

# Radio Digest

EVERY WEEK **Illustrated** TEN CENTS

TRADE-MARK

Vol. II Copyright, 1922, R. D. P. Co. Inc. CHICAGO, ILL., SATURDAY, SEPTEMBER 30, 1922 No. 12

## PERFECT LOUD SPEAKER

### VOICE OVER OCEAN BECOMES POSSIBLE

NEW WATER-COOLED TUBE DEVELOPS 100 KW

Telephony Across Atlantic May Soon Be Accomplished With Bell Co. Invention

WASHINGTON.—A super-vacuum transmitting tube, which brings this country again to the fore in Radio development, has just been perfected by the Bell System Research Laboratories. It is a 100-kilowatt water-cooled tube and takes precedence over all the vacuum tubes perfected during the past few years which depended on thermal radiation and were therefore limited in output to from 1 to 5 kilowatts when used as an oscillator. Engineers of the American Telephone and Telegraph Company have even surpassed the tube recently brought out by Professor Irving Langmuir of the General Electric Company, capable of delivering 20 kilowatts of high frequency current and also water-cooled.

Although the A. T. & T. officials will make no predictions as to the future uses or practical applications of the new tube—the largest in the world—they should now be able to transmit code messages around the world from WBAY, AT&T Station, New York City, with two such tubes in parallel, and it is probable that with two or four tubes the human voice could be sent across the Atlantic. Ten of the Langmuir 20-kilowatt tubes in parallel, it has been estimated, would be required for trans-oceanic communication.

#### Development of Transmitters

Besides the high power of the tube, great economies in eliminating equipment, saving both space and cost, are promised when the 100-kilowatt tubes become commercialized. Uninterrupted long-distance communication is assured in the near future due chiefly to the method of cooling this high powered tube and the scheme for hermetically sealing the copper and glass parts, itself an achievement of considerable importance.

The art of Radio transmission has developed from the spark sets to arc sets, thence to alternators recently perfected, and finally to tubes which are daily in process of development and perfection. Some of the larger broadcasting stations employ two or more tubes of the 250-watt type and it is a common occurrence for their broadcasts of music and voice to be heard 1,000 miles. The voice does not carry as well as telegraph signals and therefore for telegraph work two of the new 100-kilowatt tubes, 200 times the strength of the 250-watt tubes, and five times the size of the recently heralded

(Continued on page 15)

### A FORCE TOWARD WORLD UNITY?



### POSTAL PLANTS' CALL LETTERS ANNOUNCED

Given Out for Convenience of Code Readers

(Special to RADIO DIGEST)

WASHINGTON.—For the information of Radio users the post office department has announced the call letters of all Radio stations used for air mail, post office business and broadcasting. The stations and their letters are as follows:

Washington, WWX; Hazelhurst, WWU; Bellefonte, WWQ; Cleveland, NRH; Chicago, NAJ; Iowa City, KDTS; Bryan, O., KDEL; Omaha, KDEF; North Platte, KDHM; Cheyenne, KDEG; Rock Springs, KDHN; Salt Lake City, KDEH; Elko, KDEJ; Reno, KDEK; San Francisco, NPG.

Amateurs who can receive code can read the market and weather reports sent out from the post office department stations.

### Two Detroit Stations Specialize in Sermons

Religious Leaders Cooperate With Newspaper Plant

DETROIT.—Two big stations here are making a specialty of broadcasting church services. Alternating each Sunday, Stations WCX, the Detroit Free Press, and WWJ, the Detroit News, are broadcasting from the Central Methodist Episcopal church, and St. Paul's Cathedral, Episcopalian.

It will be interesting to a great many Mid-west Radio enthusiasts to know the preacher at the Central Methodist church is Dr. Lynn Harold Hough, former president of Northwestern University, at Evanston, Ill. The Cathedral rector is Dean Rogers, also prominent in the religious world.

### EXPERTS' 'TIN DIPPER' TYPE A REVOLUTION

Radio Corporation of America Plans to Offer Product Before Holidays

Avoids All Distortion

Engineers End Six Months' Work on Latest in "Loud Speakers"

(Special to RADIO DIGEST)

NEW YORK.—According to a report current here the engineers of the Radio Corporation of America have succeeded after six months' work in perfecting a new and radical design of loud speaker said to be revolutionary in that it is almost entirely free from distortion and foreign noises.

The new loud speaking device is described as having a shape similar to the old fashioned tin dipper. A special diaphragm is used and the device is constructed of a special composition material entirely unlike anything on the market at the present time.

#### Comes Through Tests Successfully

In private demonstrations of the original model which was developed in the laboratories of the Western Electric Company for the Radio Corporation of America, the signals came through the loud speaker clear and distinct without any distortion, vibrations, or metallic sound. Tests were made with reception of various musical instruments, the human voice, and musical notes. The reproduction of these by the new device gave force and distinctiveness practically equal and identical to the original sounds.

With a satisfactory working model completed, plans are now under way, it is understood, to produce the new piece of apparatus in quantities. It is said that the new product will be offered to the public before the Christmas holidays.

The important contribution which the development of the loud speaker makes to the Radio science cannot be over-estimated.

(Continued on page 2)

### FAIRS SPREAD RADIO BUG THROUGH TEXAS

SAN ANTONIO, TEX.—Southwest Texas is coming to the front in Radio affairs according to the various county fairs held recently. There have been more than a dozen county fairs so far where loud speaking Radio apparatus carried music and world news to the rural residents for the first time from Station WJAE at San Antonio.

### WALLINGFORD PLAY BROADCAST TO FANS

SCHENECTADY, N. Y.—Parts of the comedy "Get-Rich-Quick Wallingford" were broadcast by the WGY players, headed by Edward H. Smith, Tuesday, September 19, from Station WGY, located here. The play was presented in three episodes by a complete cast. This was the third of a series of Radio plays which have been presented.

# BUSIEST PLANT IS AT RIVERHEAD, L. I.

## RECEIVES MESSAGES FROM ALL OVER WORLD

### Little Known Station Vies In Versatility with Popular Radio Central

NEW YORK.—It is interesting to note that although Radio Central, the transmitting station near Port Jefferson, L. I., is the most powerful station in the world, Riverhead, L. I. is the most versatile, and also the busiest.

Although Radio Central can talk to Wales, France, Germany, or Norway with ease, Riverhead can listen simultaneously to messages from all those countries. At the same time it can close its "ears" to the powerful impulses sent out only a few miles away by the giant Radio Central, and is able to eliminate 90 per cent of the prevailing atmospheric disturbances.

Every person interested in Radio knows a good deal about Radio Central and very little about Riverhead, but from an engineering standpoint, however, what has been accomplished at Riverhead in the receiving line is as remarkable as what has been done in transmitting at Radio Central. Riverhead does its work quietly and without ostentation, while Radio Central's tall towers and terrific currents advertise it to the world.

The station is not a network of antennae such as one might imagine. It has simply one antenna, consisting of two copper wires, nine miles long, strung on ordinary telegraph poles. The system of concentration, achieved after much experimentation, makes it possible to add new receiving circuits for communication with any new station in Europe simply by installing another set of receiving apparatus.

# Davy Jones Didn't Like the Program

## Music Stops When He Broadcasts Huge Wave In Protest

TORONTO, CAN.—There are many things which act as impediments to proper transmission by Radio, such as static, extremely hot weather, high buildings and hills, etc. These are all well known.

But last week a new element was responsible for the absolute cessation of a broadcast. Davy Jones, or whoever it is that handles the levers at the bottom of the lake and changes the surface from a placid affair into an ugly, writhing, billowy contortion, was really responsible.

The water had been "smooth as oil," and artists on the Steamship Dalhousie City were doing themselves credit in front of the microphone which bore their performance out on the ether, when suddenly, Davy Jones got busy and set the ship tossing round quite a bit. An experienced sailor might have described the state of the water as "ripply," but the artists were not experienced sailors. To them, well, they simply had to cease broadcasting.

The Dalhousie City has made large numbers of friends among the invisible audience during the last two weeks, and no doubt many of them are wondering why one of the concerts ended so abruptly. Now they know.

# McADOO TAKES RADIO SET ON FISHING TRIP

## Listens In after "Hard Day" With Rod and Gun

CHICAGO.—When William Gibbs McAdoo, former Secretary of the Treasury, and a party of friends, including George E. Hill, of Rigby, Idaho, electrical dealer, started down the Snake River on a fishing and hunting trip on the morning of September 5th, the raft on which they were carried was equipped with a receiving set with two steps of amplification, together with a loud speaker.

Mr. McAdoo and his friends were on a ten-day trip, they have taken annually for the past twelve years. This, however, is the first time they had been able to keep in close communication with the outside world at all times during their voyage, and it is only through the development of Radio that such an accomplishment is possible.

Mr. McAdoo is an ardent Radio fan, and has expressed a determination to take a receiving set with him every time he enters territory in which there are no facilities of obtaining news. He also is a great admirer of music, and, like all other lovers of the great out-doors, takes pleasure in listening to a few vocal selections after a "hard" day with the gun or reel.

# State Fair Plant Will Transmit Visitors' Word to "Home Folks"

SHREVEPORT, LA.—A Radio transmitting as well as receiving station will be placed at the disposal of visitors at the seventeenth annual state fair to be held here beginning Oct. 19. Arrangements have been made with the Shreveport Radio Installation Company, according to W. R. Hirsh, secretary-manager for the fair, to install numerous substations where visitors may file messages for Radiophoning to the folks at home.

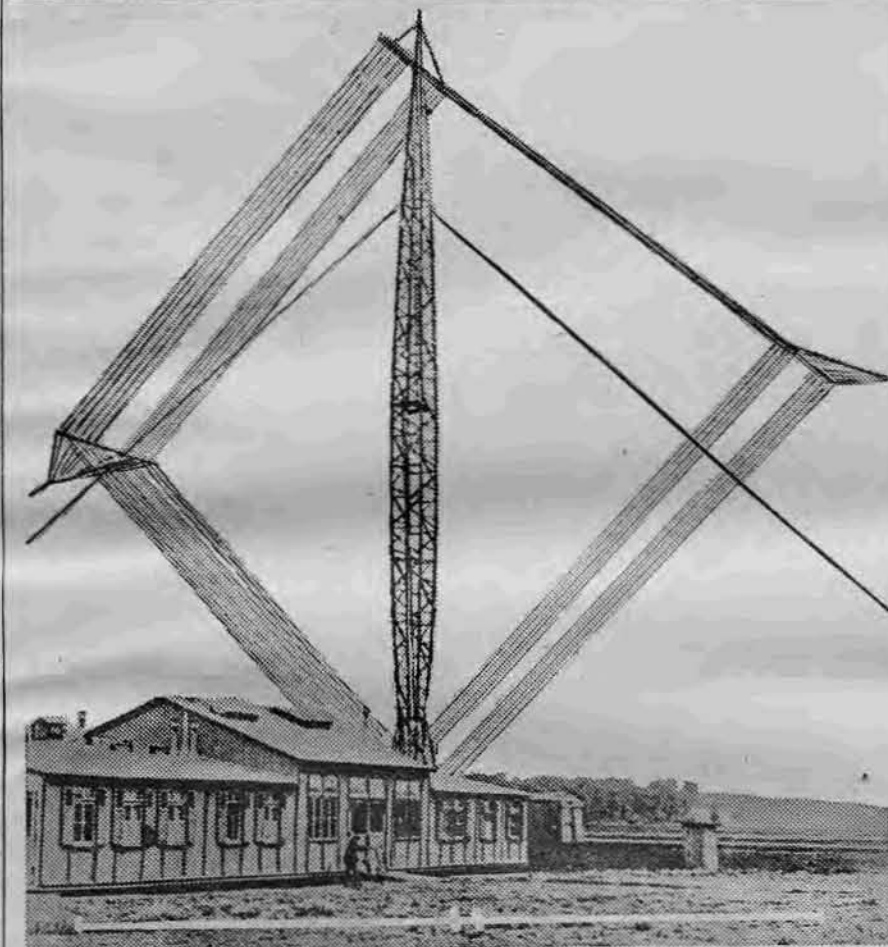
The fair will be formally opened by Governor Parker, whose address will be broadcast by Radio. This is said to be

the first state fair in the country to be thus opened.

It is planned to communicate with inter-oceanic stations, and to receive musical programs, news items, market reports and messages from various cities and towns within the state. Information about the state fair and its visitors will also be sent out. This will include the results of races, prize exhibits, winners of baseball games and other contests of the fair.

The large station will be located at the Exposition building, where operators will explain the equipment. It is thought that many sales of Radio equipment will result from the service and display.

# GERMAN LOOP HAS BIG RANGE



Germany's Radio center which is strong enough to transmit nearly around the globe, differs from other stations mainly in the construction of its aerial, which, as seen in the photo, is a greatly enlarged loop type antenna, suspended on a steel tower. The plant is located at Oranienburgerstrasse. ©INT.

# STATION WIAC HAS OPENING CONCERT

## New Station Will Alternate With WSY, Alabama Pioneer

BIRMINGHAM, ALA.—The new broadcasting station of the Matthews Electric Supply company gave its first concert this week. It was recently licensed as Station WIAC. Arrangements have been made by which it will alternate with Station WSY, the pioneer broadcaster of Alabama operated by the Alabama Power Company. WSY will use Monday, Wednesday and Friday nights and Sundays while WIAC will broadcast on Tuesdays, Thursdays and Sunday mornings.

The Alabama Power company is preparing to install a more powerful station of 500 watts. This will be ready for operation by October 1. It will be second to none in the south.

# Southern California Gives Santa Ana Plant Welcome

LOS ANGELES, CALIF.—With the commencement of operations, Station KFAW, Santa Ana, Calif., has been given the hand of welcome into the Radio broadcasting field of Southern California. The Radio Den and the Santa Ana Register are operating the new plant. The hours which have been assigned to it at the present time are from 4 to 4:30 p. m., Pacific time, daily except Sunday, and Mondays and Thursdays from 8 to 9 p. m.

During the latter part of the World War submerged submarines a short distance from the American coast were able to pick up Radio messages from Nauen, Germany, through the water.

# First Radio Exchange in World in England

## Connects Aerial Traffic Controller With Airway Pilots

LONDON, ENGLAND.—The first Radio-phone exchange in the world is now in daily use at the London Air Station, Croydon. Installed by the Air Ministry, its chief use is to "connect" the aerial traffic controller with the pilots of the various machines flying on the airways between London and continental Europe, and it can also put the pilot in communication with any office on the aerodrome.

This Radio exchange is the latest addition to the central control tower at Croydon, from which outgoing and incoming "air expresses" have been directed since the regular cross-Channel traffic began to assume its present proportions. Nearly all machines on regular service are now fitted for Radiophony. The pilots report to the traffic controller every fifteen minutes, so that the position of each machine is known throughout its journey.

# PERFECT SPEAKER

(Continued from page 1)  
mated. Signals received by a set in the home may now be amplified so that it will be a pleasure to listen to grand opera, concerts, and other forms of entertainment.

# Ether Welcomes "Home-Comers"

WINDSOR, ONT.—Speaking from one of the most powerful Radio broadcasting stations in Detroit, Mayor H. W. Wilson of Windsor, welcomed in advance the Old Boys of the Border Cities of Canada who were on their way to the Old Home week celebrations on the Essex frontier. He also invited those who had not yet turned their steps homeward to hasten to attend at least for the closing days.

# Radio Digest Illustrated

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# CONTENTS

- Perfect Loud Speaker; Voice Over Ocean Becomes Possible; Postal Plants Call Letters Announced; Two Detroit Stations Specialize in Sermons; Fairs Spread Radio Bug Through Texas..... 1
- Busiest Plant Is at Riverside, L. I.; Davy Jones Didn't Like the Program; McAdoo Takes Radio Set on Fishing Trip; German Loop Has Big Range; Station WIAC Has Opening Concert; Southern California Gives Santa Ana Plant Welcome; First Radio Exchange in World in England..... 2
- Third Trans-Atlantic Tests; Postal Telegraph Takes Radiograms; Columbus, Ohio, Has First Radio Chapel; WSY Sends Milady Latest in Fashions; Mummy Now Washes to Music; Hears Ty Cobb on 300-Mile Antenna..... 3
- Broadcasting War Stopped by Hoover; Explorers Keep in Touch with World; Sets Will Guard Forests from Fire; Ohio State University to Have Big Broadcast Plant; Receiving Records Contest..... 4
- "Educate Kentucky" Aim of WHAS Plant; Gotham Hospitals Move to Get Sets; Bryan Declares Radio Will Save Democrats; Vertical Antenna for Plant in Skyscrapers..... 5
- Give Plans for Second Big Show in Boston; Government Radio Activity Growing; Vice-President Named for Radio Corporation; Ohio Stations Draw Unusual Attention..... 6
- Radiophonists' Mart..... 7
- Broadcasting Station Directory..... 8
- Index to Broadcasting Directory..... 9
- Editorials—Knowledge Carried by Ether Waves; Teletype Leads to Newer Things; Broadcasting Stations Increase; Radio Parasites Are with Us; Condensed, by Dielectric; Indi-Gest, Humor..... 10
- Use of the Radio Receiving Set in the Home, Part IV, Regenerative Receivers, by H. M. Towne..... 11
- Receiving Set Hook-Up Has No Aerial; Vacuum Tube from Ford Double Filament Globe..... 12
- Simple Instructions for the Beginner, H. C. Coils for Radio Frequency, By Harry J. Marx..... 13
- The Storage Battery on the Radio Set; Hook-Up R. D.-51 and R. D.-52..... 14
- Questions and Answers..... 15
- Radio Illustrated..... 16

# Looking Ahead

The fifth of the series by H. M. Towne will appear next week. Mr. Towne for a number of years has been employed in the laboratories of the General Electric Company.

Panel Units for Your Receiving Sets. Details of panel construction will soon begin. This popular feature has been requested by many readers and will be written by Thomas W. Benson.

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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# A.R.R.L. TO CONDUCT THIRD TEST SERIES

DECEMBER 12 TO 31 ARE DATES SCHEDULED

Preliminary Tests to Be from October 25 to November 3—Entrants Must Make 1,200 Miles

HARTFORD, CONN.—The third series of Trans-Atlantic Amateur Tests will be conducted by the American Radio Relay League in co-operation with the Radio amateurs of England, France and Holland from December 12th, to December 31st, 1922, inclusive. During the first ten days of the tests, American and Canadian Amateurs will transmit signals for reception by the Radio amateurs of the European countries. Those of the American and Canadian transmitters making the best records as determined by reception reports from the European amateurs, will be used to transmit the results of reception by American and Canadian Radio amateurs when the English and French Radio amateurs are transmitting.

**First American Reception Test**  
For the first time in the history of Amateur Radio, American and Canadian Amateurs will have an opportunity to demonstrate their skill in receiving amateur signals from across the Atlantic. As a result of the success of the A.R.R.L. Trans-Atlantic Tests of last December, when thirty Radio amateur transmitters succeeded in bridging the Atlantic, the French Government has permitted the issuance of several amateur transmitting licenses. Also the British Post Office Department has issued a special permit to the Wireless Society of Manchester to use a power of 1,000 watts of continuous wave energy for the express purpose of establishing amateur Radio communication with the amateurs of the United States.

**Optimistic About Results**  
The American and Canadian members of the American Radio Relay League are highly optimistic in reviewing their chance of hearing the British amateurs using this amount of power, since several American amateurs using less than 50 watts of continuous wave energy were heard by Paul F. Godley, who was sent over for the tests by the A.R.R.L., and who was stationed at Ardrosson, Scotland. Mr. Godley is arranging to establish his record breaking receiver at some point on the north Atlantic Coast during the coming tests with the idea of copying signals from the European amateur stations.

A series of preliminary tests, for the purpose of determining what American and Canadian transmitters shall be given a place in the final tests with an individual schedule and code letters, will be conducted from October 25th, to November 3rd, inclusive. To qualify for the final tests a transmitter must cover a distance of at least 1,200 air line miles during the preliminary tests.

**Will Transmit By Inspection Districts**  
The preliminary tests will cover a period of two and one-half hours (9:30 p. m. to midnight, Central Standard Time) which is divided into ten periods of fifteen minutes each. Transmission will take place by inspection districts. One district transmits at a time, and all others remain silent endeavoring to copy as many of the transmitting stations as possible.

After the tests each night, the receiving stations are to send a confirming record to all transmitters heard at a distance of 1,200 air line miles or over. When filing application for entry in the final tests, a transmitter shall include at least one 1,200-mile record, or show documentary evidence that its signals have reached out 1,200 air line miles during the months of September or October.

**Add Book Reviews to Program**  
CINCINNATI, O.—In another effort to provide amusement for the thousands of persons who listen in on broadcasts from their station, the managers of WLW have provided for book reviews, one to be read every night the plant is in operation.

## COLUMBUS, OHIO, HAS FIRST ETHER CHAPEL

COLUMBUS, O.—For the first time in the history of Radio in Columbus, Ohio, the broadcasting of services in a Columbus church was accomplished by Station WCAH, the Entrek Electric Company. The sermon of Rev. W. M. Hindman, in the Northminster Presbyterian church was broadcast by Station WCAH, although the station is a quarter of a mile away.

## WSY SENDS MILADY LATEST IN FASHIONS

BIRMINGHAM, ALA.—Fashion News is the latest feature inaugurated by Station WSY, broadcaster of the Alabama Power company. Marion Taylor, of "Vogue," wrote the first style letter to be broadcast. It discussed the fall frocks, the popular fabrics and method of trimming and ornamenting. "Vanity Fair" will soon tell of the correct clothes for men.

## POSTAL TELEGRAPH TAKES RADIOGRAMS

BECOMES RECEIVING AND TRANSMITTING AGENT

Radio Corporation of America Reaches Agreement with Company

NEW YORK.—Announcement has been made by Edward J. Nally, President of the Radio Corporation of America, that an agreement had been signed between his company and the Postal Telegraph-Cable Company whereby every office of the Postal Company in the United States becomes an agency of the Radio Corporation for the acceptance of Radiograms for transmission across the Atlantic Ocean and for the delivery of Radiograms received from overseas for points in the United States.

This important linking up of Radio and wire line services reflects the rapid growth of the corporation's overseas telegraph traffic since the return of its high power stations by the Government after the close of the World War.

These stations transmit and receive Radiograms directly to and from England, France, Norway and Germany, and through connecting stations abroad, to and from all countries in Europe, Asia and Africa.

**Connect with Many Countries**  
The Radio Corporation now maintains the only direct line of telegraph communication with Germany and Scandinavia; and additional direct service is planned for the near future with Belgium, Holland, Italy, Poland and Sweden, giving to those peoples the opportunity to communicate directly with their scattered brethren and nationals in all sections of the country.

Prior to the arrangement made by the Radio Corporation of America whereby it is enabled to use the extensive land line service of the Postal Telegraph Company, practically all of the Radiograms transmitted to transatlantic countries originated in New York City and Washington, D. C. The contract just signed gives to the inland commercial centers and the thousands of small points reached by the postal system equal facilities with those now enjoyed by the eastern cities mentioned, the Postal Telegraph Company performing the same service for Radiograms of the Radio Corporation of America as it does for cablegrams to be transmitted by submarine cable.

## HEARS TY COBB ON 300-MILE ANTENNA

Chicago Telegraph Chief Attaches Home-made Set to "Dead" Telegraph Wire

CHICAGO.—An aerial nearly 300 miles long was used when R. C. Blackwell, general repeater chief in the Postal Telegraph and Cable Company's main office in Chicago, listened recently to a talk made by Ty Cobb, manager of the Detroit Tigers, which was broadcast through the Detroit Free Press Station, WCX.

With the co-operation of Joseph M. Richardson, night chief operator in Detroit, Mr. Blackwell "killed" one of the trunk wires between the two cities by taking off the batteries. He then attached his homemade receiving set in the Chicago office. Proximity of the Postal wires to the Free Press aerial in Detroit made the long line a perfect aerial. The use of two variable condensers completed the circuit.

Campers at Goodhue Lake, N. Y., with a simple Radio set, having an aerial between two trees and grounded with a tin biscuit box resting on the bottom of the lake, report that they got satisfactory concerts from as far as Atlanta, Ga.

## MAMMY NOW WASHES TO MUSIC



It is much easier picking music from the air than cotton from the plant, and the old fashioned mammy from "Kaintuck," that we read about, now goes about her duties with receivers over her ears listening to "Old Black Joe" and other time proven favorites © INT.

## CONCERTS AT ARTS SHOW

Exposition Visitors Hear Daily Musical Programs

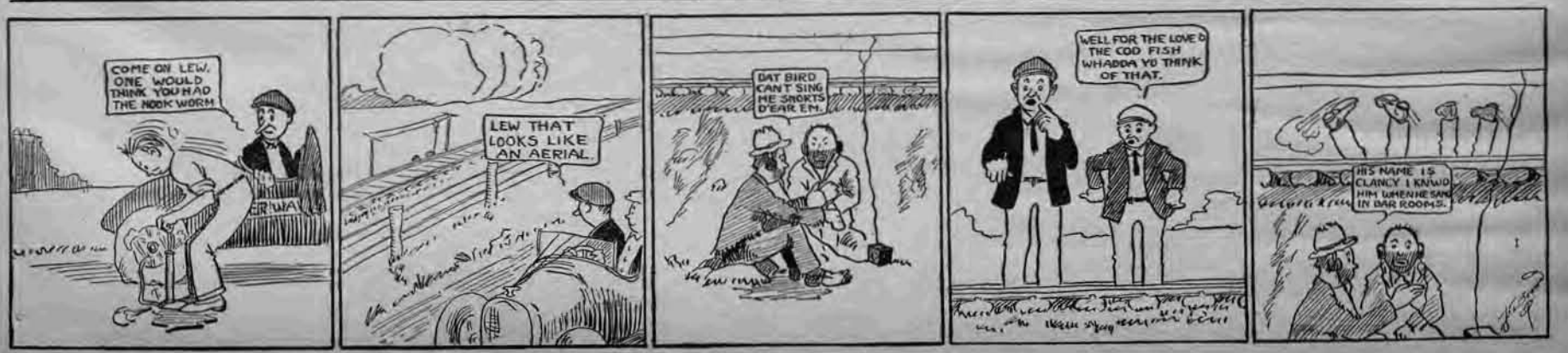
BOSTON, MASS.—Daily Radio concerts were given at the recent Graphic Arts Exposition in Boston by the Boston Mailing Company, one of the firms exhibiting. The concerts were free to visitors at the exposition. The apparatus was installed by the International Radio Corporation of Boston.

## COPS NAB YOUTHFUL 'BUG'

Becomes Too Zealous in Apparatus Collecting

BIRMINGHAM, ALA.—Over eager to possess a complete receiving set, according to the police C. F. Boykins, local boy, was placed in the city jail this week following his arrest at one of the public school buildings where he was attempting to remove the telephone receivers. He was charged with burglary.

## THE ANTENNA BROTHERS Spir L. and Lew P. "Bum" Reception, or "Strays"



## BROADCASTING WAR STOPPED BY HOOVER

NEW YORK STATIONS WILL WORK ON 400 METERS

WJZ Gets 360-Meter Length, While WOR, WBAY and WEAJ Change to 400 Meters

(Special to RADIO DIGEST)

NEW YORK.—The broadcasting war between the big stations in the metropolitan district has at last been settled. While the remedy is only temporary it is intended to make provision along the same line so that future conflicts will be avoided. Briefly the disposition of the argument has been this. A conference was called of representatives of the various stations, Secretary of Commerce Hoover, Arthur Batcheller, Radio inspector of the Second District, and other federal officials. The decision reached was that Station WJZ, Westinghouse Electric and Manufacturing Co., Newark, N. J., would be given the 360-meter wave length, while Station WOR, L. Bamberger Company of the same city, would work on 400 meters.

New Schedule to Be Made

The Western Electric Company's station in New York City, WEAJ, and the new plant of the American Telephone and Telegraph Company, Station WBAY, will broadcast on the 400-meter wave length. The former station will use that length only temporarily.

Mr. Batcheller will announce a new time schedule for the stations in this district within a few days. The interfering stations have agreed to stand by his, the Radio inspector's, word in this regard. The assignment of the new 400-meter length will solve the problem satisfactorily as each of the warring stations is given a greater length of time in which to operate, and at the same time will have less "competition" on the same wave length.

### Civil Service Has Job Open

WASHINGTON.—The Civil Service Commission has announced that examinations will be held in the near future to fill a vacancy as junior Radio engineer, Signal Service at Large, at Camp Alfred Vail, N. J., at a salary ranging from \$1,200 to \$2,000 a year.

## Sets Will Guard Forests from Fire

Los Angeles County Plans to Protect Reserves—To Use Eleven Stations

LOS ANGELES, CALIF.—Radio as an alarm for the prevention of forest fires is to be used shortly by the county of Los Angeles, according to a statement given out recently. Sites have already been selected for at least eleven transmitting and receiving stations which are to be erected at the expense of the county in the forests under county control and outside of the federal reserves. Each of the stations is to be equipped with Radio apparatus which will enable them to broadcast the discovery of fires, to summon help, and to quicken the action of extinguishing the incipient blazes.

The Board of Supervisors have authorized the appropriation of adequate funds for installation, and everything but the delivery of the instruments is definitely scheduled now. It is understood that the instruments are to be obtained through the navy department at Washington. It is expected that the system of Radio forest fire alarms will be in complete operation in the county by next season. However, the new system may become partly operative this year.

## Ohio State University to Have Big Broadcast Plant

COLUMBUS, O.—Ohio State University will begin during the year the construction of a broadcasting station that will rank equal with the best. The money for the new station has been collected by the alumni of the university and plans for the station are being designed and supervised by the instructors of the Physical Department of Electrical Engineering.

It was found in canvassing the alumni for the fund for the apparatus for the broadcasting station that 80 per cent of those solicited owned their own receiving apparatus, or had a sufficiently strong interest in Radio to listen in on concerts and entertainments by means of receiving stations near their homes.

From the west comes a story of a method to use the telephone overhead wires for a Radio antenna. This cannot be done, however, with a grounded return circuit such as is found in farmer's lines.

## Explorers Keep in Touch with World

Members of Expedition in Mackenzie River District Get Messages Daily from CFCN

CALGARY, CAN.—J. P. Henderson, of the Dominion Observatory of Ottawa, at present several hundred miles north of Fort Norman, the extreme outpost of civilization of the Mackenzie River district, is keeping his exploration and survey expedition in touch with the civilized world through the Radiophone. Mr. Henderson tunes in nightly to Station CFCN, the broadcasting station of the W. W. Grant Radio Company of Calgary, from which station messages are transmitted to the various members of the expedition at the conclusion of the regular concert program.

In a letter recently forwarded by courier from Fort Norman, he expressed his appreciation of this service and related some of his experiences in establishing communication with distant Radio stations under such unfavorable conditions as severe static and six months of constant daylight. He also stated that Radio time signals are of great aid to the expedition in fixing the exact longitude occupied by the explorers at the time of the signal reception.

## "Henry's" Call Is WWI; Listen in on Wednesdays

DETROIT.—It may be of interest to Radio enthusiasts to know that Station WWI is the Ford Motor Co. Henry Ford at present is broadcasting every Wednesday night, a fine concert program with addresses from staff members of the Ford Hospital, one of the largest institutions of the kind of the country. The time is from 10 to 11 p. m., Eastern Standard, and it is well worth the time of any Radio enthusiast to tarry an hour after the other broadcasting stations are through, to hear what WWI is sending forth. He might catch Mr. Ford, himself, once in a while.

### Texas to Have Second Show

SAN ANTONIO, TEX.—The second big Radio show to be given in Texas within a month will open here October 9 and close October 15. The first was held September 18 at Houston, closing September 23.

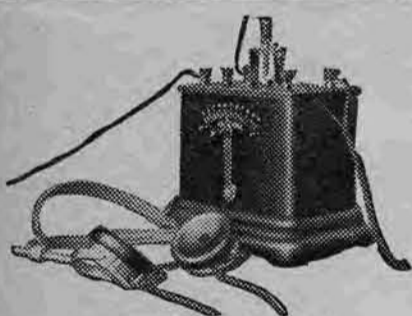
## RECEIVING RECORDS? SEND THEM IN—

The complete list of receiving record holders, appears only once each month. The next complete list will appear in the October 21 issue of RADIO DIGEST. The last complete list appeared September 23. Amateurs who have beaten old records or made new ones will have their names listed each week.

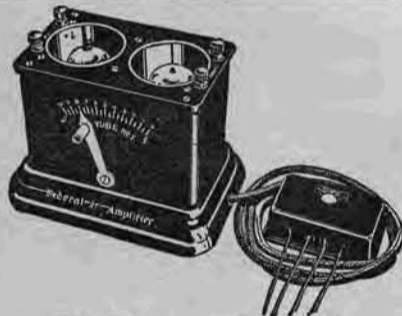
Distances MUST be given AIRLINE. Makers of new records or amateurs who have broken old records during the past week are:

Station, Miles Record, and By Whom Heard

CKCK—300—V. D. Lord, Cando, N. D.  
KDKA—1,400—H. S. Johnson, Chandler, Okla.  
KFAF—1,150—P. H. Russell, Inisfail, Alb., Can.  
KOG—355—K. Kinney, Berkeley, Cal.  
KSD—1,800—H. Chapelle, Woodburn, Ore.  
KZN—2,050—E. W. Blanchard, Providence, R. I.  
WAAB—918—H. E. Jameson, Milwaukee, Wis.  
WAAO—1,000—O. M. Smith, Miller, Nebr.  
WAAT—700—L. V. Pottinger, Owensboro, Ky.  
WCAS—360—L. V. Pottinger, Owensboro, Ky.  
WCAY—700—H. Flanders, Salina, Kan.  
WXC—1,000—T. E. Woll, Sulphur, Okla.  
WDX—875—D. Anderson, Norman, Okla.  
WEAF—350—H. B. Plowman, Fairmont, W. Va.  
WFAA—1,100—C. A. Pearson, Minneapolis, Minn.  
WFAM—825—D. Anderson, Norman, Okla.  
WFRN—115—L. Hull, Eureka, Kan.  
WGH—775—C. Masters, Jr., New Castle, Pa.  
WGM—800—H. L. Peterson, Charles City, Ia.  
WHA—1,800—A. Chapelle, Woodburn, Ore.  
WHAC—1,050—A. Lieder, Baltimore, Md.  
WHAE—655—G. Gould, McKinney, Tex.  
WHAL—600—J. Shamburg, Tekamah, Nebr.  
WHB—1,250—M. E. Collins, Manchester, N. H.  
WHC—600—C. Ashley, Memphis, Tenn.  
WLAK—300—L. Hull, Eureka, Kan.  
WJAP—385—V. D. Lord, Cando, N. D.  
WKM—950—E. E. George, Philadelphia, Pa.  
WLAB—500—D. Mills, Emporia, Kan.  
WLAD—170—W. Heald, Rolfe, Ia.  
WLAE—500—J. Shamburg, Tekamah, Nebr.  
WLAG—460—V. W. Wells, Grand Rapids, Mich.  
WLAT—578—M. H. Renken, Cole Camp, Mo.  
WNAL—100—M. S. Miller, Sioux City, Ia.  
WOB—555—W. B. Summer, Beverly, Mass.  
WPH—800—J. Shamburg, Tekamah, Nebr.  
WWZ—1,200—J. Shamburg, Tekamah, Nebr.



Federal Crystal Receiver



Federal Junior Amplifier No. 20

# Federal RADIO INSTRUMENTS

—ARE SUPERIOR—

## The Federal CRYSTAL RECEIVER

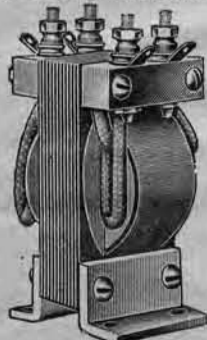
is a highly efficient instrument for the reception of RADIO Programs in a clear, soft, pleasant tone—when used within a radius of 30 MILES of a broadcasting station.

WITH THE ADDITION OF

## THE Federal JUNIOR AMPLIFIER No. 20

The receiving range is increased to

100 MILES



No. 226-W Voice Frequency Amplifying Transformer

## THE Federal JUNIOR AMPLIFIER No. 20

is equipped with Two of the famous

No. 226-W Voice Frequency Amplifying Transformers

THESE INSTRUMENTS are exceedingly simple to operate—No knobs and Dials—merely operate control arms until reception is loudest.

THIS TRANSFORMER was used in ARMY and NAVY radio equipment throughout the war and has been used continuously in commercial equipment.

Federal Telephone & Telegraph Company  
BUFFALO, N. Y.  
CHICAGO BRANCH OFFICE: 805 STEGER BUILDING, CHICAGO, ILL.

# CROSLEY

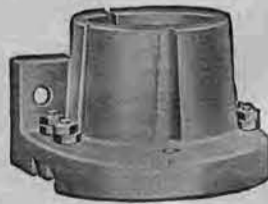
Better—Cost Less

## Radio Receivers

## Radio Parts

Catalog on Request

### CROSLEY V-T SOCKET



This socket has been pronounced by many radio engineers the best socket on the market. Ever since its announcement, its success has been phenomenal. Although the success has been largely due to the price, its real popularity is based on its high quality, efficiency, service and practical unbreakability. Patents Pending. Beware of imitators. Made of porcelain for base, or panel mounting—\$.50.

### CROSLEY SHELTRAN

Incorporated in the design of the Crosley Sheltran, are all the characteristics so essential and necessary to obtain the maximum amplification from the modern vacuum tubes used in radio work. These tubes, with their high amplification constant, operate most effectively at large fluctuations of the grid potential. The Crosley Sheltran is designed to accomplish these results and tests have shown that the design is correct to insure maximum efficiency. Completely shielded—9 to 1 ratio. "Better—Costs Less"—\$4.00.



Handled by Jobbers and Dealers everywhere. If your Dealer does not handle CROSLEY Instruments, write us direct.

Write for Catalog

CROSLEY MANUFACTURING CO.  
DEPT. RDI 10  
CINCINNATI, OHIO



The orchestra and soloist of Station WHAS, Louisville, are shown directly above in the studio on the opening night. To the left a crowd is listening to the motor-mounted receiving set of WHAS, which has paid a surprise visit to the countryside.

# 'EDUCATE KENTUCKY' AIM OF WHAS PLANT

## Purpose Back of Louisville Station Is One of Broad Service to State

(By J. Crow Taylor)

An evening with WHAS, the broadcasting station owned and operated by the Louisville (Kentucky) Times & Courier-Journal gives one something of the general impression of a neighborhood gathering in a country town which includes both the young folks and old, and at which each do their part toward making the evening entertaining by singing, reciting or playing musical instruments. Again, you notice between times a visiting and lively chatter characteristic of the old-time neighborhood party.

So, while the many fans "listening in" get their entertainment from a distance, those who furnish the evening programs for the broadcasting station also have their own enjoyable times, and one of the side effects plainly is to stimulate a livelier interest in both vocal and instrumental music, in elocution and reading. It helps the teachers and professionals who encourage the development of this kind of talent, and it also helps stimulate and enliven the interest of students.

### The Vision Back of WHAS

This is one of the by-products of Radio in Louisville, but back of it all as a reason for the establishment of Station WHAS and the management of it by Credo Harris, there is a vision. This vision caused Judge Robert W. Bingham, owner of the papers, to invest in the equipment, and led his friend, Credo Harris, to make a sacrifice of time and income in his own business of writing to take charge of the station and to help develop an interest in Radio.

That vision is one of broad service to the state of Kentucky, and after the evening's program was over Mr. Harris sat in his office and told me about it.

### People of State to Benefit

The great thought he has, and which he has been busily selling to the teachers of the normal schools in Kentucky, is that of reaching all the school houses and through them all the school children of Kentucky both with music and with instructive talks of some aid in the school work itself.

Mr. Harris has made talks before the normal schools and has started the work. Short courses in Radio will be given to all the Kentucky teachers, and they in turn will take it into the schools until, it is hoped by Mr. Harris, every school house in Kentucky will have a Radio receiving set.

Then the plan is to broadcast from Station WHAS a morning program for the schools of the state. This program will consist of concerts, short talks, and perhaps instruction in setting-up exercises, with an orchestra to furnish music while these are going on.

Finally, it is hoped that this will make the school houses into community centers where both young and old may gather in the evenings to hear Radio news reports, concerts and all things going on in the world.

### Kentucky Hospitality Background

To fully understand the atmosphere and the human side of Station WHAS and what it means, one must know something of Kentucky and the Kentucky spirit of friendliness. This makes Louisville and the feelings and the impressions one gains from the Louisville station in the evening different from those of most large cities. Louisville, though a city of a quarter of a million inhabitants, has many of the neighborly characteristics of a country town. The people seek to know each other and to be friendly and neighborly. It is this spirit which makes an evening at the station seem like a neighborhood party.

The station, which is on top of the Courier-Journal Building at Third and Liberty Streets, is made up of half a dozen rooms, including reception room, office, and speakers' room, in addition to studio, Radio room, and generator room. This is the center of operations where nightly there is an interesting time among those furnishing the talent. The number of programs leads one into speculative wonder as to how Mr. Harris keeps the microphonists all enthused and coming regularly. He says that about half of the talent is amateur and the other half is professional, including orchestras, bands, performers and teachers. First and last,

there is almost every kind of talent offering that can be used in Radiophony.

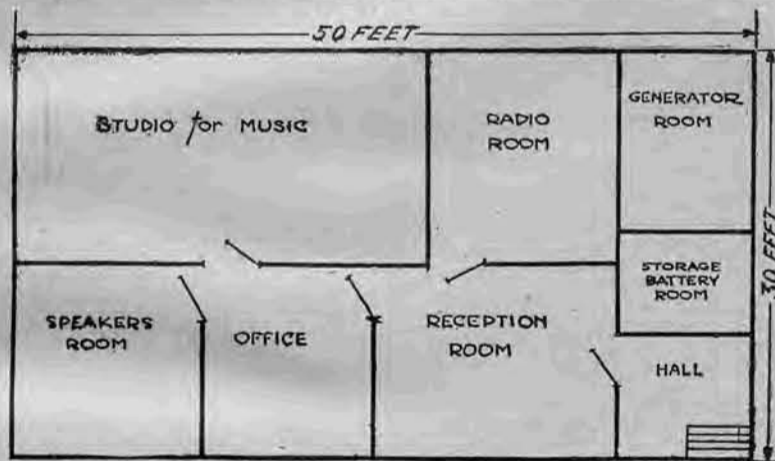
But it is too early yet to get a definite idea of what type of broadcast makes the strongest appeal. In music there is a noticeable trend in the applause toward ballads, medleys, melodies of old-time tunes and songs, which points clearly toward a return to real music.

### Present Program

At present the daily programs, beginning at 4 o'clock in the afternoon, include news and special matter, as well as some concerts and music. The evening program, from 7:30 to 9:00 p. m., Central time, is usually varied and consists of music, reading, recitation and short talks.

In addition to broadcasting by WHAS, the papers maintaining the plant also have a mobile unit local receiving set which is mounted on wheels and makes surprise visits to the towns and communities in the surrounding territory. Sometimes the unit will amuse some picnic in the afternoon and then in the evening will suddenly appear at a neighboring town and get busy at reproducing the evening concerts.

## HOW STATION WHAS IS ARRANGED



This floor plan shows exactly how the Louisville plant is laid out. The entire station is on top the Courier-Journal Building.

## BRYAN DECLARES RADIO WILL SAVE DEMOCRATS

### Party Truths Can Go Through Air, Says Commoner

CHICAGO.—One of the highest tributes ever paid to Radio is that recently given by William Jennings Bryan, who declared that it was the greatest gift Providence had ever presented for the Democratic party.

His basis for this assertion was his belief that the means of dissemination of the party's policies which this medium would afford would ride the party into power in 1924. Hence it can be seen that Mr. Bryan expects more of Radio than prohibition or the League of Nations have been able to accomplish. The great commoner further asserted that the newspapers stood in the way of proper publicity for his party, and that the Radio stations, if impartially employed by their owners, would overcome this obstacle.

The three-time candidate for President has had more experience with broadcasting than any other man in political life, having spoken to some 60,000,000 people already by that method.

Army posts are trying to overcome the principal difficulty in the operation of Radio apparatus on airplanes, the noise produced by the engines driving the plane.

## VERTICAL ANTENNA FOR PLANT IN SKYSCRAPERS

### WCX Waves Penetrate Nearby Steel Structures

DETROIT.—Station WCX, the Detroit Free Press, probably is more peculiarly situated, when it comes to broadcasting than any other station in the country. Surrounded by skyscrapers, it is forced to string its aerial practically straight up, one end being attached to the roof, of a building three times as high as its own. At first, owing to the solid wall of steel and brick on the south, that section of the city had difficulty listening in. This difficulty has recently been remedied, and now the waves are going through the brick and steel walls of the adjoining buildings as easily as if they did not at all exist.

## Second Semi-Annual Show in Pittsburgh This Fall

PITTSBURGH, PA.—The second semi-annual Radio show and exhibition for the Pittsburgh district will be held this fall. Plans are being completed by the American Radio Exhibitors' Association. Large quarters have been obtained as interest in the industry is constantly increasing.

## GOTHAM HOSPITALS MOVE TO GET SETS

### ONE INSTITUTION ALREADY IS EQUIPPED

### Believe Contact with Outside World May Shorten Convalescent Period

NEW YORK, N. Y.—The benefits that Radio can bring to hospital patients of many types are so fully recognized that steps have been taken to install Radio outfits in several New York hospitals. At the Cumberland Hospital, Brooklyn, several sets have been installed at the personal expense of the medical superintendent, Dr. W. F. Jacobs, who declares that "Radio deserves to be ranked with the best mental therapeutic agencies. In fact, for hundreds of cases the Radio telephone can be described as the one best treatment."

At the Bronx Hospital it is said that negotiations for the installation of a receiving set on the roof garden are under way in order that concerts may be given for the convalescent patients. It is also planned to have a receiving station in the wards for those who are bedridden. Head phones will be used in wards where some of the patients might be disturbed by the use of a loud speaker.

### To Use Call System for Radio

At the Manhattan Eye, Ear and Throat Hospital there is an annunciator system with loud speakers in all the wards and corridors for calling the doctors. It is planned now to adjust the loud speaker of a Radio set in front of the main transmitter of the annunciator system, thus distributing throughout the building all Radio programs.

It is pointed out that the average patient in a municipal institution, where visits are usually not more often than once a week, is apt to be discontented, no matter how excellent the medical care, nor how scrupulous the attention to material needs. He feels bored, out of touch with the world, and impatient at delay.

"There is reason to think," says one authority, "that the period of convalescence would actually be shortened by the use of the right sort of Radio equipment."

## London Florist Announces "Flowers Sent by Radio"

LONDON, ENGLAND.—The announcement, "Flowers sent by Radio" is made by a Bond-street, W., firm of florists.

Suppose a young man in London has just remembered that the birthday of his New York fiancée is due the day after tomorrow. He places the order and specifies the flowers she likes. Two days later a bouquet that might have come fresh from his own hands is delivered in New York.

"Altogether we have 2,300 agents," said the manageress of the firm, "and flowers can be delivered in all parts of America and Canada in a few hours. The idea is spreading rapidly in England, though we receive more orders from the other side than we send."

## Italy, Marconi's Country, Backward in Radio Science

ROME, ITALY.—There is apprehension among the more progressive groups of manufacturers in Italy over the attitude of the government toward the development of Radio, particularly broadcasting. It is felt by the manufacturers that the country from whence the wizard Marconi came should lead the world in all activities pertaining to Radio.

# GIVE PLANS FOR 2ND BIG SHOW IN BOSTON

## NEW ENGLAND AMATEURS' MEET COOPERATES

Week of Oct. 30 to Nov. 4 to Be Featured by Exhibits and Lectures

BOSTON, MASS.—Plans are announced for the second Radio Exposition to be held in Boston at the Mechanics' Building. The exposition will be combined with the New England Radio Amateur convention during the week of October 30 to November 4. The convention sessions will be held at the Mechanics' Building during the show. Nearly 5,000 invitations have been sent out to New England amateurs to attend, along with a request to them to boost the exposition, made by F. Clifford Estey, chairman of the New England Executive Radio Council.

November 4 will be "Amateur Day," winding up at night with a meeting of the traffic men and a banquet in the evening. Talbot Hall has been turned over to Sheldon Fairbanks, general manager of the exposition, for the banquet and meetings. The amateurs will have special space at the show and a novel exhibit on the main floor of the building. H. W. Castner has charge of the details of the banquet, and Philip F. Robinson, division manager of the American Relay League, will have charge of the traffic men's meeting. E. B. Dallin is chairman of the committee on publicity.

**Will Schedule Reception**  
Owing to the troubles experienced at the first show, when a dozen or more receiving concerts were going on at once within a few feet of each other, a new method of broadcast reception has been adopted for the show. There will be but one demonstration for the entire hall at one time, and each demonstration will be run on a time schedule, which will give various exhibitors a chance some time through the day and provide an almost continuous broadcast program. All phonograph records are to be barred from the hall, owing to a misconception resulting from their presence at the exposition in May.

One of the important features of interest to the general public will be the Bureau of Radio Information where the public may ask questions of the simplest or "fool" type or the most technical questions on the subject. The names of the various pieces of apparatus, their purpose and the different types of hook-ups will be explained. Persons having difficulty in building sets or getting them in working order will be able to receive advice in solving their problems.

**To Have Educational Lectures**  
Besides the trade and other exhibits, there will be an extensive educational and entertainment program. The educational side will include lectures by leading men in Radio for the novice, motion pictures and other features, under the supervision of O. C. Roos, Fellow of the Institute of Radio Engineers, technical director of the exposition. Other members of the Radio Council will co-operate with him.

There will be broadcasting by the Amrad, Shepard, Eastern Radio Institute and Edwin C. Lewis stations. Theodore McElroy of Somerville, who won the world's Radio receiving championship at the Boston show in May and clinched the title in New York and Chicago, will give demonstrations twice daily in receiving trans-Atlantic and ship-to-shore signals.

## Texas Man Hears Honolulu with Bed Spring Antenna

SAN ANTONIO, TEX.—Bedsprings placed across two chairs and used as an antenna enabled Claiborne De Bona, operating a set for W. E. Milligan at Medina Lake, a summer resort near here, to pick up Honolulu, Hawaii, recently. De Bona is making an affidavit to substantiate the claim.

The set used was a Westinghouse RC receiving set with a Western Electric loud speaker and power amplifier. De Bona claims also to have heard the following stations with bedsprings for an aerial:

Kansas City Star, WDAF, Kansas City, Mo., playing two new songs, "Say It While Dancing" and "All for the Love of Mike"; Iris Theater, WEAY, Houston, Tex., two phonograph records; Western Radio Corporation, KFAF, Denver, Colo., announcing; Atlanta Journal, WSE, Atlanta, Ga., orchestra music; Post-Dispatch, KSD, St. Louis, Mo., man singing; Seattle, Wash., failed to hear call letters, and Honolulu, Hawaii, announcing "This is government station" and a series of numerals.

The music from Houston, 200 miles away; Kansas City, 644 miles away, and St. Louis, 720 miles away, was loud enough for dancing.

MEXICO CITY, MEX.—The installation of small Radio outfits in all lighthouses of the Mexican department of communications is to be given a trial. Two sets are being supplied, after which, if the results are satisfactory, all lighthouses will be similarly equipped.

# Book Reviews

**The New Armstrong Super-Regeneration Receiver, How to Construct and Operate It.** By Kenneth Harkness. An eight-page leaflet, giving six diagrams and seven half-tones of the famous receiving sets and hook-up. Price, 50c.

**Radio Experimenter's Hand Book.** By M. B. Sleeper. This book will help in the selection and construction of simple apparatus for transmission and reception of Radio telegraph and telephone signals. Price, \$1.00.

**Home Radio—How to Make It.** By A. Hyatt Verrill. This book is particularly adapted for the amateur who desires to know how to make Radiophones. Twelve full page illustrations and diagrams. Price, 75c.

**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.

**Radio for the Amateur.** By A. H. Packer and R. R. Haugh. 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.

**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.

**How to Retail Radio.** A new book telling of tested plans and methods and policies for the dealer in Radio. Financing, location, store equipment and arrangement. Price, \$2.

**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 Thermionic 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 vacua. Price, \$5.

The book department of the Radio Digest is prepared to send you any of the books on Radio published, whether listed in our Book Review or not. Let us know what book you want, send us your check and we will see that the book is mailed to you. Postage stamps in payment for books not accepted. Send money order or check. Book Department, Radio Digest Illustrated, 123 W. Madison St., Chicago, Ill.

## Vice-President Named for Radio Corporation

David Sarnoff, 32, Advanced in Organization

NEW YORK.—Edward J. Nally, president of the Radio Corporation of America, announced recently that at a meeting of the board of directors held September 8th, David Sarnoff was elected vice-president and general manager of the corporation.

Mr. Sarnoff is probably one of America's youngest executives, being only thirty-two years old. He has been associated with Radio for more than sixteen years, and with the Radio Corporation of America since its organization. An early exponent of the modern Radio broadcasting idea, Mr. Sarnoff is today considered one of the foremost workers of the Radio industry. His activities have been marked by ever increasing achievements as an executive of unusual ability.

William Brown was elected to the office of vice-president and general attorney. Mr. Brown has been connected with the Radio Corporation of America for a number of years, during which time he has handled many of the important legal matters that have been incidental to rapid growth of this organization.

## Plane Passengers Get Concerts

PARIS, FRANCE.—Broadcast concerts for air passengers have now become an assured fact, as proved by the trip of a commercial passenger airplane from Geneva to Paris recently. The experiment, which had been tried on the Paris-London route with only passable results, was, on this trip, completely successful and satisfactory. The music was sent out by the station at Lausanne, and was heard plainly until the machine struck rain some distance beyond Dijon. From that point, however, music was received from the Bourget.

One of the latest uses for Radio is in connection with the field work of moving picture troops. The director is able to remain in a studio and instruct camera men and players miles away.

# GOVERNMENT RADIO ACTIVITY GROWING

Health and Educational Bureaus Expect to Open Service; Other Departments Act

WASHINGTON.—Since the establishment of the Inter-Departmental Radio Board, Radio activities in several of the governmental departments and bureaus have been increasing rapidly. The Army and Navy are constantly going full tilt and increasing their official and public service almost daily, while the Postoffice with fifteen stations is perfecting Radio-telephone broadcasting and planning control of its cross country air mail planes. The Public Health Service and the Bureau of Education now expect to open broadcasting services for the dissemination of information and educational matter.

A little while ago the Veterans' Bureau began weekly broadcasting of want ads; Secretary Davis wants a labor Radio news service, and the Department of Commerce has just authorized its thirty-three co-operating offices to arrange with local broadcasting stations to release all cable and Radio information on foreign markets in the form of a daily world survey.

Shortly you may expect to hear interesting items on foreign trade and commerce emanating from broadcasting stations at Akron, Atlanta, Baltimore, Boston, Bridgeport, Chattanooga, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Dayton, El Paso, Indianapolis, Los Angeles, Milwaukee, Newark, New Orleans, New York, Norfolk, Omaha, Pensacola, Philadelphia, Pittsburgh, Portland, Richmond, Rochester, San Francisco, St. Louis, Seattle, Syracuse and Manila.

The Inter-Departmental committee which acts on governmental priority in broadcasting, when the Naval stations are used, has before it a large number of requests, as practically every Governmental Department has found Radio beneficial to its operation, if not essential.

## West's Largest Broadcaster Now Operates in Seattle

SEATTLE, WASH.—The west's biggest Radiophone transmitter went into operation September 12 when KFC, the Seattle Post-Intelligencer broadcasting station, inaugurated its fine new 300-watt set. The new set was dedicated with appropriate ceremonies. A splendid musical program and several talks were broadcast.

The new instrument, it is stated, possesses the greatest volume of any on the Pacific coast. It will be heard as far south as the Mexican boundary and beyond the Arctic Circle under favorable atmospheric and geographical conditions, and will have a consistent range of more than a thousand miles.

The new set is contained in a red gum-wood cabinet about five feet high and thirty inches square. It embodies some of the very latest improvements in equipment. Its power comes from ten 50-watt Radiotron tubes, six of which are used as oscillators and four as modulators. The ten tubes are supplied with power from four 50-watt kenitron rectifying tubes. Wonderphone modulation control is used for picking up or conveyance of sound to the instrument. Louis A. Wasmer of Seattle is the manufacturer of the new instrument.

# OHIO STATIONS DRAW UNUSUAL ATTENTION

WCAH and WBAV Strive for Better Programs

COLUMBUS, O.—The two Radio broadcasting stations in central Ohio to attract more than ordinary attention are WCAH, the Entekin Electric Company, and WBAV, the Erner-Hopkins Company, both of this city. The two are doing their utmost to furnish the Radio fans of this part of the state and country with interesting programs and are obtaining the best talent to be found. Both stations are sending out every evening programs of excellent worth and at the present time are spending much time on the broadcasting of musical programs. This variety of entertainment appears to be making the hit of the year throughout central Ohio and in other parts of the country where the stations are heard.

# Phantom-Circuit

**BUILD YOUR OWN.** This marvel of mystery with no aerial, no loop, no ground brings in music instead of static showers. We consistently best results on Magavox from stations 100 miles distant, audible 100 feet from horn. The simplicity of this set will surprise you. No Radio frequency. Complete instructions including photo of circuit sent prepaid for 50c.

VESCO RADIO SHOP, Box 704, Vacaville, Calif.

# "ALL-AMERICAN" Amplifying Transformers

Two years of successful use all over the world guarantees permanent satisfaction. Radio and Audio Frequency. SEND FOR CIRCULARS

RAULAND MANUFACTURING CO. 35 South Dearborn Street Chicago

# Carter "HOLD-TITE" Jacks

1 to 5 Springs Prices 70c to \$1.10

Heavy tapered phosphor-bronze springs; no spacer washers. Write for Bulletin on these Jacks, Carter "TU-WAY" Plugs and other products. CARTER RADIO COMPANY, 209 South State Street, Chicago



Entirely does away with outside antenna and lightning arrester—all for \$2.00. Simply plug into any electric light socket—no current necessary. "ANTENELLA"

## It Simply Has to Work And It Will

At Your Dealer's Otherwise Direct by Mail

CHARLES FRESHMAN COMPANY, Inc. SOLE MANUFACTURERS 290 Hudson St., Dept. D, New York City

# Our METRO JACKS are made in 5 types

- No. 1 Single Circuit Open.....\$0.55
- No. 2 Single Circuit Closed..... .65
- No. 3 Double Circuit Closed..... .85
- No. 4 Four Spring Filament Control .95
- No. 5 Six Spring Filament Control.. 1.15

These "Jacks" have heavy silver contacts, and nickel silver contact springs with high resiliency.

# Our VACUUM TUBE SOCKET No. 24

is made only in the Single Type. It has a moulded base 2 1/4" square x 1/2" thick, with brass tube heavily Nickel Plated. Price.....\$1.00

# Our No. 30 VACUUM TUBE SOCKET

has a fibre base 2 1/4" square x 1/4" thick. Brass tube heavily Nickel Plated. We make the Type 30 Sockets with Double and Triple Bases. The Double Socket with base 4 1/2" x 2 1/4" being listed as No. 31 at \$1.50. The triple Socket with base 6 1/4" x 2 1/4" as No. 32 being listed at.....\$2.25

Attractive proposition for dealers

Metro Electric Manufacturing Company, Inc. 121 PRINCE STREET NEW YORK CITY

# The Radiophonist's Mart

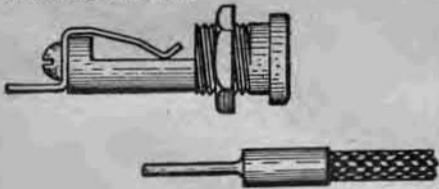
**A**N EXCEEDINGLY attractive little loud speaker designed to give very good results simply by snapping in place of one of the receivers against the mouthpiece of the horn, has been placed on the market. The unit, as illustrated, is known as the Plan-O-Phone and is manufactured by the Planet Radio Corporation of Chicago, Illinois. Good materials and workmanship are found throughout. The horn is mounted on a solid cast base which holds it steady and minimizes outside vibration.



Amplifying Horn for One Receiver

It is designed primarily for use in a small room where the reception is to be made audible to several people at one time without the use of extra head receivers. Due to its reasonable price it will be very popular with the average Radio Fan. A large rubber bushing is used and acts as the mouthpiece of the horn against which the cap of the receiver is held in position by the spring back. This spring has a rubber tip which prevents scratching to the receiver unit. The entire piece of apparatus is bronze plated and presents a very handsome appearance.

**T**ELEPHONE jacks and plugs are an attractive addition to any Radio receiving set, but their cost prevents many an amateur from using same, and a cheaper substitute has long been sought. The jack and plug shown in the illustration are manufactured by the Carter Radio Company of Chicago, Illinois, under the trade name of the "Imp Jack and Plug." The jack replaces unsightly binding posts for phone connections and provides a quick and easy means of making connection in any circuit. It is made of brass, nickel plated, and provided with a phosphor-bronze spring, which insures a positive contact with any standard cord tip. All that is necessary is to drill a 3/16-inch hole in the panel and mount the unit similar to any phone jack. It projects 1 1/4 inches back of the panel and is designed for any thickness of panel up to 5/16 inch. The tip of the brass spring is the terminal for soldering the lead.



Miniature Jack and Plug

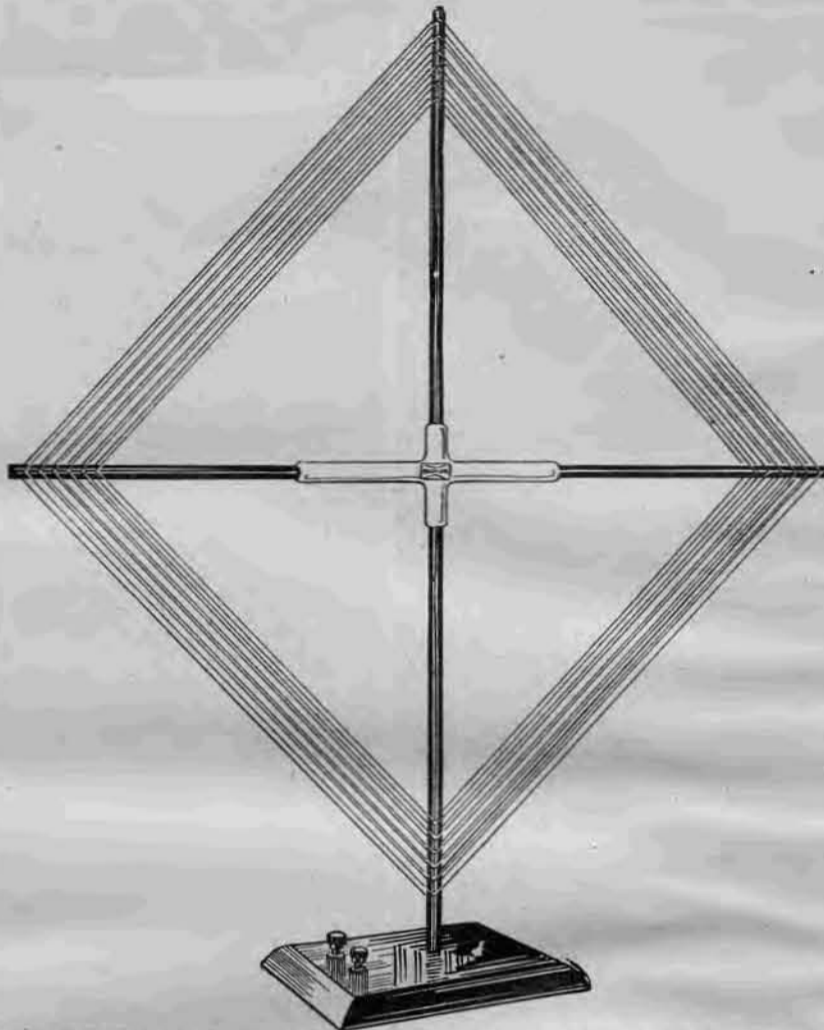
Any of the standard telephone receiver tips can be pushed into the jack, making a sure contact. In such cases, however, where a connection other than the telephones are to be made and the wires are not equipped with tips, a special plug has been designed that it can be easily connected to a tinsel cord or wire without soldering.

When used in conjunction with the jack, the tip provides a quick and easy means of connecting antenna, ground and battery wires. By means of this combination, binding posts can be entirely eliminated, adding considerably to the appearance of any panel set.

## Connecting Up New Sets

When connecting a new, complicated and unfamiliar hook-up it is a wise Radio fan who leaves one B battery terminal open until the last connection has been made. Then by placing most of the filament rheostat in the circuit and cautiously completing the B battery connection any high voltage in the delicate filament will be detected before the tubes are burned out.

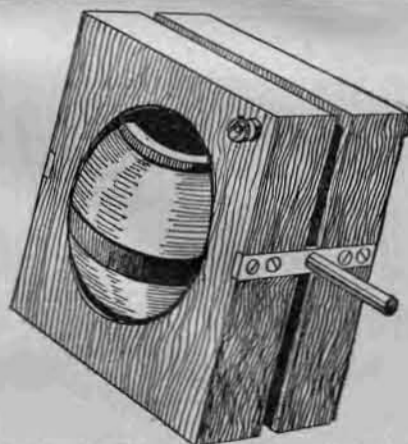
## Radi-Un Loop Has Wires Under Tension



**T**HE LOOP aerial shown in the illustration is manufactured under the trade name of "Radi-un" by the Radio Units Corporation of Chicago, Illinois. It is well designed, low priced, and forms an attractive addition to the Radio set of the fan to whom the use of an outdoor aerial is denied. The wire is wound on both sides of the crosspieces. A novel feature is that the two horizontal crosspieces projecting from each side of the center "X" slide inside of the aluminum casting and have a compression spring in the center. This keeps the two horizontal members in constant pressure against the wires, and does

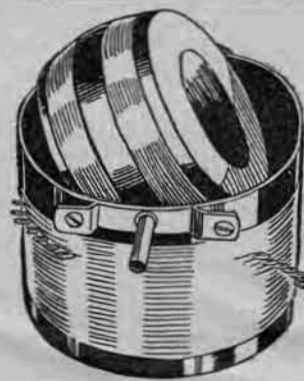
not allow the loop wires to sag or become loose. These crosspieces are lightly made so that a dainty form of frame is obtained, along with a very neat appearance. The two leads run through the base to two binding posts at the bottom. The base has enough surface to avoid any tendency of overbalancing. All wooden parts are finished in a dark red stain, and the aluminum brace in the center is polished brightly. The wire is green silk covered, uniformly wound, and spaced about one-half inch apart. The weight of the entire apparatus is exceptionally low.

## Treat Wood in Variometer and Coupler



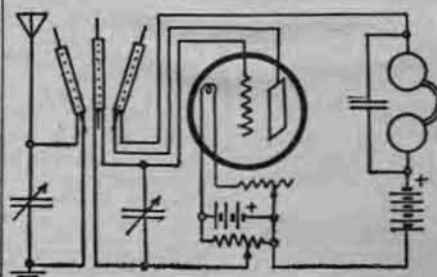
**T**HE VARIOMETER shown in the illustration is of the wooden type and has some rather efficient features. The range has been tested and covers from 150 to 500 meters. Stators and rotors are made of specially treated mahogany so that they are practically impervious to atmospheric conditions. The bearings for the rotor shaft are adjustable so that any amount of tension can be controlled, preventing the tendency of the dial to swing after an adjustment has been made.

The variocoupler is wound on a primary tube of high grade fiber with green silk covered wire and is provided with taps for both rough and fine adjustment covering a range of 150 to 800 meters. The secondary rotor is also wound with green silk covered wire. As in the variometers, the bearings are adjustable and have a self-cleaning and constant contact feature. The shafts in both instruments are one-quarter inch in diameter. Both units are adapted to panel mounting.



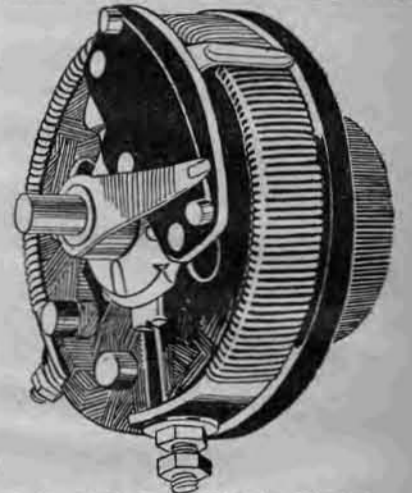
## Spider Web Coil Circuit

In Vol. II, No. 8, September 2 issue of RADIO DIGEST, a hook-up was given on page 12 together with the description of



home-made spider web coils. The diagram was incomplete as it didn't show the connection for the A battery. Herewith is a completed diagram.

**V**ERNIER rheostats are constantly being placed on the market but the one illustrated presents a new and interesting method of solving the problem. It is manufactured under the name of "Micrometer Adjustment Rheostat" by the Howard Radio Company of Chicago, Illinois. Its simplicity in construction will appeal to many amateurs. The micrometer adjustment is obtained by an attachment which is carried along with the main adjustment control and comes into operation whenever the desired adjustment



One Knob Control Vernier Rheostat

is necessitated on the main control. This construction eliminates the necessity of double knobs.

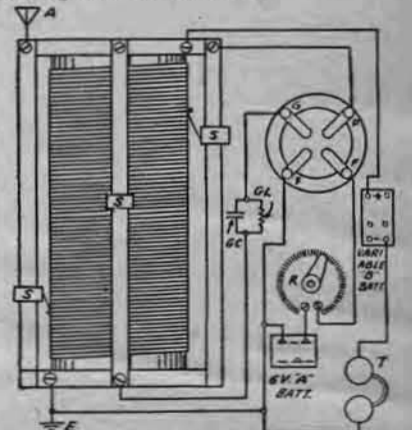
A delicate balance so necessary for most efficient operation of gas content tubes is obtained instantaneously with the greatest of ease. The wire used has nearly a zero temperature co-efficient making the adjustments very stable and constant. The resistance of the micrometer control wire is equal to that of about three turns on the main rheostat.

The total resistance is seven ohms, and the wire used will carry one and one-half amperes of continuous current. The micrometer attachment can be purchased separately and attached in a few moments time to any of the rheostats manufactured by the company.

## Regeneration on Tuning Coil

The old standard three-slide tuning coil has long been recognized by the early Radio experimenters as a general utility coil. Its uses in Radio work are many and varied. In series with the aerial it becomes an efficient loading coil. Bridged across the ground condenser it answers the purposes of a variable static leak and conductively coupled inductance filter. We are also more or less familiar with its merits as a stand-by and selective tuner for crystal detectors, particularly galena.

The flexibility of the three-slide tuning coil also adapts itself to the vacuum tube detector. The diagram shows a V. T. regenerative hook-up, which is in reality a receiving auto-transformer.



THREE SLIDE TUNING COIL AND REGENERATIVE CIRCUIT

Resonance and wave length is regulated by the relative position of the three slides to one another and to the ground; coupling, by the number of turns in common with the aerial and ground, and grid and ground. It will be seen that a tight or direct coupling as well as a loose or selective conductive coupling is possible.

Since the grid and plate are tuned to resonance, the auto tickler repeats the oscillations back upon the grid. The plate's inductance and auto-inductive relation to the grid may be adjusted to precision, thus insuring regeneration without howl or distortions but with maximum amplification.—S. K. Culbertson, South Chicago, Ill.

## When a Horn Can Be Used

The use of a horn in connection with the telephone receivers generally does not give good results unless the signal can be heard well at least one or two feet from the telephones without use of the horn.

# Radiophone Broadcasting Stations

Corrected Every Week.

## CONTENTS AND HOW BEST TO USE—

THE STATION schedules, given below, are listed alphabetically by call letters. Following the call is given the city and state, the wave length (PROVIDING a wave length other than 360 meters is used), the miles range of the station, the owner of the station, the schedule of operating hours, and the kind of time used.

The state, city and call list given following the station schedule list is merely an index. One wishing to find the calls of the stations in his vicinity, will find this index useful. All licensed broadcasting stations in operation are given in the index, while only those which have made special reports to RADIO DIGEST, are given in the station schedule list.

## Station Schedules

**AGI**, Presidio of San Francisco, Cal. 50 mi. Signal Corps. U. S. A. Sun, 7-9 pm, instruction. Pacific.

**AS6**, San Antonio, Tex. 480 only. Camp Travis, U. S. Army. Tues, 7:30-8:30 pm. Thurs, 8:30-9:30 pm. Central.

**CFCA**, Toronto, Canada. 400 only. 500 mi. Toronto Star. Daily ex Sun, 7-7:30 pm, baseball, stocks, concert. Tues, Fri, 8:30-9:30 pm, concert, address. Eastern.

**CFGB**, Vancouver, Canada. 440 only. 500 mi. Daily Province. Daily ex Sun, 8:30-9:30 pm, news, weather, concert. Pacific, daylight saving.

**CFOF**, Montreal, Can. 440 only. 200 mi. Marconi Co. Daily, 1-1:30 pm, concert. Mon, Thurs, 8-8 pm, concert. Eastern. Daylight Saving.

**CHBC**, Calgary, Canada. 410 only. 1,000 mi. W. W. Grant Radio Ltd. (Morning Alberta.) Daily, 8:45-10 pm, news, stock quotations, music. Mountain.

**CHCB**, Toronto, Canada. 440 only. 500 mi. Marconi Co. Tues, 8-10 pm, concert. Eastern.

**CHCC**, Calgary, Canada. 400 only. 200 mi. Western Radio Co. (Calgary Herald.) Daily ex Sun, 3:30-4:30 pm, music, news, baseball; 7:45-8:45, music, etc. Sun, 7:45-8:45 pm, church service. Mountain.

**CHVC**, Toronto, Canada. 410 only. 200 mi. Metropolitan Motors Co. Daily ex Sat and Sun, 5-5:30 pm, news, concert. Eastern.

**CIBC**, Montreal, P. Q., Can. 290 and 420, 40 mi. Dupuis Freres. Wed, Fri, 9-10 pm or 8-9, music etc. Eastern.

**CJCA**, Edmonton, Canada. 450 only. 500 mi. Edmonton Journal Ltd. Daily ex Sun, every evening, music, bedtime story, news, weather, markets, etc.

**CJCD**, Toronto, Canada. 410 only. 200 mi. T. Eaton Co. Daily ex Sat and Sun, 4-4:30 pm, concert. Sat, 12-12:30 pm, concert. Eastern.

**CJCF**, Kitchener, Ont., Can. 430 only. 100 mi. News Record Limited. Mon, Tues, Fri, Sat, 9-9:30 pm. Thurs, 8 pm on, concert. Eastern.

**CJGG**, Winnipeg, Canada. 410 only. 1,000 mi. Manitoba Free Press. Daily ex Sun, 10-10:30 am, news, 12-1 pm, reports. Mon, Thurs, 8-10 pm, concert, Tues, 7-8 pm, music, Fri, 5:30-6:45 pm, music. Sun, 8-8:30 pm, every other week starting August 20, Central.

**CJNC**, Winnipeg, Man., Can. 400 only. 500 mi. Winnipeg Tribune. Daily ex Sun, 9:30-10 am, 1-2 pm, Mon, 5-6:45 pm. Tues, Fri, 8-10 pm. Thurs, 9-10 am, 7-8 pm. Sun, alternating, starting Aug. 27, 8-10 pm, Central.

**CKAC**, Montreal, P. Q., Can. 430 only. 2,000 mi. La Presse Pub. Co. Daily 9 am to 11 pm at intervals. Eastern.

**CKCK**, Regina, Sask., Can. 420 only. 1,500 mi. Leader Pub. Co. Daily ex Sun, 10-10:30 am, news; 1:15-2 pm, markets, news, music. Mon, Wed, Thurs, 7:30-8:15 pm, sports, music. Tues, Fri, 7:30-9 pm, concert. Mountain.

**CKH**, St. John, N. B., Can. 400 only. 150 mi. Jones Electric Radio, Ltd. Daily, 9-10 pm, 60th meridian.

**DD5**, Denver, Colo. 340 only. 200 mi. Fitzsimmons General Hospital. Daily ex Sun, 8:15 pm, weather, news, concert. Thurs, 8:15-9:30 pm, special concert, speech. Mountain.

**DM7**, San Antonio, Tex. Brooks Field, U. S. Army. Daily ex Sun, 7-7:30 pm, music. Sun, 7:30-8 pm, music. Central.

**DN4**, Denver, Colo. 340 only. 200 mi. Colorado National Guard. Daily ex Sun, 8:15 pm, weather, news, concert. Thurs, 8:15-9:30 pm, special concert, speech. Mountain.

**KDKA**, Pittsburgh, Pa. 1,000 mi. Westinghouse Elec. Co. Daily ex Sun, 10-10:15 am, 12:30-1 pm, 2-2:20, 4-4:20, music; 7:30, bedtime story; 7:45, news; 8:30-9:30, music, news. Sat, 3-4 pm, concert. Sun, 10:35 am, 3 pm and 7:30, church service. Eastern.

**KDN**, San Francisco, Cal. 485 also. 250 mi. Leo J. Meyberg Co. Daily ex Sun, 11-12 am, 1-2 pm, 4:30-5:30, concert; 7-7:15, weather; 8:30-9, concert. Sat, nothing after 5:30 pm. Sun, 10-11 am, sacred concert, Pacific.

**KDPT**, San Diego, Calif. 250 mi. Southern Elec. Co. Daily 7:30-9 pm, news, weather, concerts, lecture. Pacific.

**KDL**, Salt Lake City, U. 485 also. 300 mi. Salt Lake Telegram. Daily ex Sun, 7-8 pm, music, baseball, news, weather; 9-9:30 (occasionally), Sun, 2-3 pm, church service. Mountain.

**KDVS**, Great Falls, Mont. 200 mi. Tribune. Wed, 8-10 pm, bedtime story, concert. Sun, 4 pm, church service. Mountain.

**KDXX**, Honolulu, Hawaii. 750 mi. Star-Bulletin. Daily ex Sun, 12:15-1:15 pm, stocks, markets, business news; 6:30-7:30, concert, lecture. Sun, 11-12 am, church service; 4-6 pm, concert, lectures. Honolulu.

**KDZE**, Seattle, Wash. 300 mi. The Rhodes Co. Daily ex Sun, 3:30-4:15 pm. Mon, Wed, Fri, 7:15-8:15 pm. Pacific.

**KDZH**, Fresno, Calif. 50 mi. The Herald-Buford Co. Daily ex Sun, 4-5 pm, news, sports, music. Mon, Wed, Thurs, Sat, Sun, 7-8 pm, music. Tues, 8-9 pm, music. Fri, 8-8:30 pm, music. Sun, 10-11 am, sermon. Pacific.

**KDZO**, Denver, Colo. 100 mi. Moore-Bird Radio Co. Mon, Wed, 8:15-9:30 pm, concert. Mountain.

**KDZZ**, Everett, Wash. 100 mi. Kinney Bros. & Stephens. Daily ex Sun, 2:30-3:30 pm, 8-9:30 pm. Pacific.

**KFAC**, Glendale, Calif. 355 and 485. 250 mi. Daily Press. Daily ex Sun, 4:15-5:15 pm, news etc. Mon, Wed, Fri, 7-8 pm, concert. Pacific.

**KFAD**, Phoenix, Ariz. 485 also. 100 mi. Mon, Wed, Fri, 8-15 pm, concert, weather, stocks, market. Sun, morning, church service. Mountain.

**KFAE**, Pullman, Wash. 200 mi. State College of Wash. Program irregular.

**KFAF**, Denver, Colo. 1,800 mi. Western Radio Corp. Mon, Tues, Wed, Fri, Sat, 8-9 pm, music, news, etc. Mountain.

**KFAU**, Boise, Idaho. 485 also. 400 mi. Boise High School. Daily ex Sun, 8-8:10 am, markets; 9:30-9:35, weather; 9:35-10, news, lecture; 12:15-12:30 pm, 1:20-1:30 and 2-2:10, markets; 8:15-9, music. Sun, 8:30 pm, weather. Mountain.

**KFBC**, San Diego, Cal. 150 mi. W. K. Azbill. Thurs, Sun, 7:30-8:30 pm. Pacific.

**KFBD**, Hanford, Calif. 100 mi. Calif. Radio Lab. Daily ex Sun, 3-4 pm, 8-9, Sun, 5-6 pm. Pacific.

**KFBE**, San Luis Obispo, Calif. 50 mi. Clino's Elec. Shop. Daily ex Sun, 4-5 pm. Tues, Fri, 7-8 pm. Sun, 10-11 am. Pacific.

**KFC**, Seattle, Wash. 700 mi. Northern Radio & Electric Co. Daily, eight hours, miscellaneous. Pacific.

**KFI**, Los Angeles, Calif. 200 mi. Earle C. Anthony, Inc. Daily, 1:45-2:30 pm, music, news; 4:30-5, news. Sun, 10:45-11:30 am, 4-5 pm. Pacific.

**KFZ**, Spokane, Wash. 300 mi. Doerr Mitchell Elec. Co. Daily ex Sun, 7:30-9:30 pm, concerts and voice. Pacific.

**KGB**, Tacoma, Wash. 200 mi. Wm. A. Mullins Elec. Co. (Tacoma Ledger.) Daily, 4-5 pm. 7:30-9:30. Pacific.

**KGC**, Hollywood, Cal. 300 mi. Elec. Lighting Supply Co. Tues, Thurs, Sat, 7:30-8 pm, concert. Pacific.

**KGF**, Pomona, Cal. 150 mi. Pomona Fixture & Wiring Co. Thurs, 7:30-8:15 pm, news, markets, concert. Mountain.

**KGG**, Portland, Ore. 500 mi. Hallock & Watson Radio Service. Daily ex Sun, 4:30-6 and 7-7:30 pm, baseball scores, markets, news. Sat, 9:10 pm, instruction. Sun, 4:30-6 pm. Pacific.

**KGN**, Portland, Ore. 500 mi. Northwestern Radio Mfg. Co. Daily, 12-1 pm, concert, lecture; 2:30-3:30, miscellaneous. Mon, Fri, Sun, 9-10 pm, health bulletin, concert. Tues, 7-7:30 pm, miscellaneous; 8-9, concert. Wed, Thurs, Fri, Sat, 7-7:30 pm, miscellaneous. Pacific.

**KGO**, Altadena, Calif. 300 mi. Altadena Radio Lab. Daily, 1-2 pm, 6-7. Pacific.

**KGU**, Honolulu, Hawaii. 485 also. 150 mi. The Honolulu Advertiser. Daily, 7:30-9 pm. Tues, Thurs, Sat, special program, 150th meridian. (Three hours later than Pacific.)

**KGW**, Portland, Ore. 200 mi. Ship Owners Radio Service Inc. (Daily Oregonian.) Daily, 3:30-4:30 pm, news etc. Mon, 7:30-8:30 pm, concert. Wed, 8-10 pm, concert. Fri, 8-9 pm, concert. Sun, 7-8 pm, church service. Pacific.

**KGY**, Lacey, Wash. 100 mi. St. Martins College. Tues, Fri, Sun, 8:30-9:30 pm, concert, news. Pacific.

**KHD**, Colorado Springs, Colo. 200; 485 meters only. Daily except Sun, 8:15 am, weather, forestry bulletins, etc. Mountain.

**KHJ**, Los Angeles, Calif. 485 also. 50 mi. C. B. Kierulf & Co. (Los Angeles Times) Daily ex Sat and Sun, 1-1:45 pm, 7:15-8, concert, lecture, news. Pacific.

**KJC**, Los Angeles, Calif. 100 mi. Standard Radio Co. Backer Bros. Daily ex Sun, 11:30-12 noon, Mon, 10-11 am, Wed, 9-10 am, Sun, 1-2 pm, 5-6. Pacific.

**KJJ**, Sunnyvale, Cal. 1,000 mi. The Radio Shop. Tues, 8:15-9 pm, concert. Fri, 7:30-8:15 pm, concert. Pacific.

**KJR**, Seattle, Wash. 200 mi. Northwest Radio Service Co. Daily ex Sun, 8-9 pm, miscellaneous. Pacific.

**KJS**, Los Angeles, Calif. 100 mi. Bible Inst. of Los Angeles. Tues, Wed, 12-12:30 pm, sacred music, lecture. Sun, 11:30-12:30 pm, sacred music, sermon. Pacific.

**KLB**, Pasadena, Cal. 300 mi. J. J. Dunn Co. Mon and Fri, 7:30-8:15 pm, concert. Tues, 3-4 pm and 8-9, concert. Pacific.

**KLN**, Monterey, Cal. 150 mi. Noggle Electric Works. Daily, 12-1 pm, weather, markets, news; 7-8 pm, concert. Pacific.

**KLP**, Los Altos, Cal. 1,500 mi. Colin B. Kennedy Co. Mon, 7:30-8:30 pm, industrial news, concert. Tues, 8:30-9 pm, concert. Sun, 4-5 pm, concert. Pacific.

**KLS**, Oakland, Cal. 150 mi. Warner Bros. Daily 12-1 pm, Denver. Sat, 7:30-8:15 pm, concert. Pacific.

**KLZ**, Denver, Colo. 485 also. 200 mi. Reynolds Radio Co. Daily ex Sun, 7:30 pm on, news, markets, bedtime story, concert. Sun, 8-9 pm, church service. Mountain.

**KMC**, Redley, Calif. 100 mi. Lindsay-Weatherill & Co. Mon, Wed, Fri, 8:30-9 pm, concert. Pacific.

**KMO**, Tacoma, Wash. 200 mi. Tacoma Times. (Love Electric Co.) Daily ex Sun, 11-11 pm, 6-7, 9:15-10, concert, news, lecture. Pacific.

**KNJ**, Roswell, N. M. 300 mi. Roswell Public Service Co. Daily ex Sun, 7-9 pm, weather, financial, markets, news. Sun, 7-9 pm, church service. Mountain.

**KNN**, Los Angeles, Calif. 100 mi. Bullock's. Standard Radio Co. Tues, Thurs, Fri, 10-11 am. Pacific.

**KNT**, Aberdeen, Wash. 400 mi. Grays Harbor Radio Co. Daily, 5-5:30 pm, 7:30-8:15, news, concert. Pacific.

**KOG**, Los Angeles, Calif. 800 mi. Western Radio Elec. Co. (Evening Herald.) Daily, 12:15-12:30 pm, markets; 5-5:30, news. Tues, Wed, Fri, 8:15-9 pm, concert. Pacific.

**KON**, Los Angeles, Calif. 200 mi. Holzwasser Inc. Daily ex Sun, 4-5 pm and 8:15-9, concert, news. Sun, 10-11 am, 4-5 pm and 8:15-9, church service. Pacific.

**KOP**, Hood River, Ore. 300 mi. Hood River News. Daily ex Sun, 7 pm, markets, news. Tues, Fri, 8:30-9:15 pm, concert. Sun, 9-9:45 pm, concert. Pacific.

**KOV**, Pittsburgh, Pa. 100 mi. Doubleday-Hill Elec. Co. Daily ex Sat and Sun, 12-12:30 pm, 2:30-3 pm. Mon, Wed, Fri, 10-11 pm, Sat, 12-12:30 pm. Sun, 1-5 pm, Eastern, daylight saving.

**KQW**, San Jose, Cal. 200 mi. Chas. D. Herrold. Daily, 1-1:30 pm, Wed, 8:15-9 pm, concert. Pacific.

**KQY**, Portland, Ore. 100 mi. Stubbs Elec. Co. Daily, 1-2 pm, 6-7, miscellaneous. Pacific.

**KRE**, Berkeley, Cal. 100 mi. Maxwell Elec. Co. Sun, 1-2 pm, 6-7 pm, concert. Pacific.

**KSD**, St. Louis, Mo. 400 and 485 only. 1,500 mi. Post-Dispatch. Daily ex Sun, 8:40 am, 9:40, 10:40, 11:40, 12:40 pm, 2:40, markets, stocks, bonds, weather, news; 4, music news; 8, concert, etc. Sun, 8:15 pm, baseball. Central.

**KSL**, San Francisco, Cal. 50 mi. The Emporium. Daily ex Sun, 10-11 am, concert, news; 2-3 pm, concert, educational talk. Sun, 2-3 pm, concert and educational talk. Pacific.

**KSS**, Long Beach, Calif. 25 mi. Prest & Dean Radio Research Lab. Daily ex Sun, 3:30-4:30 pm, news, concert. Pacific.

**KTW**, Seattle, Wash. 200 mi. First Presbyterian Church. Sun, 11-11 pm, 7:30-10, church service. Pacific.

**KUO**, San Francisco, Cal. 1,500 mi. San Francisco Examiner. Daily ex Sun, 3-3:50 pm, and 5:30-6:45, news, etc. Sun, 5-6 pm, news, etc. Pacific.

**KUY**, El Monte, Calif. 500 mi. Coast Radio Co. Daily ex Sun, 4-4:45 pm, lecture, concert. Mon, 8-9 pm, lecture, concert. Thurs, 8-9 pm, concert. Pacific.

**KVQ**, Sacramento, Cal. 1,000 mi. J. C. Hobrecht (Sacramento Bee). Daily ex Sun, 5:30-6:30 pm, concert, news, markets, weather. Wed and Sat, 3-9 pm, concert. Sun, 5-7 pm, concert. Pacific.

**KWG**, Stockton, Cal. 1,500 mi. Portable Wireless Telephone Co. Daily ex Sun, 4-5 pm, news, concert, markets. Tues and Fri, 8-9 pm, concert. Sun, 2-3 pm, concert. Pacific.

**KWH**, Los Angeles, Calif. 485 also. 300 mi. Examiner. Daily ex Sat, 12:30 pm, music, news, crop reports. Daily, 5:30-6:30 pm, music, news. Sunday, 2-3 pm, concert. Pacific.

**KYG**, Portland, Ore. 100 mi. W. P. Hawley, Jr. Tues, Thurs, 9-10 pm, concert. Sat, 8-9 pm, concert. Pacific.

**KYJ**, Los Angeles, Cal. 1,000 mi. Leo J. Meyberg Co. (Hamburget). Daily ex Sun, 4-5 pm, concert, markets, weather, news. Mon, Thurs, Sat, 8-9 pm, same program. Pacific.

**KYW**, Chicago, Ill. 485 also. 1,500 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 9:35 am-1:20 pm, market quotations every half hr; 2:15, news, markets; 3, baseball; 4:15 and 6:30, news, final markets and stocks; 7:30, baseball, bedtime story; 7:45, feature; 8-9, concert; 9, news. Sun, 3:30 pm, church service. Central, daylight saving.

**KZC**, Seattle, Wash. 50 mi. Public Market & Dept. Store Co. Daily ex Sun, 6:45-7:15 pm, prices of foodstuffs. Pacific.

**KZM**, Oakland, Cal. 200 mi. Preston D. Allen. Daily ex Sun, 7:15-7:30 pm, news. Tues, 7:30-8:15 pm, concert. Fri, 8:15-9 pm, concert. Pacific.

**KZN**, Salt Lake City, U. 485 also. 1,000 mi. Deseret news. Daily ex Sun, 3-4 pm, weather, markets, music; 8-9, news, concert. Mountain.

**KZY**, San Francisco, Cal. 1,500 mi. Atlantic Pacific Radio Supplies Co. Daily ex Sun, 3:30-4:30 pm, concert; 8:45-9, news. Wed, 7:30-8:15 pm, concert. Sat, 8:15-9 pm, concert. Sun, 11-12:15 pm, church service; 3-4 pm, concert. Pacific.

**WAAG**, Shreveport, La. 50 mi. Bordeaux Co. Daily ex Sun, 7:30-9 pm, baseball, concert. Central.

**WAAH**, St. Paul, Minn. Commonwealth Elec. Co. 100 mi. Daily ex Sun, 11-11:30 am, 2-2:30 pm, 9-9:20. Central.

**WAJ**, Boston, Mass. 50 mi. Eastern Radio Inst. Mon, Wed, Fri, 9-10 pm, concert. Eastern.

**WAJK**, Milwaukee, Wis. 485 also. 300 mi. Gimbel Bros. Daily ex Sun, 10 am, markets, weather; 11, markets; 12:10 pm, markets; 1:25, closing markets; 2, and every hr. after, concert, test; 7, weather; 7:15, baseball; 7:30, concert. Central.

**WAOD**, Charleston, W. Va. 40 mi. Radio Service Co. Daily ex Sun, 6:45-7:45 pm, music, news, weather, baseball. Eastern.

**WAAP**, Wichita, Kan. 200 mi. United Elec. Co. Daily, 12-1:30 pm, music, news; 5, weather; 7:15-7:30, sports, markets; 9:45-12, talks, music, and code on C. W. 10:30, weather. Tues, Fri, 8 pm on, concert, etc. Central.

**WAQ**, Greenwich, Conn. 600 mi. New England Motor Sales Co. Daily ex Sun, 9:30 am-5:30 pm, every half hr. Eastern, daylight saving.

**WAAT**, Jersey City, N. J. 70 mi. Jersey Review. Wed, 7-8 pm, concert, lecture. Sun, 7-8, church service, concert. Eastern.

**WAAV**, Athens, O. 500 mi. Athens Radio Co. Daily, 7-9 pm, miscellaneous. Central.

**WAAW**, Omaha, Nebr. 100 mi. 485 also. Omaha Grain Exchange. Daily ex Sun, 8:45 am, 9:45, 10:45, 11:45, 12:30 pm, 8, markets. Central.

**WAAY**, Youngstown, O. 300 mi. Yoehring Rayner Music Co. Tues, Thurs, Sat, 5:45 pm, baseball, news; 7:30, music; 8-9, address, music. Eastern.

**WAAZ**, Emporia, Kan. 250 mi. Hollister-Miller Motor Co. Daily ex Sun, 8:45-12:15 pm, market quotations every half hr; 7-8 pm, concert, weather. Sun, church service, 2 pm. Central.

**WBAA**, W. Lafayette, Ind. 100 mi. Purdue University. Fri, 12:15-8:30 pm, educational lecture. Other features irregular. Central.

**WBAB**, Syracuse, N. Y. 1,000 mi. Andrew J. Potter. Daily ex Sun, 7-8 pm, concert, baseball, weather, news, bedtime story. Sun, 6:30-7:30 pm, church service, etc. Eastern.

**WBAG**, Bridgeport, Pa. 485 also. 300 mi. Diamond State Fibre Co. Daily ex Sun, 10:45-11:15 am, weather, markets. Eastern.

**WBAN**, Minneapolis, Minn. The Dayton Co. 100 mi. Daily ex Sun, 1-1:30 pm, 3-3:20, 5-5:20, 9:20-9:40. Central.

**WBAJ**, Toledo, O. 450 also. 500 mi. Marshall-Gerken Co. Tues, Thurs, Sat, 6:30-7 pm, news, bedtime story; 8-9 pm, concert. Eastern.

**WBAM**, New Orleans, La. 100 mi. I. B. Rennyson. Daily ex Sun, 10-11 pm, real estate bulletins, lecture, concert. Central.

**WBAN**, Paterson, N. J. 100 mi. Wireless Phone Corp. Daily, 10:30 pm, on the hour to 9:30 pm, concert, baseball. Eastern.

**WBAP**, Fort Worth, Tex. 485 also. 100 mi. Star Telegram. Daily ex Sun, 8:45-9 am, opening markets; 11-11:30, weather, markets; 1:30-2 pm, closing markets; 3:45-4, news, road conditions; 5:15-5:30, police; 6:30-6:45, baseball, police news; 9:30-10, music. Sun, 11-12:15 pm, church service; 2-2:30 pm, sermonette; 3:30-4, concert; 6:45-7 baseball. Central.

**WBAQ**, South Bend, Ind. 100 mi. Myron L. Harmon. Daily, 5:30-6 pm, news, concert; 8 pm, concert, news, police reports. Sun, 3:30 pm, church services. Central.

**WBAY**, Columbus, O. 485 also. 200 mi. Erner & Hopkins Co. Daily ex Sun, 5:30-7:30 pm. Central.

**WBAX**, Wilkes-Barre, Pa. 200 mi. John H. Stenger, Jr. Three nights of week, not regular.

**WBAY**, New York, N. Y. 400 only. 1,500 mi. A. T. & T. Co. Daily, 11-12 am, 4:30-5:30 pm. Thurs, 7:30 pm on Eastern daylight saving.

**WBZ**, Richmond, Va. 300 mi. Times-Dispatch. Daily, 8 pm, news, concert, markets, etc. Eastern.

**WBL**, Anthony, Kan. 800 mi. T. & H. Radio Co. Daily ex Sun, 8:30 am, 9:50, 10:30 and 1:15 pm. Kansas City train markets; 1:15, roads, local markets; 7-8, concert, etc. Sun, 4-5, concert. Central.

**WBT**, Charlotte, N. C. 485 also. 500 mi. Southern Radio corp. Daily ex Sun, 11 am, weather; 8 pm, baseball, markets. Mon, Wed, Fri, 8:30-9:30 pm, concert. Sun, 11 am, 8 pm, church service. Eastern.

**WBZ**, Springfield, Mass. 500 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 7:30 pm, children's hour; 7:45, markets, weather, news; 8-9, concert. Sun, 3 and 8, church service. Eastern.

**WCAB**, Newburgh, N. Y. 100 mi. Newburgh Daily News. Daily ex Sun, on half hour 12:30-6:30 pm, news, sports, concert; 10:30-11 pm, concert, feature. Eastern, daylight saving.

**WAC**, Fort Smith, Ark. 500 mi. John Fluk Jewelry Co. Fri, Sun, 8-10 pm, music, talks, sermon. Central.

**WCAH**, Columbus, O. 300 mi. Entreklin Elec. Co. Tues, Fri, 7-8 pm, concert, bedtime stories. Sat, 3-4 pm, lecture, music. Central.

**WCAK**, Houston, Tex. 200 mi. A. P. Daniel. Daily ex Sun, 7:15 pm, news etc. Wed, Sat, 8-9 pm, concert. Sun, 4-4 pm, concert. Central.

**WCAL**, Northfield, Minn. 400 mi. St. Olaf College. Fri, 9:15-10 pm, concert, lecture, news. Sun, 8:30-9:30 pm, chapel, music. Central.

**WCAR**, San Antonio, Tex. 500 mi. Alamo Radio Elec. Co. Daily ex Sun and Thurs, 8:30-9:30 pm, music. Thurs, 9:30-10:30 pm, music. Sun, 2:30-3:30 pm, church service. Central.

**WCAQ**, DeFiance, O. 200 mi. Tri-State Radio Mfg. Co. Daily, 11:30-12:30 pm, 3, baseball; 6-6:30, baseball, concert; 8, special program. Central.

**WCAT**, Rapid City, S. D. 385 only. 100 mi. S. D. State School of Mines. Daily ex Sun, 9:30 am, weather; 8:30 pm, storm warnings. Central.

**WCAW**, Quincy, Ill. 200 mi. Quincy Elec. Sup. Co. (Quincy Herald.) Daily ex Sun, 8:45 am, markets; 11, markets; 1 pm, markets; 5, music, baseball. Tues, Wed, Thurs, Sat, 8:30-9:45 pm, concert. Sun, 6:30-7:30 pm, religious. Central.

**WCB**, St. Louis, Mo. 485 also. 50 mi. Stix Baer & Fuller (Grand Leader). Mon, Wed, Fri, 6:45-8 pm, concert, lecture, bedtime story. Central.

**WCN**, Worcester, Mass. 485 also. 100 mi. Clark Univ. Daily, 11:15 am, 5:15 pm, weather. Evening program irregular. Eastern.

**WDB**, Portsmouth, O. 100 mi. H. C. Summers & Son. Daily, Wed, Sat, 2-2:45 pm, 8:30-9:30 pm, concert. Sun, 2-2:45 pm, church service. Central.

**WDAE**, Tampa, Fla. 485 also. 750 mi. Tampa Daily Times. Wed, Fri, 8-10 pm, concert, Spanish and English. Eastern.

**WDAF**, Kansas City, Mo. 500 mi. Kansas City Star. Daily ex Sat and Sun, 3 pm and quarter hours after. baseball. Mon, Wed, Fri, 7:30, news, concert. Central.

**WDAH**, El Paso, Tex. 500 mi. Mine & Smelter Supply Co. Tues, Thurs, Sat, 7:30-8:30 pm, concert. Mountain.

**WDAJ**, College Park, Ga. 300 mi. A. & W. P. R. Co. Daily, 9-10 pm, concert. etc. Central.

**WDAK**, Hartford, Conn. 150 mi. Hartford Courant. Daily ex Sun, 1:30 pm, 2:30, 3:30, 4:30, 6:45. Mon, Wed, Sat, 7:15-8:45 pm, concert. Sun, 3:30 and 7 pm. Eastern.

**WDAL**, Jacksonville, Fla. 485 also. Times-Union. Daily ex Sun, 3:30-4:15, 4-4:15, 5-5:15, 6-6:15, baseball, markets, weather; 8-9:50, general. Eastern.

**WDAP**, Chicago, Ill. 485 also. 1,000 mi. Midwest Radio Central, Inc. Daily ex Sat and Sun, 9:45 am, 10:45, 11:45, 1:45 pm, 3:15, foreign exchange; 3:17, closing Chicago stocks. Sat, 9:45 am, 10:45, 11:45, 12:45 pm, foreign exchange; 12:47, closing Chicago stocks. Sun, 8:30-10:30, concert. Central, daylight saving.

**WDAQ**, Brownsville, Pa. 200 mi. Hartman-Riker Elec. & Mach. Co. Daily ex Sun, 10:30-10:50 am, music; 12:50-1:10 pm, music, news, weather; 5:05-5:30 music. Tues, Thurs, Fri, 9:15-10 pm, concert. Sun, 5 pm, chapel. Eastern.

**WDAU**, New Bedford, Mass. 60 mi. Slocum & Kilburn. Mon, Wed, 7-9 pm, concert etc. Eastern, daylight saving.

**WDAA**, Atlanta, Ga. 485 also. 500 mi. Georgia Ry. & Power Co. Daily ex Sun, 6-7 pm; 9-9:55. Sun, 3:30-4:30 pm. Central.

**WDAX**, Centerville, Ia. 250 mi. First Nat. Bank. Daily ex Sun, 1-1:30 pm, 2:30 pm, markets, news. Sun, Mon, Thurs, 7:30 pm-9:30 pm, concert. Central.

**WDAY**, Fargo, N. D. 485 also. 100 mi. Fargo Radio Service Co. Daily ex Sun, 12:15 pm, weather; 7-7:30, news, music. Mon, Wed, Fri, 9-10 pm, concert, etc. Sun, 12:15 pm, weather. Central.

**WDM**, Washington, D. C. 50 mi. Church of the Covenant. Sun, 9:30 am, church service; 3 pm, lecture; 7:30, church service. Eastern.

**WDZ**, Tuscola, Ill. 70 mi. James L. Bush. Daily ex Sun, every half hr., 8:30 am-12:15, Chicago Board of Trade quotations. Tues, Fri, 7-8 pm, concert, entertainment. Central.

**WEAB**, Fort Dodge, Ia. 250 mi. Standard Radio Equip. Co. Daily ex Sun, 7:30-8:30 pm, music, news. Sun, 10:45 am, church service, 3-3:30 pm, music. Central.

**WEAD**, Atwood, Kan. 485 also. 150 mi. N. W. Kansas Radio Supply Co. Daily ex Sun, 11-11:30 am, markets, music; 12, markets; 1:45 pm, markets; on half hour 8:15 to 5:45, news, baseball. Tues, Wed, Thurs, Sat, 7:30-9, concert. Sun, 11 am, church service; 3 pm, sacred music; 7:30, church service. Central.

**WEAH**, Wichita, Kan. 485 also. 500 mi. Lander Radio Co. Daily ex Sat and Sun, markets at 8:40 am, 9:40, 10:40, 11:40, 12:30, 1:30, 2:30, 3:15, Wed, Sat, 8-9 pm, concert. Sat, markets at 8:40 am, 9:40, 10:40, 11:40. Sun, 8-9 pm every third week, concert. Central.

**WEAK**, St. Joseph, Mo. 100 mi. J. B. Abernath. Daily, 12-1 pm, St. Joseph live stock markets; 7:30-8:45, concert. Central.

**WEAM**, North Plainfield, N. J. 75 mi. Borough of N. Plainfield. Daily, 7:30-8 pm, music, police news, etc. Eastern, daylight saving.

**WEAN**, Providence, R. I. 100 mi. Shepard Company. Daily ex Sun, 8-5 pm, music; 6-8, bedtime stories, baseball, weather, music. Mon, Wed, 8-10 pm, concert. Eastern, daylight saving.

**WEAP**, Mobile, Ala. 485 also. 50 mi. Mobile Radio Co. Daily, 4-5 pm, 7-8:55. Central.

**WEAS**, Washington, D. C. 100 mi. The Hecht Co. Daily ex Sun, 3-4 pm, music, retail news. Wed, 7-8 pm, concert. Fri, 7:30-8:30 pm, concert. Eastern.

**WEA**, Sioux City, Ia. 150 mi. Davidson Bros. Co. Daily ex Sun, am, opening markets, weather, sports, news. Central.

**WEAV**, Rushville, Nebr. 200 mi. Sheridan Elec. Service Co. Wed, Fri, Sun, 8-9 pm, concert, news, etc. Mountain.

**WEAZ**, Waterloo, Ia. 100 mi. A. C. Sweetman. Mon, Thurs, Sat, 7-8 pm, news, concert, lecture. Central.

**WEW**, St. Louis, Mo. 485 only. 100 mi. St. Louis University. Daily ex Sun, 10 am, weather, opening grain and live stock markets; 2 pm, closing of markets. Sat, 2 pm program at 1 pm. Central.

**WEY**, Wichita, Kan. 485 also. 500 mi. Cosradio Co. (Wichita Beacon.) Daily ex Sun, hourly, 8:40 am-12:40 pm, stock markets. Daily, 10:45 am and 4:30 pm, weather; 10:45 am, baseball, concert. Tues, 2:30-3:45, weather. Sun, 8:10 pm, church service, concert. Central.

**WFAA**, Dallas, Tex. 485 also. 250 mi. News and Journal. Daily ex Sun, 10:15-10:45 am, weather, cotton region bulletin; 12:30-1 pm, music, talk; 2-2:30, markets; 3:30-4, baseball; 3:30-3:45 pm, markets, news; 6:45-7, baseball final; 8-8:30, concert. Sun, 2:30-3 pm, chapel; 6:30-6:45, baseball final; 9:30-10, concert. Central.

**WFAC**, Superior, Wis. 100 mi. Superior Radio Co. Daily, 7:30-9 pm. Central.

**WFAD**, Salina, Kan. 100 mi. Watson Weldon Motor Supply Co. Daily ex Sun, 8:45 am, 9:45, 10:45, 11:45, 1:15 pm, markets at 4, news. Tues, Thurs, Fri, 8 pm, concert. Sun, 11 am, church service; 8 pm, concert. Central.

**WFAE**, Waterford, N. Y. 340 only. 300 mi. Radio Engineering Lab. Wed, Sat, 7:45-10 pm, concert. Sun, 2-4 pm, church service. Eastern.

**WFAM**, St. Cloud, Minn. 485 also. 100 mi. Granite City Elec. Co. Daily ex Sun, 3:30-4:00 pm, markets; 7:30-9, entertainment. Central.

**WFAN**, Hutchinson, Minn. 485 also. 500 mi. Hutchinson Elec. Service Co. Daily ex Sun, 1 pm, markets etc. Central.

**WFAP**, Peoria, Ill. 200 mi. Brown's Business College. Daily ex Sun, 10:30 am, weather; 12-12:15 pm, music; 1:30-2:30, baseball; 4:30-5:30, business lecture; 7:45-8:55, baseball, news, concert. Sun, 11 am, church service. Central.

**WFAT**, Sioux Falls, S. D. 300 mi. Argus Leader. Daily ex Sun, 7:30-8 pm, baseball, concert. Tues, Thurs, special concert, 8-9 pm. Sun, 7:30-8 pm, concert. Central.

**WFAV**, Lincoln, Nebr. 485 also. 300 mi. Univ. of Nebr. Daily ex Sun, 10:10 am,



WGL Philadelphia, Pa. 2,000 m. Thos. F. J. Howlett, Thurs, Sat, 7:45-11:30 pm, concert. Eastern.

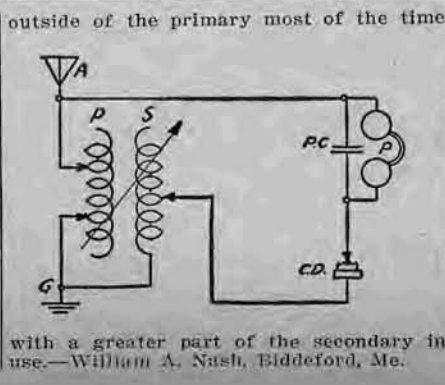
WKY, Oklahoma City, Okla. 485 also. 500 m. Oklahoma Radio Shop. (Daily Oklahoma.) Daily, 12 m, weather; 7-7:30 pm, baseball, specials; 8:30-9:30, concert; 9, weather, news, Sun, 3:30-4:30 pm, concert. Central.

State, City, Call Alabama: Birmingham, WIAG, WSY Mobile, WEAP Montgomery, WKAN

State, City, Call Kentucky: Louisville, WHAS, WKAG, WLAF, 9ARU Paducah, WIAR

State, City, Call Washington Court House, WGAX Wooster, WGAU Youngstown, WAAV, WMC Zanesville, WPL

Crystal—Loose Coupler Set Employed in this crystal set hook-up is a small loose coupler with the primary 2 1/4 inches in diameter, wound with No. 20 SSC wire, and fitted with two sliders.



with a greater part of the secondary in use.—William A. Nash, Eldeford, Me.

Illinois: Chicago, KYW, WAAF, WBU, WDAF, WGS, WGU, WJAZ, WQX Decatur, WBAO, WCAP, WHAP

Washington: Aberdeen, KNT Bellingham, KDZR Centralia, KDZM Everett, KDZJ, KFBL Lacey, KGY Pullman, KFAE Seattle, KDZE, KDZT, KFC, KHQ, KJR, KTW, KZC

# Radio Digest Illustrated

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## Knowledge Carried by Ether Waves

Higher Education Reaches Remote Districts

THERE is now an opportunity through the medium of ether waves to place the elements of a higher education within the reach of all. Thousands of young men and women who are denied at present further educational advancement than their grammar or high school courses may receive daily lectures by the foremost educators in our large college of learning. Developments of long distance Radio reception permit the words of the instructor to be clearly received at far distant points.

## Teletype Leads to Newer Things

Inventions Will Follow Recent Success

IT'S ONLY a question of time when Radio will accomplish the same thing as electricity and wires can do at the present time. For years the telephone and telegraph has been the one principle aid to the stock broker, but now the Radiophone is a much better means of communication. The automatic Radio teletype now copies messages from the air on a typewriter. An airplane operator can write a message at any time and feel assured that it's being copied at headquarters whether the signal corps clerk is on the job or not. We may dream of the time when trains will receive power from Radio waves or a watch kept over the home while you are away on a vacation, but how soon will this all come to pass is a question to ponder over.

## Broadcasting Stations Increase

Only One State Still Remains Without a Station

SINCE the licensing of the first public service broadcasting station in the fall of 1921 there have been only sixteen such station licenses withdrawn and the number has increased until we have now 502 stations in the United States. The number of licenses granted each week has been decreasing to some extent. However, those who have taken out licenses within the first few months do not contemplate cessation of their activities.

It is natural that the licensing should decrease slowly, for today the saturation point is being approached. There are now stations in all but one state, and in practically every city of importance. Too many, unfortunately, are at work in some cities, so that frequent interference with each other is common. With the new regulations, depending upon legislation, granting broader bands for broadcasting, however, it is hoped that better and far more efficient service can be rendered. The establishment of class "B" stations on the 400-meter wave length will also improve the situation.

## Radio Parasites Are with Us

The Unscrupulous Promoter Sells Radio Stock

THERE is no new device or machine of merit which tends to have a basis for a substantial manufacturing proposition but what the promoter is an important factor. It is quite necessary to have a promoter if a big business is to be established, but right here is where the faker, the stock jobber and wily broker starts his nefarious money grabbing scheme to pick up the savings of the working class.

All of the fake companies run true to form. Immense profits, association with highly successful financiers, examples of success made by old established Radio firms, are some of the inducements laid before the prospects.

Unscrupulous brokers have taken advantage of the sudden popularity of Radio. They have "organized" companies of large sounding names and high paper value only to fleece the gullible public of its money. Blue sky laws have been no hindrance to them apparently, for they have gone on gathering in their dollars from the "one-a-minute" class just as though there were no law to check them.

There is also an epidemic of "pirate Radio parts," as they are called, which struck the business in such a way that it has caused turmoil in the ranks of the established manufacturers. Radio companies have sprung up like mushrooms after a storm, and with them have come all sorts of Radio apparatus, good, bad and indifferent.

Almost the same is true of companies that actually produce parts. Many of them never knew what Radio was until the craze came along. Many knew just enough to produce something that looks like something it ought to be, but isn't! The parts are put up to sell, more than to serve. The result is an overstocked competitive market which confuses the buyer.

## Condensed

By DIELECTRIC

It is not an infrequent occurrence, nowadays, to see a picture of some inventor of Radio apparatus viewing his latest addition to the marvels of the science with the expression of a seer—visualizing the great things to come from its use. Dr. De Forest transmits code signals for "seer," as he stands looking at his new Radio Bottle. This "Bottle" seems to have some of the potentials found in half-pint varieties, known as portable hip sets; only requires a short wave but carries for a long distance. It is worthy of note that with this oscillating audion one-third of a kilowatt carries the voice from the wilds of New Jersey to the Middle Western states.

All of my criminal impulses are rapidly fading out. If you have any, better encourage them to do likewise. With the new broadcasting system installed at Police Headquarters in New York City, capable of covering an area of 30,000 square miles, quite an army of sleuths can become actively interested in the touring intentions of criminals before they wander very far afield. The day is surely coming, too, when like equipment will be installed in every large city, so that the police resources of the entire nation may be available a few seconds after the detection of a crime.

Another link fastened to the world's ether chain. When the Postal Telegraph-Cable Company consummated an agreement with the Radio Corporation of America, not only was communication through the air extended, but the supremacy of American-controlled service advanced considerably. So now, whatever may happen to the Atlantic cables, a message entrusted to the Postal company will surely reach its foreign destination via Radio. "Tubes out" for five seconds in honor of this additional gem to the Radio Crown of America!

Electricity has a fairly intimate acquaintanceship with many lines of industry. Perhaps you can recall when it was otherwise. Hertzian waves have not as yet been formally introduced, though some shrewd individual will show us the proper etiquette to follow in bringing the two together. Operating a cotton loom by means of these electromagnetic waves is an experiment which may easily prove the forerunner of wonderful things to follow. "The hand that sends the spark rules our industries." When will that become a maxim?

In Elkins, Pa., lives a man evidently jealous of the innovations made in Radio receiving sets, who determined to show us fans how a pocket telephone outfit could be made, attachable to any telephone line, for securing the services of "central." This "cuckoo bona" (for that is its name) the inventor believes will become used by policemen getting in touch with headquarters—and by stranded autoists. We don't deny Mr. Macfarlane the usefulness of such an invention. Can't we coax him to join the Radio bugs and produce something for us?

So Howard Thurston, the famed magician, has at last succumbed to the spell which mastered Sir Oliver Lodge and Sir Arthur Conan Doyle sometime ago. Maybe Mr. Thurston will learn the language of the spirits so well as to be able to hobnob with them at his pleasure. It is comforting to see that he makes no specific mention of Mars, yet does conclude all of the planets may be inhabited, either by spirits or physical beings. Sitting before my mundane set I have numerous times been impressed with the idea (as he) "that someone was trying to impart information," and, by readjusting the dials, found such to be the case. However, in each instance it was a well-known broadcasting station not over six hundred miles away. Perhaps there is "a direct connection between occult force and Radio power," as the great magician says, but it takes a magician to explain the trick.

A little while ago, as you remember, a freight train was set in motion at East Pittsburgh by Radio, being haled as a remarkable event. Why is it not possible to control moving trains, change signals and accomplish many other things on railway systems using the same medium? If it can be adapted to the saving of lives of passengers by avoiding train wrecks, what a boon that would be. The longer we enjoy the entertainment it affords, the more convinced we become of its ultimate utilitarian use.

Just as I was beginning to entertain a real friendly feeling for Dr. Steinmetz (gradually forgetting his denial of the ether wave theory) Mr. Arzinger broadcasts a message from Birmingham, Ala., substantiating the Doctor's conclusion. This new wizard essays to tell us what does carry our Radio messages. Hydrogen ions are the thing, ye Radio bugs, not ether waves! Verily, nothing is static save static in Radio. To receive with the utmost perfection, according to this investigator, one must install his set in a clime where there is no bottom to a thermometer. Hydrogen ions increase as the temperature decreases. Old Man Static fears one theory no more than another.

One other number before signing off. Mr. Arzinger uses no aerials with a set he has made, yet receives from distant stations with entire satisfaction. The time was, and not so long ago, when an outside antenna was considered absolutely essential, then we brought them inside—finally developing the loop antenna. My question is can this aerial-less set accomplish what the directional loop does?

## RADIO INDI-GEST

### Cutting Up While Being Cut Up

"Through it all," the Times says of the Philadelphia girl who listened to the Radiophone while undergoing an operation, "the patient entertained the nurses with laughing comment on the 'good execution' of the artist who was transmitting Chopin for her." What do you suppose some of her laughing comment was? Probably she said, "Chopin, eh? Ought to be Choppin'."

### Then He Will Hear the "Bugs"

An American has constructed a Radio receiving set which fits into a finger ring. We await with interest the



announcement that another American has invented one which is only visible through a microscope.—The Passing Show (London).

### He's Married

Maybe Assistant Secretary Roosevelt was afraid the lady politicians would not ring off if he let them use the navy's Radio.—Indianapolis Star.

### They'll Never Squeal Again!

Charles Howard Norton, of Paoli, Pennsylvania, writes us that while placing shields between transformers he unnecessarily ran his B battery through the filaments of three perfectly good vacuum tubes. That is, they were good before he did it. He wishes us to tell of his sad experience in our columns for the benefit of the rest of our friends. Here goes:

### MORTUARY NOTICE

Died of incapacity for electrons, three loving vacuum tubes of Chas. H. Norton. The filaments were electro-



cuted by experiment. Funeral arrangements will be announced later. Please do not broadcast sympathy.

### Amends Senator White's Radio Bill

An experience I had the other day suggests to me an improvement in Radio that must be made before Radio can be truly useful to all families.

My wife called me up at my Radio station and asked me to bring home a loaf of bread. This occurred in the busiest hour of the day. Had she called me up on the regular telephone I would have upbraided her severely for her thoughtlessness in calling me up at the wrong time.

But over Radio I could not speak to her in that way, because all the neighbors who have Radio sets would have heard it.

Therefore, I had to swallow my anger, as the saying is. Thus, you see, Radio interferes with the normal family life. It should be made safe for cussing, so that a



man can tell his wife what he thinks of her without everybody in town hearing him. I hope something can be done about it.—Al Segal in the Cincinnati Post.

### Send It Back if You Don't Like It

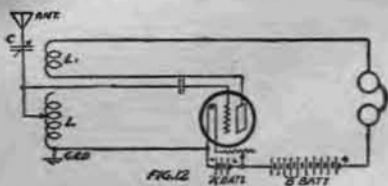
A fan in St. Louis recorded a Radio selection upon a phonograph record and then passed it along. He suggests sending it back to its place of origin by the same process. The first thing we know a fellow talking by Radio around the world will be bothered by the sound of his own voice received at the same time it is sent. And that's going some.

# Use of the Radio Receiving Set in the Home

## Part IV—Regenerative Receivers

By H. M. Towne

**T**HE PRINCIPLES of regeneration in a vacuum tube are best understood if we consider the vacuum tube circuit as comprising two individual circuits. The part of the circuit from filament to grid is the "input" circuit and the part between filament and plate including the B battery is the output circuit. The fundamental feature of a regenerative receiving circuit is some means of returning some of the energy from the output circuit back into the input circuit.



We must keep in mind that the input controls the output, and that the output circuit supplied by the B battery contains many times the normal input energy to the grid which is supplied entirely by the feeble oscillations of the antenna circuit. If we can feed back some of the output to the input it will affect a still greater output since the feeble antenna circuit oscillations will be reinforced by the energy which is fed back. This may be accomplished by coupling the output and the input circuits together using either inductive, capacitance or resistance type of coupling.

### Inductive Back Coupling

The inductive coupling is the best known and more commonly used method of regeneration and it provides for a fine adjustment of the coupling so that the amount or degree of regeneration can be easily controlled. Figure 12 shows the diagram of connections for an inductively coupled regenerative circuit employing the single-circuit system of tuning. It will be seen that the only difference between this and the simple vacuum tube detector circuit previously shown in Fig. 10, is the addition of the inductance coil L which is called a tickler coil. This is coupled by variable coupling to the main tuning inductor L. There are two important conditions and these are that the direction of the current should be such that the sign of the charges fed back to the grid by the coil L will always be the same as created by the incoming antenna oscillation, and that the degree of coupling should not be close enough to make the vacuum tube generate continuous oscillations.

The first condition is obtained by proper relation of direction of coil windings of both L and L<sub>2</sub>, which will be explained more fully later, and the second condition is had by using the proper number of turns on L<sub>2</sub> combined with suitable variation of coupling and correct plate voltage as supplied by the B battery. Other factors affecting the regeneration are the size of grid condenser, the filament temperature, and the antenna circuit constants. The general relationship, however, is such as to permit design without experimentation.

### Design Governs Type of Coils Used

The arrangement and mounting of the various instruments to compose a regenerative receiving set will govern, more or less, the type of coil system used for L

turns of No. 20 single cotton covered copper wire with a tap brought out at every tenth turn and these taps soldered to the switch points on the back of the panel. The variometer on the left end consists of 7 turns on the outer cylinder and 8 turns on the inner cylinder and these connected in series. This variometer provides for a very small but accurate or vernier adjustment of the tuning inductance and while it is a big advantage for sharp tuning, it is not necessary and may be omitted.

### The Variometer Rotor

A variable tuning condenser with vernier adjustment will accomplish the same result. The inner cylinders are 3/8 inches in diameter. The rotary cylinder of the variometer is 1 inch long while the tickler coil is wound on a cylinder 1 1/2 inches long. The tickler coil consists of 75 turns of No. 26 double cotton covered copper wire with taps brought out at every 25 turns. Ordinarily about 50 or 60 turns is about right for a tickler coil but the taps enable trial of different number of turns and the permanent connection can be made then to whichever tap proves best to control the regeneration.

The coils should be so connected, that with the main inductor and the tickler inductor on a given axis, the antenna to ground winding of the main inductor will be clockwise and the tickler winding from plate to the B battery will be counter-clockwise, or vice versa. This is the condition for maximum regeneration. By rotating the tickler in either direction the regeneration will be reduced and will be a minimum when the tickler has been rotated just 180 degrees, or one half revolution. In this position, the current through the tickler coil produces a magnetic field which will oppose the field of the main in-

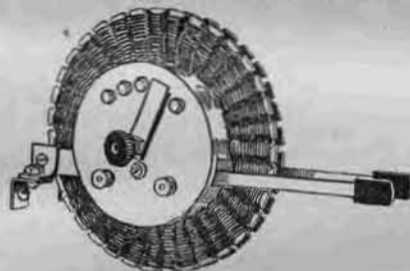


Figure 14

ductor as produced by the incoming antenna oscillations.

### Spider Web Coil System

Figure 14 shows the so called "Spider Web" form of coil system. This form of coil is very simple to construct and mount. The coils shown are about 4 inches inside diameter of winding and 6 1/4 inches outside diameter and consist of 50 turns of No. 22 double silk covered copper wire. Taps are brought out to a multi-point switch at every tenth turn. Two binding posts provide for connection to the inner end of the winding and to the switch arm which by rotation will engage any desired tap. The tickler coil may be made identical to the tuning inductor with the exception of multi-point switch being mounted on the opposite side so that the coils can be closely coupled as shown. One or both coils are mounted on a hinge so that they can swing away from each

punching on a sheet of pressboard and mark around it with a pencil. Then follow the pencil lines in cutting. A spider web winding form should have an odd number of spokes so that adjacent turns will come on opposite sides of the spokes.

mended for receiving sets where the wiring is to be permanent and about No. 14 E. & S. size will be found easy to bend and still make rigid connections. If tinned copper wire can be obtained it is to be preferred as it simplifies the task of solder-

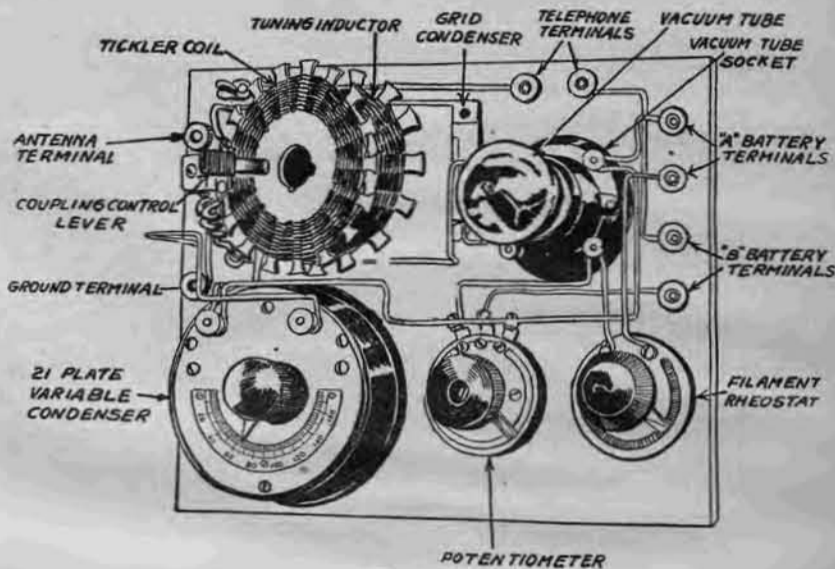


Figure 15

### Simple Inexpensive Set

Figure 15 shows a simple and inexpensive regenerative receiving set using single-circuit tuner and employing the spider-web type of inductors. While this outfit does not present as pleasing appearance as some, it is second to few in efficiency for broadcast reception. The parts for this set can be purchased at a Radio supply store for a total cost of about \$21.00. This includes B battery and telephone receivers. The various parts are mounted on a hard wood base which should be dry and well seasoned. The connections may be made using flexible stranded conductor similar to lamp cord, or stiff bare copper wire may be used as shown. The bare wire connections are to be recom-

ing, it will not oxidize, and it matches up better with the nickel finish on most of the Radio instruments.

### Connection Scheme

The diagram of connections for this set is shown in Figure 16. It will be seen that the inductor has no taps. This simplifies the construction somewhat. Most of the broadcasting stations operate on wave lengths between say 325 and 400 meters. The range is sufficiently small to be covered by adjustment of the variable condenser in combination with a fixed value of inductance. Both the tuning inductor and the tickler have 56 turns of No. 22 double cotton covered copper wire. The tuning inductor is screwed down to the

(Continued on page 12)

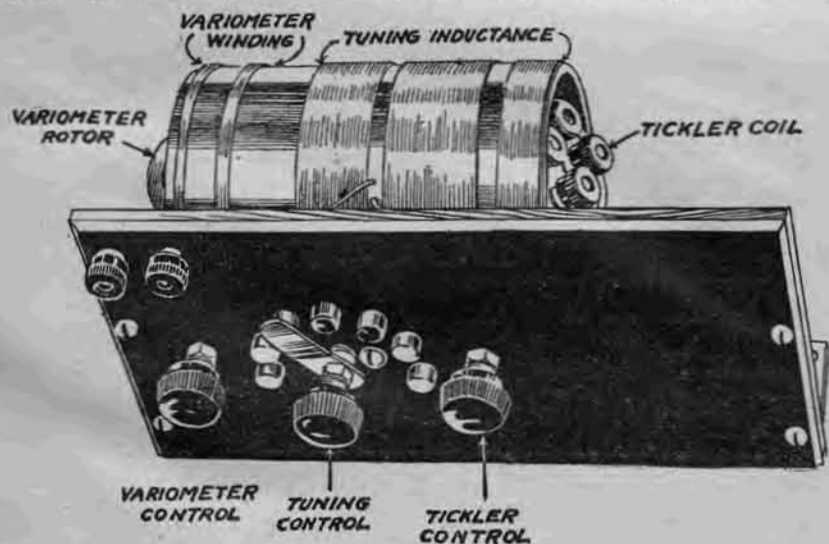


Figure 13

and L<sub>2</sub>. For panel mounting, the cylindrical type of coils are conveniently employed. Figure 13 shows a single circuit tuning inductance with tickler coil mounted inside the main inductance and arranged on a shaft for rotary coupling, and a similar mounting of a 15 turn variometer in series with the main inductor and the whole mounted on a 1/4-inch panel with the controlling knobs on the front of it. The outer cylinder is 4-inch diameter and about 5 inches long and has about 1/8-inch wall. The main inductance consists of 70

other for coupling adjustment. With the coils close together and looking along the axis of both coils, the antenna to ground winding should be clockwise when the plate to B battery winding is counter-clockwise or vice versa. Regeneration is controlled by varying the distance between the two coils.

The forms used for winding these coils were cut from pressboard and the layout was made from a motor armature iron punching. These armature punchings of various sizes can be had for the asking at most any electrical repair shop. Lay the

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# Receiving Set Hook-Up Has No Aerial

## Ground Only Required to Intercept Messages

The diagram accompanying this article shows a hook-up that employs no aerial. I am getting results better than when I use a loop aerial. This hook-up can be used to advantage on an automobile Radio set, because there is no aerial to disfigure the appearance of the car. The tuning is

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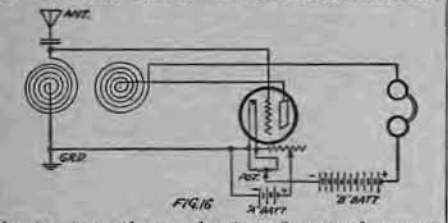
very critical, but favorable results have been obtained. Atmospheric noises are greatly reduced by this circuit. I have heard Stations KYW, WHA and many others very plainly by means of this

**USE OF RADIO SETS**  
(Continued from page 11)

base and the tickler is supported on a hinge arrangement so that it will swing up away from the tuning inductor to provide control of regeneration. The variable condenser is a 21-plate size, which in conjunction with a 125-foot antenna and the 56 turn, tuning inductor was found to permit a tuning range from 270 to 475 meters. This just nicely takes in the present broadcasting band. An adjustment of 80 on the condenser scale corresponds to about 360 meters with the 125-foot antenna. A shorter antenna will, of course, require a large number of turns on the tuning inductor, while a still longer antenna will permit a reduction of the inductor turns.

**Grid Condenser Construction**

The grid condenser can be constructed or purchased as desired. If purchased a .005 mfd. capacity is recommended. If constructed, it may consist of two sheets of tinfoil 1 inch by 3 inches, separated by a sheet of thin mica or waxed paper 1 1/4 inches by 3 1/4 inches. Connection is made to each foil sheet. A convenient method



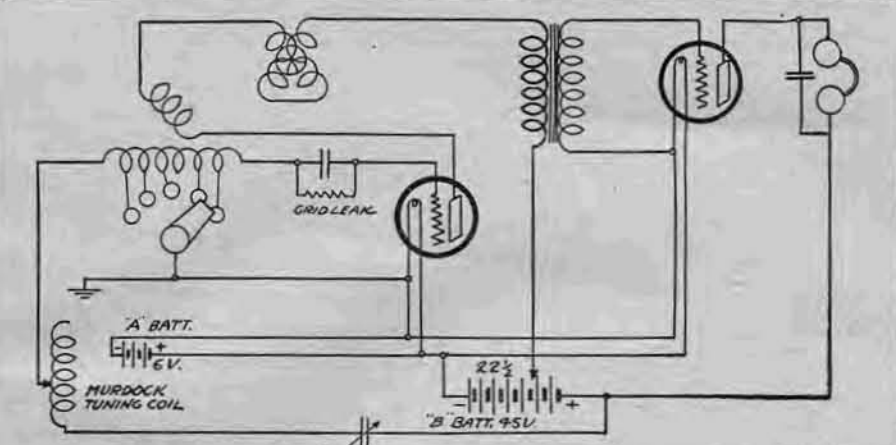
is to use three sheets of waxed paper with the foil sheets inserted between the middle and outside sheets of paper and the whole rolled up over a lead pencil. This is permanently held by a gummed label around the roll. A connection is made to each foil strip.

If it is desired to try a grid leak resistance in shunt with the grid condenser, a simple leak may be made using a small strip of rather stiff drawing paper and applying lead pencil marks to the paper to form the high resistance leak. A strip of the paper about 1/2 inch by 2 inches is about right and both ends should be given a very heavy coating of lead for an area of about 1/2 inch by 1/2 inch. A very soft lead pencil should be used so that the covered end areas are very black with the lead. Then insert a small wood screw through the center of the lead covered ends and screw the sheet down to a small block of wood or to the base of the receiving set. Make connection from each wood screw to each side of the grid condenser.

**Adjusting Grid Leak**

It is then ready to apply lead pencil marks between the two heavily leaded end areas to form the high resistance conducting path. A good way is to apply the lead while a station is being received. As the band of lead becomes wider and heavier the resistance will decrease. The best value will be evidenced by slightly louder and clearer signals. The paper alone presents infinite resistance provided it contains no moisture. By slowly applying the lead the leak resistance can be made most any desired value. If too much lead is applied, it can be erased cross-wise to remove some of the lead. This increases the resistance again. A leak of this kind will remain permanent in resistance value and has the advantage of being flexible, that is, it may be readjusted at any time in case a vacuum tube

## DIAGRAM OF CONNECTIONS USED



new form of Radio receiver without an aerial. I am using a loud speaker successfully in the reception of concerts in the immediate vicinity. Walter C. E. Druse, Milwaukee, Wis.

**Insulating Tubes**

It is best to protect the lead-in wire from the wood when running it into the house. A good insulator for this purpose is one of the small glass bottles in which candy pills are sold. Two of the bottles in which "New Skin," the liquid court-

with different characteristics is used. As previously stated, however, a lot of the vacuum detector tubes operate equally as well without a grid leak as with one.

**The Potentiometer**

It will be noted that a potentiometer is shown with the regenerative receiving set. This is a coil of high resistance wire to give a total resistance of about 200 or 400 ohms. It has three terminals, one on each end of the resistance wire and a middle terminal which connects to a contact arm that rotates and makes contact with any turn of the coil. As shown in the diagram, the two end terminals are connected across the filament terminals of the detector tube and the connection from plate circuit to filament is made to the middle potentiometer terminal. This enables the plate circuit to be connected to either the + or - side of the filament or at any intermediate point. The filament has normally 5 volts across its terminals and we can, therefore, think of some point on the filament where the average voltage is zero. Then the + terminal is 2 1/2 volts positive with respect to the average zero point, and the - terminal 2 1/2 volts negative with respect to zero point.

The potentiometer effect enables the plate circuit to be connected to any point on the filament wire; that is, at the zero point or at any point on either the negative or positive halves. This adjustment permits a very accurate control of regeneration in the receiving circuit.

What actually happens is that the voltage of the B battery with respect to the average or zero point of filament is made variable plus or minus 2 1/2 volts, or an effective variation of 5 volts. On most soft tubes (those having relatively high gas content), the plate voltage is more or less critical and the slight variation made possible by the potentiometer enables the action of the tube to be gradually adjusted to the best point of regeneration.

**Phone Receiver Connections**

There is one point which might be mentioned about the proper connection of telephone receivers. The receivers consist of a combination electro-magnet and permanent magnet to actuate the receiver diaphragm. The permanent magnetism will be observed if the receiver cap is removed and diaphragm lifted carefully away from the receiver case. This permanent magnetism is essential in the operation of the receiver and it must be retained in order to prolong the life of the receiver.

The small coils of wire around the pole pieces from the electro-magnet and current through these coils will either buck or boost the permanent magnetism, depending upon the direction of current through the coils. It is noteworthy, therefore, when using receivers with a battery in the circuit, that the connections are made so that any direct current flow will be in the direction which will not tend to reduce the strength of the permanent magnets. Most all telephone receiver sets have the terminal cords marked differently in the braided insulation covering, and this is to indicate polarity.

Different manufacturers have different method of indication and therefore, general instructions will not always apply. One should get the correct polarity indication from the manufacturer of whatever type of receivers he has and connect them with the correct terminal on the B battery. The receivers will operate when connected either way but the maximum volume and best tonal qualities are more apt to follow

plaster, is sold will serve the same purpose. These bottles have no tapering neck and are about 3/8-inch in diameter. The closed end may be removed by tying a string about the bottle close to the end, soaking the string in kerosene and applying a flame. While burning briskly and the bottle end is hot, quickly dip it in cold water. The end will break off. Bore a hole through the window casing or sash at the top and fit the glass in tightly. Run the wire through this tube.—Vernon Hagelin, Geneseo, Ill.

the correct polarity connection, and moreover, the strength of the permanent magnets is better preserved.

### Operation of Finished Set

The operation of any Radio receiving set generally sifts down to personal ideas which come after a bit of experience. With the circuit shown in the diagram Figure 16, the sequence should be as follows. First set potentiometer about midway between the ends of the resistance wire. Then set tickler coil at fairly close coupling. Next adjust filament rheostat until the filament is between red and white in incandescence. When regeneration begins there will be a hollow purring sound in the receivers or it is evidenced by a sharp click when a moistened finger is touched to the grid terminal. Regeneration is augmented by increasing filament temperature, the plate voltage, or the tickler coupling.

One or all of these adjustments can be tried. When the tube is in the state of regeneration, adjust the tuning condenser until the desired signal is heard. Then adjust the potentiometer and filament slowly until maximum intensity of signal is had without distortion of quality. Over-regeneration will produce a state of oscillation in the circuit which will be evidenced by badly distorted quality of voice of music or by a shrill howl or squeal. Always aim to keep the regeneration well below the oscillating point, as the oscillating state converts the receiving set into a miniature transmitting set and the oscillations produced by it can be heard for a radius of half a mile or more and will greatly interfere with the operation of other receiving sets which may be in the same neighborhood or locality.

(Continued in October 7 issue.)

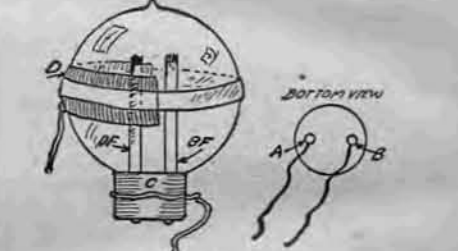
## Double Filament Globe Makes Vacuum Tube

A very good detector tube can be made at the cost of about one dollar. The necessary parts are, one Ford double filament globe, one strip of pure tin 3 inches long, eight inches of friction or adhesive tape and one piece of copper wire about 6 inches long. On the base of the globe you will find two contact points. One leads to the dim filament and the other to the bright filament.

Twist a wire around the brass part of the globe and connect the other end to one side of a six-volt storage battery. A wire from the other battery terminal is touched to each lead contact point to determine which filament is the dim one. When the dim filament is found, burn it out. This may be accomplished by applying a large voltage.

Attach the piece of tin on the outside surface of the globe with friction tape as shown and solder wires to A, B, C, and D. The burned out filament A is the grid. The wires B and C are the filament leads and D is the plate.

Extreme care should be taken to see



that the plate is attached on the "grid" side of the globe. These tubes are cheap, efficient, and will last for a considerable length of time. They are not as efficient, of course, as the manufactured kind, but they will do the same work.—H. P., Dallas, Tex.

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# Simple Instructions for the Beginner

By Harry J. Marx

## H. C. Coils for Radio Frequency

WHEN great receiving range or long distance reception is desired, it is necessary to adopt amplification at Radio frequency, that is, the amplitude of the oscillations is increased prior to rectification by the detector tube. As has been stated before the high frequency currents when received from any considerable distance are entirely too weak for rectification with the result that the audio frequency amplification has no positive current to build up.

The only remedy, then, is the amplification or building up of the initial current by means of Radio frequency amplification. This does not produce such an increase in the strength of reception for each added step of amplification as would audio frequency stages. The former will bring in reception, though perhaps weakly, which any amount of audio frequency amplification alone would not render audible, because a certain required strength or amplitude is essential for rectification.

Many types of Radio frequency transformers have been placed on the market. Amateurs, in experimenting with these, have had a varied degree of success. Very often the cost has been prohibitive, especially when the success has been dubious. Even resistance couplings are rather expensive and do not furnish the degree of efficiency that is desired, especially for the low wave length ranges. For this reason, many of the amateurs are seeking other methods and types of couplings for their Radio frequency amplification.

**Honeycomb Coils and Condensers**  
Of all the Radio apparatus found in the miscellaneous collection of the average amateur, honeycomb coils are usually in abundance. Likewise variable condensers are also unusually well represented. Such being the case, what would be more reasonable than to attempt the use of these two pieces of apparatus for Radio frequency amplification? Both pieces are reasonably priced and easily obtained.

Radio frequency amplifying stages must have their couplings of such a design that they can be relied on to have all induction values identical. Otherwise one slightly different than the remainder will filter out signals on which the others would give best amplification. No two coils with their leads and connections can be commercially made to exactly balance each other. For this reason, variable condensers must be used for accurate control of the inductive values.

Likewise, in Radio frequency amplification, it has been found that the induction coils should have a reasonably low self-capacity in order that they may operate over as wide a band of wave lengths as possible. On this account, it will be found desirable to use variable condensers with a low maximum capacity, that is, not more than .0005 mfd. In fact, .00025 mfd. will be found to give much more satisfactory results.

### Selecting Honeycomb Coils

In selecting the proper honeycomb coils to use for a reactance capacity coupling in Radio frequency, it will be found that the number of turns or type of coils depends upon the wave length range desired, and the variable condenser that is to be used in conjunction with the coil.

For example: Suppose it is desired to cover a wave length range running from 700 to 1000 meters. It will be found that a 75-turn coil with a .001 mfd. condenser will have a range running from about 300 to a little over 1000 meters. The high capacity of the condenser, however, is not favorable for Radio frequency work. A 100-turn coil used in conjunction with a .0005 mfd. variable condenser will have a wave length range from 462 to slightly over 1000 meters. The results with this combination will be found slightly better than the previous one.

The best results will be obtained through the use of a 150-turn coil with a variable condenser of .00025 mfd. capacity. The range in this case will be from a little below 700 to slightly above 1000 meters.

In addition in this case, the 180 degrees rotation of the condenser coil will permit adjustment over a range of 300 meters. This will be found, therefore, to be much more accurate than in the first case where the adjustment would cover 700 meters. In addition, maximum efficiency will be obtained because of the low maximum capacity value of the condenser. (The fact must not be overlooked that every induction coil has a natural self-capacity, the effect of which must be added to the other.)

### Design for Present Broadcasters

With the present broadcasting range for popular service, running from 360 to 400 meters, or even 485, it will be wise to select an operating range of 300 to 500 meters. The 35, 50 and 75-turn honeycomb coils will be found to cover this range. The 35-turn, however, requires a .001 mfd. variable condenser, making the capacity too high.

The 50-turn coil is much more practical since the required capacity is only .0005

mfd. For most accurate tuning and best results, the 75-turn coil with the .0005 mfd. variable condenser will be found most practical. Following this idea through, any range in wave lengths can be suited. Slight variations between coils for different stages can be overlooked and later accounted for by the condenser adjustment.

To the amateur who desires to wind single layer coils, the second column in the table shown gives the inductance of the honeycomb coil in milhenries.

$$L = \frac{39.47 K r^2 n^2}{1}$$

In this formula, "L" equals the inductance of the coil in centimeters (one million centimeters equal one milhenry), "r" equals radius of coil in centimeters, "n" equals

number or turns, "1" equals equivalent length of coil in centimeters, "K" equals a variable factor depending on the value of 2r+l.

The term "equivalent length in centimeters," for "1" is the length of the winding in inches, multiplied by 2.54. The values of the correction factor "K" are given in the table. By changing the milhenry inductance to centimeters inductance by multiplying the former by one million, the necessary diameter of tube and number of turns can be calculated.

Two hook-up diagrams using this type of Radio frequency coupling are given. The one shown in Figure 1 is intended for use with an outdoor aerial and has one stage of Radio frequency amplification, the detector, and one stage of audio frequency amplification. The second hook-up (Figure 2) is intended primarily for a loop aerial, and has two stages of Radio frequency amplification and the detector. If desired, audio frequency amplification can be added.

### List of Apparatus

The hook-up of Figure 1 requires the following apparatus:

A variocoupler for tuning in which the rotor is used as a tickler on the plate of the detector tube; two .001 mfd. variable condensers, one for tuning the primary circuit and the other for tuning the primary of the audio frequency transformer; two amplifying vacuum tubes; one detector tube; three rheostats; a six-volt A battery; a 50 to 90-volt B battery.

A .01 mfd. fixed condenser is shunted across the B battery. A .002 mfd. grid condenser and a two-megohm grid leak are used for the detector tube. The audio frequency amplifier coupling is the usual audio frequency transformer. A .002 mfd. phone condenser is shunted across the receivers. The selection of the coil and condenser for Radio frequency amplification has been explained. This circuit permits very close and selective tuning for distance reception.

### Circuit of Figure 2

The second circuit, Figure 2, will require the following apparatus:

A loop aerial and a variometer for varying the inductance; a .0005 mfd. variable condenser to shunt across the grid circuit for more accurate control of the wave length; two amplifying tubes; one detector tube; three filament control rheostats.

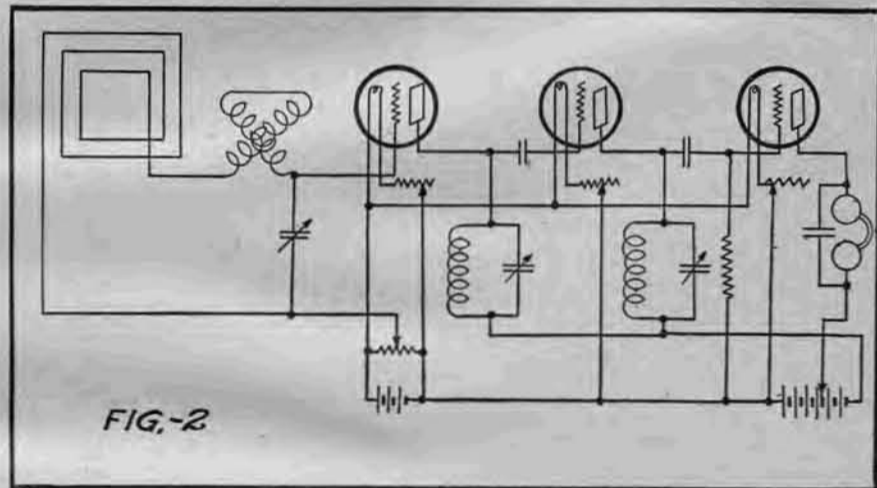
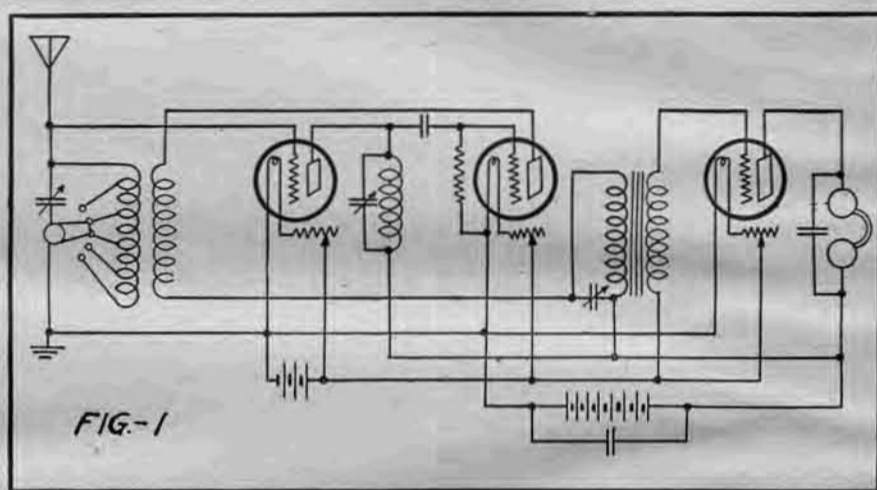
The two fixed condensers in the grid circuit of the second and third tubes are both .00025 mfd. capacity and the grid leak in the detector tube has one megohm resistance. The A battery has a 200-ohm potentiometer shunted across it for control of the grid potential on the first Radio frequency amplifying tube. The B battery consists of about 80 volts and has a 22½ volt tap for the plate circuit of the detector tube. A .002 mfd. phone condenser is shunted across the receivers.

The same method for selecting the reactance and capacity units for the Radio frequency amplification applies in this circuit, as was explained before. If an outdoor aerial is used, some form of tuning unit similar to the loose coupler or variocoupler is recommended.

In assembling a panel with Radio frequency stages, it is well to remember that sensitivity of the grid circuit prohibits long leads, and for this reason all wirings should be as short as possible, avoiding parallel runs in order to reduce all inductive effects apt to create considerable howling and interference in reception. A .01 mfd. condenser (or more) can be shunted across the B battery and another one across the A battery to advantage.

Experts believe that it will be possible to carry on a two-way Radiophone conversation with people in London next year.

No. of Turns	Milhenries Inductance	Wave length with .001 mfd. capacity	Wave length with .0005 mfd. capacity	Wave length with .00025 mfd. capacity	Wave length with .0001 mfd. capacity
25	.04	377	267	188	85
35	.075	516	365	258	163
50	.15	730	516	365	230
75	.3	1032	730	516	326
100	.6	1460	1032	730	462
150	1.3	2148	1632	1074	679
200	2.3	2854	2020	1426	901
250	4.5	3992	2822	1996	1263
300	6.5	4802	3445	2400	1517
400	11.0	6244	4415	3622	1790
500	20.0	8429	5960	4214	2653



2r	K	2r	K	2r	K	2r	K
1		1		1		1	
0.00	1.000000	0.40	0.849853	0.80	0.735079	2.00	0.525510
0.01	0.995769	0.41	0.846583	0.81	0.732593	2.10	0.513701
0.02	0.991562	0.42	0.843335	0.82	0.730126	2.20	0.502472
0.03	0.987381	0.43	0.840110	0.83	0.727675	2.30	0.491782
0.04	0.983224	0.44	0.836906	0.84	0.725240	2.40	0.481591
0.05	0.979092	0.45	0.833723	0.85	0.722821	2.50	0.471865
0.06	0.974985	0.46	0.830563	0.86	0.720419	2.60	0.462573
0.07	0.970903	0.47	0.827424	0.87	0.718033	2.70	0.453686
0.08	0.966847	0.48	0.824307	0.88	0.715663	2.80	0.445177
0.09	0.962815	0.49	0.821211	0.89	0.713308	2.90	0.437023
0.10	0.958807	0.50	0.818136	0.90	0.710969	3.00	0.429199
0.11	0.954825	0.51	0.815082	0.91	0.708647	3.10	0.421687
0.12	0.950868	0.52	0.812049	0.92	0.706339	3.20	0.414468
0.13	0.946935	0.53	0.809037	0.93	0.704047	3.30	0.407524
0.14	0.943025	0.54	0.806046	0.94	0.701770	3.40	0.400840
0.15	0.939141	0.55	0.803075	0.95	0.699509	3.50	0.394401
0.16	0.935284	0.56	0.800125	0.96	0.697262	3.60	0.388192
0.17	0.931450	0.57	0.797195	0.97	0.695030	3.70	0.382203
0.18	0.927639	0.58	0.794285	0.98	0.692813	3.80	0.376421
0.19	0.923854	0.59	0.791395	0.99	0.690611	3.90	0.370834
0.20	0.920093	0.60	0.788525	1.00	0.688423	4.00	0.365433
0.21	0.916356	0.61	0.785675	1.05	0.677697	4.10	0.360206
0.22	0.912643	0.62	0.782844	1.10	0.667315	4.20	0.355147
0.23	0.908954	0.63	0.780032	1.15	0.657263	4.30	0.350249
0.24	0.905290	0.64	0.777240	1.20	0.647527	4.40	0.345503
0.25	0.901649	0.65	0.774467	1.25	0.638094	4.50	0.340898
0.26	0.898033	0.66	0.771713	1.30	0.628951	4.60	0.336431
0.27	0.894440	0.67	0.768978	1.35	0.620086	4.70	0.332098
0.28	0.890871	0.68	0.766262	1.40	0.611487	4.80	0.327890
0.29	0.887325	0.69	0.763565	1.45	0.603144	4.90	0.323800
0.30	0.883803	0.70	0.760886	1.50	0.595055	5.00	0.319825
0.31	0.880305	0.71	0.758225	1.55	0.587182	5.50	0.301504
0.32	0.876832	0.72	0.755582	1.60	0.579543	6.00	0.285410
0.33	0.873377	0.73	0.752958	1.65	0.572119	6.50	0.271146
0.34	0.869948	0.74	0.750351	1.70	0.564903	7.00	0.258406
0.35	0.866542	0.75	0.747762	1.75	0.557885	7.50	0.246949
0.36	0.863158	0.76	0.745191	1.80	0.551057	8.00	0.236582
0.37	0.859799	0.77	0.742637	1.85	0.544413	8.50	0.227152
0.38	0.856461	0.78	0.740100	1.90	0.537945	9.00	0.218532
0.39	0.853146	0.79	0.737581	1.95	0.531647	9.50	0.210618

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# The Storage Battery on the Radio Set

By Thomas W. Benson

**T**HE GREAT popularity of Radio broadcasting has resulted in extensive use of storage batteries by many persons not fully acquainted with the proper methods of caring for this expensive current source. Not only are storage batteries being used for filament current but are being widely adopted for B battery service. These paragraphs were prepared with the idea of instructing the layman in the care of his battery to the end that he may get maximum life and satisfactory results from his batteries.

### Simple Form of Cell

A few words as to the theory of the storage battery may not be out of place. In its simplest form a storage cell would consist of two lead plates immersed in a dilute solution of sulphuric acid. The acid reacts with the plates and forms a thin film of lead sulphate on each plate, thus stopping further chemical action. Now, if a current is passed through the acid from one plate to the other, the sulphate on the positive plate, or the plate where the current enters, is converted to lead peroxide or red lead, that on the negative plate being reduced to pure spongy lead. On disconnecting the charging source it will be found that a current can be drawn from this simple cell which will flow until the positive plate is reduced to lead sulphate and the negative spongy lead is changed back to its former sulphated condition.

### Does Not Really Store Electricity

We can then see that a storage battery does not actually store electricity. The current in flowing through the battery causes certain chemical changes that enable the plates to give off a current of electricity for a certain period of time.

It will be understood from the description of a simple battery that the coating of lead peroxide and spongy lead in the charged battery would be very thin, but repeated charging and discharging would cause it to grow thicker and thus increase the capacity of the battery. But this process is too slow and tedious, so the modern storage battery makes use of what is termed pasted plates.

### Pasted Plates Like Grids

Here the plates take the form of a grid into which is pasted mixtures of red lead for the positive and litharge for the negative plates. The exact formula for these mixtures vary with the manufacturer, the idea being simply to use a mixture that can be converted readily into the condition most suitable for its use in the battery. The plates are interleaved closely, there being one more negative than positive plate. To insulate them wood or rubber separators are used. These serve the double purpose of preventing the plates from touching each other and to retain the paste in the plates to a certain extent.

### Electrolyte Constituents

The plates are sealed into a hard rubber jar and covered with sulphuric acid and water with a specific gravity of 1250 or 1300. This is a mixture of 30 per cent chemically pure sulphuric acid and 70 per cent distilled water, the specific gravity being determined by means of a hydrometer. This latter is simply a weighted float enclosed in a syringe so that a portion of the acid can be readily drawn from the battery for testing. The float will sink to a certain depth in the solution, depending upon its specific gravity or density. A scale on the stem of the float properly graduated enables one to read the gravity direct.

### Examination of Battery

A storage battery is usually shipped charged and ready to go into service. The battery should be first examined carefully to see that none of the lugs are loose, the case damaged or the jars leaking. With a hydrometer take a reading. This should be 1280 to 1300 in order to indicate a fully charged battery.

Whenever possible the battery should be mounted in some place where it will not be disturbed, and with connections made securely. Make sure that the joints are perfectly clean, then smear some vaseline over the connectors to prevent corrosion. It is well to mount a fuse block in a convenient place to prevent an accidental short circuit ruining the battery or causing a fire. Leads can be run up to the Radio set, using No. 12 rubber covered wire fastened under knobs or cleats.

### Capacity and Rating

Storage batteries are rated in ampere-hour capacity on an eight-hour discharge basis. For instance, you have, say, a 60-ampere-hour battery. This means that it will deliver six amperes for ten hours, or five amperes for twelve hours, and so on. The product of the current in amperes and the time in hours is 60. A battery should never be discharged at a rate that will run it down in less than eight hours for any length of time.

From the above, the length of time a battery will operate a Radio set before it needs recharging can be determined readily. Determine the load on the battery, allowing one ampere for each tube, and divide the sum into the ampere-hour rating of the battery. The quotient then will be the number of hours the battery will operate the set.

### What Specific Gravity Tells

As a battery discharges, the specific gravity of the solution or electrolyte decreases at a rate proportionate to the discharge. Thus the hydrometer reading gives an indication of the amount of charge in the battery. When the battery is fully discharged the gravity should read 1150. When the reading decreases to this point, the battery should be recharged immediately. Intermediate readings in the following table show the amount of the charge remaining:

- 1300 to 1280, battery fully charged
- 1280 to 1200, more than half charged
- 1200 to 1150, less than half charged
- 1150 or less, fully discharged

The voltage of each cell of the battery will be a little over two volts when freshly charged. This immediately drops to two volts on discharge and remains there till the discharge is nearly complete. When discharged the voltage should be 1.8. Discharging should not be carried beyond this point.

### Watch Evaporation

After being put into service the battery should be examined frequently to see that the solution does not evaporate, leaving any of the plates exposed. Any evaporation should be made up by adding distilled water. Do not use spigot water for this purpose.

Be careful in filling not to get the cells too full. A quarter of an inch over the plates is sufficient. When a cell is flooded it should be wiped dry immediately to prevent the moisture short-circuiting the cell and rotting the wooden box if such a container is used to hold the battery. Flooding should be avoided. The solution spilled carries with it some acid which cannot be replaced readily. It is well to wipe off the top of the battery with a rag dampened with ammonia to counteract any acid spilled on the top of the cell.

### Charging the Battery

In order to recharge the storage battery a source of direct current is essential. This is a simple matter where the lighting

current is direct. It is only necessary to insert some form of resistance in series with the battery in order to hold the current down to the proper amount, and then connect to the lighting mains. Lamps are usually employed for the purpose, using one 32-candle power carbon lamp for each ampere of charging current required. The lamps are connected in parallel.

It is important that the battery be connected properly or it may be ruined. The positive line of the lighting current is connected to the positive terminal of the battery. The positive of the battery is marked either with red paint or the lettering P, Pos. or +. The positive of the mains may be determined by dipping the charging wires from a lamp bank into a small quantity of water to which has been added a few drops of acid or salt. The wire giving off a cloud of bubbles is negative. Proper connections can then be readily made.

### Charging With Alternating Current

Where only alternating current is available a rectifier must be employed. This is a device that rectifies the alternating to direct current by mechanical, chemical or electronic means. Full instructions usually accompany such devices and should be followed carefully.

As previously mentioned, a proper charging rate should be used or the battery is liable to be damaged. It might be said that as high a charging rate as will not cause the battery to heat up is permissible. A temperature greater than 100 deg. Fahrenheit will result in sulphation of the plates and "shedding" or disintegration of the active material in the plates.

However, a safe charging rate is one that will take eight hours to charge the battery completely. Knowing the ampere-hour rating of the battery, simply divide this figure by eight and the proper rate of charge in amperes is the result.

### Use of Hydrometer

The hydrometer now enables us to determine the extent of the charge, even as it previously showed discharge conditions. The specific gravity of the electrolyte can

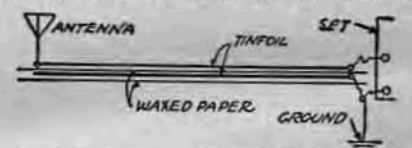
be taken at periods during the charge and when it reaches a value of 1280 to 1300, the battery is fully charged. When this condition is reached, gas will be noticed bubbling freely out of the solution. This indicates that the current has ceased causing chemical reactions on the plates and is acting to "split" the water in the solution into oxygen and hydrogen. At this point charging should be discontinued, immediately, for the current passing through the battery is being wasted.

### A Few Battery Axioms

- The care of a storage battery might be summed up into this brief form:
- Keep the battery exterior dry and clean.
- Keep all connections tight and free from corrosion.
- Have the plates covered to a depth of 1/4-inch.
- Use only distilled water in refilling.
- Check the charge often with a hydrometer.
- Charge the battery every month whether used or not.
- Remove vent plugs while charging.
- Keep open flames away while charging, as the gases given off are explosive.
- Do not let the battery heat up.
- Never discharge the battery below 1175 specific gravity or 1.7 volts per cell.

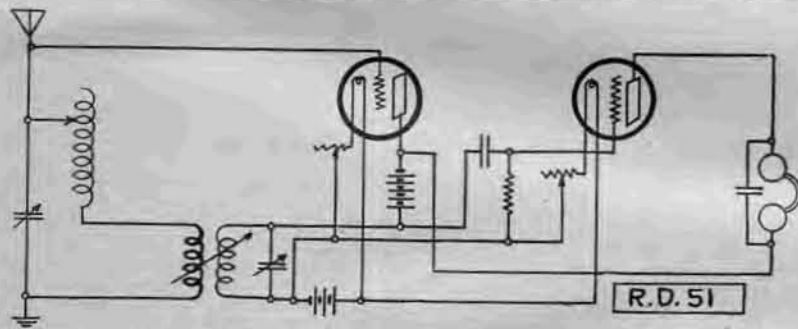
### Special Condenser Cuts Static

Take an old fixed condenser of .01 or .1 mfd. capacity and unwrap it, taking care not to tear the parts. When completely unwound solder the wire to one sheet of the tinfoil, then wrap it up again as



tightly as possible so that the wire will be in the center. When rolled up solder a wire to each of the two sheets of the tinfoil. Connect the wire that was soldered in the center of the coil to the antenna and the opposite end of the same sheet of tinfoil to the set. Ground the other sheet of tinfoil.—Lloyd Johnson, Liberty, Ind.

## HOOK-UP R.D.-51



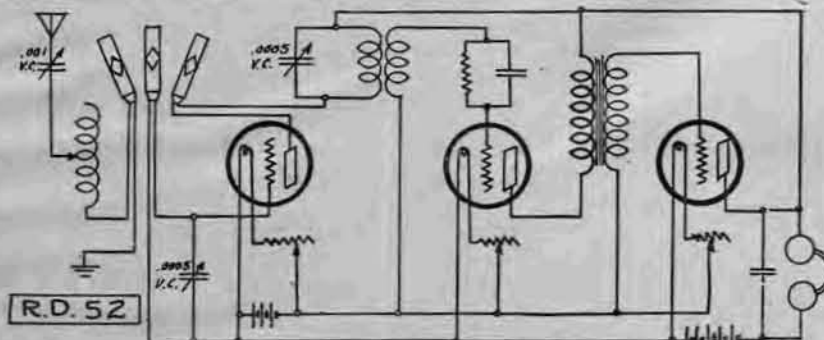
This hook-up follows the English practice and therefore differs somewhat from the usual form employed in this country. The variocoupler windings are untapped. Tuning of the primary circuit is accomplished by means of the single-slide tuning coil inserted in series with the primary of the variocoupler and the 23-plate variable condenser shunted across both. Variation of the secondary of the variocoupler is controlled by the 23-plate variable condenser shunted across it.

and the second tube as a detector. A .0005 mfd. fixed condenser is in series in the grid circuit of the second tube. A one megohm grid leak to the plus side of the filament controls the grid potential. Rheostat control is used for filaments of both tubes. A .002 mfd. fixed condenser is shunted across the phones. The plate voltage is 45.

Both tubes have a parallel connection. The first tube really acts as an amplifier

This hook-up will prove very interesting to the amateur who desires to indulge in a little experimental work with different types of hook-ups.

## HOOK-UP R.D.-52



This hook-up should be a very popular one to the novice having a honeycomb coil set, who is desirous of having one stage of audio and one stage of Radio frequency amplification. In order to avoid unnecessary changing of the primary honeycomb coil for variations in primary wave length, a single-slide tuner and 43-plate variable condenser are inserted in series in this primary circuit. By means of both of these, accurate control of the wave length is obtained.

The primary coil need not be more than L 25. The secondary coil is an L 50 with a 23-plate variable shunted across for control of the wave length. The tickler

coil is optional between L 25 and L 75 and only experimental work will determine which will give the best results. Filament control rheostats are used on all three tubes. The primary of the Radio frequency transformer is tuned by means of the 23-plate variable condenser shunted across it. This will permit tuning for most efficient results in a plate circuit. The plate circuits of all three tubes use the full B battery value which may vary from 45 to 90 volts.

In tuning this circuit it is important to watch that the over-regeneration is avoided, as a regenerative circuit does not operate at its maximum efficiency with radio frequency amplification.

## Transmitting Station For Sale

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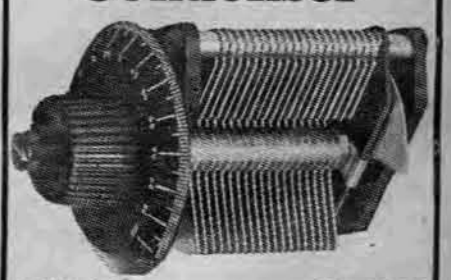
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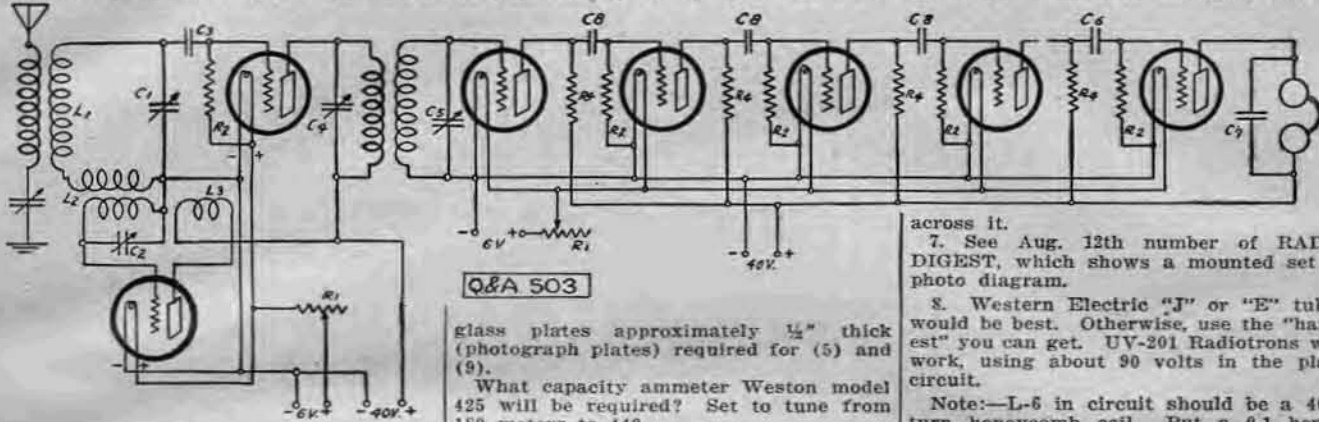
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# Questions and Answers

## Super-Heterodyne Circuit Data

(503) ABR  
 1. I am figuring on the construction of a receiving set using the Super-Heterodyne circuit and would like to have a diagram of the circuit with capacities of all condensers used.  
 2. Would also like to know if it is possible to construct a variocoupler with a wave length range of 150 to 2,500 meters. If so, wish you would tell me where I can secure plans and dimensions or if you can furnish same to me. My idea on



Q&A 503

glass plates approximately 1/2" thick (photograph plates) required for (5) and (9).

What capacity ammeter Weston model 425 will be required? Set to tune from 180 meters to 440.

Approximately what distance should I reach with aerial two wire, 90 feet long, 6 feet high, natural wave length including lead in approximately 235 meters.

A.—Disregard (1) and (4). Don't shunt key across primary of step up transformer. Put it in series with the 60 cycle 110 volt source. (8) is unnecessary except where needed to increase wave length. (9) is not advised except where required to decrease wave length. (10) should have five amperes capacity.

Make (7) from two flat spirals wound in same direction. The primary should contain about five turns, spaced one inch apart, beginning on a three-inch diameter. The secondary, starting on same diameter can contain eight to ten turns, spaced about three-fourths of an inch apart.

The actual tuning and adjustment of your set will require a wave meter. Formulas are all right in design, but length of leads and many strange conditions are factors in practice. Therefore, I cannot say how many turns will be used in either primary or secondary.

Condenser capacity should be about .03 mfd. Calculations show twenty sheets of dielectric needed. This would be eleven sheets of zinc on one side, ten on the other, and separated by twenty glass plates. You do not state speed of motor. I assume this to be 3,000 R. P. M. If less, the condenser must be larger, inversely proportionate to the speed and vice versa.

I have known 1/2 K. W. transmitters to have a range of over 1,000 miles. It all depends on your efficiency.

## More Super-Regenerator Questions

(876) CCH  
 In an article in your issue of July 29th by E. N. Hollingsworth, "Two Simplified Armstrong Super-Regenerators," there are a few things I do not quite understand and would be pleased if you will kindly answer the questions set forth on attached sheet.

1. He says—Loop 3 ft. on a side No. 18 Bell wire—9 turns. How far apart are the wires on loop from each other in making the turns?

2. He says—The duo-lateral coils L and L-2 are quite "closely coupled"—How close are they to each other and what position do they occupy on the panel?

3. He says—L-3, L-4 and L-5 are L1250, L-250 and L-1500, respectively—Are these duo-lateral, and what position do they occupy on panel? How close together are they?

4. He says—R and R1 are 12,000-ohm non-inductive resistances. Can I make these? If so, what size wire and how large in dia. and length? How many turns?

5. Will a Jefferson or All American 10 to 1 Audio Amplifying Transformer answer same purpose as U.V.-712 amplifying transformer?

6. He says—C5 is a .002 mfd. variable Condenser—but don't see any advertised. How many plates would this be? Would a .002 fixed answer?

7. A rough pencil sketch showing location of all parts on panel would assist me greatly, as I wish to have everything properly located and connected.

8. What tubes are best to use?  
 A.—1. One-half inch apart.

2. Use an ordinary double coil duo-lateral mounting so that coupling may be adjusted. The closer L and L-2 are coupled, the greater will be the amplification. See RADIO DIGEST, issue of August 12th, for layout used by W. W. Harper, pages 6 and 7.

3. Keep them apart. They are not coupled—and would be best at right angles to one another. You don't want induction between any of the three coils mentioned.

4. Graphite or carbon resistances of 12,000 ohms will work. To wind non-inductive, begin winding by soldering ends

of resistance wire from two spools together, and then winding double. You then will have two wire ends right together at the end. These are your terminals. Eight hundred and seventy feet of German silver wire, B. S. gauge No. 40, gives 12,000 ohms resistance. Diameter and length of tube or asbestos used does not figure in.

5. Probably—but a 4 1/2 or 5 to 1 ratio transformer will be best.

6. Use a .001 mfd. fixed condenser with a .001 mfd. variable condenser shunted

improve this circuit much. C-4 can be a .001 mfd. variable, while a .005 fixed should (not necessarily) be shunted across primary of T.

## Super-Regenerative Queries

(875) KTS  
 Attached please find drawing and description of an Armstrong Super-Regenerative Circuit. This was described in your issue of July 29th.

Reading through the description you will note that it gives the description of the various coils and condensers, but it does not tell how large to make the coils or where to place them, how they are coupled together and various other information.

The information I would like to get is the coupling between coils L and L-2. I understand these are ordinary honeycomb coils and can probably be mounted in the regular way. L-3 is a 1250-turn coil. It does not specify where it is to be situated or how large the diameter. Coils L-4 and L-5 I judge are to be loosely coupled in a similar manner to coils L and L-2.

A.—L and L-2 are ordinary honeycomb coils, mounted on a 2-coil variable coupling mounting.

L-4 and L-5 are NOT COUPLED. Put them at right angles. L-3 is not coupled to L-4 or L-5, either. Best put it at right angles to L-4 and L-5. Space them away from one another or shield if otherwise impossible.

Diameter of all coils depends on their windings. L1250 and L1500 coils are about 8 inches in diameter. This has no relation to working of circuit.

## VOICE OVER OCEAN

(Continued from page 1)

Langmuir tubes, should carry half way round the world.

"The development of Radiophone and the use of continuous wave transmission in Radio telegraphy have led to the general adoption of the vacuum tube as the generator of high frequency currents in low power installations," says Dr. W. Wilson in describing the new tubes. The ordinary vacuum tube is unsuited for handling large amounts of power, he points out, and today at large Radio stations where the plants are rated in hundreds of kilowatts, either the arc or the high-frequency alternator is used. The development of Radio telephony called for more powerful tubes in proportion to the power of the big stations, and for years the research men of the Bell System have been working on the problem. When Arlington Radio Station, NAA, first bridged the Atlantic and Pacific Oceans with a spoken message, some time ago, 300 tubes of 25 watts each were used in parallel—an achievement difficult of operation.

### Need for Kilowatt Tubes

Kilowatt tubes were needed in place of tubes measured in watts. The elimination of heat developed was the big problem. But the idea of cooling the anode by the passage of water, somewhat as the barrel of a machine gun is cooled by a water jacket, was finally hit upon. Drs. E. R. Stoekle and O. E. Buckley with other assistants finally developed an experimental tube cooled by water which developed 10 kilowatts. They were later aided by Mr. W. G. Housekeeper and Dr. M. J. Kelly, the former working on the mechanical structure and the latter determining the electrical design and process of tube exhaust. It was Mr. Housekeeper who developed the vacuum seal for clos-

ing the metallic and glass portions of the tube, so that it would withstand repeated heating and cooling varying from the cold of liquid air to a temperature of 350 degrees, without cracking the glass or breaking the vacuum seal. This he did, perfecting the ribbon, disc and tube seals for joining copper and glass by a sort of welding process.

### Big Tube Weighs Ten Pounds

The big tube is a little less than two feet in length, and weighs only ten pounds, yet it is capable of developing 100 kilowatts of high frequency energy, applicable to both Radio telegraphy and telephony. "These 100-kilowatt tubes," an official of the Telephone Company states, "by no means represent the largest tube possible by the present development. There is no doubt that if the demand should occur for tubes capable of handling much larger amounts of power, they could be constructed along the same lines."

### Description of 100-Kilowatt Tube

The anode, which is made of a piece of seamless copper tubing closed by a copper disc welded into the end, is 14 inches long and 3.5 inches in diameter. The filament is of tungsten and is .06 inch in diameter and 63.5 inches long. The current required to heat it is 91 amperes and the power consumed in it 6 kilowatts. The filament leads are of copper rod 1/4-inch in diameter and are sealed through 1-inch copper disc seals. The grid is of molybdenum and is wound around three molybdenum supports.

"The significance of this development in Radio art," it is stated by officials, "cannot be over-estimated. It makes available tubes in units so large that only a very few would be necessary to operate even the largest Radio stations now extant, with all the attendant flexibility of operation which accompanies the use of the vacuum tube."

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the variocoupler, if feasible, would be to switch contacts so that it would be capable of very fine adjustment.

A.—1. The circuit for Armstrong Super-Heterodyne circuit is illustrated on this page. The constants marked are as follows:

2. It would be possible to construct the 150 to 2,500 meter variocoupler, but the dead end losses would be very high. Why not use honeycomb coils? They are much more satisfactory for higher wave lengths. Winding data enabling you to construct coils of any inductance will be found on page 13, of both June 10th and June 17th issues, of Radio Digest.

R1—10 ohms, R2—1 megohm, R4—50,000 ohms, C1—.0005 mfd., L1—50 millihenries, L2—18 turns No. 30 D.C.C. wire wound on a 2 1/2 diameter tube, L3—18 turns No. 30 D.C.C. wire wound on same tube close to L2 and in same direction, C2—.001 mfd., C3—.0001 mfd., C4—.0005 mfd., C5—.0005 mfd., C6—.0001 mfd., C7—.001 mfd., C8—.005 mfd.

## Tubes for Super-Regenerator

(938) DF  
 1. In the Armstrong super-regenerator circuit, shown in your issue of July 29, 1922, can you give me the size of wire and turns not given in the magazine, and whether bank wound or otherwise. I prefer the circuit shown in Figure 1, but wish to build both soon.

2. Please give me a list of very hard tubes. Are the Cunningham 301's of an extremely hard variety?

3. In repairing a short wave Kennedy I found the plate variometer has no effect and a circuit travels the full length of the winding. What can the trouble be? There is no difference whether the plate circuit enters it or whether you short it—still it works good up to 500 miles.

a.—1. See August 12th issue, pages 6 and 7, for detailed data on circuit. Use this later circuit—it is better. The inductance (number of turns) is given also.

2. Radiotron and Cunningham Amplifier tubes are hard enough to work this circuit.

3. The plate circuit variometer, if not internally short-circuited, should tune the plate circuit, producing regeneration (noted by squealing or howling). Does it do this? If so it is functioning, otherwise something is wrong with it. Write to the Kennedy Company.

## Trouble With Super-Regenerator

(878) HBH  
 Don't seem to be able to get the Armstrong Super-Regenerative Circuit (July 29 issue) to work, although I have all the apparatus called for. Where may I look for trouble? When moving either one of the variable condensers I get the beats but no signals. The only signals I have heard are heterodyne spark stations, and those have come in only once or twice. No telephone signals are heard.

A.—Have had several complaints on circuit, Fig. 2. Fig. 1 is O. K., but L-3, L-4 and L-5 are at right angles to one another and not coupled. L and L-2 are closely coupled.

To remedy Fig. 2, make L-5 a 400-turn honeycomb coil. Add a 1500-turn honeycomb coil in series with plate of second tube and R. Add a 0.1-henry iron-core choke coil in series with and just above C-4. Change C-4 to a .001 mfd. fixed condenser across primary of T, which should have a ratio of about 4 1/2 or 5 to 1.

Experiment with various voltage grid bias batteries on tubes. Vary B battery voltage. See page 7, August 12 issue.

## Transmitting Data

(932) TH  
 You perhaps will do something for me now, P. J. M. Clute's article, Vol. 1, Number 7, page 11. I would like to receive from you more data.

# Radio

## Illustrated



Children enjoying an outing in Lincoln park, Chicago, take their Radio outfit along. In their frolics they make the statue of Shakespeare listen in on some up-to-date music and Radio talks



The twentieth century baby no longer lisps a request for muvver's song. The children demand that only the most up-to-date methods of putting them to sleep be employed. "Rock-a-bye baby" is a song of the past, and bedtime stories by Radio have taken its place with the infant of today. Here shown is a mother rounding out a perfect day before the children are ready for the sandman  
© Keystone

The Radiophone takes the place of an orchestra heretofore employed to play during the filming of scenes. The juvenile film star, Wealey Barry, is shown in an emotional role, facing the cameras and directors, while the Radiophone is sounding plaintive music © Int.