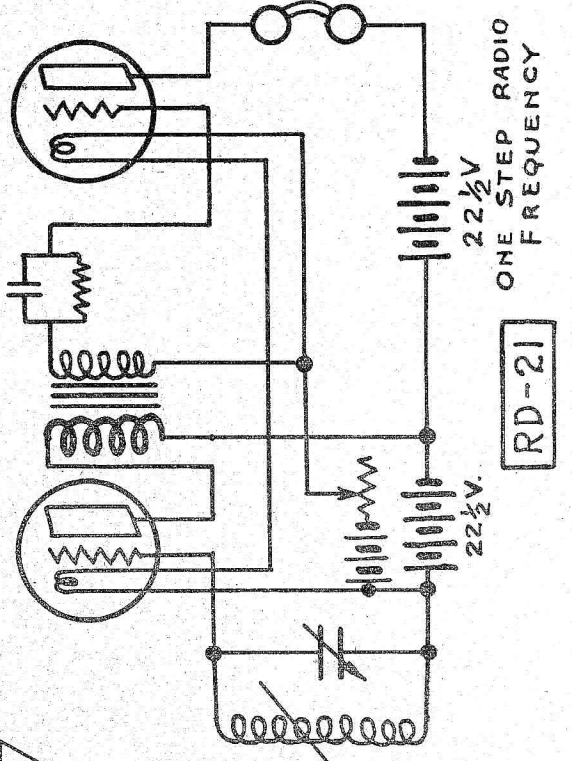
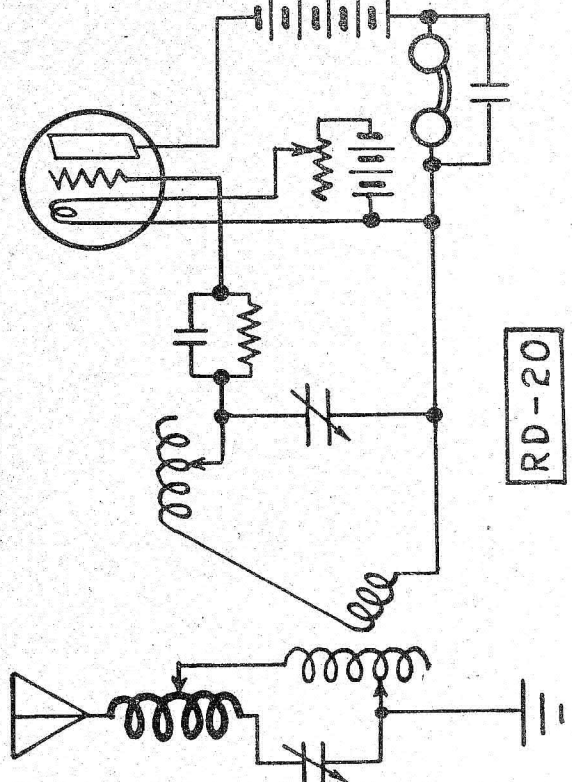
Radio Digest  
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