

# Radio Digest

EVERY  
WEEK

Illustrated

TEN  
CENTS

TRADE-MARK

Vol. III

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CHICAGO, ILL., SATURDAY, NOVEMBER 11, 1922

No. 5

## OPERA SEASON OPENS



Mary Garden as "Carmen" in the opera of that name.

Rosa Raisa costumed as "Aida."

Angelo Minghetti to make American debut this season.

Edith Mason in "La Boheme" is example of a popular American soprano.

Giulio Crimi (center figure) sings opposite Miss Raisa in "Aida." Tune in for KYW (400 meters) on the evening of Monday, November 13, and listen

in on the opening opera of the Chicago season. The stars shown above will be heard in "Aida," "Carmen," and "La Boheme" the opening week.

### FIRST OPERA ON AIR SOON

"Aida" for Fans Nov. 13

Chicago Opera Company and KYW to Release Four Presentations First Week

CHICAGO.—Grand opera starts "on the air" Monday, November 13. Once more Radiophans of the Middle West will hear the sublime presentations of the Chicago Opera Company. Every opera suitable to Radiophony will be broadcast by KYW, an class B (400-meter) station of the Ringhouse Company. KYW, it will be remembered, broadcasted the Chicago opera last season.

By "suitable to Radiophony" is meant such operas as can be appreciated by Radio without the visualization afforded by the costumes and actions of the artists.

The opening opera "Aida," in which Rosa Raisa sings the title role, will be the first to be broadcast. On the night following, Tuesday, November 14, the beloved "Carmen" with Mary Garden as Carmen, will be tendered the Radiophans. Wednesday night, "La Boheme," Edith Mason starring, will be microphoned from the Auditorium to KYW, and on Saturday

evening, November 18, "The Jewels of the Madonna," with Rosa Raisa again singing the leading part, will be heard by listeners in.

The operas on Thursday night and Saturday matinee, "The Snow Maiden" and "The Love of Three Kings" respectively, will not go over the microphone. Their nature is such as will not permit the best obtainable Radio results.

Such is the program for the first week of the season. Four of the six presentations will await the homebody on his receiving set.

#### Thumb Nail Sketch of Rosa Raisa

Rosa Raisa, who will be heard in the opening opera "Aida" singing the part of Aida, has been acclaimed by New York as well as Chicago as one of the foremost dramatic sopranos. The story of her life is picturesque.

Born in Russian Poland, she was obliged to flee Russia at the age of fourteen. Finally reaching Capri, Italy, a philanthropic woman befriended her and made provisions for her instruction in music. Mme. Campanini (Eva Tetraxini) heard Miss Raisa sing, and introduced her to Cleofonte Campanini. Under this auspicious patronage the young artist made her debut at Parma, and later came to the Chicago Opera. She has been with this organization since, except for a year passed in European opera houses and several visits between Chicago seasons, spent in Buenos Aires and Mexico City.

#### Crimi to Sing in "Aida"

Giulio Crimi, who will be heard with Miss Raisa in "Aida," returns to the Chicago opera stage after an absence of four years. Before his first appearance here, Mr. Crimi had a remarkable career in Italy despite the fact that he was just out of his twenties. He had appeared and been highly praised for his performances

in the principal opera houses of Milan, Rome, Palermo, Florence and Bologna, as well as in the theatre Sarah Bernhardt in Paris and at Covent Garden, London, where he created the tenor role in "L'Amore del Tre Re."

He won additional honors at the Colon Theatre, Buenos Aires. Then came his first engagement with the Chicago Opera. He was received with enthusiasm, but left after a time to fill engagements with the opera in Mexico City and with the Metropolitan in New York.

The Italian tenor comes back to Chicago this season to sing a number of the leading tenor roles in the Italian repertoire.

#### "Our Mary" Garden

Mary Garden, who will be with Radiophans Tuesday, November 14, as "Carmen" in the opera bearing that name, hardly needs an introduction. Her career is inseparably associated with the great rise in popularity of French opera in America. She was born in Aberdeen, Scotland, but has been an American since six years of age. Her first attention to music was through the violin, but her vocal power became apparent, and after preparation with American teachers, she went to Paris and studied with Trabodella, Chevallier and Fugere successively.

She obtained a hearing at the 'Opera Comique, and found there her great opportunity in "Louise," in which she appeared for 100 performances. After other successes in Paris, she appeared in London and then came to the Manhattan in New York. Her career with that and the Chicago company is familiar history.

She is the only woman who has held the position of general director of any American opera company. During her regime in that capacity, she gave her audi-

(Continued on page 9)

### NO OPERA FOR EASTERN FANS

Metropolitan Sends Word

Says It Cannot Broadcast Opera—RADIO DIGEST Starts Entreaty for Easterners

"Regret much we cannot broadcast opera." That was the short reply the Metropolitan Opera Company of New York City gave to RADIO DIGEST ILLUSTRATED when the latter asked the well-known musical organization what their intentions were in this regard.

Do the hundreds of thousands of Radiophans in the area surrounding the largest city in the world want the highest class of music this winter? Does the great army of listeners in desire to hear the compositions which have come down through history? RADIO DIGEST believes the consensus of opinion will be in favor of hearing Metropolitan opera. To that end this publication is making an earnest effort to get Metropolitan opera in the fan's head set.

Last week the Chicago Civic Opera Company announced through this publication (Continued on page 2, column 1)

# EASTERN FANS MINUS METROPOLITAN MUSIC

## RADIO DIGEST Begins Campaign to Petition Great Musical Organization to Broadcast

(Continued from page 1)

that all operas suitable to Radiophony would be broadcast. This is the second service stripe for the Chicago Opera Company, which won its first last year when opera was broadcasted for the first time in the world. Throughout the 1921 season KYW, Westinghouse station of Chicago, and international pioneer opera broadcaster, popularized good music and the Radiophone by registering on the ether the great musical achievements by the Chicago Opera Company. KYW will put opera "on the air" again this year for the benefit of all broadcast enthusiasts of the Middle West.

### No Opera for the East

But inasmuch as no provision has been made to microphone Metropolitan opera, the citizens in the East not possessing sensitive and, usually, expensive, receiving sets will not be able to hear the type of music considered the most wonderful produced by man, that of opera.

That is, no opera will be available for the eastern fan, unless the Radiophans and other interested persons make it their duty to aid RADIO DIGEST in its entreaty to the Metropolitan Opera Company. To that end every reader of RADIO DIGEST is asked to fill in the petition coupon to be found in the lower left hand corner of page 2. Spaces are provided so that readers may secure also signatures of their Radiophan friends.

### Petition Only Part of Program

The petition, when compiled and submitted to the Metropolitan Opera Company by RADIO DIGEST, will only be a part of the program. Daily newspapers, leaders in the Radio industry, New York civic figures and all possible influences are being asked by this to use their good offices to promote the broadcasting of opera in New York City.

Opera stands without an equal as the most excellent program Radiophony has to offer. Broadcasts of Chicago opera from KYW were largely responsible for the wonderful, spontaneous popularity of listening in, in Chicago and the surrounding states. The generous ether contribution made last season by the Chicago Opera Company, and to be repeated during the season starting November 13, was not in vain. It brightened and cheered hundreds of thousands of bedridden in hospitals and asylums, and countless of aged and infirm unable to leave their homes.

### Educational Influence

Radio broadcasting of opera has been the greatest educational and cultural influence of the present era. An appreciation of the beautiful in music has been born in the multitudes by this service.

The Chicago Opera Company realizes that the propagation of the great masters handwork by means of electromagnetic waves is a benefit to mankind. Its philanthropic view is justified by the indirect advertising the company and its supreme artists acquire by means of broadcasting. It is claimed that attendance at the opera is increased as a result of this advertising and educational influence.

Last season, so it is said, a man from Texas who heard Chicago opera by Radio in his Texan home, when in Chicago on a trip bought tickets to the opera. He told

## CLAIMS ETHER WAVE HURTS MANY BIRDIES

LONDON, ENGLAND.—Baroness Constance Strachie has started a newspaper campaign against Radiophony, asserting it is very destructive of bird life. "Many birds that have happened to get into a direct line from broadcasting stations have been picked up dead," she says, urging that broadcasting should be reserved "for the high seas and not for the amusement of crowds."

## NEW YORK WON'T BE "ON AIR"



RECEIVED AT  
8215 A1 7 COLLEGE WASHINGTON ST.  
NEW YORK, N.Y. 12034 OCT 25 1922

RADIO DIGEST ILLUSTRATED  
C 395 CHICAGO ILL  
REGRET MUCH WE CANNOT BROADCAST OPERA  
METROPOLITAN OPERA CO  
1127A

the management that he desired to hear, firsthand, what his receiving set had brought to his far away home. His was a typical example of the thousands of similar cases.

### Support of Many Sought

Three of the many telegrams sent out asking the help of civic, Radio and editorial officials, are reproduced below. They serve to show what work RADIO DIGEST is doing in the interest of broadcast opera. The telegrams follow:

"Mayor Hylan, New York City.  
"On behalf of the common people of New York and the East, we appeal to you to use your good offices in influencing Metropolitan Opera Company to Radio broadcast opera this season. Management of New York opera company wires us, 'Regret much we cannot broadcast opera.' Millions in the metropolitan area will lose the opportunity of hearing the great masters. Radio has been the greatest educational influence of modern times. Hundreds of thousands of bedridden in hospitals, old homes and asylums were brightened and cheered last season by hearing the opera by Radio. Only the East will suffer as the Chicago Opera Company will broadcast in the West. Management claims Radio increases attendance. Why deny the great population of New York their opportunity of listening to the opera? Can we advise our New York readers through the columns of our magazine that they can count on your support in the campaign to secure

the opera for the East? (Signed) RADIO DIGEST.

"Arthur Brisbane, New York Journal, New York City.

"On behalf of the common people of New York and the East, we appeal to you to use the power of Hearst's great newspapers in influencing Metropolitan Opera Company to Radio broadcast opera this season. Management of New York opera company wires us, 'Regret much we cannot broadcast opera.' Millions in the metropolitan area will be cheated of the opportunity of hearing the great masters. Radio has brought the immortal classics into the humblest homes and has been the greatest educational influence of modern times. Hundreds of thousands of bedridden in hospitals, old homes and asylums were brightened and cheered last season by hearing the opera by Radio. Only the East will suffer as the Chicago Opera Company will broadcast in the West. Management claims Radio increases attendance. Why deny the teeming millions of the East their only great moments? (Signed) RADIO DIGEST.  
"David Sarnoff, Radio Corporation of America, Woolworth Building, New York City.

"On behalf of Radio industry and millions of fans, we appeal to you to use your good offices in influencing Metropolitan Opera Company to broadcast opera this season. Management wires us, 'Regret much we cannot broadcast opera.' Chicago Opera Company will broadcast beginning November 13th. Management claims Radio increases attendance. Opera is the greatest single factor that will revive public's interest in Radio. RADIO DIGEST is making a campaign to secure the opera for the eastern public. Will you help? (Signed) RADIO DIGEST."

### Marconi Wins Austrian Right

LONDON, ENGLAND.—Following a long battle for the privilege, the Marconi Company has succeeded in winning from the German Telefunken Company the sole right to build Radio stations in Austria, and to handle all commercial Radio business between Austria and other countries during the next thirty years. The original equipment is to consist of two sending and three receiving stations.

### Organize Concern for Asia

WASHINGTON.—Under the name of "Radio-Orient," the Campagne Generale de Telegraphie sans Fils has organized a subsidiary to handle business with Syria and other Asiatic countries. Reports state that the company has been chartered with a capital of 8,000,000 francs, 4,000 shares of one series and 12,000 shares of another—of which 10,250 are being offered for public subscription at a par value of 500 francs per share.

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## Looking Ahead

The eleventh of the series by H. M. Towne will appear next week. Mr. Towne always constructs and tests all apparatus he describes.

There will soon appear a series of articles written by an instructor in a well known electrical school. The series will discuss all the rudiments of electricity pertaining to Radio. They will be instructive to the beginner as well as the more advanced person in the art.

Broadcasting Directory. Gets better and larger each week. The only convenient reference to aid you in finding a station heard.

"How to Make Department." Many kinks every week are interchanged here.

Radio Illustrated. The picture page is the best of its kind.

## Newsstands Don't Always Have One Left

# WHEN YOU WANT Radio Digest YOU WANT IT!

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Publisher, Radio Digest, Illustrated, 123 West Madison St., Chicago, Illinois. 3-5  
Please find enclosed check M. O. for Five Dollars for One Year's Subscription to Radio Digest, Illustrated.

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Address.....  
City..... State.....

## MAIL THIS IN TODAY FOR OPERA

### METROPOLITAN OPERA PETITION

Mail to Opera Editor, RADIO DIGEST, 123 W. Madison St., Chicago

We, the undersigned, most heartily endorse the RADIO DIGEST campaign to secure opera for the eastern citizens possessing Radio receiving sets, and petition the METROPOLITAN OPERA COMPANY to broadcast their presentations in a manner similar to the service rendered by the CHICAGO OPERA COMPANY and Station KYW.

(Blanks are provided for friends' signatures.)

- .....  
(Name) (Address)
- .....
- .....
- .....
- .....

(This petition may be pasted on another sheet of paper in case it is desired to add more names)

# GREATER RANGE IS LISTENERS' DEMAND

SEEKS TO EXTEND FIELD BEYOND LOCAL PLANTS

Officials Advise Inspection of Sentiment for "Silent Nights"—Radiophans' Opinions Asked

WASHINGTON.—The Radio public is beginning to demand not only good entertainment, high class transmission, but a greater range of reception. In other words, the listener-in wants to reach farther afield, his horizon is extending, he wants to hear the distant stations outside his city and state, and the Department of Commerce Radio officials are making a survey of each Radio district to see if there isn't some way that this can be arranged.

One Radio enthusiast has put it well; he says that, while he is appreciative of all his local stations, he sometimes wants "to go visiting by Radio"—listen to some of the big stations outside the local field, just as he frequently likes to listen to the conversation of others than his immediate family, which he cannot do if those at home talk all the time. It's the same in Radio broadcasting he says.

### Tell the Radio Inspector What You Think

In an effort to aid in seeking a solution of this new problem, the Department of Commerce has written letters to its nine Radio district inspectors advising that information reaching the Department indicates that there is developing a sentiment throughout the country for silent local Radio broadcasting periods so that the listeners-in can hear the distant stations, which is often impossible when local stations are broadcasting. In some sections of the country steps for such an arrangement have already been taken. In other sections the local broadcasters remain silent for one evening a week or a few hours one or two evenings a week so that those having receiving sets capable of long distance reception can pick up some of the powerful broadcasters outside of their district. The commerce department points out that there is a great fascination in listening to distant stations and it is the opinion of the Radio section that this desire on the part of the Radio public will meet with the co-operation of most of the broadcasting stations. Broadcasters and local enthusiasts will do well to advise local inspectors what they think of the plan or take it up with the Department directly.

### Silent Evenings Recommended

It may be found desirable to divide the United States into zones somewhat as it is divided into time zones, the stations in a particular zone having silent nights or periods of two hours each. It might be arranged so that the broadcasters in the Eastern Time Zone would not transmit on Monday night, those in the Central Zone keeping quiet on Tuesday, Mountain section Wednesday and the Pacific Coast on Thursday, all sending on the other nights. The inspectors have been requested to bring this suggestion to the attention of owners of broadcasting stations in their districts and explain it to broadcasting and listening in organizations. Reports from the inspectors will indicate the desire on the part of the public and the attitude of the broadcasters, who will have to arrange the matter as the department's plan is only a suggestion.

Radiophans who complain of interference must not forget, officials point out, that the execution of such a plan will not enable them to get long distance stations unless they have good sets and know how to tune them properly. The scheme is expected to receive the indorsement of the public and broadcasters alike, but it can only be carried out successfully with close co-operation of everyone. The reports of the inspectors are awaited with interest in Washington.

Hundreds of jewelers in Paris have installed Radio sets for the purpose of setting their clocks by Greenwich time.

## YALE WILL AIRPHONE ALL ATHLETIC EVENTS

NEW HAVEN, CONN.—The authorities at Yale University announce that in the future, athletic events will be broadcasted by Radio to the surrounding cities. This means that anyone within a distance of 25 to 50 miles of New Haven, will be able to receive by Radio, play-by-play reports of the football games, hockey, lacrosse, and other sports.

## DRY CELLARETTE NOW HARBORS PHONE SET

COLUMBUS, O.—H. L. Solomon, pants impresario of the Buckeye Dry Cleaning Company of this city, has found a new use for his good old cellarette. Since the passing of the last ship over the bar, the Solomon cellarette has been regarded as entirely useless in the Solomon family. Its owner has recently equipped it with a complete receiving set.

# PIONEERS' DEVICE BLOTS OUT STATIC

INVENTION SELECTS ONLY SIGNALS DESIRED

Dr. D. Galen McCaa, Ephrata, Penn., Perfects Two Systems, Bringing Superior Results

LANCASTER, PA.—Prevention of static interference in reception of Radio signals is declared by the Lancaster Examiner Era to have been solved by a recent invention of Dr. D. Galen McCaa of Ephrata, Pa., who is known widely as a pioneer in Radio.

"Two different systems have been developed," the doctor says, "that function on an antenna at any wave length. Either one, when combined with a tone selective device that has been developed, operates to eliminate static. In California this summer, the static of five thousand audibility was reduced to 5, at which time commercial signals were received two hundred and fifty times the strength of the static."

### Claims Superior Results

The second system, developed in his laboratory since his return East, has produced results superior to those obtained in California, he declared.

"Tests have been made on the latest development at three hundred and sixty meters," he said, "on which a broadcasting telephone system is operated, and it is known that the device will operate on all Radio systems at any wave lengths. The latest device is free from critical adjustments, is absolutely stable in operation, requiring no attention."

### Is Selective Device

"The tone selective device is an interference preventer designed to select signals of Radio frequency and will permit only one frequency to pass through. It also prevents the admission of static and succeeds in clearing the signals of all disturbing noises or hisses."

Dr. McCaa's invention is a simple mechanical device that operates on the Radio signals and converts them into mechanical motion, which may be used to open and close contact points. The contact points then control any electrical circuit for purposes such as the printing telegraph, for making a permanent record of the signals, converting Radio signals to wire lines and operating transmitting stations by received signals.

## WNAD AND WEY TELL PEOPLE SPORT RESULTS

Missouri Valley Gridiron Battles Go on Ether

NORMAN, OKLA.—Broadcasting of inter-collegiate football play by play in Kansas and Oklahoma made its initial hit with the Radiophans of the middle west when WEY and WNAD, stations of the Wichita Beacon, Wichita, Kans., and of the Oklahoma Radio Engineering company of Norman, Oklahoma, respectively, sent out the results of gridiron games recently.

Drug stores were utilized in the small towns over the state as central receiving points. Miniature football fields were kept in action by the results which were coming in continuously during the game. WEY was the first station in Kansas to use this system of sending football scores, as was WNAD in Oklahoma.

Norman is the home of the University of Oklahoma and will be the scene of three Missouri Valley gridiron battles this fall. WNAD will broadcast these scores play by play in the afternoon of the game and will send out a summary of the game in the evening.

Station WSB boasts of its first and only mascot, namely a young alligator, sent to the station by W. G. Bowden of Jacksonville, Fla., who claims he caught him in Deland, Fla.

## EVEN THE SKULL GETS A CHUCKLE



Mrs. Jack Barry of Chicago, shown at the cabinet set of the Benson Company of that city, when asked about the skull, informed the photographer, "He's dead but he still enjoys Radio!" Radio Digest Photo

## Plan \$2,000,000 Vancouver Plant

VANCOUVER, B. C., CAN.—The Marconi Wireless Telegraph Company of Canada, in cooperation with the parent company in England, is contemplating erecting at Vancouver what will probably be one of the largest and most powerful Radio stations in the world for direct communication with Australia and the

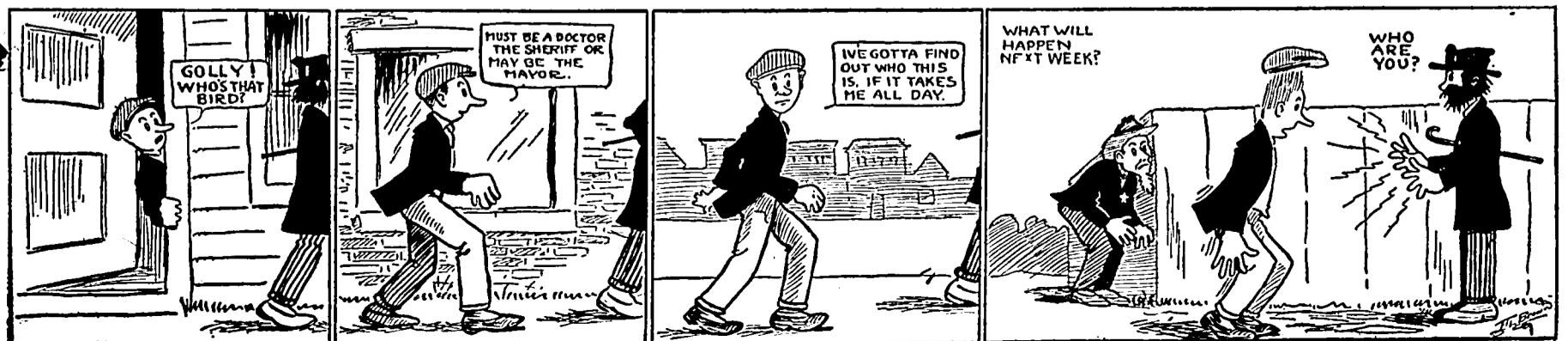
East. It will cost upwards of two million dollars and will be the last word in modern Radio engineering.

The British government has been anxious for some time past to establish a great chain of imperial wireless stations around the empire, under government operation and control and has been urging the different parts of the empire to cooperate.

## THE ANTENNA BROTHERS

Spir L. and Lew P.

Part I—The Duggerville Announcer?



# New Code Signal Recording System Makes 180 Words a Minute Possible

## "Creed Method" Speeds Radio Dispatches to Press and Business Centers, Smashing Old Hand Transmission Records of Forty Words—Vacuum Tubes Amplify Feeble Currents

Code Radio communications from ships and land stations, which Radiophone users frequently hear, are transmitted by hand, generally at a speed ranging from twenty to thirty words a minute. Since the early days of Radio various methods of automatically recording messages at high speed have been developed in order to facilitate the clearing of heavy traffic in the shortest time possible, especially between long-distance points.

The trans-Atlantic transmitters and receivers are in constant operation handling the hundreds of Radiograms and press reports between Europe and the United States. To use a speed of forty words a minute would require many hours to get the latest press news and business messages across the sea. One of the latest methods of speeding up Radio communication is known as the Creed system, which is applicable at the present time for commercial work at a speed of 180 words a minute.

### Signals Must Be Accurate

One of the greatest problems in the operation of printing or recording Radio apparatus is the necessity of accuracy of the signal form; that is, the duration of the dots and dashes. The accuracy required for mechanical or automatic receiving must be carried to a much higher degree than if the reception is through a headset and the human ear, and more particularly so when high telegraphic speeds are used. In the operation of the high-speed mechanism it is necessary to insert a mechanical relay between the Radio and

ordinary electrical circuits. The relay in this case is an instrument actuated by the Radio currents after they are amplified to sufficient strength to cause the relay to operate and control other instruments in the circuit.

The new relay used in connection with the Creed system was developed in England and has features which overcome many of the difficulties and deficiencies existing in mechanical relays. Its salient points are: Stability of adjustment, firmness of contact pressure, and absence of rebound, sensitivity, shortness of transit time and ability to work at high speeds.

### Reads Continental Code

In connection with the Creed system the signals are transmitted in the ordinary continental Morse code. The impulses as picked up by the antenna wires are passed through special vacuum tube amplifiers, which build up the signal strength sufficiently to actuate the relay, capable of following the dots and dashes perfectly up to 200 words a minute, with a current as low as one-quarter milliamperes. The relay in turn operates a performer which punches the dots and dashes on a paper tape. This tape is run through an automatic typewriter, which records the message in print on another tape. The new features of this relay are ability to follow at high speed and at the same time work with entire fidelity on such a feeble current. The inertia of all the mechanical parts, as well as the electrical magnetic circuits, have been so finely calculated that the maximum efficiency theoretically possible is produced.

# Captive Balloons Tap Air of Power

## German Inventor Claims to Draw Steady Yield of 200 Electric Horse-Power from Ether

NEW YORK.—Herrman Paulson, a German scientist, has, it is said, succeeded in tapping the upper air for its burden of electricity. He makes use of balloons of his own special design with which he secures a sufficient amount of current of which to make practical. The balloons used by the inventor are made of thin aluminum leaf. No fabric is used. A simple internal system of ribs, stays and wires gives the balloon rigidity as well as elasticity. The balloon, when made airtight, is filled with helium, which is non-inflammable, and will keep a balloon aloft for several weeks.

The outer surface is dotted with pins, sharpened electrolytically and made of an amalgam of zinc containing a radium preparation in order to ionize the air.

At his experimental station Mr. Paulson has 100 such captive balloons, 100 yards from each other, which give a steady yield of 200 horsepower, it is said. In the winter, due to the higher electrification of the atmosphere, more than 400 horsepower is claimed.

Today even if farmers are not equipped with private sets, they may hear the reports transmitted directly by calling the equipped.

## RADIO LETTERS TO SHIPS

### Organization Inaugurates Novel Mail Extension Service in Australia

MELBOURNE, AUSTRALIA.—In an effort to extend the use of Radio service in Australia, a system of Radio transmission and mail delivery from steamers has been inaugurated by the Amalgamated Wireless.

The company agrees to send out at the ordinary Radio rate, plus 2½ pence postage on each letter, messages for mail steamers which have departed any time within the previous week. These messages will be written out by the ship's Radio operator, placed in envelopes and mailed at the particular port of call that the sender specifies.

COLUMBUS, O.—Those who listened in on Station WCAH a few nights ago heard the Al G. Field quartet, including Billy Church and Eddie Jones, sing from the office of the Atlanta Journal, Atlanta, Ga. The Al G. Fields minstrel troupe is "Columbus' Own."

**"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

## SET ANTIQUES FOUND AMONG OLD CLOTHES

THE home-made apparatus with which David Hughes made his early experiments in Radio in 1879, many years before Marconi took out his first patent, and the first microphones invented by Hughes have been found among a heap of old clothes in a London depository. Knitting needles, sewing needles, corks and ash trays were all used in making the apparatus.

## Ship Stations Can't Receive or Send Near Swedish Coast

WASHINGTON.—The American Consul General at Stockholm states that the decree of May 13, 1921 prohibiting the operation of Radio of foreign ships in Swedish territorial waters within 10 nautical miles of a coastal Radio station is being strictly enforced. The only exception to this rule, the report says, is in cases of great urgency, or where the safety of the ship is concerned. Under the same decree, ships in Swedish harbors may not receive messages without permission of the telegraph directorate.

## WGI Starts "Radio Nights"

MEDFORD HILLSIDE, MASS.—A series of New England Radio Nights (not Arabian Nights), to take place during the fall and winter months, is the latest announcement in the broadcasting program of the station WGI, located here. It is planned to devote specified evenings at periodic intervals to certain organizations who will be responsible for the program during the time allotted. The first two New England Radio Nights were given October 23 and 26 respectively. Others are to be announced from time to time.

Scientists have discovered that the aurora has a decided interfering effect on Radio. Apparatus affected by the aurora could receive but not transmit signals while the influence lasted.

## DEALERS

Write for Special Discount Sheet

Baldwin, Myers, Atwater Kent, Radium Loops, Erla

HUDSON-ROSS, 123 W. Madison St., Chicago

## Jap Firm Asks Permit for Radiophone System

WASHINGTON.—Application for government sanction to establish a Radiophone system has been made by the Daido Electric Power Company, of Nagoya, Japan, according to advices received by the Department of Commerce. The company proposes to operate this Radio system primarily for its own convenience in connecting the various stations with its electric light and power system, but its use may be extended eventually to the general public if sufficient demand should arise.

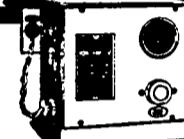
As at present planned the Radio system will start from Okuwa in Nagano Prefecture on the Central Japan Railway Line, from which point communication will be established through Nagoya and as far as Osaka, a distance of about 150 miles.



## Carter "TU-WAY" Radio Plugs

take two head sets and all types cord tip terminals. Price \$1.50. Write for Bulletin on Carter "HOLD-TITE" Jacks and other products. CARTER RADIO COMPANY, 209 South State Street, CHICAGO

## HOMCHARGE YOUR RADIO BATTERY for a Nickel



ENJOYABLE Radio Concerts and Maximum Receiving Range are obtained only when your battery is fully charged. The

charges your "A" or "B" battery over night. Silent and clean in operation—requires no watching—may be used right in your living room. Connects to any lamp socket. Self-polarizing—fully automatic—cannot overcharge or injure the battery. Entirely enclosed—approved by Underwriters. Unconditionally GUARANTEED. Lasts a lifetime.

Beautifully finished in Mahogany and Gold—the most efficient and handsome rectifier ever produced. Bulletin 637 gives it—send for your copy today—IT'S FREE. Sold by all good dealers or shipped prepaid for \$18.50, complete.

Dealers—Jobbers: The HOMCHARGER Merchandising Plan offers the best proposition in the entire radio field—send for details.

THE AUTOMATIC ELECTRICAL DEVICES CO. West Third Street Cincinnati, Ohio

Over 50,000 HOMCHARGERS in Use

It has been talked about but never fully realized until NOW

# Radio Frequency Amplification

**Federal Radio Frequency Amplifying INSTRUMENTS** are unquestionably the most satisfactory that have yet been devised.

THEY INCLUDE

No. 55	Federal Radio Frequency Amplifier	\$ 58.00
(Two stages Audio Frequency)		
No. 56	Federal Radio Frequency Amplifier and Detector	52.00
(One stage Radio Frequency Amplification and Detector)		
No. 57	Federal Radio Receiver	98.00
(One stage Radio Frequency, Detector and two stages Audio Frequency)		
No. 58	Federal D. X. Radio Receiver	116.00
(One stage Radio Frequency, Detector and two stages Audio Frequency)		
No. 8	Federal AUDIO FREQUENCY Amplifier and Detector	52.00
(One stage Audio Frequency and Detector)		
No. 9	Federal AUDIO FREQUENCY Amplifier	58.00
(Two stages Radio Frequency Amplification)		

A combination of No. 55, No. 56, and No. 9 is ideal for use with loop or other restricted antenna.

WRITE FOR BULLETIN No. 119-W

## Federal Telephone & Telegraph Company

BUFFALO, N. Y.  
CHICAGO BRANCH OFFICE: 805 STEGER BUILDING. CHICAGO, ILL.



"THE right path is near," says Mencius, "yet men seek it afar off."

The right receiver is here—the Grebe CR-5. The wise Radioist need seek no further!

A. H. GREBE & CO., Inc. RICHMOND HILL, N. Y.

Doctor Mhu.

# AIR WAVE BILL IN "MESS" AT CAPITAL

## 'THROAT CUTTERS' DISGUST HOUSE COMMITTEE

Lack of Cooperation from Radio Interests Perils Measure—Don't Want Navy Press

WASHINGTON.—Advocates of the Radio control bill now pending in congress may have their hopes for the passage of that measure at the coming session blocked by a combination of legislative circumstances and by the disgust of congress with those affected by the bill who refuse to accept any compromise legislation that may be suggested.

In the language of an advocate of the measure, the interests which naturally would be expected to cooperate with the government in establishing a systematic control of the air are literally engaged sub-rosa "in an attempt to cut each other's throats for their own selfish purpose."

### Ship Bill Gets Attention

The Radio bill is pending in the house committee appointed and no hearings have yet been had on it. This committee devoted the major part of the last session to hearings on the ship subsidy bill and this measure is likely to be made the principal business, aside from appropriation bills, in the coming session of congress.

It is apparent, however, that even if the house committee were in a position to consider the Radio bill upon the opening of congress a long and hotly contested argument would result among the Radio interests.

In order to get any kind of Radio bill before congress the government experts, in consultation with the Radio followers agreed upon the pending compromise bill. That compromise is now satisfactory to none of the interests involved, according to reports, and they are engaged in an underhand fight to defeat each other and to block the bill.

### Don't Want Navy Press

Selfish interest has become paramount to any other consideration, according to the reports of members of congress who have listened to some of their arguments and watched their movements. There is also a concerted drive among some Radio manufacturers against permitting the navy to render any press or commercial service in the Pacific or elsewhere. They want that service stopped and are not willing to have it continued during the interim while they finance, organize and equip a private corporation to render this service.

Members of congress look upon the situation surrounding the Radio bill at this time as a "mess" and are inclined to let the combatants fight it out until such time as they are willing to make peace and get together on some reasonable legislation.

# SIR HARRY INNOCENTLY TALKS FOR RADIOPHANS

## Visits Tufts College but WGI Men Arrive First

MEDFORD HILLSIDE, MASS.—Sir Harry Lauder, the famous Scottish comedian, was at Tufts College recently, and unknowingly participated in a remarkable Radio stunt. At 9:30 in the morning, officials of Station WGI were advised that Sir Harry and Lady Lauder would appear at noon at the Goddard Memorial Chapel, a quarter-mile from the Amrad station. Permission was secured from the college authorities to connect the chapel with WGI, but the machinery could not be set in motion until 10:30. Between 10:30 and 11:55 a. m. wire connection was established between the two points, microphones were placed at suitable points in the chapel, and a brief test was made. Sir Harry Lauder began to speak at 12:05 p. m. and at 12:06 his voice and his entire repertoire as given was being broadcast. Never before has greater speed in arranging relayed broadcasting been accomplished with successful results, for not only were the inimitable Scotchman's talk and songs radiated all over New England, but also the songs and cheers of the Tufts students.

Thursday, October 19, was the opening night for Station WGI's new 500-watt transmitter. The studio and station have undergone complete re-design and reconstruction and a program by internationally known artists celebrated the event.

### Mayor on WOAI Heard Far

SAN ANTONIO, TEX.—Mayor O. B. Black and G. A. C. Half, president of the Southern Equipment Company, were heard as far as Glen Cove, N. Y., recently when the new 750-watt Southern Equipment-Evening News Radio plant, WOAI, was opened. The plant was dedicated to the "citizens of San Antonio and vicinity and the boosting of the community."

# Gongs, Whistles, Slogans, Used as "Personalities," Identify Stations

## Peculiarities in Announcers' Voices and Methods of Introducing Program Numbers Aid Radiophans in Distinguishing Various Plants—Time Signals Appreciated by Forgetful Ones

Broadcasting stations are coming to be known by the voices of their announcers, their slogans and the stunts they do to identify their stations as well as the cryptic call letters assigned by the Department of Commerce.

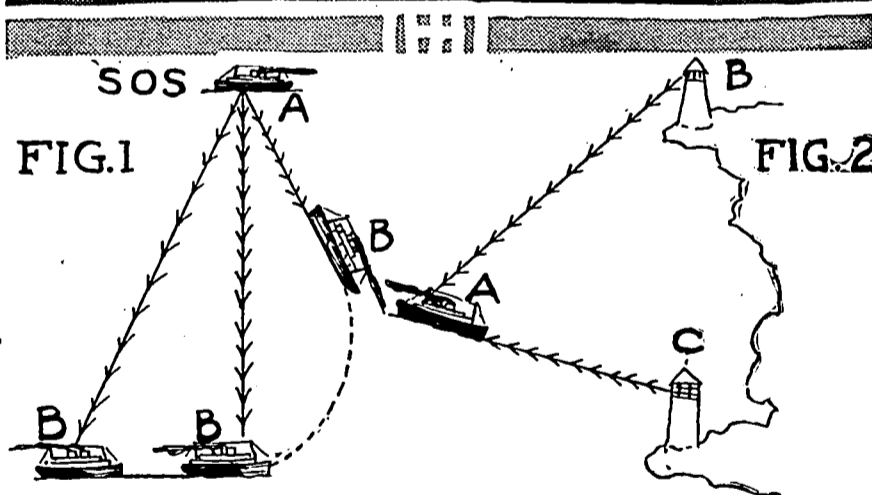
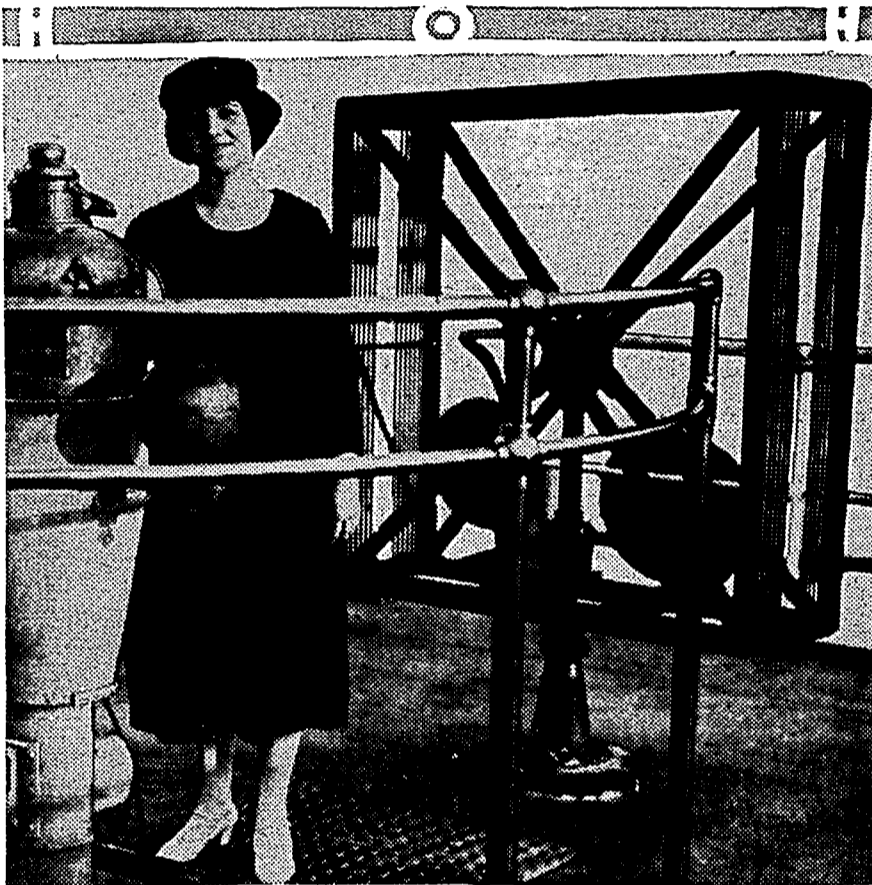
There is little romance or euphony in the letters WSB, but listeners-in are very familiar with the big gong which rings

to be WDAJ broadcasting. The naval Radiophone station at Anacostia, D. C., NOF, is known by the deep bass voice of the announcer.

### Slogans Popular

It is not only in the Southland that these slogans and phrases have become popular. Farther west we have the Palmer School of Chiropractic at Daven-

# CONQUERING THE FOG AT SEA



The Radio compass and ship's position finder newly installed on the Pacific coast liner H. F. Alexander is shown in the photograph with Miss Claire Tarawell standing by the apparatus, which is located beside the ship's compass. The pen-and-ink sketch below the photo shows how the Radio compass is used. In Figure 1, "A" is a ship in distress, signaling "S O S." "B" ship, equipped with new direction finder, gets the signal. The vessel keeps on her course for a ways, and continuing to get the signals, shifts course according to compass reading indicated by the finder. She then heads directly for the distressed ship. In Figure 2 the method of "triangulation" to get position is illustrated. "A" is a ship taking shore signals from B and C, two Radio compass stations, a considerable distance apart. Each has a different transmitting wave length and signal beat. The navigator locates the stations on his chart, and by triangulation finds his own position with reference to the two signal stations and the general coast line. Fog or darkness does not hinder the Radio compass and direction finder. Photo © Int.

"bong, bong, bong" with the announcement of the entertainment and know it is the Atlanta Journal. The unmistakable southern drawl of the broadcaster there announcing that this is the "Voice of the South" is also an indication that WSB is sending.

### Play Tunes, Blow Whistles

As the Radio enthusiasts well know, there are a number of other stations using identifying phrases and sounds. For example, the Courier Journal and Louisville Times, WHAS, plays a few bars from the appropriate Southern melody, "My Old Kentucky Home." WDAJ, the Atlanta and West Point R. R. Company station, at College Park, Georgia, has conceived the unique method of establishing its identity and business by blowing four blasts on a locomotive whistle. When "toot-toot-toot-toot" resounds in your receivers, it is sure

port, Iowa. "This is WOC," the announcer states, "out where the west begins." Another station identifies itself with: "Out where the corn grows tall." The voice of the spokesman at WOH, the Hatfield Electric Company, at Indianapolis, might confuse one at first, as it sounds so southern and similar to that of WSB in Atlanta.

Who says "Ayand"? The pronunciation of the simple word "and" would hardly locate a station, but ask anyone who has heard "MR." KDKA at Pittsburgh, and see if they will not admit that the drawled "ayand" is a positive identification. The voices of the evening storytellers are well-known by the younger Radiophans. Some of the broadcasters sound a signal on the telegraph key giving their call or some single letter indicative of their station besides the customary

# KHJ BUILDS WEST'S STRONGEST STATION

## WAVES WILL REACH FROM PACIFIC TO ATLANTIC

### New Plant Takes Place of Old—to Be First Class B Broadcaster in West

#### (Special to RADIO DIGEST)

LOS ANGELES, CALIF.—Once more taking the commanding position in the field of progress on the Pacific Coast, Radio KHJ (Los Angeles Times), is now having installed a 500-watt Radiophone broadcasting station which will have an effective range covering the entire Pacific Slope and, under favorable conditions, will reach to the Atlantic sea-coast. The new equipment represents the acme of Radio engineering research and will operate under a class B license, using the new 400-meter wave length.

The new KHJ Station will be the first set of such capacity to be installed west of Kansas City and the first western broadcast station to qualify for the very exacting class B license rating. This rating will admit of the Los Angeles Times going in the air at any time of the day between the hours of 9 a. m. and 10 p. m., regardless of any other station in this part of the country. KHJ will be the only western station to enjoy such a privilege.

### Old KHJ Dies Fighting

Like the pioneers of old who felt it an honor to "die with their boots on," the old station did its duty up to the final minute of its passing in the giving listeners in two excellent programs. The next day dismantling of the equipment commenced, so as to make way for the new 500-watt set which is expected to be second to none in the United States.

During the evening program of the closing night, October 18, the listeners in of Radioland were told of the efforts of KHJ, during its six months on the air, to bring the best in Radio. The features of the new KHJ were outlined and an expression of thanks was given the artists who had so generously co-operated in making the programs the best, and to Dean Farran and the C. R. Kierulff & Co., for their earnest endeavor in operating KHJ so creditably since its inception six months before.

### Plan Ideal Station

As this story goes to press, the giant new Radio leviathan, outfitted with a full cargo of world news, educational matter, music and entertainment, is expected to be launched in the air. The provisions of class B classification require a guarantee of dependable news matter, music and entertainment of high quality. The new KHJ will fulfill these demands and believes that the construction of its plans for broadcasting will result in a far-reaching, public-spirited, humanitarian achievement in the interest of human life and happiness.

# Army and Navy Officers to Get Stations ready for War

WASHINGTON.—Plans for employment of Radio in war are being considered by a board of officers of the army general staff in cooperation with the Radio experts of the signal corps. This work is being carried on in coordination with a similar board of navy officers. Both boards will consider the international aspects of the subject, particularly with a view of avoiding interference or confusion in Radio communication during war.

Maj. Alfred E. Larabee, of the signal corps, attached to the office of the chief signal officer of the army has left Washington for Honolulu, where he will be engaged for about three months in investigating the military telegraph system connecting army stations and posts on the island of Oahu, with a view of making recommendations for betterment of the system, which for some time has been inadequate to meet the demands placed upon it. After plans for improvements have been prepared and approved, it will be necessary to obtain an appropriation before the system can be overhauled.

transmission of the letters by an announcer.

### Time by Radio Voices

Methods of announcing the time also serve to establish who is at the transmitter, and those who hear the Louisville Courier Journal say they like the method of telling the time as the hour approaches, with a simple statement of ten o'clock when the minute hand reaches twelve better than the standard tick system of the naval broadcasting stations. When the Detroit News, WWJ, signs off the exact time is given. The time signal service is a benefit to those who have not set their timepieces for the night.

Probably the custom will grow rapidly and familiarity with the voices of broadcasters all over the country as well as the mottoes and slogans of stations will extend the acquaintance of listeners-in with the voices of the air.

# "KATIE" PORTABLE IS NEWS REPORTER

## COVERS HAPPENINGS IN ISOLATED SECTIONS

### Frisco Newspaper Set Last Word in Design, First Ever Used for Purpose

By Stanley F. McCracken

KTA, the portable Radiophone and C.W. receiving and transmitting set of the San Francisco Examiner, is the latest development in Radio on the Pacific Coast. The Examiner is probably the first newspaper in the world to utilize a portable Radiophone set regularly for the purpose of newsgathering and other activities.

After several successful demonstrations which showed the effectiveness of this new scientific wonder, the Examiner Radio experts now have "Katie" prepared for any emergency and Radiophans of the west are looking with considerable interest to its future stunts.

KUO, the Radiophone broadcasters of the San Francisco Examiner, is the mother station. "She" is located on top of the Hearst Building, Third and Market streets, San Francisco.

### Voice or Code

KTA will be used to communicate with the main station either by voice or telegraph. In this manner important news can be transmitted directly to the Examiner station from remote sections of the country where there are no means of communication.

Simplicity and compactness of construction have made portability a simple matter. And yet "Katie" is the last word in scientific Radio engineering skill. Inclosed in a specially built box she is always ready for action.

Hundreds of letters from Radio enthusiasts located in all parts of the western states as well as from those beyond the Sierra Nevada mountains are being received daily by the Radio department of the Examiner. Officials of the United States Bureau of Standards have also written in for details of construction and the success of the new service.

### Where "Katie" Gets Power

"Katie" gets her power from batteries and a dynamotor.

It is qualified to transmit on a 540-meter wave length under federal license and can operate within a distance of 150 miles from KUO, the mother station. The set was designed and built by the Wilson-McGuire Company of San Francisco.

The idea was first conceived by the Examiner Radio experts when a United States Army field transmitting set mounted on a motor truck was used in reporting the great Shriner parade in this city last June. The remarkable success obtained in gathering news of the colorful pageant of the visiting Shriners formed the idea which finally led to the development of the portable set which is now an important part of the Examiner Radio equipment.

## Portugal to Contract for System of Radio Stations

WASHINGTON.—Consul General Hollis, Lisbon, reports that the Portuguese government is authorized by a recent bill to contract with the Marconi Wireless Telegraph Co., Ltd., for a system of Radio telegraph and telephone stations in Lisbon, the Azores, Madeira, Cape Verde, Angola, and Mozambique. The bill provides that this authority must be exercised within three months from the date of approval so that all installations may be complete within four years.

The Marconi Company must bind itself to organize a Portuguese Radio telegraph and telephone company, the board of directors of which shall be composed of 7 members, 5 of whom shall be Portuguese citizens. At least two-thirds of the capital of the new company is to be reserved for subscription in Portugal. If this portion of the stock is not subscribed, the unsubscribed portion may be taken up by the government or by any other interest.

In canvassing the alumni of the Ohio State University to raise funds for a university broadcasting station, it was found that eighty per cent of those solicited owned their own receiving apparatus.

## 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 bear concerts on Magnavox from stations over 550 miles distant, audible 100 feet from horn. The simplicity of this book-up will surprise you. No Radio frequency used. Just one tuning control. Complete instructions, including photo of circuit, prepaid for 60c.

VESCO RADIO SHOP, Box 704, Vacaville, Calif.

## RADIO MAILING LISTS

9270 Retail Radio Dealers U.S. . . . . per M \$ 7.50  
1064 Radio Manufacturers . . . . . per list \$0.50  
1307 Radio Supply Jobbers . . . . . per \$2.50  
260 Radio Stations . . . . . per \$4.00  
14000 Radio Amateurs and Managers of Radio Stations . . . . . per M 7.50

Typewritten and ready to send on receipt of remittance covering the amount. Guaranteed 95% correct.  
Trade Circular Addressing Co., 166 W. Adams St., Chicago, Ill.

## WGM NOW 400 METERS; LICENSE, 14 STATIONS

CHICAGO.—Fourteen new stations were licensed for public service broadcasting last week, and WGM, The Atlanta Constitution, Atlanta, Ga., passed the necessary qualifications and was given a 400-meter wave length, class B license. The fourteen new plants are:

WQAP, American Radio Co., Lincoln, Neb.; WDAG, Apollo Theater, Bolvidere, Ill.; WQAA, H. A. Beale, Jr., Parkesburg, Pa.; KFBS, Chronicle News and Gas & Electric Supply Co., Trinidad, Colo.; KFCH, Electric Service Station, Billings, Mont.; WOAD, Friday Battery & Elec. Co., Sigourney, Ia.; WNAM, Ideal Apparatus Co., Evansville, Ind.; WGAK, Macon Elec. Co., Macon, Ga.; WOAC, Maus Radio Co., Lima, O.; KYG, Radio Service Bureau, Inc., Portland Ore.; WNAR, C. C. Rhodes, Butler, Mo.; WNAN, Syracuse Radio Telephone Co., Syracuse, N. Y.; WOAB, Valley Radio, Grand Forks, N. D.; WWAX, Worman Bros., Laredo, Tex.

## Ships Find Arc System Best for Reliable Communication

HOBOKEN, N. J.—Arc Radio equipment at present enjoys a worldwide application, particularly with reference to point-to-point communication and ship long distance work.

For a number of years past the arc has steadily been gaining in favor among the governments of the world, United States navy adopting the policy in 1914 of equipping all large vessels with this type of apparatus, since it was found by very exhaustive tests that the arc system gave much more reliable communication over greater distances than was possible with spark apparatus.

These sets installed by the government have so conclusively proved the reliability of arc transmitters for shipboard work that numerous installations are now being made on vessels of the American merchant marine. This is particularly true of the U. S. Shipping Board fleet, all the larger passenger vessels being equipped with apparatus ranging in size from 2 to 5 kilowatts.

## Warrior River Tugboats Will Be Dispatched by Airphone

BIRMINGHAM, Ala.—Barges and towboats on the Warrior river have been equipped with Radio receiving sets and work on the Mobile sending station, which will be located at Blakely Island, has been started, according to officials of the barge line. Henceforth the operations of the towboats and barges will be directed entirely by Radio, it is announced. F. C. Moore, Radio engineer of New Orleans, and a corps of workmen are installing the station at Mobile. The vessels will report every three hours by Radio and any instructions or information will be given out by the central station.

### Boston Gets Silent Periods

BOSTON, MASS.—As a result of the new Radio time schedule drawn up by Radio Inspector C. C. Kolster, which went into effect the week of October 15, there are now some silent periods in the broadcasting, which allow fans to tune in for distant cities at intervals between programs of the nearby stations and get a variety of entertainment, as well as practice in catching far-a-way places. In addition they can play "Radio Golf" without sitting up until nearly daylight to get "DX" stations in order to beat their scores in this new indoor sport.

### Cambridge "Y" to Teach Radio

CAMBRIDGE, MASS.—Courses in Radio for licensed operators and other courses for persons who have a limited general knowledge of the subject have been arranged at the Cambridge Y. M. C. A. F. D. Wheeler, former president of the Massachusetts Institute of Technology Radio Society, will give the course.

## THE ONLY KNOB and DIAL WITHOUT A SET SCREW

ASK YOUR DEALER  
4 in., \$1.50 3 in., \$1.00  
TAIT KNOB & DIAL CO., Inc.  
11 East 42nd Street NEW YORK CITY

## Increase Your Range

By Adding a Perfectly Constructed Variable Condenser to Your Set  
11 PLATE.....\$1.25—Unassembled.....\$0.75  
23 PLATE..... 1.40—Unassembled..... .85  
43 PLATE..... 1.75—Unassembled..... 1.10  
MAIL ORDERS FILLED SAME DAY  
B. K. FORD & CO.  
63 W. 5th Ave. CHICAGO

## Book Reviews

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

**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 outfits at home. Price \$1.

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

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

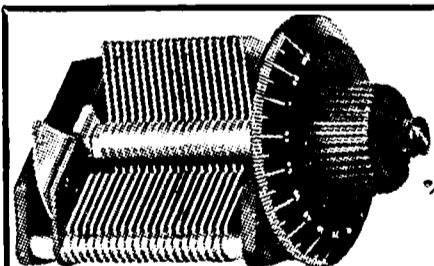
**Elements of Radio Telephony.** By William C. Ballard, Jr., M. E. A reliable, authoritative discussion, in simple form, of the essential principles of Radio telephony and their application. The use of mathematics has been almost entirely avoided. Price, \$1.50.

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

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.

## Consider World Communication

WASHINGTON.—At the request of the Department of State, each governmental department interested in or having to do with wire and Radio communication has appointed a representative to serve on an inter-department committee for the consideration of problems of international electrical communications. At a meeting, soon to be called in Washington, the several members of the United States Committee will study the problems to be considered at the forthcoming international conference to be held in Paris, and the American agenda and policy will be worked out, in detail.



The B-T Vernier Condenser has no equal .00025—\$4; .0005—\$5; .001—\$6, with Dial. Ask your dealer—or write us direct  
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Diagram showing three terminals labeled ANTENNA, GROUND, and TICKLER.

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READINGS  
ANTENNA HI-VOLTAGE +  
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OUTPUT LO-VOLTAGE +  
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TICKLER MODULATION

### SOMERVILLE Insulated Terminals

FROM 8C TO 5C EACH  
"The Original and Best" at Your Dealer or Direct  
Somerville Radio Laboratory  
43 CORNHILL, BOSTON, MASS.

## PUBLISH NEW LIST OF COMMERCIAL STATIONS

Complete Index on Sale at 15 Cents Per Copy

WASHINGTON.—An index to commercial and government Radio stations of the United States has just been issued by the Department of Commerce, and is available to the public for fifteen cents a copy at the Office of the Superintendent of Documents at the Government Printing Office, Washington, D. C. It gives complete lists of all commercial and government stations both on land and sea licensed up to June 30, 1922, including the broadcasting stations. The list of amateur stations is still in press but will soon be available for distribution by the Superintendent of Documents at about 25 cents a copy.

### F. H. Day to Test Sets

WASHINGTON.—F. H. Day of the Bureau of Foreign and Domestic Commerce, is to take over the activities of the Bureau of Standards in connection with Radio receiving apparatus now on the market. Mr. Day will issue from time to time data which was formerly made public by the Bureau of Standards.

# Government Surplus RADIO SETS

### U. S. ARMY SIGNAL CORPS, TYPE B. C. 14-A

We were lucky enough to secure a limited number of these wonderful Radio Sets and Head Phones, which have just been declared Surplus! These Receiving Sets are complete in every way, with wave length range, 200 to 600 meters. **\$23.95**

ALSO U. S. A. AVIATION TYPE, 194 W. WESTERN ELECTRIC PHONES

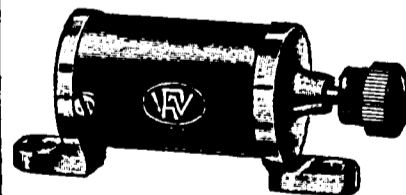
Each Phone Cap is covered with large soft rubber ear cushions, and an aviation leather helmet goes with each set! **\$7.95**

SIGNAL CORPS SUPER-SENSITIVE MICROPHONE TRANSMITTER, **\$2.45**

Mail orders filled on day received

Chicago Salvage Stock Store  
509 So. State St., CHICAGO, ILL.

# The "R-W" Self-Adjusting Crystal DETECTOR



PRICE \$1.50

The Ultimate in Crystal Detectors

Always Sensitive—Always Ready

Don't lose the best part of the program adjusting your Detector. Use the "R-W" and get it all. The "R-W" is not a so-called fixed detector that is useless when one particular spot on the crystal goes dead, but the original Multi-Contact detector that will always find many "live" spots and hold it and deliver 50 per cent more volume than any other detector on the market. Ask anyone who has heard a "R-W" at the Chicago Radio Show or elsewhere and he will tell you to get one quick. You can't go wrong with an "R-W" Crystal Detector. It always delivers the goods.

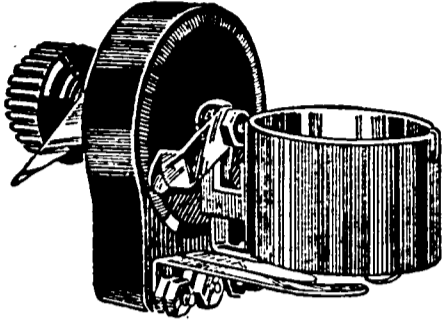
Ask for it at your dealer's or send direct, \$1.50 Postpaid, for it to DEPT. R

Central States Engineering Co.  
224 N. HALSTED STREET  
CHICAGO, ILLINOIS

# The Radiophonist's Mart

**T**HERE is a decided advantage in combining any two Radio instruments into—not merely because of the possible reduction in the price, but more so because of the compactness and simplicity for panel mounting.

The socket rheostat shown in the illustration is manufactured by the Ajax Radio Corporation of Newark, N. J. The socket forms a firm and compact unit with the rheostat and is easily mounted on the panel of any receiving set. The rheostat is of the usual resistance wire type and has the normal adjustment of the average instrument. The knob with the pointer gives a clear indication from the front

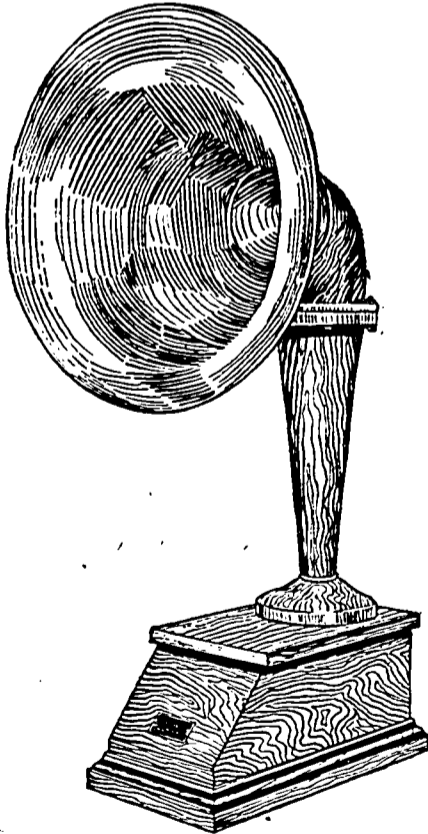


Combination Tube Socket and Rheostat

of the panel as to the adjustment. Four spring contacts are used to bear up against the terminals of the tube when inserted in the socket. These four springs connect to four posts marked P, F, F, and G. Connections are made in a manner similar to that of the individual instruments with the exception that the rheostat connections are combined in the terminals.

The neat workmanship and appearance make the unit a pleasant addition to the homemade receiving set.

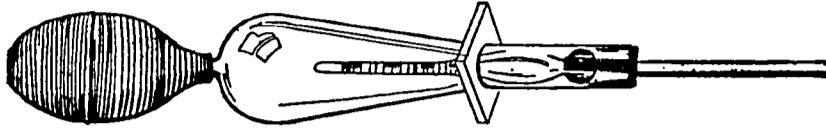
**B**EAUTIFUL tone quality is the prime requisite of a musical instrument. There is no question that the Radio receiving set's chief attraction lies in its use as a reproducer of music. The loud speaker is the horn of the Radio set and should therefore possess good tonal qualities. Much has been said from time to time relative to the merits of the loud speaker and constant progress is being made by the manufacturers in improving its reproduction qualities.



Loud Speaker Having Volume and Good Tonal Qualities

A new form of loud speaker is the Thorophone, manufactured by the Winkler-Reichmann Company of Chicago. This instrument uses the filament storage battery for its field excitation and has the merit of large volume and good tonal qualities. Its graceful lines marks a real step in the artistic design of loud speakers. The base and pedestal are of wood, highly finished in dark walnut. The horn throat is a casting and the bell of extra heavy spun aluminum. These are finished in a deep black with a satin finish. The base unit is also furnished in a form for connection to the phonograph so as to take advantage of its horn.

## Hydrometer Test for Storage Cell



**A** NEW hydrometer placed on the market for Radio use is the Chargometer of the Ala Manufacturing Company of Chicago, Ill. One trouble with many hydrometers is the tendency of the float to stick to the sides of the container, thus destroying the possibility of accurate specific gravity readings. The one illustrated is designed so as to avoid this attraction of the float towards the containing glass tube. The chamber extends outward so that no coaxing or tapping is necessary to keep the float vertical. The

right tube permits insertion in both taps without trouble or danger of spilling acid on clothes. The glass is clear so the reading on the float is easily made.

When the hydrometer floats freely at the rest, the line on the scale in the stem even with the surface of the acid is the specific gravity of the solution. A fully charged cell should read about 1280. A discharged cell should not run lower than 1150. In fact, it is unwise to allow your battery lower than 1180 to 1200.

**M**ANY attempts have been made to devise something as good as mica for diaphragm purposes in all kinds of sound producing machines but mica has always won out. Mica diaphragms are used by nearly all phonograph manufacturers. For many years the entire effort was devoted to getting volume. Every beginner wants a lot of volume. Today, however, the Radiophonist wants to hear quality. Clearness in speech, pure tone in music, sharp and clear signals are desired. He wants all the metallic, tinny sounds eliminated.

Very little theory is known concerning diaphragm action and it is largely by constant experimentation that any advance is made. The United States Bureau of Standards are now at work on elaborate methods for testing head sets and among other things have found that no pair of phones can be matched at the factory. They must be matched at the owner's Radio set under the conditions of use. On one make of phones tested, it was found that although they were perfectly matched at an audio frequency of 1200 cycles per second, they would gradually grow apart as the frequency was lessened until at 500 cycles one phone was twice as loud as the other.

A form of mica diaphragm is manufactured by the Radio Mica Products Company of New York City. The diaphragm is made for insertion in any of the standard sets, and is intended to replace the metal diaphragms.

A spacing ring is supplied with each Micaphone mica diaphragm in order to match the loudness and tone in the two re-

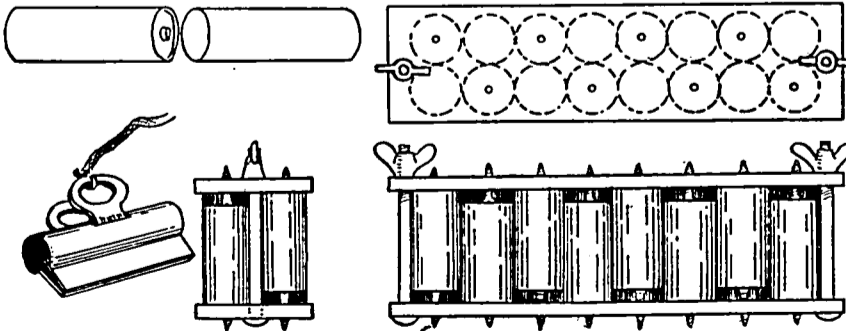
ceivers. To accomplish this the user may from time to time adjust his diaphragms. After a time no changes will be necessary as after a short period of use the diaphragms are said to "wear in" and give clearness of tone with all harsh sound and interfering noises cut out or softened. In tests made in laboratories the manufacturers claim that success has been attained in entirely eliminating even the noises due to tube oscillation and hearing the broadcast program perfectly, while with metal diaphragms on the same head set there was a tremendous volume of noise in which it was impossible to distinguish the program's presence.

## Winding Coils for Receivers

In Radio receiving circuits, telephone receivers with high-resistance coils are used. This is due to the fact that the currents which actuate the receivers are generally very feeble and it is therefore absolutely necessary to wind a large number of turns of wire on the magnet poles in order to obtain a sufficient amount of magnetic flux to cause the diaphragm to vibrate. To get this large number of turns of wire in a small space and as near the iron magnet cores as is possible, it is necessary to use very fine wire which results in the presence of high resistance windings. While it would be possible to wind the coils of telephone receivers with high-resistance wire, such as German silver wire, to the required value of resistance, this would reduce the number of turns of wire on the magnets, thereby making the receivers practically worthless.—J. M. C.

## Practical B Battery

The B battery constructed as shown in the illustration has given good results, and its life is long, if not longer, than the manufactured article. Large size flashlight cells are used in its construction. Purchase eight of these and cut their cases in half. Do not remove cases. Procure two 1/2-inch carriage bolts with wing nuts. Cut two pieces of wood 10 inches long, 2 3/4 inches wide, and 1/4 inch thick. This wood may be cut from material used to trim wall board on rooms. Bore holes in the ends, as far apart as the diameter of the eight cells collectively,



to take the carriage bolts. Use slim wood screws long enough to pass through the wood as shown. These screws hold the pieces of metal, brass or copper, for connections.

Clamp the cells between the boards with the carriage bolts. This makes it possible to remove any single cell and substitute a new fresh one. The end connection is made by winding one wire tightly around one terminal of the battery and attach the other to a paper clip as shown.—W. J. Fell, Shawnee, Okla.

## Honeycomb Coil Efficiency

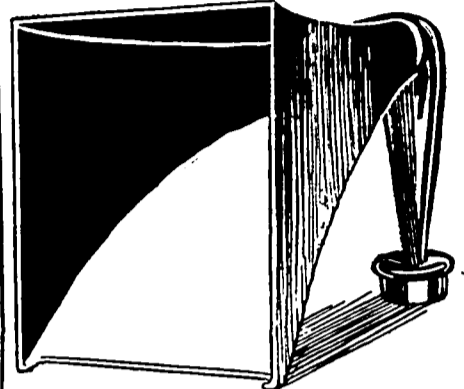
When honeycomb coils were first manufactured for Radio work, they were dipped in an insulating varnish to hold the turns together securely without the possibility of damaging them from handling and to protect the insulation on the wire.

It was known, however, that energy losses occurred in the varnish, as it acts as an imperfect dielectric between the turns. Therefore, if the varnish could be removed, except for a thin film, from the interior of the coils, the capacity and high-frequency resistance would be reduced.

Of a number of tests to accomplish this result, the last was the simplest, most effective and most economical. The coils were dipped and then put upon a revolving shaft. Centrifugal force threw off the excess varnish and dried them so that the time required for baking was greatly reduced.

Honeycomb coils are all treated in this manner now, with the result that they are much more efficient electrically than before this new method was adopted.—J. M. C.

**T**HE Clarophone shown in the illustration is a new loud speaker placed on the market by the Master Radio Corporation of Los Angeles, Cal. Baldwin head sets have long been known in the Radio field, and it is the new Master Baldwin unit that is used in connection with the Clarophone. The diaphragm on this unit is operated by an armature superimposed in a polarized magnetic field. It is unaffected by changes in temperature, and is constructed for operation under heavy plate voltages. The wide diameter of the diaphragm gives very high volume with good tone qualities and reproduction.



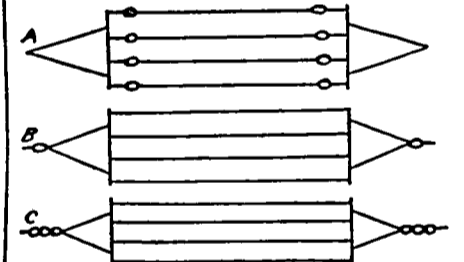
Baldwin Clarophone Uses "Throat" Horn

The loud speaker horn has a sheet metal throat, while the horn proper is constructed of wood. The design is such that it eliminates the buzzing and rasping sounds usually found in metallic horns. The tone variation is also very full and clear. It presents the advantage that no outside current is necessary for operation and is connected to the receiving set in the same manner as a head set.

The entire unit is small, neat, and strongly made and has no adjustments. It is designed so that anyone can operate it.

## Antenna Insulation

Ohm's law, on which all electrical formulae are founded, has a direct bearing on antenna insulation. This is one thing that is often overlooked. Let us assume, for the purpose of comparison, that the resistance of an insulator is 100,000 ohms. In the illustration A the actual



effective insulation to the earth, with the use of eight insulators, is only 12,500 ohms. In B the use of only two insulators, the insulation is 50,000 ohms, then again in C with eight insulators, and we want to use them all, the effective insulation resistance is 200,000 ohms. The only excuse for the distribution of the insulators in A is that the weight of the antenna is too great for the insulator to support, and the weight of it is divided among four insulators, with the strain divided in hauling the antenna taut.—H. B. Cowan, St. Louis, Mo.

## What Causes Radio Noises?

Anyone who has listened in on a Radio receiving set during the approach of a heavy thunder shower has little new to experience or discover in the way of frying, hissing or sputtering noises. It is quite natural for the listener to wonder where all the peculiar noises come from.

In general there are only two kinds of Radio noises; those that cannot be avoided, and those that can. To the first classification come all the natural noises that result from electrical disturbances in the ether, through which all Radio waves travel. These noises are variously called "strays," "atmospherics," or "static." It must be borne in mind that these waves resulting from ether disturbances follow the same laws as the electromagnetic waves sent out from a Radio transmitter. Hence, interference from this cause cannot be entirely eliminated.

In the second classification, we find those noises that result from faulty wiring and poor connections. In many cases, an imperfect or improperly constructed battery will cause sounds similar to static. In making Radio sets, special care should be exercised to solder all connections even though binding posts or terminal posts give a seemingly tight grip on the wires.—J. M. C.

# Radiophone Broadcasting Stations

Corrected Every Week.

(NOTE.—The second half of the schedule list appears below. The first half appeared last week.)

**WDAY**, Fargo, N. D. 485 also. 300 m. Daily ex Sun. 12:15-12:30 pm. 7:30-8:15, reports, news, music. Central.

**WDM**, Washington, D. C. 50 m. Church of the Covenant. Sun, 10:30 am, church service; 3 pm, lecture; 7:30, church service. Eastern.

**WDY**, New York, N. Y. 5th Owners Radio Service. WDT, Omaha, Neb. 100 m. John O. Yelverton, Jr. Daily 7-8 pm. Tues, Sat, 12-12 am. Fri, 10-10:45 pm. Sun, 2-4 pm. Music. Central.

**WDY**, Roselle Park, N. J. Radio Corp. of America. **WDZ**, Tuscola, Ill. 70 m. 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.

**WEAA**, Flint, Mich. Fallain & Lathrop. **WEAB**, Fort Dodge, Ia. 600 m. Standard Radio Equip. Co. Daily ex Sun, 9:40 am, 10:40, 11:40, 1:40 pm, 5:15, market reports; 6:30 pm, sports; 7:30-8:45 pm, music. Sun, 10:45 am, church service; 7:30-8:45 pm, music. Central.

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

**WEAE**, Blacksburg, Va. Polytechnic Inst. **WEAF**, New York City, N. Y. 400 only. 1,500 m. Am. Tel. & Telg. Co. Daily ex Sun, 4:30-5:30 pm. Mon, Wed, Thurs, Sat, 8-10 pm, concert. Eastern.

**WEAG**, Edgewood, R. I. Nichols-Hindline-Bassett Lab. **WEAH**, Wichita, Kan. 485 also 500 m. Lander Radio Ex. Daily ex Sun, 9:40 am, 10:40, 11:40, 12:30 pm, 1:30, 3:15 reports. Wed, Sat, 3 pm, concert. Every third Sun, 8 pm, concert. Central.

**WEAI**, Ithaca, N. Y. Cornell Univ. **WEAJ**, Vermillion, S. D. 300 m. Univ. of S. D. Mon, Wed, Fri, Sat, 7:30 pm, music, lectures. Central.

**WEAK**, St. Joseph, Mo. 100 m. Julius B. Abernethy. Thurs, 8:45-9:45 pm concert. Central.

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

**WEAN**, Providence, R. I. 50 m. The Shepard Co. Daily ex Sun, 3-5 pm. 6-8, music, bedtime stories. 10-10:30 am, church service. Eastern.

**WEAO**, Columbus, Ohio. Ohio State Univ. **WEAP**, Mobile, Ala. 485 also. 50 m. Mobile Radio Co. Daily, 4-5 pm, 7-8:55. Central.

**WEAR**, Baltimore, Md. Balt. American & News Pub. Co. **WEAS**, Washington, D. C. 150 m. The Hecht Co. Daily ex Sun, 3-4 pm, Wed, Sat, 7-8 pm. Eastern. **WEAT**, Tarrytown, N. Y. John J. Fogarty. **WEAU**, Sioux City, Ia. 50 m. Davidson Bros. Co. Daily ex Sun, 9 am, 10, 11, 1 pm, reports, news. Mon, Wed, Fri, 8:30 pm, concert. Central. **WEAV**, Rushville, Nebr. 200 m. Sheridan Elec. Service Co. Wed, Fri, Sun, 8-9 pm, concert, news, etc. Mountain. **WEAW**, Anderson, Ind. Arrow Radio Lab. **WEAX**, Little Rock, Ark. T. J. M. Daily. **WEAY**, Houston, Tex. Will Horwitz, Jr. **WEAZ**, Waterloo, Ia. 100 m. A. C. Sweetman. Mon, Thurs, Sat, 7-8 pm, news, concert, lecture. Central. **WEB**, St. Louis, Mo. 800 m. The Benwood Co., Inc. Daily ex Sun, 9-9:40 am, 12-12:45 pm, 3-4, Wed, 7-9 pm. Central. **WEH**, Tulsa, Okla. (300 S. Main St., Eldorado, Kans.) Midland Refining Co. **WEV**, Houston, Tex. 485 also. 500 m. Hurlburt-Sull Elec. Co. Daily ex Sun, 10 am, 5:30 pm, weather, roads, Tues, Thurs, 8 pm, concert. Central. **WEW**, St. Louis, Mo. 485 also. 400 m. St. Louis Univ. Daily ex Sun, 9 am, 10, 12 pm, reports. Central.

**WEY**, Wichita, Kan. 485 also. 500 m. 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; 8-10 pm, sports, concert, lecture; 10:45 weather. Sun, 8:10 pm, church service, concert. Central.

**WFAA**, Dallas, Texas. 400 only. 250 m. Dallas News and Dallas Journal. Daily, 10:15 am, reports; 12:30-1 pm, address; 6:45-7, bedtime story; 8-8:30, music. Tues, Thurs, Sat, 11-12 pm, music. Central.

**WFAB**, Syracuse, N. Y. 100 m. C. F. Woese. No definite schedule. **WFAG**, Superior, Wis. 400 m. Superior Radio Co. Daily, 7-7:45 pm, news. Central. **WFAD**, Salina, Kan. 250 m. Watson Weldon Motor Supply Co. Daily ex Sun, 8:45 am, 9:45, 10:45, 11:45, 1:30 pm, reports. Tues, Thurs, Fri, 8 pm, concert. Sun, 11 am, church service; 8 pm, concert. Central.

**WFAE**, Poughkeepsie, N. Y. 200 m. H. C. Sprately Radio Co. Daily ex Sun, 10:10-10:30 am, 11:30-11:45, 1:30-2 pm, 4-4:15. Tues, Thurs, Sat, 8:15 pm, feature program. Eastern.

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

**WFAJ**, Fort Arthur, Tex. Elec. Supply Co. **WFAK**, Asheville, N. C. III-Grade Wireless Instrument Co. **WFAI**, Houston, Tex. Chronicle Pub. Co. **WFAM**, St. Cloud, Minn. 485 also. 400 m. Granite City Elec. Co. Daily ex Sun, 8:30-4:00 pm, markets; 7:30-9, entertainment. Central.

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

**WFAP**, Peoria, Ill. 200 m. Radio School of Browns Business College. Daily ex Sun, 10:25 am, reports; 12-12:15 pm, concert; 1:40, reports; 4:25, business lessons; 7:45, concert. Central.

**WFAQ**, Cameron, Mo. Cameron Radio Co. and Mo. Wesleyan College. **WFAH**, Sanford, Me. Hall & Stubbs. **WFAS**, Fort Wayne, Ind. United Radio Corp. **WFAT**, Sioux Falls, S. Dak. 485 also. 400 m. Argus Leader. Daily ex Sun, 10:15-12:15 pm, 2:15, reports; 7:30 pm, music. Tues, Thurs, Sat, 8:30 pm, concert. Central.

**WFAU**, Boston, Mass. Edwin C. Lewis. **WFAV**, Lincoln, Nebr. 485 also. 300 m. Univ. of Nebr. Daily ex Sun, 10:10 am, weather, markets. Sat, 9:00 pm, concert. Central.

**WFAW**, Miami, Fla. Daily Metropolis. **WFAZ**, Birmingham, N. Y. 400 m. Arthur L. Kent. Daily, 6-6:45 pm, music. Eastern.

**WFB**, Independence, Kan. 500 m. Daniels Radio Supply Co. Daily ex Sun, 12 m, 4 pm, news. Mon, Tues, Wed, 7:30-8 pm, entertainment. Thurs, Fri, 7:30-8 pm, Sat, 7-9 pm, music. Sun, 11 am, church services. Central.

**WFC**, Charleston, S. C. 400 m. S. C. Radio Shop. Daily ex Sun, 12 m, reports, news, music. Tues, Thurs, 8-10 pm. Eastern.

**WFI**, Philadelphia, Penn. 400 and 485 only. 350 m. Strawbridge & Clothier. Daily ex Sun, 1:16 pm, news; 3:30-4:30, concert; 5:30-6, sports. Mon, Fri, 6:30-7 pm, Radio talk. Wed, Fri, Sat, 7:30-8:30 pm, concert. Fri, Sat, (alternate weeks) 7:30 pm, concert at 8:30 pm. 485 also. 300 m. Rike-Kumler Co. Daily ex Sun, 9 am, 11, 4 pm, music, news, reports. Mon, Wed, Fri, 8 pm, concert. Sat, 11:30 pm, concert. Central.

**WGB**, Houston, Tex. 250 m. QRV Radio Co. Daily ex Sun, 8:30-9 am, police reports; 1:30-2:30 pm, concert, agriograms; 4-5, concerts, police reports. Central.

**WGAD**, Encarnada, Porto Rico. 250 m. Escuela Hispano Americana de Radio Telegrafía, Inc. Sat and Sun etc. **WGAF**, Tulsa, Okla. Goller Radio Service. **WGAH**, New Haven, Conn. New Haven Elec. Co. **WGAI**, Shenandoah, Ia. W. H. Gass. **WGAK**, Macon, Ga. Macoun Elec. Co. **WGAL**, Lancaster, Pa. 85 m. Lancaster Elec. Supply & Construction Co. Mon, Wed, Fri, 7-8 pm, concert, lecture. Sun, 3-3:30 pm, church service. Eastern.

**WGAM**, Orangeburg, S. C. 150 m. Orangeburg Radio Equipment Co. Daily ex Sun, 10 am, markets, weather; 11:55, time; 4 pm, Radio talk, markets, baseball; 6, music, lecture; 10, time, weather, entertainment. Sun, 11 am, church service; 11:55, time; 10 pm, time, weather, music. Eastern.

**WGAN**, Pensacola, Fla. Cecil E. Lloyd. **WGAQ**, Shreveport, La. 500 m. Glenwood Radio Corp. Daily ex Sun, 8 pm, music. Sun, 11 am, 7:30 pm, church service. Central.

**WGAS**, Chicago, Ill. 1,000 m. Ray-di-co Organization, Inc. Daily ex Sun, 9-9:20 am, 11:15-11:30, 1:30-1:45 pm, 2:45-3, 5-6, music. 12:15-12:30 pm, 4:30-4:45, reports. Wed, Fri, 10-11 pm, music. Central.

**WGAT**, Lincoln, Nebr. 100 m. Am. Legion, Dept. of Nebr. Mon, Wed, 9 pm, announcements. Fri, 9-10 pm, patriotic program, concert. Sun, 3-5 pm, sermon. Central.

**WGAU**, Wooster, O. Marcus G. Limb. **WGAW**, Altoona, Pa. Ernest C. Albright. **WGAZ**, Washington C. H., O. 75 m. Radio Elec. Co. Daily ex Sun, 9 am, 2 pm, music, news. Mon, Wed, Fri, 9:30 pm, concert, news. Sun, 10:30 pm, sermon. Central.

**WGAY**, Madison, Wis. 100 m. North Western Radio Co. Daily ex Sun, 9-10 am, financial news; 11:30, news, opening markets; 4 pm, news, closing markets. Mon, Wed, Thurs, Sat, 7:30-8:30 pm, concert. Sun, 10:30-12 am, sermon. Central.

**WGZA**, South Bend, Ind. 200 m. South Bend Tribune. Daily ex Sun, 9-9:30 am, household hints, menus; 2-3 pm, music, 7-8 pm, music. Central.

**WGF**, Des Moines, Iowa. 485 also. 300 m. Register and Tribune, Tues, Fri, 7:30 pm, entertainment. Sun, 5 pm, religion. Central.

**WGI**, Medford Hillside, Mass. 485 also. 200 m. Am. Radio and Research Corp. Daily ex Sun, 7 am, setting up exercises; 9:30, 11:30, 3:25 pm, music; 10:30 am, 1:30 pm, 3, 6, 9:30, reports, news. Mon, Wed, 7 pm, entertainment. Tues, 8:30 pm, fashion talks, concert. Thurs, Fri, 9 pm, concert. Sat, 8 pm, concert. Sun, 4 pm, concert; 6:30 pm, reports; 7:30, church service; 8:30 concert. Eastern.

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

**WGM**, Atlanta, Ga. 400 only. Atlanta Constitution. **WGR**, Buffalo, N. Y. 485 also. 300 m. Federal Tel. & Telg. Co. Daily ex Sat and Sun, 12:15 pm, weather, reportograms; 2, music; 3, lecture; 3, music; 5:30, reports; 7:30, bedtime stories; 8:10, concert. Eastern.

**WHAW**, Tampa, Fla. 50 m. Pierce Elec. Co. Daily ex Sat, Sun, 12-1 pm, 4-5, music, agriograms. Sat, 12-1 pm, 8-10, music, entertainment. Eastern.

**WHAX**, Holyoke, Mass. Holyoke Street Ry. Co. **WHAY**, Huntington, Ind. 75 m. Huntington Pub. Co. Daily ex Sun, 12 m, 3 pm, music; 1:30 pm, 6, reports, sports. Mon, Wed, Sat, 8 pm, concert. Central.

**WHAZ**, Troy, N. Y. 400 only. 500 m. Rensselaer Polytechnic Inst. Mon, 8:15-9:30 pm, music. Eastern.

**WHB**, Kansas City, Mo. 400 and 485 only. 1,000 m. Sweeney Auto & Tractor School. Daily, 10 am, 3 pm, 5, weather. Daily ex Sun, 2 pm, ladies' hour; 7, bedtime stories. Tues, Thurs, Sun, 8-10 pm, concert. Central.

**WHD**, Morgantown, W. Va. 100 m. W. Va. University. Daily, 4-6, 7-7:30, news etc. Eastern.

**WHK**, Cleveland, O. 300 m. Warren R. Cox. Daily ex Sun, 1:30-2 pm, 4-4:30, 6-6:30. Tues, Thurs, Sun, 8-9:30 pm, concert. Eastern.

**WHM**, Ridgewood, N. Y. Times Printing & Pub. Co. **WHU**, Toledo, O. Wm. B. Duck Co. **WHW**, East Lansing, Mich. 485 only. 150 m. Stuart Wm. Seeley. Daily ex Sun, 11:30 am and 12:30 pm, weather and markets. Eastern.

**WHX**, Des Moines, Iowa. 50 m. Iowa Radio Corp. Daily, 12:30-1 pm, 6-6:30, Sat, 3 pm, sports. Central.

**WIAA**, Waupaca, Wis. Waupaca Civic & Commerce Assn. **WIAB**, Rockford, Ill. 50 m. Joslyn Automobile Co. Tues, Fri, 8:30-9:30 pm, music. Central.

**WIAC**, Galveston, Tex. 485 also. 100 m. Galveston Tribune. Tues, Thurs, Sat, 7 pm on, bedtime story, evening prayer, concert. Central.

**WIAD**, Ocean City, N. J. 200 m. Ocean City Yacht Club. Fri, Sat, Sun, 8-12 pm. Eastern.

**WIAE**, Vinton, Ia. 75 m. Zimmerman Radio Co. Tues, Thurs, Sat, 9 pm, music, news. Wed, 8 pm, band concert. Sun, 2:30 pm, music. Central.

**WIAF**, New Orleans, La. 300 m. Nola Radio Co. Sun, 10-11 am, music, lecture. Central.

**WIAG**, Birmingham, Ala. Mathews Elec. Supply Co. **WIAH**, Newton, Ia. 200 m. Continental Radio & Mfg. Co. Daily 12:30-1 pm, music, news. Mon, 7:30-8 pm. Central.

**WIAI**, Springfield, Mo. 100 m. Heer Stores Co. Daily ex Sun, 10:30-11, reports, news. Tues, Thurs, Sat, 7:30-8:30 pm, music. Central.

**WIAJ**, Neenah, Wis. Fox River Valley Radio Supply Co. **WIAK**, Omaha, Neb. 485 also. 300 m. Daily Journal-Stockman. Daily ex Sun, 7:45 am, 9:10, 10:15, 12 m, 1:50 pm, 3:50, markets, weather. Central.

**WIAN**, Allentown, Pa. 100 m. Chronicle-News. Schedule irregular.

**WIAO**, Milwaukee, Wis. 200 also. 100 m. School of Engineering. Mon, Tues, Thurs, Fri, 10:15-10:30 am; 11:30-11:45, news; 11:45-12:10 pm, lecture; 5-6 pm, news; 7-7:15, music; 7:15-7:30, lecture. Central.

**WIAP**, Springfield, Mass. Radio Development Corp. **WIAR**, Marion, Ind. Chronicle Pub. Co. **WIAS**, Paducah, Ky. 150 m. J. A. Rudy & Sons. Daily ex Sun, 11-12 am, markets, weather, news, music; 4-5 pm, same and sports; 7:30-8, concert, lectures, etc. Sun, 11-12 am, church service. Central.

**WIAT**, Burlington, Ia. 400 m. Hawk-Eye Home Elec. Co. Tues, Thurs, 8-9 pm, concert. Central.

**WIAT**, Tarkio, Mo. Leon T. Noel. **WIB**, Macon, Ia. Am. Trust & Savings Bank. **WIC**, Huntington, N. Y. N. Y. Radio Lab. **WIAW**, Saginaw, Mich. Saginaw Radio & Elec. Co. **WIAZ**, Lincoln, Neb. 200 m. Capital Radio Ex. Thurs, 8 pm, music, entertainment. Sun, 2:30 pm, 8, 9, church service. Central.

**WIAY**, Washington, C. 200 m. Woodward & Lothrop. Daily ex Sun, 10:30-11:30 am, 2-5 pm, music. Sat, 8-10 pm, concert. Eastern.

**WIAZ**, Miami, Fla. Flager St. Elec. Supply Sales Co. **WIK**, McKeesport, Pa. 500 m. K. & L. Elec. Co. Daily ex Sun, 8:30-7 pm. Tues, Thurs, 9:30-10:30 pm. Sun, 1:30-2:30 pm and 6:30-7 pm. Eastern.

**WIL**, Washington, D. C. Continental Elec. Supply Co. **WIP**, Philadelphia, Pa. 500 m. Gimbel Bros. Daily ex Sun, 2:30-3:30 pm. Mon, Wed, Thurs, 7-7:30 pm. Tues, Fri, Sat, 7-12 pm. Sun, am, pm, church service. Central.

**WIZ**, Cincinnati, O. 485 also. 200 m. Cino Radio Mfg. Co. Daily ex Sun, 12 m, 3:30 pm, 7-8, reports, entertainment. Central.

**WJ**, Neenah, Nebr. Am. Radio Co. **WJAG**, University Place, Nebr. 485 also. 150 m. Nebr. Wesleyan Univ. Daily ex Sat and Sun, 12 m, weather; 4 pm, markets. Sat, 12 m, markets, weather. Thurs, 9:30 pm, concert. Central.

**WJAD**, Waco, Tex. 485 also. 500 m. Jackson's Radio Engrng. Lab. Daily ex Sun, 12:30-1 pm, markets, news, music; 3:30-4, news, music; 6-6:15, sports; 8:45-9:45, concert, news. Sun, 11-12 am, church service; 3:30-4 pm, music; 6-6:15, sports; 8:45-9:45, music. Central.

**WJAE**, San Antonio, Tex. 500 m. Texas Radio Syndicate. Mon, Thurs, Fri, Sat, 7:30-8:30 pm, music, news. Tues, 9:30-10:30 pm, music, news. Central.

**WJAF**, Muncie, Ind. 100 m. Muncie Press and Smith Elec. Co. Daily ex Sun, 3:30-4 pm. Mon, Wed, Fri, 7-8 pm. Sat, 6-7 pm. Central.

**WJAG**, Norfolk, Neb. 485 also. 150 m. Norfolk Daily News. Daily ex Sun, 10:30 am, 12:15 pm, 3:30, 5:30, reports. Central.

**WJAH**, Rockford, Ill. Central Park Amusement Co. **WJAJ**, Dayton, O. Y. M. C. A.

**WJAK**, Stockdale, O. 485 also. 250 m. White Radio Lab. Daily ex Sun, 10:30-10:50 am, music; 11:05-11:30, reports, news; 6-6:30, music, news. Wed, 8-9 pm, concert. Sun, 2-2:45 pm, church service. Central.

**WJAL**, Portland, Me. Victor Radio Corp. **WJAM**, Cedar Rapids, Ia. 100 m. Evening Gazette. Daily, 7-8 pm, musical program. Central.

**WJAN**, Peoria, Ill. 500 m. Peoria Star and Peoria Radio Sales Co. Daily ex Sun, 11:30 am, markets, weather; 1:30 pm, closing markets, agriograms, bond news; 6:15, sports. Tues, Thurs, Sat, 9:15-9:45 pm, concert. Central.

**WIAP**, Duluth, Minn. 200 m. Kelley Duluth Co. Daily ex Sun, 8-9:30 pm, concert. Sun, 11-12 am, pipe organ; 12:30-12:45 pm, church service. Central.

**WJAP**, Duluth, Minn. 200 m. Kelley Duluth Co. Daily ex Sun, 8-9:30 pm, concert. Sun, 11-12 am, pipe organ; 12:30-12:45 pm, church service. Central.

**WJBR**, Providence, R. I. The Outlet Co. **WJAS**, Pittsburgh, Pa. 150 m. Pittsburgh Radio Supply House (Pittsburgh Leader). Daily ex Sun, 11-11:30 am, 2:30-3 pm. Mon, Tues, Fri, 7-8 pm. Eastern.

**WJAT**, Marshall, Mo. 100 m. Kelley-Vawter Jewelry Co. Daily ex Sun, 2-2:30 pm, 5:35-6, concert. Central.

**WJAX**, Cleveland, O. 485 also. 500 m. Union Trust Co. Daily ex Sat pm, Sun, 9-9:45 am, 10-10:45, 2-2:45 pm, 3-3:45, music, financial reports, news. Eastern.

**WJAZ**, Chicago, Ill. Chicago Radio Lab. **WJBB**, Dayton, O. 100 m. Dennison University. Daily, 5-6 pm, concert, lecture. Central.

**WJH**, Washington, D. C. 100 m. White & Boyer Co. Daily ex Sun, 1-2 pm, music. Tues, 7:45-10 pm, music. Eastern.

**WJK**, Toledo, O. 300 m. Service Radio Equipment Co. Daily ex Sun, 3-4 pm, concert. Mon, Wed, Fri, 7:30-9, church service, concert. Eastern.

**WJT**, Erie, Pa. 1,000 m. Elec. Equipment Co. Daily ex Sun, 7:30 pm, sports, markets, weather, police reports. Mon, Wed, Fri, 8, bedtime stories; 8:15, concert, lecture. Sun, 7:45 pm, church service. Eastern, daylight saving.

**WJW**, Chicago, N. Y. De Forest Radio Telephone & Telegraph Co. **WJZ**, Newark, N. J. 1,500 m. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 15 minutes hourly from 9 am to 6 pm; 12-12:30 pm; 7-7:15 pm. Miscellaneous program of highly varied nature. Sun, 3-10:15 pm, misc. Eastern.

**WKAA**, Cedar Rapids, Ia. 200, 485 also. 200 m. H. F. Paar. Daily ex Sun, 12:45 pm, reports; 5:30, reports, agriograms; 6-7, music. Thurs, 11-12 pm, music. Sun, 4-5 pm, church service. Central.

**WKAC**, Lincoln, Neb. 400 m. Star Pub. Co. Tues, Fri, 8-9:30 pm, concert, entertainment. Central.

**WKAD**, East Providence, R. I. Charles Loeff. **WKAF**, Wichita Falls, Tex. W. S. Radio Supply Co. **WKAG**, Louisville, Ky. Edwin T. Bruce. **WKAN**, West Palm Beach, Fla. Planet Radio Co. **WKAJ**, Fargo, N. D. 150 m. Fargo Plumbing & Heating Co. Daily ex Sun, 5-5:45 pm, concert, sports. Central.

**WKAH**, Okemah, Okla. Okfuskee County News. **WKAL**, Orange, Tex. Gray & Gray. **WKAM**, Hastings, Neb. Daily Tribune. **WKAN**, Montgomery, Ala. 200 m. Alabama Radio Mfg. Co. Daily ex Sun, 3:30 pm, 8:30, music, news. Eastern.

**WKAJ**, Granston, R. I. Wilcox Flint. **WKAP**, San Juan, Porto Rico. Radio Corp. of Porto Rico. **WKAR**, East Lansing, Mich. Mich. Agril. College. **WKAS**, Springfield, Mo. 100 m. I. E. Lines Music Co. Daily ex Sun, 6:30-7 pm, sports. Mon, Fri, Sat, 8-9:15 pm, music. Central.

**WKAT**, Frankfort, Ind. Morning Times. **WKAW**, Laconia, N. H. Laconia Radio Club. **WKAX**, Beloit, Wis. 100 m. H. A. Turner. Daily 12:15-12:45 pm, 7-7:30 pm, concert. Central.

**WKAZ**, Bridgeport, Conn. 75 m. Wm. A. Macfarlane. **WKAY**, Gainesville, Ga. Brenau College. **WKBA**, Wilkes-Barre, Pa. 100 m. Landau's Music Co. No definite schedule. Sat, 8-12 pm, dance music. Sun, 11 am, 8 pm, church service. Eastern.

**WKBG**, Baltimore, Md. 500 m. Jos. M. Zamolski Co. Tues, Thurs, Sat, 7:30-9:30 pm. Eastern, daylight saving.

**WKN**, Memphis, Tenn. Riechman-Crosby Co. **WKY**, Oklahoma City, Okla. 485 also. 500 m. Oklahoma Radio Shop. (Daily Oklahoma.) Daily, 12 m, weather; 7-7:30 pm, sports, special; 8:30-9:30, concert; 9, weather, news. Sun, 8:30-9:30 pm, concert. Central.

**WLAB**, Carrollton, Mo. George F. Grossman. **WLAC**, Raleigh, N. C. N. C. State College. **WLAD**, Hastings, Neb. 150 m. Arvanetto Radio Sup. Co. Program not established. **WLAH**, Lincoln, Neb. Johnson Radio Co. **WLAG**, Minneapolis, Minn. 1,000 m. Cutting & Wash. Radio Corp. Daily ex Sun, 9:30-12 am, music, market reports; 1:30-3 pm, music, farm news, styles; 3:30-4:45, markets, music; 6:30, farm news, children's hour. Thurs, Fri, Sat, 8:30-9 pm, concert. Sun, 4:30-5:30 pm, church services. Central.

**WLAI**, Syracuse, N. Y. Samuel Woodworth. **WLAL**, Waco, Tex. 485 also. 1,000 m. Wvaco Elec. Supply Co. Daily ex Sun, 9:30 am, 10:30, 2:30 pm, music, reports. Tues, Thurs, Sat, 7:45-8:45 pm, music. Sun, 3 pm, church service. Central.

**WLAK**, Bellows Falls, Vt. Vermont Farm Machine Co. **WLAM**, Springfield, O. 150 m. Morrow Radio Co. Mon, Wed, Fri, 8-9:30 pm, dance music. Central.

**WLAN**, Houston, Me. Putnam Hdwe. Co. **WLAO**, Scranton, Pa. 50 m. Anthracite Radio Shop. Daily ex Sun, 7:30 pm, reports; 7:45, talks; 8, music. Sun, 11 am, church service. Eastern.

**WLAP**, Louisville, Ky. W. V. Jordan. **WLAQ**, Kalamazoo, Mich. 100 m. A. E. Schilling. Daily, 10-12 pm, music. Central.

**WLAR**, Marshalltown, Ia. 50 m. Melick Music Co. No definite schedule. **WLAT**, Burlington, Ia. Chas. G. Bosch Co. **WLAV**, Pensacola, Fla. 200 m. Elec. Shop, Inc. Daily ex Sun, 8-9 pm, music, entertainment. Central.

**WLAW**, New York, N. Y. New York Police Dept. **WLAY**, Fairbanks, Alaska. Northern Commercial Co. **WLAZ**, Warren, O. Hutton & Jones Elec. Co. **WLB**, Minneapolis, Minn. Univ. of Minn. 100 m. Daily ex Sun, 12-12:30 pm, 7:30-7:50. Central.

**WLK**, Indianapolis, Ind. 485 also. 500 m. Hamilton Mfg. Co. Daily ex Sun, 11:30 am, 12:30 pm, 7:30-8:30, 2-2:30, 3-3:30, 5-5:30, reports. Thurs, 8:30-10 pm, concert. Sun, 2-4 pm, 8:30-10. Central.

**WLW**, Cincinnati, O. 485 also. 500 m. Crosley Mfg. Co. Daily ex Sun, 10 am-8 pm, music, reports. Tues, Thurs, Fri, 8-10:30 pm, music, news. Sun, 12 am, church service. Central.

**WMA**, Anderson, Ind. 25 m. Arrow Radio Lab. Mon, Wed, Fri, 7:30-8:30 pm, concert, news etc. Central.

**WMAA**, Oklahoma City, Okla. 500 m. Radio Supply Co. Daily ex Sun, 9:30-10:30 pm, music. Fri, 11:30-12:30 pm. Central.

**WMAE**, Cazenovia, N. Y. 330, 250, 275 only. 500 m. W. B. Meredith. No definite schedule. **WMAF**, Dayton, Ohio. Massillon Hills Radio Corp. **WMAJ**, Liberal, Kan. 75 m. Tucker Elec. Co. Daily ex Fri, Sun, 7:30-8:30 pm, music, news. Fri, 8-9 pm, concert. Central.

**WMAK**, Lincoln, Neb. 100 m. General Supply Co. Daily ex Sun, 2:15 pm, music, news. Mon, Wed, Thurs, 7:30 pm, music. Sun, 2:30, music, news. Central.

**WMAJ**, Kansas City, Mo. 485 also. 600 m. Daily Drivers Telegram. Daily ex Sun, 8:15 am, 9:15, 10:15, 11:15, 1:15 pm, 2:30, weather, markets. Central.

**WMAK**, Lockport, N. Y. Norton Labs. **WMAI**, Trenton, N. J. 100 m. Trenton Hdwe. Co. Daily, 7:30-9 pm, music, lecture. Eastern.

**WMAM**, Beaumont, Tex. Beaumont Radio Equipment Co. **WMAN**, Columbus, O. Broad St. Baptist Church. **WMAE**, Easton, Pa. Utility Battery Service. **WMAQ**, Chicago, Ill. 1,500 m. Chicago Daily News. Daily, 7-7:30 pm, 9:30-10. Central.

**WMAH**, Duluth, Minn. Waterloo Elec. Supply Co. **WMAI**, Duluth, Minn. Waterloo Elec. Supply Co. **WMAU**, Shreveport, La. La. State Fair Assn. **WMAV**, Auburn, Ala. Ala. Polytechnic Inst. **WMAW**, Wahpeton, N. D. Wahpeton Elec. Co.

(Continued on page 9)



STATION SCHEDULES

(Continued from page 8)

WMAX, Ann Arbor, Mich. K. & K. Radio Supply Co.
WMAV, St. Louis, Mo. Kingshighway, Presby. Church.
WMB, Auburn, Me. Auburn Elec. Co.
WMC, Youngstown, O. 500 ml. Columbia Radio Co.

11 and every other week, 11 am, 4 pm, church services. Sun, all in weeks, 2 pm, 7:30, church services, special, Eastern 100.
WVL, New Orleans, La. Loyola Univ.
WWT, Buffalo, N. Y. McCarthy Bros. & Ford.
WWX, Washington, D. C. 1,160 only. 600 ml. Post Office Dept. Daily ex Sun, 10 am, weather; 10:30, markets; 5 pm, 7:30, 8, markets; 9:50, weather. Eastern.

OPERA SEASON OPENS

(Continued from page 1)
once a brilliant season of opera. She returns this year as one of the most valued soprano artists.

Edith Mason Comes Back
Edith Mason, who sings the leading role of "La Boheme," is an American, educated in Europe. She studied voice with Victor Maurel and Edmond Clement in Paris, and was coached in the Italian repertoire in Milan. She made her debut as Sophie in "Rosenkavalier" at the Metropolitan in New York, where she appeared for two seasons in such roles as Nedda, Micaela, Musetta, Gretel, Marceline, in "Fidelio," the page in "The Masked Ball," and similar assignments in "L'Oracolo" and the "Canterbury Pilgrims." In Paris and Monte Carlo her repertoire included all three soprano roles in "The Tales of Hoffman" and many other roles.

Minghetti Makes Debut
Singing with Miss Mason in "La Boheme" will be Angelo Minghetti. He is the son of the well-known ex-minister Marco Minghetti and comes from an old and artistically inclined family. As a boy the young Angelo proved to be an exceptionally talented sculptor, giving a very successful exhibition of his work in Genoa when he was only fourteen years old and graduating from the academy of "Belle Arte" when sixteen. He did some very important portrait busts for the Italian government.

Conductor's Staff at Work
Giorgio Polacco, musical director, assisted by Richard Hageman and Pietro Cimini, has made such headway that the choristers and orchestra have already had full-stage rehearsals with the principals, and the entire ensemble is ready for the opening of the season.

Of the repertoire so far established, eighteen operas will be sung in Italian, one in English, six in French and five in German. Of these "The Snow Maiden" (Snegour-otchka) by Rimsky-Korsakov, "The Jewess" (La Juive, by Halévy and "The Force of Destiny" (La Forza del Destino) by Verdi are all new to Chicago, at least to this generation as far as operating history records. Seven others, Wagner's "Parsifal" and "The Valkyrie" (Die Walkure), Humperdinck's "Koenigskinder" and "Haensel and Gretel," Von Flotow's "Martha," Victor Herbert's "Natoma" and Giordano's "Andrea Chenier" are all welcome and interesting revivals unheard in Chicago for a long time. The twenty or more other operas to be heard in the ten-week season at the Auditorium Theatre are all established favorites of the repertoire of several seasons past.

WGI Arranges Church Services
BOSTON, MASS.—The Greater Boston Federation of Churches has taken up Radio and arranged for a series of Sunday night services to be broadcasted from Station WGI. Hon. Wayne B. Wheeler, attorney for the American Anti-Saloon League, Rev. Clinton H. Mays, Rev. George A. Gordon and many other noted church workers are included in the list.

An entire musical comedy, "The Gingerbread Man" was given recently from Station WGI, by a concert company, with a picked chorus of 25 voices out of the full hundred comprising the company.

WHAS SURPRISES FANS WITH ADDRESS BY COX

Also Features Speech by Ida Tarbell, Author

LOUISVILLE, KY.—Station WHAS of this city, surprised its listeners October 25, by broadcasting addresses from two very prominent personages, James Cox, former Governor of Ohio, and Ida M. Tarbell, well known in the literary world. This was in reality a surprise party given by The Courier-Journal and Louisville Times station, as no previous announcement of the double attraction had been made.

Mr. Cox recounted some of his recent experiences and expressed the impressions gathered from his recent European trip. His description of the American cemeteries on the battlefields of France must have brought comfort to the hearts as well as tears to the eyes of many mothers in his unseen audience.

Miss Tarbell is in Kentucky seeking new facts and data for a work she is writing on Abraham Lincoln, who spent much of his younger days in that state. She told WHAS listeners some of the interesting results of her researches and appealed to them for such assistance as they could give her in her efforts to reconstruct the life of the Great Emancipator.

Sophomore Runs New Ohio College Plant

Station at Springfield Broadcasts Activities of School

SPRINGFIELD, O.—Wittenberg College of this city now has an official Radio broadcasting station, WNAP, which will be used to broadcast college activities. The station is in charge of Robert F. Weing, sophomore student, who passed a Radio broadcasting examination at Dayton recently, thus giving the station official status. A Radiophone transmitting set has been constructed and installed in the science hall. This set is the best of its kind, having a vocal broadcasting range of approximately 300 miles, and a telegraphic range of over five times that distance. Wittenberg athletic events on the gridiron, diamond, basketball floor, play by play, will be broadcasted, as well as general news of college activities. The set was used for the first time at the recent football game between Wittenberg and Western Reserve College at Cleveland.

Boston Show to Transmit Messages Free for Ladies

BOSTON, MASS.—Among the novelties planned for the coming Radio Show here is the free transmission of messages from ladies attending the show. By arrangement with the American Radio Relay League and the Radio Inspector's office, these messages will be transmitted to the nearest relay station and thence to their destination. Another interesting exhibit will be a demonstration of coil winding by machines, showing how lattice or honeycomb coils are made. This will be given by the Coto-Coil Company of Providence, R. I. Samples of these coils will be given free at the show to attending fans.

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CONDITIONS RETARD PROGRESS IN CUBA

Poor Facilities Make Radio Development Slow

WASHINGTON.—Owing to the lack of adequate broadcasting facilities, Radio developments in Cuba have not kept pace with the progress of Radio transmission in the United States, says Assistant Trade Commission Livengood, Havana; but recently a high-power sending center has been established in the capital and the popularity of Radio receiving sets is expected to grow rapidly. This station has not yet made arrangements to supply broadcasting service, but it will do so soon. The apparatus of the company operating Station PWX, which has a capacity of 500 watts, is an exact duplicate of that used by A. T. and T. Company in its Walker Street station. Test messages from the new Havana station have been heard as far away as Worcester, Mass.

Static Disturbs

As in all tropical countries, Cuban enthusiasts have met with difficulties because of static disturbances. In spite of all obstacles, however, a considerable number of Cuban amateurs have been receiving messages and one or two transmitting. In order to receive from United States stations, apparatus of the more expensive kind is necessary. With such sets messages have been received from Memphis, Tenn., Detroit, Mich., Pittsburgh, Pa., Jacksonville, Fla., Wichita, Kan., Kansas City, Mo., and Schenectady, N. Y. Messages from Atlanta, Ga., have been received very successfully in Havana.

Havana dealers are well equipped to supply Radio apparatus in anticipation of popularity as a result of the broadcasting from the new Havana station. Interest in Radio matters is very active.

Canada Invited to Take Part in Imperial Plan

OTTAWA, CAN.—Canada has been asked by the British Government to take part in a new Imperial Radio scheme. Arrangements have already been made to link up Britain with India, Egypt and Australia. Now Canada has been asked to build a powerful new station to communicate with the British station. It would cost over \$1,000,000 to build and about \$250,000 annually for upkeep. Hon Ernest Lapointe has cabled for Superintendent Edwards, of the Canadian Government Radio telegraphs, to come to England to go into the matter.

The U. S. army is making a special study of Radio, especially in the direction of devising some plan by which the noise of airplane engines will not drown out Radio reception. This has been one of the main difficulties in the operation of Radio on airplanes.

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is a vacuum tube detector set compactly and efficiently built that will stand rough usage when necessary and is a decoration to any home.

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The AERIAL-A has been awarded the certificate of Excellence by the New York Evening Mail and is guaranteed by the New York Tribune Institute. Nothing more need be said.

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## Political Patronage

**Municipal Broadcasting Opens Up a New Field**  
WHILE municipal Radiophone broadcasting is opening up a new field for political patronage, the system is too new to give any idea as to what the outcome will be in the near future. Commissioner Whalen of the New York Department of Plant and Structures is asking from the Board of Estimates for 1923 an appropriation of \$3,000 for a broadcasting supervisor and \$3,600 to provide for the salaries of two Radio operators.

## Steel No Barrier to Ether Waves

**Loop Aerial Within Steel Car Picks Up Messages**  
THERE seems to be no obstruction for the ether waves. In recent tests on a fast traveling train and within cars made of steel, messages were picked up with a receiving set. It heretofore has been believed impossible to receive Radio communications with apparatus entirely within any steel inclosure, such as a modern railroad car, or steel frame office building. A loop eighteen inches long, composed of light lamp cord on a wooden frame, was employed in connection with receiving instruments enclosed entirely in one of the compartments on the last car of the train. The apparatus was so compact that all of it fitted in two small Pullman trunks.

## Farmers' New Friend

**Reports of Value and Entertainment Reach Him**  
WITHIN a year Radio will bring most farmers the information and close proximity of the outside world they have long wanted. At the present time the United States is making a very definite use of the Radiophone in broadcasting reports of interest to them.

While Radio is very instructive and highly entertaining to people in all walks of life, yet the Radiophone means more to the farmers, perhaps, than to any other class of citizens.

Before the coming of the Radiophone the farmer was entirely isolated from enjoying the entertainments within the reach of the city folks. He was also ignorant of the latest market reports, something in which he was intensely interested in order to know the best time to sell his produce. Now, with the Radiophone receiver the farmer can be just as quickly informed of important information as city dwellers and can enjoy the world's best artists while sitting at his fireside, resting in an easy chair.

When one realizes that a good Radiophone costs less than a first class phonograph, is just as simple to operate, costs less to operate than to keep a phonograph supplied with up-to-date records, and has a constantly changing program, it must be admitted a logical act to install a receiving set.

## Increased Size of Audience

**The Walls of the Radio Theater Are Infinite**  
OPERA singers must appeal to the opera goers, a preacher of the gospel must satisfy the congregation that chose him for their pastor and the actor interests his followers in the theater, but how about the director of a broadcasting station whose audience cannot be counted, are unseen and cannot express their appreciation? The area is often two or three thousand miles in diameter.

Until the time may come when certain stations, on certain wave lengths, will specialize in particular kinds of broadcasting, the director of Radio programs must endeavor to arrange his broadcasts in a manner gratifying to all humanity. Fortunately for him, Radio listeners are human beings, actuated by a fascinating enthusiasm, which makes them magnanimous and sympathetic with the difficulty of all this task. We used to say "free as the air," but now we may add a new air—Radio.

Radio enthusiasts enjoying this new air are grateful and voluntarily write to stations whose programs please them. Once the public is convinced that the station is genuinely endeavoring to please them it will respond almost to a person.

It is apparent that the task of the Radio broadcasting director is to find music and speech of a character that will bring real information and pleasure to the greatest number who listen in with their home sets.

## Condensed

By DIELECTRIC

It is interesting to note in connection with the work of constructing a water power electric plant in the mountains of Northeastern Fresno County, Calif., that Radio plays an important part. About 10,000 feet above sea level, three CW Stations are sending the messages which direct several thousand employees in their operations. This is truly a case of getting one's orders from the man higher up. I understand that no one ever climbed so high, as this company has, to install a Radio station. Maybe they intersperse a little jazz with the commands to make the days seem shorter.

Secretary of State Hughes was able to keep in touch with all that was transpiring in the world, although for a time far removed from land, when he sailed to and from Brazil. The battleship Maryland was wonderfully equipped with Radio apparatus that provided the means for receiving information. It is possible for any of our State officials to fulfill outside engagements and still maintain a close connection with the home office, providing Radio sets are at hand. If coal continues to be scarce, the whole personnel of the Government could move to a warmer place (Southern city) and continue their administering efforts, taking only a transmitter with them.

When a quorum of Congressmen is needed in the Senate Chamber at Washington, it will probably save much time and effort if they are immediately sought in the public parks of the city, now that Station WIAY is broadcasting. This department store station has installed loud speakers for the benefit of devotees of the parks. It would be possible for a Senator to enjoy what he hears in the park, but while in the Senate—!

Welcome to the ranks, Wyoming! It seems a long time that we have waited for you to get in line with the broadcasters, but that is all forgotten in the joy of having every State in the Union represented by one or more broadcasting stations. It is possible that in some states there are really more such stations than are beneficial to the cause. But I am not concerned about that here. What interests many of us just now is the type of program Laramie is putting out. We are listening, KFBU.

Where a great many people have owned phonographs for years, there is very little pleasure to be derived from listening in to reproductions of records, especially when Radio can bring to some of them otherwise unobtainable entertainment. For this reason the establishment of the Class B stations is most welcome. "Canned" music cannot be sent from these stations, and only entertainment of a character better than common will be sent out on this special 400-meter wave length. Praise be! By turning up the dial a bit we can hear something other than The Five Kings of Jazzapation—I mean we who tire of continuous performances of that sort. Both classes of stations are certainly needed, yes, BOTH.

Well, Sir Thomas Lipton has come in first, but not on a trim sailing craft this time. He said a few well-chosen things in English to Mr. Selfridge of London, England, and said them in the broadcasting room at Station WOR, yet he was heard in England. If so many astonishing things were not occurring almost daily in some branch of Radio science, this feat would still be on the tongue of every fan. One promising thing may be taken for granted, however, which is that our esteemed English friend will be a big booster for Radiophony when he returns to his native land. They need some stirring up over there just now, you know.

No doubt most of you are familiar enough with the conditions amid which lighthouse keepers carry on their lonely vigil, and you have wished that they might be benefited by having Radio sets at hand. According to the latest report from the Commissioner of Lighthouses quite a few of these keepers will have such sets; many of them have now in Alaska, where mail comes in at long intervals. What a new world for them! Think of them getting the reports from the World's Series; music, other than that of the waves; interesting speeches, etc., etc. Life will present a new face—thanks to the inventors of Radio apparatus.

The slogan "Say it with flowers" has been changed to add, "sent by Radio," by one of the florist firms in London. When you are traveling in England, stop in and see one of their agents, give in your order and they will have the flowers presented to your wife, within a few hours, right here in the United States. That's modern service in the modern way.

A great many of the large broadcasting stations have supplied religious services to their audiences for some time past. This is a distinct boon to many, who could not otherwise hear a church service, and for that reason those who tune in WGY will be glad to know of their having included this feature. Really, it doesn't take much time from the stories and secular music that come in all the balance of the day. Try it.

One of the really important discoveries was that of the direction-finder, for use on ships at sea. If you happened to be a passenger on one of the many vessels that for one reason or another had lost its course, this device enabling the skipper to get back again would appeal strongly to you. The Canadian Pacific's ships are being equipped with the latest Radio direction-finders, and eventually all vessels will be so equipped.

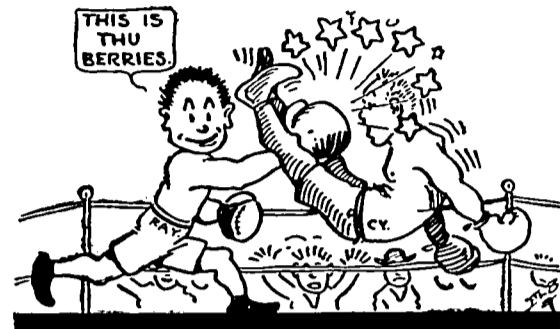
## RADIO INDI-GEST

### Honeymoon Broadcast from Station WET

We suggest that they install a gigantic broadcasting station up at Niagara Falls right over the falling waters. This will allow the roar of the great falls to be heard throughout the country and will save millions of dollars in honeymoons alone. All a young couple will have to do is tune in for Niagara, hold hands and let their gosh darn imagination run riot.

### Radio Faster Than Cyclone

Sailor Joe-Joe, otherwise Radioman Joseph H. Boyer, "Radio pug," recently knocked out "Cyclone" Clifford



in the sixth round of a "fist fest" at the Coco Solo, Canal Zone, Naval Air Station. This is the first victory of a Radio man over a cyclone. Nautical witnesses state that "Cyclone" Clifford didn't know his "code," but admitted it may have been that static interfered, as it does with most everything in the tropics.

### It Happens in the Best Modulated Families

Helen Tyler-Cope

When Ma talked summer style and gown,  
And "time to get us out of town,"  
I shouted "Old vacation time, hurray!"

But Dad said, "There's no sense in that—  
Why you just bought a dress and hat,  
The kids are well, I think at home we'll stay!"

Then big Sis up and said her bit—  
Asked Dad how much he spent on it,  
His inexpensive (?) pastime, Radio!

### From Old Virginia

Dear Indi:

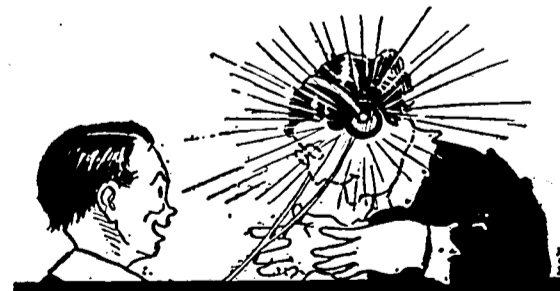
It isn't my fault. Just blame my fourteen-year-old son. He's been bitten by the Radio bug or has gotten the fever or something. Anyway, he's a regular F. F. V. city-cured ham. But let me tell you, I "listened in" the other night. I didn't listen in anything, but my son insists that I did. While IOU was telling me there would be a bass solo, "Rocked in the Cradle of the Deep," I heard a 'cello playing, "Call Me Thine Own," and while this was going on, I heard some one say, this is HIC, we will now have "One Sweetly Solemn Thought," by a baritone.

Now, I'll ask you, Mr. Editor, if call me thine own isn't one sweetly solemn thought to a bass rocked in the cradle of the deep by a baritone? This was some thrilling to an old married woman to hear in the air.

Then I heard, "Giants, so many hits, Yankees so many runs." My goodness! There they were having a fight right in my ears.

"Cut her out, cut her out," exclaimed my son, and he proceeded to yank frantically, in turn, each of the five things he could turn on the front of the set. "Now I know you'll hear some music," he said. Music! Yo Gods! such a rasping and roaring and whistling and groaning, the elements were let loose, no doubt. "What do you get now, Mother?"

"O, I get the 4th of July and Mustapha Kemal at



Constantinople fine." Yanking of the knobs and buckling up some more wires and rolls of wires on pasteboard tubes, and then, O, my, some boy was giving a whistling solo all on one key, while several cats were fighting in addition.

"Well, Mother, its ten o'clock and the reports are coming in." So extra slides were unbuckled and what a da-de da, da-da in my ears. "O, that's the 'hams' sparking." No, I didn't say that, that's what my son said, as he took the receiver and half my side hair off. My! what a relief! Such a hair-raising, rather hair-pulling exhibition! I had heard it all, and that "all" in less than an hour.

Only I forgot about the woman reader, who cut in just as the poor man was going to sleep in the deep, and the man, who was making a talk, but who just would not talk loud enough for me to hear.

Believe me yours,

Mrs. Radio Lite.

# Use of the Radio Receiving Set in the Home

## Part X—Radio Frequency Amplification

By H. M. Towne

IN THE preceding installment, the resistance and transformer types of coupling for Radio amplifiers were discussed. There are two other forms of coupling which have given very good results and these are the choke coil coupling and the tuned circuit coupling. The

mendous influence on their operating efficiency. The amount of iron has a direct relation to the number of turns in the winding and to the frequency range over which the device will function. The capacitance of the amplifier tube elements to which the transformer or

three different chokes are required, all of which fit the same base. If only broadcasting wave lengths are to be received, only one choke is required which has a range of about 300 to 425 meters.

### An Efficient Receiving Set

Figure 31 shows the wiring diagram of a complete and efficient receiving circuit using one stage of Radio frequency amplification with choke coil coupling, together with detector and three stages of audio amplification using high plate voltage on the last audio amplifier tube. In this combination considerable flexibility is had by the switching facilities.

The circuit normally employs a honeycomb coil as the main tuning inductor and the switch S1 is thrown to the left so that the tuning condenser is in series with the honeycomb coil. The honeycomb coil can be removed from its socket and the secondary of a loose coupler may be connected to the antenna and ground terminals thus enabling the two-circuit tuning system to be used. Also, a loop may be connected across the antenna and

are provided so that one or two separate 'phone sets may be inserted independently of each other and the phones are always inserted on the output of the first audio

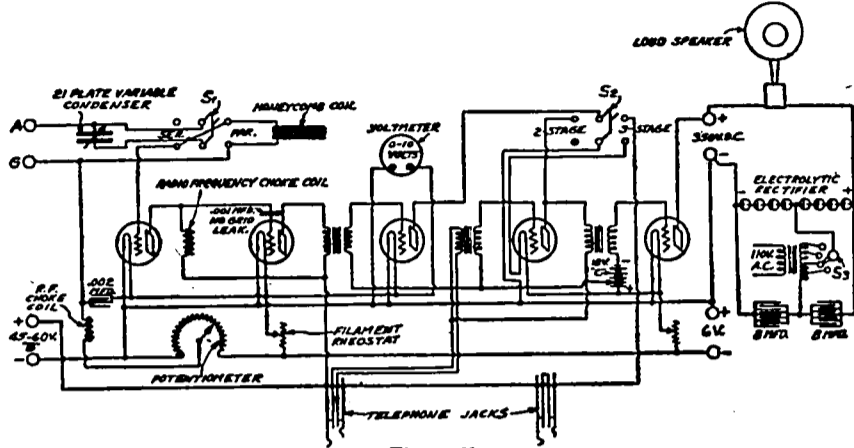


Figure 31

choke coil is one of the most efficient and perhaps the simplest type of coupling for use with the broadcasting frequencies. It has similar characteristics to the transformer and may be likened to a transformer having a 1 to 1 ratio.

### Use of Choke Coil

It consists of a coil of fine wire (about No. 30 B&S) the number of turns depending upon the frequency for which it is designed, and the coil containing an iron

choke coil is to be connected will also have an influence on the operating efficiency. These factors combine to make the Radio choke coil or transformer a very difficult device to design correctly on paper and it is safe to say that most of the present developed radio transformers or choke coils on the market are the result of numerous "cut and try" experiments to decide the final design. It is for this reason advisable to buy the trans-

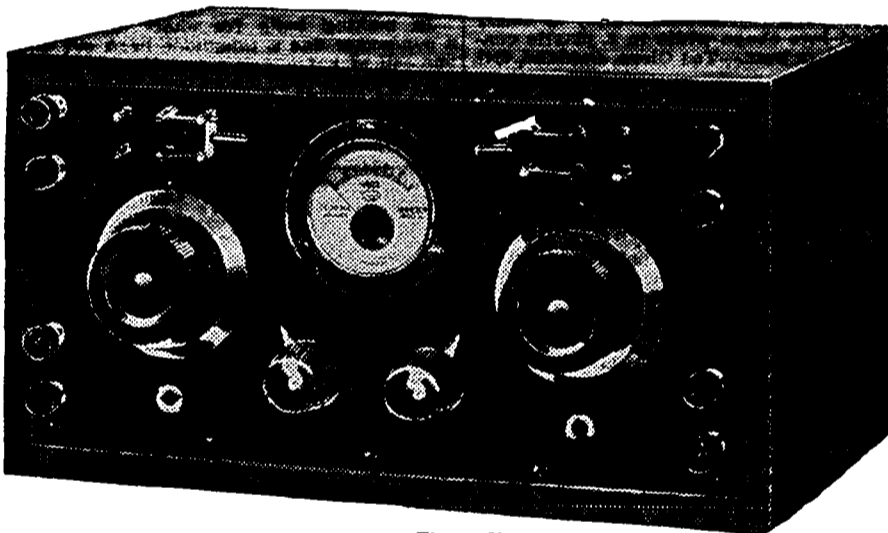


Figure 32

core. The core may be of the usual high grade thin laminations of iron same as used with the Radio frequency transformer, or it may be a composition of iron dust and suitable binder. Ordinary transformer iron cannot be used at Radio frequencies owing to the slight flux penetra-

tion in the iron and the subsequent losses from eddy currents and hysteresis within the iron. The quality of the iron used for cores in Radio frequency transformers, reactors, or choke coils, will have a tre-

formers or choke coils unless one wishes to make up several designs and try each out for relative efficiency. There are Radio frequency choke coils on the market which will give very good results. One simple and efficient design is made up in a small cylinder with metal

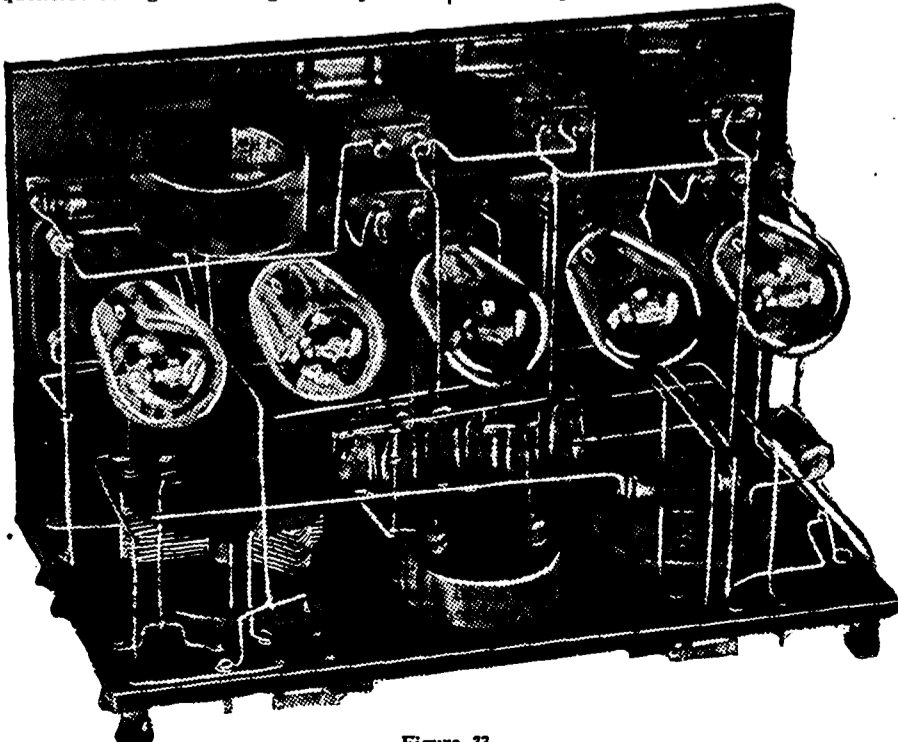


Figure 33

tion in the iron and the subsequent losses from eddy currents and hysteresis within the iron. The quality of the iron used for cores in Radio frequency transformers, reactors, or choke coils, will have a tre-

caps, and can be mounted in a standard grid-leak base. It is made in several designs, each design taking in a short band of wave lengths so that for a complete range of from 200 to 600 meters, about

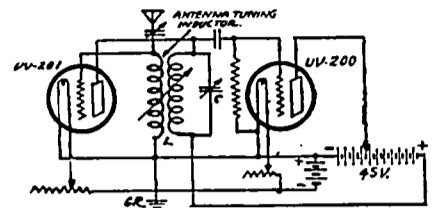


Figure 35

amplifier tube thus giving the combination of one stage of Radio amplification, detector, and one stage audio amplification.

### Grid Potential Control

It will be noted that the potentiometer is used to control the grid potential on the Radio amplifier tube. As the variable contact is turned from the positive side to negative side of the A battery, the oscillation point of the Radio amplifier tube is approached.

It will be seen that a Radio frequency choke coil is inserted in the lead from the contact arm of the potentiometer and that a condenser is shunted between the lead and the filament terminal of the first

(Continued on page 12)

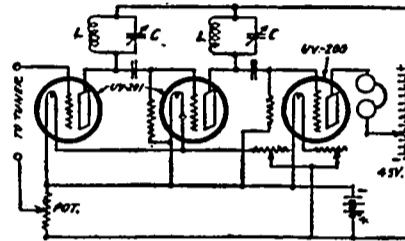


Figure 34

ground terminals without any change in connections.

When using the loose coupler or the loop, the switch S1 should be thrown to the right in which position the 21 plate tuning condenser is in shunt with the secondary of the loose coupler, or the loop, as the case may be. For average size of antenna the honeycomb inductor may be of about 75 turns (L-75) and the tuning condenser in series with it permits a range of from about 300 to 475 meters.

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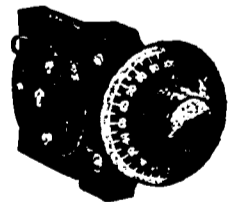
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# Construction of Ring Variometer

## Turned Wooden Pieces Make Bases for Coils

A novel way to make a variocoupler or a variometer is shown in the illustration. Two rings are made of wood or other suitable material. One of the rings is 1/4 inch thick and as large in diameter as desired. The other ring or better, disk, is

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1/4 inch thick and large enough to fit inside of the first ring with clearance for the wire. The outer ring need not be round if it is more convenient to make it square.

The diagram illustrates the method of winding. One ring is placed inside the other and pivoted so that it will revolve. Be sure to wind the inside disc, or ring, first. Then place it in the center of the outer ring before winding the latter.—Donald Farrell, Elroy, Wis.

## Making Taps for Switch Points

When making taps for switch points on tapped coils, instead of twisting a loop of wire together and baring it only at the end where it connects to the switch contact it is advisable to also bare the two wires where they leave the tubing and when they are twisted together the loop will be shorted. By making all the switch taps in this way, it will not be necessary for the energy of the incoming oscillations to traverse both sides of the loop forming the tap before reaching the tap on which the switch arm rests.—J. M. C.

## USE OF RADIO SET

(Continued from page 11)

tube. This combination prevents the adjustment of the potentiometer from having any effect on the tuning of the circuit, since the Radio frequency is by-passed through the condenser to the filament and held out of the potentiometer by the choke.

The choke and condenser do not interfere with the grid voltage control by the potentiometer. A grid leak may be an improvement with some tubes but it will be generally unnecessary. In trying out this receiving circuit it was found that the UV-201 worked fully as well as the UV-200 as a detector when used with a .001 mfd., or larger, grid condenser. The set was therefore wired for the same B battery voltage on all tubes except the last audio amplifier which has the high voltage from the electrolytic rectifier which was described in a previous installment of this series. The first three tubes are controlled by one filament rheostat and the last two by another rheostat. This seems to be ample control if proper care is given to biasing the grids of amplifier tubes where necessary.

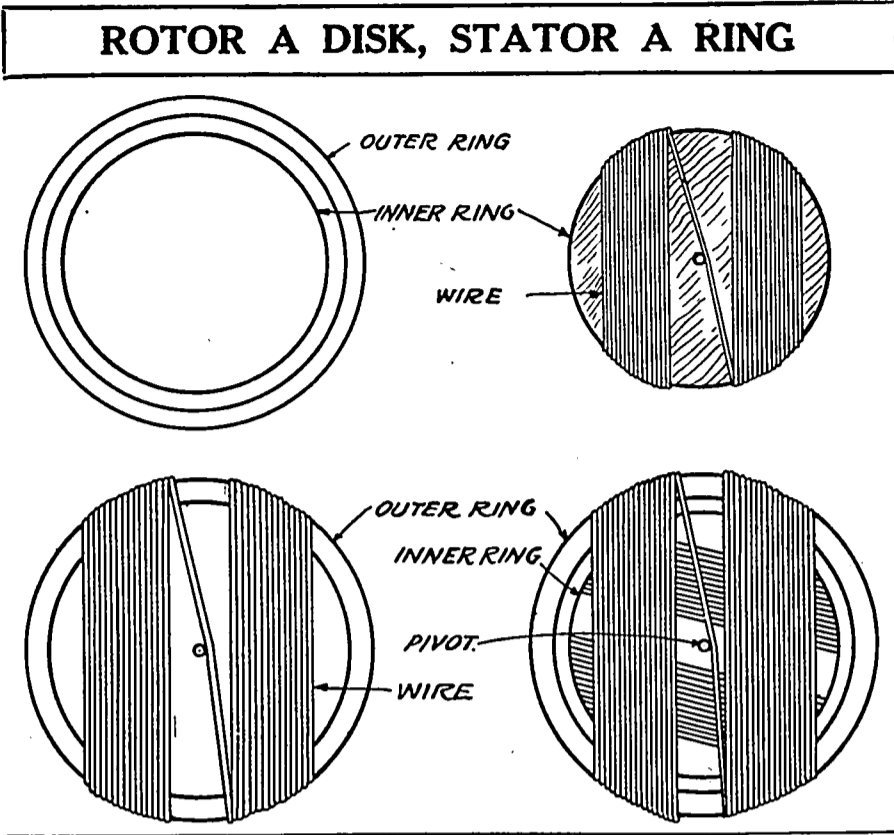
### The Assembled Combination

The Figures 32 and 33 are photographs showing the exterior and interior of the assembled combination shown in the diagram. With this outfit an open air concert was given and music from a 1 K.W. phone transmitter 60 miles distant was reproduced with sufficient intensity to be heard clearly one-half mile from the loud speaker. Using a loop, the signals broadcast from stations up to 300 miles distant can be heard with pleasing intensity in an ordinary living room.

Another stage of Radio amplification will, however, considerably increase the range of reception by loop, but for the antenna the writer has found one stage of Radio amplification in combination with two or three stages of audio amplification to be entirely satisfactory and efficient when used with a loud speaker and during this present period of the year stations 1,000 miles distant can be heard at night on a good antenna with intensity approximating that of a victrola.

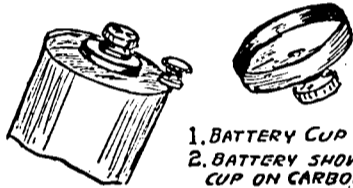
### Coupling Radio Amplifiers

Figure 34 shows the method of coupling Radio amplifiers using the tuned circuit. The tuned circuit consists of an inductor (L) and a variable capacitance (C) in parallel and the combination inserted in the plate circuit the same as the choke coil type of coupling. For broadcasting



## Cup for Mounting Crystals

A cup for mounting a crystal may be found on the covering of almost every dry cell. If no battery is available a small file will do as well. The ad-



vantage of the battery cover is that it has a small machine screw attached to

the bottom which can be used to fasten it to the base of the detector.

It is best to mount the crystal right in the cup, using equal parts of liquid mercury and solder. This alloy is easily worked into shape while in a plastic condition from heat.—Ted Olsen, Oakland, Cal.

## Battery Terminal Corrosion

The Radio fan using a storage battery with his receiving set, should remember that ordinary vaseline is perhaps the best medium available for coating battery terminals and connectors. The vaseline acts to minimize corrosion from acid or water that may have been spilled on the sealing compound.—J. M. C.

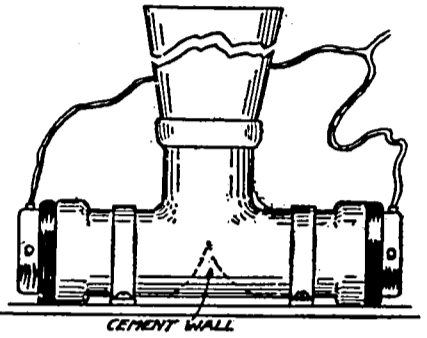
## Tuning and Adjusting

Considerable care should be taken when tuning or adjusting the Radio frequency amplifier circuits to avoid the state of oscillation in the amplifier tubes. The amplifier tubes use higher plate voltage than the ordinary detector tubes and therefore a receiving set with Radio amplification when oscillating will generate much greater currents in the antenna circuit than the plain detector set when it is oscillating. A Radio frequency amplifier circuit should not be allowed to oscillate, as the oscillations will be of sufficient energy to interfere with other receiving sets within a radius of one or two miles, and may completely heterodyne the waves of good broadcasting stations to a point where speech becomes unintelligible and music becomes as "sounding brass or a tinkling cymbal." Regardless of the circuit in use the operator should first master the control of the regeneration or oscillation and prevent his receiving set from becoming a transmitter to jeopardize the efforts and interests of other "Fans" in Radio reception.

(Continued in the November 18 Issue)

## Base for Loud Speaker Made of Gas Pipe Tee

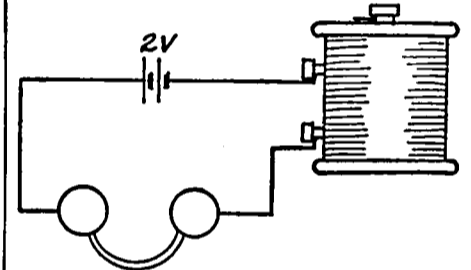
As I was in a hurry to demonstrate how loud KSD came in and not having a loud speaker, I used the method shown in the illustration. An ordinary 1 1/2-inch cast-iron gas pipe tee fitting was strapped to a wooden base with two brass strips; two other pieces of the same material were fastened with screws at a distance from the openings in the fitting so that the phones would slip in tightly. An old megaphone was fastened with tape to the side outlet of the tee. There happened to be some cement work going on in the vicinity and some of the mixture was procured and formed in the center of the tee,



as shown. This, while not absolutely necessary, gave greater clarity to the signals. They came through so good that it was made a permanent fixture and regularly entertains as many as twenty people.—H. B. Cowan, St. Louis, Mo.

## Testing Condenser for Shorts

In making tests for short circuits in a condenser use a telephone head set and one cell of battery in a test line as shown



in the illustration. If there are any plates touching, a click will be heard in the phones, when the moving plate arrangement is rotated.—L. W. Bale, Cleveland, Ohio.

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# Antenna Capacity and Inductance Calculations

## Comparison of Two Methods for Determination of Wave Length

By H. J. Marx

**E**VERY beginner in Radio has discovered that the antenna has some sort of a natural wave length. In a vague sort of a way, he probably knows that this natural wave length is dependent upon two factors—namely inductance and capacity. Just why an antenna should have inductance or capacity and what both of these terms mean is usually a mystery.

It is an accepted observation that when a direct current passes through a wire, a magnetic field is formed around it. In the case of a direct current, this magnetic field exists as long as the current is flowing. In Radio reception, however, we are dealing with an alternating current.

### Self Induction.

Instead of one fixed magnetic field about the wire carrying alternating current, there is a constantly changing magnetic field with the lines of force running first in one direction and then reversed in the other direction. From the study of magnetism and induction coils it is known that this constant reversal in the direction of these lines of magnetic force creates induced current.

Naturally this induction depends upon such items as the length of the wire, the diameter, the effect of the earth's magnetic field, and the position of the wire. This self-induction or inductance is expressed in units such as centimeters, millihenrys, microhenrys or henrys.

### Inductance Formula.

If the wire is vertical such as the lead-in from an inverted L type of aerial, the formula for this inductance is

$$L = 2l[\log \frac{4l}{d} - .75]$$

In which L is self-inductance expressed in centimeters, l, the length of wire in centimeters, and d, the diameter of the wire in centimeters. The logarithm is the Napierian logarithm, the table of values for which was given on page thirteen of the November 4th issue of RADIO DIGEST. For example: assume that the lead-in from an aerial has a vertical length of forty feet and it is desired to find the self-inductance if No. 14 gauge wire is used. The solution of the problem would be as follows:

$$l = 40 \text{ ft.} = 480 \text{ inches} = 1,219.2 \text{ cm.}$$
$$d = \text{B. \& S. \#14} = .1628 \text{ cm.}$$

$$L = 2,438.4 [\log \frac{4,876.8}{.1628} - .75]$$

$$= 2,438.4 [7.245] = 17,666 \text{ cm.} = .0177 \text{ milhenry.}$$

### Horizontal Wire.

If the wire is horizontal the effect of self-induction is altered and the formula becomes

$$L = 2l[\log \frac{4h}{d} + .25]$$

In which the letters have the same significance as the preceding formula and h represents the distance from the ground to the wire in centimeters.

### Parallel Wires.

In the case of an antenna having two parallel wires, before self-induction of the whole can be calculated, the mutual induction between the two must first be known. The formula for the mutual induction is

$$L_m = l \times \log \left( \frac{s^2 + 4h^2}{s^2} \right)$$

where  $L_m$  is mutual induction expressed in centimeters, l, the length of each wire in centimeters, h, the height above ground in centimeters, and s, the distance between the two wires in centimeters. Having found the mutual induction, then the self-induction of the two-wire antenna can be calculated from the formula

$$L' = \frac{L + L_m}{2}$$

In which L' is the inductance of the antenna in centimeters, L, the self-induction of one wire of the antenna, and  $L_m$ , the mutual induction of the two wires.

### Effect of Single and Double Wires.

To illustrate the effect of single and double wires, let it be assumed that the single horizontal wire length is one hundred feet, that No. 14 gauge wire is used at a height of fifty feet above the ground. It is desired to find the self-induction of one wire, and then of two parallel wires spaced ten inches apart.

$$l = 100 \text{ ft.} = 1,200 \text{ inches} = 3,048 \text{ cm.}$$
$$h = 50 \text{ ft.} = 600 \text{ inches} = 1,524 \text{ cm.}$$
$$s = 10 \text{ inches} = 25.4 \text{ cm.}$$
$$d = \text{B. \& S. \#14} = .1628 \text{ cm.}$$

$$L = 6,096 [\log \frac{6,096}{.1628} + .25] = 6,096 [10.532 + .25]$$

$$= 65,727 \text{ cm.} = .0657 \text{ milhenry.}$$

The inductance of the one horizontal wire then is .0657 milhenry. The mutual inductance between the two parallel wires described will be

$$L_m = 3,048 \times \log \frac{25.4 \times 25.4 + 4[1524 \times 1524]}{25.4 \times 25.4}$$

$$= 3,048 \times \log \frac{(645.16 + 9200304)}{645.16}$$
$$= 3,048 \times \log 14,400$$
$$= 3,048 \times 9.574982$$
$$= 29,184 \text{ cm.}$$

The mutual inductance then between the wires is 29,184 cm. Making use of the two previous calculations the inductance of the two parallel wires can then be obtained as follows:

$$L' = \frac{65,727 + 29,184}{2}$$

$$= 47,455 \text{ cm.} = .0475 \text{ milhenry.}$$

It will be seen that as the spacing between wires is increased, the mutual induction between the two wires is diminished, thereby reducing the self-induction of the antenna.

### Capacity.

Another one of the characteristics upon which the natural wave length of an antenna depends is its capacity. The condenser effect between any two wires or between a wire and the ground is too well known to require further description. Every amateur realizes that when a wire is stretched horizontally at a given distance from the earth and then is used as the antenna of a receiving set, the wire and the ground form the two plates of a condenser. In the same sense that such a condenser has capacity, so does the antenna have a capacity value. It is this capacity, in conjunction with the inductance value, which determines the natural frequency or wave length of the aerial.

Again considering the case of a single vertical wire such as might be used for a lead-in, the formula for capacity will be found to be

$$C = \frac{1}{1.8 \log \frac{2l}{d}}$$

In which C is the capacity in microfarads, l, the length in centimeters, and d, the diameter of the wire in centimeters. Then the capacity of a lead-in with a length of fifty feet, using No. 14 gauge wire will be calculated as follows:

$$l = 50 \text{ ft.} = 600 \text{ inches} = 1,524 \text{ cm.}$$
$$d = \text{B. \& S. \#14} = .1628 \text{ cm.}$$

$$C = \frac{1}{1.8 \log \frac{1,524}{.1628}} = \frac{1}{1.8 \log 9,337.346} = 86 \text{ mmfds.} = .00086 \text{ mfd.}$$

It will be noticed that the capacity of the single vertical wire is rather low—only .00086 microfarads. For the calculation of the capacity of a single horizontal wire, the following formula is used:

$$C = \frac{1}{1.8 \log \frac{4h}{d}}$$

In this the values of the letters have the same significance as before, and h represents the height in centimeters above the ground.

If the same length, fifty feet, and same gauge of wire as before is used with a height above the ground of fifty feet, the calculation for the capacity will be as follows:

$$l = 50 \text{ feet} = 600 \text{ inches} = 1,524 \text{ cm.}$$
$$d = \text{B. \& S. \#14} = .1628 \text{ cm.}$$
$$h = 50 \text{ feet} = 600 \text{ inches} = 1,524 \text{ cm.}$$

$$C = \frac{1}{1.8 \log \frac{37,444}{.1628}} = \frac{1}{1.8 \log 23,015.50493} = 18.955 \text{ mmfds.} = .00018955 \text{ mfd.}$$

It will be noticed that the horizontal wire capacity is less than that of the vertical wire. This is due to the fact that the horizontal wire is calculated at a distance of fifty feet above the ground. As this distance diminishes the capacity value increases, whereas in the inductance formula a decrease in height will mean a decrease in inductance.

### Capacities of Parallel Wires.

In calculating the effect of parallel horizontal wires, like inductance, there is a mutual capacity between the wires which must be taken into consideration before the resultant capacity of the two-wire antenna can be calculated. This mutual capacity is first calculated through the following formula:

$$C_m = \frac{1 \times \log \frac{s^2 + 4h^2}{s^2}}{1.8 \left[ \left( \log \frac{4h}{d} \right)^2 - \left( \log \frac{s^2 + 4h^2}{s^2} \right)^2 \right]}$$

In which l is the length in centimeters of one wire, d, the diameter of the wire in centimeters, s, the distance between wires in centimeters, and h, the height above ground in centimeters.

After the mutual capacity has been found, it is an easy matter to find the resultant capacity of two horizontal wires connected together by means of the formula

$$C' = 2C - C_m$$

in which C' is the resultant capacity, C, the capacity of one wire, and  $C_m$ , the mutual capacity, all capacities being in micro-microfarads, or any other common unit. It will be noticed that as the wires come closer together the mutual capacity becomes greater. Therefore the capacity of the antenna is reduced (since the mutual capacity is deducted). If the two wires were to be brought so close that they touched, their total capacity would be reduced almost to the capacity of one wire.

### Example of Problem.

As an illustration of the application of this problem, let it be assumed that each wire length of a two-wire antenna is equal to one hundred feet. The distance from the wires to the ground is fifty feet, the gauge, B. & S. #14. Spacing between wires is twenty inches. The capacity of the antenna is required. Then

$$l = 100 \text{ ft.} = 1,200 \text{ inches} = 3,048 \text{ cm.}$$
$$h = 50 \text{ ft.} = 600 \text{ inches} = 1,524 \text{ cm.}$$
$$d = \text{B. \& S. \#14} = .1628 \text{ cm.}$$
$$s = 20 \text{ inches} = 50.8 \text{ cm.}$$

$$C_m = \frac{3,048 \times \log \sqrt{\frac{2,584}{.1628}}}{1.8 [(10.530494)^2 - (8.188688)^2]}$$

$$= \frac{3,048 \times 4.094344}{1.8 (110.89 - 67.05)}$$

$$= 158 \text{ mmfds.}$$

Having found the mutual capacity, it is a simple matter to calculate the single wire capacity. Substituting,

$$C = \frac{3,048}{1.8 \log \frac{6096}{.1628}}$$

$$= \frac{3,048}{1.8 \times 10.530493}$$

$$= 160 \text{ mmfds.} = .00016 \text{ mfd.}$$

Combining the values found for the mutual capacity between wires and that of the single wire, the resultant capacity of the two-wire antenna is

$$C' = (2 \times 160) - 158$$

$$= 320 - 158 = 162 \text{ mmfds.}$$

$$= .000162 \text{ mfd.}$$

It is quite apparent that the calculations involving the mutual capacity are entirely too complex in character for the average novice's use. Furthermore the formula for mutual capacity should not be used in cases where the distance between wires is one foot or less, as the resultant mutual capacity value will be entirely too high.

### Comparison to Austin Formula

$$C = \left[ 40 \sqrt{A + 8.86 \frac{A}{h}} \right]$$

In which A is the area of the antenna in square meters, h, the height of the antenna in meters, and C, the capacity of the antenna in micro-microfarads. In this formula the area of the antenna is considered as the length multiplied by the distance between wires. Results will be sufficiently accurate for all amateur use.

An example of its application is given as follows, in which the same values are taken as in the preceding calculation for the capacity:

$$l = 100 \text{ ft.} = 30.48 \text{ meters}$$
$$s = 20 \text{ inches} = .508 \text{ meters}$$
$$A = 15.48 \text{ sq. meters}$$
$$h = 50 \text{ ft.} = 15.24 \text{ meters}$$

$$C = 40 \sqrt{15.48 + 8.86 \frac{15.48}{15.24}}$$

$$= 157.2 + 9 = 166 \text{ mmfds.} = .000166 \text{ mfd.}$$

It will be noticed that the actual variation from the previous calculation is very small. In fact it is less than three per cent, whereas, the amount of work is reduced to less than one-third.

### Wave Length Calculation

Of course, after the capacity and inductance values have been found—taking into consideration both the flat top of the antenna and the lead-in—the actual wave length can be calculated from the formula

$$W = 1885 \sqrt{C \times L}$$

where C is the capacity in microfarads, L, the inductance in microhenrys, and W, the wave length in meters.

### Sorting Out Signals

While all broadcasting stations in this country except a dozen or so class B stations operating on 400 meters, are supposed to be transmitting on the same wave length, it is often possible to tune out one and listen to another without interference if the listener is not too close to either transmitting station.

If all the stations were operating on exactly 360 meters, the required wave length, it would be impossible to separate signals from two or more stations about the same distance from the listener. But most of the stations are only approximately on 360 meters and therefore a selective receiving set will sort the music by careful tuning.

The wave lengths used by the various stations range from 345 to 380 meters and weather reports are transmitted on 485 meters.—J. M. C.

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75c High Quality Dial.....	.20	\$1.50 Crystal Detector.....	.98
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\$5.50 43-Pl. Variable Condenser.....	1.95	\$1.50 Twin Adapter.....	1.15
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ACME RADIO AND AUDIO TRANSFORMERS.....SPECIAL PRICE

## Radio Engineer Tells About Radio Frequency

Radio frequency amplification is regarded at present as the most interesting subject connected with Radio telephony. Charles Kilgour, Radio engineer, makes the following explanation which is very clear for the beginner:

A Radio enthusiast is not satisfied with a mere definition of Radio frequency amplification. He wants a plan of construction, for a great part of Radio fascination is due to the ease with which it is possible to try out various schemes for making audible the infinitesimal waves of the ether which constantly are lapping upon our aerials.

The first essential of a Radio frequency amplifier is a proper vacuum tube. Any standard amplifier tube will serve. Upon the grid of this tube is impressed incoming alternating current. This is accomplished by connecting one side of the secondary coil to the grid and the other to the filament circuit. No grid condenser is used because the tube acts as an amplifier and not as a rectifier or detector.

To cause a vacuum tube to amplify properly the voltage impressed upon its grid, it is necessary to place an impedance, or resistance, in the plate circuit, which is the connection between the plate and the filament. It also is necessary to hold the plate at a positive potential of about 45 volts for most tubes with respect to the filament. This is accomplished by the familiar B battery.

The high impedance required in the plate circuit may be obtained in several ways. A high resistance may be used, but as this has a high resistance to direct current it opposes the action of the B battery, thus introducing difficulties.

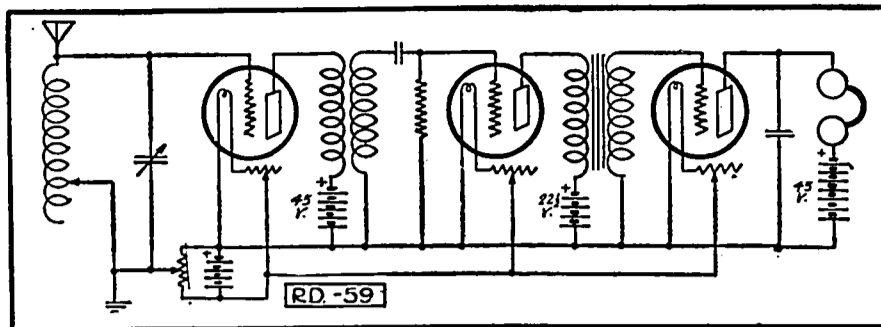
An inductance or coil may be used to set up the necessary impedance. An inductance may have very low ohmic resistance and so not interfere with the proper action of the B battery and at the same time, due to its reactance, offer high impedance to an alternating current such as we wish to amplify. At the high frequency handled, a condenser or capacity effect is always present in a coil. This is equivalent to connecting a condenser across the terminals of the coil. This capacity, together with the inductance of the coil, forms a closed circuit which has a natural period of oscillation or is resonant at a certain frequency. It is a peculiar quality of such a circuit that it offers a very high resistance to an alternating current of the natural frequency of the circuit.

In other words such a coil introduced in the plate circuit of a vacuum tube will have a high impedance to one frequency and will cause currents of that frequency to be greatly amplified. It is essential, however, that the amplifier works properly on various wave lengths. For this reason the ohmic resistance of the coil may be increased, broadening the range of the amplifier but materially reducing its efficiency.

By far the best solution of the problem is the use of a rather small inductance with a variable condenser connected across its terminals. The same sort of a circuit is formed as in the last case, but the variable condenser makes it possible to change the natural period of the circuit and so amplify a signal of any desired frequency within the range of the condenser and coil. The ohmic resistance of such a condenser and coil may be very low and paradoxically the impedance at resonance as a consequence will be extremely high. In fact such a circuit is often said to have infinite impedance at resonance. It thus serves to bring out the maximum voltage amplification of the tube.

Not only does this tuner amplifier give us the greatest increase in signal strength but it is very effective in eliminating interference. This feature is rapidly becoming very important with the greatly increased use of Radio. Tuning the antenna circuit will, of course, cut out some interference but the addition of a step of tuned Radio frequency amplification which amplifies one sharply defined and selected wave length will so increase the selectivity of a set that it must be used to be appreciated.

## THREE B BATTERY HOOK-UP



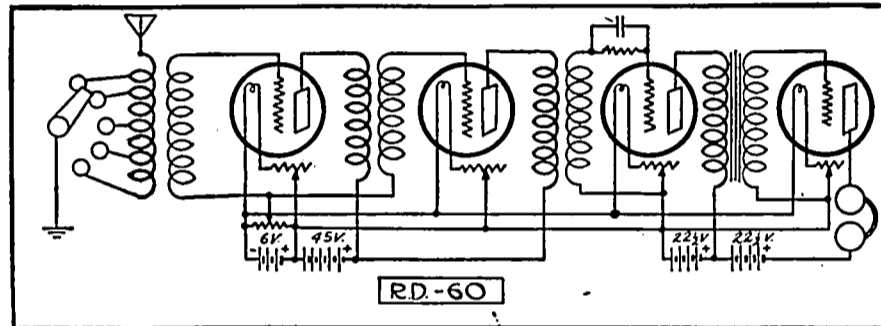
This hook-up is made up of one stage of Radio frequency amplification, one of audio frequency and detector. It is somewhat unusual in the fact that separate batteries are used for all of the tubes. This permits the best possible results from each tube and at the same time decreases the drain on the separate B batteries. The two amplifying tubes use two individual 45-volt batteries in their plate circuits, while the detector tube has a 22½-volt unit.

Tuning is accomplished by means of the typical commercial, single-slide tuner with a 43-plate variable condenser shunted across it. The potential of the grid of the first tube is controlled by the potentiometer shunted across the A battery. The grid

condenser has a value of about .0005 mfd., and the grid leak has a resistance of one megohm. Filament rheostats are used on all three tubes. The two amplifier tubes are hard tubes, and a soft tube is used for the detector stage. The amplifying transformers are of the usual commercial type. A .002 mfd. phone condenser is shunted across the phone and B battery of the last tube.

Outside of the rheostats, this circuit has only three variable adjustments and will be found quite simple for tuning in. For reception of local stations signals should be loud enough to operate a loud speaker, while distant stations will come in fairly well with the head receivers.

## TWO A.F., DETECTOR, ONE A.F. SET



This hook-up with two stages of Radio frequency amplification, detector and one stage of audio frequency is especially designed for the amateur who is desirous of establishing distance records. A tapped vario-coupler is used for the primary inductance. The secondary is designed for operation over a set wave length corresponding to the design of the Radio frequency transformers. The potential of the grid of both of the Radio frequency stages is controlled by means of the potentiometer adjustment which is shunted across the filament battery. A 45-volt B battery is used on the plate circuits of both of the first two amplifier tubes. Both of these tubes, as well as the remaining

two, are equipped with filament rheostats. The grid condenser capacity is .00025 mfd., and the grid leak ½ megohm. Twenty-two and one-half volts are used on the plate circuit of the first tube. In series with this battery is another unit of the same type, so that 45 volts are placed in the plate circuit of the Audio frequency tube.

This circuit will permit fairly close tuning, which can be made more critical by the addition of variable condensers shunted across the primary and secondary circuits. It will give exceptionally good results for distance reception, although it is not intended for loud speakers unless another stage or two of audio frequency is added.

## Long Distance Receiving

I have experimented with various types of tuning coils and hook-ups in the endeavor to find the most efficient type of tuner to use in conjunction with one tube for tuning in long distance phone stations. The type I decided upon as being the most efficient, is the standard honeycomb coil hook-up, with one or two modifications, using spider web inductances in place of the honeycomb coils. There are, however, two important points in the operation of this type of set, and unless the amateur who is using a set of this description hits on these modifications of the standard hook-up, he will not get satisfaction in tuning long distance stations.

During the past four months, I have heard stations as distant as the following: WHAN, Wichita, Kansas (1,200 miles); WHAS, Louisville, Kentucky; WHB, Kansas City, Missouri; WOC, Davenport, Iowa; and many others not so far distant.

Only one tube (soft) has been used. WHAS has been very strong lately, sometimes putting WJZ in the "shade."

### Plate Current Control

The two points which are essential for obtaining these stations are the control of the plate current, and the phone condenser.

The condenser usually recommended for shunting across the telephones is a fixed condenser of .001 mfd. capacity. I have found this to be too small. For local work, doubling or trebling the capacity of this condenser results in a remarkable increase in the strength and tone of the signals. (Note: After adding this capacity across the phones, the tickler coil will probably need re-adjusting to obtain the full benefit of this improvement.)

For long distance work a variable condenser across the phones is essential. A .0005 or .001 mfd. condenser gives about the required capacity when used as well as the .001 mfd. fixed condenser connected in parallel. After a station has been tuned in, adjusting this condenser will cut out whistling and other noises, and bring the music in with a fine tone.

Now for the B Battery. The adjustment of the plate voltage has been found

to be of equal, or even more importance than the variable phone condenser.

The B battery must be variable. Tapped cells are probably the most convenient method. The soft tube I am using seems to prefer voltages between 7½ and 18 to the usual 22½ volts. (This is with the negative pole of the B battery connected to the positive pole of the A battery.)

The correct plate current will vary with the particular station being tuned in, the tube, and also with the weather.

When the correct voltage has been found, the filament current can generally be cut down, and in this respect a vernier rheostat will be found to be a distinct advantage.

The soft tubes seem to be very critical as to the plate current. A difference of three volts will cause a distant station to fade right out. The correct voltage must be found by experiment.

### Very Sensitive and Selective

This type of tuner, with the variable phone condenser, and plate current control, will be found to be extremely sensitive and very selective. An interfering station on the same wave length may generally be cut out by slight adjustment of the phone condenser or plate current. As stated above, long distances have been covered regularly during this summer by the writer, with a set as described.

I hope some of your readers will find this information of practical use to them. The writer has found the two points described to be invaluable in the successful operation of his set.—F. Harrison, Ottawa, Canada.

## Simple Primary Cell

The simplest form of primary cell is made of a strip of copper and a strip of zinc immersed in water acidified with sulphuric acid. If the zinc is sufficiently pure to be free from local action, no visible action will take place until the zinc and copper are connected by a wire. The strips are, however, at different potentials with respect to each other and when they are connected by a wire a current of electricity will flow in the wire.

As this action progresses the strip of zinc will pass into solution and bubbles of gas will appear on the copper strip. The electric current flows from the copper strip through the wire to the zinc strip and from the zinc strip through the liquid to the next copper strip. The current is transported through the liquid, which is called the "electrolyte," by particles of molecular size that carry electric charges. These particles are called "ions."

The external circuit is connected to the cell at its terminals or "poles." The copper terminal is usually called the positive terminal and is indicated by a + sign; similarly the zinc is the negative terminal.

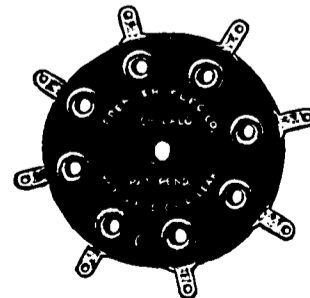
When a voltmeter is used to measure the voltage of a cell or to determine its polarity, the voltmeter terminal which is marked is always to be connected to the terminal of the cell.

To avoid confusion that sometimes arises in a designation of the positive and negative electrodes of the cell, the exact terms "cathode" and "anode" may be used. The cathode is the electrode toward which the ions with positive charges move, while the ions with negative charges move to the anode. The cathode terminal is the one which we have defined above as the positive terminal.

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21	32	29	25	32	30	27	30
22	37	33	29	36	33	31	34
23	41	37	32	40	37	34	37
24	46	40	34	44	41	38	42
25	51	44	37	49	45	42	46
26	57	48	41	54	50	46	51
27	64	54	44	60	56	50	57
28	74	59	47	67	65	55	63
29	80	64	50	74	71	60	69
30	90	70	54	82	77	65	76
31	101	75	57	90	83	71	84
32	112	82	60	99	90	77	92
33	127	88	64	108	97	83	101
34	141	95	67	119	104	89	110
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# Questions and Answers

### Location of Variocoupler

(1052) FWC  
Am a reader of RADIO DIGEST and would appreciate your answering some questions.

Is a Radio outfit consisting of 43-plate condenser, 1 variocoupler, 2 variometers and 1 23-plate phone condenser more efficient than one consisting of 43-plate condenser and tuning coil tapped to 10 or 12 points on switch? Some sets consist of the former and others consist of the latter. If the first is more efficient, why?

In a hook-up consisting of first named is it necessary that variocoupler be between the two variometers? What is the common cause of "howling"?

A.—Replying to your query, a Radio outfit consisting of 43-plate condenser, 1 variocoupler, 2 variometers and 1 23-plate phone condenser would be more efficient than the other you describe because it would permit of closer tuning to the wave length of the transmitting station.

It would not be necessary in this hook-up for the variocoupler to be placed between the two variometers of the latter are sufficiently far apart to prevent howling; which is commonly caused by resonance between two circuits or types of tubes.

### Regenerative Amplifier

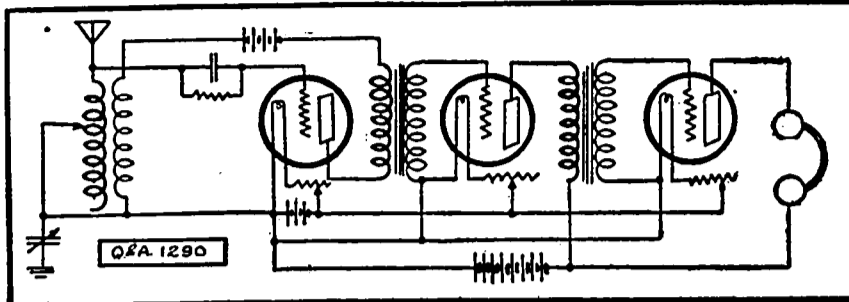
JVM, 1287  
Please furnish me the hook-up for the following:

Regenerative set consisting of variocoupler, two variometers, potentiometer, variable condenser and detector bulb in one panel. Diagram for two-steps of audio frequency amplification in one other panel so that it may be easily connected and disconnected to the first or detector panel.

A.—Designated as Q. & A. 1287 on this page is a hook-up of a regenerative circuit employing the apparatus specified, and for two-steps of audio frequency

### Audio Frequency Stages

CCS, 1290  
Will you kindly tell me how I can add two stages audio frequency to the hook-up enclosed?



A.—Numbered as Q. & A. 1290 is a hook-up of two stages of audio frequency amplification connected with regenerative detector circuit you enclosed.

### Range of Sets

(1033) GLT  
One of your recent issues contained an article on one of the last pages showing three of four panels of a two-stage amplifying receiving set and underneath same gave the dates of the different issues which contained the information for the proper building and wiring.

I would be pleased to have you advise if it would be possible for me to secure these copies and at what cost and if they contain enough information that I could construct such a set. Although I have built a small crystal set from which I am getting excellent results, I know little or nothing at all about the different paraphernalia that goes into the making of such a set about which I am inquiring. What would be the receiving distance of

crests of two successive waves radiated through electrical vibrations from the transmitting antenna. Including a crystal connection with this set would not be practical nor necessary.

plate voltages. I could hear only the local broadcasting station less than five miles distant and a simple crystal set brought this in much louder.

Am I a "bum" operator or is the hook-up a poor one?

A.—Candor demands a certain degree of indignation when we are confronted with an evidence of the "bunk" that is being set forth by uninformed Radio sections of newspapers for the equally uninformed public. The diagram in question couldn't be a better demonstration of a condition like this, if designed with purpose to deceive and mislead. Forget it!

You are not in the class of "bum" operators, but we should say rather above the average in your discernment.

We take pleasure in referring you to a correct wiring diagram on page 12 of July 1st issue of RADIO DIGEST.

RADIO DIGEST has treated upon crystal amplification as an experimental diversion if you are interested in it.

### Bunk Diagrams

(1136) HL  
I am sending you herewith a "self-starter" envelope and a newspaper hook-up. Please give me your opinion of the latter and return the clipping with your letter. I spent nearly one-half hour listening with it trying various DL coils and many adjustments of condenser, filament and

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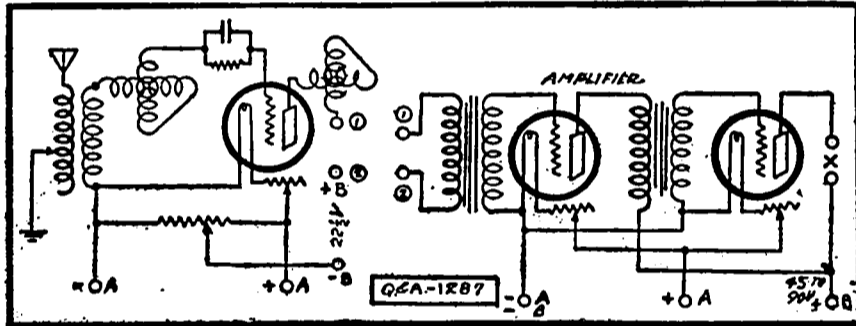
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amplification with diagram for wiring the jacks. When using only the detector, the phones go between 1 and 2. Hook 1 to 1 and 2 to 2 when using the amplifying panel. Phones go on binding posts marked X when using the two stages. The battery connections are also given.

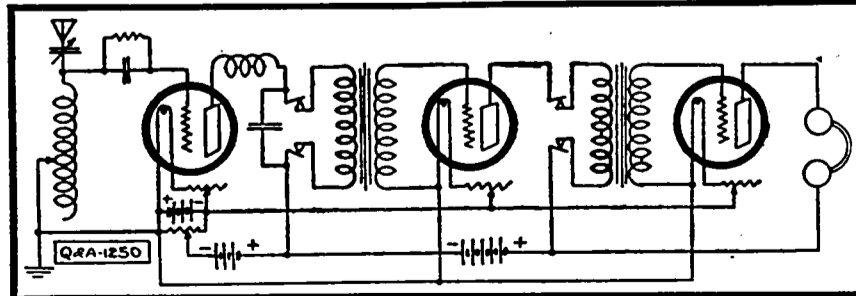
### Radio Frequency Troubles

GN-1144  
I had my outfit working fairly good with two stages of audio frequency but I hooked up one stage of Radio frequency with it and can't get anything. Will you please give me a good hook-up with two stages audio frequency and one Radio frequency, one variocoupler, two variometers, and a grid condenser and leak? I can't get any results by connecting the antenna to the switch of the variocoupler.

How can I tell which is primary and secondary on the Radio frequency transformer, also grid, plate and filaments?

A.—Frankly speaking Radio frequency has its limitations, and requires much precaution in its use. It requires skill and care in wiring. For your convenience we refer you to Figure 4, page 13 of the July 1st issue of RADIO DIGEST and advise elimination of the first step of Radio frequency.

Primary and secondary of R. F. transformer are indicated by the way in which the binding posts are marked. "P" and positive "B" are primary and "F" and "G" secondary.



### Poor Diagram

(1250) WAH  
I enclose diagram of a set, which I ask that you look over and advise me if all right, and if not, what is wrong and how to remedy it. I would also like to have any suggestions you may offer to increase the range and efficiency of such a set.

A.—Your hook-up is not an effective one. Hook up Q.&A. 1250 will be entirely satisfactory if properly executed.

enough to be one of the limited number to receive one. Copies of back issues of RADIO DIGEST may be secured at ten cents each upon application.

The receiving radius mentioned for the set which you contemplate is quite possible.

Your idea as to a wave length is somewhat confused as it has no bearing on length of instruments. Wave length is determined as the distance between the



Antenna attached to a kite string provides aerial for campers and boy scouts © K & H

Govt. super-heterodyne long distance set © K. & H.

Robert E. Scott holding rotary detector and a 50-watt transmitting tube © K. & H.

# Radio

Receiving set with glass panel, a novelty at the recent Chicago show. Little Miss Catherine Donovan listening in

# Illustrated

Boy scouts of the Radio patrol members at Alexandra Palace, England, where the Prince of Wales reviewed many thousand boys at exhibition drill © Int.

New tube uses a single dry cell to light it and in operation long distance reception may be obtained © K. & H.