

Radio Digest

EVERY WEEK

Illustrated

TEN CENTS

TRADE-MARK

Vol. III

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CHICAGO, ILL., SATURDAY, DECEMBER 9, 1922

No. 9

STOP POPULAR MUSIC

PUBLISHERS ORDER BROADCAST'S HALT

THREATEN PROSECUTION ON INFRINGEMENT

Protective Association Installs Own Station to Send Popular Music Over Country

(Special to RADIO DIGEST)

NEW YORK.—Licenses for broadcasting copyrighted songs were canceled by E. C. Mills, executive chairman of the Music Publishers' Protective Association, in official notices sent all stations following the second unsuccessful conference between representatives of the broadcasting stations, Department of Commerce, M. P. P. A. and the American Society of Composers, Authors and Publishers. Mills also warned the broadcasters that further performance would be prosecuted as infringement cases.

The second move of the M. P. P. A., after the unsatisfactory meeting between the conflicting bodies, was to purchase

R. C. A. RENTS SPACE FOR BIG NEW PLANT

WASHINGTON.—The Radio Corporation of America is reported to have rented space in a building being erected by the Riggs National Bank here. It is understood that the corporation intends to erect a powerful broadcasting station.

equipment for a powerful Radiophone broadcasting station, said to be equal to WJZ, Westinghouse station at Newark, N. J. The plant is now being installed at the headquarters of the association on West 45th street, and, as soon as a license is received, will begin broadcasting popular music.

This move is one of strategy, it is claimed, in that it will aim to offset the (Continued on page 2)

CONGRESSMEN TALK INTO SOUND PHONES

Newspapermen Lounge at Ease While Pick-up Amplifiers Collect Speeches in House

WASHINGTON.—Newspaper men of Washington are enjoying what might be termed "reporting de luxe," in view of an innovation, which has just been made in the lounging room of the House of Representatives Press Gallery.

Daily papers have been carrying stories to the effect that pick-up amplifiers have been installed in the chamber of the House of Representatives, but no mention has (Continued on page 2)



Cesare Formichi is of noble birth and here he is in a noble part, that of Amnaso, the King of Ethiopia, in Verdi's famous opera, Chicago Opera Photo



Kundry, the beautiful temptress in the opera "Parsifal," as portrayed by Cyrena Van Gordon. Heard via K Y W Moffet Photo

Rosa Raisa, Chicago Opera star, as Leonora in "Il Trovatore," broadcasted by Station K Y W from the Auditorium Theater Wednesday night, November 22. The picture was taken from Scene 2, Act II, when Leonora decides to enter a convent, believing her lover dead. Letters have come from all parts of the country praising Raisa Daguerre Photo

8-Year-Old Piano Marvel Gives 2nd Radio Concert

NEWARK, N. J.—Morton Gould is an eight-year-old musical marvel. He cannot read a note of music, but plays the piano like a finished artist. His second appearance at Station WOR, L. Bamberger and Company, was on November 23. He composes and can improvise at will. All such selections as Rachmaninoff's C sharp minor Prelude and similar pieces have been learned by him from hearing and watching the playing of a player-piano roll.

BRITONS HEAR FIRST PRESS BROADCASTS

LONDON, ENGLAND.—The Radio broadcasting of news was inaugurated in Great Britain recently by the British broadcasting organization which holds the sole license for broadcasting in this country. The service is being supplied by Reuters on behalf jointly of Reuters, the Press Association, Exchange and Central News Agency.

HEAR CLEMENCEAU MAKE ETHER DEBUT

AGED STATESMAN'S VOICE BROADCAST BY KYW

Chicago Westinghouse Plant Initiates Frenchman—Voice Amplifiers in Theater Save "Tiger's" Strength

CHICAGO.—Georges Clemenceau, war Premier of France, now touring the United States, made his debut on the ether here Tuesday, November 28. Speaking from the Auditorium theater, his voice was caught in the same pick-up microphones as are used for opera broadcasting, and sent out by Station KYW.

Besides broadcasting the 81-year-old statesman's message to the American people, engineers had installed a voice amplifier within the theater to save the speaker's voice and yet enable all present to hear.

First Experience

Both the voice amplifier and Radio-phone broadcasting were entirely new to the Frenchman. His ether bow was particularly interesting to him in that he was mystified by so many invisible persons in all parts of the country being able to hear his speech.

M. Clemenceau had not visited Chicago since before the fire of 1871. He said he remembered Chicago when it was built of "yellow Milwaukee brick," and now thinks the great metropolis "wonderful."

Many persons who listened in to his broadcast have written Station KYW thanking the officials for the opportunity of hearing Clemenceau's message.

STOP POPULAR MUSIC

(Continued from page 1)

commercial broadcasting stations, as well as advertise indirectly all the new popular songs.

Meeting of Representatives Stormy

The meeting of the representatives was stormy and brought forth warm discussion. The commercial Radio side expressed itself as opposed to paying any license fee for broadcasting the authors' and publishers' copyrighted popular output. The music publishers, on the other hand, demanded some revenue on the theory that broadcasting constitutes a public performance for profit.

Refuting this argument, the commercial Radio representatives claimed that if they paid for copyright privileges, they would have to pay then for the talent, singers, orchestras, etc., which is considered entirely impractical at this time.

Sold Sets; Must Entertain

The composers and publishers explained their attitude was based on the fact that the Radio manufacturers and industry have assumed a moral obligation to entertain. This obligation was incurred when the companies sold sets, costing on the average of \$25 each, to a million fans, or an aggregate sale of \$25,000,000 worth of apparatus. It was maintained that the selling companies were therefore obligated to supply the purchasers of these sets with entertainment.

The M. P. P. A., in sending its ultimatum to the broadcasting stations, enclosed application blanks for licensed privileges. The music men claim very little popular music will be on the air unless their proposal for the licensed privileges is accepted. Considerable response is expected from the stations, according to Mr. Mills.

Effect Not Visible Yet

Whatever the effect of the break between the conferees, station programs have shown no visible change. Whether or not a deadlock will follow remains to be seen. If a test case of copyright infringement on this basis is brought to court, a clearer definition will be possible, it is believed.

However, as the situation is now, neither side has proven the legal status of its argument. Summary action by the music men is expected in an early test case.

Complete Program of WJZ Heard Clearly in London

LONDON, ENGLAND.—Operators of the Burndep company, Radio engineers, heard an hour long Radio concert sent out by Station WJZ, the Newark, N. J., Westinghouse plant, recently. The program was clearly distinguished, including a Chopin overture. This was the first time an American Radiophone musical program has ever been picked up in Europe. The Burndep operators also heard messages of nine code amateurs, including one in Chicago.

Experiments are being made to test the practicability of using Radio as an auxiliary to railroad telegraph systems.

TWO OF THIRD WEEK'S OPERAS PUT ON ETHER

"Parsifal" and "The Snow Maiden" Heard by Fans

CHICAGO.—Two operas were broadcast by Station KYW during the week of November 27. On Wednesday night, "The Snow Maiden," and Thursday night, "Parsifal," were the two Chicago Civic Opera Association performances to go on the air.

"The Snow Maiden" was given with the same cast as when it was broadcast Tuesday evening, November 21. "Parsifal" went out on the ether for the first time this season. Its cast included Van Gordon, Lamont, Schwarz, Steschenko, Cotreuil, and Beck. Panizza conducted the opera, while Richard Hageman conducted "The Snow Maiden."

Letters received from thousands of fans indicate that with sufficiently sensitive receiving apparatus, the operas are being heard in almost every part of the United States and Canada.

Tells of Asia Minor Horrors

NEWARK, N. J.—A most timely talk was given December 1 from Station WOR, L. Bamberger & Company, by Dr. Esther Lovejoy, just back from Asia Minor. Dr. Lovejoy is president of the American Women's Hospital Association and was the only American woman in Smyrna at the time of the evacuation. She told of some of the horrors she witnessed from September 24 to September 29, during which time over 250,000 aged men and women and children had been huddled on board 70 steamships and sent from Asia Minor with hardly any clothing or shoes on their feet.

In a recent interview Dr. Lovejoy said that it was the most awful sight that has ever been witnessed in the history of the world so far as can be judged by any chronicles which have been handed down.

Buckeye Capital's Mayor Opens New Phone Station

WPAL Inauguration Shows City's Head Has "Radio Voice"

COLUMBUS, O.—Columbus' newest broadcasting station, WPAL of the Superior Radio & Telephone Equipment Company, was officially opened here on November 22 with Mayor Thomas, of Columbus, delivering a 15-minute address as the first official message sent from the station. The address included a resume of local broadcasting of the past and future.

"Without his having had previous experience as a Radio speaker, Mayor Thomas impressed me as being possessed of a natural 'radio voice,'" declared one of the officials of the company following the opening. The mayor has never been accused of being a musician, but his latest attribution classes him as a man of diversified talents. While at Los Angeles last summer on the Shriners' convention trip, his honor was persuaded to take the role of mayor in one of Chester Conklin's comedies. The little actor declared that Mayor Thomas was in his element in the films. This the mayor denied, stating that his regular was acting as mayor.

KDYL to Put on "La Boheme"

SALT LAKE CITY, UT.—Active rehearsals of "La Boheme," to be sung some time next month in Italian over Station KDYL, Salt Lake Telegram, have begun. This opera was given early last September and was so popular that it has been decided to give it again and also other operas to be announced later. A unique feature of the opera is the introduction of an elocutionist who tells the story in English before each act. The operas are being produced under the direction of Cedric E. Hart, considered one of the youngest leading tenors in the grand opera.

Japan is working out a plan to link her various islands by Radio.

DENIES EXISTENCE OF PLANT FRICTION

PROVES NO INTERFERENCE BETWEEN CLASSES

Uncle Sam Discredits Complaints—Claims Properly Tuned Selective Sets Will Avoid Trouble

SAN FRANCISCO, CALIF.—For some time the department of commerce Radio section has insisted that there was no actual interference between broadcasting stations using a 360-meter and a 400-meter wave, if good sets were used and properly tuned, and this contention has been proven recently.

There were numerous complaints in California that serious interference was experienced by listeners-in while two neighboring stations were transmitting simultaneously, one on 360 meters and one on 400 meters. The Radio inspector arranged a test with a single coil tuner and also two inductive tuners located at a point midway between the two transmitting stations.

Two-Circuit Tuner Selective

These two stations, which were about a mile apart, were then requested to transmit at exactly the same time. It was found that with the single coil tuner it was impracticable to separate the two waves. However, by using a two-circuit tuner, a change of six degrees either way would tune out either one of the stations. This corresponded to a change of about six meters on either side of the transmitting wave.

As the receiving station was located on almost a direct line between the two stations mentioned, it seemed to demonstrate beyond any possible doubt that with a selective tuner it would be entirely feasible to receive from either station at will, without interference from the other.

CONGRESSMEN TALK

(Continued from page 1)

been made of the fact that a loud speaker has been installed in the lounging room of the House press gallery.

On November 21, when President Harding read his opening message to the extra session of Congress, newspaper men who had to report the speech were lounging about in the rest room, smoking and talking and yet able to hear clearly the President as he spoke. The amplifier will remain in the House press gallery if the Congressmen decide to leave the pick-up amplifier in the main chamber. It is now in there merely as an experiment.

If the amplifier is left in the chamber of the House there is a possibility that at least one important speech a day will be broadcast from Washington. Arrangements can very easily be made to connect the loud speaker in the House chamber with the powerful Radio apparatus of the navy department, from which point it can be broadcast. This matter is understood to have been given careful consideration, but no definite decision has been reached.

Chi Electric Club Goes in for Radio; Hears Notables

CHICAGO.—With the initiation of a Radio committee as an integral part of the Chicago Electric Club, meetings devoted to scientific and popular Radio subjects are being held every two weeks. At a recent meeting, E. A. Beane, federal Radio inspector for the ninth district, gave a talk, the subject of which was, "How to Tune a Regenerative Receiver to Zero Beat." Major J. O. Mauborgne, chief signal officer for the Sixth U. S. Army Corps Area, discussed the matter of interference when using the zero beat method of tuning. At a more recent meeting Major Mauborgne illustrated the circuit in use in the latest U. S. Army receiving set, type SCR-105. He also demonstrated the operation of the set using a standard army loop aerial. One of the present plans of the Electric Club is to form a local chapter of the Institute of Radio Engineers.

Tells of Remote Control

COLUMBUS, O.—Captain H. W. Webb, Signal Corps, U. S. A., gave a wonderful demonstration lecture this week at Robinson Laboratory, Ohio State University, on "Remote Control by Radio." Radio broadcasting was demonstrated in the laboratory, utilizing Station WEAO. The meeting was held under the auspices of the Columbus section of the American Institute of Electrical Engineers.

The Rev. E. W. Rice of Philadelphia was a frontier circuit-riding preacher sixty-six years ago. Recently he broadcast a talk over Station WGY, Schenectady, N. Y., which was headed by residents of Minnesota and Wisconsin who also heard Dr. Rice preach on his missionary travels in 1856.

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Looking Ahead

Lambdin Kay—Ever Heard the WSB Announcer—Will appear next issue together with his autobiography. And that is as comical and welcome as he is when he breaks in with his "Bong, Bong, Bong—This is 'The Voice of the South'." Watch for this exclusive Radio Digest feature.

A Flewelling Set in Photo Diagram. Next issue page 7 will show, by the clear, photographic-diagram method, just how the very successful Flewelling Super-Regenerative Circuit is laid out. Page 6 will tell how to operate the set described on page 7. And best of all, Harry J. Marx, on page 13, will give constructional details and information regarding the making of a Flewelling "Super." If you haven't tried this wizard hook-up yet, buy next issue before your newsstand dealer says, "Sold out."

"Listening In," by Vera Brady Shipman—An interview with Mrs. Marx Obendorfer (Anne Faulkner)—Next issue tells how Radio is bringing a war-crazed America back to its senses.

Potentiometer "Uniset" Panel Unit construction will be described in the December 16 issue by Thomas W. Benson. He tells how to make a Radio frequency amplifier unit this week. See page 11.

Broadcasting Stations You Hear Would Be Hard to Find, if it weren't for the Digest's complete and up-to-date directory. Part I, together with the index, will be in the next issue.

Radio Station KHJ of Los Angeles, California, Has Been Reaching 'Cross the Continent. The first pictures of the new plant of the Los Angeles Times, the first 500-watt transmitter on the Pacific Coast, will appear in the December 16 issue of Radio Digest.

Newsstands Don't Always Have One Left WHEN YOU WANT

Radio Digest

YOU WANT IT!

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Please find enclosed check M. O. for Five Dollars (Six, Foreign) for One Year's Subscription to Radio Digest, Illustrated.

Name

Address

City State

RADIO PHOTO RIGHT TO GOTHAM WORLD

SEND PICTURES THROUGH AIR BY PROCESS

New York Newspaper Buys American and Canadian Privileges—Trans-Oceanic Transmission Aim

NEW YORK.—The New York World has acquired the sole rights for the United States and Canada to the Belin process of transmitting photographs by wire and radio. The contract with the Etablissement Edouard Belin was signed on Armistice Day in Paris. M. Belin, inventor of the process, is a famous French engineer.

In 1920 M. Belin came to America and conducted experiments in transmitting photographs on a telegraph wire between New York and St. Louis. The New York World at that time published the photograph of an American Indian which had been sent in less than ten minutes from St. Louis.

Not Considered Practical First

Because of a breakage in the apparatus at the St. Louis end, the photographs sent from there were received in poor condition. The experiments, while a great scientific success, were not then considered to have established the practicability of the process.

M. Belin again came to America last year and, at the Otter Cliffs Radio Station, Bar Harbor, Me., received the autographs of C. V. Van Anda, managing editor of the New York Times, and of Gen. Pershing.

Improves Apparatus

Since then M. Belin has greatly improved his machinery and has made it feasible to transmit photographs over an ordinary long-distance telephone wire with, it is asserted, as much ease as a conversation is carried on over such a wire.

M. Belin has demonstrated that conversation can be held over the wire at the same time. When radio telephony develops further, he believes, he will be able to send pictures across the ocean by radio. The first definite experiments in this direction will be made between the World in New York and the Matin in Paris, which has the French rights to the process.

Sound Collectors in Orchestra Pit

WHAS Experiments in Broadcasting Musical Programs of Motion Picture House

LOUISVILLE, KY.—WHAS, the Radio-telephone station of the Louisville-Courier Journal and Times, has been experimenting in broadcasting the musical numbers of an orchestra at a local theater while the orchestra is at its regular place in the theater carrying out its usual musical program.

The Almo Theater, of this city, one of the leading motion picture houses, has a splendid orchestra directed by Walter J. Rudolph, and is the theater with which the experiments have been conducted successfully. Plans have been completed to broadcast fifteen minutes or more of the afternoon program, and later the theater concert will be placed on the evening program. The plans also include broadcasting some organ selections from the large pipe organ which is a part of the equipment of the theater.

Carrying out the idea involved the installation of complicated telephone apparatus with a wire, carefully shielded and insulated, running from the radio studio direct to the theater.

In the East the libraries have found it necessary to buy heavily of books covering radio subjects, in order to meet the demand of readers.

MASSACHUSETTS TECH OFFERS RADIO COURSE

BOSTON, MASS.—Dr. S. W. Stratton, for twenty-one years the director of the bureau of standards at Washington, has been elected president of the Massachusetts Institute of Technology, in Boston. This institution will give a four-year course in radio engineering, and is the first college to inaugurate such a course in that branch of engineering.

POET-NOVELIST GIVES PROGRAM IN NEWARK

NEWARK, N. J.—Clement Wood, poet and novelist, broadcasted from Station WOR on Friday evening, November 24. He is the winner of numerous literary prizes and is the author of the poems, "Glad of Earth," "The Earth Turns South," etc. Has done much for the negro through his novel, "Nigger," according to John Hall Wheelock.

BUTTERFLY FLUTTERS FOR RADIO



The voice of Edith Mason, of the Chicago Civic Opera, has pleased Radiophans in several of the operas broadcasted by Station KYW. She is pictured here in the role of Madame Butterfly in the opera of that name. Hutchinson Photo

Ohio Prison Entertainers Present Novelty Program

COLUMBUS, O.—Orchestra, quartet and solo numbers by the Ohio Penitentiary Entertainers formed a unique program recently broadcasted by Station WBAV of the Erner & Hopkins company. The group consisted of E. Rogers, first tenor; C. Canary, second tenor; William Douglas, baritone; E. Jones, bass; S. Grant, pianist; Jack Rose, "the lone entertainer;" Peter-vitch Bowlinski, violinist; B. Clifford, saxophone; William Douglas, trombone; E. Trautman, banjo, and E. Gayman, drums. The closing number on the program was a vocal selection by the penitentiary quartet.

Police Blotter Carries First Ether Report of Auto Theft

SPRINGFIELD, O.—By means of the Radio receiving set of John Miller, of the Springfield waterworks department, Police Inspector Bargdill, of this city, was notified of the theft of a Ford auto in Knoxville, Tenn., a few nights ago. The message was broadcasted from Davenport, Iowa, and was to the effect that a telegram had just been received from police in Knoxville, offering a reward of \$50 for the recovery of the car bearing a Tennessee license No. 64246 and motor number 6444727. The report is the first taken from the air to be placed on the Springfield police blotter.

U. S. GIVES PLANS FOR SIMPLE SETS

BUREAU OF STANDARDS OFFERS PAMPHLETS

Construction and Operation of Easy Outfits Fully Explained in Booklet Series

WASHINGTON.—The Bureau of Standards has on hand a series of pamphlets which give descriptions of parts of very simple Radio receiving sets. They are Circular No. 120, "Construction and Operation of a Simple Homemade Radio Receiving Outfit," and Circular No. 121, "Construction and Operation of a Two-Circuit Detector." The later pamphlets of the series, describing a simple loading coil, auxiliary condensers, and vacuum tube detector and amplifier units have now been prepared. They are included in Letter Circulars Nos. 46, 47, 48, and 49 of the Bureau of Standards and are not now available to the public.

The description of auxiliary condensers includes two fixed condensers, one of which is connected in series with the antenna to adjust to short wave lengths and the other of which is connected across the telephone receivers.

Load Coil for Greater Lengths

The purpose of the loading coil described in one pamphlet is to extend the range of the receiving equipment so as to respond to wave lengths between 600 and 3,000 meters.

The vacuum tube detector unit described may be used instead of the crystal detector with either the single-circuit or two-circuit Radio receiving sets. It makes the receiving set operate for signals from transmitting stations at greater distances. The audio frequency amplifier unit described in another of the pamphlets employs a single tube. The amplifier unit is used by connecting it to the receiving set in place of the telephone receivers and then connecting the telephone receivers to the output of the amplifier. The distance over which the receiving set receives is increased by the use of one or more of these amplifier units.

Wants Polar Radio in Cyclone Study

Norwegian Scientist Would Establish Observation Posts to Probe Weather Conflicts

NEW YORK.—Prof. Bjerknes of Norway, who has done much to advance our knowledge of cyclones forming in the temperate zones, holds that weather conditions there depend chiefly upon the conflict between two streams of air—a cold current flowing southward from the north polar regions and a warm current drifting northward from equatorial sources already well known. These air streams, he believes, meet along a wavering front in the temperate zone, and in their intermingling give birth to those mysterious swirls in the atmosphere which are called cyclones.

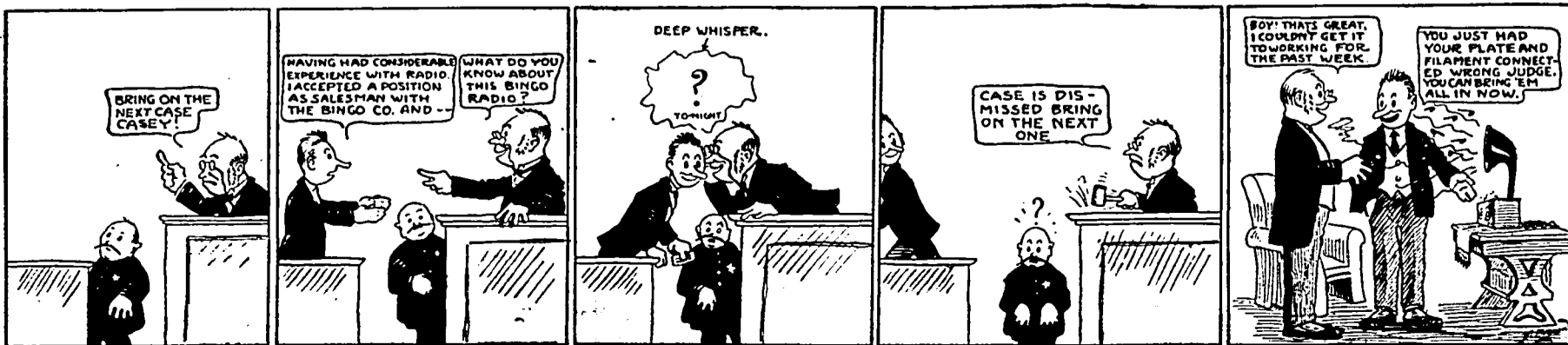
To study these possibilities, he desires to establish a chain of Radio equipped observation stations round the pole, from the records of which the tracks followed by the polar current southward and the centers of conflict with the warm currents may be definitely determined. Such a series of circum-polar meteorological posts will have more than theoretical importance when regular forecasts for the north Atlantic are required in connection with daily air flights between Europe and America, he says.

Seattle, San Francisco and Salt Lake carry on three-cornered Radio talks. This is an indication of the possibilities of the future, when all of the cities of the country may join in a Radio discussion of civic problems.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Part II—Political Radio



RECEIVING RECORD CONTEST

THE receiving records almost swamped the contest editor last month. He had to work nights to catch up with the incoming mail. But he did succeed in cleaning up the contest and verifying every record printed below. There should be no complaints of inaccuracy in distances if the same type of map is used for measuring. Every record given has been checked within a limit of fifty miles for accuracy.

Rules to Remember

The rules to follow in the contest are but few and easily followed. They are:
1. Amateurs who are able to beat the records given, or who can claim with good evidence distance receiving records of 1,000 statute miles or more for Radiophone broadcasting stations NOT listed below, BUT to be found in the "Broadcasting Station Directory," page 8, of any two consecutive issues, may send in such records.

2. Distances must be measured AIR-LINE and expressed in statute miles. Disregard of this rule may cause amateurs to be declared ineligible.

3. Call signals of station heard, its location and the mileage, as defined in Rule 2, must be given in reporting record. Otherwise record will not be considered.

4. Distances are verified by the contest department of this publication, using a Geo. F. Cram Co. standard Radio map of the United States. Owing to much variance in maps, the distances are only given to the nearest 25 miles and are claimed accurate only within 50 miles. This leeway is believed necessary.

Station—Miles Away—Holder and Location

- CFAC—1225, J. Claude Chilton, Los Angeles, Calif.
- CFCB—1800, G. G. Ehrler, Chicago.
- CFCN—1225, R. P. Wallace, Cedar Rapids, Ia.
- CHCQ—1225, M. L. Johnson, Atchison, Kans.
- CJCA—1300, A. G. Lewis, Topeka, Kans.
- CJCG—1250, W. D. Newcomb, Socorro, N. M.
- CKAC—1175, J. Shamburg, Tekamah, Nebr.
- CHBC—2075, J. Kurtz, Brooklyn, N. Y.
- CKCK—1050, B. F. Butler, Bartlesville, Okla.
- CKCZ—1000, A. H. Jessup, Erie, Pa.
- DD5—1225, C. D. Mason, Cleveland, O.
- DN4—2100, W. E. Davison, Berwick, N. S., Can.
- KDKA—2150, Geo. Walker, Fresno, Cal.
- KDN—2175, F. C. Woodford, E. J. Poyser, Canton, O.
- KDPT—1800, C. Hackney, Fairmount, Ind.
- KDYL—1350, C. Hackney, Fairmount, Ind.
- KDYQ—2550, C. M. Rice, Jr., Worcester, Mass.
- KDYS—1025, R. P. Wallace, Cedar Rapids, Ia.
- KDYX—3900, American Radio Equip. Co., Minneapolis, Minn.
- KDYY—1100, P. Weisgerber, Jackson, Mich.
- KDZQ—1325, H. S. Rahiser, Pittsburgh, Pa.
- KFAD—1075, L. S. Icke, Holden, Mo.
- KFAF—1550, J. Johnson, Jr., Bartow, Fla.
- KFAM—1775, J. W. Hawes, Boston, Mass.
- KFAP—1575, C. D. Mason, Cleveland, O.
- KFAS—1900, F. Brumon, Urbana, O.
- KFBK—1525, C. E. Cornwell, Osage, Ia.
- KFBM—2450, T. W. Ziegler, Charleston, S. C.
- KFC—1525, R. P. Wallace, Cedar Rapids, Ia.
- KFDB—1200, G. D. Robarts, Edmonton, Alta., Can.

- KFI—1400, Glenwood Radio Corp., Shreveport, La.
- KFZ—1750, E. Stonton, Vicksburg, Miss.
- KGF—1350, S. M. Woodson, Jr., Liberty, Mo.
- KGG—1450, A. G. Lewis, Portland, Ore.
- KGN—1550, R. P. Wallace, Cedar Rapids, Ia.
- KGY—1225, A. Taylor, Winnipeg, Man., Can.
- KGW—2150, J. O'Dell, Johnson City, Tenn.
- KHJ—2900, W. E. Davison, Berwick, N. S., Can.
- KHQ—2500, C. M. Rice, Jr., Worcester, Mass.
- KLP—2180, W. G. Mann, London, Ont., Can.
- KLZ—2100, W. E. Davison, Berwick, N. S., Can.
- KMO—1200, A. Taylor, Winnipeg, Man., Can.
- KNI—1575, K. K. Kevill, Malden, Mo.
- KNJ—1350, N. M. Holmes, Chippewa Lake, Ohio.
- KNT—1950, C. Hackney, Fairmount, Ind.
- KOB—1975, C. M. Rice, Jr., Worcester, Mass.
- KOG—2125, A. H. Jessup, Erie, Pa.
- KQW—1900, C. Conrad, Logansport, Ind.
- KSD—1450, W. E. Davison, Berwick, N. S., Can.
- KUO—2675, C. M. Rice, Jr., Worcester, Mass.
- KUY—2100, Roland Smith, Hilo, Hawaii, Alta., Can.
- KVQ—1125, G. D. Robarts, Edmonton, Alta., Can.
- KWG—2200, H. S. Rahiser, Pittsburgh, Pa.
- KWH—1925, F. Brumon, Urbana, O.
- KYG—2175, J. F. Means, Oil City, Pa.
- KYJ—1400, J. F. Harrison, Jr., Memphis, Tenn.
- KYW—1850, J. J. Beales, Jr., San Anselmo, Cal.
- KYY—1450, M. L. Johnson, Atchison, Kans.
- KZM—1325, F. E. Cox, Hutchinson, Kan.
- KZN—1650, E. K. Kitts, Bluefield, W. Va.
- KZY—1950, A. Galloway, Jr., Grand Rapids, Mich.
- NOF—1025, W. Loomis, Jr., Blencoe, Ia.
- PWX—1825, H. Lardner, Halifax, N. S., Can.
- WAAB—1050, H. Olson, St. Paul, Minn.
- WAAC—1425, T. Taylor, Winnipeg, Man., Can.
- WAAJ—1600, R. & P. McDAVID, Houston, Tex.
- WAAM—1450, C. Sawyer, Liberal, Kans.
- WAAN—1400, H. Baird, River de Chute, N. B., Can.
- WAAP—1175, E. T. Denton, West Chester, Pa.
- WAAQ—1325, W. Douglass, Guthrie, Okla.
- WAAZ—1700, W. E. Davison, Berwick, N. S., Can.
- WBAD—1125, N. Theobald, Attleboro, Mass.
- WBAF—1250, M. Neuman, Guthrie, Okla.
- WBAP—2550, C. Blanch, Amherst, N. S., Can.
- WBAY—1425, O. Gose, Holliday, Tex.
- WBL—1450, C. H. Vale, Providence, R. I.
- WBL—1825, W. E. Davison, Berwick, N. S., Can.
- WBT—1100, W. E. Davison, Berwick, N. S., Can.
- WBZ—1400, C. Pearce, Hallis, Kan.
- WCAG—1325, K. McNeil, Ottawa, Ont., Can.
- WCAH—1000, A. Taylor, Winnipeg, Can.
- WCAK—1025, F. J. McKenny, New Prague, Minn.
- WCAL—1150, G. D. Robarts, Edmonton, Alta., Can.
- WCAR—1025, J. Dinkel, Charles City, Ia.
- WCAS—1125, G. D. Roberts, Edmonton, Alta., Can.
- WCM—1650, C. M. Rice, Jr., Worcester, Mass.

- WCN—1075—C. N. Schwab, Grinnell, Ia.
- WDAE—1225, J. Shamburg, Tekamah, Nebr.
- WDAF—1675, W. E. Davison, Berwick, N. S., Can.
- WDAH—1300, C. Hackney, Fairmount, Ind.
- WDAK—1200, R. Hastings, Atchison, Kan.
- WDAL—1125, M. M. Cardwell, Republic, Kan.
- WDAN—1375, W. H. Spencer, Montreal, Que., Can.
- WDAP—1800, A. G. Hilton, Bicknell, Calif.
- WDAU—1250, A. L. Lewis, Stanberry, Mo.
- WDT—1125, R. Hastings, Atchison, Kan.
- WEAH—1375, E. A. Howard, Watch Hill, R. I.
- WEAO—2100, Dobson & Tucker, Oakland, Cal.
- WEAP—1250, M. J. Columbe, Pittsburgh, N. Y.
- WEAT—1175, R. Luther, Jefferson, Ia.
- WEAV—1200, H. S. Rahiser, Pittsburgh, Pa.
- WEAY—1550, E. A. Howard, Watch Hill, R. I.
- WFAA—1925, W. E. Davison, Berwick, N. S., Can.
- WFI—1250, W. Douglass, Guthrie, Okla.
- WGAN—1625, H. Lardner, Halifax, N. S., Can.
- WGAS—1250, W. E. Davison, Berwick, N. S., Can.
- WGI—1750, E. L. Dye, Plainview, Tex.
- WGL—2375, R. R. Martindale, Phila., Pa.
- WGM—1325, W. E. Davison, Berwick, N. S., Can.
- WGY—2575, J. J. Beales, Jr., San Anselmo, Cal.
- WHA—1250, W. E. Davison, Berwick, N. S., Can.
- WHAE—1050, H. Rawls, Phoenix, Ariz.
- WHAN—1250, K. McNeil, Ottawa, Ont., Can.
- WHAS—1275, W. E. Davison, Berwick, N. S., Can.
- WHAZ—1000, R. P. Wallace, Cedar Rapids, Ia.
- WHB—1675, W. E. Davison, Berwick, N. S., Can.

- WHK—1550, L. W. Gushwa, Firth, Ida.
- WIAC—1200, H. Meetze, Manassas, Va.
- WJAD—1100, F. A. Rose, Two Harbors, Minn.
- WJAJ—1000, D. J. Morris, Weir, Tex.
- WJX—1400, H. Simons, Ft. Worth, Tex.
- WJZ—2575, J. J. Beales, Jr., San Anselmo, Cal.
- WKAN—1100, C. M. North, Malden, Mass.
- WKAQ—2150, Dr. F. R. Zeit, Cedarville, Mich.
- WKC—1200, J. E. Latt, Fairfield, Tex.
- WKY—1125, H. Meetze, Manassas, Va.
- WLAC—1175, D. J. Morris, Weir, Tex.
- WLAD—1100, C. H. Hewitt, Southern Pines, N. C.
- WLAG—1075, G. D. Robarts, Edmonton, Alta., Can.
- WLAJ—1300, A. Taylor, Winnipeg, Can.
- WLAH—1500, D. J. Morris, Weir, Tex.
- WLB—1100, C. H. Vale, Providence, R. I.
- WLK—1150, W. E. Davison, Berwick, N. S., Can.
- WLW—1100, W. E. Davison, Berwick, N. S., Can.
- WMAB—1025, C. H. Hewitt, Southern Pines, N. C.
- WMC—1000, A. Taylor, Winnipeg, Man., Can.
- WNAD—1025, C. H. Hewitt, Southern Pines, N. C.
- WOAI—1500, T. K. Rodger, Sudbury, Ont., Can.
- WOC—1675, H. S. Trost, San Jose, Calif.
- WOH—1150, W. E. Davison, Berwick, N. S., Can.

(Continued on page 9)

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Doctor Hsi

RADIO BRINGS CHURCH TO FIRESIDE SOLVES PROBLEM OF 'TO GO OR NOT TO GO'

4-Tube Transmitter, Gift to Congregation, Carries Sermons 200 Miles

By Agnes Bryant Dickinson

"Be it ever so humble, there's no place like home."

—So chant the back-sliding churchgoers on the crisp Sundays of autumn when crackling logs in the fire-place deaden the call of church bells, and the voluminous Sunday paper offers several hours' entertainment. But W. E. Heskett, owner of one of the largest furniture stores in Columbus, Ohio, thought that the sermons of Rev. Dr. Daniel F. Rittenhouse, pastor of the First Baptist Church of that city, ought to reach even those who remained by the fire-place, so he has had installed in the church a Westinghouse four-tube Radiophone transmitting set, call signal, WMAN. Mr. Heskett also retains the services of Operator Verdon Lucas, assistant in the college of electrical engineering at Ohio State University, at both the morning and evening services on Sunday, which are held at 10:30 and 7:30 respectively. (Central standard time.)

Not Church Member—Gives Set

Although he is not a member of a church, Mr. Heskett says:

"On account of the high esteem I hold for Dr. Rittenhouse and his brilliant and broad-minded sermons, and the quality of his voice, which seems so well fitted for broadcasting, I feel that these splendid sermons should reach farther than the four walls of his church. I believe that the people within a 200-mile radius will highly appreciate the broadcasting of these sermons."

"Another reason why I am presenting this station to the First Baptist Church, although not a member of any church, but a strong believer in all churches, is that my father was a member of the Baptist denomination."

Pastor Well Read

The pastor of this fortunate church, Dr. Rittenhouse, spends a large portion of his time in his study with the best literature the world has to offer, as a consequence of which he is able to preach with gripping eloquence, and to throw a much-needed light on the problems of religious, political, economic, and home life. His morning talks are inspirational, while the evening service is of a more popular nature.

In addition to being a man of much thought, developed by twelve years' study in the University of California, Denison University, Oxford, England, Edinburgh, Scotland, and Heidelberg, Germany, Dr. Rittenhouse is a man of great activity. His clever toasts and stirring addresses have made him so much in demand that in some months he has averaged more than one speech every day. And these speeches are not all delivered in Columbus. They may be anywhere between Maine and California.

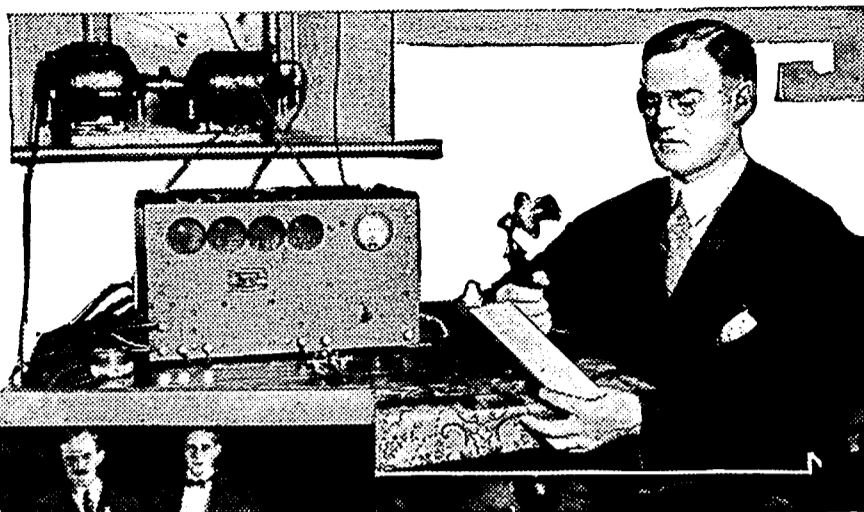
Six Hundred Members Contribute Freely

The church has an annual budget of \$14,000 for current expenses and \$7,500 for benevolences, in addition to which the members have contributed over \$5,000 during the past year for the relief of the poor, the Anti-Saloon League, the Near-East Relief, and other kindred charities. This makes a total expense of \$26,500 which was borne by the 600 members and a few generous friends of the church who are not members.

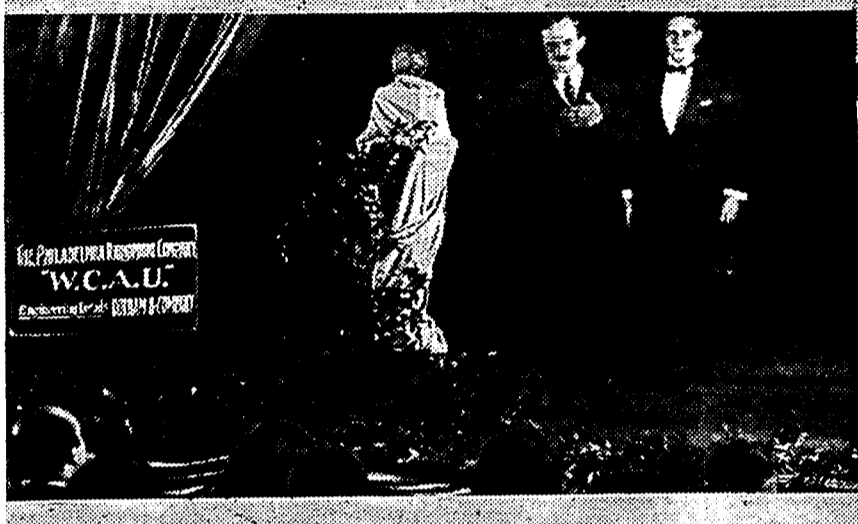
Dr. Rittenhouse is assisted by Miss Nola Musselman, pastor's assistant, and Mr. Frank Shaffer, director of religious education. The church supports two foreign missionaries, and expects to have two more young people go into training soon for foreign service. Since Dr. Rittenhouse came to Columbus in 1919, the church has established two mission churches in the city and put them on a self-sustaining basis. It is little wonder, then, that this minister is one of the first in the country to have his sermons broadcasted regularly, and that he speaks each Sunday evening to the largest audiences in the city of Columbus.

Fans Hear Tuneful Saw

COLUMBUS, O.—The oboe, one of the odd instruments of an orchestra, and the tuneful saw, played so that it is a musical instrument, were heard recently in the concert of Station WBAV of the Erner & Hopkins Co. T. H. Barrett, who uses the identification of "musical evangelist," played both instruments.



Rev. Dr. Daniel F. Rittenhouse, pastor of the First Baptist Church at Columbus, O., speaking into broadcaster WMAN. Rev. Dr. Rittenhouse's church is one of the first in the country to own its own broadcasting plant



J. Hampton Moore, Philadelphia's Mayor, is shown here just after finishing a speech on the studio-stage at the Radio show held in his city. Barclay H. Warburton, of the concern which installed the outfit, is beside Mayor Moore. The microphone is shown on its pedestal

STUDIO ON STAGE PROVES A SUCCESS

Steinmetz Praises Broadcasts Made as Audience Hears and Looks on

(Special to RADIO DIGEST)

PHILADELPHIA, PA.—Monday following the close of the first Radio show ever held here, word was received at the office of Durham and Company of this city from Dr. Charles P. Steinmetz in Schenectady, N. Y., that a speech on the Prevention of Tuberculosis which was broadcasted from the Radio show was heard. Dr. Steinmetz commented very favorably on the speech.

The covering of this distance is not in itself out of the ordinary, but the circumstances by which this transmission was effected are in themselves worthy of comment.

Stage Set Like Studio

On the second floor of the LuLu Temple, where the show was held, the stage was decorated to resemble as closely as possible an up-to-date broadcasting station. It was hung in black velvet to deaden the sound. It was artistically furnished with wicker chairs and tables. In fact, nothing was forgotten, not even the red, white and green signal lights which indicated whether or not broadcasting was in progress. Special telephone lines, through the courtesy of the Bell Telephone Company, were laid between this station at Nineteenth and Market streets and the LuLu Temple, Broad and Spring Garden streets, a distance of a little more than a mile.

A special type of microphone was connected to these leads, which in turn were directly connected at the other end to the broadcasting station, WCAU. In this manner the voice of the speaker addressing the audience at the show was carried by telephone lines to the broadcasting station and placed on the air for the benefit of the Radiophans.

Mayor Broadcasts

J. Hampton Moore, mayor of Philadelphia, was pleased with the arrangement. The photograph shows the stage with the microphone on its pedestal and the mayor just after having completed his speech. Barclay H. Warburton, associated with the engineering firm which made the installation, is beside the mayor.

Tells Methods of Tuning to Avoid Interference Between Two Plants

Westinghouse Expert Shows How to Pick Up Either 360 or 400-Meter Waves, Operating in Close Proximity, Without Hearing Both

By C. W. Horn

In order to assist Radio broadcasting the Department of Commerce has specified two wave lengths on which broadcasting may be conducted. These wave lengths are 360 meters, the one in general use up to this time, and 400 meters, just recently allotted. While these wave lengths are 40 meters apart, undoubtedly there will be considerable confusion on the part of those owning Radio receivers who are located very near a broadcasting station.

For the purpose of assisting those who are located so that a 360-meter and a 400-meter station are picked up by their receivers simultaneously, a number of methods will be described, which, if applied, should greatly assist those desiring to get either one of the two waves without interference. There is one case, however, which will be very difficult to assist; that is, where the receiver is exceptionally near to a broadcasting station, say within a few thousand yards.

Better Tuning Apparatus Needed

The assignment of two wave lengths so close together will have the effect of stimulating construction of Radio apparatus which will be capable of tuning more sharply, and it is the case of "necessity being the mother of invention." Therefore, while there may be some inconvenience at the present time, this could be overlooked in order to help the Radio game by creating a condition which will stimulate the construction of better apparatus, and which will permit the assignment of more wave lengths, ultimately creating a better situation in the ether.

One of the greatest faults that has been found in connection with the installation of Radio receiving apparatus is that it is believed that the more wire and the larger the antenna, the more will be received. An exceptionally large antenna makes it more difficult to tune sharply, and for this reason it is advocated that a very short, single wire antenna, approximately 75 feet long, measuring from the apparatus to the far end, be used. This single wire antenna should be stretched away from all metallic objects and run straight and clear of all obstructions.

Another fault in the installation of receiving apparatus can be eliminated by not running the antenna or lead-in over metal roofs, along water spouts or drains, or parallel to telephone and power wires.

Frank Conrad, assistant chief engineer of the Westinghouse Company, has made

measurements and drawn resonance curves which show that a short, low antenna tunes more sharply than a large and long antenna. This holds true both for coupled and single circuit tuners.

Another method to pursue in overcoming interference, especially where vacuum tube receivers are used and where the receiver is located close to a broadcasting station, is to make use of the well-known directional properties of the loop antenna. A very simple loop can be constructed by winding a half dozen turns of wire spaced about one inch apart, on a framework, which can be rotated. It will then be easy to tune out a station which has a difference of 40 meters in wave length, especially so as a loop antenna forms a closed circuit which can be more sharply tuned than an open antenna. The two ends of the loop should be connected across the antenna, the ground terminals of the receiver, and no other ground or antenna used.

How to Erect Antenna

Those who are located a greater distance from a broadcasting station can, without

(Continued on page 9)

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WSY HAS PRIDE IN BRAND NEW STUDIO

PALATIAL ROOM IS VERY LATEST IN DESIGN

Felt Padded Walls and Floor Kill Reverberation—Push Button Changes Air Each Minute

BIRMINGHAM, ALA.—WSY, the broadcasting station of the Alabama Power Company, is now located in a new studio in the Radio section of Loveman, Joseph & Loeb's department store. The studio, designed by the foremost acoustic engineer in the country, was built to destroy all reverberation, and in that respect it is said to be the finest in the country.

The walls and floors of the studio are thickly padded with a special kind of felt to a depth of about four inches. Several inches from the felt is stretched a perforated membrane which works in such a manner with the felt that sound waves striking the two with the air chamber in the middle are assimilated and destroyed.

Studio Work of Art

In addition to its unsurpassed acoustical properties, WSY's new studio represents the very latest word in studio beauty. The impression that an artist gains on entering the room is that he or she is in a palatial home. The delicate tints of the walls, harmonizing tones of the electrical fixtures, and the mahogany furniture are pleasing to the eye. With growing ferns on mahogany pedestals and a handsome floor lamp matching the larger pieces of furniture, the room has all the appearance of a music room in a well kept home rather than a mere concert rendezvous.

Renew Air Every Minute

Perhaps the most novel arrangement in connection with the studio is a push button which causes the room to be completely emptied and refilled with air every minute. The construction of the room permits the broadcasting of orchestral and quartet music without the usual distortion, the voices of the artists and the tones of the instruments coming out clearly and distinctly and blending perfectly with one another.

The equipment includes a baby grand piano, and in addition a phonograph designed especially for WSY.

WSY is the pioneer Alabama station and one of the first in the South.

Airphones Brighten Road Workers' Camps

Furnish Evening Amusement for Highway Construction Gang

LOUISVILLE, KY.—An interesting feature of Radio interest and development comes from those in charge of highway construction. There is a great era of road building all through the country and in much of this work it involves the setting up of small local stone crushing plants, and the maintaining of a sort of temporary housing camps for quite a crew of men. These find evening entertainments and amusements very scarce so that the hours hang heavily. Realizing this, and also that there is music and other entertainment in the air, contractors in charge of road work are taking an interest in the subject of camp Radio receiving sets to furnish wholesome entertainment for the men during the evening. Specific mention was made recently of the George M. Eady Company, which has a road contract in Barren County, Ky. After they had brought all equipment on the job they finally determined that something was missing, so made arrangements for a Radio receiving set. The idea is proving very popular.

French Waves Find Ships

PARIS, FRANCE.—By combining Radio direction finding with submarine sound detectors French engineers have been able to determine accurately the positions of ships at sea. Errors due to atmospheric fogs, storms and other natural causes were averted.

FANS HEAR TALK OF YOUNGEST REPORTER

COLUMBUS, O.—Horace Wade, nationally known 14-year-old newspaper reporter and author, a guest in this city of the High Towers of the Lazarus Company's Boys Shop, broadcasted a typical message this week from Station WBAV of the Erner & Hopkins Radio company. The youngest reporter has had considerable experience in Radio broadcasting.

Champ Code Taker Is W. U. Operator

Joseph Smyth Breaks World's Record by Receiving 55 Words in One Minute

NEW YORK.—World's records for code receiving are going up and up. The pace grew very swift at the Boston Radio Exposition and the New England Amateur Convention in Mechanics hall during the week of Oct. 30 to Nov. 4. Mr. T. P. McElroy, the former world's champion, made one error too many and lost to Mr. Joseph C. Smyth of 269 Eighty-sixth street, Brooklyn, N. Y. The record "hung up" by Mr. Smyth was 55 words per minute.

Mr. Smyth was born in County Kerry, Ireland, 27 years ago, and has been an operator for the Western Union Cable Company since 1916 at the Broad Street office, New York City. With only sounder experience he finished sixth at the 1921 convention at the Hotel Pennsylvania, and fifth at the convention of March, 1922. Then he busted himself with the Radio buzzer during his spare time, and so increased his speed that he came out second at the 71st Regiment Armory, New York, in May, 1922.

Three contests, all won by Smyth, were conducted at the Boston show. The first was the jamming test, or receiving through interference of strength equal to that of the signals copied. In the reception of cipher code, Smyth set a new world's record of 44 words per minute, and later won first place in plain English copying at 55 words.

\$3,600 YEAR'S RENT FOR FLORIDA PLANT

Boston Concern Highest Bidder for Miami Beach Station

MIAMI, FLA.—The lease of the U. S. naval Radio station at Miami Beach, Fla., was awarded to the Tropical Radio Company of Boston, Mass., the highest bidder in the recent call for bids. This company, which is connected with the United Fruit Company, offered to take the station for eighteen months at an annual rental of \$3,600, with permission to extend the lease an additional year.

According to the terms of the lease, the Tropical Radio Company must replace the old rotary spark set with modern equipment which will reduce the objectional noise to a minimum.

With the enactment of necessary legislation, it is understood that the U. S. Navy will ultimately offer the station for sale.

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Book Reviews

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.

The Armstrong Super-Regenerative Circuit. By George J. Eltz, Jr., E. E. This is a De Luxe edition of this famous circuit. Profusely illustrated and fully explained. Fifty-two pages. Price, \$1.00.

Radio Receivers for Beginners. By Snodgrass and Camp. Answers the universal question, "How can I receive Radio?" Price, \$1.00.

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

Elements of Radiotelegraphy. By Elery W. Stone. The text was written for the guidance and instruction of Radio students in the communication service of the Navy. It is an instruction book for Radio schools. Price, \$2.50.

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

Radio Communication. By John Mills. The fundamental principles and methods upon which recent developments are based are emphasized. The vacuum tube is treated in a simple, fundamental and up-to-date manner. Present methods and tendencies of the art are explained in a chapter which is non-mathematical. Price, \$2.00.

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

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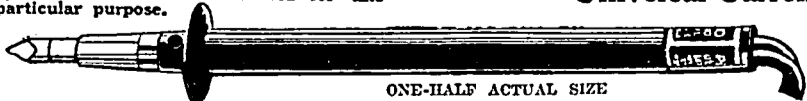
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\$14.50 A Battery, 80 amp., 6 V.....	8.75	\$2.00 Chelton Lightning Arresters.....	1.25	\$1.50 Muir Jack.....	1.15
\$1.00 Rheostat.....	.32	HOMCHARGER.....	11.95	\$1.50 Twin Adaptor.....	1.15
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\$4.25 Variocoupler, guaranteed, high quality.....	2.25	\$4.50 Thordarson Transformers.....	2.35	85c Closed Circuit.....	.95
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Unassembled Variometer, complete.....	1.25	\$1.50 Thordarson Vernier Rheostat.....	1.10	Knobs.....	.07
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75c Sockets.....	.23	3/2-in. Composition Red Fibre Tube.....	.42	\$3.00 Radio Frequency Transformers.....	1.65
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3-plate Vernier Variable Condenser.....	.70			\$1.65 Improved Potentiometers.....	1.10
50c Mica Condensers.....	.25			Knife Switch, S. P. S. T.....	.14
\$1.00 All Moulded V. T. Sockets.....	.25			Knife Switch, S. P. D. T.....	.22
				Knife Switch, S. P. D. T.....	.35

DELICATE SOLDERING

Both the manufacturers' and amateurs' problem on all fine work is readily solved by the instrument constructed for this particular purpose.



ONE-HALF ACTUAL SIZE

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POST ELECTRIC COMPANY, Dept. 509, 30 E. 42nd St. NEW YORK

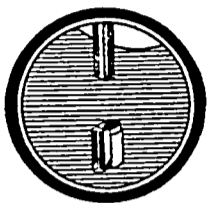
The Post Soldering Iron Platinum Heating Unit Interchangeable Tip Universal Current

W.E. Supply & Service Corp

Dept. "RD" 18 Murray Street New York City

The Radiophonist's Mart

WITH the price of tubes as high as it is, and new prospects of a shortage staring the amateur in the face, any simple, effective device for the protection of vacuum tubes arouses the interest of the fan. With the fuse shown in the illustration protecting the bulb, the fear of a filament burn-out due to excessive voltage is eliminated. This fuse, manufactured by the Radio Equipment Company of Boston, Mass., is so designed as to fit the terminals of any standard bulb used in any standard socket. As it is applied directly at the point where the current



Fuse to Protect Tubes

enters the tube, it makes it impossible for an overload or crossed leads to burn out any vacuum tube. At a small cost, it is designed to save hundreds of times its value in burned-out tubes.

It is no trouble to attach the safety fuse. To do this the filament terminals are cleaned. The two prongs on the side opposite from the small projecting pin on the band are the ones on which the fuses fit. The fuses will slip on easily over the prongs. Although one fuse on one filament prong offers adequate protection, the manufacturers recommend that two, or one on each filament prong, will give greater protection to the filaments.

TO THOSE who are acquainted with the Bradleystat, its new relative, the Bradleyometer, will prove very interesting. The same principle of compression resistance (carbon pile) has been applied in this potentiometer.

Two columns of discs are assembled in the porcelain container, each column with a separate pressure plug extending through the top cover plate, as shown in the sectional drawing above. The pressure knob rotates through 180 degrees, and through a special shaped cam, applies pressure to one column in one direction of rotation and to the other column in the other direction. As pressure is supplied to one of the columns the pressure is released on the other.

The resistance of a column of the discs varies with the pressure, so that the action of the Bradleyometer is to decrease the resistance on one column and at the same time increase the resistance in the other. The total resistance between the outside terminals (A battery connections) remains constant while the center connection (balancing point) may be shifted with respect to the resistance between it and the outside terminals.

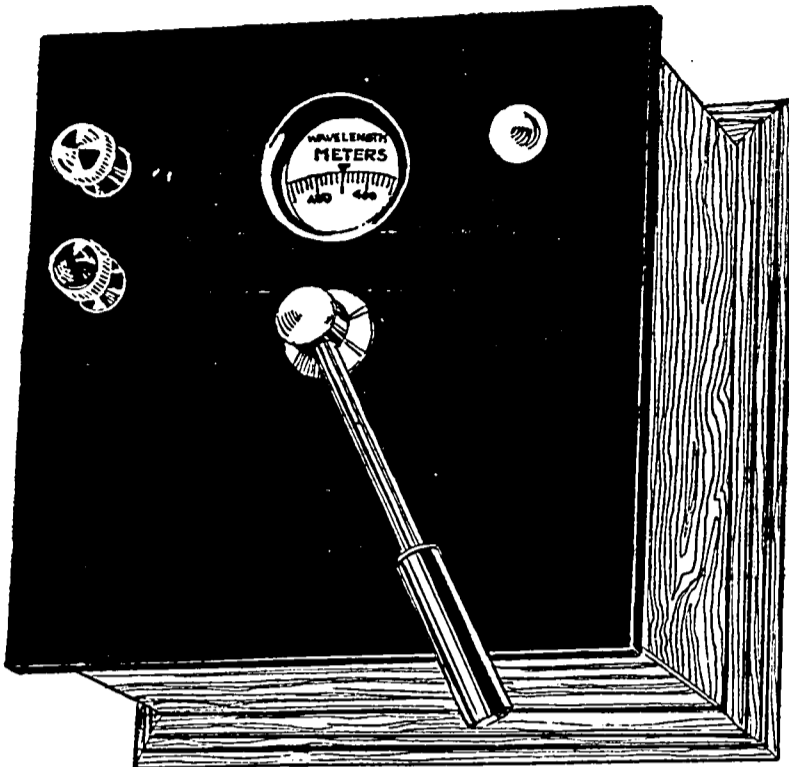
The outside terminals are connected across the A battery, and the third terminal is a tap into the resistance that provides for balancing or dividing the potential (voltage) either in the plate or



Compression Type Potentiometer

grid circuits. The Bradleyometer accomplishes the full range in resistance balancing with 180 degrees rotation of the knob. It is made in both 200 and 400 ohms capacity by the Allen-Bradley Company of Milwaukee, Wis.

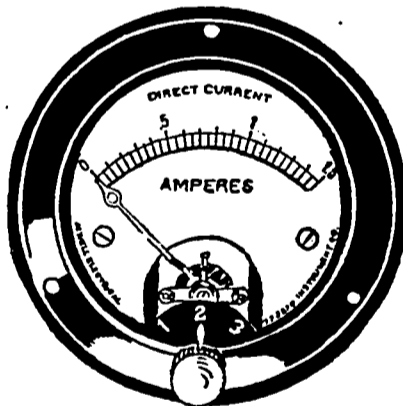
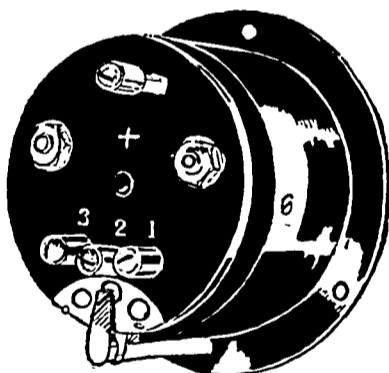
Wavemeter for the Amateur



COMMERCIAL wavemeters have always been considered too expensive an item for amateur use. The Jewell Electrical Instrument Company of Chicago is producing a unit that is well suited for amateur purposes. As shown in the illustration, it is assembled in a compact unit and equipped with a small light bulb. The intensity of the filament lighting indicates the condition of resonance. The lever handle controls the setting of the

condenser. The dial on the condenser which shows through the small window in the center is graduated in meters, giving direct wave length readings. The light bulb can be taken out and a plug inserted with two flexible cords attached for connection to a hot wire galvanometer if more accurate resonance is desired. Directions are furnished for use with each instrument. The readings run from 150 to 650 meters, thus covering the range of amateurs and public service broadcasting.

Flush Type Panel Ammeter



THE use of ammeters for indicating the current consumption presents considerable attraction to every Radiophan. The number required, however, for a three- and four-tube set would make too expensive an item for the average novice's pocketbook. The Jewell Electrical Instrument Company of Chicago, in its new Tri-Plex filament meter has solved this problem by means of a self-contained mechanism for switching to either of three

tubes without breaking the circuit. This mechanism consists of a small thumb screw on the base of the instrument with a pointer which can be turned to positions one, two and three for indication of the relative consumption of the three tubes to which it is connected. The meter registers from 0 to 1.5 amperes and is of the flush type of mounting, being fastened to the panels with three screws fastened through the flange of the base.

Lead-in for an Aerial

Possibly some Radio bugs have been confronted with the problem of making some kind of an entrance through the walls of their houses for their aerial leads without disfiguring the premises, especially so in rented houses. This problem especially arises as the cold weather sets in and the open window must be discontinued.

A plan which will work admirably is to take two sheets of tin foil, the size can be adjusted to the capacity desired, cover the outside of a portion of your window with glue, attach the sheet of foil and apply a coat of shellac, do the same on the inside of the window attach your aerial lead to the outside foil and the receiving lead to the inside foil, grounds can usually be made on water systems and you have a set up without making entrance through your walls.

A suitable lightning arrester may, if desired, be placed on the wall near the window and the aerial lead run to this, the other side to the tin-foil.—Bert M. Foote, Cedar Rapids, Iowa.

Aerial Lead-in Tube

When putting up an outside aerial the problem presents itself as to how the wire is to enter the house. Some means must be provided for insulation as well as to keep out rain. The illustration shows a good homemade affair that has proven to be very efficient. It consists of two porce-



lain tubes cut to the right length for the thickness of the wall. These are run through holes bored in the wall so that they join between the wall boards or coatings. A 1/4-inch copper rod is run through the porcelain tubes and held in place with large washers and nuts. The aerial wire is clamped between the outside nuts and the same procedure is carried out in the room.—F. T. Lesser, Ridgeway, Pa.

THE Armstrong Super-Regenerative circuit has created a considerable demand for 12,000-ohm non-inductive resistance units. The Allen-Bradley Company of Milwaukee, Wisconsin have met this demand with a new form of unit that can be installed with two screws that act as terminal connectors. Neither is it fragile nor are there any delicate wires to be broken. Its non-inductive feature is obvious since no wire or metal is used except in the terminal eyelets. Its con-



12,000 Ohm Resistance Unit

struction is that of the non-metallic base with a special resistance coating applied over it. Each unit is tested for accuracy. The size is approximately 1/2 inch by 3/4 inch by 2 1/2 inches.

In installing a receiving set, put in an air gap or lightning switch. Without this precaution, the aerial will not be a protection to the house.

THE ONLY KNOB and DIAL WITHOUT A SET SCREW

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257 Mfrs. who make and assemble complete Radio sets	per list	4.00
25,000 Radio Amateurs and Managers of Radio Stations	per M.	7.50
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87 Radio Supply Jobbers in Canada	per list	2.50
131 Retail Radio Dealers in Canada	per list	3.00
125 Mfrs. and Jobbers and Retail Dealers, England	per list	4.00

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The Peerless Variable Condenser

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\$1.25 postpaid and fully guaranteed. Large production and elimination of jobbers' and retailers' profits make this ridiculously low price possible. Order direct from manufacturer today

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MAGNAVOX Radio The Reproducer Supreme

THE two sizes of Magnavox meet every requirement—from home gathering to large public audience.

To hookup is simple—no extras or adjustments are required.

R-3 Magnavox Radio with 14-inch horn (as illustrated)

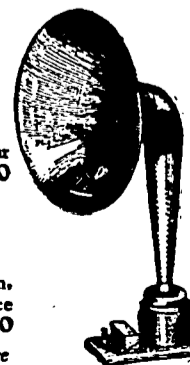
For homes, offices, amateur stations, etc. . . \$45.00

R-2 Magnavox Radio with 18-inch horn

For store demonstration, large audiences, dance halls, etc. . . \$85.00

At good dealers everywhere THE MAGNAVOX CO. Oakland, Cal.

New York Office 370 Seventh /



Radiophone Broadcasting Stations

Corrected Every Week.

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

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

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

WDT, New York, N. Y. Ship Owners Radio Service. Wm. Omaha News, 100 mi. John O. Yeiser, Jr. Daily 7-8 pm, Tues, Sat, 12-1 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 mi. James L. Bush. Daily ex Sun, every half hr. 8:30 am-12:15, Chicago Board of Trade quotations. Tues, Fri, 7-8 pm, concert, entertainment. Central.

WEAA, Flint, Mich. Fallain & Lathrop.

WEAB, Fort Dodge, Ia. 600 mi. 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, Terre Haute, Ind. 485 also. 75 mi. Baines Electric Service Co. Daily ex Sun, 10:15 am, weather; 12-1 pm, 5-6, music. Central.

WEAD, Atwood, Kan. 485 also. 150 mi. N. W. Kansas Radio Supply Co. Daily ex Sun, 11-11:30 am, markets, music; 12, markets; 1:45 pm, markets; on half hour, 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 mi. Am. Tel. & Telg. Co. Daily ex Sun, 4:30-5:30 pm. Mon, Wed, Thurs, Sat, 8-10 pm, concert. Eastern.

WEAG, Edinburg, Pa. Nichols Inclined-Basket Lab. Radio Co. Daily ex Sun, 9:40 am, 10:40, 11:40, 12:30 pm, 1:30, 3:15, reports. Wed, Sat, 8 pm, concert. Every third Sun, 8 pm, concert. Central.

WEAI, Ithaca, N. Y. Cornell Univ.

WEAJ, Vermillion, S. D. 300 mi. Univ. of S. D. Mon, Wed, Fri, Sat, 7:30 pm, music, lectures. Central.

WEAK, St. Joseph, Mo. 100 mi. Julius B. Abercrombie. Thur, 8-9:45 pm, concert. Central.

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

WEAN, Providence, R. I. 50 mi. The Shepard Co. Daily ex Sun, 8-8:45 pm, 6-8, music, bedtime stories. Mon, Wed, 8-10 pm, concert. Eastern.

WEAO, Columbus, Ohio. Ohio State Univ.

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

WEAR, Baltimore, Md. Balt. American & News Pub. Co.

WEAS, Washington, D. C. 150 mi. The Hecht Co. Daily ex Sun, 3-4 pm, Wed, Sat, 7-8 pm. Eastern.

WEAT, Tampa, Fla. John J. Fogarty.

WEAU, Sioux City, Ia. 50 mi. Davidson Bros. Co. Daily ex Sun, 9 am, 10, 11, 1 pm, reports, news. Mon, Wed, Fri, 8:30 pm, concert. Central.

WEAV, Rushville, Ind. 200 mi. 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. Daly.

WEAY, Houston, Tex. Will Horwitz, Jr.

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

WEB, St. Louis, Mo. 800 mi. 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 mi. Hurlburt-Gull Elec. Co. Daily ex Sun, 10 am, 5:30 pm, weather, roads. Tues, Thurs, 8-9 pm, concert. Central.

WEW, St. Louis, Mo. 485 also. 100 mi. St. Louis Univ. Daily ex Sun, 9 am, 10, 2 pm, reports. Central.

WEY, Wichita, Kan. 485 also. 500 mi. Corrado Co. (Wichita Beacon.) Daily ex Sun, hourly, 8:40 am, 12:44 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 and 485 only. 250 mi. 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 mi. C. F. Woese. No definite schedule.

WFAC, Superior, Wis. 400 mi. Superior Radio Co. Daily, 7-7:45 pm, news. Central.

WFAD, Salina, Kan. 250 mi. 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.

WFAF, Poughkeepsie, N. Y. 300 mi. H. C. Stratley Radio Co. Daily ex Sun, 10-10:30 am, 11:30-11:45, 1:30-2 pm, 4-4:15, Tues, Thurs, Sat, 8:15 pm, feature program. Eastern.

WFAE, Waterford, N. Y. 340 only. 800 mi. Radio Engineering Lab. Wed, Sat, 7:45-10 pm, concert. Sun, 2-4 pm, church service. Eastern.

WFAH, Fort Arthur, Tex. Elec. Supply Co.

WFAJ, Asheville, N. C. Hi-Grade Wireless Instrument Co.

WFL, Houston, Tex. Chronicle Pub. Co.

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

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

WFBP, Peoria, Ill. 200 mi. 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.

WFBG, Cameron, Mo. Cameron Radio Co. and Mo. Wesleyan College.

WFBH, Sanford, Me. Hall & Stubbs.

WFBK, Fort Wayne, Ind. United Radio Corp.

WFBM, Sioux Falls, S. Dak. 485 also. 400 mi. Argus Leader. Daily ex Sun, 10:15-12:15 pm, 2:15, reports; 7:30 pm, music. Tues, 8-9 pm, concert. Central.

WFAU, Boston, Mass. Edwin C. Lewis.

WFAV, Lincoln, Neb. 485 also. 200 mi. Univ. of Neb. Daily ex Sun, 10:10 am, weather, markets. Sat, 9-9:30 pm, concert. Central.

WFAW, Miami, Fla. Daily Metropolis.

WFAZ, Birmingham, N. Y. 75 mi. Arthur L. Kent. Daily, 5-5:30 pm, music. Eastern.

WFAJ, Independence, Kan. 500 mi. Daniels Radio Supply Co. Daily ex Sun, 12 pm, 4 pm, news. Mon, Tues, Wed, 7:30-8 pm, entertainment. Thurs, Fri, 7:30-8 pm, music. Sun, 11 am, church service. Central.

WFAZ, Charleston, S. C. 400 mi. 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 mi. 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. Sun, 4 pm, church service. Eastern.

WFO, Dayton, O. 485 also. 300 mi. 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 mi. 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, Ensenada, Porto Rico. 250 mi. Escuela Hispano Americana de Radio Telegrafia, Inc. Sat and Sun, etc.

WGAF, Tulsa, Okla. Goller Radio Service.

WGAI, New Haven, Conn. New Haven Elec. Co.

WGAK, Shenandoah, Va. W. H. Gass.

WGAL, Macon, Ga. Macon Elec. Co.

WGAL, Lancaster, Pa. 35 mi. Lancaster Elec. Supply & Construction Co. Mon, Wed, Fri, 7-8 pm, concert. Lecture. Sun, 3-3:30 pm, church service. Eastern.

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

WGAM, Orangeburg, S. C. 150 mi. 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.

WGAP, Pensacola, Fla. Cecil E. Lloyd.

WGAR, Shreveport, La. 500 mi. Glenwood Radio Corp. Daily ex Sun, 8 pm, music. Sun, 11 am, 7:30 pm, church service. Central.

WGAS, Fort Smith, Ark. Southwest American.

WGAS, Chicago, Ill. 1,000 mi. 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, 4-4:15, 4:30-4:45, reports. Wed, Fri, 10-11 pm, music. Central.

WGAT, Lincoln, Nebr. 100 mi. 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.

WGAU, Altoona, Pa. Ernest C. Albright.

WGAX, Washington, D. C. 75 mi. 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.

WGAZ, Madison, Wis. 100 mi. 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.

WGAY, South Bend, Ind. 200 mi. 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 mi. Register and Tribune. Tues, Fri, 7:30 pm, entertainment. Sun, 5 pm, church service. Central.

WGI, Medford Hillside, Mass. 485 also. 200 mi. 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, 6:30, 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.

Wed, Fri, 6-8 pm, concert. Tues, Thurs, Sat, 6-7 pm, music. Eastern.

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

WHAY, Huntington, Ind. 75 mi. 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 mi. Rensselaer Polytechnic Inst. Mon, 8:15-9:30 pm, music. Eastern.

WHB, Kansas City, Mo. 400 and 485 only. 1,000 mi. 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 mi. W. Va. University. Daily, 4-6, 7-7:30, news etc. Eastern.

WHK, Cleveland, O. 300 mi. 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.

WHN, Ridgewood, N. Y. Times Printing & Pub. Co.

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

WIAA, Waupaca, Wis. Waupaca Civic & Commerce Assn.

WIAA, Rockford, Ill. 50 mi. Joslyn Automobile Co. Tues, Fr, 8:30-9:30 pm, music. Central.

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

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

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

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

WIAH, Birmingham, Ala. Mathews Elec. Supply Co.

WIAH, Newton, Ia. 200 mi. Continental Radio & Mfg. Co. Daily 12:30-1 pm, music, news. Mon, 7:30-8 pm, Central.

WIAM, Cedar Rapids, Ia. 100 mi. Evening Gazette. Daily, 7-8 pm, musical program. Central.

WIAN, Peoria, Ill. 300 mi. 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 mi. Kelley Duluth Co. Mon, Thurs, 8-8:30 pm, music. Sun, 11-12 m, pipe organ, 12-1 pm, church service.

WIAP, Topeka, Kans. Capper Publications.

WIAR, Providence, R. I. The Outlet Co.

WIAS, Pittsburgh, Pa. 150 mi. Pittsburgh Radio Supply House (Pittsburgh Leader). Daily ex Sun, 11-11:30 am, 2:30-3 pm. Mon, Tues, Fri, 7-8 pm. Eastern.

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

WIAX, Cleveland, O. 485 also. 500 mi. 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.

WIAY, Chicago, Ill. Chicago Radio Lab.

WJD, Granville, O. 100 mi. Dennison University. Daily, 5-6 pm, concert, lecture. Central.

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

WIK, Toledo, O. 300 mi. Service Radio Equipment Co. Daily ex Sun, 3-4 pm, concert. Mon, Wed, Fri, 7:30-9 pm, concert, lecture, etc. Sun, 7:30-9 pm, church service, concert. Eastern.

WIX, New York, N. Y. De Forest Radio Telephone & Central Co.

WIZ, Newark, N. J. 485 also. 1,500 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 15 minutes hourly from 9 am to 6 pm; 12-12:30 pm; 7-10:15 pm. Miscellaneous program of highly varied nature. Sun, 3-10:15 pm, music. Eastern.

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

WKAC, Lincoln, Neb. 400 mi. 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.

WKAJ, Louisville, Ky. Edwin T. Bruce. A. Macfarlane.

WKAH, West Palm Beach, Fla. Planet Radio Co.

WKAL, Fargo, N. D. 150 mi. Fargo Plumbing & Heating Co. Daily ex Sun, 5-5:45 pm, concert, sports. Central.

WKAK, Okemah, Okla. Okfuskee County News.

WKAO, Orange, Tex. Gray & Gray.

WKAM, Hastings, Neb. Daily Tribune.

WKAN, Montgomery, Ala. 200 mi. Alabama Radio Mfg. Co. Daily ex Sun, 3:30 pm, 8:30, music, news. Eastern.

WKAP, Granston, R. I. Wilcox Flint.

WKAJ, San Juan, Porto Rico. Radio Corp. of Porto Rico.

WKAH, East Lansing, Mich. Mich. Agril. College.

WKAS, Springfield, Mo. 100 mi. E. Line. Music Co. Daily ex Sun, 6:30-7 pm, sports. Mon, Fri, Sat, 8-9:15 pm, music. Central.

WKAT, Frankfort, Ind. Morning Times.

WKAU, Laconia, N. H. Laconia Radio Club.

WKAU, Beloit, Wis. 100 mi. L. M. Turner. Daily 12-12:15 pm, 7-7:30, concert. Central.

WKAJ, Bridgeport, Conn. 75 mi. W. A. Macfarlane.

WKAJ, Gainesville, Ga. Brenau College.

WKAZ, Wilkes-Barre, Pa. 100 mi. Landau's Music Co. No definite schedule. Sat, 8-12 pm, dance music. Sun, 11 am, 8 pm, church service. Eastern.

WKC, Baltimore, Md. 500 mi. 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 mi. Oklahoma Radio Shop. (Daily Oklahoman.) Daily, 12 m, weather; 7-7:30 pm, sports, specials; 8:30-9:30, concert; 9, weather, news. Sun, 3:30-4:30 pm, concert. Central.

WL2, Fairfield, O. U. S. Army.

WLAB, Carrollton, Mo. George F. Grossman.

WLAC, Raleigh, N. C. N. C. State College.

WLAD, Hastings, Neb. 150 mi. Arvanetto Radio Supply Co. Program not established.

WLAF, Lincoln, Neb. Johnson Radio Co.

WLAG, Minneapolis, Minn. 1,000 mi. 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; 6-7:30, farm news, children's hour. Thurs, Fri, Sat, 8-9:30 pm, concert. Sun, 4:30-5:30 pm, church services. Central.

WLAH, Syracuse, N. Y. Samuel Woodworth.

WLAJ, Waco, Tex. 485 also. 1,000 mi. Waco 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.

WLAK, Bellows Falls, Vt. Vermont Farm Machine Co.

WLAL, Tulsa, Okla. Tulsa, Okla.

WLAM, Springfield, O. 100 mi. Morrow Radio Co. Mon, Wed, Fri, 8-9:30 pm, dance music. Central.

WLAN, Houlton, Me. Putnam Hdwe. Co.

WLAO, Scranton, Pa. 100 mi. 485 also. R. C. Ehrhardt and J. H. Jones. Mon, Wed, Fri, 7:15 pm, bedtime stories, reports, 8-9:45 pm, music. Sun, 7:30 pm, music; 8:30, church services; 9:15, music. Eastern.

WLAP, Louisville, Ky. W. V. Jordan.

WLAQ, Kalamazoo, Mich. 100 mi. A. E. Schilling. Daily, 10-12 pm, music. Central.

WLAR, Marshalltown, Ia. 50 mi. Melkel Music Co. No definite schedule.

WLAS, Hutchinson, Kan. Hutchinson Grain Radio Co.

WLAT, Burlington, Ia. Radio and Specialty Co.

WLAV, Pensacola, Fla. 200 mi. Elec. Shop, Inc. Daily ex Sun, 8-9 pm, music, entertainment. Central.

WLAW, New York, N. Y. New York Police Dept.

WLAX, Greencastle, Ind. Greencastle Community Broadcasting Station. (Putnam Elec. Co.)

WLAY, Fairbanks, Alaska. Alaska Commercial Co.

WLAZ, Warren, O. Hutton & Jones Elec. Co.

WLB, Minneapolis, Minn. Univ. of Minn. 100 mi. Daily ex Sun, 12-12:30 pm, 7:30-7:50. Central.

WLC, Indianapolis, Ind. 485 also. 500 mi. Hamilton Mfg. Co. Daily ex Sun, 11-11:30 am, 12-12:30 pm, 3-3:30, 6-6:30, reports, Tues, Thurs, 8:30-10 pm, concert. Sun, 2-4 pm, 8:30-10. Central.

WLW, Cincinnati, O. 485 also. 500 mi. Crosley Mfg. Co. Daily ex Sun, 10 am-3 pm, music, reports. Tues, Thurs, Fri, 8-10:30 pm, music, news. Sun, 11 am, church service. Central.

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

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

WMAF, Cazenovia, N. Y. 330, 250, 275 only. 500 mi. C. B. Merod. No definite schedule.

WMAE, Rock Port, Mo. Atchinson County Mail.

WMAE, Dartmouth, Mass. Round Hills Radio Corp.

WMAE, Liberal, Kan. 75 mi. Waterloo Elec. Co. Daily ex Fri, Sun, 7:30-8:30 pm, music, news. Fri, 8-9 pm, concert. Central.

WMAH, Lincoln, Neb. 100 mi. 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 mi. 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.

WMAL, Trenton, N. J. 100 mi. Trenton Hdwe. Co. Mon, Thurs, 7:30-9 pm, music, lecture. Eastern.

WMAE, Beaumont, Tex. Beaumont Radio Equipment Co.

WMAN, Columbus, O. 50 mi. First Baptist Church. Sun., 10:30-12 m., 7:30-9 pm, church services. Central.

WMAP, Easton, Pa. Utility Battery Service.

WMAE, Chicago, Ill. 1,500 mi. Chicago Daily News. Daily, 7-7:30 pm, 9:30-10. Central.

WMAE, Waterloo, Ia. Waterloo Elec. Supply Co.

WMAE, Duluth, Minn. Paramount Radio Corp.

WMAV, Auburn, Ala. Ala. Polytechnic Inst.

WMAW, Wahpeton, N. D. 50 mi. Wahpeton Elec. Co. Daily, 7-7:30 pm, music, sports, news. Central.

In Two Parts—

THE BROADCASTING station directory is the most complete and authentic list of Radiophone plants. Letters are being sent various stations every day for information. No other paper or source provides the data given here. The idea is original and a service which RADIO DIGEST has maintained from the start. Every public service broadcasting station is to be found now, not only in the location index, but in the schedule list. The latter, however is divided, one-half appearing this week, and the other half to appear next week.

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

The state, city and call list appears with the first half of the station schedules every other week and is merely an index. One wishing to find the calls of the stations in his vicinity, will find this index useful. Two successive issues of RADIO DIGEST will give one the most complete and accurate list of broadcasting stations obtainable.

WGM, Atlanta, Ga. 400 only. Atlanta Constitution.

WGR, Buffalo, N. Y. 485 also. 300 mi. Federal Tel. & Telg. Co. Daily ex Sat and Sun, 12:15 pm, weather, agriograms; 2, music; 3, lecture; 4, music; 5:30, reports; 7:30, bedtime stories; 8:10, concert. Eastern.

WGV, New Orleans, La. Interstate Elec. Co.

WGY, Schenectady, N. Y. 400 and 485 only. 1,000 mi. General Elec. Co. Daily ex Sun, 11:55 am, 12:30 pm, 6, 10, reports, time, sports. Mon, Tues, Thurs, Fri, 2-2:30 pm, 7:45, concert. Fri, 10:30 pm, special. Sun, 10:30 am, 4:30 pm, church service. Eastern.

WHA, Madison, Wis. 485 also. 600 mi. Univ. of Wis. Daily ex Sun, 12:30-1 pm, weather, markets. Tues, Thurs, Fri, Sat, 12-1 pm, weather, markets, time. Tues, 8-9 pm, concert. Fri, 8-8:15 pm, news, concert. Sat, 1-1:20 pm, instruction. Central.

WHAA, Iowa City, Ia. 200 mi. State Univ. of Ia. Daily ex Sun, 8-8:30 pm, lecture, concert. Sports. Sun, 10:45-12 am, church service. Central.

WHAB, Galveston, Tex. 300, 485, 600 also. 500 mi. Clark W. Thompson Co. Daily ex Sun, 9:45-10:15 am, 3 pm, 5 pm, reports, music, news. Mon, Wed, Fri, 8 pm, entertainment. Sun, 10 am, church service. Central.

WHAC, Waterloo, Ia. 150 mi. Cole Bros. Elec. Co. Daily ex Sun, 6:15 pm, news, sports. Mon, Wed, Fri, 9:30 pm, concert. Central.

WHAD, Milwaukee, Wis. 485 also. 100 mi. Marquette Univ. Daily ex Sun, 10:58 am, time; 11:20, weather. Wed, 7:30-8:30 pm, music, entertainment. Central.

WHAJ, Sioux City, Ia. 200 mi. Automotive Elec. Service Co. Daily ex Sun, 12:30-5:30 pm, music, reports. Thurs, 7:30 pm, music. Central.

WHAF, Pittsburgh, Pa. 200 mi. Radio Elec. Co. Daily ex Sun, 11:30-12 m, 3-3:30 pm, music, news. Sun, 9-10, music. Eastern.

WHAG, Cincinnati, O. 100 mi. Univ. of Cincinnati. No definite schedule.

WHAN, Joplin, Mo. John T. Griffin.

WHAI, Davenport, Ia. 30 mi. Radio Equip. & Mfg. Co. Daily ex Sat and Sun, 2-2:30 pm, 4:30-5-30, 10-11, Sat, 10-11 am, 2-2:30 pm, 5-5:30, 11-11:30. Central.

WHAK, Clarksburg, W. Va. Roberts Hdwe. Co. 50 mi. No definite schedule.

WHAL, Lansing, Mich. 200 mi. The Capital News. Daily ex Sun, 9:15-9:45 am, 12:30-1 pm, 3:45-4:15, 7:30-8:30, Sun, 2:30 pm. Central.

WHAM, Rochester, N. Y. Univ. of Rochester.

WHAN, Wichita, Kans. Southwestern Radio Co.

WHAO, Savannah, Ga. 100 mi. Frederick A. Hill. Daily, 9:30-10 pm. Eastern.

WHAP, Decatur, Ill. 100 mi. Dewey L. Otta. No definite schedule.

WHAQ, Washington, D. C. 75 mi. Lemmes Motor Co. Mon, 7-8 pm, lecture on automobile upkeep, music. Eastern.

WHAR, Atlantic City, N. J. Paramount Radio & Elec. Co.

WHAS, Louisville, Ky. 1,500 mi. Courier Journal and Louisville Times. Co. Daily ex Sun, 4-5 pm, 7:30-9, Sun, 9:57-10:45 am, 4-5 pm, church service. Central.

WHAT, Yale, Okla. Yale Democrat (Yale Telephone Co.).

WHAV, Wilmington, Del. 200 mi. Wilmington Elec. Spec. Co. Daily ex Sun, 12-1 pm, music. Mon, Tues, 8-9 pm, 9-9:30 pm. Central.

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

WIAJ, Necedah, Wis. Fox River Valley Radio Supply Co.

WIAK, Omaha, Neb. 485 also. 300 mi. 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 mi. Chronicle-News. Schedule irregular.

WIAO, Milwaukee, Wis. 200 also. 100 mi. 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.

WIAQ, Marion, Ind. Chronicle Pub. Co.

WIAR, Paducah, Ky. 150 mi. J. A. Rudy & Sons. Daily ex Sun, 11-12 am, markets, weather, news, music; 4-5 pm, same and sports; 7:30-9, concert, lectures, etc. Sun, 11-12 am, church service. Central.

WIAS, Burlington, Ia. 400 mi. Hawk-Eye Home Elec. Co. Tues, Thurs, 8-9 pm, concert. Central.

WIAT, Carle, Mo. Leon T. Noel.

WIAU, Le Mars, Ia. Am. Trust & Savings Bank.

WIAV, Birmingham, N. Y. N. Y. Radio Lab.

WIAW, Saginaw, Mich. Saginaw Radio & Elec. Co.

WIAZ, Lincoln, Neb. 200 mi. Capital Radio Co. Thurs, 8 pm, music, entertainment. Sun, 2:30 pm, 8, 9, church service. Central.

WIAY, Washington, D. C. 200 mi. Woodward & Lothrop. Daily ex Sun, 10:30-11:30 am, 2-3 pm, music. Sat, 8-10 pm, concert. Eastern.

WIB, Miami, Fla. Flieger St. Elec. Supply Sales Co. Daily, 7-7:30 pm, 500 mi. K. & L. Elec. Co. Daily ex Sun, 6:30-7 pm, Tues, Thurs, 9:30-10:30 pm. Sun, 1:30-2:30 pm and 6:30-7 pm. Eastern.

WIL, Washington, D. C. 100 mi. Continental Elec. Supply Co. Daily 5:30-7 pm, music, entertainment. Eastern.

WILP, Philadelphia, Pa. 400 meters only. 1,000 mi. Gimble 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.

WIZ, Cincinnati, O. 485 also. 200 mi. Cino Radio Mfg. Co. Daily ex Sun, 12

STATION SCHEDULES

(Continued from page 8)

WMAU, Shreveport, La. La. State Fair Assn. WMAU, Ann Arbor, Mich. K. & K. Radio Supply Co. WMAU, St. Louis, Mo. 1,000 ml. Kingshighway Presbyterian Church, Sun, 11 am, 8 pm, church services. Central. WMAZ, Macon, Ga. 250 ml. Mercer University. Daily ex Sun, 5:30-6 pm, 7-7:30, 8:30-9:30, music Tues, Wed, 10:30-11 am, chapel. Central. WMB, Auburn, Me. Auburn Elec. Co. WMC, Youngstown, O. 500 ml. Columbia Radio Co. Mon, Wed, Fri, Sat, 8:30-9:45 pm, concert, address etc. Eastern. WMD, Cincinnati, O. 485 only. 500 ml. Precision Equipment Co. Daily ex Sun, 11 am, 4 pm, reports. Mon, Wed, Sat, 8:15 pm, entertainment. Central. WNU, Washington, D. C. 100 ml. Doubleday-Hill Elec. Co. Daily, 4:30 pm, concert, sports. Thurs, 8-9, concert. Eastern. WNAB, Bowling Green, Ky. Park City Daily News. WNAC, Boston, Mass. 200 ml. Shepard Stores. Daily ex Sun, 5-5:30 pm, dance music. Mon, Tues, Thurs, 10-11 pm, concert. Wed, Fri, Sat, 7-8 pm, 8-9, concert. Sun, 11-12 am, 6:30-8:30 pm, church service. Eastern. WNAD, Norman, Okla. 200 ml. Okla. Radio Engineering Co. Daily ex Sun, 7:45-8:15 pm, news. Central. WNAG, Enid, Okla. Enid Radio Dist. Co. WNAG, Cresco, Ia. Rother Radio and Electric Shop. WNAH, Wilkes-Barre, Pa. Wilkes-Barre Radio Repair Shop. WNAJ, Chicago, Ill. Benson Co. WNAK, Manhattan, Kans. Manhattan Radio Supply Co. WNAL, Omaha, Neb. R. J. Rockwell. WNAM, Evansville, Ind. 200 ml. 485 also. Ideal Apparatus Co., Inc. Mon, Wed, Fri, Sat, 10-11 am, music, reports; 3-4 pm, 7-8, entertainment. Sun, 3-4 pm, music. Central. WNAN, Syracuse, N. Y. Syracuse Radio Telephone Co. WNAP, Charleston, S. C. Charleston Radio Elec. Co. WNAR, Springfield, O. Wittenberg College. WNAR, Butler, Mo. C. R. Rhodes. WNAS, Austin, Tex. Tex. Radio Corp. (Austin Statesman). WNAT, Phila. Pa. Lennig Bros. Co. WNAV, Knoxville, Tenn. People's Tel. & Telg. Co. WNAW, Fort Worth, Tex. Henry Kunsman. WNAZ, Baltimore, Md. D. D. Radio Apparatus Co. WNAZ, Baltimore, Md. Shipowners Radio Service. WNJ, Albany, N. Y. 60 ml. Shotton Radio Mfg. Co. Inc. Daily ex Sun, 10-10:15 am, market reports. Wed, 8:15-10 pm, concert. Eastern. WNO, Jersey City, N. J. Wireless Telephone Co. of Hudson Co., N. J. WOA, Okla. Dr. Walter Hardy. WOAB, Grand Forks, N. Dak. 50 ml. 485 also. Valley Radio. Daily ex Sun, 10-11 am, 2-2:30 pm, entertainment, reports. Sun, 3-4 pm, music, church service. Central. WOAC, Lima, O. Maus Radio Co. WOAD, Bismarck, N. D. Friday Battery & Elec. Co. WOAE, Fremont, Neb. Medford College. WOAF, Tyler, Tex. Tyler Commercial College. WOAG, Belvidere, Ill. Apollo Theatre. WOAI, San Antonio, Tex. 485 also. 1,000 ml. Southern Equip. Co. Daily ex Sun, 10:30 am, 12:15 pm, 3, 6, news, markets. Wed, 7:30-8:30 pm, concert. Sun, 7-8:30 pm, concert. Central. WOAJ, Parsons, Kans. Ervin's Elec. Co. WOAK, Erie, Pa. Erie Guard. WOC, Davenport, Ia. 400 and 485 only. 500 ml. Palmer School of Chiropractic. Daily ex Sun, 10:55 am, time; 11, weather; 12 m, chimes; 1:30 pm, markets; 3:30, talk; 5:45, chimes; 6:30, sports; 7, concert. Sun, 9 am, chimes; 1 pm, 6, concert; 7, church service. 8, concert. Central. WOE, Akron, Ohio. 100 ml. Buckeye Radio Service Co. Mon, Wed, Fri, 7-8:15 pm, music, ariograms, sports. Sat, 4-4:30 pm, music, sports. Eastern. WOH, Indianapolis, Ind. 1,000 ml. Hatfield Elec. Co. (Indianapolis Star). Daily ex Sun, 10-11 am, music; 10:15, financial, markets; 1-2 pm, music; 1:20, markets; 4-5 pm, music; 4:15, police notes; 4:50, sports. Mon, Wed, Sat, 8:50-10 pm, Concert. Central. WOIA, Ames, Ia. 485 also. 200 ml. Iowa State College. Daily ex Sun, 9:30 am, 12:45 pm, 9:30, music, weather. Central. WOK, Pine Bluff, Ark. 485 also. 500 ml. Ark. Light & Power Co. Tues, Fri, 8-9:30 pm, concert. Sun, 10-12 am, 7-9 pm, church service. Central. WOO, Philadelphia, Pa. 400 and 485 only. 500 ml. John Wanamaker. WOQ, Kansas City, Mo. 485 also. 1,000 ml. Western Radio Co. Mon, Tue, Wed, Thurs, 9:45 am, 10:55, 11:30, 12:30 pm, 2, 7:30, time signals, reports, etc. Fri, 1:15 pm, sacred service. Sat, 8 pm, concert. Sun, 7 pm, concert. WOP, Newark, N. J. 400 only. 150 ml. L. Bamberger & Co. Daily ex Sun, 20 minutes on half hour from 10:30 am to 6:30 pm, miscellaneous. Eastern, daylight saving. WOS, Jefferson City, Mo. 485 also. 1,500 ml. Mo. State Marketing Bureau. Daily ex Sun, 9:30 am, 11:30, 2 pm, weather, markets. Mon, Wed, Fri, 5 pm, markets, 8-9 pm, concert. Central. WOV, Omaha, Neb. R. B. Howell. WOU, Omaha, Neb. Metropolitan Utilities Dist. WOZ, Richmond, Ind. 485 also. 300 ml. Palladium Printing Co. Daily ex Sun, 12-12:25 pm, 4-5, 6:30-7, music, markets. Central. WPA, Fort Worth, Tex. 485 also. 500 ml. Fort Worth Record. Daily ex Sun, 11:30 am, 2:30-3 pm, 6-6:15, 7-7:15, 7:30, 8-8:30, 9-9:30 pm, 6:30. WPAE, Waco, Neb. Anderson & Webster Elec. Co. WPAE, State College, Pa. Pa. State College. WPAF, Chicago, Ill. W. A. Wieboldt & Co. WPAF, Council Bluffs, Ia. Peterson's Radio Co. WPAL, Columbus, O. Superior Radio & Tel. Equip. Co. WPAO, Topeka, Kans. Awerbach & Guettel. WPAO, Houston, Tex. 300, 600 also. 50 ml. Lery Bros. Dry Goods Co. Daily ex Sun, 10:30-11 am, fashion talks, beauty hints. Central. WPAZ, Scranton, Pa. 485 also. 100 ml. Radio Sales Corp. Daily ex Sun, 11 am, music; 12 m, reports; 3:30-5:30 pm, reports, music; 7-8:30, bedtime stories, music. Sun, 8 pm, chapel. Eastern. WPE, Kansas City, Mo. 300 ml. Central Radio Co. Mon, Fri, Sun, 7:45 pm, concert. Sun, 8:15 pm, sermonette. Daily, afternoon, sports, scores. Central. WPG, New Lebanon, Ohio. 485 also. 500 ml. Nushaw Poultry Farm. Daily ex Sun, 8-9 am, 3-4 pm, music, markets. Tues, Thurs, Sat, 7:30-9:45 pm, music. Central. WPH, Clearfield, Pa. Elec. Supply Co. WPI, Philadelphia, Pa. 30 ml. St. Joseph's College. Daily ex Sun, 2:30 pm, 8:30, sports, news. Sun, 10:45-12 noon, 7:45-8:30 pm, church service. Eastern. WPM, Washington, D. C. 200 ml. Thos J. Williams, Inc. (Washington Daily News). Daily ex Sun, 12:30 pm, news, Mon, 8 pm, concert. Eastern. WPO, Memphis, Tenn. 100 ml. United Equip. Co. Daily, 7:15-8:15 pm, music. Central. WQAA, Parkersburg, Pa. 1,500 ml. Horace A. Beale, Jr. Two nights weekly, 10:05 pm. Eastern. WQAP, Lincoln, Neb. Am. Radio Co. WQAP, Abilene, Tex. West Tex. Radio Co. WQX, Chicago, Ill. Riverview Park, Walter A. Kuehl. WRAR, David City, Neb. Jacob Carl Thomas. WRAU, Amarillo, Tex. Daily News. WRK, Hamilton, O. 1,000 ml. Doron Bros. Elec. Co. Tues, Thurs, 9-10:30 pm, music, lecture. Sun, 10:30 am, church service. Central. WRN, Schenectady, N. Y. 800 ml. Union College. Sun, 7:30 pm, sacred concert, speeches, etc. Irregular miscellaneous weekday program. Eastern. WRM, Urbana, Ill. 410 also. 300 ml. Univ. of Ill. Mon, Thurs, 8:30-8:50 pm, 9-9:30, news, talks, music. Central. WRP, Camden, N. J. 250 ml. Federal Inst. of Radio Telg. Daily ex Sat, Sun, 10-10:45 pm, music, news, ariograms. Eastern. WRR, Dallas, Tex. 485 also. 200 ml. City of Dallas. Daily ex Sun, 12-12:30 pm, weather; 3-3:30, sports, news; 7-7:15, police news; 8:30-9, music. Sun, 11 am, church service; 7-8 pm, police news, church service. Central. WRW, Tarrytown, N. Y. 500 ml. Koenig Bros. Daily ex Sun, 8:15-7 pm, 10:30-12. Mon, Wed, Sat, 5-5:30 pm, Tues, Fri, 2:30-3 pm. Sun, 1-3 pm. Eastern. WSAS, Lincoln, Neb. 485 also. 700 ml. Nebr. Dept. of Agr. Daily ex Sat pm and Sun, 9:30 am, 9:45, 10, 10:30, 10:45, 11, 11:30, 11:40, 11:50, 12 m, 1:15 pm, 1:30, 1:45, reports. WSAV, Houston, Tex. 300 ml. C. W. Vick Radio Const'n Co. Tues, Fri, 8-10 pm, concert, entertainment. Central.

WSB, Atlanta, Ga. 400 and 485 only. 1,500 ml. Atlanta Journal. Daily ex Sun, 12-1 pm, music; 2:30, reports; 4-4:45 pm, music, reports; 5-6 pm, 7-8, 10:45-12, music. Sun, 10:45 am, 5-6 pm, 7:30-9, church services. Central. WSL, Utica, N. Y. 500 ml. J. & M. Elec. Co. Daily ex Sat, Sun, 11-11:30 am, 2-2:30 pm, 3-3:30, 4-4:30, 5-5:30, music, news. Mon, Wed, 8-9 pm, Sat, 11-11:30 am, 5-6 pm, 8-9, Sun, 10:30-12 m, 7:30-9 pm. Eastern. WSN, Norfolk, Va. 100 ml. Shipowners Radio Service Inc. Mon, Wed, Sat, 8:15-9:30 pm, concert. Eastern. WSV, Little Rock, Ark. L. M. Hunter & G. L. Carrington. Erie, Pa. 75 ml. Erie Radio Co. Tues, Thurs, Sat, 10-10:55 pm, news, concert, lecture. Sun, 12:15-1:30 pm, sermon. Eastern. WSY, Birmingham, Ala. 500 ml. Alabama Power Co. Mon, Wed, Fri, 8-8:30 pm, 8-8:45, reports, concert. Sun, 8-9 pm, church service. Central. WTAW, College Station, Tex. Agricultural and Mechanical College of Tex. WTB, Manhattan, Kan. 485 only. 75 ml. Kan. State Agr. College. Daily ex Sun, 9:55 am, weather (code). Central. WTK, Paris, Tex. 300 ml. Paris Radio Elec. Co. Daily ex Sun, 8-9 am to 6 pm, 7-11 pm, miscellaneous. Sun, 11 am to 8 pm. Central. WTP, Bay City, Mich. 75 ml. Ra-Do Corp. Mon, Wed, Fri, 1:30-2 pm, reports, news; 6:30-7:30 pm, concert. Central. WVP, New York, N. Y. Signal Corps, U. S. Army. WWAQ, Waco, Tex. 485 also. 200 ml. San Antonio Post. Daily ex Sun, 10 am, weather, 1:30 pm, music. Mon, Wed, Fri, 8:45 pm, music. Central. WWAQ, Laredo, Tex. Worman Bros. WWB, Canton, O. Daily News Printing Co. WWI, Dearborn, Mich. 200 ml. Ford Motor Co. Wed, 10-11 pm, music, lectures. Eastern. WWJ, Detroit, Mich. 400 and 485 only. 1,500 ml. Evening News. Daily ex Sun, 9:30-9:40 am, household hints; 9:40-10:25, entertainment; 10:25-10:30 am, 11:55-12 m, 12:05-12:45 pm, reports, music; 3-3:30, music; 3:30-3:35, reports; 3:35-4:15, markets; 5-6, sports; 7:30-10, entertainment. Sun, November 11 and every other week, 11 am, 4 pm, church services special. Eastern. WWL, New Orleans, La. Loyola Univ. 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. WWZ, New York City. 200 ml. John Wanamaker. Daily ex Sun, 1:15-2:15 pm. Tues, Fri, 7:30-8:30 pm. Eastern. WXAD, Pawtucket, R. I. Standard Radio & Elec. Co. 2XAI, Newark, N. J. Westinghouse Elec. & Mfg. Co. 2XII, Schenectady, N. Y. General Elec. Co. Test Call. 2XJ, Deal Beach, N. J. Amer. Tel. & Telg. Co. 2XK, Parkersburg, Pa. 378 only. 485 ml. Horace A. Beale, Jr. No definite schedule. Test station. 3YN, Washington, D. C. 100 ml. Nat'l Radio Inst. Daily ex Sun, 6:30-7:30 code practice, lecture. Eastern. 3ARU, Louisville, Ky. 200 only. 200 ml. Darrell A. Downard. Mon, Wed, 8 pm, police news, concert. Central. (Note—This completes the station schedule list. The first half, together with the location index, will appear next week.)

RECEIVING RECORDS

(Continued from page 4)

WOI—1450, J. C. Chilton, Los Angeles, Calif. WOK—1150, H. Rawls, Phoenix, Ariz. WOO—1325, J. E. Lott, Fairfield, Tex. WOQ—1150, G. W. Perkins, Thompson, N. Y. WOR—1375, J. E. Lott, Fairfield, Tex. WRP—1300, A. Taylor, Winnipeg, Can. WRR—1175, A. Taylor, Winnipeg, Can. WRW—1225, K. E. Gabbert, Clay Center, Kan. WSB—2275, L. K. Poyntz, Victoria, B. C., Can. WSL—1175, L. Hull, Eureka, Kan. WVP—1000, A. C. Rothmund, St. Paul, Minn. WWJ—2200, F. W. Hill, Cristobal, C. Z.

INTERNATIONAL ETHER CROP SERVICE BEGINS

Agricultural Departments of U. S., Germany and Italy Report

WASHINGTON.—The international Radio crop service of the Department of Agriculture got away to a flying start with the receipt of a Radiogram from the department's Berlin representative regarding beet sugar production in Germany. In less time than it takes to read this sentence, traveling with the speed of light—186,000 miles a second—the message filed in Berlin was flashed to the Department of Agriculture at Washington. Then relayed throughout the United States, the news was in the hands of receiving operators all over the country in less than five minutes from the time the message left Berlin.

A part of the department's service is the dispatch by Radio to the International Institute of Agriculture at Rome, of a weekly report on the condition of the cotton crops and wheat seeding in the United States. The messages are sent from Radio stations of the navy department.

Have Boy Scout Night

NEWARK, N. J.—Every Tuesday evening, headquarters of the Boy Scouts of America are sending to Station WOR, L. Bamberger and Company, a speaker of note who addresses the invisible audience on a Boy Scout subject. On Tuesday evening, November 28, 1922, Charles A. Gammons, field executive, Boy Scouts of America, had as his subject, "How Long Is a Scout?" Messages have been sent to 1,500 scout masters asking them to be sure to let their boys know about the start of this series of lectures, which will include instructions on scout craft, camp fire stories, and novelties that will interest the general public.

Fans Want Classical Music

TACOMA, WASH.—A ballot of the fans of the Northwest shows that instrumental music is more popular than vocal selections. Classical and semi-classical music have more voters than jazz.

'CLICKS' OF W. U. T. BROADCAST AT WSB

'WIRE' EMPLOYEES FURNISH MUSICAL PROGRAM

One-String Fiddle Is Novelty Hit of Night—Sounder "Ticks" Carry Greetings

ATLANTA, GA.—When Radiophone Station WSB of the Atlanta Journal was turned over recently to the employees of the Western Union Telegraph Company, who had arranged an elaborate program for the occasion, the Western Union gave the world a message unlike anything that had ever gone over the "wires." More than a dozen artists, representing all departments of the Atlanta Western Union organization, presented a prodigiously varied and spirited musical program.

The novelty hit of the night was L. V. Crabb's one-string, broom handle-cigar box "fiddle," constructed at a cost of exactly seventy-five cents. This produced amazingly fine harmony with Vincent Hurley's piano accompaniment.

Broadcast Sounder "Ticks"

During the course of the evening the familiar "Tick, Tick, Tick" of the sounder was heard, sometimes as a "background" during an announcement and again all by itself, carrying greetings and best wishes to all, especially to those who understood the "key" language. It is believed that this is the first time the click of a telegraph sounder has been heard over such great distances without the usual conducting wires. The original idea was supplied by C. C. Call.

The following points reported hearing and enjoying the concert: Vicksburg, Miss., Demopolis, Ala., Ft. Valley, Ga., Macon, Ga., Richmond, Va., Bristol, Tenn., Des Moines, Iowa, Bainbridge, Ga., Dallas, Tex., St. Louis, Mo., Omaha, Neb., Camden, N. J., Pittsburgh, Pa., Tampa, Fla., Buffalo, N. Y., Schenectady, N. Y., Pensacola, Fla., Charlotte, N. C., Cincinnati, Ohio, Cleveland, Ohio, Chicago, Ill., New York, N. Y., Key West, Fla., Raleigh, N. C., Birmingham, Ala.

British Columbia Fan Gets Columbus Amateur

R. C. Higgy Qualifies 100-Watt Transmitter for Test

COLUMBUS, O.—R. C. Higgy, 81B, of this city, claims to hold the Radio distance record of Central Ohio, following a recent exploit with his transmitting outfit. This Columbus amateur on the night of October 29, bridged the same distance it took the "sourdoughs" in the days of the gold-rush weeks to fight their way, when he "talked" with Jack Barsley, Canadian district station 9BP, an amateur in the town of Prince Rupert, British Columbia. Barsley has just acknowledged the reception of the air signals with a postcard. Prince Rupert is located just 25 miles south of the Alaskan border.

Higgy is given the right, by this record, to easily qualify for the trans-Atlantic amateur sending tests to be held next month by the members of the American Radio Relay league. In addition to the amateur station in the far north, others all along the Pacific coast heard station 81B and sent cards. The transmitting set used by Higgy is made up of two 50-watt tubes, and is a continuous wave outfit supplied with rectified alternating current. Mr. Higgy is the third Columbus man to qualify for the trans-Atlantic tests, so far as is known.

TELLS TUNING METHODS

(Continued from page 5)

any difficulty, tune in either one of the wave lengths mentioned. They should, however, bear in mind that a single wire antenna, not too long, kept free from obstructions and not running near grounded metallic objects, will tune sharper. Where the amateur has a transmitting apparatus it is of course desirable to have a fairly large antenna, with more than one wire, and if such is the case, he should use a separate wire for receiving.

The ideal condition will be when stations can operate independently on either of two wave lengths without interfering with each other, and because the receiving apparatus is an important factor these suggestions are given in order that owners or receiving apparatus may have the necessary information to increase the efficiency of their apparatus.

WBAV Heard in Vermont

COLUMBUS, O.—One of the farthest points reached by Station WBAV of the Erner & Hopkins Co., this city, is in Vermont. The company received a letter from an amateur in that state telling of the picking up of the Columbus' station a few nights ago.

Houston Rotary President Talks to Galveston Club

GALVESTON, TEXAS.—Members of the Rotary club here enjoyed a program by Radio during a recent luncheon at Hotel Galvez. The program consisted of several musical numbers which were broadcasted from the Clark W. Thompson station, WHAB, and an address on "Rotary" by Fred W. Wilson, vice president of the Houston Rotary club, who spoke from the Isis theater station in Houston. The chairman presided from Station WHAB and besides introducing the guests, announced the various numbers on the program. Mr. Wilson's address was clearly heard and was an eloquent discourse upon the principles and purposes of Rotary. The feature that excited most comment was the manner in which the Houston talk was made. To the listeners at the club it was simply a part of the program, and the minute that the chairman had introduced Mr. Wilson his voice commenced coming in.

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5 PLATE Variable Condenser \$1.25

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Aid to Lighthouse Service

Economical Use of Radio on Light Ships

RADIO outfits on vessels of the United States lighthouse service are in the interest of economy, as shown by a recent instance on the coast of Maine. A light station reported one afternoon to the district office by telephone that a large can buoy had broken adrift and was moving away. A Radiogram was sent to the tender that was working on buoys a few miles away. The buoy was recovered and placed back on the station before sunset. The buoy was saved as well as probably a day's steaming of the tender, and also shipping was safeguarded by promptly replacing the buoy on its station.

Holds Interest for Children

Streets Are Cleared When the Radiophone Starts

RADIOPHONES seem to hold enough interest for the children to keep them from the street. If you cannot afford a Radio set, try to get the community interested in the safety of the children by this means. The plan has already been tried out with success in New York. Teachers of a certain institution got together and installed a Radio receiving set with a loud speaker in the courtyard. After their school hours the children gathered for athletic practice and were surprised to hear the returns of the world series. They told their chums who had decided to stay out and play in the streets around their homes. The next day the athletic center was crowded with eager children. The lives of many children, who might have played on the crowded streets, were kept out of danger.

Heathen Reached by Radio

Inaccessible Parts of the Orient Embraced

IT WAS decided upon at a meeting of missionaries in Tzechow, West China, that Radiophones, together with airplanes, were to be used as aids in missionary work in the Orient. In the city where the meeting was held the delegates could see the mountains of Tibet located at a distance that would take several weeks' journey from Shanghai to reach, as there are no rail lines in that region.

Because of the lack of transportation facilities and inaccessibility of some sections, missionaries have been unable to reach many of these localities.

The missionaries, planning work for the next ten years, voted for four sets of Radiophone receivers with which to link up the widely separated main stations, and four two-passenger airplanes with which to reach the inaccessible sections.

Understand Your Outfit

Have Patience and You Will Reap Results

FROM printed comment gathered from various cities throughout the United States Radio is gradually reaching its proper level and is safely enthroned as an entertainer. There is absolutely no doubt in the minds of thousands of Radio enthusiasts already enjoying the good things going through the ether that as an entertainer a Radiophone can't be beat, and, in addition, it furnishes the foundation for a practical education in electricity that cannot help but benefit the boy or young man.

There are certain fundamental rules to be followed, and you must follow them to get the best results. Radio waves are weak things at the best, and require careful handling. Therefore if you have a nice "tight" path for them to travel they will do your bidding, but if the pathway is lined with obstacles in the way of loose or improper connections, and indifferent equipment, then the fault is entirely your own.

Trace out the wires from your aerial to the phones, figure out just what each unit does and why, as, for instance, the tuning device, the variable condenser, the grid leak, in fact every-part of the set. Learn what makes the "wheels go around," and you will be getting somewhere. It is out of the question to sit down and turn a few dials to start off the music unless you are familiar with the mechanism, and what part each dial plays. Do not start without any preliminary knowledge, and then give up in disgust and start knocking Radio because you did not have patience enough to master your set

Condensed

By DIELECTRIC

We have known instances where a certain week was designated as a time to nationally celebrate some specific enterprise, and it usually met with more or less success. The intention back of each such movement, of course, was to draw increased attention to apples, or to music, or something else needing a boost, and if you were to check up on the results they would be found quite interesting. Now we are to have a National Radio Week, and while it will undoubtedly bring into the ranks a great number of fresh "bugs," it will also present an occasion for hilarious rejoicing on the part of the crystal cured "hams" who have labored without ceasing for the advancement of Radio. This was to be the first Radio Christmas. No doubt it will. In fact that doubt has faded to the point where it can't be tuned in again. Radio, and little else, will fill the mind of the holiday shopper of 1922.

Station WIP, in Philadelphia, is an interesting place to visit and quite accessible to anyone wishing to view "the works," as attested by the crowds which gather there every afternoon. A short time ago I stood looking through the glass windows at Uncle Whip, as he addressed dear knows how many listeners in, and the only sound I received was from the loud speaker located on the floor of the salesroom. I wanted to ask him if he could visualize any of his vast audience, but when he came out a little later to be surrounded by senior fans and junior fans, all eager to express appreciation for some former programs, the question was unnecessary. Such is the fame of an announcer; also the recompense for painstaking care in enunciation. I believe if more of us fans would take the pains to communicate with those who announce the program from the different stations we tune in, it would give encouragement. Let's try it.

Personally, golf is uninteresting as ordinarily played, but when it comes to swinging a dial at a 400-meter wave and see it clear all obstacles, then sir, count me among the contestants. There are thousands of you gamblers trying your luck at "Radio Golf," who receive with the utmost glee an announcement of silent periods. Such periods on the part of nearby broadcasting stations would enable many of us to pile up a right sizable score. Still, it isn't only that we want, but a fair chance to hear the news from a station in some distant State. This arrangement should not be objectionable to any broadcasting station, if it becomes universally adopted. Toward that end let's pull all the wireless within reach.

To every fan living in the East the attempt of RADIO DIGEST ILLUSTRATED to have the Metropolitan Opera Company's productions broadcasted is deserving of hearty support. Fortunate, indeed, are those who can tune in KYW and listen to the stars of the Chicago Opera Company. If fear of detracting from the performances at the opera house is the basis for refusing to grant permission to broadcast, then they are utterly without argument. Many will attend operatic performances who never knew the beauties inherent therein until they had listened to broadcasts of opera. Phonographic reproductions of music as rendered by great artists have not depleted the ranks of concert-goers; nor would it be different in this case. Bring to bear all the influence at your command and trust to the matter being reconsidered.

As you probably know, there is to be a new station in the East to replace Station WJZ, at Newark, N. J. It is reported that this new station is to be about the largest and most powerful one in the country. Whether they will succeed in overcoming the present antipathy to Radio manifested by the Metropolitan Opera Company is a matter for the future to decide. However, this station has already contracted to broadcast programs by some of the foremost musical artists appearing in the United States. We fans are assured of opportunities to listen in to violin, piano, quartette and orchestra broadcasting second to none in the world. Silent periods will become more and more anticipated as such programs are made the regular feature of the Class B stations.

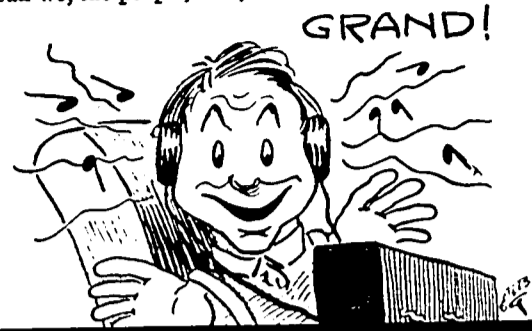
The impressive effect one may gain through the use of a receiving set was recently made apparent to me and is worthy of notice for its possible use in the future. Listening in to the broadcasting of the football game in the stadium at Cambridge, Armistice Day, while Harvard and Princeton were battling for honors, there were very few moments when the noise from the crowds was not entirely audible. Between the first and second halves, however, the crowd was silent. What they heard and saw, I could only hear. Thousands of others at their sets heard too. It was the tribute paid the fallen heroes in the World War, a twenty-one gun salute, followed by taps and that by the playing of the National Anthem. I felt (as though present) the awe and thrill of the moment! Reading of such an incident lacks the effect of hearing what transpired. Hence, when it becomes necessary for the nation to be stirred at some critical juncture, the means will be at hand adequately to meet the occasion. Our leaders will use Radiophony and we, at our receiving sets, will respond.

Don't forget that the time between December 23 and 30 is National Radio week. The time of giving and receiving is at hand, the joyous season of the year. When you "can't think of a thing" for a present for a friend, think of Radio, a new present that he will like.

RADIO INDI-GEST

Putting the Grand in Grand Opera

Dear Dickie: Read all about those first nighters at the Civic Opera, and not a mention of us. By "us" I mean we, the people, who, instead of getting all dolled



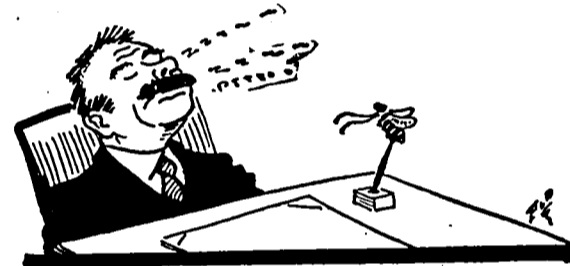
up for the show, just slip into some comfy clothes, nice warm cozy house slippers, ease into a real rocker, maul two-bits' worth of candy (maybe a cigarette), and then put on those marvelous money-savers, the headphones of a crystal set. That's a real first night.
A Line O'Type or Two, Chicago Tribune.

The Radio Bug

I was sitting one day at my office desk,
Writing of boys and men,
When a Radio bug crawled out of a crack
And perched on the tip of my pen.

He scratched his neck with a wiry paw
And gazed at my half-writ poem,
Then settled back with a sleepy air
And ohmed an indolent ohm.

"Your room is chilly," said he to me,
As he shivered his aerial wire;
"If I were you I know what I'd do—
I'd build me an ampli-fire."



Then, tipping back till the pen point cracked,
He ohmed again and said:
"I swallowed a couple of codes today
And they gave me a pain in the head."

I asked him about his sister Ann,
And Galena so crystal fair.
"Oh, Gale is tickling the cat," said he,
"And Antenna is up in the air."

"I think that Ann's getting sour because
Of the unripe currents she ate,
For when I come with 'the Weather' she
scolds,
'Now, wire you in-su-late?'"

He kicked his foot in a drop of ink,
Then slid from my pen with a snap—
Gave a switch of his tail and disappeared
Where the spark had begun to gap.

—American Boy.

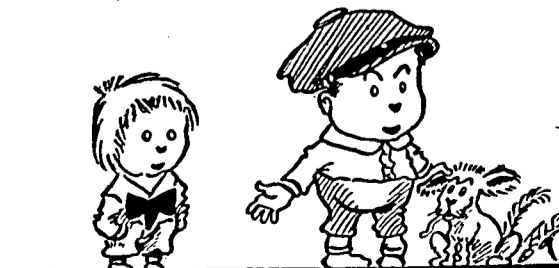
Camp Fire Radio



Miss Peabody's conception of a binding post, or why a Q. and A. editor soon goes crazy.

Sure, and He Growls and Howls

First Kid: "We've got Radio at our house. My big brother's got a set."



Second Kid: "That ain't nuthin'. This is my brother's setter."

How to Make Uniset Panel Receiver

By Thomas W. Benson

THE modern Radio receiver is not quite complete without one or two stages of Radio frequency amplification. Every day new long distance reception records are being made with sets

drilling are given in the diagram. The terminal panel follows the usual construction except that it is 8 inches long and mounts seven binding posts. (See Figure 2.)

Panel Mounting the Uniset Type

The mounting of the tube and its controls follows closely the method in assembling the detector panel with the exception that no jack is employed. The right half of the panel mounts a .0005 mfd. variable condenser at the top and a two-point switch at the bottom. This switch controls the inductance and permits the use of the small variable condenser to cover the range from 200 to 700 meters.

Any variable condenser built by a reliable concern can be used, but it will be necessary to wind the inductance. The winding consists of 75 turns of No. 24 S. C. C. magnet wire wound on a two-inch fiber tube tapped at the 50th turn. In order to make this winding smaller it is wound in three layers separated in a rather novel manner.

Making the Coil

To construct the coil cut a piece 1 1/2 inches long from a 2-inch fiber tube with about 3/16-inch wall. Mark off each end of the tube into sixteen parts and with a hack saw cut slots 1/4-inch deep around both ends. Small holes are drilled in the tube ends to pass the ends of the winding and the tap.

To wind the coil first put one end of the wire through a small hole at the edge of the tube and start the winding around the tube clear of the slots until twenty-five turns are wound which should bring the

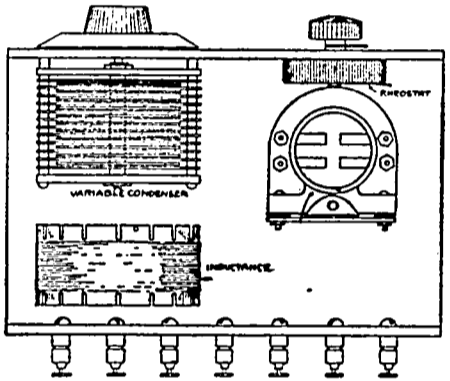


Figure 4

winding close to the other side of the tube. Now pass the wire down through one of the slots and up through the next, bring the wire at right angles across the face of the winding and down through the corresponding slot on the opposite edge.

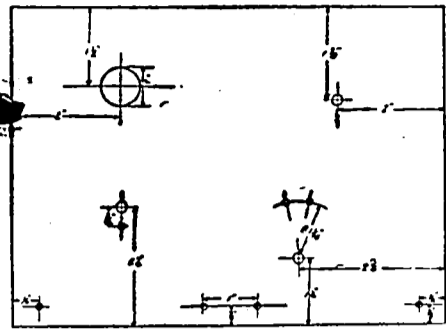


Figure 1

using amplification before detection, the logical method of increasing the range. When one realizes that an audio frequency amplifier can only amplify signals that have been detected, it becomes apparent immediately that the amplification signals that are too weak to affect the detector will result in an appreciable increase in range as well as intensity of received signals.

Types of Radio Amplifiers

There are several types of Radio frequency amplifiers at present in general use. The type employing an untuned transformer for coupling one stage to the next is perhaps the favorite. This is due probably to the simplicity of this method. But claims of manufacturers for this type of amplification must be considered carefully. Experiments have shown that the amplification obtained with each stage is comparatively small due to the fact that the condenser effect between the tube electrodes serves to shunt part of the Radio frequency currents away from the tube elements with a resultant loss in signal strength.

The use of resistance coupled Radio frequency amplifiers is limited to the longer waves. Below 1,000 meters this type of amplifier does not prove practical. On the other hand the tuned circuit type seems to possess none of these disadvantages. The main objection to a tuned amplifier is the necessity of adjusting another circuit, or as many circuits as stages of amplification used. This disadvantage is more apparent than real for the writer has handled two

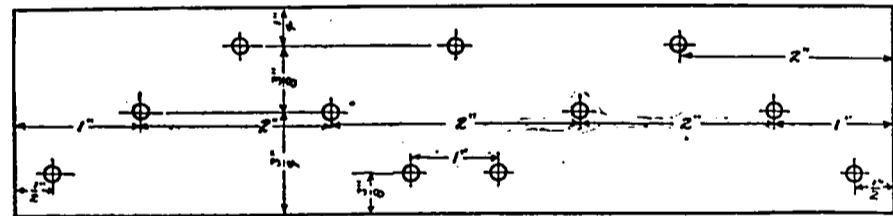


Figure 2

stages of tuned Radio amplification without any great difficulty. Of course they must be returned with each change in wave length, but in listening to concerts it is often unnecessary to make any adjustment for an hour at a time, and the extra work necessary is in reality no detriment to Radiophone reception.

Tuned Type Amplifier

With the above facts in mind the tuned type of amplifier was selected as the best to use in the Unisets in that it is easily constructed and gives the best results. The tuned circuit consists of an inductance, fixed or adjustable in steps, and a variable condenser. Inasmuch as a tube is always used with the amplifier, it was thought advisable to mount the tube and its controls with the amplifier controls to form one unit.

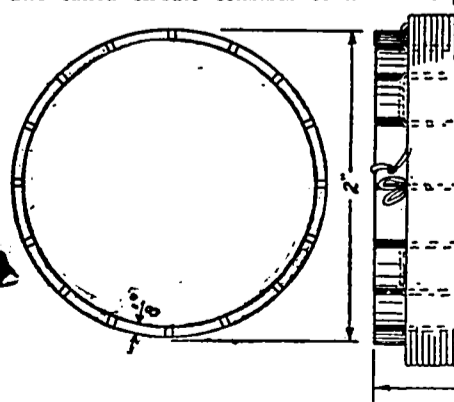


Figure 3

The inductance can now be mounted in the set and the internal connections completed as shown in figure 5. Any questions as to the arrangement will be answered by figure 4 which shows the top view of the unit. In the unit shown the coil is stood on end parallel to the terminal panel.

the coil again, and the third layer is then wound. This completes the inductance.

Mounting the Inductance

The inductance can now be mounted in the set and the internal connections completed as shown in figure 5. Any questions as to the arrangement will be answered by figure 4 which shows the top view of the unit. In the unit shown the coil is stood on end parallel to the terminal panel.

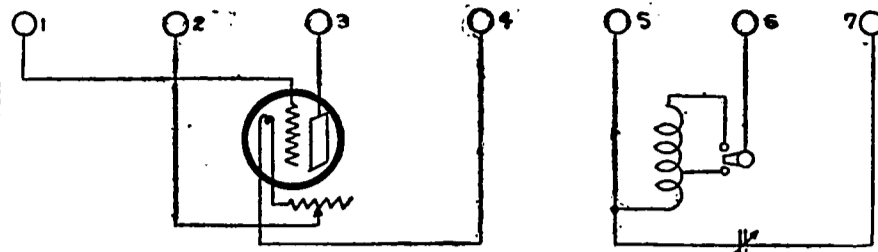


Figure 5

Should two stages be used it is advisable to mount the coil in the second unit at right angle to the panel to prevent feed-back effects. The wiring leads should be as short as possible and kept clear of one another to prevent capacity losses. The tube used in this set should be a hard tube in the detector socket. The amplifier unit can be attached to the

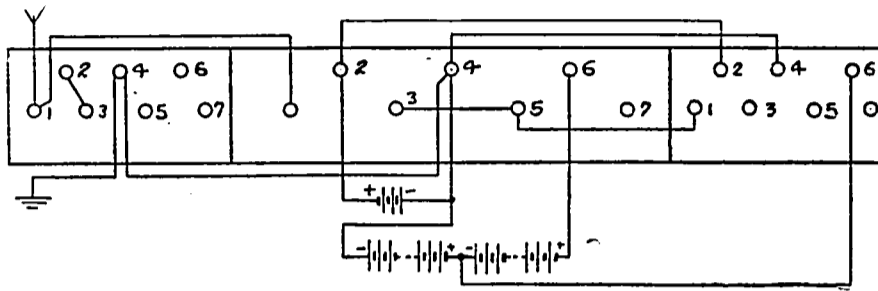


Figure 6

back effects. The wiring leads should be as short as possible and kept clear of one another to prevent capacity losses. The tube used in this set should be a hard tube in the detector socket. The amplifier unit can be attached to the

(Continued on page 12)

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Honeycomb Coil Winding Machine

Reciprocating Motion for Duolateral Coils

The illustration shows a simple home-made winding machine for making honeycomb coils. The whole is mounted on a base 12 inches long. The uprights for the

WORKSHOP KINKS? EARN A DOLLAR—

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

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

horizontal shaft are 6 inches long and 4 inches at the base, tapering to the top at 1½ inches wide. The lower spool for producing the reciprocal motion is shown at B. This is driven by a rubber band C. The crank pin is driven into the end of a half spool D. The sketch E shows how this movement is made, and its position on the main frame in F. Another half spool G is put on the end of the shaft H for turning it by hand. The crank is represented by I and the reciprocating lever at K. All dimensions are given. The wire is easily wound on the core regularly and evenly with this machine. —Frank Mirolli, Greensburg, Pa.

Windows for Vacuum Tubes

High class watchmakers put all watch movements in what is called a movement case. This case is a small box about one and one half inches in diameter, and is made of heavy material nickle plated with a good glass top and bottom. This glass is for the purpose of sealing the movement without exposing movement to dust. One of these movement cases makes an excellent "window" for a vacuum tube, or rather one case will make two windows, and make a nice appearance on panel. —Hallett B. Graeff, Los Angeles, Cal.

TO MAKE UNISETS

(Continued from page 11)

rest of the Uniset by links as described in connection with the other units. The wiring diagram shown in figure 6 is used in connecting it into the circuit.

Method of Handling the Unit

A little experimenting will teach one quickly how to handle the unit. The shorter waves will be amplified with the switch on the point on the left side, while for the longer waves the switch is placed on the point on the right side. To use the amplifier after having connected it according to the diagram, proceed as follows:

From previous experience it is possible to adjust the receiving set to approximately 360 meters and bring the tubes to their most sensitive state. Light the amplifier tube and with the switch on the point on the left side, turn the condenser dial slowly. The tuning is very sharp and the dial must be turned slowly or the signal may be missed. When music is heard adjust the condenser until signals are loudest. Then readjust tuner and the filaments of the various tubes until maximum signal strength is obtained.

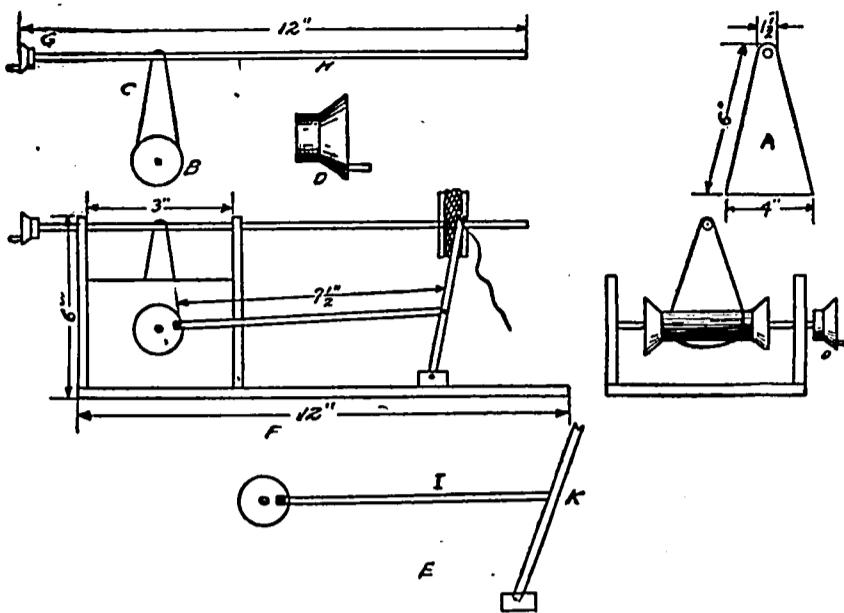
Results Obtained

One will be agreeably surprised with the results obtained with this device. After a little practice a second stage can be added with an increase in range of the set. The full efficiency of the Radio frequency and the audio frequency amplifier (previously described) units will not be obtained without the use of potentiometers to control the grid potentials of the tubes. The next installment will cover the details of a potentiometer panel that will greatly improve the operation of both types of amplifiers.

Those who have followed the evolution of the Uniset have now sufficient data to construct a high class, long range receiver piece by piece and still always have their set in operation. This enables one to build a set suitable for each individual need of range and power. A complete set consisting of two stages of Radio amplification, detector and two audio, comprising eight panels, will satisfy the most exacting, as to range, appearance, ease of operation and above all can be built at a very reasonable cost.

(Potentiometer Uniset Next Week.)

DIAGRAM OF MECHANISM

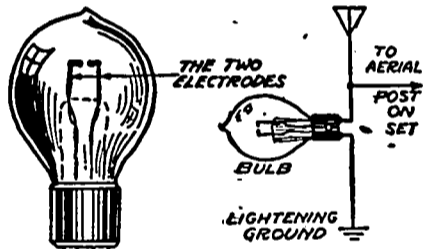


Recharging Dry Cells

Bore two holes in the top of the cell and on opposite sides ¼-inch in diameter and 3 inches deep. Fill these holes with cider vinegar or a 20 per cent solution of sulphuric acid and water, then plug up the holes with paraffin wax to prevent evaporation. A battery may be charged in this manner several times and it often doubles the life of the battery. —Dial Murphy, Neosho, Mo.

Vacuum Lightning Arrester

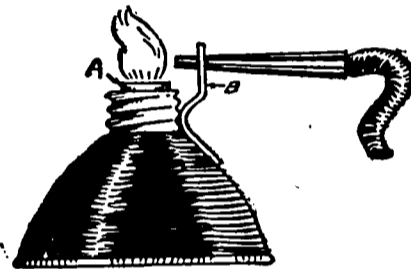
An electric bulb, such as is used on automobile headlights, will make a good lightning arrester. One that is burned



out and cast aside is just the kind to use. The electrodes to which the filament was attached will be separated about ¼-inch. This bulb is connected to the set as shown in the illustration. —H. Gordon Gwinn, Anderson, Ind.

Oil Can Makes Soldering Torch

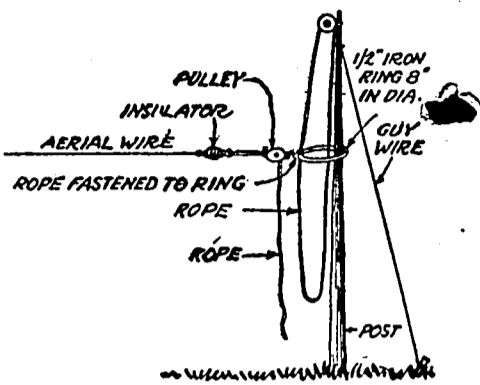
An inexpensive soldering torch can be made from a small size oil can. The spout



of the can is filed off at the base A and a wick inserted. The spout is used for the blower. It is attached to the can with a bracket as at B. —Russell Decker, West Branch, Mich.

Aerial Wires Hoisted Like a Flag on Pole

The illustration shows a method of making a connection to a post or mast so that an aerial may be raised or lowered. This



arrangement is very convenient when it becomes necessary to make repairs, especially so if you have an aerial placed 40 feet or more in height. —M. J. Gebhardt, Howard Lake, Minn.

Finding Ground in Condenser

When a variable condenser goes short due to plates striking each other it is usually difficult to locate. To find the striking plates proceed as follows: Connect about four dry cells in series with the condenser. Rotate the knob on the condenser slowly and watch the plates. You will detect sparks where the plates rub together. Run a knife blade between the striking plates to separate them. —F. E. Hotchkiss, Estherville, Iowa.

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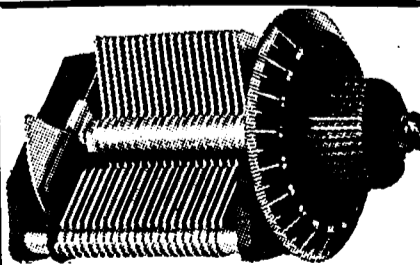
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Flewelling Super-Regenerative Amplifier Panel

A Two Stage Audio Frequency Amplifier

By H. J. Marx

CONTINUING the panel description that was given in the last issue of RADIO DIGEST, the addition of a two stage audio frequency amplifier is described and further details are given on the first panel. The possibility of a Radio frequency amplifier is being taken up at the present time and experiments are being conducted in order to find out whether such additional stages are practical and whether results warrant the addition. While it is a simple matter to draw up Radio frequency stages on the basis of theory, still the actual operation does not necessarily come up to that desired at all times. Although a longer time will be required, yet when results are published the fan can feel satisfied that performance will come up to expectations if the directions are carefully and conscientiously carried out. Ninety-five per cent of the letters received on the Flewelling circuit praise the wonderful reception possible by means of this receiver; whereas, but five per cent complain of poor reception. Of this five per cent, the best part of the trouble apparently is caused by lack of sufficient knowledge of receiving sets, or poor workmanship and carelessness in assembly of the apparatus.

Description of Apparatus

The parts in the panel diagram are numbered for identification. The transformers, No. 1, are any of the commercial type of transformers with a ratio winding of about four to one. The higher ratios are apt to add considerable difficulty in tuning the unit, in addition to increasing the howling tendency.

The vacuum tubes, No. 2, are amplifiers and can be of the Radiotron, Cunningham, Myers, V T-2 or WD-11 type. Two of the average commercial type of filament rheostats are required. The variable leak, No. 4, is shunted across the primary of the audio frequency transformer and should have a resistance range of one-tenth to two megohms. It is impossible to state the best value to be used as it varies considerably with the characteristics of the individual hook-ups. After this resistance is once determined, it can remain fixed and requires no further adjustment.

Binding Post Connections

Eight binding posts are shown in the diagram. The two on the left are for the input connections and should line up with the phone binding posts on the right side of the first panel illustrated on this page of the last issue. The two on the right side of the amplifier panel are the phone connections. The four binding posts at the base are for the A and B battery connections. One of the two in the center can be eliminated as the A+ and B- terminals of the batteries are connected together.

It has been found that although the same filament or A battery can be used for both panels, satisfactory reception with audio frequency amplification requires a separate one hundred-volt B battery for amplifying stages. For this reason the primary of the second transformer and the plate circuit of the last tube running through the phones are both connected to this extra one hundred-volt plate battery.

Transformer Notations

It will be noticed that one terminal of each of the secondary windings of the transformers is connected to the grid of a vacuum tube, and the other side to the positive A battery circuit. In the last number attention was called to the fact that when the primary of the transformer is substituted for the head phones, the detector circuit is unbalanced and the grid leak, No. 8, in that circuit requires readjustment. The insertion of the variable leak, No. 4, across the primary of the first audio frequency amplifying transformer helps balance this condition and reduces considerably the necessary readjustment of the detector circuit.

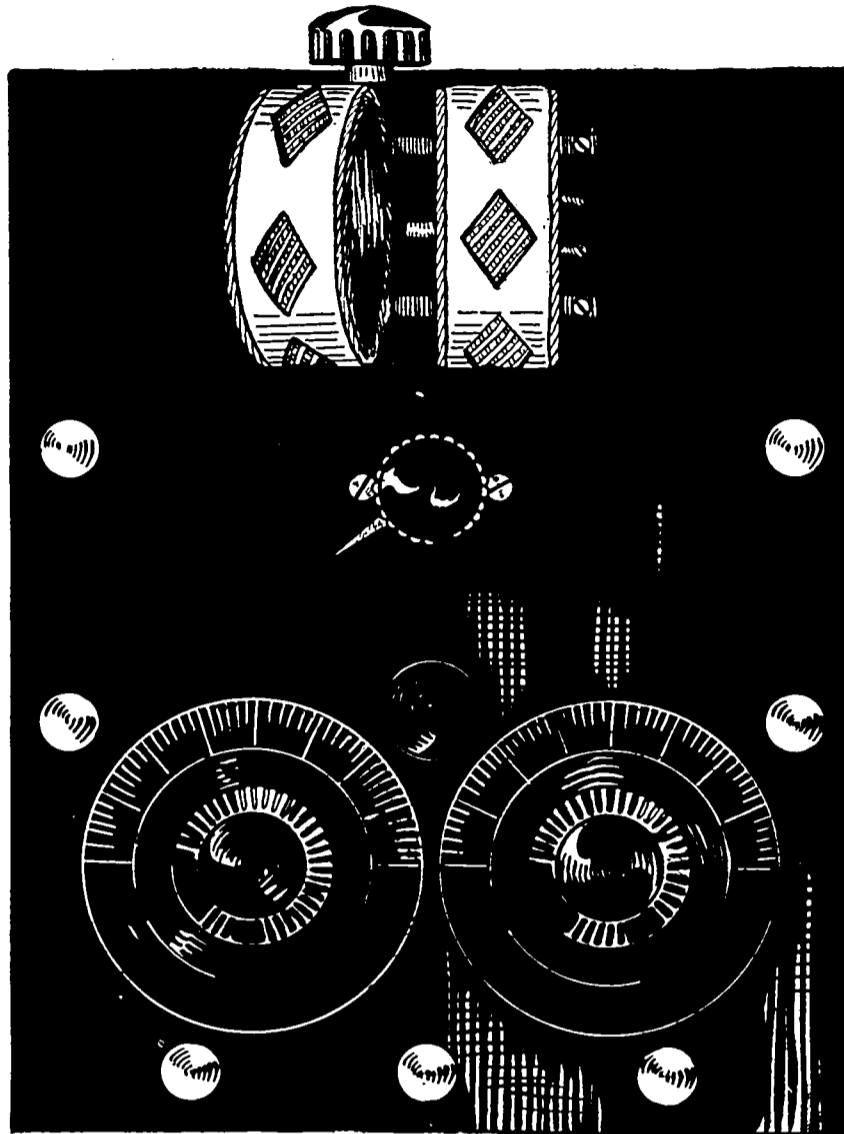
Tuning Operation

Before attempting to use the amplifying stages, the amateur should become thoroughly acquainted with the operation of tuning of the first unit, as the addition of amplifying stages increases the necessary critical adjustments. When the audio frequency unit is connected to the first unit and the phones connected to the binding post on the right side, it will be found that the set is especially noisy and has a decided whistling.

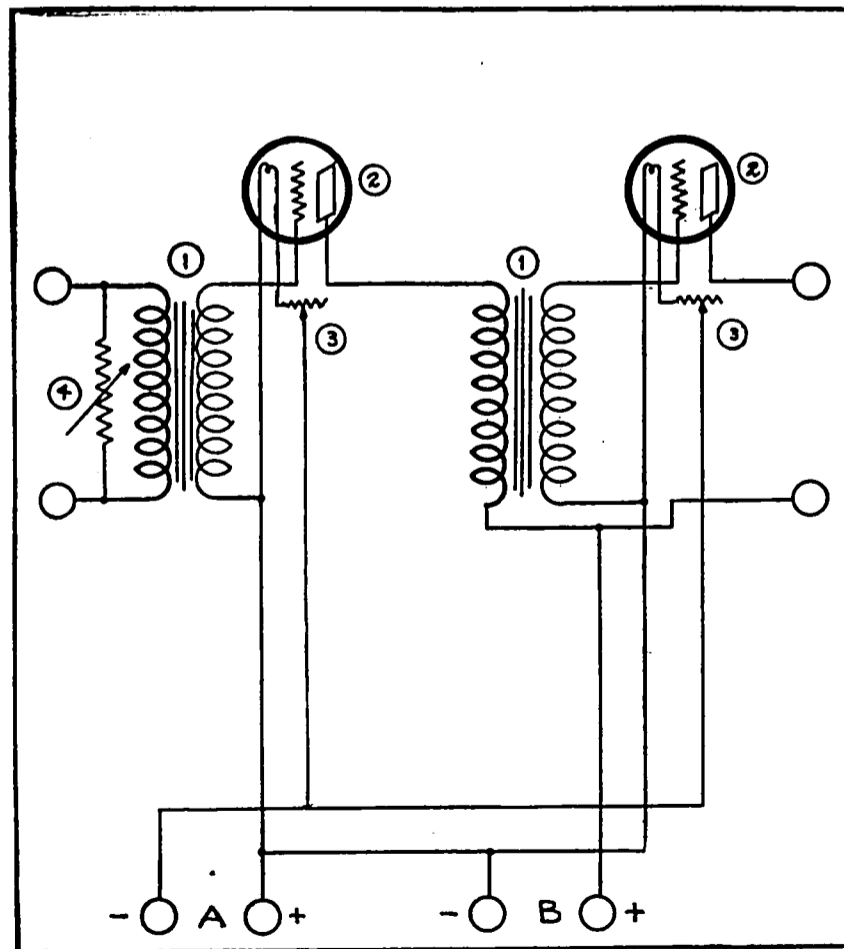
This noisy tendency is first reduced by means of the variable leak across the primary of the transformer until the point of minimum noise is found. Note that the adjustment is merely to reduce the noise to a minimum, as further elimination of the whistling must be accomplished through the detector circuit readjustment. Even then, entire elimination of the whistling requires a filter.

Grid Controls Whistle

The whistling is controlled by readjustment of the grid leak, No. 8. The resistance must be decreased slightly. If the pencil type of variable grid leak is used, additional pencil lines must be added to provide a larger path for leakage, thus decreasing the resistance. This must be



continued until the whistle is reduced to a minimum. It will be found rather difficult to entirely eliminate it, but will not prove troublesome after the grid leak has been adjusted for best results. No change of adjustment is required on the bank of



LIST OF PARTS USED

Numbers According to Diagram

- 1 and 2—Audio frequency transformer— 4—Variable leak with a resistance from 0.1 to 2.0 megohms.
- 2—Amplifier vacuum tubes with Eight Binding posts.
- 3—Filament rheostats. One bakelite (or equivalent) panel.

three condensers and the leak across them. It is advisable to keep the headset with the receiver caps on the face beside the ears, as the howling noise, until properly readjusted, is so considerable as to become decidedly unpleasant. A sudden elimination of all tube noises in the receivers may indicate a burned out transformer or phone.

Tuning Best of Circuit

The tuning of the condensers and coil coupling is a simple matter after the grid leak adjustments have been made. The condenser, No. 4, should first be set for full capacity, and the coupling between honeycomb coils at an angle of about fifteen degrees. The condenser, No. 3, is then adjusted for the critical wave length point. The detector rheostat can then be set for the best point of operation for that tube. The regeneration should then be readjusted by alteration of the honeycomb coil coupling, for maximum amplification. The rheostats of the amplifying tubes should then be reset for maximum results.

Two stages of audio frequency amplification should give at least twice the usual volume given by the average regenerative set. Although either an antenna or ground connection is made, both are by no means necessary.

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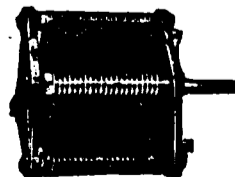
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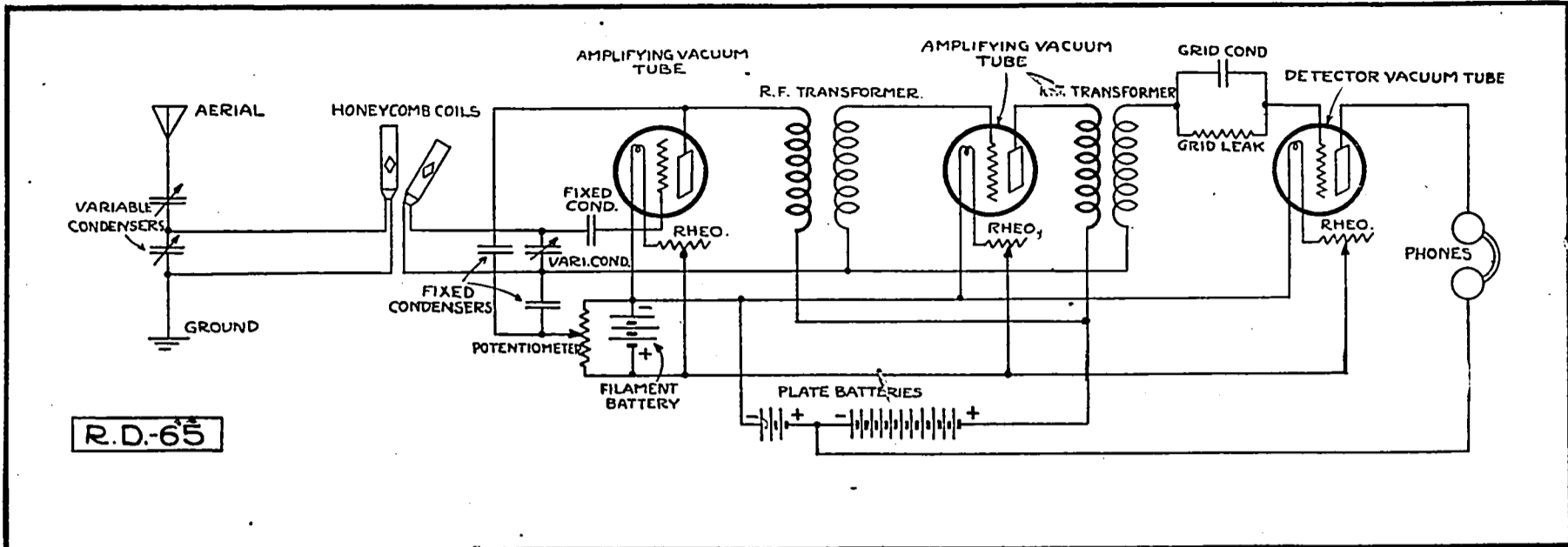
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SELECTIVE LONG DISTANCE RECEIVER



This hook-up will be especially interesting to the amateur who desires a very selective long distance receiver. The adjustments are not as difficult as are usually found in apparatus of this type. The circuit is designed for long distance reception with an outdoor aerial. Audio frequency amplification can be added if the amateur feels so inclined. The hook-up calls for outdoor aerial construction. If a loop is to be used, the honeycomb coils and the primary condensers are eliminated and the loop connections are substituted in the place of the second-

ary coil leads. The two variable condensers in the primary circuit are both of the 43-plate type. The lower condenser is shunted across the primary honeycomb coil and gives an accurate control of wave length. The upper series condenser can be omitted if the antenna length is not very great. Its principle function is to reduce the natural wave length of the antenna circuit in cases where a long antenna or an over size honeycomb coil is used. The primary honeycomb coil can be of either the 25 or 35-turn size. The secondary

should be a 50-turn coil and an adjustable mounting should be used so that control of coupling is possible. The fixed condenser in the grid circuit of the first tube has a capacity of .00025 mfd. The fixed condenser connected between the potentiometer and the plate circuit of the first tube should have a capacity of about .0005 mfd. This, however, may be of a variable type to permit closer adjustments for maximum results. The potentiometer across the filament battery is of the usual 400-ohm type. Three vacuum tubes are used, two of

which are of the hard or amplifying type, while the other is a soft or detector tube. Two Radio frequency transformers are necessary. Each tube is equipped with a rheostat filament control. The grid condenser on the detector tube has a capacity of .00025 mfd. and the leak has resistance of .5 to 1 megohm. The plate batteries consist of a 22½ and 45-volt unit both connected in series, with the plate circuit of the detector tube tapped in after the first 22½-volt battery.

Wave Trap in the Antenna Line Reduces Interference

By J. C. Callanan

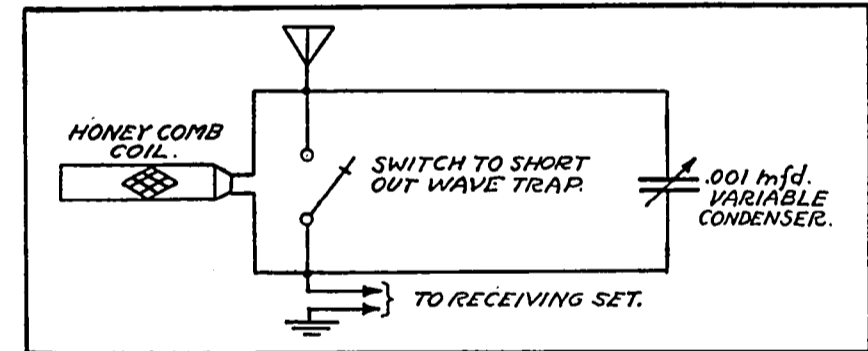
The annoyance of listening in on a conglomerated mess of signals is worthy of attention looking forward toward its reduction, if not its elimination. Curiously enough, although a device for this purpose is not new, it is not in general use among amateur stations, although

opposite to all other tuners in that the signal vanishes at one setting but is audible at all others.

Retune for Desired Station

As the tuning of the wave trap changes the wave length of antenna circuit, slight retuning of the primary is necessary after having eliminated the interfering station in order to bring in the desired station satisfactorily.

Having once adjusted the trap, it is in no wise affected by the tuning of the re-



It is a highly desirable accessory to the average receiving set. The introduction of a wave trap in the antenna circuit will accomplish in most cases the elimination of interference experienced in congested Radio communities where wave lengths differ, more or less, from the listening wave. It is a simple contrivance consisting essentially of an inductance and capacity placed in parallel.

Wave Trap Construction

In the construction of the wave trap in mind the writer prefers to use as inductance honeycomb coils, because of their compactness, simplicity of mounting and fairly low distributed capacity. These coils should be five in number, 25, 35, 50, 75 and 100 turns respectively. The capacity used (see illustration) is a .001, 43-plate variable condenser of standard construction. The trap may be placed in a small separate unit (not in the panel with the rest of the set as there will be appreciable coupling between its inductance and that of the tuner). The antenna lead can be run through the trap before entering the receiving set, shunting the trap with a switch to short it out when not in use.

How to Operate

In explanation of its operation, the interchangeable honeycomb coils are plugged into unit as follows:

The 25 or 35-turn coil eliminates stations using amateur wave lengths. The 50 or 75-turn coil and 75 or 100-turn coil cuts out government wave lengths. The coil to be used in each case depends upon the wave length of interfering station and is best determined by trial of the several designated.

Thus it appears that the tuning of the trap is very simple. If, when listening in on 360 meters, a 200-meter wave length station interferes, plug in a 25 or 35-turn coil and open the switch. The tuning is

ceiver, and a station once cut out will not interfere so long as the trap adjustment remains unchanged.

It is also quite practical to use two or more wave trap units in series for the elimination of more than one interfering station at the same time.

In erecting an aerial mast be sure to put an insulator in each guy wire.

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Crystal Scrapings

While experimenting with a galena crystal detector I scraped the surface of the mounted crystal to make a new sensitive spot, but I neglected to remove the scrapings from the crystal. Upon readjusting the cat whisker I was surprised to find that the detector was in adjustment, no matter on what part of the crystal the cat whisker was placed. Thinking that this was caused by the scrapings, I made a small pile of them on top of the crystal and plunged the cat whisker into the center of the pile. The strength of the signals and the ease of adjustment amazed me. I am sure this method will greatly aid anyone not possessing a test buzzer and battery, but desiring the fine adjustment which they afford.—A. A. Walter, Peoria, Ill.

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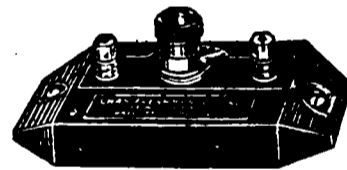
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Questions and Answers

Wants Super-Regeneration
(1163) DWS, Memphis, Tenn.
Would like to try super-regeneration. Do I have to discard my variocoupler and variometers and buy honeycomb coils? Is there any way I can avoid spending more money? I have never seen a diagram of this circuit without honeycomb coils.

A Cunningham amplifier tube I use with my set refuses to work if I put more than sixteen volts on the plate. Music distorts when I use thirty volts, and with forty-five volts I can barely hear signals, although there is no distortion at this voltage. Can I correct this?

A.—Answering your inquiry with reference to super-regenerative receiver, no honeycomb or coils with an equivalent inductance are required. The high value coils will need to be bought or else wound by yourself. It is easier to buy the coils with the proper value, rather than attempt to adjust the coil values, if you make them.

The action of amplifying tube as described by you indicates a defective tube. You should take the matter up with your dealer and have tube tested and proven or replaced.

Variable Condenser

(1164) BHS, Bristol, Conn.
Permit me to take advantage of your question department. I have a Radio set but can not get anything steady but code. All the concerts come in now and then. I have the following:

Tube detector, three-slide tuning coil, A and B Batteries. See enclosed hook-up. I have no variable condenser. Would one help? Please give me a wiring plan for connecting up the winding of a vario-

coupler. Is it like a loose coupler?
A.—A variable condenser shunted between the antenna and grid will undoubtedly give you desired results as it will afford much closer tuning. An 11-plate condenser will be the proper size. A variocoupler is connected the same as a loose coupler.

Microphone

(1177) WPH, Cairo, Ill.
On the 7th page of your September 9th issue you furnish a description of a loud speaker, same being furnished by H. Bank, Philadelphia, Pa. Will you kindly give me further particulars about the microphone, advising how same is made, that is material, etc.?

A.—The microphone consists essentially of two carbon discs in container and separated by a quantity of small carbon balls. Although very simple in construction, the cost of instrument is nominal and hardly justifies home manufacture.

Business Set Installation

(1168), SL, Marshall, Texas
We are building set by a diagram given by Harry J. Marx in RADIO DIGEST ILLUSTRATED, August 26th, 1922, page 14, using variocoupler, variometer tuning unit described, and would like to ask several questions concerning this set.

1. Give simple directions for tuning, adjusting amplifying units, etc. The writer is not familiar with anything but simple single variocoupler tuner and detector.
2. The variocoupler I have is tapped on the secondary side. Should this be connected to the aerial side?
3. Is 43-plate, .001 mfd. variable condenser suitable for this set?

4. What is the receiving range (miles) of this set?
5. What length aerial is best for this set?
6. Should I add another stage of amplification to use Magnavox loud speaker? Radio or audio?

We are installing this set for public benefit as a business stimulant. The writer is well versed on all electrical lines except Radio, and any suggestions you can make will be highly appreciated.

A.—1. Page 14 of August 19th issue shows a diagram of panel units which will be helpful to you. The best rule for tuning is to understand in a general way what each control does. This knowledge, with the experience which follows, will give you the ability to use the controls systematically.

2. The tapped winding of variocoupler is always connected to the aerial side.
3. We would advise the use of a 23-plate variable condenser in preference to a 43-plate as you suggest.
4. Your receiving range should be approximately eight hundred miles.
5. The best construction for aerial consists of two wires, each one hundred and fifty feet in length, including lead-in.
6. It will be necessary to use amplification in order to have a loud speaker. We would advise audio frequency.

Variocoupler Windings

(1156) ERW, Lufkin, Texas.
1. Which variocoupler is the most efficient for reception on 360 meters; one with 56 turns on primary (No. 22 wire), or one with 80 turns on primary (No. 22 wire), and 44 turns on secondary (No. 22 wire)?

2. How many turns and what size wire should be used in winding the tuner used in the enclosed hook-up, using variocoupler parts, primary 3 1/4 inches in diameter and tickler rotor 3 1/4 inches in diameter? What capacity condenser should be used in primary circuit? Should variable condenser be in antenna lead or as shown in dotted lines, for best results?

3. To which end of antenna should lead-in be connected?
A.—1. The variocoupler consisting of fifty-six turns of No. 22 wire on primary and fifty-six turns of No. 26 wire on secondary is best adapted to receive 360-meter wave lengths.

2. For tuner in circuit you submit, you should have about sixty turns of No. 22 wire. Use .001 variable condenser in the primary circuit. This condenser should be in the antenna lead.

3. Lead-in should be taken off the end nearest receiving station. A slight directional effect may be obtained by constructing the antenna in line with direction toward broadcasting station, although it is hardly noticeable.

Best Receiving Set

(1173), EDF, Chicago, Ill.
Which is the best in a receiving set, one Radio transformer and two audio transformers or three audio? Please inform at once. Also what transformers are the best?

A.—If you can make the three audio transformers work without excessive howling they will afford you the best results. This can be accomplished only with the best of material and construction. In any other case would advise one Radio and two audio transformers. Any standard nationally advertised make is suitable.

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Angelo Minghetti as Rudolph in "La Boheme." This opera, so far this season, has not been broadcast. Minghetti, besides being a famous singer, is a talented sculptor and ex-soldier in the World War
Moffett Photo

Claudia Muzio (above) is a talented Italian soprano with the Chicago Opera Company. Miss Muzio is dividing her time this season between the Chicago and Metropolitan companies. One of her triumphs is in "Tosca"
Mishkin Photo

Ina Bourskaya (left) in the title role of "Carmen." Listeners in to KYW have heard her two times in "The Snow Maiden" and once in "Aida"
Moffett Photo

Anna Ludmila (right) and Amata Grassi (left) in "Aida" ballet. Miss Ludmila is Premiere Danseuse. "Aida" opened the other opera season
Chicago Opera Photo