

# Radio Digest

EVERY WEEK

# Illustrated

TEN CENTS

TRADE-MARK

Vol. III

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CHICAGO, ILL., SATURDAY, OCTOBER 28, 1922

No. 3

## NO RADIO FOR FORD

### LONDON HEARS 2ND "VOICE ACROSS SEA"

SON TALKS FROM FRISCO TO "DAD" IN ENGLAND

Speaks Over Wires to Newark, Station WOR, from Where Words Are Transmitted

SAN FRANCISCO, CAL.—The attempt of H. Gordon Selfridge, Jr., son of the

famous London merchant, to transmit his voice from San Francisco to his father in London recently through the agency of land and Radio telephony was indifferently successful, according to a cablegram received from London.

The cable stated that a few faint words were heard.

Selfridge used long distance wire telephone to Newark, N. J., where his voice was taken up at Station WOR, the same plant as was used by Sir Thomas Lipton in his transatlantic trials. From WOR, Bambrugger's, the voice was transmitted by Radiophone to London.

#### Bank's Set Reports News

JEFFERSONVILLE, O.—The Citizens Bank of this city has installed a receiving set and now announces price changes in live stock, bonds, grain and other markets four times daily. News and weather reports and correct time are also features of the bank's new service.

#### CHANGE DETROIT PAIR TO 400-METER CLASS

DETROIT.—The Detroit Free Press, WCX, and the Detroit Evening News, WWJ, recently have been granted permission to do their broadcasting on 400 meters. The newspaper stations are two of the few plants having this special privilege. Congratulatory messages have been received from far up in northwestern Canada and from boats on the Pacific ocean.



#### WOC's Revival of Voice Surprises Fans of Nation

DAVENPORT, IA.—When Station WOC here buzzed out its concert recently there was much surprise all over the country, as Radio stations from Colorado to the Atlantic Coast heard the rejuvenated voice of the Palmer School of Chiropractic transmitter.

To secure the rejuvenation and to eliminate a hissing noise which interfered with transmission, WOC officials brought Dr. J. G. Bernhard, noted Radio engineer, here from New York. Dr. Bernhard made the few changes in the transmitter which brought the astonishing results.

#### Columbus Hotel Installs Phones

COLUMBUS, O.—The first hotel in Columbus to have a Radio receiving set is the Southern. The apparatus was installed especially to receive the World's Series reports.

#### BROADCASTS MAKE BOW IN CUBA WITH CONCERT

New Jersey Amateurs Pick Up Havana Plant

HAVANA.—President Alfredo Zayas of Cuba inaugurated Radio broadcasting in Havana on the afternoon of October 10. His speech was delivered in the national palace and relayed by telephone lines to the sending station of the Cuban Telephone Company.

A second musical program was given in the evening from 8:30 to 10 o'clock, Havana time, a half hour earlier than Eastern time. The wave length used was 400 meters. The station was erected by the American Telephone and Telegraph Corporation of New York and is a duplicate of the equipment at WBAY.

American amateurs as far north as New Jersey have already heard the new Cuban plant.

Merchants in a western town are boosting business by uniting in a scheme to give away tickets with each sale, the citizen having the greatest number of tickets on a given date to receive a Radio set.

### FLIVVER KING SAYS RUMOR IS NOT TRUE

Will Not Enter Radio Manufacturing Industry According to Present Plans

Sets Questioners at Rest

Disagrees with Statement of Stage Star and Friend—Will Not Make \$25 Sets

CHICAGO.—Henry Ford denies that he is planning to make Radio sets. Upon inquiry resulting from a statement by Will Rogers, personal friend of the "flivver king," RADIO DIGEST was informed

that Ford had no intention of going into the Radio manufacturing business at this time. Many rumors have been heard that Mr. Ford was intending to invade the new field of popular interest, but these seem to have had no real foundation.

Persons who have heard the rumors and hoped that Ford would enter the Radio industry are doomed to disappointment for the present. A Radio "flivver" king may rise but it will not be Ford.

#### What Rogers Said

The indirect statement credited to Mr. Ford by Will Rogers, the lariat-philosopher of Folles and motion picture fame, was, "There's a lot of profit in these wireless sets. We can build them for twenty-five dollars and make money. I may go into the manufacturing of Radio sets."

Mr. Rogers is a close friend of Henry Ford. Every time "Will" plays in Detroit he visits the great motor car magnate at his palatial mansion.

#### RADIO SPOOK! 'PHONE REPRODUCES MUSIC

GREAT FALLS, MONT.—This city evidently has a Radio ghost. A citizen heard phonograph music over his telephone, although the subscriber at the distant end didn't answer. A portion of a broadcast program was also heard. The local enthusiasts are trying to find out why the telephone was able to reproduce the Radiophone program.

# FREE RADIOGRAMS FOR LEGION CONFAB

## NEW ORLEANS "BUGS" OFFER VETS SERVICE

### Ex-Soldiers at Convention Take Advantage of Chance to Send Word Home

NEW ORLEANS, LA.—A decided innovation and the largest attempt ever undertaken by any amateur Radio association in the world was the free Radiogram service New Orleans amateurs gave the American Legion veterans during the convention here October 16-20.

The Radio association members originated the plan of accepting Radiograms from any veteran who wished to send a Radio message home. The messages were relayed through the American Radio Relay League stations throughout the United States. All messages were limited to 10 words.

#### Amateurs Handle Traffic

The burden of the service was assumed by local amateurs who have acquired a reputation for transmitting long distances. C. A. Freitag, Roy Alciatore, E. H. Christy, V. A. Jensen, H. Wehrman, C. R. Randall and L. Bastian were prominent among the "DX" or long distance bugs who handled the work.

The feature was one of the best at the fourth annual convention of the Legionnaires. It helped carry a part of the good time New Orleans gave to the veterans to those they left at home. Many a mother received a thrill such as letters from overseas once brought her, when an amateur in her home town read a Radiogram from far away New Orleans where her boy and his comrades had gathered for a good time.

## UNCLE SAM TELLS HOW TO MAKE HANDY METER

### Government Circular Explains Portable Wavemeter

WASHINGTON.—How to make a portable short-wave wavemeter for use in tuning amateur transmitting stations is explained in a circular just issued by the Bureau of Standards. According to the Bureau, amateur stations in the United States are at present required by law, when transmitting, to use wave lengths not exceeding 200 meters, and it is, therefore, important that amateur operators should have a wavemeter available so that they can adjust their sets carefully.

The circular points out important features in the design of a wavemeter and describes the construction of an instrument suitable for the measurement of wave lengths from 100 to 570 meters. A very limited number of copies of the circular are available in mimeographed form at the Bureau of Standards, Washington, D. C. These are only for persons carrying on experimental work.

## "Intermission" Affords Outside Plants Chance

### Two Detroit Stations Discontinue Saturday Night Programs

DETROIT.—In order that Detroit listeners in may have at least one evening in the week to hear the outside stations, WCX, Detroit Free Press, and WWJ, Detroit Evening News, have discontinued Saturday evening broadcasting. In place of this, however, at different times during the week, the Detroit Evening News is giving a late concert from 11 p. m. to 12 midnight for fans living in the western and mountain states. These changes are appreciated, because WCX and WWJ are so powerful it is almost impossible on regular nights to tune in here on outside station.

Detroit is rapidly becoming one of the important Radio centers in the country. As the winter months approach great numbers of people are equipping their homes with apparatus, while many others, who had contented themselves with crystal sets, are changing over to bulb sets.

## Plan Radio Train Coach After Successful Test

BIRMINGHAM, ALA.—The Louisville & Nashville Railroad plans to Radio-equip one of the coaches on its fast De Luxe train running from Cincinnati to New Orleans. Announcement was made this week following a successful test made at Louisville under direction of R. R. Hobbs, superintendent of telegraph of the company, with a fully equipped Radio railroad car.

Radio concerts, broadcast by the Louisville Courier Journal (WHAS), were picked up on this car and the reception of the concerts was not impaired in any way by the speed of the train.

## College Offers Fall Course on Airphones

ATLANTA, GA.—A complete and thorough course in the theory and practice of Radio, with emphasis on practical Radio work, is being given for the first time in the evening school of applied science at Georgia Institute of Technology, according to the announcement recently of Dean A. B. Morton.

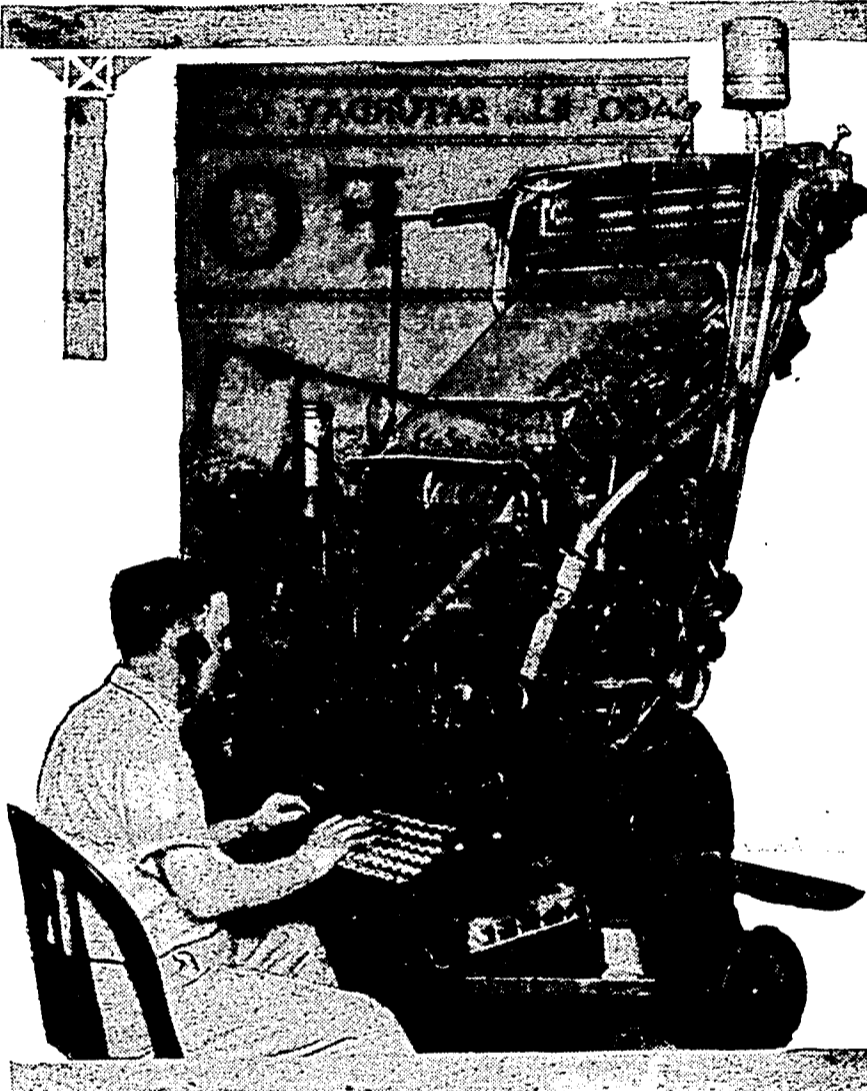
The Radio course includes complete training on how to make Radio apparatus, as well as instruction in the principles and theory of Radio. Both the receiving and transmitting of Radio messages and the principles and practice of Radio telephony are being taught to the students.

## Latest Canadian News Plant on 430 Meters

LONDON, ONT.—The London Free Press is the latest newspaper in Canada to start a Radio broadcasting service. Its station was officially opened here recently with an address by Sir Adam Beck. A program of vocal and instrumental music followed, lasting about an hour.

The call letters of the new station are CJGC, and the wave length is 430 meters. It has not yet been decided what the hours for broadcasting will be. Four 50-watt tubes are used in the transmitting apparatus, two tubes of which act as modulators for the other two, which are oscillators. The estimated normal range of the plant is 100 miles.

## NEWS HOT OUT OF THE AIR



To beat rival "sheets" with up-to-the-minute reports of the World's Series games, a Dallas News linotype operator, with a set of phones over his ears, copied the news from the air and immediately set it up in lead slugs ready to be rushed to the press and printed. Photo shows the operator at work. The enterprising Dallas News conducts Station WFAA

## THOUSANDS ON BOSTON COMMON HEAR TALKS

### Columbus Day Speeches Strengthened by Loud Speakers

BOSTON, MASS.—Powerful loud speakers were connected to the Parkman Bandstand on Boston Common Columbus Day, October 12, so that the thousands gathered at the celebration, many hundreds of feet away from the stand, were able to hear the speakers distinctly. A private telephone line was also run to the Common in order to relay the speeches from the Shepard Stores station, WNAC. The speech of W. Bourke Cochran, the famous orator, was broadcasted to thousands of Radio fans throughout the East, as well as was the cheering and applause of the huge audience assembled on the Common.

A thirty-foot tower was equipped with loud speaking horns at the top facing every direction. These horns were connected with a microphone and amplifier, so that speeches and music could be heard clearly within a radius of a quarter of a mile. In the evening the entire exercises of the Knights of Pythias in conference at the Mechanics' Building was broadcasted over the Common through the same battery of horns. The Knights of Pythias program included a band concert, music by the Pythian Glee Club of Brockton, an address by John Ballantyne and an oration by Congressman Tom Connolly of Texas.

Some of the fire insurance companies are demanding that Radio installations be inspected and certificates of approved wiring be obtained. Possessors of home outfits would do well to see that their policies are not affected by their equipment.

## U. S. Awards Extra Navy Stock to New York Firm

WASHINGTON.—Surplus stock of Radio broadcasting materials, including transmitting, receiving and miscellaneous equipment used by the Radio section of the Navy Department, bids for which were received this week, yesterday was awarded to the Greeley-Madison Corporation of New York. Close interest in the sale was shown by Radio dealers throughout the country.

Most of the material consists of the type CW1936 Radiophone sets, employing high powered Radio reception. This will be used to supply the amateur demand for Radio equipment.

The Greeley-Madison Corporation has handled several important government contracts. Taking the surplus Radio material of the Navy Department will enable the government to buy apparatus which has been needed to make satisfactory installations at the stations throughout the United States.

## Radio for Kobe Harbor, Japan

TOKIO, JAPAN.—In order to connect the city of Kobe, Japan, with ships by means of the ordinary existing telephone and Radio apparatus provided on board the large steamers, a company has been formed at Kobe, with a capital of about \$75,000. A circuit that has been tested thoroughly.

## Rail Line, Mail Ships Jabber

NEW YORK.—The New York Central railroad has arranged for Radio communication with the government steamships used in transporting foreign mail from steamships arriving at the port of New York.

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## Looking Ahead

The ninth of the series by H. M. Towne will appear next week. Mr. Towne always constructs and tests all apparatus he describes. There will soon appear a series of articles written by an instructor in a well known electrical school. The series will discuss all the rudiments of electricity pertaining to Radio. They will be instructive to the beginner as well as the more advanced person in the art. Broadcasting Directory. Gets better and larger each week. The only convenient reference to aid you in finding a station heard. "How to Make Department." Many kinks every week are interchanged here. Radio Illustrated. The picture page is the best of its kind.

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# STAGE STARS HELP OPENING OF WDAP

## MIDWEST RADIO CENTRAL IN FORMAL BOW

Program One of Longest, Most Diversified Ever Heard in Central United States

CHICAGO.—Sunday evening, October 15, marked the formal opening of the new Radiophone Studio and station of Midwest Radio Central, WDAP, located on the Drake Hotel. The program broadcast was one of the most diversified and lengthy entertainments ever heard in this section of the country.

A number of prominent stage stars gave their services for the benefit of the Radio fans of the country.

The first section of the program was given by the Friars Society Orchestra, who are famous throughout the country as makers of Gennett records. Herbert Vogel and Irving Foster sang some of the latest hits accompanied by the orchestra. Their program included "Bugle Call Blues," "Tiger Rag," "Panama," "Eccentric Rag," "Oriental," "Farewell Blues" and "Discontented Blues."

**Northwestern Syncopators Broadcast**  
Next came the Northwestern Syncopators under the direction of "Rick" Gale, who gave the fans "Nobody Lied," "Sensation," "Georgia," "Sun God," "Dixieland," "Dear Old Southland," "Some Sunny Day," "All the World Is Waiting for the Sunrise," "Eccentric," "Hot Lips," "San," "Don't Bring Me Posies," "Dan."

The third and last part of the program was under the direction of Salda Ballentine, who is well known to WDAP's listeners. Her program was rendered by Signor Liberati, world famous cornettist and band leader.

### Complete Program

Among the numbers concluding the program were the ladies' orchestra from Glen Inn, very popular in Chicago; the Ballantine Ladies' Orchestra, a new organization of the Ballantine Bureau; Hugh Marshall, Scotch baritone who impersonated Harry Lauder; Florence Berney, pianist; Costello's twenty-piece jazz orchestra; Miss Schoefeld, dramatic soprano; Delphine Cook, and Harry Miller, operatic tenor.

On its early test concerts, WDAP was heard in 42 states and Canada and is using its new transmitter at about half its normal rating. The sending wave length used is 360 meters.

# INMATES OF PRISON GIVE FULL CONCERT

Federal Prisoners' Program from Atlanta Is Relayed by WCAG, New Orleans

NEW ORLEANS, LA.—The New Orleans States broadcasting station, WCAG, recently relayed one of the most unique programs ever heard by New Orleans Radio audiences.

The entire program was given by inmates of the federal penitentiary at Atlanta via the Atlanta Journal Station, WSB. The prisoners were outside the penitentiary walls at midnight for the first time since they began serving their sentences. The announcements were made, giving prison numbers instead of names, and New Orleans enthusiasts declared the quality of the music indicated that many famous names must have been hidden by the numbers.

### To Change Call System

OTTAWA, CAN.—Similarity of call letters used by Canadian amateurs and those in the United States has caused the Dominion naval service to consider a plan for changing the system of call letters there. It seems that those of greatest likeness are nearest the border and cause much confusion.

# BOYS BUILD SETS IN SCHOOL WORKSHOPS

CHICAGO.—The manual training classes in public schools throughout the country are beginning to be more attractive to the schoolboy. In the Chicago public schools part of the manual training course includes the making of Radio sets. The youths jump at the opportunity and are now eager to take the manual training they formerly attended with reluctance.

# HURRAY! BROADCAST CLUB TO CLEAR ETHER

NEW YORK.—The Radio Broadcasting Society has been formed to bring together broadcasting stations for the purpose of allotting them hours that will avert interference such as has been prevalent in the past. Through these society conferences, it is hoped to clear the air of the jumble of signals and the crossing of different kinds of broadcast material.

# "BOSS" TALKS TO EMPLOYEES



James E. Gorman, president of the Rock Island railroad, at K Y W microphone, addressing employees in 30 cities, and a group in Chicago listening in on his speech

# Lotus Male Quartet Sings for WGI Plant

Famous Four, Organized 17 Years, Give Special Treat

MEDFORD HILLSIDE, MASS.—The Lotus Male Quartet, one of the most famous musical organizations in the country, was heard on the broadcasting program of WGI recently. The quartet, comprising Robert C. Martin, first tenor; W. W. Hicks, second tenor; H. N. Raymond, first bass, and F. B. Cannell, second bass, has been singing together for seventeen years without a break. As many as 58 concerts in one month have been given. John D. Rockefeller invites them to Cleveland each year for a concert at his church. They sing regularly at Tremont Temple, Boston.

# SPORT NEWS BY RADIO FILLS DETROIT PARKS

Crowds Gather to Hear Latest Reports on Series

DETROIT.—Two Detroit down-town parks were crowded with people every afternoon of the World Series baseball games. The Detroit Evening News, WWJ, installed loud speakers at these points and progress of the game was announced, play by play. The announcer's voice was so loud it could be heard a block away.

During the good weather of Indian summer WWJ also has maintained loud speakers in two parks where broadcast music has been reproduced every afternoon and evening. These took the place of the band concerts which had been given by the city throughout the summer.

# TEXAN CLAIMS NEW MYSTERY RECEIVER

DEVICE CUTS OUT ALL WHISTLES, SHRIEKS

Non-regenerative, Long-distance Concert Set Called Improvement on Armstrong Hook-up

(Special to RADIO DIGEST)

SAN ANTONIO, TEX.—Non-regenerative long distance reception of Radio concerts has been accomplished by John G. Holterman of San Antonio, he announced after perfecting what he claims is an improvement on Armstrong's famous hook-up, without the use of ideas incorporated in Armstrong patents.

A model, sealed so that no one can tell how the dials operate inside of the black box, about two feet long, enclosing the new set, is now on display at a local Radio supply store. By turning three dials, stations at Kansas City, St. Louis, Denver, Atlanta, Fort Worth and nearby points are heard.

### No Howling Heard

A peculiarity of the new set is that when tuning in stations not in the immediate vicinity, no whistle or shriek is heard as is the case with a regenerative receiving set. A turn of the knobs suddenly brings in loud and clear one station after another, those who have operated the new set say. As the station is tuned out, the customary whistle is missing.

This feature of the set aids a great deal in tuning for various stations with a loud speaker, as a crowd sometimes breaks up when the operator causes untimely shrieks to come from the horn.

Mr. Holterman is now working on a "tuned circuit" and has found how to hook up a set which will tune in stations as far as 1,000 miles away by simply turning a single knob. The knob is slightly larger than the ordinary dial and is the only adjustment on the set.

### Works on Battery and Rectifier

Further experiments are being made before patents are applied for on the newer device. Holterman also is working on a storage battery which he expects to offer to manufacturers soon. The battery has not been tested thoroughly, but preliminary tests show that it develops a high voltage, lasts a long time and discharges current rapidly without "wearing out."

The inventor also is working on a rectifier which he expects to have manufactured at a lower cost than most commercial devices now on the market. This device, he claims, will charge an ordinary A battery at a cost of but two cents, using ordinary city electric light alternating current.

# DEVICE FINDS FIELD FOR PLANE LANDING

"Localizer" Informs Aviator When Craft Is Over Middle of Aerodrome

CHICAGO.—After three years of experiments the United States Air Mail Service has developed a device which utilizes electromagnetic waves to inform an air pilot when he is over the center of the landing field. This apparatus is termed a "localizer." A brief description released by the Air Mail Service follows: "The localizer is a device for transmitting Radio signals more or less vertically, so as to form an electromagnetic field over the landing field itself, and extending to a sufficient altitude to enable the pilot to intercept this zone of sound above the clouds or fog."

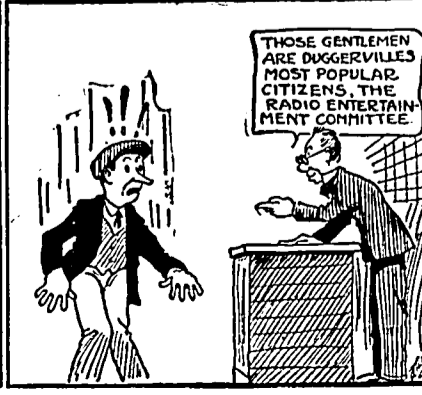
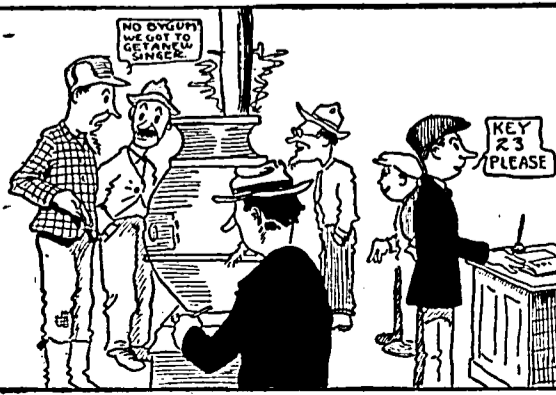
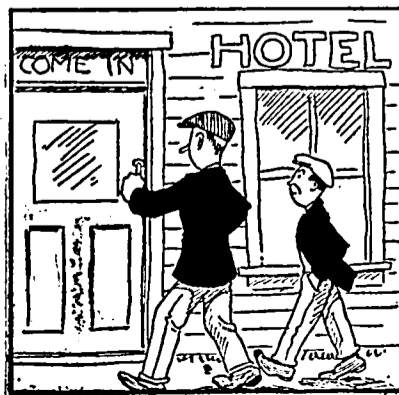
### Boston Symphonies on Air Soon

BOSTON, MASS.—Station WNAC, the Shepard Stores, began October 8 to broadcast Sunday evening services of Tremont Temple, and at a later date will begin the regular broadcasting of Boston Symphony Orchestra concerts.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Spir L. May Now Fade Out



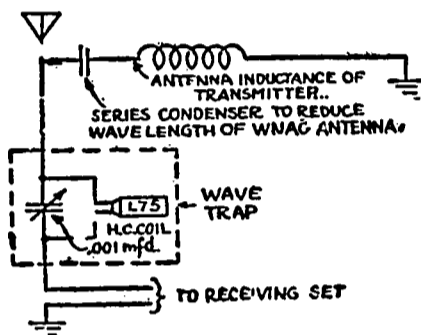
# WNAC TRANSMITS, RECEIVES AT ONCE

## BOSTON STORE STATION ON DUPLEX SYSTEM

### "Wave Trap" Aids First Feat of Kind Accomplished in New England —Time Signals Relayed

BOSTON, MASS.—WNAC, the Shepard Store's broadcasting station, is the first plant in New England to accomplish duplex operation, or transmitting and receiving at the same time. This feat was accomplished on several nights recently. In order to work it out, a "wave trap" or filter was utilized. This was placed in series with the antenna, using a potential "node," which was placed near the set.

By means of this node, the receiving set aerial lead is tapped off the main transmitting antenna while the set is broadcasting. The duplex operation can be performed, according to the operators, on wave lengths as low as 460 meters while broadcasting is going on at 360 meters. Transmission is not affected in any way by tapping the transmitting antenna in this fashion.



The accompanying diagram shows how the Shepard duplex operation was accomplished.

### Can Relay Distant Broadcasts

Broadcasts from distant stations can be received at the Shepard station through the duplex set, and, by means of the microphone, relayed to fans in the vicinity as an addition to the regular program.

Beginning October 2, the Shepard station has been broadcasting Arlington (Station NAA) time signals on Mondays, Tuesdays and Thursdays of each week, from 11:55 to 12 noon Eastern time and from 9:55 to 10 p. m. They are received by telephone from the Charlestown Navy Yard, which receives them direct from the Arlington broadcasting station.

### Hears Wire Phone Talk on Set

TORONTO, CAN.—After listening in on some distant broadcasting stations, Mr. L. W. Fraser, of 36 Bracondale Hill road, shut off the "juice" from his detector filament, leaving the first and second stage amplifier tubes lit. Suddenly, much to his dismay, he broke in on a telephone conversation. The voices were very plain and clear. By increasing the voltage on the amplifying filaments he was able to bring in the talk still louder. Mr. Fraser's three-wire aerial is at right angles to the nearest telephone line, which is 25 feet below.

Station WBAY of New York, has employed an expert newspaper man to prepare a daily news digest for broadcasting.

# MAGAZINE TO ANSWER QUERIES BY AIRPHONE

## "Adventure" Announces Novel Use of Radio

NEWARK, N. J.—A novel use of Broadcasting has just been announced by the magazine "Adventure." In a series of Radio talks, L. Patrick Green, of the editorial staff, will read the answers to a number of questions submitted by readers to the "Ask Adventure" experts, from WJZ at Newark, twice a month.

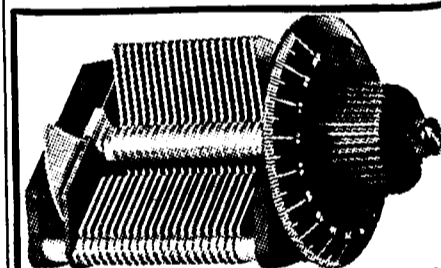
Nearly fifty experts having first-hand knowledge of the far corners of the earth have been answering readers by mail but will now use Radio. If "listeners in" wish to know about Alaska, India, Borneo, Central Africa or any other country, they are invited to mail their questions to the "Ask Adventure" Man, care of Adventure, New York City. When possible the answers to questions will be broadcast but all will be answered by mail.

## Flying Boat Broadcasts News of Detroit Air Meet

DETROIT.—A Radio-equipped flying boat broadcasted the news of the National Airplane Races at Detroit on October 9. "Listeners in" on 507 meters heard the first Radio report on an aviation meet! The high powered flying boat, "Wilbur Wright," equipped by the General Electric Company with a 50-watt Radio transmitting set, broadcast the reports over a range of 100 miles. Reports from this aircraft were sent out on a wave length of 507 meters. Soaring at a height of 3,000 feet, this flying boat observed the contestants in the various events and reported by Radio the progress of the races. Special receiving sets were placed about the flying field so that the spectators could be informed at all times as to the position of the planes, even when they were out of sight.

## Ocean Buoy Breaks Loose; Radio "Tip" Warns Tender

WASHINGTON.—The introduction of Radio outfits on vessels of the Lighthouse Service was an important step in the interest of economy, as shown by a recent instance on the coast of Maine. A light station reported one afternoon to the district office by telephone that a large can buoy had broken adrift and was moving away. A Radiogram was sent to the tender that was working on buoys a few miles away, the buoy was recovered and placed back on station before sunset, and so saved the buoy and probably a day's steaming of the tender, and also safeguarded shipping by promptly replacing the buoy on station.



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# Book Reviews

### Radio Reception.

 By Harry J. Marx, Technical Editor Radio Digest Illustrated, and Adrian Van Milling. A simple treatise on Radio reception. Beginning with the elementary principles of electricity, it carries the reader on into the essentials of Radio telephony. The most successful methods of Radio reception are explained and special reference given to practical tuning. 230 pages, with 130 illustrations. Price, \$2.

### Radio First Aid.

 Illustrated with working drawings and complete data as to the necessary equipment and cost of constructing from the simplest to the most modern Radio outfit at home. Price, \$1.

### Armstrong's New Super-Regenerative Receiver.

 By Kenneth Harkness. This is an eight-page leaflet which gives six diagrams and seven halftones of the famous receiving sets and hook-up. It tells how to make and operate it. Price, 50c.

### Radio for the Amateur.

 By A. H. Packer and R. R. H. The underlying principles of Radio thoroughly explained in simple language and understandable illustrations. This book will teach you how to construct and operate a receiving set successfully. Price, \$1.50.

### Elements of Radio Telephony.

 By William C. Ballard, Jr., M. E. A reliable, authoritative discussion, in simple form, of the essential principles of Radio telephony and their application. The use of mathematics has been almost entirely avoided. Price, \$1.50.

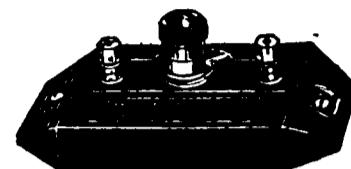
### The Theronic Vacuum Tube and Its Applications.

 By H. J. Van der Bijl, M. A., Ph.D. This book supplies the first

comprehensive and reasonably concise treatment of principles of operation and the more important phenomena exhibited by the passage of electrons through high vacuum. Price, \$5.

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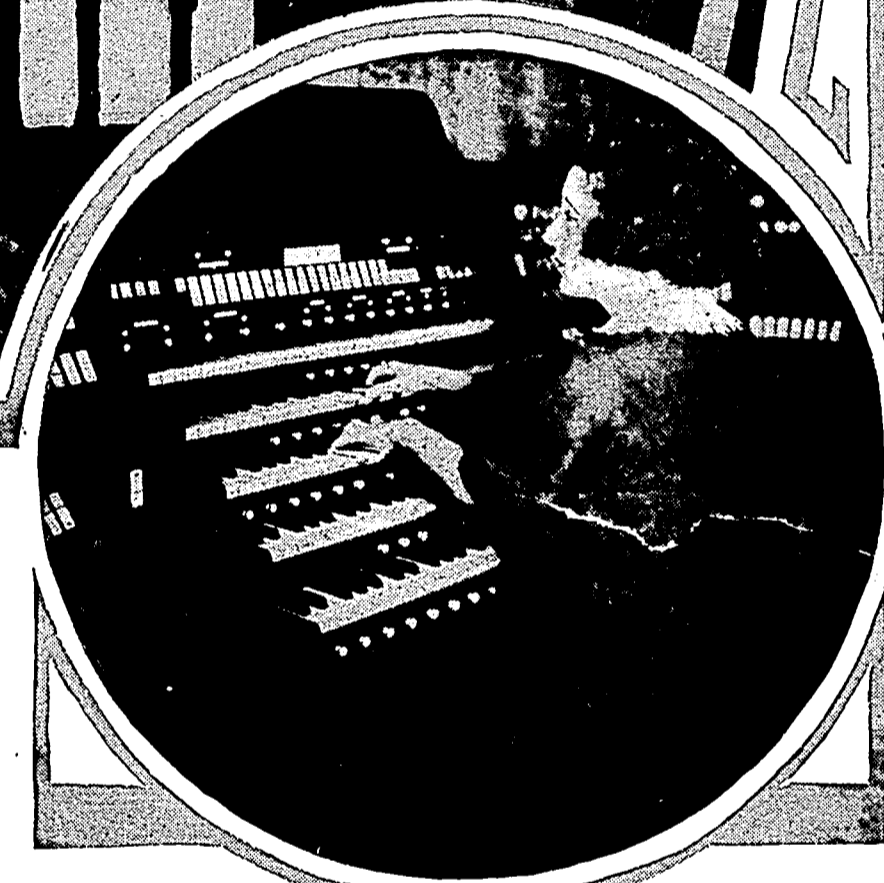
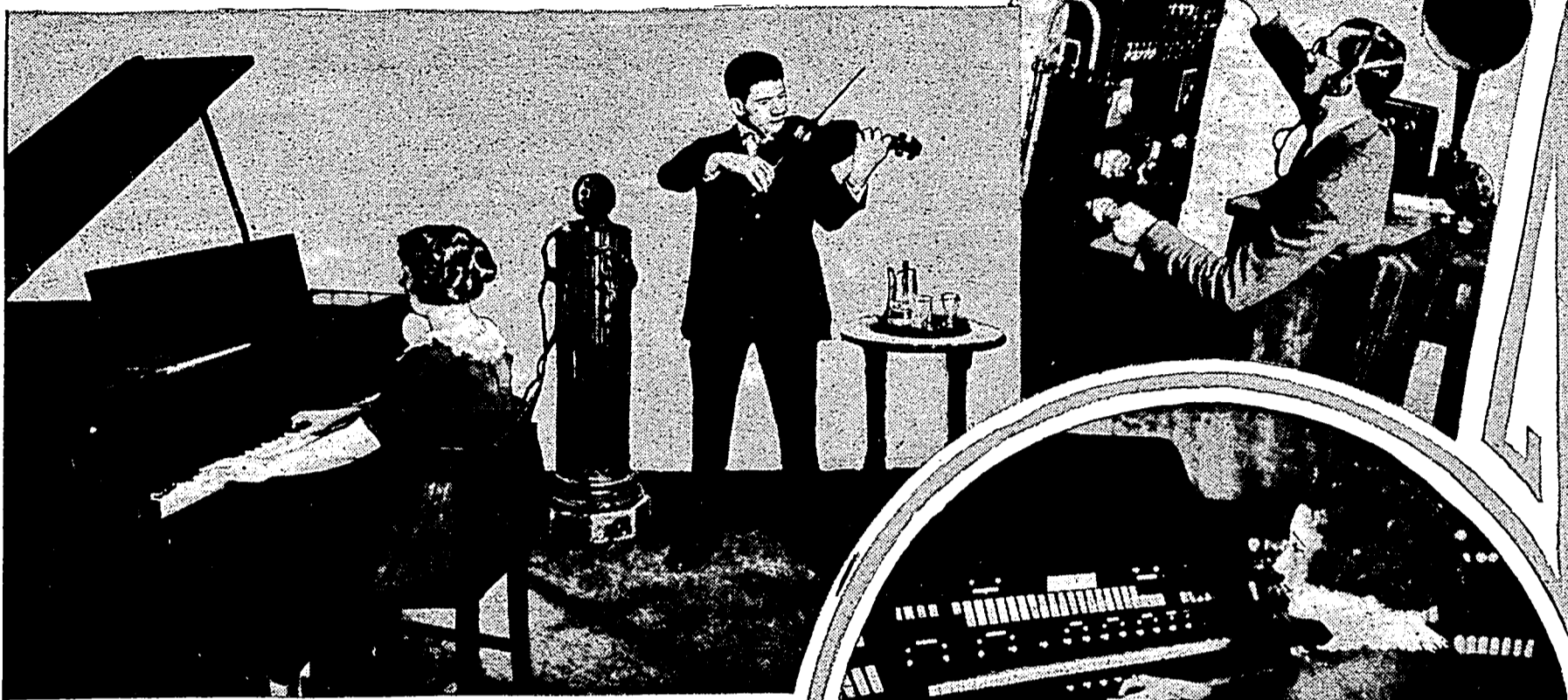
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"HE IS rich," said Confucius, "who knows when he has enough." Would you find the richest man? Look for the owner of a Grebe Receiver.

Doctor Wu

# WOO TRANSMITS TUNES OF LARGEST PIPE ORGAN



## Harmonic Programs of Wanamaker Plant Add to Ranks of Receivers

PHILADELPHIA, PA.—That the new Wanamaker broadcasting station, WOO, as it is known in the government call book, is fit to rank with any other source of aerial communication in the country has been proven by the successful results which have attended it ever since the opening ceremonies two and one half months ago. Not only have its messages been heard at almost unbelievably distant points, but, more significant, there has been a steady increase in the number of amateur receiving stations in this vicinity and surrounding states.

Following a rigid inspection recently made by the government, Station WOO has been re-licensed as a Class B or super-station and given the right to use the exclusive 400-meter wave length. This raises it above the interference of the usual 360-meter broadcasting wave and enables the station to operate practically at will, without jamming or crowding out less powerful stations in the region.

The station was formally opened on August 7th of this year, its first message being the 23rd Psalm read by Rev. Dr. Macauley, of Bethany Presbyterian church. This was followed by an inaugural address delivered by Honorable John Wanamaker.

### Wanamaker Organ Broadcast

But it was not until September 14th that the greatest feat was accomplished in the broadcasting of the music of the Wanamaker grand organ.

Organ music has for years almost completely baffled reproduction and it is for this reason that it is rarely, if ever, found on phonograph records. In spite of this Mr. Wanamaker was anxious that the organ music should be broadcast. The organ is the largest musical instrument in the world, and is described by musical people as the noblest. The Wanamaker organ is played at intervals every day in the store and it is a great joy to thousands of people.

With the advent of Radio it seemed that the organ ought to be broadcast, and the Western Electric Company undertook the task even against the advice of many experts who said that no microphone could be constructed that would transmit the organ's tonage.

### Design Condenser, Microphone

A long series of experiments in the laboratories finally developed a microphone of the condenser type and an amplifying device constructed upon a new principle. The construction of this new microphone and its amplifying device is a jealously guarded secret, and it has been installed so far only for the purpose of broadcasting the Wanamaker organ.

The organ is broadcasted every week-day at 11 A. M. and 11:55 and 4:45 P. M., and

every Monday and Thursday evening at 9 o'clock with results so successful that the store is receiving letters and telegrams from all over the United States expressing the amazement and pleasure of "listeners in" who hear its music.

The Wanamaker broadcasting station while designed to cover a region of from 100 to 150 miles from Philadelphia and to deliver 500 watts of Radio frequency power to the antenna system, under favorable conditions can be heard at much greater distances. Reports have been received from Berkeley, California, and from San Juan, Porto Rico.

### Build Special Studio

To obtain ideal operating conditions for the Wanamaker broadcasting station a special suite of rooms was prepared in which every means has been taken to insure suitable acoustic properties. The chamber that houses the microphone and which forms the headquarters for the speakers, singers and musicians secured to conduct the broadcasted programs, is a mysterious compartment with walls shrouded beneath layers of draperies and a floor buried beneath the heaviest of carpets. Constant study has proven that to prevent the reflection of sound and to prevent the impairment of the quality of vocal and instrumental music, such precautions are needed.

In addition to the room just described, there are two other rooms, one given over to the sending and receiving apparatus, and the other to the power equipment required to supply the transmitting energy. The former of the pair accommodates the transmitter, power panel, input amplifier panel, monitoring receiver, antenna relay control and receiving devices.

### Transmitter Weighs One Ton

The transmitter or the heart of the broadcasting station is contained in a large black steel cabinet weighing a ton in which are installed the vacuum tubes, filters, relays, resistances and the other auxiliary apparatus which make possible modern aerial communication. The antenna relay is mounted on top of this framework, whose sides, outside of that section given over to the insulating panels, are inclosed by expanded metal guards which serve both to protect the apparatus from injury and to prevent accidental contact with those parts subject to high potential.

Four 250-watt vacuum tubes and one 50-watt tube are used for transmitting. These tubes, which have an oxide coated filament that insures maximum electron emission with minimum expenditure of filament circuit power, are mounted in the upper part of the framework of the trans-

To the left is a view of WOO'S sound-proof studio with two artists playing into the super-sensitive, stretched-steel diaphragm microphone on the pedestal. The operator of the Wanamaker plant is seen in the picture above the circle, "listening in" on a monitor receiver and governing the modulation by means of a potentiometer. In front of him is the power panel. In the circle is Miss Mary E. Vogt, organist, at the keyboard of the famous Wanamaker Pipe Organ that furnishes fans with one of the most novel forms of Radio Music

mitter. This location provides an adequate ventilation.

### Each Tube Takes Six Amperes

Each of the vacuum tubes requires a filament current of 6.25 amperes. The current for heating the filaments is supplied from a constant potential generator. The filament current is adjusted and held constant by means of the generator field rheostat. The tubes are rated in accordance with their filament resistance, each tube being marked with a designating letter A, B, C, D, or E. A separate adjustable resistance with stages correspondingly marked is placed in circuit with the filament of each tube.

The transmitter is essentially a generator of Radio frequency energy (an oscillation generator) with means for modulating this energy in accordance with current variations produced by a microphone operating in conjunction with an amplifier and certain other auxiliary equipment. The oscillator comprises a tuned circuit which includes the antenna system. This tuned circuit determines the frequency and wave length of the radiated energy.

### What Modulation Is

The modulation system provides means whereby the alternating currents corresponding to speech or music are supplied in amplified form direct to the oscillator circuit. Operation of this system may be understood by considering that the plate circuit of the oscillator is supplied with speech currents directly from the modulator. The combined circuits provide a sort of mixing chamber in which the speech currents are combined with the steady carrier wave supplied by the oscillator to produce the modulated wave required.

The system of modulation used in the equipment, insures the highest efficiency in clearly reproducing speech and music; in other words, complete and perfect modulation.

### How Wave Length Is Controlled

The frequency of the transmitted energy (wave length) is controlled by the value of the inductance in the oscillatory circuit which includes the antenna. The inductance is adjusted by means of a variometer.

To provide this feature, a portion of the oscillator coil included in the antenna circuit is arranged to turn on an axis at right angles to its normal axis so that the inductance of the movable coil either aids or opposes the inductance of the remainder of the coil. The movable coil also serves to vary the coupling between the antenna circuit and that portion of the coil system which is connected to the plates and grids of the oscillator tubes in a manner to insure satisfactory operating conditions throughout the frequency range for which the transmitter is designed.

### Oscillator Output Control

A variable condenser connected across the plate coil controls the plate current through the oscillator tubes, and to a large extent the output of these tubes. This condenser consists of a variable unit in parallel with two fixed units which may be switched in or out of the circuit as required. The variable unit is controlled by a knob on the front of the set. Both the adjustable inductance and the adjustable condenser are provided with the graduated dials so that after the transmitting set has once been calibrated in connection

(Continued on page 14)

## SET PHOTO DIAGRAM IS PARAGON R A 10

### ARTICLE EXPLAINS OPERATION IN DETAIL

Tuning Adjustments of Popular Adams-Morgan Regenerative Receiver Simple Once Learned

(See Photo Diagram, Facing Page)

The standard receiving set illustrated on page 7 is the Adams-Morgan Company Paragon Type of receiving apparatus, known as type R A 10 regenerative-amplifying receiver and type D A 2 detector-amplifier. This receiving set has a wave length range of from 160 to 1,000 meters.

Inasmuch as the tuning unit is sealed when sold by the manufacturer, the inside construction is not shown here. The procedure however, of the detector amplifier is the same as has been followed heretofore with all of the standard receiving sets.

#### Description of Tuning Unit

The unit shown to the left (front view) is the tuner. The two binding posts on the extreme left side are for the aerial and ground connections as illustrated. The binding post in the upper right-hand corner is for the grid connection. The second from the top is the filament plus connection. The third is the tickler connection to the plate circuit. The two in the lower right-hand corner are for phone connection. When the two units are used together, these binding posts are strapped across to the corresponding binding post on the detector-amplifier unit as pictured, with the exception that the inner telephone post is kept open.

Although turn-by-turn adjustment is provided in the primary circuit, the use of a series antenna condenser will facilitate tuning and provide for a marked increase in the selectivity for wave length ranges below 600 meters.

#### Tap Switches and Coupling

The two tap switches on the left-hand side of this unit control the amount of inductance in the antenna circuit—the upper ones in the groups of turns, the lower in the single turn steps. The small dial controls the coupling between the antenna circuit and the secondary or grid circuit.

The large dial in the center of the panel controls the wave length of the secondary circuit. The switch below it is the wave range switch. When thrown to the left and contacting on back contacts, the receiver is set for a wave length range of from 160 to 410 meters, and when thrown to the right, for a range of from 390 to 1,000 meters. The dial on the right of the panel controls the plate circuit inductance and hence the regenerative amplification.

#### Detector-Amplifier Unit

When the amplifier unit is used, the four sets of binding posts on the adjacent sides of the two units are strapped together. Phones or loud speaker are connected to the two binding posts marked "TEL" in the lower right-hand corner of the detector-amplifier unit. The binding post, marked "+60," in the upper right-hand corner is for the positive side of a 40-volt plate battery. The second binding post, marked "+20," is connected to the positive side of the 20-volt battery and the negative side of the 40-volt battery. The third binding post from the top, marked "-20," is for the negative side of the 20-volt plate battery. The fourth and fifth binding posts, marked "+6" and "-6" respectively, are for the positive and negative leads from the filament storage battery. Although the binding posts are marked 20, most B batteries on the market are in units of 22½ volts. Such a unit may be substituted for the 20-volt unit and a 45-volt battery may be used instead of the 40-volt unit called for by the binding post markings.

The three dials along the lower part of the panel represent rheostat controls. The dial in the upper right-hand corner is the potentiometer control for the detector tube grid. The knob in the upper right-hand corner controls both the tube lighting and the connection of the phones to the various stages of amplification.

#### Tuning Principles

For maximum signals, greatest selectivity and most amplification, the setting of the coupling control dial for short wave reception will vary between 40 and 55 degrees (tighter couplings are required for

## LICENSES FOR WEEK SET NEW LOW MARK

CHICAGO.—Only three stations were licensed for public service broadcasting during the past week. The drop in the weekly number is appreciated by commerce department officials, who have hopes that the applicants will continue to be few. The three stations are KFDD, St. Michael's Cathedral, Boise, Idaho; WNAP, Wittenburg College, Springfield, Mo.; KFEB, City of Taft, Calif.

## Tank Charges by Radio

### Command from Rear Lines

WASHINGTON.—One of the new Signal Corps Radio sets designed for the Whippot tanks of the Army was tested out for the first time at the annual field day of the Army Ordnance Association at Aberdeen, Md., Friday last. The standard sets, designed for the master tanks of each group, include both telegraph and telephone apparatus. Under direction of the commanding officer in the rear the Radio tank executed intricate orders immediately, charging and attacking enemy tanks directed solely from back of the lines. Observers report a most satisfactory test.

the shorter wave lengths), and on the longer waves, the adjustment may be between 50 and 65 degrees.

With the receiver set up and the tube lighted, place the plate circuit dial at zero, and adjust plate voltage and filament temperature of detector tube until a slight hiss is heard in the telephones. The filament temperature should then be reduced until hiss stops.

Set coupling at, say, 50 degrees; set secondary at, say, 40 degree; advance plate circuit dial until a slight hiss or a thud is heard in the telephones.

#### Bringing in Station

Now vary antenna wave length by the use of inductance (tap switches), or capacity (variable condenser), or both, until the antenna approaches resonance with secondary circuit, at which time the closed circuits should stop oscillating. Increase the advance of the plate circuit dial, and continue adjustment of antenna wave length. Providing the setting of the coupler is correct, a final adjustment will be found, where the movement of the antenna condenser by as much as one degree, or a change in inductance of one turn, will start or stop oscillation of the closed circuits.

The coupling should be loosened as far as maintenance of this effect by the primary on the closed circuits will allow. When this point has been reached the receiver is in a highly sensitive and selective condition. A similar setting of controls may be had for any wave length within the range of the receiver.

#### Another Way to Tune

Ordinarily, however, antenna and secondary circuits are first tuned to an incoming signal, the plate circuit being set at zero and ignored until such time when signals have been properly tuned in. Under these circumstances (the signal having been picked up by resonating antenna and secondary circuits), the coupling is reduced to a point slightly below that where the apparently maximum strength signal is to be heard.

(Every change in coupling calls for a retuning of the antenna and secondary circuits. Any change in the reaction which these circuits have upon one another changes their effective wave length.)

If the plate circuit dial is now advanced, a point will be reached where the circuits begin to oscillate. At this point reduce by a small amount the secondary setting, at the same time adjusting the plate circuit. A setting will be found on

## BROADCAST SCHEDULE CLEARS AIR AT BOSTON

### New Time Table Cuts Out All Conflict Squabbles

BOSTON, MASS.—Beginning Monday, October 16, a new broadcasting schedule for Boston stations went into effect, the stations included being WNAC, WGI, WAAJ and WFAU, and the news is welcomed by thousands of New England fans who have endured the nuisance for several months of two or more stations messing up the air by broadcasting simultaneously. Boston has no "broadcasting wars" like New York and Los Angeles, but there has been frequent interference by two stations working at the same time, and much negotiation for "signing off" for periods of time. The new operating schedule, which affects evening broadcasting only, is given in Eastern time as follows:

Monday, 7 to 8:30—WGI; 8:30 to 10—WNAC; 10 to 11—WAAJ.  
Tuesday, 7 to 8:30—WNAAC; 8:30 to 10—WGI; 10 to 11—WFAU.  
Wednesday, 7 to 8:30—WGI; 8:30 to 9:30—WAAJ; 9:30 to 11—WNAC.  
Thursday, 7 to 8:30—WGI; 8:30 to 9:30—WAAJ; 9:30 to 11—WNAC.  
Friday, 7 to 8—WAAJ; 8 to 9:30—WNAC; 9:30 to 11—WGI.  
Saturday, 7 to 8—WFAU; 8 to 9:30—WGI; 9:30 to 11—WNAC.

ceiver is carefully adjusted for incoming signal.

(2) An advance of the plate circuit dial until oscillations just commence.

(3) A decrease in the setting of the secondary circuit and a simultaneous adjustment of the plate circuit until all circuits are in resonance, at which time the amplification is of a remarkable order.

Several hours' work with the receiver will be required before best results are attained uniformly. After a time the operations will, however, be gone through automatically without thought on the part of the listener in.

## Series Wins Sets for Schools

SAN ANTONIO, TEX.—Convinced by the success of Radiophones in public schools during the World's Series, the local school board is now installing loud speaking Radio receiving sets in the two high schools of this city. Lady of the Lake College, West Texas Military Academy, Santa Rosa College and other private and parochial schools also have sets in their assembly halls.

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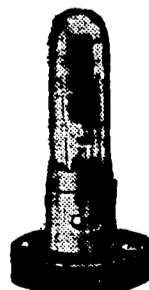
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Patent Applied For

NATIONAL Crystal Detectors are the only detectors made with three points of contact which insures getting the most sensitive spots on the mineral. It has the advantages over the cat whisker type of being semi-fixed as well as adjustable. All detectors are tested to Radio Broadcasting before being shipped and are covered with a glass cap which excludes moisture and dust from the mineral. They are made in both base and panel types. The base type is shown in the illustration. One of the outstanding features of the panel type is that when in use the detector bulb is turned to the right in the socket and when not in use should be turned to the extreme left, thereby disconnecting the detector from the circuit and preventing the using or burning up of the mineral. PRICE, EITHER TYPE, \$1.00

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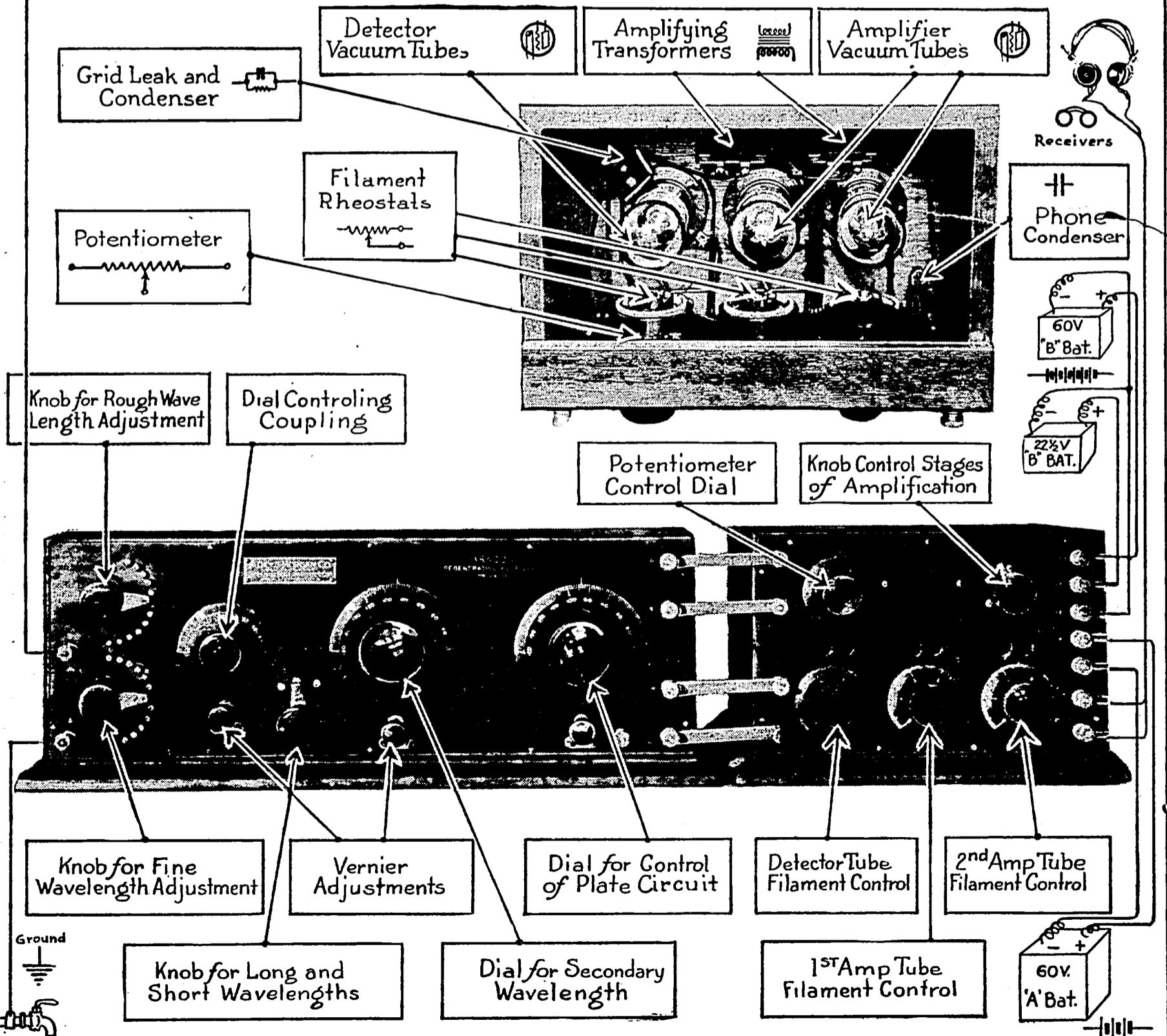
DEALERS WRITE FOR PROPOSITION

# Radio Receiving Sets

## Paragon R A 10 Regenerative Receiver

As the thirteenth of the series of standard receiving sets, RADIO DIGEST illustrates herewith the Paragon type R A 10 regenerative receiver and type D A 2 detector-amplifier, manufactured by the Adams-Morgan Company, Upper Montclair, N. J. Full installation and operation instruc-

tions will be found on the facing page. Although the amateur may not possess this particular make of apparatus it will be well for him to study the diagram and instructions carefully. Numerous points of similarity are to be found in the operation of many standard receiving sets.







STATION SCHEDULES

(Continued from page 8)

WNAC, Boston, Mass. 200 mi. Shepard Stores. Daily ex Sun, 4-5 pm, dance music. Mon, Tues, Thurs, 10-11 pm, concert. Wed, Fri, Sat, 7-8 pm, 8-9 pm, concert. Sun, 11-12 am, 6:30-8:30 pm, church service. Eastern.

RECEIVING RECORD CONTEST

THE RECEIVING RECORD contest progressed greatly last month. In fact the last time the names of the record holders appeared, September 23 issue, many aspirants allowed their records to grow many more miles between points...

Needless to say, this did not help the contest. Altogether too much confusion was caused by the unconsciously (?) erring reporters of records. For that reason a new rule has been adopted. Any aspirant who does not measure correctly...

Another change has been made. Only records of 1,000 miles or more are now eligible. Remember this in sending in records. This does not mean to add sufficient mileage in reporting to get over the 1,000-mile mark.

At the present time all records are being checked. Any errors noticed by readers and called to the attention of the Receiving Records Editor will be appreciated.

The raising of the eligibility mark to 1,000 miles was done to make the contest a little more worthwhile. One fan, Charles G. Lambert, Crichton, La., will be disappointed. He heard WIAE, the station of Mrs. R. E. Zimmerman at Vinton, Ia., approximately 750 miles away.

Station KPAF of Denver, Col., informs all of its distant listeners-in to report their records to the DIGEST. A number of other stations are doing the same thing. The contest has roused both fan and broadcasting station interest.

Rules to Remember

- The rules to follow in the contest are but few and easily followed. They are: 1. Amateurs who are able to beat the records given, or who can claim with good evidence distance receiving records of 1,000 statute miles or more for radiophone broadcasting stations NOT listed below...

Station—Miles Away—Holder and Location

- CFCB—1,690—G. G. Ehrler, Chicago. CHBC—2,050—J. Kurtz, Brooklyn, N. Y. DDE—1,190—L. Cushman, San Diego, Cal. DN4—1,525—C. S. Hewitt, Southern Pines, N. C.

- KUY—2,188—Roland Smith, Hilo, Hawaii. KWG—1,800—C. G. Munns, Hoisington, Kan. KWH—1,280—C. E. Cornwell, Osage, Ia. KYG—2,300—J. F. Means, Oil City, Pa. KXJ—1,300—H. Wantuck, Fayetteville, Ark.

- WOAI—1,245—C. S. Hewitt, Southern Pines, N. C. WOC—1,300—H. Rawls, Phoenix, Ariz. WOH—1,050—F. S. Cates, Jacksonville, Fla. WOI—1,300—F. W. Sullivan, Roxbury, Mass.

Tinner's Rivets for Switch Points

The experimenting amateur is necessarily looking for means to cheapen the cost of fittings for his tryouts in the way of turners. Using dry and well shellacked wood or bakelite panels one can cut the cost of switchpoints by using tinner's rivets...

To carry out this idea of economy completely, the writer uses a form of switch lever supplied with a bushing and bolted to the panel with a nut at the rear, using a thin copper or brass washer for soldering on the switch lead.

Homemade Grid Leak

A panel grid leak that looks well and costs nothing may be made as follows: Cut a section from a broom handle about 1/4 or 3/8 inch in length and drill two holes about 1/8 or 1/4 inch apart.

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## Utility of Radiophone Communication

Accuracy, Speed and Economy Main Features

THE UNDERLYING reason for the rapid strides made by Radio is not its romantic, intangible or mysterious nature. Its important position in the field of communication is due solely to its utility in combination with the three essentials, accuracy, speed and economy.

Accomplishments in Radio are lauded in almost every daily paper, and the day is not far distant when Radio sets, for both telephony and telegraphy, will be a vital part of the equipment of every American home.

## Bringing Classical Music Home

Music Stimulates Our Better Natures

WHO, unless he is in the class of "Can't tell one tune from another," is not moved by the masterpieces of Gounod, Wagner, Rossini and the other great masters? Who has not felt in his soul the sobs of I Pagliacci as sung by Caruso?

Radio has a great mission in the bringing of classical music to the multitudes who have heretofore never been intimately acquainted with its delights and its influences. As the military march, the rag and jazz have their functions in our lives, i. e., to quicken our pulses and drive away melancholy and brooding over life's tragedies, so are the classics given to us to stimulate our better natures and make us stronger in hope and charity.

## Radio the Poor Man's Friend

Families of Moderate Means May Have Entertainment  
IT HAS been a long road for the poor man to travel in order to reach a point where he can at least get some of the enjoyment that his more fortunate brother has received. Radio now has become the poor man's friend. Its use in hospitals and charitable institutions is becoming common, and high class entertainment is being furnished for many a heretofore weary hour to those who are bedridden or who through old age or misfortune, are compelled to end their days in institutions.

There are many places where the community is too poor to erect a church. Now such a community can have church services regularly by Radiophone. There are many such sections in sparsely settled mountainous regions and in some of them funds are being raised to buy Radio outfits. Usually the people have found it difficult even to pay the amount for the visits of an itinerant preacher. Now such places are to be furnished with services the same as those who have place of regular Sunday worship.

There is another field in which Radio performs a service to the poor and that is for educational work. The youth no longer needs to pass up the higher educational courses. The broadcasts of colleges and universities now make it possible by their broadcast lectures to gain much valuable knowledge at home.

## Sending the Voice Across the Ocean

What Will Tube Perfection Bring

WITH the development of the new water-cooled, one hundred kilowatt tubes voice messages will be sent across the ocean regularly. Station WOR has succeeded in bridging the Atlantic with only 500 watts. While the officials of the Bell system research laboratories make no prediction as to the future uses or practical applications of the new tube—the largest in the world—they should be able now to transmit code messages around the world from WBAY, A. T. and T. station, New York with two of such tubes in parallel, and with four of the giant tubes, to carry the human voice across the Atlantic under all kinds of conditions.

Uninterrupted long distance triode tube communication is assured in the near future due chiefly to the method of cooling developed in this new high powered valve and the way in which the copper and glass parts are hermetically sealed.

The art of Radio transmission has developed from the spark sets to the arc sets, to alternators and thence to the tubes which are still in the process of development and perfection. Some of the larger broadcasting stations employ less than one kilowatt of tube energy and find it a common occurrence for their broadcasts of voice and music to be heard thousands of miles.

We are nowhere near perfection in Radio transmission or reception. It was only in 1915 that the human voice was transmitted from Arlington, Virginia, to Honolulu, but the feat required 300 tubes of twenty-five watts capacity each, used in parallel. Even then the transmission was quite difficult.

## Condensed

By DIELECTRIC

Prof. Langmuir's water-cooled tubes have a big brother in the 100-kilowatt tube perfected by the A. T. & T. folks, according to latest reports. Some types of tubes are being made smaller in size, while others are rapidly enlarging. This class of transmitting tube seems to come within the latter group. Two of these tubes are estimated to do the work of ten of the Langmuir variety. All those opposed to the Eighteenth Amendment should note the statement made that, with the use of the 100-kilowatt tube long-distance communication is possible without interruption. The Volstead part comes in where the process of cooling is concerned, and that is done by using water. This new Radio baby is just two feet long and weighed ten pounds at birth. What effect will be had on increasing the possible range of transmitting the voice is left to our imagination. Code fans should be interested right from the start.

Italy and Japan are getting into their Radio stride as fast as they can. American manufacturers are receiving inquiries from the Sunny Land of Italy in goodly numbers for all kinds of Radio sets. They know where to come for the best. The Japs are anxious to erect a powerful station so they can carry on a polite conversation both with America and Europe. If they plan to spend some \$97,000,000 for this station, a part of that amount at least should be forthcoming from the savings on battleships. I honestly believe investing large sums in Radio stations will prove greater economy to the nations so doing than in putting like amounts into floating steel. If that's pacifism, your receiving set needs readjusting. There is no means available so sure of bringing better international understanding as Radio communication. Let every fan in every land tune in the World's Series broadcasts and there will be no time or inclination to start a squabble anywhere.

The improvement in broadcasting programs has been so marked, of late, that it would seem increasingly difficult to hit upon something novel and at the same time worthwhile. In two instances, however, this has been done. A critical review of some drama each week will find many listeners in anxiously awaiting the broadcast of such a program. It often happens that the name given to a play is misleading, and even when this is not the case, the merits of the play can be discovered only by attendance unless some kind individual assumes the rôle of reviewer for us. Books fall in the same category, for many of them would never be read by us except they were recommended by someone. So here, too, we will be ready listeners to the announcer's opinions on books reviewed by Radio. Would it be considered irrelevant to suggest the reviewing by some broadcasting station of musical events in its community? Undoubtedly quite a large audience would be glad to get that.

It would be idle to speculate on the number of folks in this country who tuned in the returns from the World's Series, yet I'm willing to wager a couple of binding posts that most everybody owning a receiving set, or who could find a loud speaker to accommodate the public, was right on the job every game of the series. The broadcasting by Judge Landis to the howling mob about him proved rather ineffective, when that sage was besieged on account of allowing a tie game. If the Judge had been content to hear the results of the games through a comfortable headset at his home, he might have heard the jeers but certainly would have been spared some annoyances.

Radiophony in England has been undergoing rather strenuous times since an attempt at monopoly was instituted by certain manufacturers. Those fearful of the consequences to Radio broadcasting are up in arms, over the attempt to exclude apparatus from outside countries. Johnny Bull knows we in this country are rather adept at making all sorts of things needed in receiving and sending sets, and, unless I am greatly mistaken, no attempt will be successful that would keep our English cousins from profiting thereby.

Station WOR, at Newark, N. J., is making a valiant endeavor to create more short story writers, and it is doing it in the proper Radio manner. Each story received by them will be passed upon by competent judges and the winner of the contest will enjoy the honor of broadcasting his story from this station. Incidentally, whoever thought of this scheme has devised a rather unique way in which to broaden the interest in a most fascinating science. It may be easy or difficult to write a story to satisfy the judges, but in either case, when the winner stands before the microphone, that wonderful instrument may seem hundreds of times bigger than it really is, in fact, it may seem so mysterious as to powerfully interfere with the sender's vocalizing. Others have been affected that way before now. Let's hope it won't.

Our more or less constant companion when we sit down at our sets to hear something good—Static—has at last had one perfectly good coffin provided, and it is said to be about ready for the public interment of this arch enemy of all Radio fans. If this is true, then we owe a debt of gratitude to Major Mauborgne for his discovery. If any one thing has engaged the attention of the experts, it has been the eradication of static. Others have partially succeeded in overcoming to some extent the interference due to this pirate, but no one heretofore has shut it entirely away from legitimate electromagnetic waves. Next summer's trade should show a marked increase in the event that prospective purchasers of Radio sets can be assured of freedom from static.

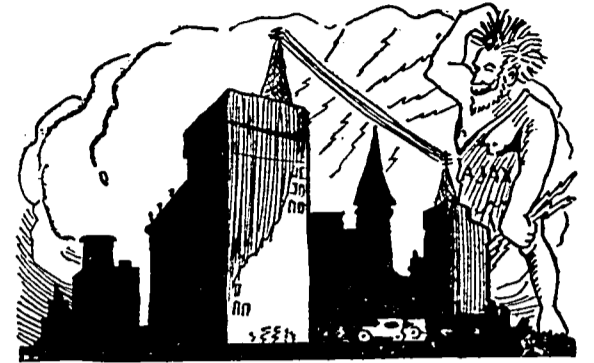
## RADIO INDI-GEST

### Or the Plaintive Squeal of a Stepped-on Ant

Now that we have Radio concerts by the marmots we shall expect soon to hear by Radio amplification the thunder that goes with the lightning-bug.

### But We Bet He's Laughing at Us

Uneasiness has been created in some sections by the belief that the widespread use of Radio is responsible



for the unusual number of thunderstorms. One writer says that compared to a thunderstorm all the voltage used in Radio plants "wouldn't be enough to tickle the nose of the god of thunderbolts."

### My QRN Party

It was nice to keep a-tunin'  
With the nabors sittin' 'round;  
They come to hear the music,  
But I couldn't get a sound,  
'Cept the demons of perdition  
That were floating in the air.  
It seemed their boss was with 'em,  
And they were everywhere.

They made my heart beat faster  
When I thought they were so near,  
And I cussed the poor broadcaster,  
Because I couldn't hear.  
With their growlin's, squawkin's, squealin's,  
I could hardly keep my chair,  
For regardless of my feelin's  
They had taught me how to swear.

I hate to meet my nabors,  
When I am out alone,  
For they are sure to twit me  
About my Radyfone.  
There's little satisfaction  
While Satan's 'lowed to roam,  
'Till someone takes some action  
To keep his imps at home.

When they are on vacations  
We are happy as can be,  
For the people of all nations  
Can hear sweet melody.  
There's nothing I can mention  
That keeps me closer home,  
And takes so much attention  
As my little Radyfone.—J. D. MYERS.

### The Hook-Up Wouldn't Stay Hooked

Maryland couple married by Radio already want a divorce. Tuned in on the wrong wave length and got a



lot of interference. Spouse they'll establish a Radio residence in Reno and get an electromagnetic divorce.

### I'm a Radio Widow

Helen Tyler-Cope  
I've been a poker widow,  
Alone night after night.

I'm oft a baseball widow—  
The game is man's delight!

I was a poor golf widow,  
At clubs friend husband stayed.

But now another widow  
Of me Radio has made!

### The Modern Wedding Band

In days of old, a band of gold  
Bound many a pair together;  
The latest thing, in place of ring,  
A double headset two together.

# Use of the Radio Receiving Set in the Home

## Part VIII—High Plate Voltage for Power Amplification

By H. M. Towne

IT WAS pointed out in the preceding installment that for best results with a loud speaker of the conventional design, it is quite important to employ plate voltage of the order of 350 to 500 volts on the last amplifier tube which is supplying the output for the loud speaker. It was also stated that the advantages of high plate voltage were alike with either the usual UV-201 amplifier tube or with the UV-202 or other power tube. B batteries are pretty expensive to consider for voltages of this order, especially when we consider the probability of replacement every four to six months or possibly even more frequently. B batteries of the storage type are sometimes recommended, but they have a high initial cost if considered for this value of voltage and, furthermore, they require the periodic charging.

### Motor-Generator Set

A direct current motor-generator set of the desired rated voltage will give good results if the machine is designed for this purpose, but trouble is quite liable to be had from a hum caused by a slight voltage ripple which originates with the closing and opening of the circuit to the armature windings by the brushes. This is called a commutator alternating current ripple and it will be of a frequency which is the product of the number of commutator segments or bars, and the revolutions per second. This may be only a very feeble alternating voltage, perhaps only one-half of one per cent of the actual direct current output, but still will be sufficient when impressed on the plate of an amplifier to cause an annoying hum in the loud speaker. This can be wholly or in part corrected by the use of the so-called filter system, generally nothing more than a combination of inductance and capacitance of large values.

This objection, together with the high initial cost and usual undesirable noise of the set in operation, contribute to turn our attention to the electrolytic rectifier as a more practical source of high continuous current plate voltage.

### Rectifier Types

A rectifier is a device for converting alternating current into direct or continuous current. Probably the best known form is the mercury arc type frequently found in power stations. There is also the mechanical or vibrating type of rectifier which is being applied quite extensively to the charging of A batteries. The vacuum valve has the same application in a device called the Tungar rectifier.

num, an applied voltage will not pass current from the aluminum to the electrolyte, but will pass current from electrolyte to aluminum. In other words, the hydroxide of aluminum film has an asymmetric property and offers a very high resistance to the current when the aluminum is positive, but offers practically no resistance to current when the electrolyte is positive. Thus, if an alternating voltage is applied to a suitable cell containing electrolyte and aluminum electrode, only one-half of the alternating current cycle will be permitted to pass through the cell. Thus the voltage which will produce an output from the cell will always be of the same sign or polarity. Therefore, an alternating current voltage from the 110-volt lighting circuit can be passed through a series of these electrolytic cells to produce a direct current voltage.

### Rectifier for Use with Receiving Sets

An electrolytic rectifier for use with receiving sets using loud speakers is shown diagrammatically in Figure 27, and a home constructed design is shown in photograph, Figure 28. There is probably no available source of purchase for this type of rectifier, but no trouble should be had in constructing the device. In fact the only parts which have to be made are the electrolytic cells.

As shown in the diagram, a transformer should be used, and this for two reasons. First, the usual 110-volt house lighting circuit is not quite high enough in voltage to give the desired direct current output, and second, the usual 110-volt lighting circuit is usually grounded on one line either at the service distribution transformer or on the consumer's premises. This grounded line will interfere with the rectifier circuit by short circuiting one-half cycle through the ground connection on the receiving set.

### Transformer for Rectifier

The transformer to be used should have a primary winding for 110 volts and a secondary winding for any value between 110 and 220. If a transformer is to be constructed specially for this service it is desirable to tap the secondary in 20-volt steps from 110 to 220 volts as shown in the diagram. A multipoint switch enables one to quickly change the secondary voltage. By adjusting this switch the direct current voltage can be varied between 275 and 575. The transformer need have but small capacity, a 25-watt size being entirely ample. It should be noted that an auto-transformer is not to be used, as it presents the objection of the secondary or

pair of shears. About .030 inch or .040 inch thickness is sufficient to give the desired stiffness.

All of the electrodes should be drilled near one end for a small machine screw

filled to within about 1 inch of the top with a saturated solution of sodium acid phosphate ( $\text{Na}_2\text{HPO}_4$ ).

To mix the solution, take a pint of water and add to it a heaping teaspoonful of the

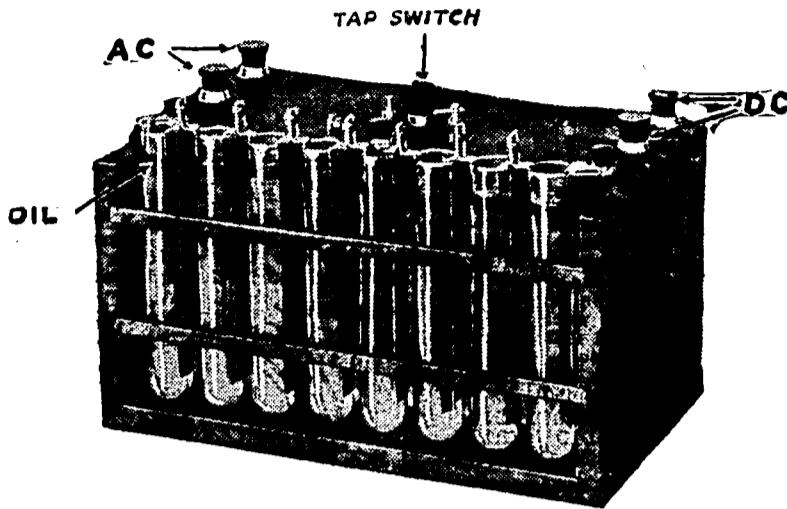


Figure 28

which will serve as a connecting terminal. Seven aluminum and seven tin electrodes should be bolted together in pairs and then bent apart so that they will straddle the edges of two test tubes so as to leave the aluminum in one tube and the tin in the next tube.

### Rectifier Assembly

When finally assembled there will be one aluminum and one tin electrode in each test tube. Connection terminals should be provided on the end electrodes, one of which is aluminum and one of tin, and a terminal should also be provided on the bolt which connects the aluminum and tin electrodes between the fourth and fifth tubes. It is important that the electrodes do not touch one another in any tube.

By proper care in bending, the electrodes can be given an adjustment so that they cannot possibly touch. The test tubes are

sodium acid phosphate. Stir until it is well dissolved and then pour the solution into the test tubes. A 1/8-inch layer of machine oil should be put on top of the solution in each cell to prevent evaporation. The oil has a lower specific gravity and will float on top of the solution.

### Condensers in the Circuit

The condensers shown should be about six microfarads each in capacity, although a greater value will be better. These condensers may be made up by connecting in parallel some of the small wire telephone condensers which are rated two microfarads each. Three or four of these in parallel should be used for each condenser shown in the diagram. In case three are used for one, three must be used for the other condenser. This holds true also if four condensers are used. These tele-

(Continued on page 12)

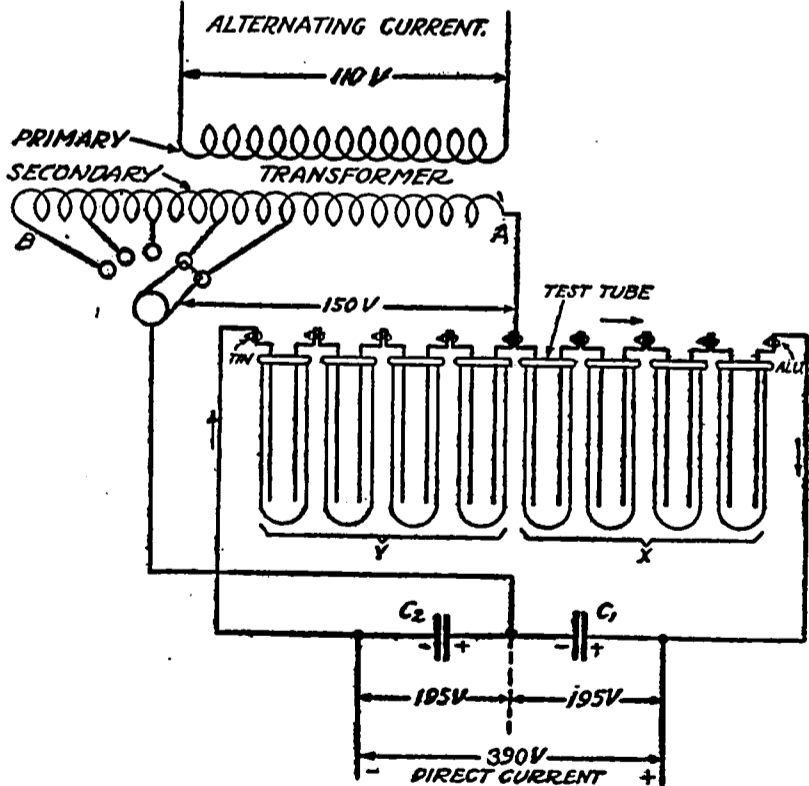


Figure 27

The electrolytic type of rectifier can be applied for classes of service where the energy required is small. For high plate voltage on vacuum tubes either for reception or for low power transmission, this type of rectifier works out admirably well.

The action of an electrolytic rectifier is based upon the property of aluminum to form on its surface a non-conducting film when current is passed from the aluminum to certain electrolytes. This film builds up when the aluminum is positive with respect to the electrolyte. The film is microscopic in thickness and is thought to consist of a porous layer of hydroxide of aluminum with the pores more or less filled with oxygen.


### Electrolytic Rectifier Operation

After the film has formed on the alumi-

num, an applied voltage will not pass current from the aluminum to the electrolyte, but will pass current from electrolyte to aluminum.

### Making Electrolytic Cells

The electrolytic cells are standard one-inch by six-inch test tubes that can be obtained at most any chemical supply house or laboratory. A suitable rack or frame should be made to hold eight of these tubes in a vertical position, spaced about 1 1/2 inches apart between centers. Each test tube is to contain two electrodes, one of aluminum and one of either tin, lead or iron, preferably tin. The electrodes should be in the form of strips 1/4 inch wide and 7 inches long, of almost any thickness which will lend some stiffness to the electrode. The metals should be procured in strip or sheet stock and cut to size with a pair of tin snips or a heavy




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# Long Distance Heard with No Aerial

## Ground Connections Eliminate Antenna

The set consists of two variometers, one mfd. condenser and a detector. The circuit is shown in the accompanying illustration. For an aerial I used a ground pipe and the fixed condenser in series with it. The circuit is simple and very sensitive. It is

### WORKSHOP KINKS? EARN A DOLLAR—

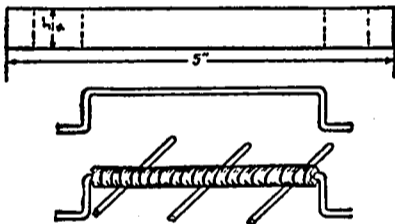
**T**HERE are many little kinks worked out at home that would aid your fellow Radio worker if he only knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. RADIO DIGEST is very much interested in securing such material. Send them in with full details, including stamped envelope so rejected copy may be returned. The work must be entirely original, not copied.

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

advisable to use two separate grounds. With this hook-up I hear WGY, KDKA, WCX, WWJ, WOC, WOS, WSD, KSD, WHB, WAAP, WAAF, WAAK, WHAS, KYW, WBU, WDAP, WGAS and WJAZ. Long-distance work is KLZ. Airline 1,022 miles.—George J. Chesky, Chicago, Ill.

### Bracket for Wall Aerial

It is not always convenient to put up an aerial, indoors or out, and conditions will not always permit one to put up the kind desired. There is always one way out of the difficulty and that is to run the wires around the room above the picture molding. Brackets for holding the wires may be made as shown in the illustration. Cut four pieces of heavy tin or sheet metal  $\frac{3}{4}$  by 5 inches and bend them as shown, like a handle for a screen door, and wrap a



piece of non-conducting material around them. They are then nailed to the wall, one in each corner of the room, and the wires run back of them.—Arthur Flinner, Wichita, Kan.

### USE OF RADIO SET

(Continued from page 11)

phone condensers can be purchased from electrical supply stores or from the Western Electric Company. Each condenser will generally stand 500 volts without failure, but occasionally one will fail at this voltage. If condensers of higher voltage rating are procurable in one or two microfarad sizes, they would of course be preferable. The advantage of telephone condensers, however, is their low cost and small space factor. There are sixteen of these telephone condensers mounted together with a transformer in the rectifier cabinet shown in the photograph, representing a total of sixteen microfarads for each condenser,  $C_1$  and  $C_2$  in the diagram. The direct current is taken from the two outside condenser terminals.

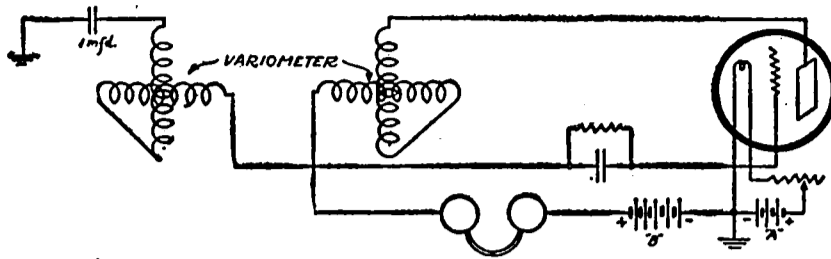
#### Film Forming on Plates

After the rectifier has been connected as shown in the diagram, it is ready for the initial film-forming test. This consists of, first, connecting the primary of the transformer to the lighting circuit, and second, short-circuiting the direct current leads by momentarily touching them together. Care should be taken that the direct current side is not short-circuited for too long a period, as this will result in heating the test tubes and the solution they contain. About twenty short circuits on the direct current side, each lasting about one-half second, will be sufficient generally to form the initial film on the aluminum electrodes. The rectifier is then ready to connect up with the loud speaker and amplifier tube.

#### Operating Principles

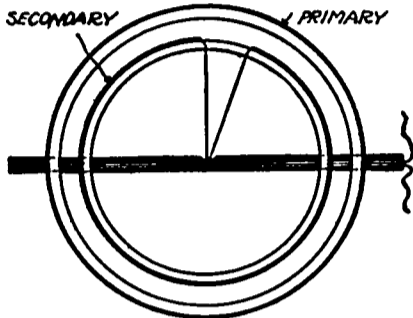
In considering the operation of the rectifier, we should first remember that the secondary voltage is alternating, first one end of the winding being + while the other end is —, and one the next half cycle that the signs are reversed. We must also remember that current can only flow through the electrolytic cells from the electrolyte to the aluminum. Since the tin makes direct contact with the electrolyte, we can say

## TWO VARIOMETERS USED IN SET



### Hollow Rod Makes Rotor Shaft

While I was making a variocoupler I found that a piece of hollow curtain rod worked fine as a shaft for the rotor. I filed the rod to the right length and also



made a small hole in the center of the shaft. The illustration clearly shows its construction.—Ed Woodward, Tujunga, Cal.

### A B C of Storage Battery Care

The actual care of the storage battery is simple. Much has been written about the care of batteries, but four simple rules cover everything. They are:

1. Add distilled water often enough to keep the plate separators just covered.
2. Keep the battery dry and clean.
3. Test the specific gravity of the electrolyte with a hydrometer before adding the water. This test is recommended at least twice weekly.
4. Have the battery charged whenever the hydrometer shows it to be necessary. What the specific gravity readings indicate:

Readings between 1.260 and 1.275 indicate a normally charged battery.

Readings less than 1.225, but more than 1.150, indicate a battery less than half charged.

Readings less than 1.150 indicate complete discharge; in which case the battery should be put on bench charge at once to prevent abnormal sulphation.—H. E. Jameson, Milwaukee, Wis.

that the current will flow only from the tin electrode to the aluminum electrode. Thus when the A side of the secondary is positive (+), the current flows through the four cells (X) to the condenser  $C_1$ , which is connected to the other side of the transformer, thereby charging the condenser  $C_1$ .

The condenser will charge up to a direct voltage of about 1.3 times the effective alternating current voltage of the transformer secondary. This is because the condenser tends to charge up to the maximum instantaneous value of the alternating current voltage wave, which on a pure sine wave is 1.41 times the effective voltage. The actual ratio of direct current charge on the condenser to the transformer effective voltage will depend on the alternating current wave form and losses in the condensers. The ratio was found in two cases of measurements to be about 1.3 to 1.

Thus with 150 volts on the secondary, the condenser  $C_1$  is charged to  $150 \times 1.3$  or 195 volts. When, on the next half cycle of the alternating current the B end of the transformer secondary becomes positive (+), the current then flows to the condenser  $C_2$  and thence through the four cells (Y) and back to the transformer secondary. This charges the condenser  $C_2$  to the same value as  $C_1$ , which was 195 volts. As shown on the diagram, the condenser charges are equal and opposite in sign. The negative side of  $C_1$  is the positive side of  $C_2$  and so the direct current voltage across the two condensers will be  $195 + 195$ , or 390 volts.

#### Best Materials Required

It is important in constructing the rectifier cells to avoid all impurities in materials. This is true particularly of the aluminum and the solution. One should buy the best grade of strip aluminum. All electrodes should be clean and free from any oxide or grease before being placed in the test tubes. The latter should also be thoroughly washed before using.

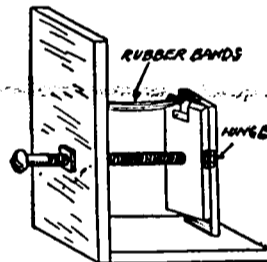
If iron is used instead of tin, it will be necessary to renew the electrodes and solution about once every six months as the

### Homemade Variable Condenser

There have appeared many descriptions on the construction of a book type variable condenser, but few good methods of controlling them. I have found the following an excellent way to do this with a condenser, and the latter can be easily made:

The materials for making such a condenser are two pieces of wood, one 2 by 3 inches and the other 2 by  $3\frac{1}{2}$  inches; also two strips of tinfoil  $1\frac{1}{2}$  by  $2\frac{1}{2}$  inches. Glue the two pieces of tinfoil to one side of the wood pieces, leaving  $\frac{1}{4}$ -inch space on each side and  $\frac{1}{4}$  inch from the end. Contacts are made by running a strip of tinfoil over the edge to the outer side, wrapping it around with a piece of copper which is fastened securely to the wood. A piece of waxed paper is then placed in between the two plates so that no part of the tinfoil touches the one on the opposite side. A hinge is then placed so that when the plates are brought together they are exactly opposite. It will then be found that one side projects. This is to fasten the instrument to a base and yet give free passage for the movable plate.

The condenser is then placed parallel to the panel and 1 inch back of it. A  $1\frac{1}{2}$  by  $\frac{3}{8}$ -inch stove bolt is then procured and the nut placed in or back of the panel, so that when the bolt is screwed through it the end will strike the exact center of the movable plate. A rubber band is then stretched from the plate to the panel, so that when the bolt is screwed outward the



rubber will pull the movable plate away from the one made stationary. The head of the bolt may be filed down to take a dial.—Vernon Hagelin, Geneseo, Ill.

iron will rust and yield a solution of ferrous oxide which in time will deteriorate the film on the aluminum electrode. This deterioration will be evidenced by a pronounced hum from the loud speaker and by sparking and heating within the cells. Under normal and correct operation, the cells should not heat beyond a perceptible warmth, and the 60-cycle hum in the loud speaker should be barely audible when about two feet away from the horn.

(Continued in the November 4th issue)

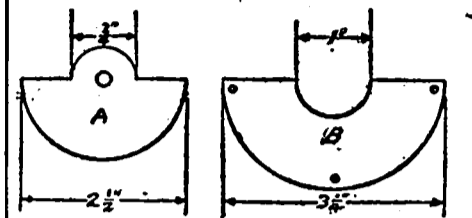
### Loose Connection Makes Noise

Loose or flexible wire connections vibrating ever so slightly are a frequent source of noise in sensitive vacuum tube receiving sets.

## Uses Mica Dielectric for Vernier Condenser

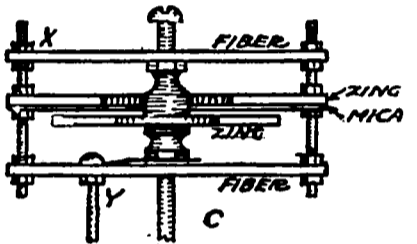
In looking over the back numbers of RADIO DIGEST I saw an article on how to figure the capacities of condensers. As I was in need of a small variable condenser I came to the conclusion that I could make one and did so in the following manner:

Two pieces of zinc were cut to the dimensions shown in A and B. A piece of



mica was also cut to the size of B and fastened with shellac to the surface of the zinc. The mica was .003 inches thick. Two pieces of fiber were drilled for the ends and the condenser was assembled as shown in C. The piece of spring brass was used to make contact on one of the battery terminal nuts Y. The connections for the condenser are made at X and Y. This condenser gives a capacity of about .0006 mfd.

Any two-plate vernier condenser can be



used the same way by shellacking .003 inch mica to the stationary plate.

This condenser was used on a single tube set using a variometer as the inductance. The hook-up is the same as is used in the Cesco set.—Russell Piller, Vallejo, Cal.

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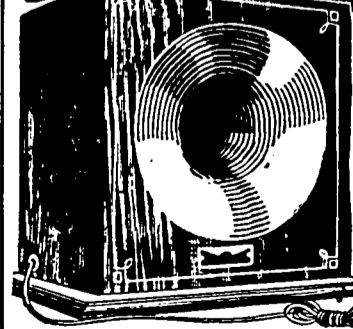
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- New York City: Harold M. Schwab, Inc.
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- Peoria, Ill.: Diamond Elec. Supply Co.
- Kansas City, Mo.: Western Radio Co.

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# Homemade Regenerative Set for \$25.00

By Charles Middleton

## For the Bug Who Likes Tools

**M**OST amateurs who would like to possess a first class receiving set are, like myself, afflicted with a chronic case of financial stringency, and cannot afford to buy a regenerative set ready built.

After considerable experimenting I have produced a set for less than \$25.00 that gives as good results as any that can be bought for several times that amount. Below I am giving detailed instructions that will enable anyone with a few tools

will have the wire and all the screws needed. The brass ribbon, brass rod, binding posts, and screw knobs can be secured from an electric or hardware shop or may be ordered from a well-known mail order house at prices listed above. I don't think it is good policy to buy a high priced storage battery for Radio work, as a Radio battery is not subjected to heavy discharges that might buckle the plates of a cheap battery, or to the jar and vibration that an auto battery gets. A Chicago firm

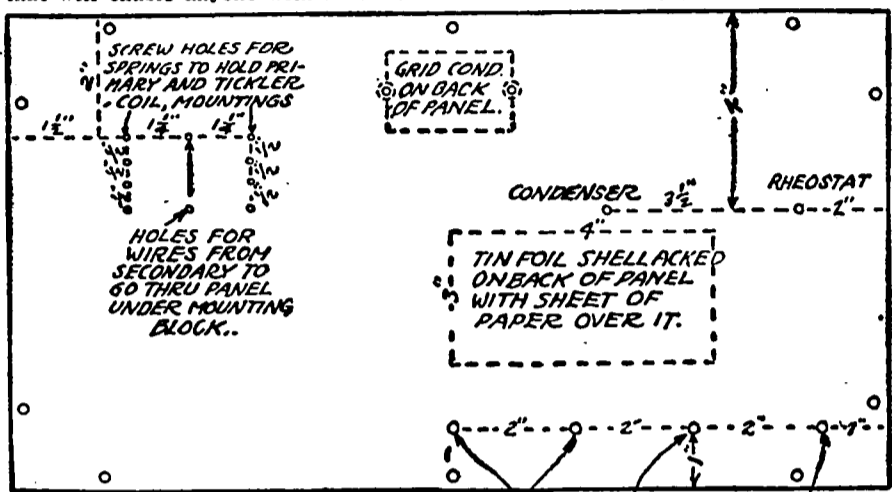


FIG. 1

PHONES POSITIVE OF "A" BATTERY NEGATIVE OF "A" BATTERY

and very little mechanical ability to build it with from twelve to fifteen hours of work.

### Wood Required

The following redwood is needed for panel and case:

- 1 piece 3/4"x9"x14"—panel.
- 1 piece 3/4"x9"x14"—back.
- 2 pieces 1/2"x8"x14"—top and bottom.
- 2 pieces 1/2"x8"x8"—ends.
- 2 pieces 1"x1"x2 1/2"—tickler and secondary mountings.
- 1 piece 1"x1 1/2"x2 1/2"—secondary mounting.

The cost of this wood at any lumber yard will not exceed.....\$0.75

### Other Materials

Other materials needed and their cost are:

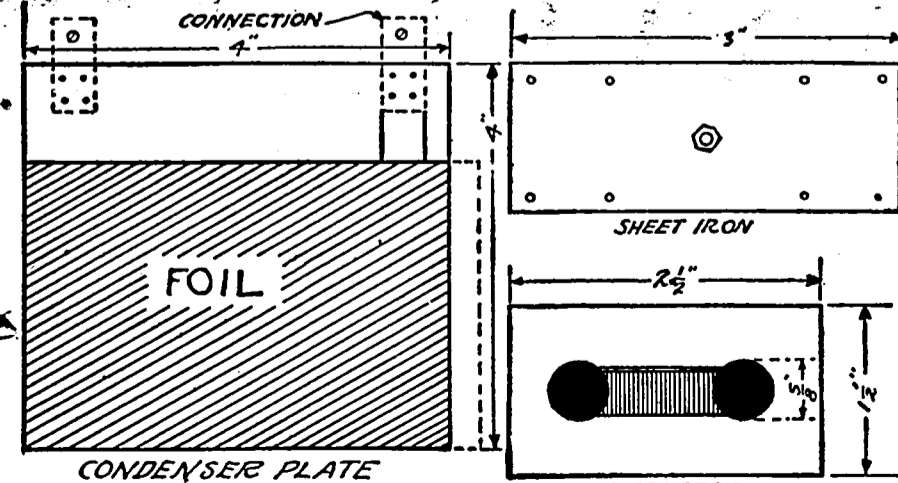
- 1 small can mahogany stain..... .25
- 3 doz. 1" round head nickel plated brass wood screws..... .30
- 1 1/2 doz. 8-32 brass screws, 1" long with nuts..... .36
- 1/4 lb. No. 24 single cotton covered wire..... .25
- 1 doz. 3/8" brass wood screws..... .05
- 1 doz. little brass washers..... .05
- 1 paper common pins..... .05
- 2 ft. 1" wide hard drawn brass ribbon..... .20
- 2 standard detector screw knobs with 8-32 stem..... .16
- 6 binding posts..... .60
- 2 ft. 6/32" brass rod..... .12
- 1 electric light or dry battery carbon..... .05
- 1 22 1/2-volt B battery..... .75
- 1 detector tube..... 5.00
- 1 pair 2000 ohm phones..... 5.00
- 1 storage battery, 6-volt, 60 ampere-hour..... 11.00

Some tin foil, shellac, cigar box, wax out of a couple old dry cells, cardboard mailing tube 2" in diameter, piece of heavy sheet iron 2"x4".

Total cost of materials .....\$24.79

### Tools Required

A screw driver, file, pair snips, soldering outfit, and small drill with 1/16" bit will be all the tools needed.



**Securing Materials and Assembly**  
You can get the parts for the case sawed out at any lumber yard for from 60 to 75 cents while you wait. Any electric shop

a pair of pliers and smooth up the surface of the wax. This coil is the secondary. The tickler coil is made in the same manner except that 140 turns are wound on.

### Mountings for Coils

Now cut four pieces of brass rod 1 1/4 inches long. Solder a washer onto each of them 1/4-inch from one end. Drill holes 1 inch deep in each end of the primary and tickler mountings and press the pieces of rod into them so that the washer and 1/4-inch of the rod protrudes. Cut four pieces of brass ribbon 2 3/4 inches long. Drill each piece as follows:

One hole 1/4-inch from the end. One hole 1/4-inch from the other end and another 1/4-inch from the last hole, that is, 3/4-inch from that end.

Bend each piece at right angles at a point 1 1/4 inches from the end containing the two holes. Attach them to the panel, two on each side of place for secondary mounting. The projecting ends should be 2 1/2 inches apart so that the rods projecting from ends of primary and secondary mountings will go through the holes in the ends and the mountings will be held in place so they can be turned.

Place the edge of the secondary coil against the edge of secondary mounting, tapping through the coil and around the block so that it is held firmly. Draw the ends of the wires from the coil over the ends of the block and through the holes in the panel, then drive two screws into block from back of panel to hold it firmly in position. Now take the primary coil and holding it so that the turns of wire go in the same direction as those of the secondary place it against the primary mounting and tape it fast so that the rounded corner of the mounting is at the back and next to secondary mounting. Solder the ends of the wires to the washers on each end. Do the same with the tickler coil, but do not solder the connections until it has been tested, as it may work better with the tickler reversed.

### Grid Leak and Condenser

To make the grid condenser and leak cut a piece of paper 7 inches long and 3 3/4 inches wide. Fold it lengthwise in two places so that from the end it looks like the letter N. Cut two strips of tinfoil 5 inches by 1 1/2 inches. Lay one inside each fold of the paper. This will separate the two sheets of foil and leave 1/4-inch project at each side. Fold it endwise until it forms a neat flat packet about 1 inch wide with foil projecting at each end.

Attach to back of panel in position shown in diagram with a washer and screw through the foil at each end, first making a lead pencil mark across it from end to end which the washers at each end will touch. Connections are made to the two screws.

### Variable Condenser

The variable condenser is built on the panel. Cut a strip of brass 1/2-inch wide, drilling a hole in the center and one at each end. Fill the hole in an 8-32 nut with mud to keep solder out of it and solder it over the center hole. Countersink the back of the condenser shaft hole in panel and place the nut in it, fastening it with two screws thru the holes in ends of the strip. Shellac a sheet of tinfoil 3 inches by 4 inches on back of panel in position shown in diagram and shellac a sheet of thin paper over it, leaving one corner of the foil exposed and clean for connection. This should be one of the lower corners and should project enough so connection will not interfere with the hinged plate.

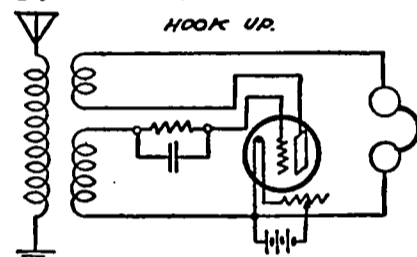
Cut a piece of cigar box lid to about 4 inches by 4 inches. Coat 3 inches by 4 inches of it with tinfoil on both sides and hinge it to back of panel with two little strips of very thin grass tacked to the upper edge, one of them forming one connection to the condenser. You can easily arrange a spring to press lightly on the back of hinged plate exactly over the point where the 8-32 stem touches it, and the condenser is complete.

### Rheostat Control

Put a wooden block 2 1/2 inches by 1 1/2 inches by 1 1/2 inches and bore two 5/16-inch holes nearly through it, so that the screw point on bit makes holes through. Put an 8-32 screw through each hole from the inside. Two nuts on the outside end of each screw make the connections. Saw a piece of carbon into discs about 1/4-inch thick and rub on file to make them smooth. Before filling the 5/16-inch holes with these discs cut a groove between the holes in which to lay a stiff piece of metal. Cut a piece of heavy sheet iron 1 1/2 inches by 3 inches and drill holes as shown in diagram. Solder an 8-32 nut over the center hole. Place stiff piece of metal across from one pile of carbon discs to the other and attach the sheet iron cover with four small wood screws. When the 8-32 stem is screwed into the nut it presses on the metal connecting bar, squeezing the discs together, allowing the current to flow and gives very fine control of the filament current.

### Tube Sockets Not Used

Tube sockets have always given me more or less trouble and I have quit using them. Cut two pieces of 1/4-inch pine board to 3 inches by 3 inches. Drill holes through one for the prongs of vacuum tube and cut a hole through the center of the other just large enough to fit snugly on base. Put this one on and put the prongs through the other. Solder a wire to the end of each prong and put an 8/32-inch screw through each corner for binding posts. A couple of wood screws hold



this fast to bottom of case, with the tip on the side of the base of tube pointing straight back. Now when you look at the tube from in front, the two connections nearest you are the filaments, the one at the back and to the right is the plate and the other is the grid.

### Connecting the Set

Now for connecting up the set. Mount two binding posts on the left end of the (Continued on page 14)

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# Installation of Radiophone Receivers

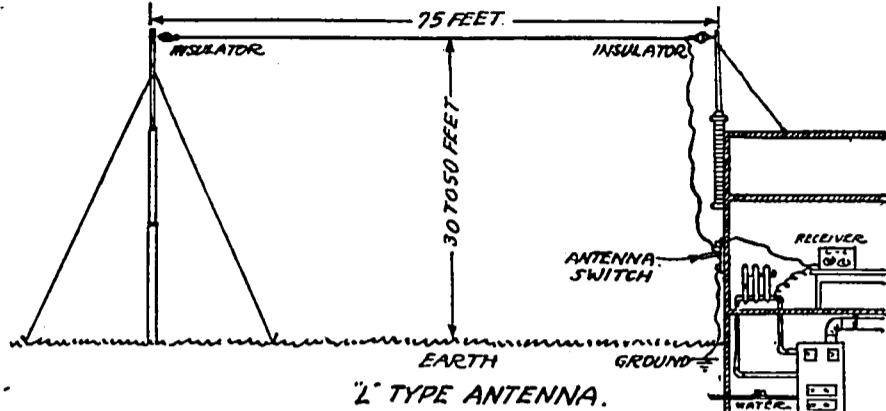
By A. H. Ford, Professor of E. E., University of Iowa

**T**HE REGULAR transmission of concerts, lectures, and market reports by Radio-telephone, during the last few months, has created such an interest in the subject that the electrical engineering department of the University of Iowa is constantly called upon to furnish information as to the necessary apparatus required to enable one to receive such messages.

surrounding buildings. When above a flat roof of metal, the supports should be at least 20 feet high.

### Antenna Switch and Ground

The lead in should be attached to the center connection of a single-pole double-throw switch located just outside the entrance of the building. This switch should be of not less than 50 amperes capacity.



"L" TYPE ANTENNA.

This bulletin has for its purpose the supplying of such information to the non-electrical public.

### Antenna

Of any Radio station the most conspicuous part is the antenna, which picks up the electric waves traveling over the surface of the earth. Since the most of the telephone sending stations are operating with a wave length of less than 500 meters, an antenna having an effective length of from 75 to 100 feet is most satisfactory. The usual antenna consists of a one or more parallel lengths of No. 14 B. & S. stranded copper wire supported at a height of 30 to 50 feet from the earth by means of two strain insulators. When the station is used for receiving only, a single wire is sufficient.

A vertical wire leads from one end of the horizontal wire to the receiver, making what is called an inverted L antenna. Sometimes the location of high supports will make it more convenient to drop the vertical wire from the center of the horizontal wire, making a T type antenna. In this case the top of the antenna should have a length of about 150 feet between insulators.

When using either type of antenna, the best results are secured by having the horizontal wire point in the direction of the station from which it is desired to receive. When an L type antenna is used, the vertical wire should be attached at the end nearest the sending station. The antenna should always be supported at least 10 feet higher than the roofs of the

Its lower point should be connected by a wire of the same size as the antenna wire to a 1/2-inch iron pipe driven to permanently moist earth. The upper contact of the switch should have the wire leading to the receiving set attached to it.

This wire should be insulated from the wall of the building by means of a tubular wall insulator. The antenna-switch should be turned so as to connect the antenna to ground at all times except when the receiving set is being used. Where a water pipe or a steam heating pipe is available in the receiving room, this should be used as the ground for the receiving set. Where such pipe is not available the grounded side of the antenna switch may be used for the receiving set ground.

### Receiver

The simplest type of receiver consists of a tuning coil, an adjustable condenser, a crystal detector, and a pair of telephone receivers. The telephone receiver "phones" are wound with much finer wire than those used on the wire telephone systems. They have an electrical resistance of from 1,000 to 3,000 ohms and are specified as 1,000-ohm or 3,000-ohm phones. Receivers of this type will answer to receive from a 500-watt station at a distance of 10 to 15 miles. Owing to their limited range, they are not recommended for the reception of Radio-telephone messages.

At present the regenerative receiver, using a vacuum bulb detector, is the type most generally used. This consists of a tuning coil, an adjustable condenser, a vacuum bulb detector, a tickler coil, a pair

of phones, a 22 1/2-volt dry battery, and a 6-volt storage battery. The phones are of the type mentioned above. Such sets can be expected to receive at from 200 to 300 miles from a 500-watt sending station.

### Use of Amplifier

Where reception from stations at a greater distance or from stations having less power is required, the addition of a two-stage amplifier is necessary. This consists of a pair of audio frequency amplifying transformers, a pair of amplifying bulbs, and an extra 22 1/2-volt battery. The amplifier is connected in place of the phones on the receiver. The phones can now be connected by means of a plug and jacks or switches so as to receive without amplification or with one or two stages of amplification.

When it is desired that several persons listen at one time, several phones may be connected to the receiver at the same time or a loud speaker may be used. The simplest form of a loud speaker consists of a horn, similar to a phonograph horn, with an ordinary high-resistance phone attached. More elaborate ones have extra powerful telephone receivers.

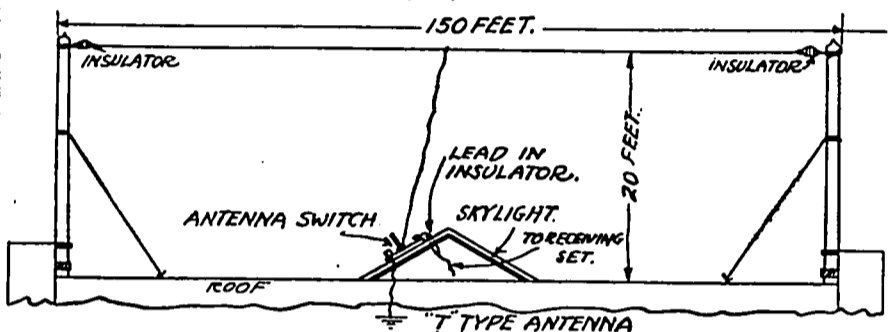
### Where to Buy and Prices

Radio telephone receiving sets can be purchased from most electrical supply houses. They can be bought complete, or

A Storage battery, 6 volts, 80 ampere hour	16.00
Phones, head band, per pair	\$8.00 to 20.00
Loud speakers	\$30.00 to 45.00
Antenna material, less supports	7.50
Complete equipment	\$30.00 to 250.00

### Operation of Regenerative Receiver

Connect the tuner, detector, and amplifier to each other, the antenna, ground, and batteries as indicated by the labels on the binding posts. Put the bulbs in place, making sure that the detector bulb is in the detector socket and not in one of the amplifier sockets. Amplifier bulbs will work as detectors but not so well as the bulbs designed specially for this purpose. Throw antenna switch to receiving position and connect phones to detector. With tickler coil adjusted for maximum coupling, light the filament in detector bulb and increase its brightness by turning filament rheostat until there is a click in the phones. Adjust tuner until you hear a shrill whistle, which decreases in pitch and then increases in pitch on turning tuner in same direction. Turn the tuner until the whistle disappears, to reappear if the tuner is turned in either direction. If the sending station is of considerable power and close at hand, the signals should now be heard. Turn the tickler toward the minimum coupling position until the voice or music is most distinct.



"T" TYPE ANTENNA

the parts may be purchased separately to be assembled by the purchaser. Current prices for complete sets and accessories are given below.

Tuner, with crystal detector and phones	\$ 25.00
No. 1 Tuner only	70.00
No. 1 Detector and 2 stage amplifier, no bulbs	70.00
No. 2 Tuner and detector, no bulbs, 700 meter	40.00
No. 2 Two stage amplifier, no bulbs	40.00
No. 3 Tuner and detector, no bulbs, 3,000 meter	80.00
No. 3 Two stage amplifier, no bulbs	55.00
Detector tubes	5.00
Amplifier tubes	6.50
B Batteries, 22 1/2 volt	3.00

### Adjusting Amplification

Amplification will usually be necessary. This is secured by connecting the phones to the first step of the amplifier and turning the amplifier bulb filament rheostat until the voice or music is heard most distinctly. The second step of the amplifier is adjusted in the same manner.

Static, the crackling and tearing noise caused in the phones by the atmospheric disturbances, frequently interferes with the reception of messages. This may prevent the high amplification which would otherwise be desirable. Static is much more prevalent during the summer than during the winter so that the working range of a set may be reduced to less than half the normal winter range.

## HOME-MADE SET

(Continued from page 13)

case and connect them to the screws that hold the upper and lower springs that hold the primary mounting. All connections are made back of panel. Connect the upper wire from secondary to the grid condenser and to the hinge on variable condenser. Run a wire from the other side of grid condenser to grid binding post on vacuum tube. Run the lower secondary wire to the projecting corner of foil of variable condenser attaching it with 3/8-inch screw and washer, then on to back of binding post marked "positive of A battery" and from there to first filament connection on vacuum tube. Run a wire from the other filament binding post to one side of rheostat, and on from other side of rheostat to back of binding post marked "negative of A battery." Run another wire from plate binding post on tube to upper connection to tickler coil, and another from other end of tickler to back of a phone binding post. Connect the other phone binding post to positive of B battery, and then connect the negative of B battery to positive of A battery, which already has two wires connected to it. Be careful to keep all wires as far apart as possible. This is true especially of those in the plate circuit as if they are too close to others the outfit may howl.

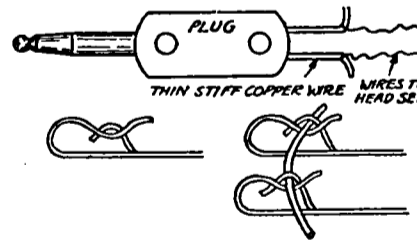
You may have to experiment some to get it working right. But, oh boy! what a "grand and glorious feeling" you have when you hear long distance Radiophone come in loud and clear the first time.

No two outfits tune alike, so it is impossible to give any worth while instructions on tuning except to say that it is best to start with the filament rather bright and the coils close together and experiment until you hear a station.

I have an outfit exactly like this with which I hear Atlanta, Georgia (WSB), every night and many other distant stations without any amplification and using a one-wire antenna 125 feet long. I get practically the same results using electric light or city telephone lines. The telephone makes a better antenna than the electric light line, however.

## Connections for Three Phones

Having three sets of head phones, I had quite a little trouble in connecting and disconnecting them from the plug. After a little experimenting I rigged up the sets as follows: One set was attached directly



to the plug in the manner shown in the illustration. Two small pieces of thin but stiff copper wire were fastened to the connections in the plug. The ends of these wires were bent at right angles in opposite directions. The wires from the head-phones were then fastened to the two protruding copper wires at the point where they are bent and each wire taped with the two bare ends of the stiff copper wire sticking out for 1 inch in length.

The extra sets of head phones were each equipped with Feihnstock connectors. Any number of head sets can be attached in series in this way to the two copper wires sticking out on the plug.

Where it is desired to connect two Feihnstock connections, a small piece of stiff copper wire is used as shown in the sketch.—M. L. Runge, Denison, Iowa.

## Fastening Dials to Shafts

Most instruments, such as variometers, rheostats, etc., are made so that dials can be placed on the control shafts, but many times it is difficult to make the dials or knobs hold firmly because the shafts are round and smooth. An easy way to overcome this is to file one side of the shaft slightly, making a flat surface. The tightening screw is placed just over this flat side. The dials will not slip.—Vernon Hagelin, Geneseo, Ill.

## STATION WOO

(Continued from page 5)

with its associated antenna, wave length adjustments can be made without a wavemeter.

The input equipment consists of microphones, input amplifier, control apparatus, batteries, and a loud speaking receiver for monitoring purposes, and may be operated by talking close up or from a distance of several feet. The microphone design is such as to insure faithful reproduction of every gradation of time of speech or music which is to be transmitted.

The microphone is mounted in a casing which minimizes the effect of mechanical vibration that might effect the clarity of the reproduced sounds.

### Feeble Microphone Currents Amplified

To obtain the best results the magnitude of the feeble currents produced by the microphone must be increased many thousand times before they are impressed on the Radio transmitter. For this purpose an input amplifier provides the necessary amplification.

This consists of a three-stage amplifier mounted upon a black finished angle iron framework so that all items of the apparatus are accessible. The dimensions of the framework are approximately five feet high by two feet wide by ten inches deep.

In addition to the amplifier tubes, transformers, etc., the input amplifier panel has mounted upon it control apparatus to regulate the amplification.

Current to operate the microphone is supplied by an 18-volt storage battery, and is regulated by a rheostat on the input amplifier panel. Filament current for the input amplifier is obtained from the same 18-volt storage battery that supplies the current to the microphone.

Current for the plate circuit of the amplifier is always at least 130 volts. To enable the operator to observe the loudness and quality of speech or music delivered to the transmitter without having to wear a head telephone set continually, a loud speaking receiver with suitable

horn and mounting is connected across the input terminals of the transmitter.

### Listen in for SOS Signals

One of the other features of the Radio room is a receiving set. Its presence makes it possible for the broadcasting station to comply with the United States Government regulations in regard to "listening" at intervals to determine whether distress signals are being sent or the transmitting operations of the broadcasting stations are causing interference with other communication.

Vacuum tubes also figure prominently in the operation of this important part of the station. The receiving set is equipped with three vacuum tubes, one for use as a detector, and the others for the two stages of audio frequency amplification. The total current drain is approximately 1.1 amperes at 30 volts for plate circuits.

Yale is preparing to broadcast reports of its athletic events play by play.

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By the

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You want to learn the code but don't want to waste time and money and obtain no results. I Guarantee that you will memorize the code signals for the alphabet in three days by one hour study each day, or to return your money. You have one week's trial, so don't need to study three consecutive nights. Some learn easily in one night. Send \$1.00 to

### CORYDON SNYDER

1161 South Ridgeland Avenue, Oak Park, Ill.

# Questions and Answers

### Connecting Batteries

(1053) CM

I have been a steady reader of the RADIO DIGEST and have a few questions to ask you.

- When the B batteries are hooked up which terminal is next to plate, positive or negative?
- Which terminal of A battery is next to filament and which is next to rheostats?
- What should be the range of a set, two-stage Radio frequency, detector and two-stage audio frequency, using a 100-foot aerial and counterpoise?
- I am interested in transmitting. Could you send me a hook-up for a one- or two-tube transmitting set? I want a set with a range of about 75 or 100 miles. I live in the country and we have a Delco lighting system of 32 volts direct current. Could I run my transmitting set from this? If so, show how in hook-up. If I have to use B batteries what voltage shall I get? If I use a high voltage will it make my station clearer and louder?
- The last question now, will you tell me how to obtain a station license? Do you have to be a licensed operator to run a sending station or does your station license make you a licensed operator? Where and how do you get both of these licenses?
- A.—1. When B batteries are hooked up positive terminal should be next to plate.
- When A batteries are hooked up, the negative terminal should be next to filament and positive to rheostat.
- The apparatus described by you should, under favorable conditions, have a universal radius.
- Using Delco lighting system of 32 volts direct will require a motor generator to furnish the plate potential. This can be run off the lighting circuit. B batteries would be impractical. Voltage adjusted not to exceed the maximum that tubes are designed for will tend to make signals clearer and louder.
- To obtain a station license you must apply to Radio Inspector of your district, and for an operator's license you will be required to pass a satisfactory examination on reception and transmission of code. Station license does not cover that of operator. To attempt transmission without a license would be a transgression of the law.

### Life of a Tube

(1050) WCV

- I have two detector tubes which light up properly but they do not give any response. May the life of a tube end before the filament falls?
- Is there danger to the instruments, the tubes and condensers, in receiving when there is a thunderstorm approaching, or when there is a thunderstorm in the distance?
- In my set I find it is necessary to run the amperage up to 1.5 and the voltage up to 5.3 in order to get results. The tubes call for one ampere and five volts. What is the matter?
- (a) I have one voltmeter and one ammeter. How should they be connected in a two-stage amplifying set? (b) Is it best to put the ammeter in the A battery circuit so as to show the whole amperage used and assume that three amperes are equally divided between three tubes, or put both meters on the detector tube only?
- A.—1. The life of a tube may end before the filament falls. Great care should be taken in the use of receiving tubes that the plate battery voltage is never high enough to cause the visible "blue glow." The tube becomes very erratic in behaviour when in this condition and is very uncertain and not sensitive as a receiver. This is because the plate current becomes so large that it is unaffected by variations of the grid voltage. Furthermore the electrodes are heated and may be damaged by the blue-glow discharge. Then, too oftentimes tubes are defective in the beginning.
- There is a minimum of danger to apparatus during lightning storm unless in the immediate vicinity.
- If you find it necessary to run amperage and voltage up beyond what tubes call for it may be that your B battery potential is not high enough, although it is true that tubes are not uniform.
- Place your voltmeter across detector tube and ammeters in series with all tubes as you wish to determine how many amperes set is consuming. Do not confine to one tube unless your ammeter will not carry the total amperage required by your set.

### Two X F, Detector, Two A F Set

(1073) CHF

I am just in receipt of the August 19th issue of the RADIO DIGEST, and I was

very much attracted by your article on page 13 about the two circuits using two stages of Radio frequency amplification, detector, and two stages of audio frequency amplification, especially the circuit employing honeycomb coils for tuning.

However, after reading over the descriptive matter concerning the two circuits, there are several points which I would like to have your advice and opinion about.

- Are RCA Radio frequency transformers suitable for the first two stages of Radio frequency amplification?
- How could the circuit be hooked up using only one A battery in place of two as shown in the diagram? Or would you advise the use of two A batteries to increase the strength of the signals?
- Give the names of one or two reliable firms where the audio frequency choke coils used in the honeycomb coil circuit may be obtained. I do not find them listed in any of my catalogs.
- Are the audio frequency choke coils and one megohm grid leak placed in relation to each other?
- Could all the instruments of the honeycomb coil set be placed in a single cabinet size 24" x 12" x 12"? If so, how should the instruments be arranged and shielded to give best results?
- Would you think it better to assemble the honeycomb coil set in three separate cabinets, having the two stages of Radio frequency amplification and jacks A, B and C in the first cabinet; detector tube, honeycomb coils, jack D and plug P, grid condenser and grid leak in the second cabinet; the two stages of audio frequency amplification, jacks E and F in the third cabinet?
- Is there any other arrangement that would give better results than the methods I have mentioned above? If so, please give a good description of how you would construct the set. I want it to give the best results possible for use in motion picture theater.

8. If the honeycomb coil set could be built in one cabinet how would the two stages of Radio frequency be shielded from the interference of the instruments of the rest of the set?

9. What is the maximum range of this set if properly constructed and used under good operating conditions?

A.—1. RCA Radio frequency transformers are suitable for the first two stages of Radio frequency amplification.

2. The circuit could be hooked up by taking leads from extra battery and placing them on storage battery from which others come. However, would advise the use of two batteries.

3. It is not our policy to comply with requests for names of dealers, although we cheerfully recommend any which are advertised in RADIO DIGEST and from whom you would doubtless be able to secure any up-to-date apparatus.

4. The A F choke coils and one megohm grid leak are not placed in inductive relation to each other, if that what you mean.

5. All the instruments in this circuit could be placed in cabinet suggested. To act as shielding, cabinet may be lined with grounded tin-foil. However, this is bothersome and it has been found that a twelve-inch length of rubber tubing or hose will remove body capacity effects and has friction enough for very fine adjustments. By pressing an end against the dial and turning it as desired it will serve very well.

6. Arrangement of instruments in cabinet is largely a matter of personal choice.

7. Your outfit should be very efficient. Be careful not to run your antenna parallel to wires conveying current to motion picture machine.

8. If the set should be built in one cabinet, shield either with screen or metal plate.

9. So many variable factors govern the range of any set that only a guess can be given at best, it might be found to be much greater or perhaps less than the approximated range. The only reliable method of determining lies in actual trial. The range should be probably 3,000 miles.

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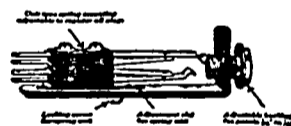
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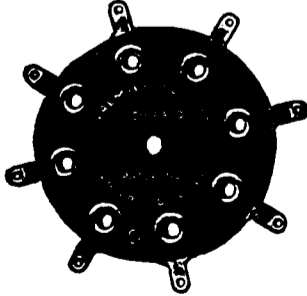
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# Radio Illustrated



Immense Radiophone shown at the Chicago show. This instrument attracted much attention from the crowds. Miss Genevieve Ketcham, Atlanta, Georgia, is shown listening in, but usually she was at the other end of the line, giving whistling and singing solos that were broadcasted at the show station, WGAS



Leonard P. Stuart, Mystic Shriner, broadcasting invitation to come to Washington next June. © U. & U.



The latest innovation in Wall Street, N. Y., is to receive stock quotations and current prices on the Radiophone. © K. & H.