

Many Features for Beginners in This Issue

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LEE-KING DRUG CO.,  
NEWNAN, GA.

# Radio Digest

## Illustrated

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Vol. 1

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E. C. Rayner

CHICAGO, ILL., SATURDAY, JUNE 3, 1922

No. 8

## CONAN DOYLE SAYS YES

### HAMMOND INVENTS A SECRECY DEVICE

CONFIDENTIAL MESSAGES  
CAN BE BROADCASTED

Reception Accomplished by Receivers  
Tuned Magnetically to Send-  
ing Station

John Hays Hammond, Jr., whose Radio controlled yacht caused a sensation several years ago, has announced an invention perfecting secrecy in Radio messages.

The apparatus, technical details of which are for the present withheld, allows transmission simultaneously of scores of messages on the same wave length, while reception will be accomplished only by receivers tuned magnetically to each of the various transmitters. Practically it works this way: If all the broadcasting stations in the country were located in Chicago, and all equipped with the Hammond apparatus were broadcasting concerts on a 360 meter wave, your receiver would take but the one concert for which it is tuned, and would suppress the carrier waves of the other stations.

Atmospheric and static interferences also have been eliminated by the new device to the point where messages can be received by it under conditions which would

(Continued on page 2)

### Keep Taxis Moving By Using Airphones

Chicago Company Installing Stations  
at Central Office to Notify  
Drivers of Calls

CHICAGO. — Distribution of taxicabs where calls are heaviest will be made by Radio, according to the announcement of a Chicago taxicab company. Contracts for the installation of Radiophone transmission plants at the company garages and in the twenty-five cabs used by traffic superintendents are being filled.

The system will enable the central office to keep the cars moving where they are needed, to notify drivers when trains are late and to improve the efficiency of the service in general.

It is predicted that Radio service will increase efficiency ten to forty per cent and do away with the idle time on the stands.

### RADIO CREATES BIG DEMAND FOR METALS

CHICAGO.—W. L. Chandler, president of the National Association of Purchasing Agents, said recently that the metal trades have followed in the wake of the Radio boom and show a great increase in orders during the past two months. A great demand has developed for strip and ribbon metals which are used extensively in the manufacture of radio equipment.

### PSYCHIC RADIO INTERESTS RENOWNED BRITISH AUTHOR



Sir Arthur Conan Doyle, creator of Sherlock Holmes and advocate of psychic phenomena

### RADIOPHONE IS PRACTICAL FOR COMMUNICATING WITH THE SPIRIT WORLD BY AMPLIFYING HIGH NOTES

Noted Novelist in Personal Interview Comments Favorably on Invention of Henry Edward Burket, of Chicago

By E. E. Plummer  
(Staff Correspondent)

"I believe the super-Radiophone is designed along the right lines to establish communication with the dead," said Sir Arthur Conan Doyle when interviewed by a representative of RADIO DIGEST regarding the practicability of the spirit phone discussed in the April 29 issue of the paper and invented by Henry Edward Burket of Chicago. "If it succeeds," continued the great English novelist and spiritualist, "Mr. Burket will be classed as one of the world's greatest inventors, even greater than Thomas Edison."

Sir Arthur explained that it was his belief that the problem to be solved in the establishing of communication with ethereal beings was that of transforming the extremely high "notes" emitted by the spirits into low, audible notes, which then would require intense amplification before they could be heard by the average human being. The application of the super-Radiophone to the task was thought by him to be research in the right direction.

#### Difficult for Spirits to Reach Our Plane

"You know it is just as difficult for Spirits to reach and communicate with the mortal plane," said Sir Arthur, "as it is for the mortal to attain the spiritual plane. The calling of a spirit on the other side, from the mortal plane may be considered analogous to the calling of one Radio station by another. There are many, many of the ethereal beings in the spirit world, and it is naturally difficult to locate the individual spirit desired."

He also explained that a person must have some psychic qualities in order to see and interpret spirit manifestations. He admitted that he had no mediumistic powers, but nevertheless has been able to communicate with the spirit world. On one occasion, he had even ridded a "haunted house" of the spirit which had been visiting it, purely by talking to the deceased being and solving its problem.

#### Spirit Came for Papers

The spirit which had been visiting the house was doing so because it thought that the house contained some papers of a compromising nature. These Sir Arthur searched for in the place the spirit named, and not finding them, communicated the result to the spirit in question, who, when mortal, had lived in the house. The spirit no longer haunted the house.

In the words of the great author and  
(Continued on page 2)

### Broadcasting Station to Open Luna Park at Coney

NEW YORK.—Luna Park will be opened this year in a new and novel way. It is to be opened by Radio from the large broadcasting station in New York. The park is boasting of complete and powerful Radio receiving set which has been installed on the battleship Recruit, which stood in Union Square for many months, where it was a point of interest to tourists, and which has been reassembled and placed in the "city of fun." Ed Glavin, the Radio control genius, will be assisted in his various demonstrations of the Radio controlled torpedo, which will be a feature of the old ship's exhibit by Capt. R. Grayce Whyte, U. S. N., and a corps of navy operators.

### Chile to Have Eleven Stations

It is reported that the Siemens-Shuckert Co., a German syndicate, has entered into a contract with the Chilean government for the erection of eleven Radio stations in Chile. The proposed stations will range from 2 to 5 kw. in capacity and cost approximately \$500,000. They will be of the Telefunken continuous-wave type.

### Speaks to Countrymen Riding on Fast Train

Broadcasts Farewell Speech to  
Bohemians Enroute

SCHENECTADY, N. Y.—Joseph Formanek, an engineer, spoke from WGY to a group of Bohemians on a D. L. & W. train running from Buffalo to New York. The talk was in Bohemian and was a farewell address to the party who are about to return to the Republic of Czechoslovakia for a short time.

This is the second time that the WGY broadcasting station has transmitted news to be received by people on moving train. The experiment justifies the prophecy that in the near future travelers will be supplied with up-to-the-minute news no matter where they are.

### Two New Army Stations Opened

WASHINGTON.—Two Army Radio stations have been added to the Signal Corps Radio Net; one at Jefferson Barracks, Missouri, and the other at Fort Leavenworth, Kansas.

### BOSTON ENTERTAINS CRIPPLED WAR VETS

BOSTON, MASS.—A Radio set is being installed at the Parker Hill hospital for disabled World War veterans, especially for the bed patients in the tubercular ward. This is being done by the Army and Navy Service Club, at the request of the hospital authorities. A committee is also planning similar sets as soon as funds are available for other hospitals.

**DOYLE SAYS YES**

(Continued from page 1)

creator of Sherlock Holmes, "the spirits can see us and our thoughts, but not material things as we do." Believing the papers to be in the house, the spirit had been unable to determine to its satisfaction, whether or not they were.

Sir Arthur gave as his opinion that there was no fantastic hell but instead, there did exist a very beautiful retributive system. He said that for example, a criminal would go to what might be compared to a hospital, and there undergo treatment for perhaps a hundred years.

**Jewelry Receivers at New York Show**

Imitation Necklaces, Cigarettes and Capsules Were Novelties Shown at Eastern Exposition

(Special to RADIO DIGEST)

NEW YORK.—In offering something of interest to both men and women the Radio show at the seventy-first regiment armory displayed various small receiving sets concealed in jewelry. A handsomely encased string of beads looked very innocent lying in its velvet case.

In place of the pendant there was a small crystal set with a tiny cat whisker and crystal. Through the entire string of beads there was run small copper wires, concealed so they could not be seen. The whole made up a set that the wearer could hear for many miles.

**Useful in Gossiping**

The jewelry, of course, was intended for the use of the ladies. It offered a nice chance for picking up gossip if there was a way to broadcast without knowing it was being done. It showed, too, that receiving sets may be carried about like wrist watches, lockets, and even in small fancy boxes, very much like the jingling vanity cases.

While developing the Radio for women, science did not neglect the masculine need. The smallest set for men was put up in a small cylinder very much like a cigarette. It consisted of a small paper covered tube, which held a cat whisker at one end. The antenna was coiled within the tube.

**Receiving Set Stick Pin**

If a man does not care for the cigarette style a tie pin was another attractive bit of jewelry. The type shown at the New York Show had a pearl setting. The pin acted as an inductor, the slide varied the wave lengths and the crystal was hidden in the top of the pearl. If you liked your Radio in medicine form there were sets put up in capsule form. These were small enough to be carried in a lady's handbag or in a gentleman's vest pocket.

**Show Has Broadcast Scene**

Broadcasting has invaded the drama! "Mollie Darling," playing now at the Palace Theatre, Chicago, is the first play to include a Radiophone broadcasting station as a part of its theme. "We will broadcast Mollie's song to all the world!" shouts Jack Osterman in the finale of the play, and immediately "The Spirit of Radio" seizes the ensemble, and the song about which the play revolves, "Syncopate," is transmitted through the ether by a replica of Station WJZ, Newark, New Jersey.

Of course, the "Mollie Darling" outfit does not transmit, but the setting is an excellent copy, panels, generators and all, of the famous Station WJZ.

**Song Really Broadcast**

As a matter of fact, the song has actually been broadcast from the stage by means of a large microphone transmitter and sound collector, from whence wires carried the song to KYW, well-known Chicago station, which did the real broadcasting.

The theme of the play is found in the failure of a classical song composed by an old violin maker's daughter and the immediate success with which it is greeted when once syncopated. The broadcasting, of course, is of the successful, or "jazzed" version of the song.

**RADIO SECRECY**

(Continued from page 1)

render them unintelligible in the ordinary set.

**May Commercialize Broadcasts**

Broadcasting in the future, through the Hammond device thus may be commercialized. One may be subscribing five or ten years from now to a broadcasting service or services which will give certain specified programs at certain hours—programs which may only be received through apparatus leased to the subscriber by the broadcasting company.

Spark stations located near the Hammond receivers do not cause interference, it is said, yet tuning in on the new device is so selective that both code and voice messages can be sent simultaneously on a very slight variation of the same wave length without interfering with one another. Details will be made public when application is made to the patent office for patent rights.

**Maimed and Sick Forget Pain in Model Radio Equipped Ambulance**

Station WCAC at Fort Smith, Arkansas, Broadcasts Music to Ambulance Speeding to Hospital from Train—Success of Test Insures Continued Use

(Special to RADIO DIGEST)

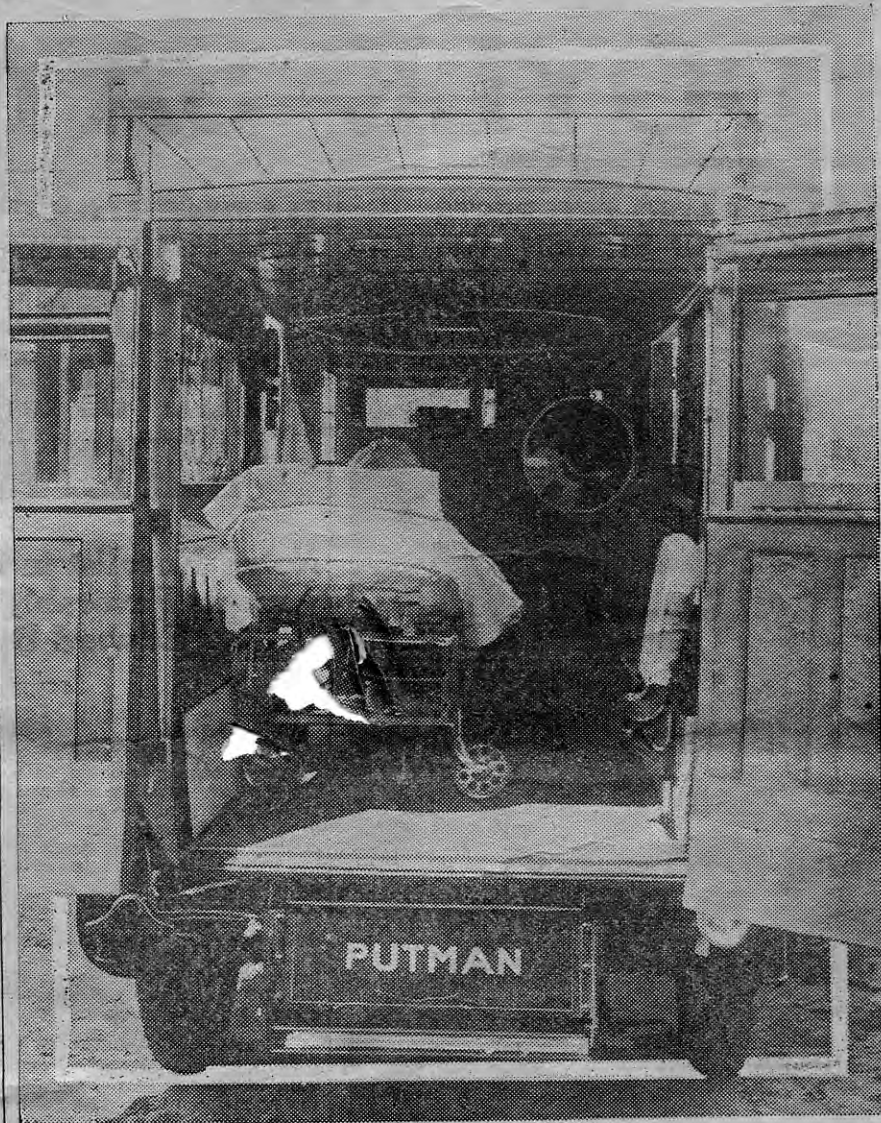
FORT SMITH, ARK.—Now it's the Radio equipped ambulance! On a test recently made here with a Radio equipped ambulance, strains of soothing music were administered to a patient being rushed from a train to the hospital. The music was broadcast from Station WCAC, owned and operated by the John Fink Jewelry Company of this city.

The ambulance, which is the first to be so equipped, was fitted with a standard two-stage amplifier receiver with loud speaker, and had an antenna mounted on its top, while the frame of the car was

used as a ground. The antenna consisted of one hundred feet of stranded copper wire. On account of the success of the test, the ambulance, owned by the Putman Undertaking Company, is being permanently equipped.

The photograph (found elsewhere on this page), shows the ambulance with the patient, a lady who was taken from an incoming train. The ambulance is shown at the hospital after the trip had been made. In the picture the patient has not yet been removed from the ambulance. Music was furnished all the way from the train to the hospital.

**AMBULANCE PICKS UP SOOTHING RADIO MUSIC TO RELIEVE PATIENT-PASSENGER**



Radiophone Equipped Ambulance of Putman Company of Fort Smith, Ark.

**Steam Radiator Used As Aerial Latest Hit**

Takes Place with Bed Springs and Fish Poles

The latest scheme for receiving Radio messages involves the use of a good steam radiator, or a hot-water radiator, for that matter, according to a report reaching the Radio section of the Army. This system, said to have been evolved and tested out satisfactorily by a former electrical engineer of the Signal Corps, has evidently a market value, as the inventor is reported to have sold out his circuits and patents to a big corporation for a large sum of money.

Many curious forms of receiving apparatus have already been used in lieu of the usual aerials, some of them with remarkable success by well-known experts. Among the unusual types of aerials employed are: the "tree antenna" demonstrated some time ago by Maj. Gen. Squier; the bed-spring antenna, used by several experimenters, a trough of water and a cake of ice employed in Signal Corps experiments a year ago, and smaller and more handy devices, such as umbrellas and fish poles. But the latest device for this purpose should interest many fans, as it is so readily available and should prove most useful, if practicable.

**MASSACHUSETTS FANS HAVE NEW STATIONS**

Local Inspector Kept Busy Policing New Outfits

BOSTON, MASS.—New England amateurs and Radio fans will be very busy this season, if they attempt to tune in on the various new broadcasting stations, as it is announced that during the coming weeks there will be three more new stations ready to operate. The newest stations, which will transmit programs of music and educational lectures are located at New Bedford, Worcester and Hartford, Conn. Incidentally, the opening of these big new stations is furnishing more than enough work for Charles J. Kolster, United States Radio Inspector for this district. The Hartford broadcasting station will be operated by the Hartford Courant, one of the largest daily newspapers in Connecticut. At Worcester the Delta Electric Company will operate a big station and Slocum & Kilburn, a New Bedford electric concern, will operate the one in that city. This station will be in charge of Irving Vermilyea of Marion, Mass., one of the best known amateurs in New England, and one of the few New England fans who was able to reach European stations during the amateur tests recently.

**Radio Digest Illustrated**

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Introductions for the Beginner, by Harry J. Marx. Articles of Interest written in a plain way for the one who is learning the Radiophone from start to finish.  
In the "How to Make" department you will find some things of interest that you can make for your set.  
The Broadcasting Directory is the only complete, correct schedule list. It grows as time goes on.  
Each week there is shown Some One or More of the Famous Broadcasting Stations, Some You May Have Heard.  
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**THE ANTENNA BROTHERS** Spir L. and Lew P. A "PICKUP"

**WASHINGTON**—The next simultaneous broadcast from the Naval Stations at Anacostia and Arlington will take place on June 2nd, when Chief Justice Taft addresses the Yale Alumni from a phone in his home at 9 p. m.

**Yale Alumni Will Hear Taft on Two Stations**  
The next simultaneous broadcast from the Naval Stations at Anacostia and Arlington will take place on June 2nd, when Chief Justice Taft addresses the Yale Alumni from a phone in his home at 9 p. m.

**KANSAS CITY**—Now comes the Radio fall. And why not? Radio waves, so the radio bugs aver, pass through grim gray walls as easily as through the air.

**Prisoners Save Tobacco Money to In- stall Receiving Set**  
Prisoners in the Wyandotte county jail here have been learning all about Radio. There's a concert by Radio every night in this section of the Middle West, and the men behind the walls want to enjoy it.

**NEW YORK**—Radio fans interested in ships and their movements will be glad to know that the service inaugurated recently at WJZ has, by arrangement with the Radio Corporation of America, become a regular part of the daily programme at the Newark station.

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**W J Z Broadcasts Marine News Eight O'Clock Every Morning**  
The Machite Storage Battery Company of Boston, Mass., who have been making Radio batteries for some time are now marketing variable condensers, complete tube and crystal receiving sets, and many other items in the Radio field.

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**LONG RANGE POSSIBLE**  
The experiments in simultaneous broadcasting from two stations on different wave lengths have been so successful that it is believed that several stations, not too greatly separated, will soon be able to broadcast a single message on a number of different wave lengths at one time, reaching receiving stations nearby and at great distances, even crossing oceans to powerful foreign stations.

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**EMPLOYS TWO WAVE LENGTHS**  
The simultaneous broadcasting of a single spoken message from two stations on different wave lengths was successfully conducted for the first time by the Navy recently. Through the co-operation of the American Telephone and Telegraph Company, direct wires were strung from the Naval air station at Anacostia and the Naval Radio Station at Arlington. Test messages spoken at their station were transmitted by wire to these stations and put on the Radio broadcasting circuits. At Anacostia, NAA, a 412-meter wave was used, with about 13 amperes radiation, and at Arlington, NAA, on a 2,650 meter wave, with 40 amperes.

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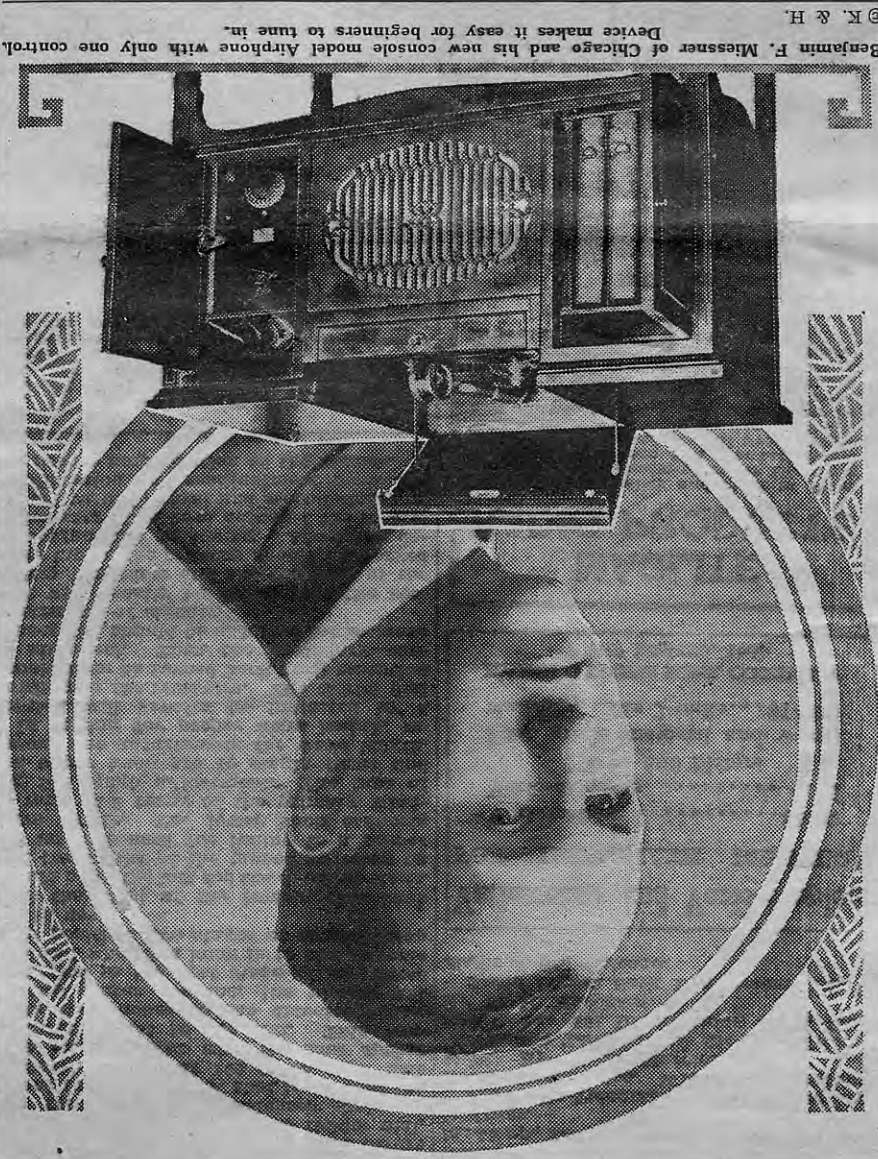
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**AIRPHONOGRAPH AND INVENTOR**

**AMATEURS IN FRANCE LEAD A TOUGH LIFE**  
If you think the government is imposing on you when it requires you to keep your wave lengths within 200 meters, you should move to France. In France no amateur is allowed to send at all and is not permitted to receive any of the government or commercial stations. In fact, if he should copy a government message found in his room he would have a lot of explaining to do and perhaps would be fined.

**PERFECTS SET WITH ONLY ONE CONTROL**  
**Apparatus of Chicago Scientist Has Three-Tube Super Amplifier without Ground or Antenna**  
A one-control Radio receiving set with a three-tube super amplifier capable of amplifying received signals fifty times more than the ordinary three-tube amplifier has been designed by Benjamin F. Messner of Chicago. Other distinctive and important features of the new unit are: no ground or aerial is used; the set is mounted in a console phonograph cabinet and is equipped with a loud speaker which employs the phonograph horn; the single control of the unit is graduated in actual wave lengths; and only one cord leads from the instrument, this going to an ordinary electric light socket.

**NAVY CODE HEARD ROUND THE WORLD**  
**TWO STATIONS SEND SAME SIGNAL SIMULTANEOUSLY**  
Experiments indicate President's Address Could Be Heard by All English Speaking People

## FULL INSTRUCTIONS ON RECEIVING SET

CUTTING AND WASHINGTON  
TYPE 11 ILLUSTRATED

Sixth Article of Series Explains  
Parts Shown by Graphic on  
Page Five

(See Diagram, Page 5)

The set shown in this number is the Cutting and Washington type 11 Short Wave Regenerative Receiver and Amplifier. The hook-up is the regenerative circuit under the original Armstrong patent No. 1,113,149 taken out on October 6th, 1914. The Cutting and Washington Corporation is licensed to build sets using this circuit.

Simplified controls replace the usual complicated and critical dial adjustments and enable an inexperienced operator to select the desired signals and to easily eliminate interference from other sources.

With a single wire antenna 150 ft. long, this receiver will not only detect signals from distant points but amplify them to such volume that connection to a "loud-speaker" is possible and an entire group may listen in.

### Explanation of Connections

This unit is a vacuum tube receiver with two stages of amplification. The manufacturers recommend using hard vacuum tubes (amplifiers) in all three receptacles.

There are eight binding posts for connections all located on the front of the panel. On the left side there are two, the top one for the aerial connection and the bottom one for the ground connection. The two binding posts on the right hand side are for the terminals of the receivers or loud speaker as desired.

At the bottom of the panel under the two large dials are four more binding posts. The two to the left are for the positive and negative terminals of the "A" or 6 volt storage battery. The two binding posts to the right are for the positive and negative connections of the "B" or plate batteries. Since all amplifying vacuum tubes are used, the "B" battery can run from 60 to 90 volts. The batteries can be tapped so that tests can be made to investigate the voltage that will give the best and clearest results. All the binding posts are marked so that no mistakes need be made in connecting the set.

### Theory of the Circuit

The design of this receiver is particularly noteworthy for the elimination of a variable coupling control between the antenna or primary, and the secondary circuits. A fixed and proper coupling between these circuits insures maximum signal strength and selectivity. At the same time it removes the control that is most frequently misused by the average operator. The above paragraph although self explanatory to the experienced fan will be difficult for the novice to understand. For this reason it has been considered advisable to go a little more into detail in the explanation of the principle of the circuit.

That the antenna, the lead-in and ground wiring have a fixed wave length that can be determined. The primary coil adds to this wave length, but the windings of wire on this primary are controlled by the two tapped switch knobs on the left side of the panel.

That is to say it is possible to use all of the windings or any number as desired by simply adjusting the two knobs. These knobs then control the proper adjustment for wave length.

Next it will be noted that there is a secondary coil that is firmly fastened to the panel. There are no taps on this coil and because it is immovable it is said to have a "fixed coupling." That is to say the proper proportions of windings and the distance between primary and secondary coils have been calculated and tried by experiment for the best results covering a limited range as desired. In the vario coupler the secondary is turned about a shaft inside of the primary while in the "loose coupler" the secondary is slid in and out of the primary and in addition there are usually taps on the secondary winding. This gives more tuning operation and requires more skill and experience on the part of the operator. The fixed coupling then eliminates unnecessary tuning for a fixed range.

### Tickler Coil Explained

Since the circuit is regenerative there is a tickler coil for controlling the feed back. This feed back is a bugbear in the minds of the novice but its operation can be

easily understood by use of the following analogy. In the gasoline motor of an automobile it is known that there is plenty of unused gas ejected from the muffler. Now, if it were possible to simply sift out the good unused gas from the muffler and feed it back to the motor to be used over again the process would be a "feed back." That is exactly what happens in the regenerative circuit. The tickler coil is effected through induction in the same way as the secondary coil, and this is fed through to the plate circuit. Of course if too much is fed back the circuit is choked, so that control of the feed-back is provided by rotating the tickler coil. In one position, it is in line with the primary and secondary coils and gets the full strength of the induction. As it is turned from this position the effect of induction is decreased so that the feed-back is gradually cut down.

### Tuning for Reception

In tuning, the filament rheostat knobs are adjusted for that point of illumination of each filament which exists just before the hissing commences. The tickler dial, and the secondary condenser dial are turned to full capacity, that is, so that the graduation mark of 100 is on top. The knob on the right with the four spring contacts is set to the left. This connects the phones to the detector alone. In the center position, the phones are connected to the first stage of amplification and when the knob is to the extreme right position, two stages of amplification are in use.

At the start of the tuning, this knob should be to the left for the detector stage. The two knobs of the tapped switches on the left are used for tuning to a proper wave length. The lower knob connects to taps of 5 turns of the primary winding for rough adjustment. The taps of the upper knob are to single turns and permit fine adjustments for wave length.

In setting for proper wave length, reception will usually be indicated by a howling in the receivers. The tickler dial should then be turned back until reception is strongest. Then the secondary condenser dial should be adjusted for increase in strength of signals.

It will usually be found that the secondary condenser dial and the knob of the units tap on the primary should be worked in conjunction in tuning. After the detector stage has been adjusted the receivers are turned to first and second stages of amplification and readjustment made for the proper amplification of the signals.

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Directive Wireless Telegraphy. Direction and Position Finding, etc., 57 illustrations and 5 tables. Price, 85c. By L. H. Walters, M.A.

Continuous Wave Wireless Telegraphy, 58 illustrations and tables. Price, 85c. By B. Mittell. (Just out.)

Telegraph, Telephony and Wireless. By J. Poole. Price, \$1.00. (Just out.)

Marine Wireless Pocket Book. By W. H. Marchant. Price, \$1.75. (Just out.)

Ionic Valve, Guide to the Study of, Showing its development and application to Wireless Telegraph and Telephony, 5 by 7 1/2 in., 65 pp., 12 diagrams, cloth, 85c., By Wm. D. Owen.

The Radio-Telegraphist's Guide and Log-Book. Pocket size. With 90 illustrations. \$1.75. By W. H. Marchant.

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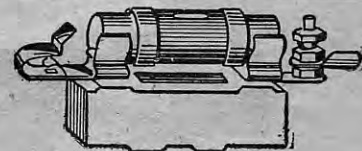
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# Radio Receiving Sets

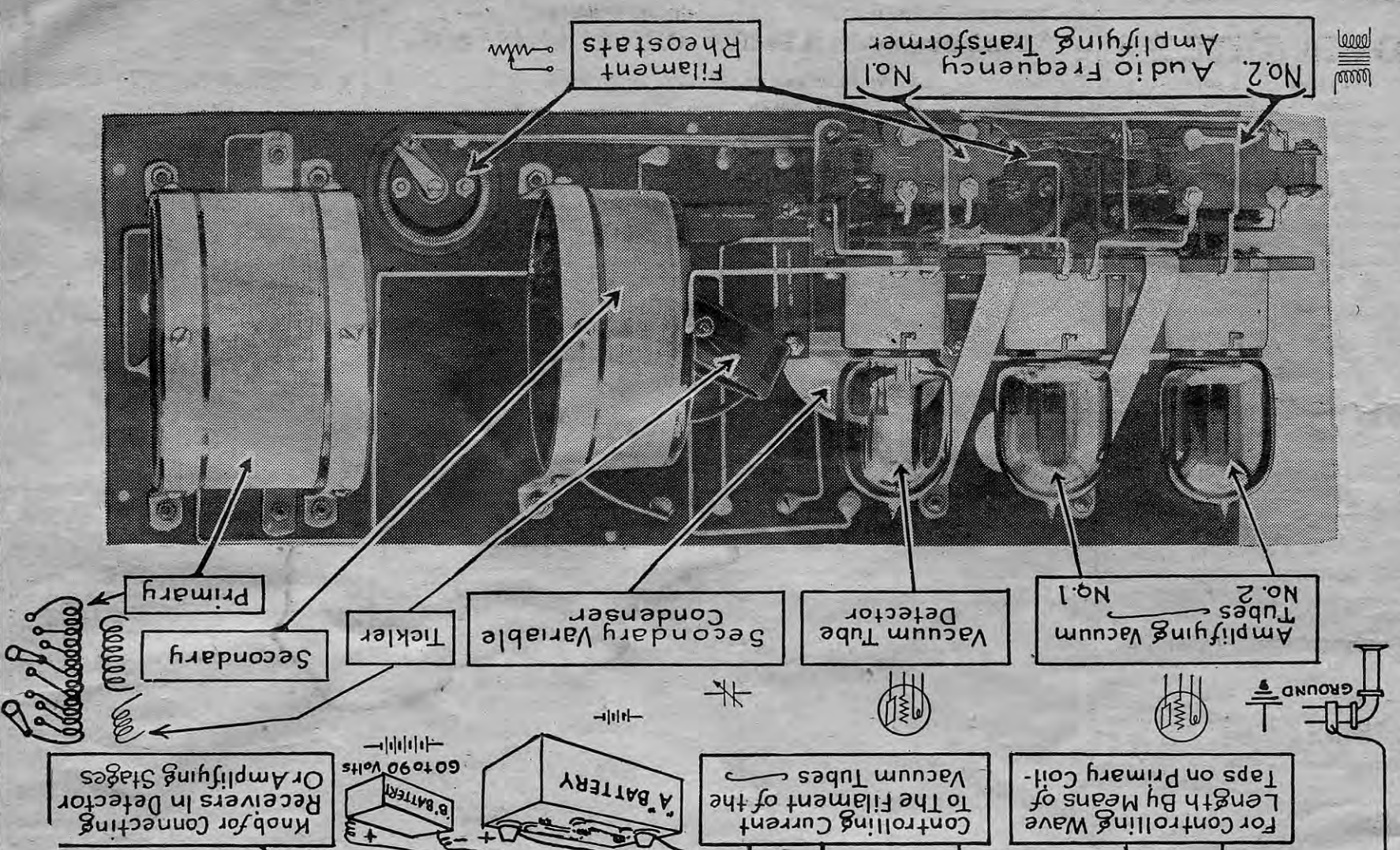
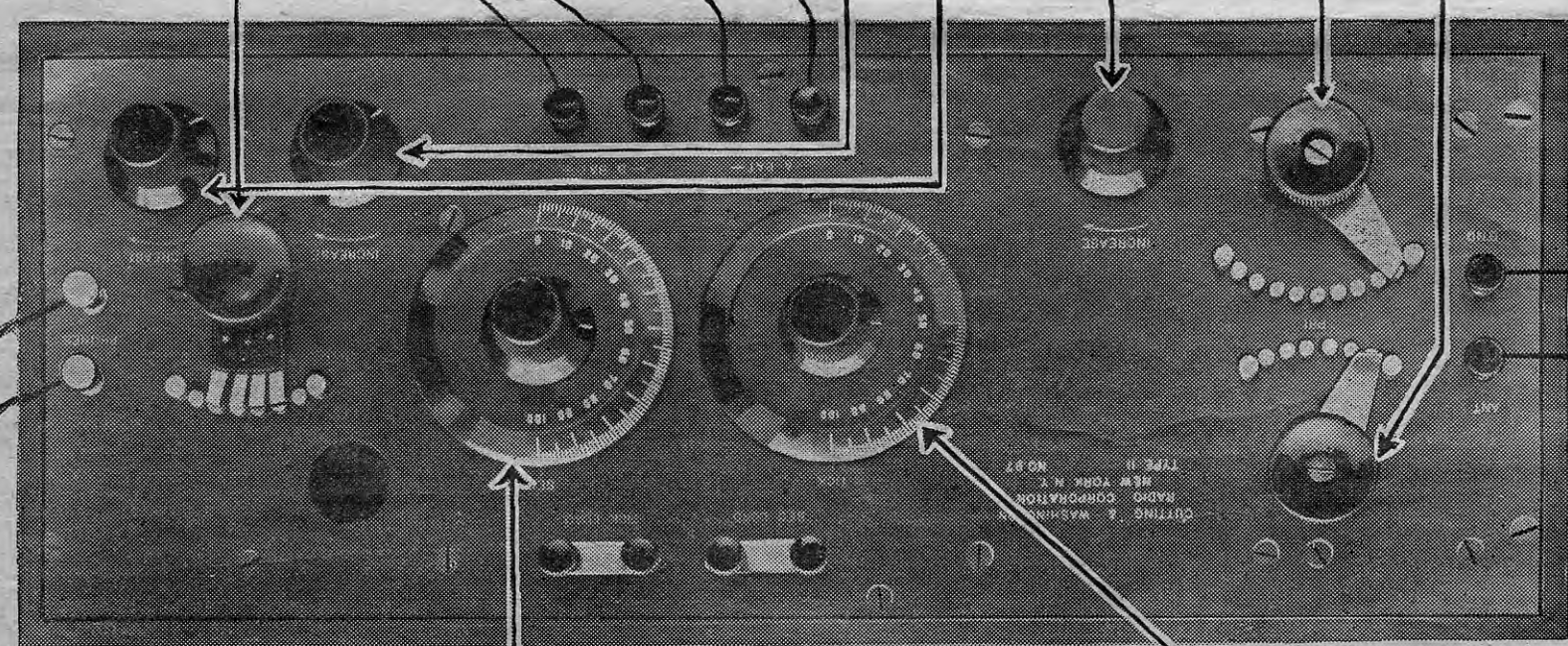
## Cutting and Washington Set

As the sixth of a series the RADIO DI-  
 GEST presents the C. & W., Type 11, Short  
 Wave Regenerative Receiving Set.  
 Full explanations of this receiving unit  
 will be found on page four, first column.  
 This receiver is manufactured by Cutting  
 & Washington Radio Corporation of New  
 York City. It is licensed under the Arm-  
 strong patent number 1,113,149, taken out  
 on October 6, 1914.



Dial For Tuning Adjustment  
 Through Secondary Condenser

Dial Controlling The Finer Adjustment  
 of Current To The Plate of Vacuum Tube



# WGR BROADCASTS AT BUFFALO

**Efficient New York Plant in Operation Only Since May 21**

**WWI Is Ford's Station**

**Dearborn, Michigan, Gets Ether Music After Flivver King's Visit to WSB**

Station WGR of Buffalo, New York, although open only since May 21, has already made a name for itself as a result of its efficiency. It is owned and operated by the Federal Telephone and Telegraph Company and is located at their factory. The following technical description explains its general lay-out.

tion on 360 meters, approximately 16 microhenries of loading inductance are required. This inductance is built up of very heavy solid copper conductor and is connected directly from the antenna and the ground.

#### Avoid Use of Series Condenser

It is to be noted that no series condenser has been used, and because of this it has been possible to get considerably higher radiation efficiency than was originally contemplated.

The transmitter proper has a power capacity (input) of about one kilowatt and is supplied by a two thousand volt direct current generator directly coupled with a single phase twenty-five cycle induction motor operating on the Buffalo General Electric Company's line. The supply lines to the motor and those between the generator and the transmitter proper are carefully fused with high voltage fuses and the generator itself is protected against Radio frequency surges by an elec-

terplaced between the microphones and the modulator system, all couplings being of the resistance type and provision is made to operate the voice amplifier tubes on the 2,000 volt supply, which operates the power tubes.

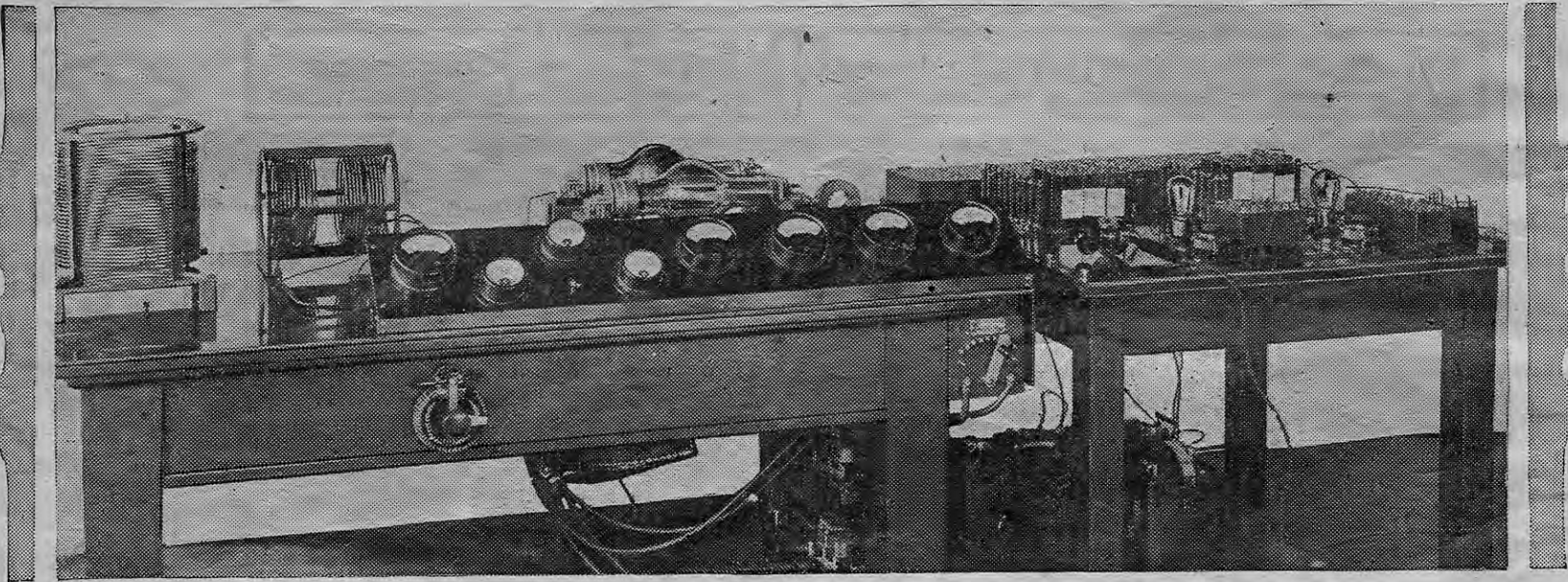
Special coupling resistance units have been devised to make this possible and to make possible the easy adjustment, observation and replacement of all parts of the system. The power tube filaments are operated on 60 cycles A. C., provision being made to reduce the resultant hum to a minimum and to increase the tube life through the use of the alternating current. The amplifier filaments, however, are supplied by means of storage batteries.

#### Controls Placed Well

Controls are provided on the set for change in wave length for the changes in coupling on the generating apparatus, for the control of the supply voltage, the filament voltage and for the instantaneous disconnection of the entire equipment

#### Has 48 Per Cent Efficiency

A test of this set indicates that the over all efficiency between the direct current generator and the antenna is, approximately 48 per cent. Reports have shown perfectly reliable daylight communication over a range of approximately 150 miles when two steps of amplification have been used with the receiver and a host of reports have been voluntarily forwarded to the Federal Company from the area around Buffalo included in a hundred mile radius, from which it is evident that daylight communication over a range of 30 miles when using a crystal detector with the ordinary single circuit type of receiver may be depended upon and with corresponding increases of range as the sensitivity of the receiver is increased. At this time it is impossible to say what the night range of the station is, reports having been secured only over distances of approximately 750 miles, but it is believed that as the operation of the station continues



By means of grouped voltmeters and ammeters, the operator of WGR, Buffalo, New York, can maintain constant observation of the performance of the station's broadcasting equipment. A small, simple receiving set located in the same room also permits a check on the transmission.

The antenna consists of a six wire cage on three foot spreaders 120 feet long, supported between two forty foot steel masts on the roof of the factory. The antenna itself is approximately eighty feet from the ground and is brought into the building through a generously large cage which connects with the grounding apparatus mounted on a large bakelite panel in the Radio laboratory. The ground connection is made to the water and steam pipe system in the factory in addition to a direct copper ground secured to large copper plates buried in the factory courtyard. The antenna and ground connections are carried to the transmitter through heavy copper tubing, all supports being of bakelite; large bakelite panels being used where the antenna passes through the walls of the building. The fundamental wavelength of the antenna is approximately 305 meters and at 360 meters has a total resistance of approximately six and one-half ohms. For opera-

tion of the commutator ripple is eliminated by the use of high voltage paper condensers and iron core induction chokes. It has been necessary to use about 27 microfarads in three groups of 9, one microfarad condensers connected in series parallel so that the normal (D. C.) voltage of each unit is never in excess of 700 volts.

#### Protect Generator with Chokes

About thirty-seven henries of inductance are used in this filter system and so distributed that the filter is alternately inductive or capacitive progressively from the generator to the vacuum tubes. The generator is further protected from Radio frequency getting back into the line from the tubes by the insertion of high frequency chokes properly placed throughout the line. These chokes have an inductance of approximately 2 milli-henries and properly chosen distributed capacities. Two low power voice amplifying tubes are in-

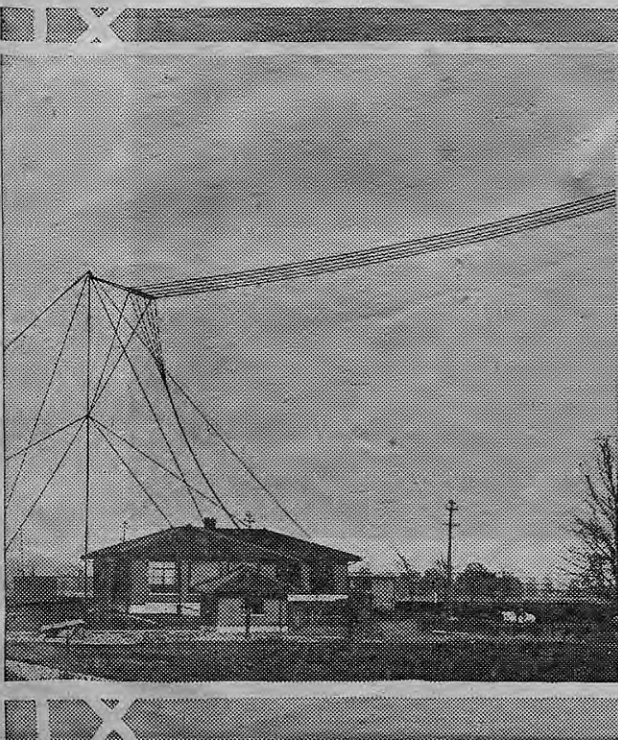
from the supplies through the medium of a quick throw switch. Plugs and jacks are used for the voice control circuits. Meters are supplied for the measurement of the antenna current, supply voltage. The currents to the several tubes, both plate current and grid current, so mounted on the set as to be under the constant observation of the operator. All parts are completely exposed for examination and the operating conditions of the set can be noted at a glance.

For the various types of reproduction, several types of microphones are used. For ordinary announcements, the common carbon microphone is used, while for special types of transmission a magnetic microphone is used in connection with considerable additional voice frequency amplification. A small and simple receiving set is mounted near the transmitter and the operator at all times, listens to his own transmission.

that signals will undoubtedly be transmitted over considerably greater distances than this, under good weather and transmission conditions.

#### WWI Owned by Henry Ford

WWI, Dearborn, Michigan, supplies concerts and other kinds of entertainment to many employes of the Ford Motor Company and all owners of Radiophone receivers within a radius of three hundred miles. The station was conceived and erected by Henry Ford as a result of his visit to WSB, the broadcasting station of the Atlanta Journal, Atlanta, Georgia. After seeing the performance of the newspaper's Radio equipment, Mr. Ford decided that his employes should be entertained by broadcasts. He immediately made application for a license and the accompanying pictures show the result. From 10:00 to 11:00 p. m., eastern standard time, every Wednesday, WWI is picked up from the air by Radio bugs in Michigan and many other states.



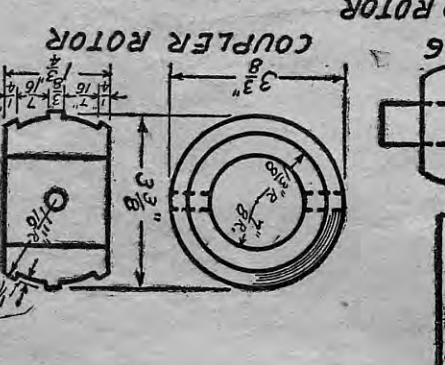
Cabin, antenna and mast of WWI, Dearborn, Michigan. The high end of antenna is supported by water tank. Below shows equipment.

# How to Make Variometers and Coupler

## Simple Device Eliminates Aerial Pulley Troubles

Almost every amateur has at one time or another experienced trouble in raising or lowering his aerial. This is usually due to the pulley rusting or the ropes becoming tangled. With the use of the simple device described herein these troubles are eliminated.

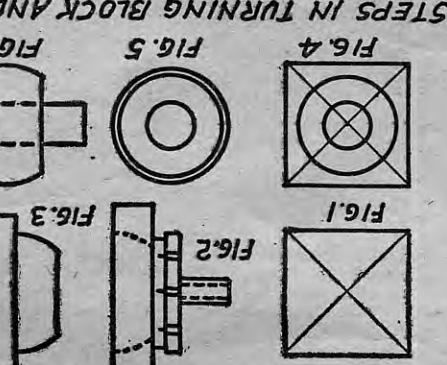
The device consists of two parts, as shown in the illustration. These are a half-inch pipe tee and a piece of half-inch pipe about one foot long. The pipe is bent smoothly, as shown in Figure 2, so that there are no sharp corners. The pipe



## Stator Block Turned Up From Seasoned Wood

A receiving set has two variometers and a coupler. The parts on which the coil is wound are often made of wood. It is quite necessary to have a wood that will not shrink or warp. The best wood to use is either cherry or mahogany. These woods when once well seasoned will have very little tendency to shrink or warp.

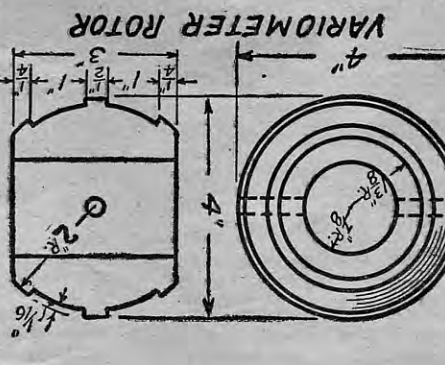
Making the parts for the variometer and coupler necessitates some wood turning. While these parts may be purchased they are never satisfactory to the person who desires to make all the parts of the apparatus that can be made at home.



## 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.



## Steps in Turning Block and Rotor

Locating the Center  
It is quite necessary to have the block accurately centered. This may be accomplished by placing a small nail in the hole in the center of the block and into the depression made by the tool on the wood face plate. The block in place on the face plate is ready for turning. The interior of the block is turned out, test-frequently with a template, which has been made from the drawing of the cross section. The template is shown in Fig. 3. In making tests always stop the lathe.

As said before, four blocks will be required, and these blocks must all be the same size. If more blocks are to be made a different means of turning should be used. Finish each block with sand-paper and give them two coats of shellac. The stator blocks require face plate turning and the rotor blocks are turned on a spindle. In turning rotor blocks a center is located on the end grain of the stock by means of diagonal lines, then by making circles of the diameters of the hole in the rotor with dividers. This is shown in Fig. 4. The center is bored out with an expansion bit, taking care to bore straight and true and to avoid splitting. When this is complete saw the outside of the stock away, as shown in Fig. 5, so that there will not be so much material to turn away on the lathe. A splinter can so that it will fit over the small hole in the bottom of the horn. A hole is cut in the bottom of the horn. A hole is cut in the bottom of the horn. A hole is cut in the bottom of the horn.

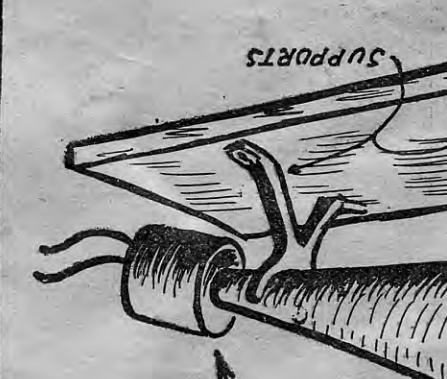
## Phonograph Horn Speaker

Many an amateur owning a small receiver set wants sooner or later a loud speaker. Amateurs not having the money to invest in one, but who have an old-fashioned phonograph horn at hand can easily make a loud speaker in a tin can and mounted in any way the builder may desire.

The inside of the tin can is padded to hold the receiver. Do not cover the hole in the can or horn or the sound will not pass through. The best results will be obtained with the use of a mica diaphragm and laying a book or something heavy on it to keep it flat.

A bevel can be put on with a coarse file and the graduations or marks can be scratched in or made with a narrow saw. The scratches or cuts are then filled in with white lead.

Class of water. Dip the ends of the wires from the battery into this solution. The negative wire will collect numerous bubbles, and the positive will remain clear.



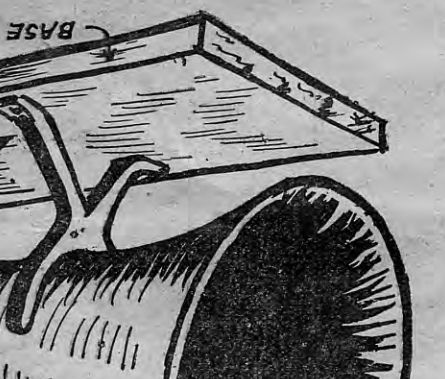
## Records Make Dials for Sets

Place the buzzer in inductive relation to the antenna circuit, make a coil 1 1/2 inches in diameter of six or seven turns of wire and connect this in the ground lead of your receiving set. Around this coil wind seven turns of wire and connect the terminals of this second coil in series with the ground lead—and therefore changes the antenna system, causing it to oscillate at the particular frequency to which it is adjusted. The loudest sound in the headphones will be heard when the crystal is adjusted for its most sensitive spot.

Secure an old record or a small ten-cent one and with a pair of compasses mark out the size for the dial wanted. When this is done hold the record over a bunsen burner or gas flame, being careful not to get it too close to burn it, until the material begins to soften, then with a pair of thin snips cut along the mark made by the compasses. After it is cut out it can be straightened by reheating and laying a book or something heavy on it to keep it flat.

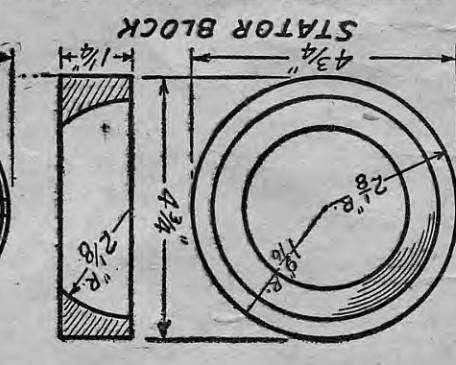
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## Radio Kinks Department, Radio Digest

123 West Madison St., Chicago, Ill.



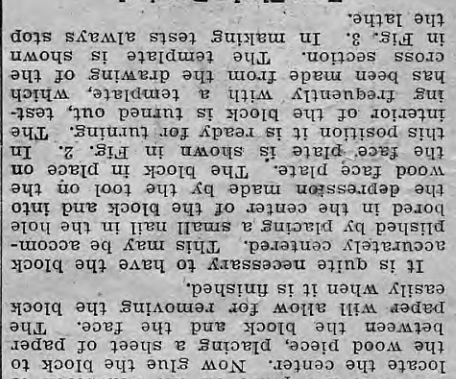
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# Radio Digest Illustrated

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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. 1 Chicago, Saturday, June 3, 1922 No. 8

## Effect on Other Entertainments

The Radiophone Draws Many from Their Usual Form of Pleasure

THERE is no question but what Radio does affect the attendance at concerts and musicals and the movies and will doubtless reduce the attendance to lectures and the pulpit.

The stimulus of applause is lacking for the artist, when speaking or singing to an unseen audience. He has no thrill, yet it is a compensation that he is not chilled by the stony glare that sometimes meets the artist. There are many advantages for the audience. There is no question but what a person has been bored many times at musical recitals and lectures just because he attends with the family, but with the Radio he has a chance to make a get-away or cut off the set.

Many of the young men and boys who were active in athletics in former years have forsaken baseball and tennis for Radio. Just how far this will affect athletics will be watched with interest.

## Receiving Sets Do Not Run Alone

Some Work Needed to Obtain Best Results

MANY of the people clamoring for Radiophones think that in buying a set the requirements are to put the thing on a table, run a wire to the roof and then sit back and enjoy the music. If we will just stop and think for a moment we will find that all things do not come that easy.

A Radio set is not a bit different from the automobile. It takes time to learn how to operate it to the best advantage. The best results are obtained from a Radiophone after it has been in use several weeks and after doing considerable experimentation.

It must be remembered that receivers are in two classes, crystal sets and vacuum tube sets. The vacuum tube will cause less trouble from weak signals, but it is harder to operate. So far, the crystal set is not reliable for long distances. A good piece of mineral must be used in the crystal set for it is the heart of the apparatus. The cat whisker detector must be handled carefully and if a good spot is found one must try not to jar or disturb the adjustment. There are only one or two knobs to turn on the crystal set and for this reason the tuning is not difficult.

## Concert Quality Fixed by the Public

The Kind of Concerts May Be Chosen by the Public

NOW that Radio has been popular for some time and it begins to shape itself into something more than just a fad, as it was first labeled, the quality of the concerts should become more fixed. It is obvious that the experience gleaned from the first year's experience in broadcasting is proof enough that the public demands the programmes to be the best that can be produced.

The sources of material for Radiophone broadcasting are unlimited. Many of these have been tried to improve the quality of the entertainment with more or less success. The principal idea is, however, to find just what the people want, then give it in the best possible manner.

This may at first glance appear to be an easy matter. However, each concert has brought forth numerous letters by which the officials are given some idea of public opinion and the type of entertainment best liked. The burden is on the Radio audience to determine what they want to hear. There is no really satisfactory way unless its wishes are known. To criticize is easy, but to suggest is helpful to every one concerned. Owners of Radiophone receiving sets should express their opinion to the broadcasting station furnishing them with regular programmes.

## Views of Radiophones from the Newspapers Here and There

JUST a little while ago very few of us knew anything about Radiophones. If we did see a small news item about it we did not have enough interest to read it intelligently. Now it is different. All Radio articles are read widely so that all angles of this new fascinating science may be understood and appreciated. The editor of the Danville News (Danville, Ill.), has something to say like this:

"Just the other morning we woke up and were amazed to find that the world had gone crazy on Radiophones. The Radiophone has corralled American enthusiasm and what was once a purely scientific instrument is rapidly becoming as common as the talking machine.

We are chided sometimes by the older civilizations of Europe because of our enthusiasm over something new. It is not weakness but an indication of one of our strongest national traits. We are now following our national bent in exploring the mysteries of the Radiophone.

The leading newspapers of the country recognize that the Radiophone has passed the experimental stage, although yet far from being perfect. It is being installed as a means of entertainment and also as a means of gathering the news."

The Radiophone is one of the first things that have been almost entirely developed by the youth of the nation. Credit is due them for the great part of the advancement and the speed the new science has attained. The Courier (Lafayette, Indiana) speaks of youth's participation in Radio in this manner:

"A dealer in Radio material in speaking the other day about Radio experiments and apparatus said, 'A lot of boys that I know, know more about the Radio than almost anyone else. Some of our people have gone in for buying expensive apparatus when they could have saved money if they had just let some of these young amateurs put in a set for them.' Then he called out a young fellow of high school age who was tinkering in his back room and began to ask him questions about Radio apparatus.

"These young fellows are not fooling with any mere toy. They are training their ingenuity and inventiveness, the qualities that have made America the leader in scientific and technical progress and they are adding to their own powers by developing these faculties.

"Young men who have formed this wholesome and developing interest are not going to settle down and work in any routine way. When they see a job of work to be done, they will put their wits upon it, the same as they have into making and operating Radio apparatus. They will want to think out better and less expensive ways of doing things.

"Parents ought to encourage boys to go in for such experiments as they lead to mental enlargement and higher ideals of accomplishment."

Training the voice for talking into broadcasting instruments is another feature of the Radiophone. Are we to develop a crop of human megaphones? The Detroit Free Press mentions this side of the Radiophone as follows:

"The Radiophone is responsible for an interesting vocal phenomenon. This is the Radiophone voice, developed through use of the receiving attachments that reproduce the sounds snared from the air. It is understandable that the wearer of a headpiece should have difficulty in distinguishing between normal and abnormal tones of speech when addressing anyone. This is particularly true when there is a considerable volume of sound coming over the Radiophone, as in the case of an orchestra or a pipe organ. Nevertheless it is a bit disconcerting to have one bellow a reply to an inquiry, and then wonder why everyone in the vicinity is startled by the outburst. The serious part of this is that the practice is quite unconsciously indulged in at times when the speaker is far removed from the Radiophone.

"Which may well give rise to wonderment as to whether we are about to raise a crop of human megaphones, or whether when the Radiophone becomes more common people will naturally readjust manner of speech to established standards."

It has been a question for sometime in just what field the Radiophone will develop and just where it will be most efficient. Commenting on this phase of the subject the Herald (Garden City, Kansas) says:

"The Radiophone is a new publicity agent which literally has everybody 'by the ears.' It immediately takes its place with the telegraph, telephone, post office, press, pulpit, public school and theater as a means of reaching the public and its possibilities are obviously so great that it cannot be regarded as a plaything or a passing fad.

"The telephone has not supplanted the telegraph and Radio is not likely to supplant either. It is already in general use for trans-oceanic communication and this application will be extended, but the Radio will not under present conditions supersede the telegraph or telephone for obvious reasons."

Radio may be a fad or a hobby but it is one of the most instructive of the kind. The owner of a set not only learns through experiments but the news and concerts he receives are most instructive. The Star (Pipestone, Minn.) speaks of instruction as follows:

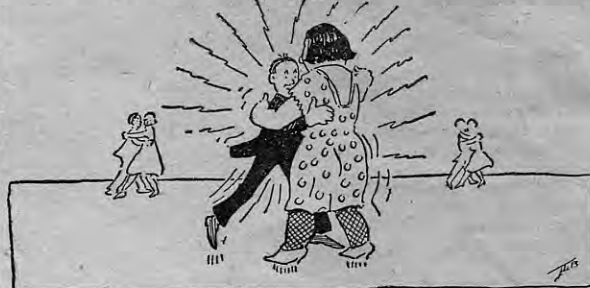
"Science is opening a new world to us through the development of the Radio. In the very near future the world's greatest singers, together with the great symphony concerts, may be heard in your own home with the exactness of the original, and practically all long distance communication will be carried on by means of the Radiophone."

## RADIO INDI-GEST

### A New Dance, the Two-Slide Tuner

And now we are to dance the "radio drift." It was debated whether the new dance or the new style of dancing should be named "the lead-in," "the detector dip," "the two-slide tuner" or "the long wave," but the name "radio drift" seems to have won. Those who are responsible for setting this dance in motion say "the long wave, or the radio drift, is slower than the shimmy, but loses none of the curves."

Time moves fast in dancing. The toddle, which lately held the center of the stage, or the whole ballroom floor,



is hopelessly old-fashioned. Some folks can remember when the cake-walk, the bunny-hug and certain "glides" were all the rage. Some memories may go back to the tango and the hesitation. There are some strong and retentive minds that hold in remembrance the twinkling bobby old waltz, the schottisch, lancers, polka and redowa, but that was a long time ago.—Washington Star.

### Puts 'Em to Sleep

"Voros, a Hungarian hypnotist, will carry on his work via Radiophone," says the Brooklyn Eagle and adds "he has already succeeded in putting people to sleep by telephone." Some people can put whole audience to sleep without either telephone or radiophone.

### Programme for Saturday Evening

C O D (New York)—2:00 P. M., score by innings, Mutual Welfare league. 2:30 P. M., concert, "The Cover Charge of the White Light Brigade," by Head Waiters' Male Quartet. 3:30 P. M., address by George Harvey, "Diplomatic Secrets, or Do I Use Ladies' or Men's Stockings When Dressing for a Court Function?" 3:31 P. M., protests at Harvey's speech, by United States senate. 4:30 P. M., exhibition of fancy crocheted work. 5:45 P. M., juggling and wire walking by Goldberg, Kelly and Krantzlein, direct from Shutage's circuit. 7:30 P. M., choir singing, "Ohm, Sweet Ohm," by Westinghouse double quartet. 9:00 P. M., daily shooting quartet from Hollywood, Cal.

### Barbs on Wire to Catch Waves

One of the Radio hounds suggests that aerial wires be fitted with barbs to aid in catching the waves. He probably remembers the results of climbing a fence while stealing watermelons.

### An Air Education

We suppose that Radio will soon be responsible for a correspondence school. We have known a good many educations that were for the most part airy.—Toledo Times.

### Thanx, Mr. Marconi!

A courting we no longer go,  
Our kiss now comes by Radio.

### Too Much Broadcasting

If it is true, as one scientist says, that every man is potentially a Radio broadcasting station, we shall have



to favor a law prohibiting some people from broadcasting themselves.—Toledo Times.

### He Married a Loud Speaker

Dear Question Editor:

I've been married to a loud speaker for thirteen years. Have you any suggestions to make as to what can be done to modify its amplification?—Henpeck.

### Now Just Where Can You Get One?

Dear Ed:

My dial on the crystal set is graduated from zero to 100. Where can I get a dial marked from zero to 360 so that I can tune in on 360 meters?—I. Liketoknow. (Honest, this really was mailed in.)

# Radio Telephony for Amateurs and Beginners

## The Aerial and the Ground

By Peter J. M. Clute

Weight—No. 12 or No. 14 B. & S. gauge bare wire is generally used. Some of the smaller sizes of wires may not withstand the sending station and on its size. Thus it will be apparent that a short aerial will not give as strong a signal in the receivers as a larger aerial, which collects more energy from the ether waves. Of course, in this case, radio-frequency amplification of the energy supplied to the detector will increase the strength of the signals. The fundamental wave-length of an antenna can be increased by inserting series loading inductance in the circuit. On the other hand, if it is desired to tune to a wave-length shorter than the natural wave-length of the antenna system, it is necessary to load with series capacity. When it is desired to prepare an antenna for receiving at any wave-length over a fairly large range without readjusting the loading, it is practical to load the antenna with resistance. In the case of an inductively-coupled tuned receiving circuit, the resistance introduced by the coupled circuit or equivalent. This ground wire should be carried outside of the building in as direct a line as possible to the earth. In case a satisfactory ground cannot be obtained outside of the building, the ground wire may be brought into the basement or cellar and connected in an approved manner to the nearest available water pipe. This ground wire must not be connected to gas pipe. Where the ground wire is brought into the building, it should be protected from contact with wood-work by a continuous porcelain tube. Third—All radio installations for sending and all receiving installations having outside exposed aerial lines for receiving or having connection with a light or power circuit, should be approved by certificate from this board.

For sending stations, the approved 100-ampere, 600-volt single-pole double-throw switch should be used for lightning protection. For receiving stations only, there is available a mounted vacuum type of arrester with a gap of not more than one-eighth of an inch. Fig. 5 shows a typical approved lightning arrester. The arrester must be on an insulated side of the building and on an insulated base five inches clear of the walls. The ground lead, if longer than twenty-five feet, must be kept five inches from the wall and insulated from it. As an added protection, so as not to have the receiving equipment connected to the aerial when a storm is near, it is desirable to have an approved switch connected in multiple with the arrester, as in Fig. 6.

When only a switch is installed, one is quite liable to forget to throw it over to ground when finished with the instrument, and the aerial is left ungrounded. The automatic lightning arrester lessens the likelihood of accidents through carelessness. It is recommended that the sparks passing between the electrodes of the arrester is merely conducting the atmospheric electricity to a condition of the atmosphere, caused usually by heated air, dust storms, the Aurora Borealis, rain and other disturbances. The static charges of electricity in the atmosphere (Continued on Page 12.)

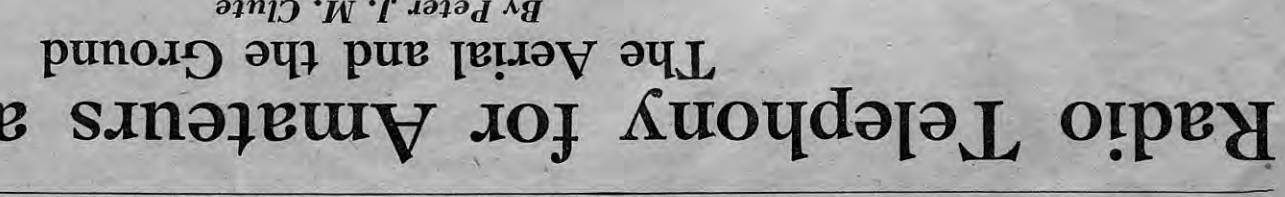


FIG 1 UMBRELLA TYPE ANTENNA

The umbrella type and the flat-topped type consists essentially of a vertical conductor from the top of which other conductors slope downward like the ribs of an umbrella. This type of aerial is used at some of the large transmitting stations. The flat-topped antenna is usually a T-shape (Fig. 2), although it is often times in the form of an inverted L (Fig. 3). Practically the only difference in construction between these two types is that in the T-type, the "lead-in" or vertical wires are connected to the center of the flat top, while in the inverted L type, the "lead-in" wires are led from one end of the antenna system.

The general construction of an antenna is easily obtained from Figs. 2 and 3. It is quite essential for a transmitting antenna to be thoroughly insulated from ground, so as to be able to radiate efficiently the energy of the high-frequency oscillations. For receiving systems, the insulation of the aerial is not as important as for the transmitting antenna, since it does not have to withstand the high transmitting potential. In erecting an antenna, care should be taken that it is not in the immediate vicinity of tall buildings, electric light and power lines, etc., because such objects absorb energy while transmitting, and also affect the incoming waves when receiving. When an aerial is to be put up near a telephone or power line it should be so arranged that it is at right angles to such lines.

Every Radio station is provided with some sort of a system of elevated wires, supported as high as possible above all surrounding objects. This system of wires is called the antenna or aerial, and it serves the double purpose of radiating or intercepting electromagnetic waves, depending on whether it is part of a transmitting station or part of a receiving station.

When used for transmitting purposes, it emits the energy present in the oscillations of the antenna circuit in the shape of high-frequency electromagnetic waves. At the receiving station, the antenna system stops or intercepts the Radio waves sent out from the transmitting station and through the "lead-in" wire conducts part of the collected energy to the receiving apparatus, which converts it into audible tones. Of the various forms of antennae which have been tried at different times but two general types are in common use, namely, the umbrella type and the flat-topped type.

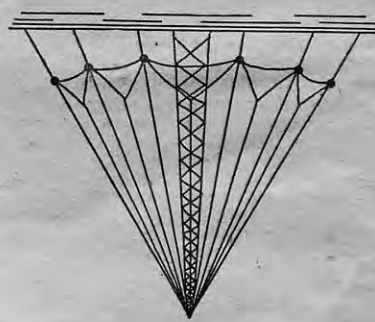


FIG 2 FLAT TOPPED ANTENNA

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:

- IX. AMPLIFIERS.
- VIII. TUBES AND TUNING.
- VII. DETECTORS: CRYSTAL AND VACUUM TUBE.
- VI. RECEIVERS AND LOUD SPEAKERS.
- V. THE BATTERIES.
- IV. RECEIVERS AND LOUD SPEAKERS.
- III. CRYSTAL DETECTOR RECEIVING SETS.
- II. VACUUM TUBE RECEIVING SETS.
- I. USEFUL INFORMATION.

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.

Outdoor aerials are to be recommended where there is no objection to their use, as they will permit operation over very much greater distances. The amount of the passing electromagnetic waves is dependent primarily on its distance from the sending station and on its size. Thus it will be apparent that a short aerial will not give as strong a signal in the receivers as a larger aerial, which collects more energy from the ether waves. Of course, in this case, radio-frequency amplification of the energy supplied to the detector will increase the strength of the signals.

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When there is more than one aerial wire, it is essential that they be spaced approximately three to four feet apart, each wire being from 60 to 75 feet long. The aerial wires are usually of copper or aluminum of such a size that it can support its own weight.

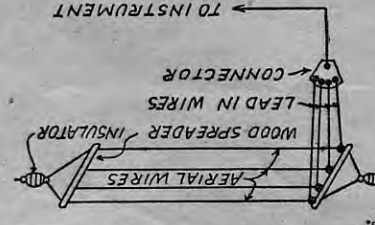


FIG 3 FLAT TOPPED ANTENNA (INVERTED T SHAPE)

According to the wave-length it is going to be used for, will prove quite satisfactory. Possessing as it does capacity and inductance in distributed form, the amount of the antenna is reduced, it becomes quite uniform over a large range of frequencies. Underwriters' rules call for some sort of lightning protector or switch (Fig. 4) to be installed wherever an outside antenna is erected for either transmission or reception or both.

The New York Board of Underwriters has laid down the following regulations regarding receiving equipment, employing an antenna. These requirements are undoubtedly specified by other boards. The regulations follow: "Where the antenna is entirely within the building the fire hazard due to Radio signaling apparatus for receiving only is relatively small and its installation requires no special safe-guards unless circuit is taken from the light or power circuit." The following requirements covering radio receiving equipments employing aerial wires should be observed:

First—The aerial wires should be protected by a lightning arrester of approved type, located outside of the building and independent primarily on its distance from the sending station and on its size. Thus it will be apparent that a short aerial will not give as strong a signal in the receivers as a larger aerial, which collects more energy from the ether waves. Of course, in this case, radio-frequency amplification of the energy supplied to the detector will increase the strength of the signals.

For the reception of Radio phone programs, multi-wire aerials are not absolutely essential. A single wire, fairly long for the reception of Radio phone programs, multi-wire aerials are not absolutely essential. A single wire, fairly long for the reception of Radio phone programs, multi-wire aerials are not absolutely essential. A single wire, fairly long for the reception of Radio phone programs, multi-wire aerials are not absolutely essential.

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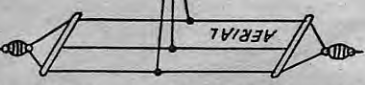


FIG 4 ANTENNA CIRCUIT SHOWING LIGHTNING PROTECTOR & SWITCH

When used for transmitting purposes, it emits the energy present in the oscillations of the antenna circuit in the shape of high-frequency electromagnetic waves. At the receiving station, the antenna system stops or intercepts the Radio waves sent out from the transmitting station and through the "lead-in" wire conducts part of the collected energy to the receiving apparatus, which converts it into audible tones.

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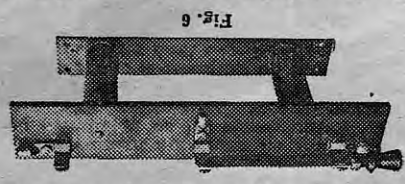


FIG 6

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FIG 10 MULTIPLE-PIPE GROUND

When used for transmitting purposes, it emits the energy present in the oscillations of the antenna circuit in the shape of high-frequency electromagnetic waves. At the receiving station, the antenna system stops or intercepts the Radio waves sent out from the transmitting station and through the "lead-in" wire conducts part of the collected energy to the receiving apparatus, which converts it into audible tones.

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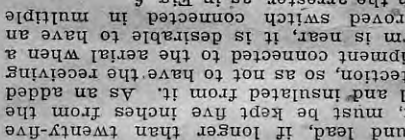


FIG 9 OUTSIDE GROUND CONSISTING OF BURIED COPPER PLATE

When used for transmitting purposes, it emits the energy present in the oscillations of the antenna circuit in the shape of high-frequency electromagnetic waves. At the receiving station, the antenna system stops or intercepts the Radio waves sent out from the transmitting station and through the "lead-in" wire conducts part of the collected energy to the receiving apparatus, which converts it into audible tones.

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## AERIAL AND GROUND

(Continued from page 11)

are positively charged. With no conducting medium between them and the negatively charged earth, the weaker charges cannot reach the earth under ordinary conditions. Static charges striking an aerial become electric currents and flow down the "lead-in" wire to the receiving set, where they set up crackling, weird noises in the receivers.

Lightning is made up of small static charges. This large accumulated charge, breaking through the high electrical resistance of the air, suddenly bursts forth as a streak of fire and rushes to ground. If a lightning charge strikes the aerial, nothing disastrous would happen if the aerial were properly grounded. If it struck an ungrounded aerial, it surely would result in fire. A properly grounded aerial is unlikely to be struck by lightning. As fast as the static charges of electricity accumulate on it they are led down to ground, thus preventing the building up of a heavy charge.

Another trouble often met with is the "dead spots" that are found in some localities. Sometimes a station approximately a hundred miles away will be picked up with difficulty, while one several times that distance will be picked up with ease. In other cases, it may be almost impossible to pick up a certain station, although in localities much farther away, it may be picked up easily. No satisfactory explanation has been given for the phenomenon. In the latter case, the difficulty has been encountered under circumstances that have led some to ascribe it to the presence of large power distribution systems that act as a screen both to blank the transmission from stations in the area and to deflect the waves over the area until they are reflected toward it again by some atmospheric condition. The formation of the earth has been blamed, but occurrences of this nature in perfectly flat country have been noted. Power systems are not the only cause, however, as such troubles have been found where no extensive systems exist.

A good ground connection is one of the essentials of an efficient station. Grounds may be made to either the water or steam pipes, the ground lead wire being as short as possible. The distance a station may transmit or receive is often a measure of the efficiency of its ground system.

To make a good pipe ground connection, scrape or sandpaper the surface of the pipe for an inch or so, until the metal is bright. Then connect to the pipe a ground clamp such as is shown in Fig. 7. This clamp is made of copper and has a screw and a nut by means of which the clamp can be drawn up absolutely tight, and is equally good for both soldered and solderless connections.

Where a ground wire is to be connected to a pipe and no ground clamp is available, the method shown in Fig. 8 may be used. Where soldering is not feasible, the connection can be wrapped with several layers of tinfoil and then with a few layers of friction tape. The tinfoil and the tape should be wrapped firmly to exclude moisture and prevent oxidation.

A good outside ground can be obtained by burying one or more sheet copper plates, about 4 to 6 feet deep, as shown in the best advantage of the plate. It is recommended that when the hole is being filled in plenty of water be used for settling the earth. This insures a ground connection between the earth and the buried plate at all times.

The practice of making multiple pipe grounds is also followed. This method of grounding (Fig. 10), consists of a number of pipe-ground units connected in parallel. The resistance of such a group is much less than that of a single unit in it. After driving the pipes, the bare copper ground wire, that is to connect the pipe ends together is wrapped around each pipe in succession and soldered to it. Common salt mixed with the earth surrounding a ground pipe or plate decreases the resistance of the ground much below that of a similar unsalted one.

It should be carefully noted that water or steam pipes inside the house, must not be used for a lightning ground, because if such a connection were called into service, it might result in a fire or in loss of life.

## Great Northern Plans Radiophone Installation

ST. PAUL, MINN.—The Great Northern Railway plans to make installations of Radio apparatus throughout the northwest this year. Climatic conditions in the northwest would be overcome with the successful development of Radio service, Great Northern officials said. They propose aerial communication in emergencies such as the recent wrecking of pole lines by sleet and the snow, the Radio to "leap the gap" on such occasions. Practical use of the Radio by railroads now appears dependent upon the elimination of existing interference with aerial communication resulting from the rapidly increasing use of the new art of transmission, said J. C. Rankine, superintendent of telegraph of Great Northern.

## Vacuum Tube Born Because Gas Light in Laboratory Flickered

Bunsen Burner Used in First Attempt to Make Thermionic Rectifier—Three Electrode Tubes Used for Radiophony by U. S. Navy in 1908

Back in 1900 when Radio telegraphy was in its infancy, before Jack Binns sent his famous SOS saving 3,000 lives when the "Republic" sank after colliding with the "Florida"—a man was working in a small, poorly equipped laboratory out in Chicago on what gave promise of being an electrolytic detector for the detecting of Radio telegraphic waves. It was a hot August night, the room was close, and overhead a Welsbach burner added to the heat and discomfort. In the closet of the laboratory was a small spark coil, battery, and antenna which, when the man at the bench touched a key, crackled and hissed, radiating Hertzian or Radio waves. The experimenter worked on hour after hour, with slight improvement being noticed in the tiny instrument on which he worked with each alteration of its construction. Suddenly the perspiring, weary scientist noticed that with each crackling of the coil there was a dimming of the gas light overhead. The next day he discarded his experiments on the electrolytic detector and took up the study of this new phenomena. Thus started a series of experiments covering twelve years which gave to mankind an invention revolutionary in its scope and invaluable now to man's daily work. The searcher into nature's secret was Dr. Lee De Forest—the result of his work was the vacuum tube.

### Bunsen Burner First Used

Taking up the story a couple of years after that August night here are De Forest's own words: "In 1902 I was first able to secure actually the effect I had been looking for, in a Bunsen gas burner, which I used for the first time then as a detector for wireless telegraph signals. It was a very crude detector at first, but it proved that the principle existed. I applied for a patent at that early date. In 1903 I recommenced these experiments, and obtained a fairly sensitive receiver with a gas flame. In 1904 I had developed the idea to a point where the sensitive gas should derive its heat not from a gas flame but from an incandescent filament, where one would at once get away from all the troubles attendant on gas lamps and flames. When the first incandescent lamp "responder" was tried out it was found that, in addition to its convenience, its sensitiveness was also much increased. In 1905 I obtained a device that showed much greater sensitiveness than that of any detector of that period. My assistant, Mr. C. D. Babcock, who was my constant and indefatigable helper through all this early work, suggested the beautiful and very appropriate title of "audion" for the incandescent lamp detector. The word "audion" is made up of two derivatives: "Audio" to hear, and "ion"; ions being the carriers of the electric charges traveling inside the exhausted vessel, by whose agency the electric current traverses the gap between the hot and cold electrodes.

### Found Applicable to Telephony

"In 1908 I discovered that in addition to being a detector and relay of high frequency Radio waves, this little audion was also an amplifier of telephone currents. I took an ordinary telephone line and by putting in resistance, cut down the strength of the current until the voice was below audibility, too faint to be understood. Then, leading that weak current to the grid and filament of the audion and connecting my telephone receiver as before between the plate and the filament, I found an increase (at first very slight) in the current in the telephone receiver. This telephone repeater was crude at first, but later developments carried on particularly in California, showed that it could increase the volume of the voice currents 10 and even 20 times."

We will here take the story out of Dr. De Forest's hands. In 1907 the Radio telephone, in which the audions were used for both transmission and reception of the human voice, was brought to the attention of the Navy department and January 1st, 1908, found the ships of Admiral Evans equipped with Radiophones, that the fleet commander might talk with the commanding officers of the various units and ships. To quote from the editorial columns of one of the great dailies on December 5th, 1907: "Communication between ships hundreds of miles apart by means of wireless telegraphy almost passes comprehension, but the wireless telephone seems even more wonderful. It is said that all the ships of the great fleet of warships now assembling to start on the cruise to the Pacific have wireless telephone equipment and that this will make conversation possible between ships twenty miles apart. In other words, Rear Admiral Evans can sit in his cabin and have a heart-to-heart talk with each Captain in the fleet."

It is to be hoped that the writer of this editorial is now the proud and happy owner of a good receiving set and listens in nightly to the broadcasting stations. How he must smile over the above. Al-

though today the production of audions or vacuum tubes is over 4,000 daily, Radio fans absorb those and clamor for thousands more.

The audion or vacuum tube of today is known by various names and is made in many and various shapes—we have Radiotrons, Audiotrons, Radio Audions, etc.—but in principle and general arrangement of the three elements, filament, plate and grid they are the same. The average Radio fan is acquainted with but two of the uses of these marvelous little tubes: as a detector and as an amplifier. One finds them in every long distance line, faithfully repeating with added strength the important messages trusted to them. In great broadcasting stations they are used first to amplify the voice of the artist or orator, then they serve as modulators and impress the electrical variations impressed by the human voice on a train of Radio waves started by other tubes used as oscillators. In receiving sets they are rapidly coming into use as Radio frequency amplifiers, strengthening the signals before these weak currents reach the detector and while they are still oscillating 50,000 to 5,000,000 times per second. There are, doubtless, thousands of uses to which the audion will yet be put, so precise, so delicate is its action. These many and varied uses it is impossible to foretell.

## AIRPHONE LESSONS TO SCHOOL KIDDIES

Cincinnati Educator Suggests School Children be Equipped with Receiving Sets

CINCINNATI, O.—One of the most novel suggestions for the use of Radiophone is advanced by James G. Fisk, a member of the Cincinnati board of education.

Mr. Fisk says that he would substitute the Radiophone for teachers. He also declares that he is in earnest about his plan and has requested details from an electrical engineer.

Fisk says further that under his plan each of the 45,000 school children in this city would be furnished with a receiving set and that the lessons would be broadcast at certain hours of the day from a central station. The children, he said, would go to the school buildings but once a week for further instruction.

He declares the plan would entail a saving of hundreds of thousands a year to taxpayers.

### TU-WAY

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



## NEW BROADCASTING STATION IN BOSTON

SHEPARD STORES INSTALL POWERFUL TRANSMITTER

Will Soon Give Extensive Program Under Personal Direction of Major John Fanning

BOSTON, MASS.—A new broadcasting station is to be located in Boston shortly, in the heart of the shopping district, on the top of the Shepard Stores building on Tremont street. This is one of the leading department stores of the city. High grade programs will be arranged similar to those broadcasted from WJZ, Newark, N. J. Musical talent, rather than "canned music" will be the main object. Major John Fanning, in charge of the Radio department, will probably do the announcing, while Samuel Curtis will be in charge of the operating. The firm has purchased a Western Electric type Z-A 100 watt Radiophone transmitter, complete in every detail, with 100 per cent spares to take care of emergencies. A Western Electric 196-watt receiving set, together with a three-step amplifier constitutes the receiving equipment. With the towers the apparatus cost around \$12,000. The Shepard Stores are the first department store in the country to install a licensed Western Electric Radiophone transmitter. The installation will be ready for operations some time early in June. At the start the station will broadcast only three evenings a week, from 7:30 to 9:30 and in the afternoons. Call letters and wave length have not yet been assigned.

## "ALL-AMERICAN" RADIO APPARATUS

Audio and Radio Frequency Amplifying Transformers  
RAULAND MANUFACTURING CO.,  
35 So. Dearborn St., CHICAGO  
AT LEADING DEALERS OVER THE COUNTRY

The Only Real Protection as it Cuts Off Your House Circuit  
Strain Type, \$6.00  
L I G H T N I N G P R O T E C T I O N With S & C Arrester  
Schweitzer & Conrad, Inc.  
4439 Ravenswood Avenue, CHICAGO



## Uncertainty Overcome

In producing the AEREX BR-1 CRYSTAL RECEIVING SET we have eliminated all technical complications. The machine is operated very simply and requires no electrical knowledge on your part. Attach the Aerex—that's all—and you are ready to receive whatever is being broadcast—concerts, news items, lectures, etc.

- Prices**  
Crystal Detector \$20.00  
(Receiver Only)  
Audion Detector \$12.00  
2-Step Amplifier \$35.00

- Features**  
Maximum Audiability  
Maximum Tuning  
Elimination of Interference

These features combine to make a receiving set of unusual excellence and service.

**BR-1** gives you anything within a radius of thirty-five miles—with its special connections you are enabled to attach an Audion detector unit which increases the range to one hundred miles—the price of this Audion Detector unit model BA-2 is \$12.00 or should you want a loud speaker attachment, the Aerex model BR-1 is also equipped with connection for two-step amplifier. MODEL ALS-3, the price is \$35.00.

Ask your dealer or write direct to us—sets shipped postpaid anywhere in the United States

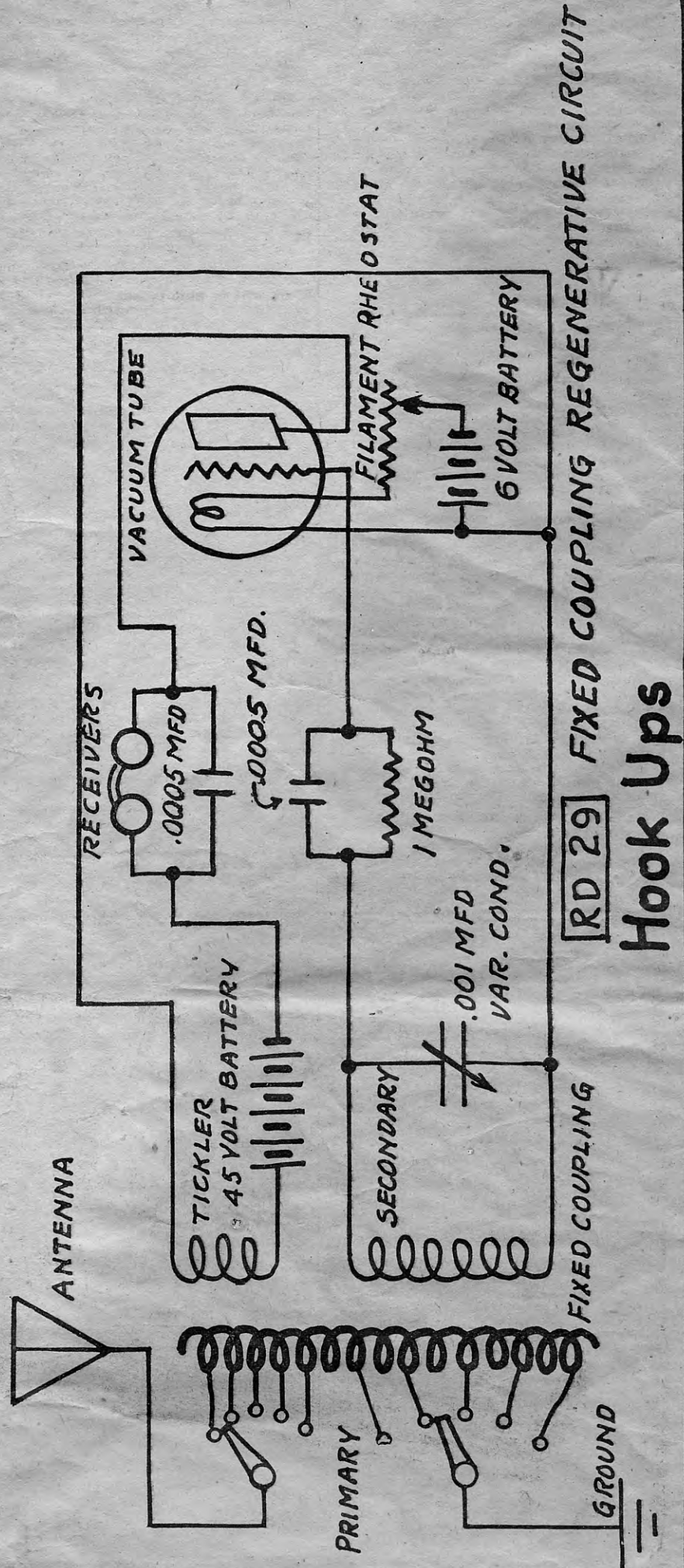
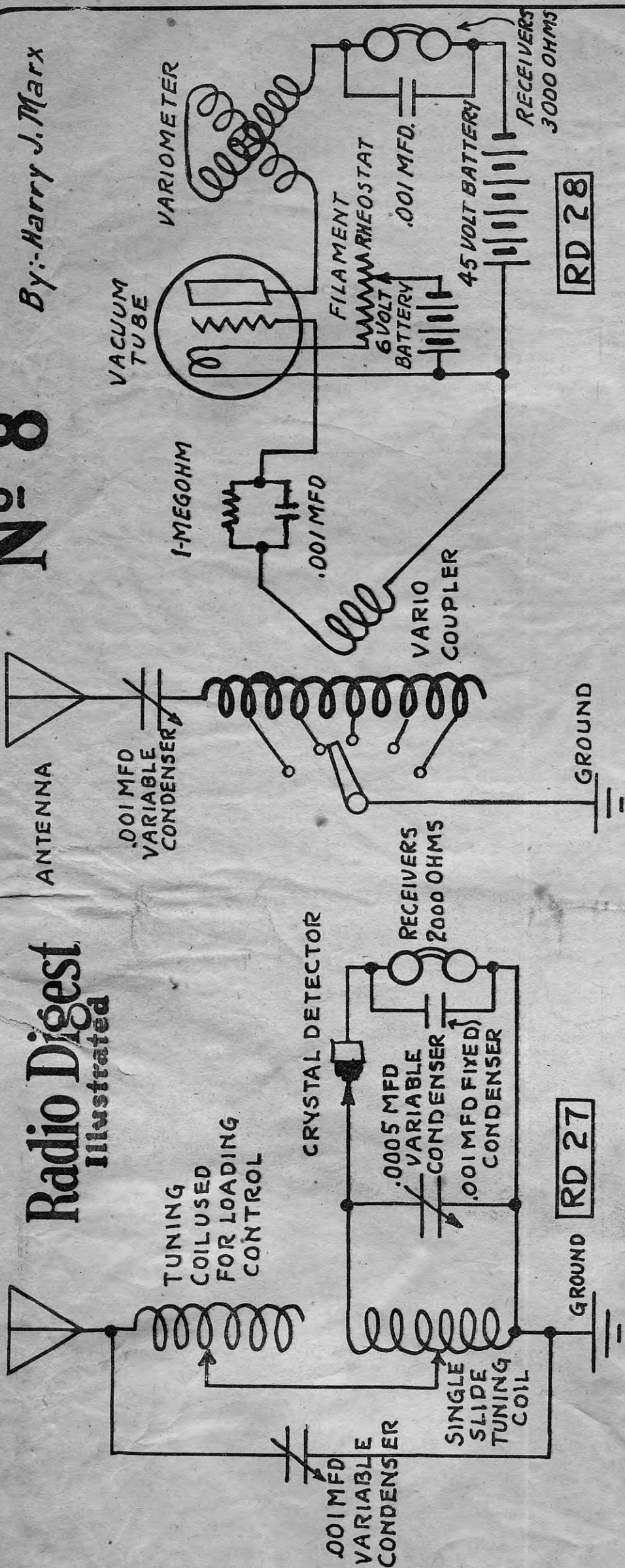
**AEREX RADIOPHONE CORP.**  
342 Madison Avenue, NEW YORK CITY



# No 8

By: Harry J. Marx

## Radio Digest Illustrated



# Hook Ups

# Questions and Answers

## Loose Coupler Hook Up

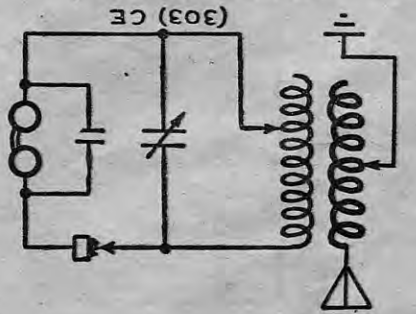
(303) CH

I am purchasing a "Crystal Detector Set" including the following, Loose Coupler, Crystal Detector, fixed and Variable Condensers and 2,000 ohm phones. Kindly send or publish the "hook up" for this set.

What type of Aerial would be best? Is it possible to receive music from a distance of 80 miles with this set?

A-1. Your aerial should be a single wire 50 feet high and 100 feet long.

2. You cannot receive with this set a distance of 80 miles normally. Hook up is given on this page.



(245) GES

I will you kindly look over the enclosed diagram and tell me if it will work on receiving concerts, etc. from a range of 500 to 1,000 miles.

2. If so, what sizes of wire should be used in winding the primary and secondary coils?

3. Will a one-step amplifier improve it?

Ans-1. You will have to go some to receive concerts a distance of 1,000 miles with this set.

2. The secondary wire should be about four sizes smaller than the primary. Primary 24 B & S gauge.

3. Better try two steps.

Hook up is shown on page 14, RD-4, issue No. 3, of the RADIO DIGEST.

**Way Up in the Mountains**

(250) RDA

I am contemplating building a Radio-Phone, but do not know just what to get or where to get it, so am taking the liberty of writing you.

1. The only broadcasting stations we have on record for Tenn. is at Memphis. If you are more than 15 miles from it you will have to use a vacuum tube set. Aerial should be 50 or more feet high and 150 feet long, including length of ground.

2. Use a storage battery, it will last

## Tennessee Broadcasts Wanted

(253) JPB

I am a reader of the RADIO DIGEST ILLUSTRATED and enclose you a stamped addressed envelope and ask that you enlighten me on the following points, if your service to your readers is free.

1. I want to put in a receiving station in Clarksville, Tenn. Am I near any large broadcasting station? What is the cheapest outfit I can get? I can have any sized aerial.

2. As I live on the farm with no electric power, what will be the cost of current used by a receiver?

3. I am especially anxious to receive dance music. What will a "loud speaker" cost and where can I get one?

4. Does the power to receive from long distance depend on the receiving set or on the power of the broadcasting station?

I would thank you to give me your advice on the following topics and when a friend of mine gets the Radio craze, I'll recommend the RADIO DIGEST ILLUSTRATED as the best paper on the subject.

Ans-1. The only broadcasting stations we have on record for Tenn. is at Memphis. If you are more than 15 miles from it you will have to use a vacuum tube set. Aerial should be 50 or more feet high and 150 feet long, including length of ground.

2. Use a storage battery, it will last

erty of bringing my troubles to you, and I would certainly appreciate it if you would tell me what equipment I need, how to make it, and how to connect it; also where to buy parts.

We are located in the mountains at an elevation of 4,000 feet, approximately 1,000 miles from the nearest broadcasting station. It is for this reason that I fear the set described in your first issue of RADIO DIGEST would be too small, as I think it will take a powerful set here.

We also have the mechanical rectifiers of the Cottrell treaters to work against. If you will send me the above information I assure you it will be greatly appreciated.

Ans-Write to any of the large manufacturers of Radio apparatus and supplies. They will be able to guarantee what their sets will do. A loose coupled receiving set with one stage of Radio and three of audio frequency amplification should turn out the trick.

## Charging Batteries in Country

(256) GEL

I have been interested in your "Questions and Answers" section of the RADIO DIGEST and am enclosing a stamped envelope and would be pleased to have you answer the following questions:

1. My parents have a Radio receiving set in the country and when using the Magnavox they find it necessary to have a storage battery re-charged quite often. This is quite inconvenient as we have considerable distance from a battery service station. Could you recommend a suitable generator to keep 6 volt storage charged up, one that could be used on a half horse power gasoline engine?

2. Would you please inform me if a person giving a radio concert to a public gathering would have the legal right to charge enough admission to cover the necessary expenses thereby incurred?

Ans-1. Loud speakers usually do use considerable current. You need a 6 volt D. C. generator with an automatic cut-off. Write any electric supply store.

2. Yes, and more if they will pay it.

Receiver For 250-Mile Range

(269) JL

I had a crystal set when in Kansas City but it is no good as the nearest station is Kansas City, 250 miles away. Would a set with a vacuum tube detector and a loose coupler be all right at that distance? The K. C. station will soon be 1,000-mile range station. If the set de-

## Plate Variometer As Ticker

(252) FRB

1. Will it be OK to use a variometer as a ticker coil in plate circuit between copper wire all right to wind a three slide tuning coil three inches in diameter and eleven inches long? Please show me how to connect a receiving set consisting of this tuning coil, a crystal detector, fixed condenser and head phones?

A-1. Yes, but No. 22 would be better.

2. The hook up is given on this page.

Charging Batteries in Country

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Receiver For 250-Mile Range

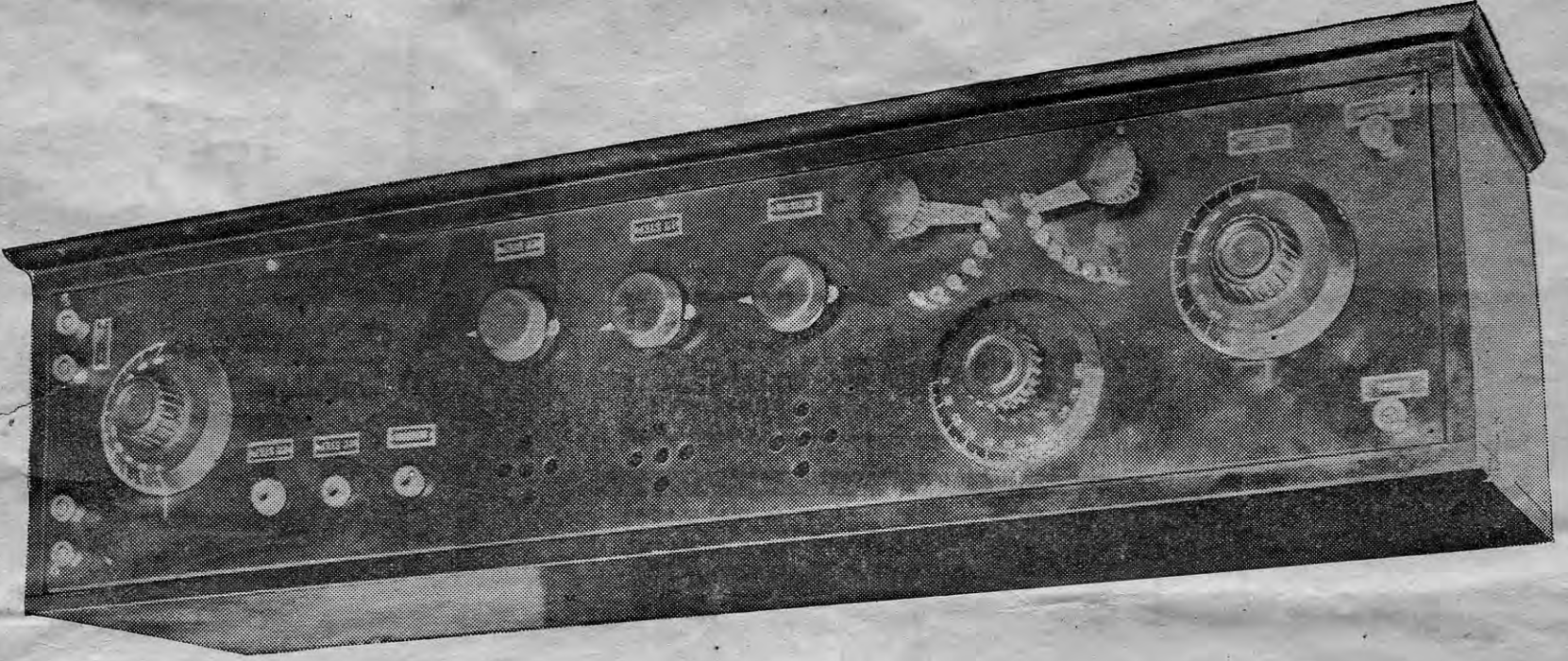
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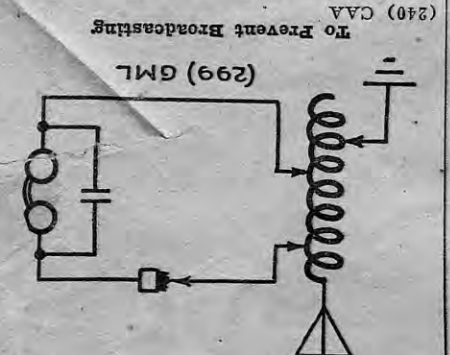
# A High Class Long Range Receiving Set

With two stages of amplification  
S. & H. MODEL No. 301  
Immediate Delivery

RADIO-PHONE SALES CORPORATION  
37 W. VAN BUREN STREET  
Room 770 Old Colony Bldg.  
CHICAGO, ILL.  
Dealers: Write for Special Proposition



A-1. The paper was hardly correct if that was what it said. Read the article on the front page of May 13th RADIO DIGEST regarding the report of the conference. Public broadcasting, the kind that is so popular, will, if the new laws are enacted, be confined to from 485 to 495 meters wave length. There is little chance of the government preventing broadcasting when it is in such general demand by the public, and when so many people have invested in receiving equipment.



(299) GML

To Prevent Broadcasting

(240) CAA

I note in today's paper that the commission appointed to make recommendations on Radio control has recommended a wave length of 285 meters for broadcasting. If this is put in force will it effect the distance over which the broadcast can be received? Is there a possibility of the government preventing broadcasting?

A-1. The paper was hardly correct if that was what it said. Read the article on the front page of May 13th RADIO DIGEST regarding the report of the conference. Public broadcasting, the kind that is so popular, will, if the new laws are enacted, be confined to from 485 to 495 meters wave length. There is little chance of the government preventing broadcasting when it is in such general demand by the public, and when so many people have invested in receiving equipment.

# Radio Illustrated

This outfit has been installed in the office of a Boston College Dean of the College of Secretarial Science, Boston University.  
© U. & U.



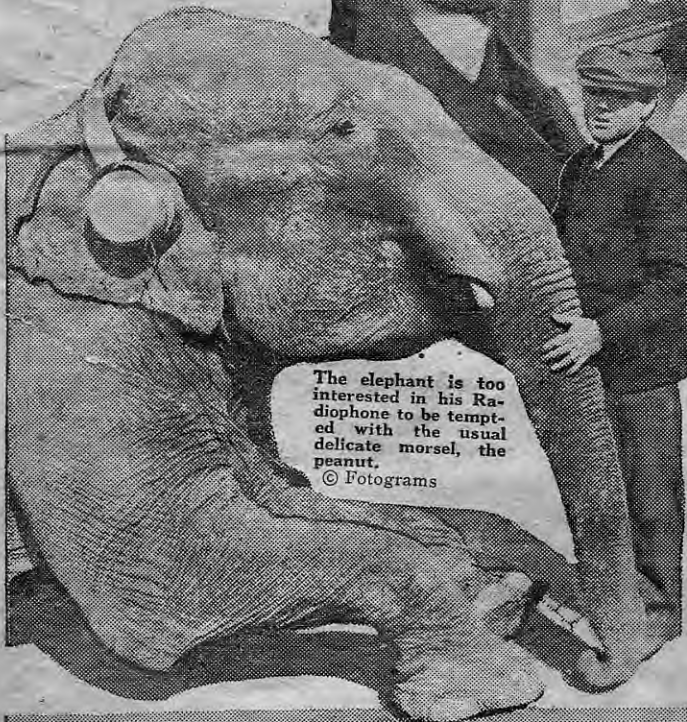
Messenger boys are now able to get the baseball scores by the innings and they will not neglect their duties while out delivering a message.  
© Fotograms



This set did valiant service in a Far-nam airplane during the first of May strike in Paris, France. © Keystone

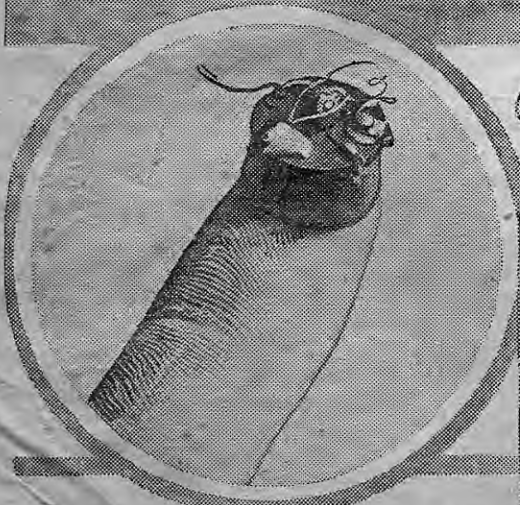


"Keep this under your hat," is a well known expression, and it applies to this Radio fan, who has a complete receiving set in his silk opera hat.  
© Fotograms



The elephant is too interested in his Radiophone to be tempted with the usual delicate morsel, the peanut.  
© Fotograms

A test successfully demonstrated that Radio concerts could be heard while riding on the top of a bus in New York City.  
© K. & H.



The "Radio Cricket," the smallest known Radio receiving set. It measures one-half inch in diameter and less than one-half inch high.  
© Keystone



Entertainment by the way of Radiophone while the actors of a film company are idle between acts.