New Two-Tube Reflex Crystal Neutrodyne Set; 58 Advance Programs; A-B-C Lessons for Radio Beginners; How to Operate and Locate Troubles

Radio Digest

EVERY WEEK Illustrated PROGRAMS TEN CENTS

REG. U. S. PAT. OFF. & DOM. OF CANADA

Vol. VIII SATURDAY, APRIL 5, 1924 No. 13

SIMPLIFIES "SUPER-HET"

POPE PIUS TUNES IN HIS GIFT SET

AERIAL POLE RIGGED ON TOP OF VATICAN

Pontiff, Now Able to Keep in Closer Touch with World, Enjoys Broadcast Reception

LONDON.—Pope Pius has joined the great crowd of listeners in. A British Radio firm has presented him with a Radio receiving set and the recent rearing of a slender aerial pole on top of the Vatican has become a striking sign of changing times.

The Pontiff blessed the installation after appropriate ceremonies and then heard the first call from London. Cardinal Gasparri, Papal Secretary of State, and several domestic prelates were present.

Pope Pius has expressed great pleasure over the gift, which has put him in touch with the entire world without an intermediary. The importance of the installation is enhanced by the fact that though the Pontiff enjoys diplomatic immunity like every other sovereign, his mails and cables must pass through Rome's central offices. From Saturday on, however, he can dispense with these when he desires.

One of the grievances which all pontiffs from Pope Pius XI down have had against separation laws is that the Vatican has been unable to communicate with the outer world directly. This objection is now partially removed.

WPAL Received in Argentine

COLUMBUS, O.—WPAL, Superior Radio Company, here, has been received with absolute clearness at Tunuyan, Argentine Republic, 6000 miles away.

ARMSTRONG BRINGS OUT NEW SCHEME

Does Away with at Least One Tube on "Rolls Royce" Receiving Set

Tells of Second Harmonic

Novel Idea Unfolded Before I.R.E. May Make Set Within Reach of All Fans

NEW YORK.—Elimination of one tube from the well-known super-heterodyne receiver by its inventor, E. H. Armstroug, is hailed with delight and import by Radio engineers.

At the recent meeting here of the Institute of Radio Engineers, the man who once owned the regenerative receiver patent, showed technicians he still had several trieks to perform when he, by what is known as the "second harmonic," caused the first detector tube to "double" for the oscillator tube.

The secret of Mr. Armstrong's improvement lies in the second harmonic, a mysterious term which will be explained. But to the practical mind the improvement has but one meaning. One less tube! Inasmuch as the "super-het" usually de-

(Continued on page 7)

When Station WJAX, Union Trust Co., Cleveland, inaugurated their series of morning half-hours for women, they were fortunate in having the series opened with a talk on "Art in the Home," by Miss Elaine Ivans (left), the winsome "Rosemary" of the "Abie's Irish Rose" company." "Abie" can hardly be blamed for loving his "Rosemary" if she looked anything like Miss Ivans. Ethel Bell (above), singer of popular classics, recently sang at Station WOR, Newark. Miss Bell appeared on the same program with Jimmy Clark and his White Way Entertainers. Mrs. Samuel Payne Reed (right), who recently gave a violin and soprano concert from KPO

A. T. & T. IN OPEN FOR FIRST TIME

OFFERS TO LICENSE ANY PLANT FOR A FEE

Even WHN Would Get a Permit—W. E. Harkness Frankly Names the Prices

NEW YORK.—The American Telephone and Telegraph company has backed down, partly at least. At a recent meeting held here under the auspices of the Radio Trade association to clarify the broadcasting situation, officials of the A. T. & T. made some frank promises and admissions, which halt for the time being any attempt at establishing a broadcasting monopoly.

W. E. Harkness, vice president of the A. T. & T. company said that the company he represented would license any broadcasting station that applied for one. In reply to a question as to whether he would license Station WHN, he answered, "Yes."

Harkness Gives Figures

At the meeting figures on the cost of patent "licenses" were disclosed by Mr. Harkness.

"The license fees are from $1 for a recognized educational institution to $2,000 for 500-watt stations operated by commercial concerns or others for their own benefit," he said. "The licenses are for the entire life of the patents.

"The patents referred to are eighteen controlled by the A. T. & T. and the De Forest companies, both parties in suit now pending against Station WHN for alleged infringement.

The statement made by Mr. Harkness, providing it is carried out, assures the American Radio public that any person or organization which has received a license from the Department of Commerce to operate a broadcasting station, can operate the station under the patents of the A. T. & T. on payment of a single fixed sum.

A. T. & T. in Open First Time

This is the first frank and definite statement from the A. T. & T. saying that any independent owners could obtain a license, or stating the price of such a license.

To the question asked by Charles Pope Caldwell, attorney for Station WHN in the suit, as to whether the A. T. & T. would license any station over 500 watts, inasmuch as Station WEAF itself was 1000 watts, Mr. Harkness replied, "Our station, WEAF, is not an argument. There never has been a set built like the set we have. It was done for experimental purposes and it cost us a lot of money. This station operates, moreover, on a special license from the Department of Commerce whose terms can only be met by concerns which have a large staff of engineers and complicated equipment. If any of you men, however, want a five-kilowatt set you can have it—if you are willing to pay for it. And it will cost you a pretty penny. It has cost us that."

Henry M. Shaw, president of the Radio Trade association, said: "There will be no monopoly in broadcasting, because the public will not stand for it."

"KING TELEPHONE" IN MORE TROUBLE

Church, Radio Trade Association, Newspapers, Shoulder Arms in Control War

NEW YORK.—Aroused by the suit against WHN, many new and important interests have joined the fight against the now plain attempt of the American Telephone and Telegraph company to control the air.

Mr. Henry M. Shaw, president of the Radio Trade association here, has announced his organization as opposed to any such control of broadcasting as the phone company desires. Rev. Charles Francis Potter, representing the Church, is up in arms because advised by the Bell company that if he erected a station of his own he would be infringing its patents. Secretary of Commerce Hoover announces that there shall be no monopoly of the air. Newspapers countrywide are taking up arms against "King Telephone."

Previously lined up against the phone company were the City of New York, Station WHN and the North American company. The public's contempt for A. T. & T. tactics had already been aroused by the poorly disguised attempt of WEAF to get contributions to its programs through the creation of the so-called Radio Music fund. Altogether, the American Telephone and Telegraph company could not have better aroused universal condemnation and hatred of its actions if it had deliberately set out to do so.

Vacuum Tube in Movies

TULSA.—The Radio exhibition recently held here under auspices of the Technical Club of Oklahoma featured a motion picture depicting the operation of a vacuum tube.

PLENTY FROM TOLLS OF 'KING TELEPHONE'

NEW YORK.—Whether or not Station WEAF, "King Telephone," will go to the poorhouse in its attempt to "get while the getting's good," may best be judged by the public themselves who are for the first time privileged to view the income from one week's series of revenue producing programs, a tabulation not released by the A. T. & T. Co., but coldly calculated by forces opposing the attempted monopoly.

The paid schedule for March 18 to 24, inclusive, yielded an income of $3,400 from other advertisers as follows:

March 18: P. M.	
7:50- 8:00—N. Y. Journal	$100
8:10- 8:20—Reid Ice Cream Co...	100
8:30- 9:00—Brooklyn Daily Eagle.	200
9:00-10:00—National Carbon Co..	400
March 20: P. M.	
8:00- 8:10—Harowitz Bros.	100
9:00- 9:10—Bank of America	100
9:45-10:15—National Carbon Co...	200
10:30-11:00—National Carbon Co...	200
March 21: P. M.	
7:50- 8:00—National Carbon Co...	100
8:00- 8:30—United Candy Co.	200
8:30- 9:00—LaSalle Exten. Inst..	200
9:00-10:00—Astor Coffee Co.	400
March 22: P. M.	
8:30- 8:40—The Curtis Co.	100
9:00-10:00—American Chicle Co..	400
March 24: P. M.	
8:00- 8:10—Lawyers Mortgage Co.	100
8:30- 8:40—Sales Literature, Inc.	100
9:30-10:30—Atlantic & Pacific Tea.	400
Total	$3,400

A movement has been started to organize a "Radio Listeners' Protective Association" with headquarters in Baltimore, Md.

Critics Rap Class "D" License Plan

Requirements Make Permits Available Only to Large Manufacturing Interests

WASHINGTON, D. C.—Recent criticism, especially since the hearings on the White Radio bill, of the granting of Class D licenses by the Secretary of Commerce, has been severe.

The explanation bas been made by officials of the department that there is nothing unusual in the granting of these licenses. They say the licenses are granted for short periods of time and will be given anyone meeting the requirements. Up to this time licenses under this class have only been granted to Stations KDKA, WGY and WEAF, controlled by large manufacturing interests, members of the Radio Corporation of America.

The requirements, however, are such as to make D licenses unavailable except to large Radio interests.

Chamber of Commerce at Birmingham Wants Plant

BIRMINGHAM, ALA.—The Chamber of Commerce here may be the first similar organization in the United States operating a big Radio station, if their present plans go through.

According to Secretary O. L. Bunn the chamber is negotiating with the Alabama Power company for the purchase of WSY. Secretary Bunn explained that the commerce body would have the funds June 1 with which to purchase WSY.

"In the event we get the station we will make it one of the largest and finest in the United States," said the secretary. "The advertising benefit to Birmingham and to Alabama would be inealculable."

RADIO TREATMENT RESTORES HEARING

DOCTORS USE AIRWAVES AS DEAFNESS CURE

Youth, Born Deaf, Puts on Headphones and Hears with Both Ears

CHICAGO.—It is believed by many physicians here that Radio eventually may cure partial deafness. A number of cases have already been cited as proof conclusive substantiating this claim.

The cure is effected by the intensely amplified sound waves which pass along the auditory nerves from the head phones, massaging the nerves and stimulating them to the extent that hearing is restored.

One case is reported of a man who two years ago, was totally deaf in his left ear. Now, after constant treatments by Radio, he declares he can hear a whisper across the room.

Deaf at Birth; Now Hears

Another, a young man twenty-two years of age, deaf and dumb at birth, placed the head phones on his ears for the first time. He wrote on a piece of paper that he was receiving music through his left ear, no sound being audible in his right.

Thinking perhaps that the organs of the right ear were in such condition that he would be unable to receive any sound into it, the phone was removed from the right ear and placed over his heart. After doing this the young man was able to distinguish the applause after a concert.

Later the phone was replaced to the right ear, and the young man discovered after listening for one hour that he was able to hear with both ears equally well.

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Looking Ahead

"What's Wrong With Your Receiving Set?"—the instructive series by Peter J. M. Clute—will tell you all the mysteries of tuned Radio frequency amplifiers next week, and the difficulties often attending the operation of such devices will be explained so that the troubles can be remedied. Four new circuits are to be shown.

What Do Radio Inductances Do?—Magnetic fields, coupling, capacity effects in coils, types of coils used in Radio, variometers, variocouplers and load coils, are to be told about next week by P. E. Edleman in his easily understandable style. How do you like "Thirty-Minute A-B-C Lessons for Radio Beginners"? Plain enough?

"Straightening Out the Reradiation Problem," a two-part article by Ralph R. Bacher, engineer for one of the finest set manufacturers, will be started next week. He will show you the finished product, made by his company, but will also tell you exactly how to proceed to make your own reradiation preventer, and thus gain the love of your neighbors again.

A New Two-Tube Circuit is promised for next issue by H. J. Marx. Its advantages are simplicity of operation and plenty of volume and distance. It's easy to make, too.

R. D.-120 for the Hook-Up Hounds has a nice new coil specified that builders of this circuit will have to wind themselves. But it's worth winding for the results.

TIME, DISTANCE OF AIRWAVES MEASURED

DOT TRAVELS 8,500 MILES IN .046 SECONDS

Message Sent from Washington to Warsaw, Answer Received in Three Minutes

WASHINGTON. — Some well-informed Radio engineers and many blasé Radiophans were electrified and even astounded to observe the Radio time and speed experiments of Captain R. H. Ranger, conducted a few days ago at the Cosmos Club here.

He not only transmitted a Radio message 4,250 miles to Warsaw, Poland, and got a reply in approximately three minutes, but he measured the time required for a single Radio impulse to make the round trip as .046 seconds. The latter experiment was to show that contrary to a popular conception, Radio is not instantaneous.

"The fact that a Radio impulse travelling over a given distance, negotiates this space in a definite and fixed time, may set a new standard against which time and distance may be measured, giving a degree of accuracy and reliability surpassing even the accepted methods of astronomical observations," Captain Ranger declared.

What Experiments Mean

"What does he mean?" some of the uninitiated immediately inquired. He meant that since it takes appreciable and measurable time for a Radio signal (a dot in this instance) to travel a given distance, we have a new standard measuring instrument which will remain the same for centuries, and, with continued use, our ability to measure even small lapses of time will increase. Practical applications include aids to the mariner, until recently dependent upon dead reckoning when the sun was invisible and Radio beacons were not available.

"Radio," Captain Ranger said "will be the answer to civilization's demand for greater accuracy." Already this system makes it possible to check the accuracy of automatic relays and in the future we may expect more useful applications.

For example, to check time differences between two distant points. With a globe-encircling chain of powerful stations, the world time could be carefully calibrated. The Radio "dot" can eventually be made to act as a very accurate check on longitude determinations.

Checks Difference in Longitude

By way of explanation, Captain Ranger said: "Suppose clocks at Warsaw and New York are geared accurately to the sun's time at each locality. Then transmit Warsaw's sun time to New York. The difference in the two clocks, in New York, gives the portion of the day or revolution of the world between the two, which is the difference in the longitude.

"With the present advances in Radio, the least accurate part of such measurements comes in the solar observations, but in spite of this, accuracies below fifteen feet in the 4250 miles covered, are in order." When the round-the-world Radio "robin" has checked the speed of Radio waves to the final degree, Radio alone will give the actual distances between any two points, according to this engineer.

Concerning the possibility of communicating with Mars, the Captain was skeptical, due to the fact that the earth's envelope acts as an impervious electric mirror and reflects Radio waves to the earth. This "heavyside" layer, he explained, would tend to deflect any signals emanating from Mars.

Rotary Uses Radio Sets to Bring Joy to Shut-ins

DALLAS, TEX.—"Bringing Sunshine to the Shut-In," is the slogan of the Radio shut-in committee of the Dallas Rotary Club. It was announced recently that an appeal for funds to buy a receiving set for the home of every shut-in in Dallas county, was under way.

LAW FAILS TO BLOCK "WHISTLING NOISES"

CHICAGO,—Present regulations of the Department of Commerce prevant legal restriction of Radio interference by improperly operated regenerative receivers, according to E. A. Beane, ninth district Radio supervisor. Mr. Beane said recently that within the past two weeks he has received hundreds of letters and telephone calls from Radiophans complaining of the whistling noises produced by regenerative sets without proper coupling adjustments.

PRISONERS TAKE "U" COURSE IN AIRWAVES

STATE COLLEGE, PA. — Several Radiophan prisoners at Rockview penitentiary, Center county, have enrolled in the Radio correspondence course of Pennsylvania State College. They are permitted the use of the prison receiving set for experimental work in connection with the studies. Instructors in college extension work visit the prison twice a week to conduct classes and report much interest in Radio engineering among the prisoners enrolled.

APPEALS FOR GREEK ORPHANS

Mme. M. Fsamados, wife of the Greek Charge d' Affaires in Washington, recently made an appeal over Station WRC, Washington, D. C., for the suffering orphans of Greece. In addition to the appeal, Mme. Fsamados, who is a talented singer, charmed the thousands of unseen listeners with a program of Greek folk songs. United Photo

200 in Two Hours Answer WAAW's Radio for Slogan

OMAHA.—More than 200 telegrams were received within two hours by the Station WAAW, Omaha Grain Exchange, recently after a message had been broadcast asking for a slogan. The slogan was to have been made of words beginning with the letters W A A W.

The judges awarded first prize for "Where Agriculture Accumulates Wealth" to Harvey C. Dendall of Lincoln, Neb.

Calcutta Fan's 5-Valve Set Hears Pittsburg Broadcast

LONDON.—Pittsburgh's broadcasting has been heard in Calcutta, India, according to recent dispatches from that city.

A Calcutta amateur Radio fan, understood to have been using a five-valve set, picked up broadcasting from Pittshurgh for a half hour. British listeners had failed to hear the broadcasting when it was relayed from London, due to atmospheric conditions here.

MOVIE DOG BARKS ABOUT HOLLYWOOD

STORY AROUSES BULL PUP; ATTACKS RECEIVER

Strongheart Tells of the Screenland "Flappers"; Says He Has a Devoted Wife

DETROIT.—Strongheart and his adored mate, Lady Jule, the two famous movie dog stars delighted a vast audience of Radio enthusiasts, including those in the dog family, when they recently appeared before the microphone in the studio of WCX, the Detroit Free Press. Strongheart barked out his story and was heard all over the United States and Canada. Lady Jule was less demonstrative and had very little to say. As most everyone who attended movies knows, Strongheart is a German shepherd dog. His English, while impressive, was only understood by the dog Radiophans, and from the communications WCX has received from many parts of the country, the dog listeners apparently were many.

Bull Pup Attacks Loud Speaker

A letter received from a bakery in Marion, Ohio, states that when Strongheart began to bark his story from WCX, a listening in bull pup started a rough house by making a ferocious attack on the loud speaker.

After Strongheart had finished his three-minute discourse in barks, his manager stepped to the microphone and interpreted what he said and this is it:

"My name is Strongheart. My weight is 92 pounds. I am a German shepherd dog. Some call me a police dog, but there is no such breed of dog as that. I will admit, however, that I am a trained police dog, but for a considerable time I have been a movie star. Like many others engaged in that particular vocation I take much delight in female society.

Takes Jule for Better or Worse

"So one day when a bunch of doggy flappers frisked before me I decided it would be better all around to take a companion for life. I gave them all the once-over and finally decided upon Lady Jule here. She weighs only 62 pounds. Although at one time a regular flapper, I have found her a most devoted and faithful wife. We have five children back in Hollywood and they are the cutest things you ever saw."

Both Strongheart and Lady Jule were a theater attraction here recently. During their spare time they visited many schools and hospitals where they delighted thousands of little folks.

Broadcasting Circuit Makes Its Appearance

Wendell Hall "Booked Ahead" on Vaudeville Plan

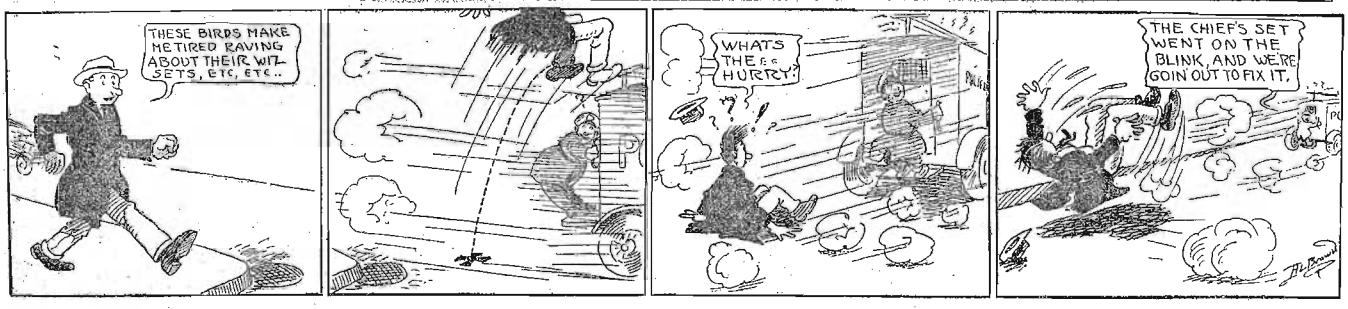
NEW YORK.—In vaudeville various acts are booked ahead and regular schedules laid out for them to visit a chain of theaters. The "Radio Circuit" has been created by the National Carbon company in making arrangements far in advance for its popular entertainer, Wendell Hall, to travel a chain of broadcasting stations on a predetermined schedule.

Mr. Hall, widely known as the "Red Headed Music Maker," has already appeared at Stations WIP, WDAR, WFI, WEAF, WJAR, WCAO, WSB, KYW, WDAF, WOS and WWJ. His route includes WBAC, Columbus, April 4; WSAI, Cincinnati, April 1, 3, and 5.

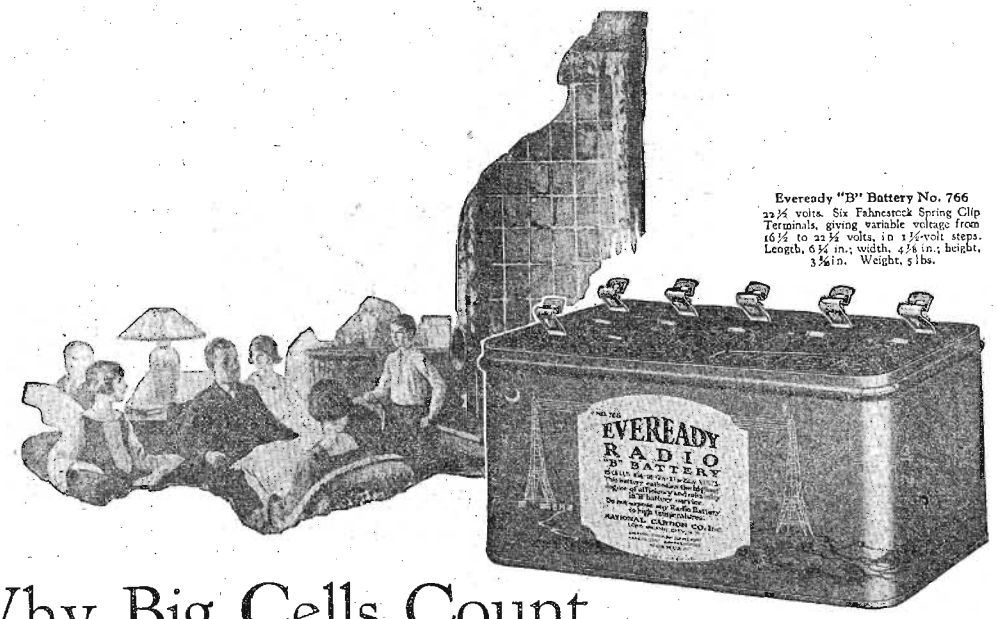
WBBX Is Name of New Sears-Roebuck Station

CHICAGO.—The new Sears-Roebuck Agricultural Foundation broadcasting station, planned to go on the air early in April, will be called WBBX, according to an announcement from Edgar L. Bill, program director. Work is being rushed not only on the station itself, but also on the loop studio in the Hotel Sherman.

THE ANTENNA BROTHERS — Spir L. and Lew P. — A Police "Flivver" Set, Maybe



"THE AIR IS FULL OF THINGS YOU SHOULDN'T MISS"



Eveready "B" Battery No. 766
22½ volts. Six Fahnestock Spring Clip Terminals, giving variable voltage from 16½ to 22½ volts, in 1½-volt steps. Length, 6¾ in.; width, 4⅛ in.; height, 3⅝ in. Weight, 5 lbs.

Why Big Cells Count in Radio "B" Batteries

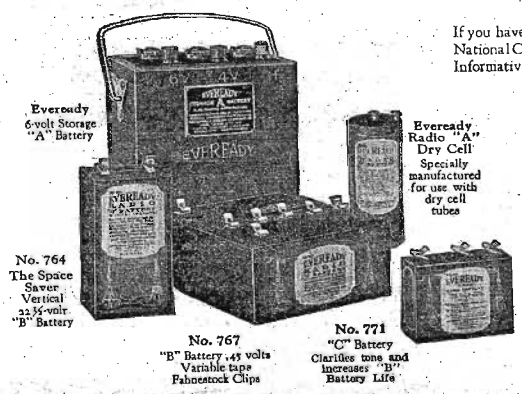
THIS handsome metal case Eveready "B" Battery No. 766 costs only two-thirds more than the smallest Eveready "B" Battery, but it *contains seven times the electricity!* This makes the No. 766 over four times as economical as its baby brother. That is why most people buy it.

Its fifteen large cells give 22½ volts of strong, steady energy day after day. Cells that pour out power the moment you turn on your tubes. Cells that rest well when idle, renewing their vigor for your next demands.

No cells have a bluer-blooded ancestry than these. They are the product of thirty years of dry battery research and development of the world's foremost electro-chemical laboratories. We think that No. 766 is the handsomest battery ever made. But that is a matter of opinion. It is a matter of engineering record, however, that this great standard "B" Battery has proved itself as perfect in performance as we are convinced it is superfine in appearance.

The 45-volt Eveready No. 767 contains the same large powerful cells as the No. 766. For maximum "B" Battery economy, therefore, buy the 22½-volt Eveready No. 766 or the 45-volt Eveready No. 767, as you prefer. Here is the "B" Battery at its best.

NATIONAL CARBON COMPANY, Inc.
Headquarters for Radio Battery Information
New York San Francisco
Canadian National Carbon Company, Limited. *Factory and Offices:* Toronto, Ontario



Eveready 6-volt Storage "A" Battery

Eveready Radio "A" Dry Cell Specially manufactured for use with dry cell tubes

No. 764 The Space Saver Vertical 22½-volt "B" Battery

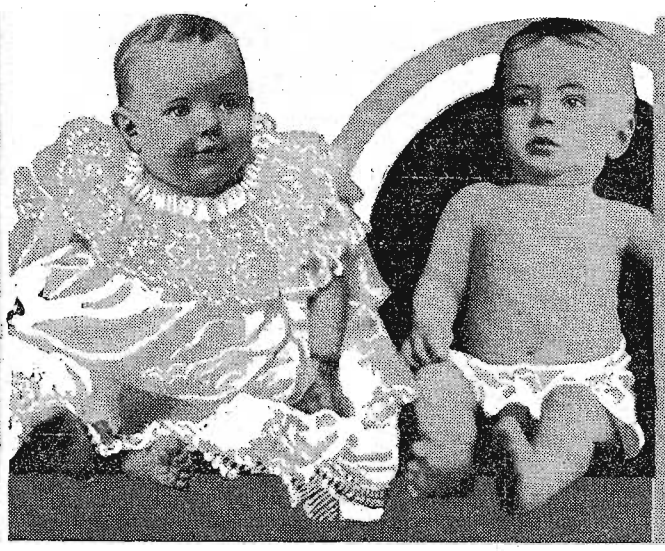
No. 767 "B" Battery, 45 volts Variable taps Fahnestock Clips

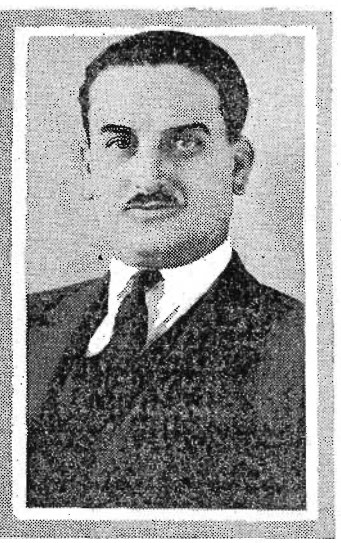
No. 771 "C" Battery Clarifies tone and increases "B" Battery Life

If you have any radio battery problem, write to G. C. Furness, Manager, Radio Division, National Carbon Company, Inc., Thompson Ave. and Orton St., Long Island City, N. Y. Informative and money-saving booklets on "A," "B" and "C" Batteries sent free on request.

EVEREADY
Radio Batteries
—they last longer

BEFORE THEY THOUGHT OF "MIKES"





Remember that little shaver that kept hold of the picture frame last week so he wouldn't fall out and into your arms? Note the crop of alfalfa he has grown in the week's interval—we mean the gentleman on your right, Arthur R. Herske of WTAM. And the other cute little fellow that sat on the rim of the circle is depicted on your left with horn-rimmed spectacles, Richard V. Haller of KGW. Read more below about the two gentlemen. No, the two babies above are not the same announcer, with and without his clothing. The one without anything more than necessary on happens to be a popular easterner, born in 1897, and recently promoted to director of broadcasting for his station. Last name begins with E. Can you guess it? Tell you next week. And the more fully clothed pride of his mother's heart is no less than—well, he likes pie and the ladies, plays the piano for his station under any one of several noms de plume, plays chess and dances lots, and is STILL SINGLE. We'll make you wait till next issue for his name, too. By the way, Mr. E of the East is also quite gifted, playing the piano, organ, vocal cords, trumpet, French horn and Mah Jongg.

WHB ON 13 HOURS IN AIR MARATHON

WORLD PROGRAMS MARKS STATION'S BIRTHDAY

Kansas City Plant Starts at 7 P. M. and Ends Program at 8:35 A. M. Next Day

KANSAS CITY.—Precedent for continuous broadcast is believed to have been set here recently, when WHB, the Sweeney Automotive and Electrical School station, was on the air for thirteen hours and thirty-five minutes.

WHB's widely known siren announced to the world, particularly the United States and Hawaii, promptly at 7 p. m., central time, that the marathon in broadcast was on. Not until 8:35 the next Monday morning, when the minister whose sermon was put on the air the night before at the beginning of the program, was about to arise, did John Schilling, director of WHB, conclude the broadcast.

The event was WHB's Second Annual International Radio program and marked the second anniversary of the dedication of the Sweeney station to the people of Kansas City.

Special Hawaiian Program

Emory J. Sweeney, owner of WHB, opened the long program with an address. Later the services and chimes of a local church were broadcast, followed by a score of diverse entertaining numbers ranging from solos by noted artists to ensembles.

An all-Hawaiian program by natives of the southern islands was given at 11:30 p. m., when an attempt was made to reach Hawaii. The numbers included the singing of the Hawaiian national anthem in the native tongue, and other selections popular in that country.

When the regular schedule of livestock quotations had been concluded at 8:30 Monday morning, Mr. Sweeney came before the microphone and delivered a short address marking the end of the unusual program.

Sailor at Cape Horn Hears WDAP, Chicago

CHICAGO.—Hearing music and news while off Cape Horn, South America, and each succeeding night, all the trip to San Pedro, Calif., is the distinct record reported by a ship operator to Station WDAP here, according to Ralph A. Shugart, chief operator of the Drake-Board of Trade station.

On the night of February 22, the ship operator heard the 10 p. m. program from Station WDAP. The airline distance from Chicago to Cape horn is over 8400 miles. This is the greatest distance that reception of music from this station has been reported.

Legionnaires Turn to Radio

PHOENIX, ARIZ.—Utilizing Radio for the advancement of the American Legion and Americanization is the latest means adopted by the legionnaires to keep interest up to the highest notch. So successful have the first experiments in this direction proven that plans have been adopted for making it a regular weekly feature of the station here.

Richard V. Haller, KGW

IF ANYBODY had told Dick Haller's mother that he would make more noise as he is in the mature picture than he did when he was as old as you see him in the other, his mother wouldn't have used Dick's language to express herself, but she would have been just as emphatic in contradicting the statement.

Dick, who is director and chief announcer of KGW, the Morning Oregonian, at Portland, Ore., held the long distance record for bawling (as his last name almost indicates) when he was a youngster. Neighbors several doors away say that he went it once for six weeks without a stop. Some of the same neighbors back in Ohio ought to hear him announce now. Dick makes the most noise during the meeting of the Hoot Owls every Friday night when the formal type of announcing is thrown to the winds and a catch-as-catch-can method is taken on.

In the Hoot Owls he is known as the Keeper of the Grand Goat, Sweet William. To the Radio audience for a thousand miles around he is known as Dick and a great many refer to KGW as Dick's station. When you write to Dick, ask him whose baby picture he substituted for his own.

BOX OFFICE SALE BIG FOR AIRPHONE STARS

S. R. O. Signs Disprove Allegations of American Dramatists

NEW YORK.—That broadcasting pays theatrical interests and stars is again proved conclusively by the barnstorming trip of "Roxie" (S. L.) Rothafel to theaters in Providence and Pawtucket, R. I. "Roxie" and favorite entertainers from the Capitol theater here who broadcast regularly, have been greeted by "Standing Room Only" signs at all performances. Washington, D. C., also had a bonanza ticket sale. This success will do much to dispute the action of the American Dramatists' society in attempting to "pinch" broadcasters for funds for the use of plays and productions.

Pacific Steamer Picks Up Chicago on Initial Test

LOS ANGELES.—Installation of a powerful Radio receiver aboard the California coastwise liner Harvard has been completed by the Los Angeles Steamship company. Station KYW, Chicago, was tuned in on the first test.

R. F. Cullen, general passenger agent, explained that the Radio concerts at sea had proved so popular with the traveling public that the company decided to install a large set capable of tuning in on all continental broadcasting stations.

Arthur R. Herske, WTAM

THE SUBJECT of this biographical sketch has black hair, but if he reads it he will probably be red headed. When Arthur Roy Herske, announcer at WTAM, the Willard Storage Battery company, Cleveland, was born some twenty-eight years ago, his mother planned to make him a doctor. The less important parent wanted him to be a lawyer.

Herske did what few men would be able to do. Days he attended Western Reserve university, studying law and medicine. Nights he studied science through correspondence schools to please himself. His hobby won because, unable to get ahead fast enough in either profession, he turned to his hobby for a living. That he succeeded is indicated by the fact that he now has charge of the electrical and steam equipment of the Willard Storage Battery company plant at Cleveland.

When the company built WTAM, Herske was picked as announced. It was his voice, "The Voice From the Storage Battery," that won him the place. The next time you hear "Double-U-Tee-Ay-Em, signing off at 12 p. x., good-night everybody," you will know you have been listening to a good-looking young fellow with patent leather hair who is in love with his work and his wife and lets her read his mail.

Takes 59½ Words Off Air in Minute

World's Copying Record Broken at Executive Convention in New York

NEW YORK.—The world's speed record for copying of Radiotelegraph code signals was shattered when A. E. Gerhard received straight copy at the astounding speed of 59½ words per minute, at a contest held at the Fourth Annual Convention of the second district Radio council at the Pennsylvania Hotel, recently.

Mr. Gerhard is a commercial Radio operator, and his remarkable feat of raising the former world's record of 56 words per minute has given him the plaudits of the entire Radio world.

What a remarkable accomplishment this is can best be appreciated, perhaps, when one figures that his record is three times as fast as the usual speed used in ship Radio communication. Mr. Gerhard is here shown holding the treasured trophy awarded by the second district executive Radio council to the winner of the contest.

KFAU Uses 150 Watts Well

BOISE, IDAHO.—KFAU, the 150-watt station of the Boise High School here is being heard consistently throughout the western and Pacific states. Encouraged by the results already accomplished, KFAU is planning to install a 500-watt set soon. Charlotte, N. C., is the farthest east point reporting KFAU.

FEDERAL OFFICIALS AT CAPITAL EXHIBIT

FIRST SUCCESS MAKES FOR SHOW NEXT YEAR

Attractive Booths Display History of Art and Uncle Sam's Much Heralded Radio Devices

WASHINGTON, D. C.—Washington's first Radio show, March 19-26, was declared success from the standpoint of the Radiophan and the exhibitors. A show next year is anticipated as a result of this year's success.

The Navy and War departments, and the Department of Commerce had attractive exhibits. Both government and private exhibits showed Radio history in its infancy as compared with the present.

During the course of the show, a number of prominent government officials spoke, including Assistant Secretary of War Dwight F. Davis, Assistant Secretary of the Navy Theodore Roosevelt, Secretary of Labor James A. Davis and others.

"Roxie" Entertains Radiophans

Prior to the show and during the first day, "Roxie," of the Capitol theater, New York, entertained Washington Radiophans both in person and on the air. Roxie came to Washington to give some performances, the proceeds from which were used for the purchase of radio receivers for disabled soldiers' hospitals near Washington.

Among the interesting government exhibits was shown the little wooden boat that carried Radio apparatus for a party of government surveyors on a 300-mile trip through the roughest waters of the Colorado river. The exhibit of the Bureau of Standards illustrated the important part which it plays in regulating the technical problems of Radio.

The Washington show was conceived, planned and promoted by Washingtonians. It was conducted under the auspices of the Radio Merchants of Washington. The three men who handled practically all of the details were William P. Boyer, president of the association, Fred S. Lincoln, local Radio dealer, and Alfred L. Stern, director of the show.

WTAS, Elgin, Ill., Opens Chicago Branch Studio

ELGIN, ILL.—Station WTAS opened a new Chicago studio recently. The W. W. Kimball company of Chicago, to which the new wire is connected, donated to the station the use of three rooms, one of which includes the large auditorium seating 600, for the use of the station to broadcast at least twice in each week regularly. In addition to this every Friday afternoon between 12:30 and 1:30 p. m., organ recitals of Kimball Hall will be broadcast by special Western Union wire running from Kimball Hall out to Station WTAS here.

Relay Greetings to England

ROCHESTER, N. Y.—Greetings and best wishes from the mayor of Rochester, New York, to the mayor of Rochester, England, were sent recently on their long trip via the relay stations of the A.R.R.L.

COVER 7,000 MILES IN RELAY RECORD

CONNECTING WIRES NOT USED IN EXPERIMENT

New York Dinner Speeches and Music Heard on West Coast and In England

NEW YORK.—An important step forward in the history of Radio occurred recently, when speeches and music presented at a dinner in the Waldorf-Astoria were broadcast simultaneously by five of America's largest stations and all plants of the British Broadcasting company without the use of connecting wires.

The program was made available to a Radio population of 50,000,000 persons, and the extreme separation of the area covered was 7,000 miles.

While this is not the first time that Radio programs have been relayed, it is the first time the linking of many stations has been attempted without connecting wires and on so ambitious a scale. The occasion was a dinner held at the Waldorf, and the list of speakers arranged for and the musical program planned led the Radio engineers to decide on this event as a suitable one for the experiment, which had been in mind for many months.

KDKA Heart of Relay

"The microphones on the speakers' table," explained the officials, "went directly to Station WJZ and, through powerful line amplifying apparatus, to Station WGY at Schenectady. Station WJZ transmitted the program on its usual wave length of 455 meters; WGY simultaneously on 385 meters. The signals from WGY were picked up by KDKA at Pittsburgh on special receivers. KDKA is the heart of the relay system, as not only did this pioneer plant broadcast the music and talks on its customary local wave length of 326 meters, but also sent out a powerfully amplified repetition on its 94-meter relay wave.

"This shorter wave length was the one picked up by Station KFKX at Hastings, Nebraska, and by British 2AC at Manchester, England.

"KFKX is equipped with two transmitters, similar to those at KDKA, one of which broadcasts for its surrounding territory on a wave length of 286 meters, while the other sends out on a new relay wave of 103 meters for stations farther west. Thus it was that Station KGO at San Francisco, the farthest link in the chain, had its choice of two relay waves from which to pick up the story, the 94-meter KDKA and the 103-meter KFKX waves.

All England Hears Program

"In England, Station 2AC at Manchester tuned in on the 94-meter transmission of KDKA. Station 2AC, which is operated by the Metropolitan-Vickers Electric company, was linked with its seven sister stations and the program broadcast all over England."

It was 10:30 p. m. Eastern time when Toastmaster Ralph H. Howes introduced the first speaker. Radiophans in San Francisco were tuning in to listen at 7:30 p. m., Pacific time, while the British listeners were listening for the words in this city at 3:30 a. m., Greenwich mean time. Eight hours' difference in time separated those who were at their sets waiting for the faraway words. Agents were posted throughout the country ready to dispatch flash telegraph messages to the diners, reporting the audibility of the test.

He Objects to Allowing Bears Eat Little Tots

Canadian Says Those Bedtime Tales Are Too Frightful

SCHENECTADY, N. Y.—From the land where wild game is still plentiful has come a request to WGY, General Electric broadcasting station here, that child-eating bears be deleted from bedtime stories for the children. In a country where bears are a frequent sight such stories, it is explained, put fear in the hearts of children.

The letter came from F. J. Lee, a resident of Lee Valley, seven miles from Massey station or New Ontario, Canada. Mr. Lee is the first settler of the place named after him. He is well over seventy years old.

"I want to file a protest," writes Mr. Lee, "against the bedtime stories for the children about bears eating up little boys or wanting to. Remember that stuff goes to this new country where there *are* bears. There are but few children going to school who haven't seen a bear. Boys eight or ten years old only laugh at such stuff here but the little tots are made afraid."

Austria to Broadcast

WASHINGTON, D. C.—The formation of a company is being undertaken by the Austrian government to carry on broadcasting in that country, according to a report from Vienna.

Evening Sermons, Music on WLW Sunday Program

CINCINNATI.—The programs of Station WLW, Crosley Radio Corporation here, will hold universal interest on Sunday evening with its new schedule recently put in effect. The program begins at 7:30 (central time) in the evening with services from the Walnut Hills Presbyterian Church, with Rev. Frederick N. McMillan in charge. This service will be for 45 minutes, and will be followed by a program of music by the Western and Southern Welfare orchestra, under the direction of William Kopp.

Tips for Ohio Farmer-Fans

COLUMBUS, O.—Ohio farmers owning Radio sets are benefiting through the semi-weekly broadcast of agricultural lectures from Station WEAO, Ohio State university. The lectures deal with the live problems of the growers and are delivered by members of the agricultural college faculty. The broadcasts are made Wednesdays and Fridays at 4 p. m., central standard time.

$335,308 Exports in December

WASHINGTON, D. C.—There were 173,776 pounds of Radio apparatus exported during December, valued at $335,308, according to a statement just made public by the Department of Commerce.

ARMSTRONG IMPROVES "SUPER-HET"

(Continued from page 1)

mands from seven to nine tubes, the invention is considered valuable from an economic and popular standpoint.

Explanation of Super-Set

The system employed in the super-het, as it is commonly abbreviated on account of its cumbersome name, should be explained before attempting to describe the new feature, the "second harmonic."

The incoming signal, for example, may be on a 375-meter wave, which means a frequency of 800,000 cycles. The object is to change the incoming signals to a higher wave length, or in other words a lower frequency.

Vacuum tubes, to date, all amplify the lower frequencies much better and give three or four times as much amplification per stage as with the higher frequencies, or shorter waves. Therefore the increase in wave length is desired.

How Wave Length Is Raised

Another tube is incorporated so as to oscillate at a frequency of 750,000 or 850,000 cycles per second. When mixed then, the incoming signal frequency and the locally generated frequency cause a differential frequency, inaudible, of 50,000 cycles per second (a wave length of 6,000 meters).

This in turn is passed through the Radio frequency amplifier tubes and transformers to the second detector, thence through the customary audio frequency amplifier, if desired.

Now to explain the second harmonic. In the new circuit, the first tube is reflexed; it is first used as a stage of ordinary low wave length, high Radio frequency amplification, and later as a stage of 6,000-meter, low Radio frequency amplification. The second tube, which is the first detector tube, serves a double purpose in functioning also as the oscillator tube.

The Second Harmonic and Its Use

The signals are assumed to be coming in at 800,000 cycles frequency. A "beat," differential or intermediate frequency of 50,000 cycles is wanted. Take one-half the incoming frequency, or 400,000 cycles and add it to one-half the desired beat frequency, or 25,000 cycles. The result is 425,000 cycles.

This is the frequency to which the combined oscillator and first detector, or "mixer tube," must be adjusted. This is the fundamental or first harmonic frequency which it generates.

Like all oscillating tubes, however, the mixer tube also generates one or more additional harmonics, the *second* of which is 850,000 *cycles* in this case. It is with this second harmonic of 850,000 cycles that the incoming signal frequency, 800,000 cycles, is mixed, and to their difference the circuit which follows is tuned.

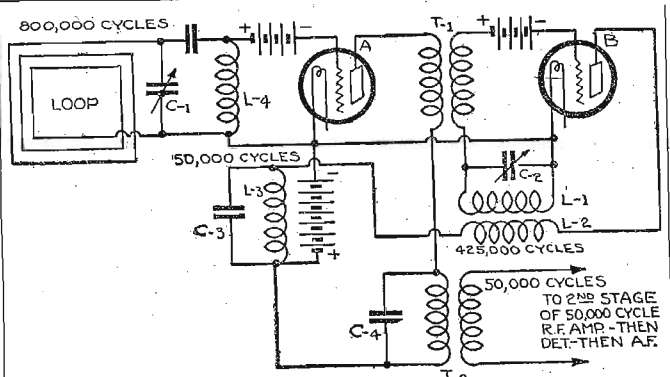


Diagram Showing New Reflex Scheme Employing "Second Harmonic"

Circuit for Second Harmonic

The diagram which Mr. Armstrong reproduced as depicting the application of the second harmonic principle is given here. The following deductions may be made from it. Neither the diagram nor the presumed operation of the apparatus shown are necessarily those used in a receiver using this principle, but if not exact are very close:

The program is picked up on the loop aerial, and the loop condenser circuit is tuned by condenser C-1 to,say, 800,000 cycles (375 meters). Tube A acts as the usual Radio frequency amplifier and passes its energy to tube B through transformer T-1.

Tube B is an oscillator by virtue of the inductance L-2 in its plate circuit being coupled to inductance L-1 in its grid circuit. This grid circuit may be tuned by means of condenser C-2 to the frequency of 425,000 cycles. With this figure as the first harmonic, the second harmonic would be 850,000 cycles, which, mixing with the incoming signal causes a "beat" frequency of 50,000 cycles. This new frequency is passed to the tuned circuit consisting of L-3 and C-3 which is coupled to the inductance L-4 in the grid circuit of the first tube.

First R. F. Tube Amplifies Twice

While this tube is already handling the incoming signals at 800,000 cycles it can also handle another, and the 50,000-cycle frequency is amplified and passed into the plate circuit which includes the primary of T-1 and the primary of T-2.

Since T-1 is designed for the higher frequency, it is unaffected by this lower one, but T-2 being designed and tuned for this low frequency, passes it through to the following stages (number can vary) of low Radio frequency amplification, the detector and finally, audio frequency amplification.

The first super-heterodyne was made of French parts by Armstrong who was at the time a Major in the U. S. Army, and his Sergeant assistant, Harry Houck. It was originally designed for direction finding work during the war, and used eight tubes; two in the "frequency changer" which includes what is now called the oscillator and first detector, and three stages of intermediate frequency with a detector and two-stage audio frequency amplifier. In this outfit, the tubes of which were placed on top of the cabinet European fashion, the intermediate amplifiers operated on a frequency of 100,000 cycles.

Houck and Armstrong Work

After their return from the war, Armstrong and Houck experimented for some time with discouraging results. Finally they designed a set for broadcast use. It worked—it worked splendidly but at that time the amplifier tubes on the market drew one ampere each. This fact gave the set its slogan, "The Rolls Royce of Radio Receivers." With a set drawing eight amperes from the battery only millionaires could own it, and think of the frequent tube casualties and replacements.

As a consequence, work on the super-heterodyne receiver for the public was deferred for awhile, to be revived when dry cell tubes made their appearance. Then it was thought that eight or nine tubes were too many; the maintenance in dry cells was too high. Plainly some functions had to be combined in the tubes, and here, Armstrong gave all the praise to Houck, who found the solution after the Major had looked for three years. That solution was the "second harmonic."

$7,500 Loud Speakers for Kansas City Public Hall

KANSAS CITY.—The executive committee of Convention Hall, municipal auditorium, has ordered a public address "loud speaker" system to cost $7,125, installed in the big hall. Also a $450 commercial Radio receiving set is to be purchased.

Contracts for installation of the loud speaker system and the receiving set were awarded to a company whose bid was $10,000. George M. Myers, president of the directors, said both instruments would be in place within four weeks.

MUSICIANS WON'T "MILK" STATIONS

REFUSE TO CHARGE FOR PICK UP CONCERTS

Chicago Federation Decides to Turn Down Dictates of Other Forces

CHICAGO.—At a recent meeting here of the Chicago Federation of Musicians it was decided to throw off the yoke presented to them, it is said, by E. C. Mills, "Czar of the Music Trust," and decide for themselves what to do regarding pay for broadcasting.

Headed by their president, James Petrillo, the musicians refused to be led by instigations of other forces, but will go on the air whenever they so decide, with or without pay.

The musicians will not charge broadcasting stations extra pay when immediate employment is in a dance hall, cabaret, hotel or theater and the music is collected by a broadcaster's microphone.

When playing in a studio especially for a broadcast station, the scale of pay will be the standard union rate.

GIVE R.C.A. SHORT TIME TO ANSWER

Trade Commission Denies Thirty-Day Extension, Gives Only Till April 10

WASHINGTON, D. C.—The Federal Trade Commission has allowed until April 10 for the Radio Corporation of America and other respondents to answer its complaint against the alleged Radio monopoly.

This is the second time that the commission has extended the time for an answer. The law requires that the commission allow thirty days after the service of the complaint in which to file answer. The respondent in this case asked first for an extension of thirty days over the regular time allowed, bringing the date to March 25. Another thirty days was asked but the commission granted only an extension to April 10.

While the commissioners will not officially discuss the extension it is understood that the second extension was granted on the plea that the commission monopoly report to Congress had not become available in printed form in which are contained many exhibits dealing with the complaint.

Radio to Help Civilize Savages of South Seas

OAKLAND, CALIF. — The American broadcasting station will soon act as a powerful educational influence on the backward civilization of the islands of the southern Pacific, predicts Major General G. S. Richardson, administrator of Western Samoa. This statement was made in a letter from General Richardson to Station KGO, General Electric company here, after he had listened to an entire program as the guest of Quincy F. Roberts, American consul at Apia, British Samoa.

The program came in so clearly 5,000 miles from the sending station that "Vailima," the old home of Robert Louis Stevenson, now the residence of Major General Richardson, has been named a "listening station" of KGO.

1,500,000 Ether Fans Claimed for California

Supervisor Estimates 4,000,000 for West Coast

SAN FRANCISCO. — California, The Golden State, has passed the mark of 1,500,000 Radiophans, according to a recent statement issued by Col. J. F. Dillon, Radio supervisor for the sixth district. The statement of Col. Dillon reads:

"Radio is growing with leaps and bounds and this department is taxed to its full capacity caring for the situation.

"There are more than 500,000 Radio receiving sets in homes, offices and business places in California, and I estimate that at least three persons listen in at each receiver.

"I can say conservatively that my figures are correct and that there are over 4,000,000 members of the invisible audience on the Pacific Coast."

Colonel Dillon has been months endeavoring to give an estimate on the popularity of Radio for Washington officials and his statement of recent date reveals the first result of this official tabulation.

Fort Leavenworth's Giant Station Nearly Completed

FORT LEAVENWORTH.—Construction of the giant Radio control station being erected here by the war department is progressing rapidly and the big plant should be completed and ready for operation some time in April, Capt. H. W. Webbe, of the United States Signal Corps, declared recently.

The set has a power of ten kilowatts. Captain Webbe, who will be in charge of the station, said that the normal daylight range for high speed commercial service will be 1,200 miles.

The set will permit either the use of code or voice. When used for voice the set will be operated on five kilowatts.

Ban Lifted In Greece

WASHINGTON, D. C.—The revolutionary government in Greece some time ago forbade the operating of private Radio apparatus to prevent the Greek public from being reached with propaganda unfavorable to the revolution. According to advices, the present government has prepared a law by which the operation of private Radio sets belonging to Greek citizens will be permitted.

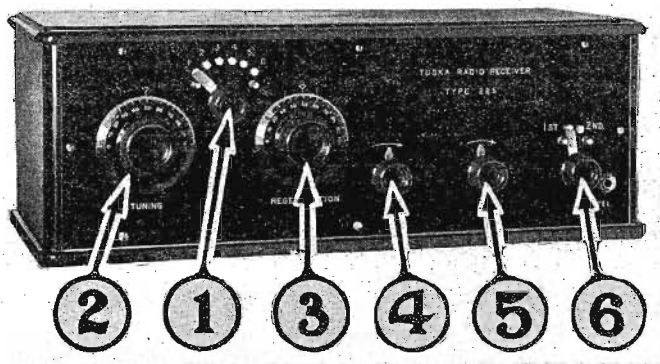
OPERATING AND TROUBLE SHOOTING

For the Owner of a

TUSKA TRADE MARK RADIO

Type 225 Receiver

"OPERATING and Trouble Shooting" is a Radio Digest feature whose purpose is to study the late models of various standard receiving sets and to show the newly initiated broadcast listener, who has purchased such a set, how he can operate it to get the best there is in it and how he can overcome minor difficulties which may be causing some trouble. On pages 9, 10 and 22 this week, Tuska Type 225 Receiver is described. Radiophans with other sets will also find these articles worth reading particularly the notes on trouble finding.



THE Tuska Type 225 receiving set does not include the accessories. It is necessary for you to erect an aerial. This requires wire, insulators, lightning arrester, and miscellaneous parts. In addition supply yourself with telephone receivers or a loud speaker, tubes and batteries. There are any number of telephone receivers or loud speakers on the market which are satisfactory.

Batteries

A 6-volt storage battery of about 80 ampere hours capacity is recommended for use as an A battery. Batteries of lower ampere hour rating are cheaper and lighter but require more frequent charging.

For B battery, three 22½-volt units are recommended, using one of the units of the variable type to adjust the proper voltage for the detector tube.

Tubes

Good vacuum tubes in the receiver are as necessary as good tires on the car. At the present time, users of Radio outfits have a choice of several kinds of vacuum tubes. The real difference in these tubes consists of the amount of power which is consumed from the battery. In the main, there are two types; those operating from dry cells and those operating from storage batteries. The storage battery tube is recommended as being the most satisfactory in the long run and producing the best results, particularly in the reproduction of musical selections. Of course, there are places where a storage battery cannot be handled, such as on a farm where charging is difficult or on light weight portable sets. Storage batteries have to be charged about once every week, depending on the amount of time they have been used, and are heavy and difficult to carry around. In certain cases, dry cell tubes have their place.

Of the storage battery tubes there are also two classes: The UV-200 "soft" tube which requires about 6-volts on the filament and draws about 1 ampere, and the UV-201 A, or amplifying tube which requires 5-volts on the filament and draws about ¼ of an ampere. These tubes require a 6-volt storage battery and are recommended for use with this Tuska receiver. However, very satisfactory results may be secured with the dry cell tubes.

Antenna

The Tuska Type 225 receiving set is designed to operate with an antenna. Under certain unusual conditions, particularly over short ranges, it is possible to operate with a small wire inside of the house, a bed spring or other metallic objects not connected to the earth. However, this is not recommended for a maximum receiving range nor can this system of reception be entirely relied upon. The following antenna specifications have been found to give the best results. Any copper wire will do but it is recommended that sizes not smaller than number 18 be used while number 14 will prove much more satisfactory, as the larger size gives more mechanical strength. Seven strands of number 22 copper wire twisted into a cable makes an ideal aerial. The advantage of using several wires in parallel and separated by a spreader at each end is so slight as to be hardly noticeable in many cases. This wire should be erected along the line suggested in the accompanying sketch; in an open space; as high as possible and at least 80 feet long. Also, see that one end of the aerial support is somewhere near where the receiving set will be located. The aerial itself should be from 80 to 125 feet long and the lead-in should not exceed 25 feet. Of course, it will be necessary to vary from this slightly as every antenna represents a new problem and has new dimensions. The important part is to make the antenna at least 80 feet over all and not longer than 150. If the supports are farther apart, it is possible to split the antenna by inserting an insulator at the required length. Very long, high aerials do not receive the short waves very well and although they give loud signals on other waves, the summer atmospheric disturbances and interference from amateur, commercial and navy stations bothers to a greater extent.

If it is necessary to run the antenna over a tin roof, be sure to set it as high above the roof as possible. If it only clears the roof by 4 or 5 feet, the results will not be entirely satisfactory.

Socket plugs that screw in the electric light fixture to take the place of the antenna occasionally give fairly good results but it is hard to predict the results that can be obtained. In rural sections where the power wires are greatly exposed to the radio waves and the houses are made of wood; good results seem to be obtained, while in congested city apartments the wiring is often metal encased and very poor signals accompanied by terrific induction noises result.

Ground Connections

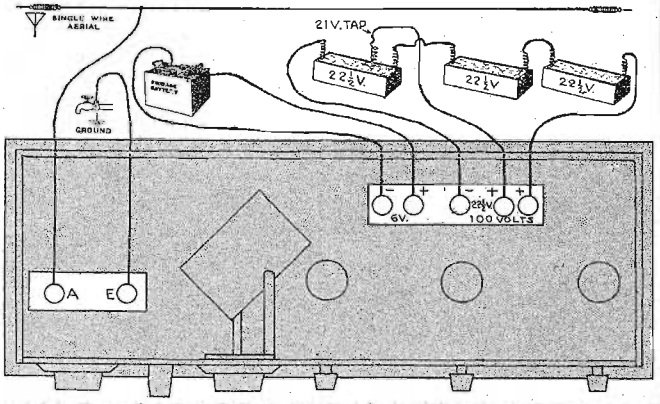
The ground connection is extremely important. Be sure to make connection to some metal pipe or object which goes deeply into the earth. A rod or pipe driven in the ground several feet is nearly always insufficient as it makes weak signals and poor tuning. Connection to a cold water pipe is best when possible. Follow the pipe layout in the basement to determine the best point to connect the wire to the pipe, keeping in mind that the shortest and most direct line to where the pipe

(Continued on page 10)

OPERATION, TROUBLES

(Continued from page 9)

actually enters the earth is the best. Gas pipes are not recommended for ground connections as they are often insulated near the meter. Pipes of the heating system often give good results if actually connected to the earth but are liable to take a much longer path in getting there. The connection to the pipe should be well made by cleaning a section of the pipe all the way around until it is bright, and then using a standard ground clamp tightly fitted over this clean place.



The regulations of the Fire Underwriters in regard to the installation of a receiving station are not hard to conform with. An antenna properly installed is more of a protection from lightning than a hazard. The regulations, in brief, say that the aerial shall be put up in a strong and durable manner, at least not run over or under any wires carrying more than 500 volts, kept five inches away from all electric light wires, and protected by an approved lightning arrester. This arrester has two terminals, one of which connects to the aerial and the other of which connects to a ground. For this ground, a water pipe should be used. The wire must not be smaller than the aerial wire and in no case smaller than Number 14. It need not be insulated wire or held away from the walls. This same wire can be used for the earth terminal of the receiver if desired.

Connections

Having erected the antenna and made your choice of vacuum tubes you are now ready to connect the set. Inside the Type 225 set are two sets of binding post strips as shown in the diagram. The strip on the left, marked A and E is for the antenna and ground connections. The strip on the right contains five binding posts for the battery connections. It is very important to connect the various batteries as indicated. The poles on the battery are generally marked. The numerals on some B batteries indicate the voltage of the terminal with respect to the negative lead. The positive pole of the battery should be connected to the plus binding post and the negative pole of the battery to the minus binding post. The whole connection is shown in the figure and you should have no difficulty in following this diagram.

The next step is to insert the vacuum tubes in the sockets, making sure that a satisfactory connection is made and that the bayonet catch locks the tube in. Occasionally, a tube will not be inserted correctly in the socket and a loose connection means noises and poor results. After the tubes have been inserted, the telephone receivers should be connected to the jack by means of a plug.

Turn the rheostat Number 4 from left to right, as shown by the arrow in the first diagram. Turning the rheostat increases the current flowing through the vacuum tubes. The amplifier rheostat Number 5 can be turned almost fully on while the detector rheostat Number 4 must be adjusted to give the most satisfactory results. The method of adjusting is as follows: First, start with a detector voltage of 22½ for the UV-200 tube and with the regeneration knob Number 3 set as zero, turn the rheostat Number 4 to the right until a slight noise is heard in the telephone receiver. The tube should be operated just below the hissing point. After you have heard some signals, you will find that the B battery voltage can be varied from 22½ down to as low as 15, but some intermediate voltage may give the most satisfactory results. Each time the B battery voltage is varied, adjust the detector filament rheostat Number 4. The combination of detector B battery and filament current is the real key to the successful operation of the outfit. Such a combination varies with different tubes and sometimes different operators select different combinations. You should learn how to adjust the detector voltage to get the best result. This can always be done by listening to signals and operating just below the hissing point on the detector. It is economical, especially with the UV-201A tubes, to adjust the amplifier rheostats as low as possible without sacrificing signal strength. Voltages above 80 for the B battery give greater volume but at somewhat of a sacrifice in quality. The rheostats may be advanced slightly above the usual point as the storage battery begins to become run down and turned back when a fresh battery is used, but other than this, the rheostats require no adjusting.

(Continued on page 22)

What's Wrong with Your Receiving Set?

Chapter VI—Tuning Out Interference

By Peter J. M. Clute

VIEWED from its many aspects, the interference problem is undoubtedly one of the most important propositions that Radio engineers are called upon to solve. Obviously, the present chaotic condition of the ether demands some sort of immediate attention. While it is generally admitted that the growth of Radio has been an unhealthy one, the facilities for controlling the ether traffic have not kept pace with the tremendous increase in the number of transmitting stations. The interference caused by the thousands of naval, commercial and amateur telegraphic code stations in addition to the multitude of broadcasting stations has dampened somewhat the enthusiasm with which the present popular form of Radio has been met by the millions who recognize in it a form of diversion that every home can enjoy at a reasonable cost.

Heterodyning Interference

Having previously considered in more or less detail the principal causes of reception interference, it is expected in the ensuing paragraphs to outline the suggested methods of reducing or eliminating, either at the source or at the receiving end, some of this interference. Radiophans experience considerable difficulty at times in eliminating interference due to broadcasting stations heterodyning each other or to a commercial or an amateur spark station, with a low decrement, forcing its impulses into the receiver by "shock exeitation." Such conditions may exist even with a highly selective receiver, with much more interference, however, if the set is not so selective. Although some interference may be so slight as to not be discernible during the reception of a broadcast program, it will still cause distortion.

It has been pointed out that the carrier waves of two or more broadcasting stations operating on approximately the same wave length will heterodyne each other, producing interference to reception in the form of whistling. This is especially true when nearby stations are broadcasting at wave frequencies close to that which it is desired to receive. The whole matter of cutting down interference from one station while listening in to another resolves itself finally into the proper selection of a receiving set. It is readily apparent that a receiver which is perfectly satisfactory in one location or for one type of service may not be suitable for use in another place for another purpose.

Selectivity Rednces Interference

In view of these considerations, in order to prevent interference from a nearby broadcasting station, the nearer the receiver is to that station, the higher must be its selectivity.. Also, the greater the distance it is desired to receive, and consequently the more sensitive the receiving outfit is, the more highly selective it must be to avoid interference. Proceeding on this basis, the following types of receivers are listed beginning with the most selective equipment, the relative rating being governed not only by the character of the circuit but also by proper design and construction: (a) superhcterodyne; (b) tuned Radio frequency amplification with regeneration; (c) tuned Radio frequeney amplification without regeneration; (d) three circuit regenerative receiver; (e) two circuit regenerative receiver; (f) single circuit regenerative receiver; (g) untuned Radio frequency amplification with regeneration; (h) non-regenerative receivers.

With hundreds of broadcasting stations on the air at the same time, it is quite difficult to receive broadcast programs and at the same time tune out the numerous heterodyned noises, unless a very selective outfit is employed. It must be borne in mind that a poorly constructed superheterodyne may be less selective than a good single circuit regenerative receiver.

Atmospheric Static

In the case of interference from atmospheric disturbances or static, the particular precautions which would minimize interference from other transmitters would have only an insignificant effect and at present there is no practical scheme which gives any appreciable reduction of static interference in broadcast reception. The use of coupled circuits gives some slight relief, but not enough to be certain that a properly designed single circuit outfit suffers more from static than a two circuit receiver. Loose coupling is slightly advantageous, but as long as tuned circuits subject to "shock excitation" are used, only a mild improvement may be expected in that direction. It may be stated that any method of reception properly manipulated will give better results, especially in tone quality, than any other method improperly used. For instance, a Radio frequency amplifier in stable adjustment, producing a moderate volume of sound, will give excellent reception when compared to an audio frequency amplifier forced to the limit of its amplification, with its attendant howling. Such erratic operation of receivers exaggerates the magnitude of static interference, more than any factor inherent in the atmospheric disturbances themselves. In other words, the best method of reducing static is to properly operate the existing equipment.

There is no reason why Radio frequency amplification should filter out static interference to an appreciable extent, because static is not an audio frequency phenomenon, but it is either a periodic discharge, or a continuous series of waves of different frequencies. By "shock excitation," static forces an antenna or a tuned Radio frequency circuit to oscillate at its own frequency, producing thereby a second signal of the same wave length as the signal the set is tuned in to receive.

Directional Aerial Systems

With due regard for the physical characteristics of the receiving equipment and with proper manipulation of controls, considerable improvement will be obtained in reception through static by using sharply directional aerial systems. In addition to the wave antenna, fairly good results may be obtained with a loop aerial. It should be borne in mind, however, that such a directional system is in general effective only when the static itself is chiefly confined to a narrow sector of the compass, which sector makes a large angle with the direction of the station broadcasting.

While it has been broadly claimed that much of the interference in the air, in the form of whistling and howling, is caused by single-circuit receivers, it can generally

(Continued on page 12)

FIXING WHAT'S WRONG

(Continued from page 11)

be traced to the lack of tuning experience on the part of the operator. The improper manipulation of controls will result in similar disturbance from any receiver of the regenerative type.

Many operators of regenerative receivers make use of the so-called "heterodyne search" or the beat note method of reception to locate stations of unknown wave length. When using this mode of procedure, the vacuum tubes are thrown into oscillation, and by adjusting the grid and plate circuit controls at the same time, the circuits are kept in oscillation while the wave length is varied over quite a wide range. With the tubes in an oscillating state, the receiver circuits will behave as a generator of Radio energy, some of which will be radiated from the receiving antenna system. The presence of this reradiation interference is manifested in nearby receivers by whistling noises of varying pitch. It is evident that when several neighboring regenerative receivers are being adjusted simultaneously to the same distant station, it is practically an impossibility for any one of them to receive the program from the distant station in a satisfactory manner.

To acquire the knack of proper tuning requires no more effort on the part of the operator than the highly undesirable method just mentioned. If the antenna system is kept approximately in resonance with the tube circuits, and the incoming signal strength is adequate to give audible tones, the broadcasting station may be tuned in by a simultaneous adjustment of both the grid and the plate controls. During this operation, the relative settings of the two control dials should be maintained to such a degree that the circuits are just below the oscillating point.

Modulated Signals

During the reception of a broadcast program or any other form of modulated signal, it is positively unnecessary to have the vacuum tube in an oscillating condition. Clear, modulated signals cannot be received when the set is in a state of oscillation. The uncalled-for method of throwing the detector tube into oscillation in order to intercept the carrier wave of a distant station, sets up a continuous barrage of reradiation interference. If operators would strive to forego this method of endeavoring to locate stations much of the present interference would be at an end.

While it is, undoubtedly, true that the single circuit receiver, using tickler coil feedback, produces the strongest interference from reradiation, the substitution of a variometer in the plate circuit, instead of the tickler coil, will aid materially in cutting down this interference. When using the inductively-coupled types of regenerative receivers, in order to obtain DX signals with sufficient intensity, the coupling must necessarily be close. If under these conditions the set is accidentally thrown into an oscillating state, it will reradiate generously for that amount of energy. In a single circuit set, the initial signal energy applied to the grid of the detector tube is about 25 per cent greater than for a two circuit receiver, with the result that the regeneration does not have to be so far advanced.

The fundamental rule to be followed for obtaining best results in tuning is to thoroughly comprehend just what the function of each control is and to manipulate them in a systematic and not in a haphazard manner. A complete understanding of the general operating principles of the set and its control is essential to getting good results consistently.

Operating Single Circuit Receiver

Inasmuch as the single circuit regenerative receiver is undoubtedly the most popular type with the Radiophans, it will not be amiss to detail the proper method of tuning such a set. Three controls are generally provided, the wave length control, the regeneration control and the filament rheostat. The filament should be operated at the lowest current which will give satisfactory results. This may be determined by slowly increasing the filament temperature until a hissing sound is heard in the phones and then cutting down the filament current just sufficient to cause this noise to cease. Having the regeneration control set at zero, the wave length or tuning control should be gradually turned until signals are heard. The regeneration control is then slowly adjusted until maximum strength of signal consistent with good quality is obtained. Advancing the feedback control too far will cause the set to oscillate and reradiate interference from the receiving antenna.

If the regeneration cannot be controlled the addition of a potentiometer across the filament battery will materially reduce the howling. First, however, it will be advisable to carefully regulate the filament temperature, reduce the plate potential and adjust the feedback control to as near zero as possible.

Tuning Inductively-Coupled Receiver

In tuning an inductively-coupled regenerative receiver, the filament current should be regulated to a point just below the normal filament brilliancy. The primary and secondary circuits are then tuned in or adjusted to a condition of resonance with the incoming wave. If a tickler coil is employed, the proper amount of regeneration is secured by regulating the coupling between the tickler and secondary coils. If a tuned plate is used, adjustment of the plate variometer will furnish the required amount of feedback energy. Careful regulation of the filament temperature will bring in the signals loudly and clearly without any howling or distortion.

Under stable conditions, the local oscillations are of the same frequency as those radiated from the broadcasting station. If the tuning is varied either way from this state of synchronism, called "zero beat" reception, a high-pitched whistling note will result, the pitch gradually becoming lower until it is replaced by music or speech. Further variation will produce a low whistling note, gradually increasing to a shrill sound.

Inasmuch as the tuning adjustments for any regenerative outfit are so extremely critical, it will well repay the operator to consider the use of vernier condensers and vernier filament rheostats. This permits of very minute variations in the tuning adjustment of the circuit and in the regulation of filament current. In this manner the point of maximum amplification may be easily found and the resulting reception will be free from any distorting effects.

The successful operation of any set depends upon the operator, who should be familiar with the apparatus and always employ critical tuning. The regeneration is easily controlled and with proper manipulation may be used as an aid in tuning. Radiophans with regenerative receivers can greatly increase interest in the Radio game by endeavoring at all times to do their level best to keep control of their circuits.

(TO BE CONTINUED.)

Amplification

A vacuum tube regenerative set, using only one tube, will bring in signals from nearly the same distance as a set having an audio frequency amplifier. The amplifier only serves to increase the strength of signals brought in by the detector tube, for the purpose of operating a loud speaker or making the signals louder in the phones.

30 Minute A-B-C Lessons for Radio Beginners

Chapter III—How Radio Is Broadcast

By P. E. Edelman

IN this series of articles the story of Radio will be told in so simple a manner that the uninitiated can follow theory and practice whether he knows anything about electricity or its application to broadcasting and reception or not. The series will consist of twenty-five chapters, of which the five next will be:
Chapter IV—What Radio Inductances Do.
Chapter V—What Condensers Are Good For.
Chapter VI—Uses of Resistance in Radio.
Chapter VII—Essentials of Radio Electricity.
Chapter VIII—The Key to Radio Circuits.

THE broadcast listener may regard the term "ether" as meaning space. In such sense, ether exists everywhere, surrounding the earth, in it, and in everything in it. Material things which appear solid in reality contain ether or space voids. Consider two bushel baskets, both said to be full, one containing carrots and the other sand. Obviously there are air spaces in the basket containing carrots. Though apparently full there are certainly voids or spaces and pockets of air in the basket containing sand. Going further, one can regard any material thing, as a piece of wire for example, as containing more or less ether or space. Dense materials have less ether voids in such a sense. It suffices here to regard ether or space as extending everywhere.

What Is Meant by Electrons

Explanations of Radio are based on the theory of electrons. The term electrons can be understood as meaning electricity in its smallest unit. Electrons are intimately related to material things and can be moved if proper force is applied. In Radio circuits they are moved rapidly back and forth and comprise Radio currents. The enormous number of electrons in even a thick piece of copper wire can be moved almost instantly at tremendous speed when such a driving force is applied.

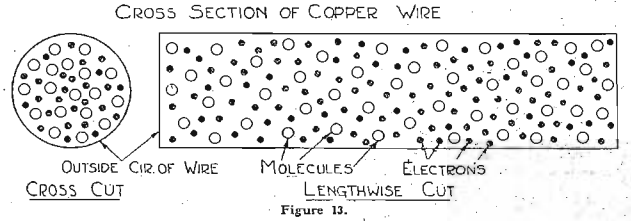


Figure 13.

If you have looked at a razor blade under a microscope, the supposed sharp edge would be seen as a series of rough flaked teeth. If there was an instrument so that one could look into a piece of copper wire and recognize what was there, a crowd of material particles or molecules would be seen intermingled with electrons. If more electrons were poured into this wire the molecules would be moved about violently, and this motion is the same thing as heat. That is what happens when you use an electric toaster.

Electrons in a Wire

Take a look at Figure 13. The motion of electrons through the wire constitutes an electric current. If too much current is sent through the wire, the molecules are made to push out and the wire expands. The number of molecules and electrons present in any material varies according to the kind of material. It is difficult to comprehend how tiny an electron really is, by itself. Although the molecule just mentioned is the smallest physical particle unit, it is comprised of chemical units still smaller, called atoms. Some electrons attach themselves to atoms and govern the nature of the molecules formed, others are free to fly about in and near the molecule. The view is sometimes taken that all matter is made up of electric particles, of which electrons are the atoms of negative electricity. But the picture of Figure 13 is intended merely to fix the term "electrons" in mind. The important point here is that it requires force to move electrons as desired in Radio apparatus and that the motion is an electric current. Another thing is that the action of vacuum tubes depends on a certain type of electron flow.

The reason a listener is concerned with the broadcasting is because it controls what is heard. If the modulation is poor a strong carrier may be recognized as a whistle but the voice may be scarcely recognizable. In Figure 14, Radio waves are pictured in the diagram.

Explaining Modulation

Modulation is important in broadcasting. A well modulated small station is preferable to an incompletely or poorly modulated station of larger power. A Radio or carrier wave is represented by chart A, and has a certain frequency, as for example, 600,000 cycles. At B the same carrier wave is shown with the same frequency, but with intensity varied or modulated. At C a voice wave envelope is shown modulating a series of waves. At D poor modulation is illustrated. At the point in the voice envelope 3-4, the radiation is too much, as shown by 1-2. Many broadcasting stations now operating have good radiation, as their carrier waves can be picked up clearly at great distances, but the modulation is imperfect. The effect is that poor modulation is the same as a much weaker station with better modulation, and the quality is imperfect.

The main broadcasting at the present time is carried on within a range of wave lengths amounting substantially to 300 to 550 meters, with a few lower. Some re-broadcasts are conducted on about 100 meters. Seldom do the broadcasting stations adhere strictly to the assigned or supposed wave lengths and in some cases a station stated to operate at 880 meters will vary some ten meters either way. Some stations give much attention to careful maintenance of radiated frequency.

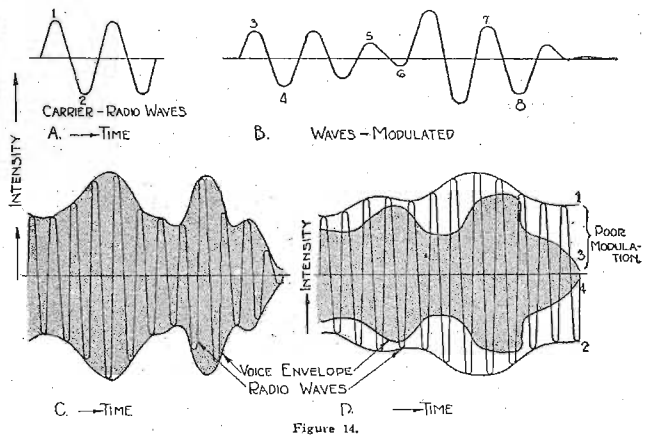


Figure 14.

Transmission in Brief

Radio, it will be recalled, is in a sense, another form of light. It would be possible to set up an oscillating circuit in back of a parabolic reflector, much like a searchlight. But for broadcasting, an aerial is used. Transmission in all directions is here desirable.

This aerial consists of a span of wires insulated from the earth. When the aerial is charged and discharged rapidly by high frequency alternating currents, electrical compressions are set up between it and the earth. This compression sends waves traveling outward in all directions, much like the waves from a stone thrown into water.

The alternating current used to charge the aerial must be of high frequency, and is termed "Radio frequency." For comparison, two common frequencies are here tabulated, with the corresponding wave length:

Wave Length	Frequency
300 meters	856,628 cycles
200 meters	1,499,100 cycles

(Continued on page 24)

AN EVENING AT HOME WITH THE LISTENER IN
(SEE INSTRUCTIONS FOR USE BELOW)

Station and City	Met.	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
CFCN, Calgary, Alta.	440	12:00- 1:00	Silent	11:00- 2:00	Silent	Silent	11:00- 1:00	Silent
CKAC, Montreal, Que.	425	Silent	6:00-10:30	Silent	6:00-10:30	Silent	6:00-10:30	3:30- 4:30
CKCD, Vancouver, B. C.	410	10:30-11:30	10:30-11:30	10:30-11:30	10:30-11:30	10:30-11:30	Silent	Silent
CKY, Winnipeg, Man.	450	Silent	8:15-10:00	Silent	8:15-10:00	8:15-10:00	Silent	7:00-10:00
CYB, Mexico City, Mex.	425	Silent	7:00- 8:30	Silent	7:30- 9:30	Silent	7:00- 8:30	Silent
CYL, Mexico City, Mex.	610	Silent	8:30-10:00	Silent	Silent	8:30-10:00	Silent	Silent
KDKA, E. Pittsburgh, Pa.	326	5:00- 9:00	5:00-11:30	5:00- 9:00	5:00-11:30	5:00- 9:00	5:00- 9:00	6:30- 7:30
KFAE, Pullman, Wash.	330	9:30-10:30	Silent	9:30-10:30	Silent	9:30-10:30	Silent	Silent
KFAF, Denver, Colo.	360	9:00-10:00	9:00-10:00	Silent	8:30- 9:00	9:00-10:00	9:00-10:00	Silent
KFOA, Seattle, Wash.	455	10:30-11:30	Silent	10:30-11:30	Silent	10:30-11:30	Silent	Silent
KFI, Los Angeles, Calif.	460	12:00- 1:00	8:45- 1:00	8:45- 2:00	8:45- 1:00	8:45- 2:00	8:45- 2:00	8:45- 1:00
KFNF, Shenandoah, Ia.	265	Silent	Silent	7:30- 9:00	7:30- 8:30	7:30- 8:30	7:30- 9:00	6:30- 7:30
KGO, Oakland, Calif.	312	Silent	10:00-11:00	Silent	10:00-11:00	Silent	10:00-11:00	Silent
KGU, Honolulu, Hawaii	360	12:00- 1:30	12:00- 1:30	12:00- 1:30	12:00- 1:30	12:00- 1:30	12:00- 1:30	12:00- 1:30
KGW, Portland, Ore.	492	10:00-11:30	9:15-10:30	10:00- 1:00	10:00- 1:00	10:00- 1:30	12:00- 2:00	9:00-10:00
KHJ, Los Angeles, Calif.	395	8:45- 2:00	8:45- 2:00	8:45- 2:00	8:45- 2:00	8:45- 2:00	8:45- 2:00	10:00-12:00
KLX, Oakland, Calif.	509	10:00-12:00	9:00- 9:30	10:00-12:00	9:00- 9:30	10:00-12:00	9:00- 9:30	Silent
KPO, San Francisco, Calif.	423	10:00- 1:00	10:00- 1:00	10:00- 1:00	10:00- 1:00	Silent	10:00- 2:00	10:30-12:00
KQV, Pittsburgh, Pa.	360	9:00-10:00	Silent	9:00-10:00	Silent	9:00-10:00	Silent	Silent
KSD, St. Louis, Mo.	546	8:30- 9:30	8:00- 9:00	7:00-10:00	8:00- 9:00	Silent	9:00-10:00	Silent
KYW, Chicago, Ill.	536	Silent	7:00- 9:30	7:00- 2:00	7:00- 9:30	7:00- 2:00	7:00- 9:30	7:00- 8:00
NAA, Radio, Va.	435	5:45- 7:20	6:05- 7:20	6:25- 7:40	5:45- 7:40	7:05- 7:40	Silent	Silent
PWX, Havana, Cuba	400	Silent	Silent	7:30-10:00	Silent	Silent	7:30-10:00	Silent
WBAP, Fort Worth, Texas	476	7:30-10:45	7:30-10:45	7:30-10:45	7:30-10:45	7:30-10:45	7:30- 7:30	11:00-12:00
WBAV, Columbus, O.	360	7:00- 9:00	Silent	Silent	Silent	7:00- 9:00	Silent	Silent
WBZ, Springfield, Mass.	337	5:00- 8:00	6:30- 8:00	5:00- 8:00	6:00- 8:00	5:00-11:00	6:00- 8:00	5:45- 8:00
WCAE, Pittsburgh, Pa.	462	5:30- 9:00	5:30- 9:00	5:30- 9:00	5:30- 9:00	5:30- 9:00	5:30- 9:00	2:00- 5:30
WCAL, Northfield, Minn.	360	Silent	Silent	Silent	9:00-10:00	5:30- 9:30	12:00- 1:00	3:30- 9:30
WCAP, Washington, D. C.	469	Silent	6:30- 9:00	Silent	6:15-11:00	Silent	6:15-11:00	6:20- 9:00
WCBD, Zion, Ill.	345	8:00-10:00	Silent	Silent	8:00-10:00	Silent	Silent	2:30- 5:30
WCX, Detroit, Mich.	517	7:30- 9:00	7:30-11:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	Silent	6:15- 7:15
WDAF, Kansas City, Mo.	411	8:00- 1:00	11:45- 1:00	8:00- 1:00	11:45- 1:00	8:00- 1:00	11:45- 1:00	4:00- 5:00
WDAP, Chicago, Ill.	360	Silent	7:00- 1:00	7:00- 1:00	7:00- 1:00	7:00- 1:00	7:00- 1:00	9:15-11:15
WDAR, Philadelphia, Pa.	395	6:30-10:00	6:30- 7:00	6:30-10:00	6:30- 7:00	6:30-12:00	6:30- 7:00	Silent
WEAF, New York, N. Y.	492	6:30- 9:00	6:30- 9:00	6:30- 9:00	0:00-11:00	6:30- 9:00	6:30-11:00	0:20- 9:00
WEAY, Houston, Texas	360	6:00- 7:00	6:00- 7:00	0:00- 7:00	6:00- 7:00	8:00-10:00	8:00-10:00	8:00-10:00
WFAA, Dallas, Tex.	476	8:30- 9:30	8:30-12:00	Silent	8:30- 9:30	8:30- 9:30	8:30-12:00	6:00-11:00
WFI, Philadelphia, Pa.	395	5:30- 6:00	5:30-10:10	5:30- 6:30	5:30- 8:00	5:30- 6:30	5:30-10:10	6:30- 7:30
WGI, Medford, Mass.	360	Silent	6:00- 7:30	6:30- 8:00	6:00- 7:30	6:30- 8:00	6:30- 8:03	7:30- 9:00
WGR, Buffalo, N. Y.	319	5:30-12:00	7:30- 7:45	5:30-12:00	5:30- 7:45	5:30-12:00	6:30- 7:45	2:00- 4:00
WGY, Schenectady, N. Y.	380	6:45- 9:00	6:45- 9:00	Silent	6:45- 9:00	6:45-10:30	8:30- 9:30	6:30- 7:30
WHA, Madison, Wis.	360	7:30- 8:30	Silent	7:30- 8:30	Silent	7:30- 8:30	Silent	Silent
WHAS, Louisville, Ky.	400	Silent	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	4:00- 5:00
WHAZ, Troy, N. Y.	380	8:00-10:00	Silent	Silent	Silent	Silent	Silent	Silent
WHB, Kansas City, Mo.	411	7:00- 7:45	7:00-10:00	7:00- 7:45	7:00-10:00	7:00- 7:45	7:00- 7:45	8:00- 1:00
WHK, Cleveland, O.	263	5:00- 6:30	6:00- 5:30	5:00- 5:30	5:00- 5:30	5:00- 6:30	5:00- 6:30	7:00- 9:30
WHN, New York, N. Y.	360	6:30-11:00	8:30-11:00	6:30-11:00	8:30-11:00	8:30-11:00	6:30-11:00	8:30-11:00
WIP, Philadelphia, Pa.	509	5:00- 6:30	5:00-11:00	5:00- 6:30	5:00-10:00	5:00- 6:30	5:00-11:00	8:30-11:00
WJAR, Providence, R. I.	360	Silent	6:00- 7:00	6:00-11:00	Silent	6:00- 9:00	Silent	Silent
WJAX, Cleveland, O.	390	Silent	6:30- 8:30	Silent	7:00- 9:30	Silent	Silent	Silent
WJAZ, Chicago, Ill.	448	Silent	10:00- 2:00	10:00- 2:00	10:00- 2:00	10:00- 2:00	10:00- 2:00	6:00- 9:00
WJY, New York, N. Y.	405	Silent	6:30- 9:30	Silent	6:30- 9:15	6:30-11:00	Silent	7:15-10:30
WJZ, New York, N. Y.	455	6:00-10:30	6:00-10:30	6:00-10:30	6:00-10:30	6:00-10:30	6:00-10:30	6:00- 9:30
WKAQ, San Juan, P. R.	360	Silent	7:00- 8:30	Silent	Silent	7:00- 8:30	Silent	Silent
WLAG, Minn.-St. Paul.	417	6:15- 7:00	6:15- 7:00	9:30-10:45	6:15- 7:00	9:30-10:45	9:30-12:30	7:45- 9:15
WLW, Cincinnati, O.	309	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00	Silent	Silent	7:45- 8:45
WMAQ, Chicago, Ill.	448	Silent	7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00	Silent
WMC, Memphis, Tenn.	500	8:30- 9:30	8:30-12:00	Silent	8:30- 9:30	8:30-12:00	8:30- 9:30	Silent
WNAC, Boston, Mass.	278	5:00- 9:00	7:00- 9:00	5:00- 9:00	7:00- 9:00	5:00- 9:00	8:00- 9:00	6:30- 8:30
WOAI, San Antonio, Texas	385	9:30-10:30	9:30-10:30	Silent	7:30- 8:30	Silent	Silent	9:30-10:30
WOAW, Omaha, Neb.	526	6:00-11:00	6:00-11:00	Silent	6:00-11:00	6:30-11:00	6:00-11:00	9:00-11:00
WOC, Davenport, Ia.	484	8:00-11:00	Silent	8:00- 9:00	9:00-10:00	8:00- 9:00	9:00-10:00	7:00-11:00
WOO, Philadelphia, Pa.	509	6:30-10:00	Silent	6:30-10:00	Silent	6:30-10:00	Silent	Silent
WOQ, Kansas City, Mo.	360	Silent	8:00- 9:30	Silent	8:00- 9:30	Silent	8:00- 9:30	7:00- 7:45
WOR, Newark, N. J.	405	5:15-10:00	9:15- 6:30	5:15-10:00	6:15- 8:30	5:15- 6:30	5:15-10:00	Silent
WOS, Jefferson City, Mo.	441	8:00- 9:30	Silent	8:00- 9:30	Silent	8:00- 9:30	Silent	7:30- 8:30
WRC, Washington, D. C.	469	Silent	7:00-10:00	Silent	7:00-10:00	Silent	7:15-10:00	Silent
WRM, Urbana, Ill.	360	Silent	7:00- 9:30	Silent	8:30- 9:30	Silent	Silent	Silent
WSAI, Cincinnati, O.	309	Silent	7:00-10:00	Silent	8:00-10:00	Silent	10:00- 1:45	Silent
WSB, Atlanta, Ga.	429	8:00-12:00	8:00-12:00	Silent	8:00-12:00	8:00-12:00	8:00-12:00	7:30- 2:00
WSY, Birmingham, Ala.	360	Silent	Silent	Silent	Silent	Silent	Silent	3:00- 9:00
WTAM, Cleveland, O.	390	Silent	Silent	7:00- 9:30	Silent	Silent	8:00-10:00	Silent
WTAS, Elgin, Ill.	286	8:15-12:00	8:15-12:00	8:15-12:00	8:15-12:00	8:15-12:00	8:15-12:00	8:15-12:00
WTAY, Oak Park, Ill.	283	Silent	6:15- 8:15	6:15- 8:15	6:15- 8:15	6:15- 8:15	6:15- 8:15	Silent
WWJ, Detroit, Mich.	517	7:30- 8:30	7:30- 8:30	7:30- 8:30	7:30-11:00	7:30- 8:30	6:00- 7:30	6:30- 7:30

Instructions for Use.—All the hours above are given in Central Standard Time. If your city uses Eastern Time, add one hour to each of the periods stated; if your city uses Mountain Time, subtract one hour; if your city uses Pacific Time, subtract two hours. This table includes only the evening broadcasts, and, on Sunday, the late afternoon program.

Radio amateurs all over the United States are now amusing themselves trying how many stations they can pick up.

If the point of the cat whisker on a crystal detector is filed occasionally, the signals received will be much better.

Thrills from Radio

No. 16 of a Series Featuring Experiences of "ALL-AMERICAN" Users

I've Tried Them All--"All Americans" are Best

By H. H. Parsons, Irving, N. Y.

"I guess I have made nearly every kind of a set, employing all the different hook-ups there are, and have used every kind of material including all the popular makes of audio frequency transformers.

"I have finally settled on the 'All-American' Transformers."

Another of the nearly three-quarter million All-American fans, Mr. T. E. Beaty, Woodlawn, Pa., confirms Mr. Parsons' opinion as follows:

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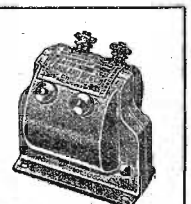

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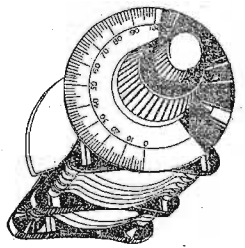

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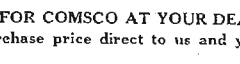

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58 PROGRAMS FOR EIGHT DAYS

Headliners of the Week

OPENING with All Fool's Day, April 1, the week need not be considered all tomfoolery. A number of stations have special features on, but at WDAF, E. O. Moffat will give the fifth of his second series of travelogues, while at KDKA you can hear an excellent program by the Brackenridge Glee club.

An evening with lovers of old tunes, old songs and old dances is promised *Wednesday* by WTAM. Mr. and Mrs. Otis C. Arnold will play "Money Musk" and "Arkansas Traveler" as they did before the Civil War. KLX has an author's program this night and will include talks by Stewart Edward White and Frederick O'Brien.

Chief Yowlache, Indian baritone of no mean ability, will sing *Thursday* evening from KFI. WFI, across the continent, will have Philadelphia boy scouts "do their stuff."

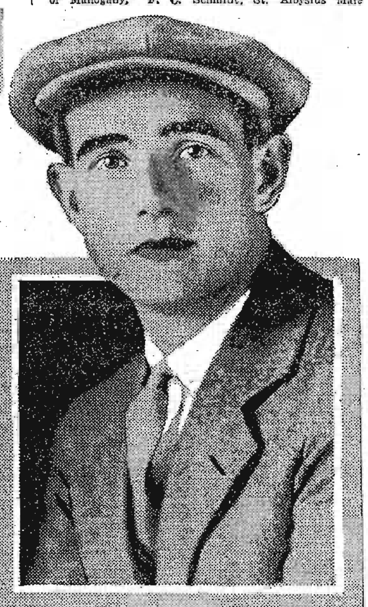
Friday night Prince Isaac Yonan, Assyrian prince, talks on Near East conditions, while the Oriole orchestra at WJAZ plays select dance numbers to the distant accompanyment (?) of Wendell Hall at WBAV with his ever-present ukulele. WDAF dedicates this evening to "Novelty Night" wherein amateurs may tryout before the mike.

Cornell university vs. Iowa State college in debate on "The Bok Peace Plan" will go on the air at WOI *Saturday* evening. Scots should tune in KHJ in the afternoon to hear the "Old Scotland" program.

Sunday presents the many usual high class sacred programs, but KFNF sounds exceptionally good. They promise old-fashioned hymns sung by the townspeople over one of those old-fashioned organs. *Sunday's* also a good night to dial KPO and hear Rudy Seiger's Fairmount Hotel orchestra.

The famous Missouri State Prison band, directed by Virgil Combs, will again be heard from coast to coast *Monday* night when WOS has this unique organization as their guest. Another good band for band lovers this evening is that at WOAW, the 17th U. S. Infantry band.

Aha! Opera at KGO *Tuesday*, April 8. The KGO Grand Opera company promises "Il Trovatore." And to the other extreme, lovers of the silent drama will have an oportunity to hear motion picture stars in program at KFI the same night.



Alicia Scott (left), soprano soloist, will sing "For You Alone" from KGO, Hale Bros., San Francisco, Tuesday evening, April 1, on the program commencing at 8:00 p. m. Another feature of this program will be a very interesting lecture by H. A. Snow, famous lion hunter, who will talk about "Hunting Wild Game in Africa." Mr. Snow is shown below feeling a lion cub captured on one of his recent trips. At the right is Dan Tothero, KGO Radio dramatic star, who will appear as Ambrose Peale in the three act comedy, "It Pays to Advertise," on Saturday, April 5

Tuesday, April 1

CKAC, Montreal, Can. (Eastern, 425). 7:00 p. m., Kiddies' stories in French and English; 7:30, Rex Battle and his Mount Royal Hotel Concert Orchestra; 8:30, Raoul Vennat and his artists; 9:30, Talk on Esperanto by Ex-Judge Blackham of Dublin (Ireland) Superior Court; 10:30, Joseph C. Smith and his Mount Royal Hotel Dance Orchestra.

CKY, Winnipeg, Can. (Central, 450). 8:45 p. m., "The Teeth and Health," member of Manitoba Dental Association; 9:00, Concert, Kiwanis Club Party.

KDKA, E. Pittsburgh, Pa. (Eastern, 326). 12:20 p. m., Lenten services Trinity Church Dr. Frank H. Nelson; 6:15 Dinner concert, Grand Symphony Orchestra; 7:15, "Pittsburgh—The Great Inland Port," William H. Stevenson; 8:00, "Moderation," from the Autobiography of Benjamin Franklin, Dr. John Ray Ewers; 8:15, U. of Pittsburgh, extension course; 8:30, Brackenridge Glee Club; 11:30, Concert, Queen City Orchestra.

KFAE, Pullman, Wash. (Pacific, 330). 7:30 p. m., Murphy's Dance Orchestra; Talk, The Outlook for Agriculture; Elsie Wicklund, pianist; Preparing for the Fair, W. W. Underwood; Automatic Army Rifles, Lieut. A. B. Pence; Mining talk, Dean L. O. Howard; "The Balance of Power and War," Prof. Carl Mauelshagen.

KFI, Los Angeles, Calif. (Pacific, 469). 6:45-7:30 p. m., Concert program by George J. Birkel Co., 8:00-9:00, Concert, Ambassador-Lyman's Cocoanut Grove Orchestra; 9:00-10:00,, Examiner Concert; 10:00-11:00, Vocal and instrumental concert.

KFKB, Milford, Kansas (Central, 286). 8:05 p. m., "Making Cheese on the Farm," Prof. N. E. Olson; 8:30, "Culling the Farm Flocks," Prof. L. F. Payne; Vocal solo, Bernice Hedge; Thelma Coffin, pianist; Vocal solos, Etta Conroy.

KFNF, Shenandoah, Ia. (Central, 266). 12:30 p. m., Noon-day concert for women.

KFSG, Los Angeles, Calif. (Pacific, 278). 3:30-4:30 p. m., Concert program; 7:00-7:30, Children's program, Bible story; 8:00-9:30, Musical service and sermon, Aimee Semple McPherson.

KGO, Oakland, Calif. (Pacific, 312). 8.00 p. m., Part I, Program, Troop Eleven Boy Scouts of America, "Boy Scouts," Scoutmaster Herbert Hauser; Assembly of Troop, Ray Kennedy; Pledge of Allegiance to Our Flag, by the Troop; "What Scouting Does for Us Boys," Eagle Scout Jean Bell; Camp songs; "Boy Scout Vacation Camps," Executive Home J. Bemiss; "What the Boy Scout Organization Does for the Boy," Abe P. Leach, president; Scout Oath and Laws; Taps; Part II, Western Electric Jazz Orchestra; Alicia Scott, soprano; Ella Lawrie, accompanist; "Hunting Wild Game in Africa," H. A. Snow; Frank Miller, baritone; Oris Osborne, contralto.

KGW, Portland, Ore. (Pacific, 492). 12:30 p. m., Concert, Civic Music Club of Portland; 3:30, Talk, by Jeanette P. Cramer; 7:45, Talk for farmers, Oregon Agricultural College Extn. Serv.

KHJ, Los Angeles, Calif. (Pacific, 395). 12:30-1:15 p. m., Program presented by White's Californians of San Gabriel; 2:30-3:30, Program through courtesy of Barker Brothers; 6:30-7:30, Children's program presenting Prof. Walter Sylvester Hartzog, Stories of American History; The Sandman and Queen Titania; H. G. Noble, harmonica; George M. Sterns, baritone; "Uncle John"; 8:00-10:00, De Luxe program.

KPO, San Francisco, Calif. (Pacific, 423). 1:00-2:00 p. m., Music, Rudy Seiger's Fairmont Hotel Orchestra; 2:30-3:30, Matinee program, New Shanghai Cafe Orchestra; 4:30-5:30, Seiger's Orchestra; 5:30-6:30, Children's stories, "Big Brothers" of KPO; 7:00-7:30, Seiger's Orchestra; 8:00-9:00, Spanish Night, management of Marie L. Boutin, School of Spanish Music; 9:00-10:00, Richard Waring, pianist; 10:00-11:00, E. Max Bradfield's Versatile Band.

KQV, Pittsburgh, Pa. (Eastern, 360). 11:00-11:30 a. m., Musical program; 1:00-1:30 p. m., Noon Musical program; 3:45-4:15 p. m., Music; 5:00-5:30 p. m., Music; "Twilight Tale" for "Kiddies"; Home features.

KSD, St. Louis, Mo. (Central, 546). 8:00 p. m., Studio program, Melharmonic Society of St. Louis; Address, C. W. Page; Address Prof. E. T. Reynolds.

KYW, Chicago, Ill. (Central 536). 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 2:35 p. m., Studio program; 6:50, Children's bedtime story; 7:00-7:30, Dinner music from the Congress Hotel, Joska DeBabary's Orchestra; Clyde Doerr's Orchestra; 8:00, Program; 8:20, American Farm Bureau Federation program, speakers, E. R. Cogswell; "The Basis of Wholesale Prices of Butter," C. L. Pier; 8:48, Chicago Musical College.

WAAM, Newark, N. J. (Eastern, 255). 7:00-7:30 p. m., Stamford Instrumental Trio; 7:30-8:00, Jimmy Clark and his Broadway Melody Entertainers; 8:00-8:15, Arline Felker, concert soprano; 8:15-8:30, Arundel Cotter of the Wall Street Journal talking on Jesse Livermore in the sixth of his intimate discourses on "Men of Prominence in Finance and Industry"; 8:30-8:45, Eleanor Nelson, society entertainer; 8:45-9:00, Dalton Sisters, harmony duet, Charles Gordon Philbin at piano; 9:00-9:30, Young Men's Christian Assn. Brass Band led by Oscar Heddy; 9:30-9:45, Russell Morgan, tenor; 9:45-10:00, Marguerite Barton, concert pianist; 10:00-10:15, American Warblers Orchestra; 10:15-11:00; Knickerbocker Novelty Orch. under direction of Arthur Hoffman; 11:00-11:15, Charles LeRoy; 11:15-11:30, George Williams, John Hill and the Trianon Melody Ensemble, singing; 11:30-12:00, Continuation Program by Arthur Hoffman's Knickerbocker Novelty Orch.

WAAW, Omaha, Neb. (Central, 360). 8:00 p. m., Lenten services by Zion Lutheran Church of Omaha, the Rev. K. M. E. Niermann, pastor.

WBAH, Minneapolis, Minn. (Central, 417). 12:30-1:30 p. m., Musical Program—Margaret Hughes Leenhuis, pianist; Miss F. Brock, soprano; Elsa Brodreau, whistler; 7:00-7:30, Musical—Minneapolis Boy Scouts.

WBAP, Fort Worth, Texas (Central, 476). 7:30-8:30 p. m., Concert, Municipal Band of Alvarado; 9:30-10:45, Concert, Hawaiian steel guitar music, Fred. Paul and Nanette Wagner.

WBAV, Columbus, Ohio (Eastern, 390). 12:00 m., Piano music, Ila Lorbach Owens.

WBZ, Springfield, Mass. (Eastern, 337). 7:00 p. m., "The Flower Garden," Hobert W. Headle; 7:30, Bedtime story for the Kiddies; 7:40, Lena Wollner, soprano; Mrs. Eleanor T. LaZazzera, accompanist.

WCAE, Pittsburgh, Pa. (Central, 462). 4:30 p. m., The Sunshine Girl; 6:30, Dinner concert, William Penn Hotel; 7:30, Uncle "Kaybee"; 7:45, Popular numbers, Ben Fields; Thelma Fields, pianist; 8:30, Musical program, Girls' Glee Club of U. of Pittsburgh.

WCAL, Northfield, Minn. (Central, 360). 9:45 a. m., St. Olaf college chapel services.

WCX, Detroit, Mich. (Eastern, 517). 6:00 p. m., Dinner concert, Hotel Tuller; 10:00, Red Apple Club.

WDAF, Kansas City, Mo. (Central, 411). 3:30 p. m., Joseph Black's Sexton Cafe Orchestra; 6:00, Travelogue, E. O. Moffat, information man; Fritz Hanlein's Trianon Ensemble; 11:45, Nighthawks.

WDAP, Chicago, Ill. (Central, 360). 7:00-8:00 p. m., Drake Concert Ensemble and Blackstone String Quintette; 8:00-8:30, Barton Organ Recital, Ralph Emerson; 10:00, Royal Whitmyer, Helen Louise Schafler, Rosemary Hughes, Frederick W. Agard, Bob Cougle, Jack Chapman's Orchestra.

WDAR, Philadelphia, Pa. (Eastern, 395). 11:45 a. m., Daily Almanac; 12:02 p. m., Stanley Theater organ recital; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories; 9:30, Features from Stanley Theater; 10:10, Howard Lanin's Arcadia Cafe Concert Orchestra.

WEAF, New York, N. Y. (Eastern, 492). 11:00-11:15 a. m., Board of Education; 4:00-4:20 p. m., Max Dutzman, tenor; 4:20-4:40, Hedy Spielter, pianist; 4:40-5:00, Sue Sar Vant, contralto; 5:00-5:30, Children's Stories; 7:30-7:40, Thornton Fisher; 7:40-8:00, Alfred Orner, tenor, and William Liebling, baritone; 8:00-8:10, Talk on Jewelry; 8:30-9:00, Brooklyn Eagle News Review; 9:00-9:30, Claire Gillespie, sopr.; 9:30-9:45, Ignatz Friedman, pianist; 9:45-10:15, Sara Alter, pianist; 10:15-10:30, Frederick Landis, philosopher; 10:30-11:00 Mrs. Geo. P. Robbins, violinist.

WFAA, Dallas, Texas (Central, 476). 12:30-1:00 p. m., Address, DeWitt McMurray; 8:30-9:00, Musical recital, Mozart Choral Club, Earle D. Behrends, director; 11:00-12:00, Musical and dramatic entertainment, players from the Jefferson Theater.

WFI, Philadelphia, Pa. (Eastern, 395). 1:00 p. m., Meyer Davis Concert Orchestra, Bellevue Stratford Hotel; 3:00, Philadelphia Music Club Concert from Bellevue Stratford Hotel; 6.00, Stories by Sunny Jim; 8:00, Coombs Concert Trio, Helen Krebs, pianist, Lester Druck, violin, Samuel Krebs, cellist; piano recital, Mildred Bonawitz; W. Orton Tewson, literary editor, Public Ledger; Homber O'Brien, negro spiritual songs; 10:10, Charlie Kerr and his Symphonic Dance Orchestra.

WGI, Medford Hillside, Mass. (Eastern, 360). 3:00 p. m., Amrad Women's Club program; Descriptive musical, by Chickering & Son's Co.; 3:45, "Tuesday Tea Talk," David McGregor Cheney; 7:00, "Africa from Cape Town to the Congo," A. S. Flint; 7:15, Musicale.

WGR, Buffalo, N. Y. (Eastern, 319). 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' Musical program; 6:00-7:30, Chamber music recital.

WGY, Schenectady, N. Y. (Eastern, 790). 2:00 p. m., Music and address, "Color and Harmony in House Decorations," Mrs. C. W. Ashworth; 6:30, Dinner music by Instrumental Trio of Hotel Ten Eyck; 7:45, Radio drama, Comedy, "Snowball," by WGY Players and WGY Orchestra.

WHAA, Iowa City, Ia. (Central, 484). 8:00 p. m., Address, "New Developments in Summer Study," Prof. Charles H. Weller.

WHAS, Louisville, Ky. (Central, 400). 4:00-5:00 p. m., Selections, Strand Theater Orchestra; Selections, Walnut Theater Orchestra; Selections, Alamo Theater organ; 7:30-9:00, Concert, Henry M. Schilling and his orchestra; Pianologues, Mrs. Stanley Thompson; pianologue, Mrs. Lee Gibson; Reading, An Interesting Historical Episode.

WHB, Kansas City, Mo. (Central, 411). 2:00 p. m., Ladies' hour of popular music by Sweeney Radio Orchestra; 7:00, W. C. T. U. talk; Piano solos, George Parish; 8:00, Program, Manard girls' class of Independence Boulevard Christian Church.

WHN, New York, N. Y. (Eastern, 360). 2:15-2:30 p. m., Jack Morisee and Lucille Du Mont, popular songs; 2:30-2:45, Richard Douglass, tenor; 2:45-3:30, Edw. B. Marks' music program; 3:45-4:30, Bob Schaefer and His Entertainers, assisted by the "Original Georgia Five"; 5:00-5:15, Al Norins and Clinton Sommer, songsters; 9:30-9:45, Fletcher Henderson's Alabam Club Orchestra; 10:00-10:15, Marie Reeve, soprano; 10:15-10:45, Bertrand J. Goodman's Orchestra of the Motamora Restaurant; 11:45-12:00, Dagmor Godowsky, motion picture star.

WIP, Philadelphia, Pa. (Eastern, 509). 1:00 p. m., Organ recital, Karl Bonawitz; 3:00, Six Saxophone Serenaders, Keach and Greene, directors; Louise T. McNay, contralto; 6:05, Dick Regan and his WIP Symphony Orchestra; 7:00, Uncle Wip's bedtime stories; 8:00, Elliott Lester, dramatic reviews; 8:15, Police Band of Philadelphia, direction Lieutenant Kiefer; 9:00-9:50, "The Yokohama Maid," by Business Women's League, Y. W. C. A., direction Henry Hotz; 10:15 p. m., Ted Weems and his Cafe L'Aiglon Orchestra.

WJAX, Cleveland, Ohio (Eastern, 390). 7:30 p. m., Program arranged by the Cleveland News-Leader; Bedtime story, Elmer G. Johnson; Radio Chalk Talk Cartoon, Don Palmer; Songs, Carabelle Johnson's Quartette; Solos, Joseph D'Angelo, baritone; Dance program, Epp-Israel Orchestra.

WJAZ, Chicago, Ill. (Central, 448). 10:00 p. m.-1:00 a. m., F. G. Bordner, baritone; Anna Nyberg, violinist; Hazel Sims, pianist; Oriole Orchestra.

WLAG, Minneapolis-St. Paul, Minn. (Central, 417). 10:45-11:15 a. m., Household Hints; 11:35-12:00 m., Surprise Hour; 2:00-2:30, Talk for League of Women Voters; 2:40-4:00, Lent's Gopher Orchestra; 4:00-4:30, WLAG Players presenting "The Dear Departed," Stanley Houghton; 5:30-6:00, Children's stories, Macalester College Girls; 6:00-6:15, "English Bull Dog," Curtis L. Mosher; 6:15-7:00, Dinner Concert; 7:30-8:15, Special musical program, Business Men's Association, Jasper, Minn.

WLW, Cincinnati, Ohio (Central, 309). 4:00 p. m., Topics of Interest to Women; 10:00, "The Romance of Mahogany," F. C. Schmidt; St. Aloysius Male Chorus, S. V. Elfert, director; 10:30, Half hour of April Foolishness, Alvin Plough, director; 11:00, Entertainment, Wadsworth Watch-case Dance Orchestra.

WMAQ, Chicago, Ill. (Central, 447.5). 2:35 p. m., Lyon & Healy program; 4:20, Items of interest to women; 4:30, Pupils, Glenn Dillard Gunn School of Music; 5:00, Weekly Child Life talk for children; 7:00, Debate, Crane Tech. and John Marshall High Schools; Humorous reading, Clinton Jerome; 8:00, Talk, Harry Hansen; 8:40, LaSalle Orchestra; 9:00, Lyon & Healy program.

WMC, Memphis, Tenn. (Central, 500). 8:30 p. m., Program, Prof. Chin-Chin, and his Britling's Cafeteria Novelty Orchestra; 11:00, Midnight frolic.

WOAW, Omaha, Nebr. (Central, 526). 6:30 p. m., Dinner program, Carl Lamps Orchestra; 9:00, Musical program, by pupils of Walter B. Graham and Choir of Hanscom Park M. E. Church.

WOC, Davenport, Iowa (Central, 484). 12:00 m., Chimes; 3:30 p. m., "Pharyngitis," A. G. Hinrichs; 5:45, Chimes.

WOO, Philadelphia, Pa. (Eastern, 509). 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wanamaker Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt.

WOR, Newark, N. J. (Eastern, 405). 2:30-2:45 p. m., Joint recital by Jack Morisee, tenor, and Lucille Du Mont, soprano; 3:30-3:45 p. m., Jack Morisee and Lucille Du Mont; 6:15-6:30, "Music While You Dine," Halsey Miller and his orchestra; 6:45-7:00, Man in the Moon Stories for Children; 7:00-7:15, "Music While You Dine," Halsey Miller and his orchestra.

WWJ, Detroit, Mich. (Eastern, 517). 8:00 a. m., Setting-up exercises, R. J. Holton, Y. M. C. A. physical director; 9:45, Fred Shaw, pianist and songster in "Ironing Day" program; 12:00, Edward Barnes, baritone; LeRoy DeTurk, tenor; 3:00 p. m., News Orchestra; 7:00, News Orchestra; Vocal numbers, Thaddeus Wronski, Lenten speaker.

WSB, Atlanta, Ga. (Central, 429). 4:00-4:30 p. m., Howard Theater overture and prologue; 5:00, Music; 5:30, Bonnie Barnhardt's songs and bedtime story; 8:00-9:00, Dahlstrand Orchestra; 10:45-11:45, Independent Quartet, darky jubilee harmonists.

Wednesday, April 2

CKAC, Montreal, Can. (Eastern, 425). 1:45 p. m., Classic concert, Mt. Royal Hotel Orchestra; 4:30, Mt. Royal Hotel Dance Orchestra.

CKCH, Ottawa, Canada (Eastern, 435). 8:00 p. m., "Nationalization of Canadian Railways," by D. E. Calloway.

KDKA, E. Pittsburgh, Pa. (Eastern, 326). 12:20 p. m., Lenten services, Trinity Church, Dr. Frank H. Nelson;

(Continued on page 16)

TEMPTING ARRAY OF FEATURES GR

Where to Hear Concerts

THESE are the stations for music lovers to dial, and you can hear, providing you dial correctly and read the programs carefully, everything from jazz to opera.

Tuesday: KDKA, KFI, KFSG, KGO, KHJ, KPO, KSD, KYW, WAAM, WAAW, WBAH, WBAP, WBZ, WCAE, WCX, WDAF, WDAP, WDAR, WEAF, WFAA, WFI, WGI, WGY, WHAS, WHB, WIP, WJAX, WJAZ, WJY, WJZ, WLAG, WLW, WMAQ, WMC, WOAW, WOO, WOR, WSB, WTAS, WWJ.

Wednesday: KDKA, KFAE, KFI, KFNF, KFSG, KGW, KHJ, KPO, KSD, KYW, PWX, WAAM, WAAW, WBAP, WBZ, WDAF, WDAP, WDAR, WCAE, WCX, WEAF, WEAO, WFAA, WFI, WGI, WHAS, WHB, WIP, WJAZ, WJZ, WLAG, WLW, WMAQ, WOC, WOO, WOR, WOS, WSB, WTAM, WTAS, WWJ.

Thursday: CKAC, KFI, KFSG, KGO, KGW, KHJ, KLZ, KPO, KSD, KYW, WAAM, WBAH, WBAP, WBZ, WCAE, WCAL, WCBD, WCX, WDAF, WDAP, WDAR, WEAF, WEAO, WFAA, WFI, WGI, WGY, WHAS, WHB, WIP, WJAX, WJAZ, WJY, WJZ, WLAG, WLW, WMAQ, WMC, WOAW, WOC, WOO, WOR, WSB, WTAS, WWJ.

Friday: KDKA, KFAE, KFI, KFSG, KHJ, KGW, KPO, KYW, WBAH, WBAP, WBAV, WBZ, WCAE, WCAL, WCX, WDAF, WDAR, WEAF, WEAO, WFAA, WFI, WGI, WGX, WHAS, WHB, WHK, WIP, WJAZ, WJY, WJZ, WLAG, WMAQ, WMC, WOAW, WOC, WOO, WOR, WOS, WSB, WTAS, WWJ.

Saturday: CKAC, KDKA, KFI, KFNF, KFSG, KGO, KHJ, KPO, KSD, KYW, PWX, WBZ, WCAE, WCAL, WDAF, WDAP, WDAR, WEAF, WFAA, WFI, WGI, WHAS, WHK, WIP, WJAZ, WJZ, WLAG, WMAQ, WMC, WOAW, WOC, WOO, WOR, WSB, WTAM, WTAS, WWJ.

Sunday: CKAC, KFI, KFNF, KFSG, KPO, KHJ, KYW, WBAP, WCAE, WCAL, WDAP, WDAR, WEAF, WFAA, WGI, WGY, WHAS, WHK, WIP, WJAZ, WLAG, WOC, WSB, WTAS.

Monday: KDKA, KFAE, KFI, KPO, WAAM, WAAW, WBAH, WBAP, WBAV, WBZ, WCAE, WCBD, WDAF, WDAR, WEAF, WFI, WGY, WHAZ, WIP, WLAG, WLW, WMC, WOAW, WOC, WOO, WOR, WOS, WSB, WTAS.

Tuesday: KPO, WHAS, WOAW, WAAW, WDAF, WIP, WOO, WLW, WGY, WSB, WTAS.

Wednesday, April 2

(Continued from page 15)

6:15, Dinner concert, Pittsburgh Athletic Association Orchestra; 8:00, Program, United Synagogue of America; 8:30, Banquet of the Hospital Association of Pennsylvania, speakers, M. T. MacEachern, M. D., Chicago; Henry G. Wasson, Pittsburgh; John W. Raper, Cleveland; Rev. Carl W. Petty, Pittsburgh.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., Detective Stories by Detective Nick Harris; Concert; 8:00-9:00, Evening Herald concert; 9:00-10:00, Examiner concert; 10:00-11:00, Instrumental concert by Hollywoodland Community Orchestra; 11:00-12:00, Concert, Ambassador-Lyman's Cocoanut Grove Orchestra.

KFKB, Milford, Kansas (Central, 286), 8:05 p. m., "Farm Accounting," Prof. I. N. Chapman; 8:30, Timely topics; Boyd Ringo, pianist; Vocalist, Prof. Ira Pratt; Harry Lamont, violinist.

KFNF, Shenandoah, Ia. (Central, 266), 7:30 p. m., Concert by Shenandoah talent.

KFSG, Los Angeles, Calif. (Pacific, 278), 2:30-4:30 p. m., Divine Healing Service, Sister McPherson; 7:00-7:30, Children's program, Bible story; 8:00-9:30, Musical program and Bible service, Sister McPherson.

KGW, Portland, Ore. (Pacific, 492), 12:30 p. m., Concert, Darby's Orchestra; 3:30, Children's program; 8:00, Concert, Elks Band, W. A. MacDougal, director; 9:00, Business talk, James Albert; 10:00, Dance music, George Olsen's Metropolitan Orchestra.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Program presenting Florence Mason Tatsch, soprano, accompanied by Mrs. Nellie Goucher Schwankovsky; 2:30-3:30, Program, Barker Brothers; 6:30-7:30, Program presenting Prof. Walter S. Hertzog, Stories of American History; Bud Pentz, pianist; "Uncle John"; 8:00-10:00, Program presenting Paul G. Hoffman Company; "The Go-Getter," E. P. Murphey, reader.

KLX, Oakland, Calif. (Pacific, 509), 8:00-10:00 p. m., Vocal solos, Jackson Bennett; Talks by authors, Stewart Edward White, Frederick Obrien and others; Comedy stories, Earle Wilson; Gertrude Nash, pianist; Address, Major A. H. Hutchinson; "Battery Troubles," J. A. Ramsey; Dance music, Sutherlands Oakland Syncopators.

KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m., Seiger's Orchestra; 2:30-3:30, Jack Fait's Entella Cafe Orchestra; 4:30-5:30, Seiger's Orchestra; 5:30-6:30, Children's stories, "Big Brother," of KPO; 7:00-7:30, Seiger's Orchestra; 8:00-11:00, E. Max Bradfield's Versatile Band; During intermissions, Joseph Carey, blind composer, and his artists will sing compositions by Carey.

KQV, Pittsburgh, Pa. (Eastern, 360), 11:00-11:30 a. m., Music; 1:00-1:30 p. m., Noon Musical program; 3:45-4:15 p. m., Music; 5:00-5:30 p. m., Music; "Twilight Tale" for "Kiddies"; Home features; 9:00-10:00 p. m., Artists' program; Anna George, dramatic soprano; Lida Houser Warner, violinist; Mrs. Minnie Rencker, accompanist.

KSD, St. Louis, Mo. (Central, 546), 6:30 p. m., Program, Abergh's Concert Ensemble; Arne Arnesen, violinist; 9:00, Studio program, Margaret Nolan, soprano; Lois Gage, pianist; 11:00, Hotel Statler Dance music, Rodemich's Orchestra.

KYW, Chicago, Ill. (Central, 536), 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 6:00, Spanish Lessons, Prof. A. A. Braschie; 6:50, Children's bedtime story; 7:00, Dinner concert, Joska Debabery's Orchestra; Clyde Doerr's Orchestra; 8:00, Sherwood School of Music, Erma Bary, director; 9:00, "Good Roads," Chicago Motor Club; 9:05, Program, Union Trust Company; 9:15, Book Reviews, Llewellyn Jones; 10:00-2:00, Midnight revue.

WAAM, Newark, N. J. (Eastern, 225), 7:00-7:15 p. m., Al Novins and Clinton Sommer; 7:15-7:30, Richard Douglas, baritone; Jos. Macy, accompanist; 7:30-7:45, Harry Hoch Cameo Record Review, assisted by Ben Jacobs, tenor of the New York Police Dept. Glee Club and Benj. Friedman; 7:45-8:00, "Silver Selections" under auspices of Alvin Silver Co.; 8:00-8:15, Orchestra of Franklin School of Music, Newark, N. J.; 8:15-8:30, Lorraine Saylor, singer; 8:30-8:45, Raymond P. White, vice-commander of the American Legion, state of New Jersey, speaking on "What the American Legion Means to the American People"; 8:45-9:00, Winifred D. Witt, contralto; 9:00-9:15, Address by E. H. Christy, publicity officer of the American Legion; 9:15-9:30, Thomas Hamilton, tenor; 9:30-9:45, "Happy" Harry Lund, Broadway's Radio critic; 9:45-10:00, Baby Babette, with Phil Moore and Blanche Vincent; 10:00-10:15, James A. Brennen, songster; 10:15-10:30, "The Difficult Art of Loafing," by Teddy O'Neil, ex-professional hobo; 10:30-10:45, Frederick and Viola Henze, singers; 10:45-11:00, Harold Taft Wright, tenor; 11:00-12:00, Edward A. Sussman's Original Memphis Syncopators.

WBAH, Minneapolis, Minn. (Central, 417), 12:30-1:30 p. m., Dick Long's Trio and soloist; 7:00-7:30 p. m., Lecture program, Dr. J. W. Holland.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, talent from Venus; 9:30-10:45, Concert, George Freeman's Sooner Serenaders.

WBAV, Columbus, Ohio (Eastern, 390), 12:00 m., Piano music, Ila Lorbach Owens.

WBZ, Springfield, Mass. (Eastern, 337), 6:00 p. m., Dinner concert, WBZ String Orchestra; 7:00, Humorous program; "Ordnance Department of the Organized Reserves," Major Charles A. Thuis; 7:30, Bedtime story for the Kiddies; 7:40, Program, Chamber music, WBZ String Orchestra; Mrs. C. D. Root, soprano.

WCAE, Pittsburgh, Pa. (Central, 462), 3:00 p. m., Piano recital, Fred Rosenfeld; 4:30, Uncle "Kaybee"; 5:00, Dave Harmon's Orchestra; 6:30, Dinner concert, William Penn Hotel; 7:30, Sunshine Girl; 7:45, Novelty piano playing, lesson 8, Henry Rolnert; 8:30, Musical program, Brecht's Family orchestra.

WCAL, Northfield, Minn. (Central, 360), 9:45 a. m., St. Olaf College chapel services.

WCX, Detroit, Mich. (Eastern, 517), 4:15 p. m., Musical program; 6:00 p. m., Dinner concert, Hotel Tuller; 8:30, Musical program, Bertha Bright Knapp.

WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., Joseph Black's Sexton Cafe Orchestra; 6:00, Health talk by representative Health Conservation Association; Children's story; Information man; 8:00, Classical music by Marjorie Rose Ryan's vocal pupils; 11:45, Nighthawks.

WDAP, Chicago, Ill. (Central, 360), 7:00-8:30 p. m., Drake Concert Ensemble and Blackstone String Quintette; 10:00, Sidonia Fredericks, A. V. Hayes, Burton Organ, Ralph Emerson, Jack Chapman's Orchestra.

WDAR, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Piano solos, Edna Finestone; Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories.

WEAF, New York, N. Y. (Eastern, 492), 11:00-11:15 a. m., N. Y. Tuberculosis Society; 11:15-11:35, Helen Morris, soprano; 12:00-12:15 p. m., Chapel Service, Columbia University; 4:00-4:30, May List, pianist; 4:30-5:00, Raymond C. Frank, tenor; 5:00-5:30, Hazel Franklin Bailey, soprano; 7:00-7:30, United Synagogue Services; 7:30-7:40, Thornton Fisher; 7:40-8:00, Viola Ellis, contralto; 8:00-8:20, Columbia University Course; 8:20-8:30, American Bond & Mortgage Co.; 8:30-10:15, Philharmonic Concert.

WEAO, Columbus, Ohio (Eastern, 360), 4:00 p. m., Agricultural lecture, member faculty; Music, Student artists.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Musical program, Red Head Girl.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis' Bellevue Stratford Concert Orchestra; 3:00, Earl Elwell, pianist; Talk, "Optics," Robert Beane; piano recital, Loretta Kerk; 6:00, Stories by Sunny Jim; 6:30, Meyer Davis' Bellevue Stratford Concert Orchestra.

WGAZ, South Bend, Ind. (Central, 360), 7:00-8:30 p. m., Elton Crepeau, baritone; Miss E. Minardo, pianist; Hotel LaSalle Orchestra.

WGI, Medford Hillside, Mass. (Eastern, 360), 6:50 p. m., Message to Camp Fire Girls, by Chas. W. Casson, "Big Smoke"; 7:30, Concert, by the G. A. R.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' Musical Program; 6:30-7:30 and 11:30, Vincent Lopez Hotel Statler Orchestra; 8:45, Reading, Mrs. Lucile Doane Swift, of the League of American Pen Women; 9:00, Concert, direction of A. Royce Grimm.

WGY, Schenectady, N. Y. (Eastern, 790), 6:30 p. m., "Adventure Story," Silent night.

WHA, Madison, Wis. (Central, 360), 7:30 p. m., "Some Acute Present Day Problems on Immigration," Prof. D. D. Lescohler.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Walnut Theater Orchestra; Strand Theater Orchestra; Alamo Theater organ; 7:30-9:00, Concert, Mrs. Jane Webster Murrell Studio; Reading, An Interesting Historical Episode.

WHB, Kansas City, Mo. (Central, 411), 12:35 p. m., Popular music, Sweeney Radio Orchestra; 2:00, Ladies' hour of popular music by Sweeney Orchestra; 7:00 Dance music by Dillard's Orchestra, Walt Filken's poems.

WHN, New York, N. Y. (Eastern, 360), 2:15-2:30 p. m., Ben Jacobs, tenor, and Nettie Harbater; 2:30-3:00, Irving Berlin Music Co.; 4:45-5:30, "The Tangoland Serenaders"—Jerry Schwartz, leader; 7:30-8:00, Paul Van Loan and His Cinderella Orch.; 8:00-8:30, Fletcher Henderson's Alabam Club; 8:30-8:50, Program by Union of Orthodox Jews; 9:00-9:15, Murray O'Neil, baritone; 9:15-9:45, Dan Gregory and His Dancing Carnival Orch.; 9:45-10:00, M. Witmark Black and White Program; 10:15-10:30, Mary L. Murphy, soprano, and Katherine Connolly, pianist; 10:30-10:45, Florence Ritchie and May Looney, piano duets.

WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Gimbel Brothers' Tea Room Orchestra, direction, Ray Steen; 3:00, Artist recital; Ethel Smaltzer Littlehales, soprano; Laura T. Bast, contralto; Emily Loeben, pianist; 6:05, Dinner music, St. James Hotel Dinner Dance Orchestra; 7:00, Uncle Wip's bedtime stories.

WJAZ, Chicago, Ill. (Central, 448), 10:00 p. m.-1:00 a. m., Earl Wetteland, pianist; Isadore Mishkin, baritone; George Maitland violinist; Oriole Orchestra; 12:00 midnight, Bowdoin program.

WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 10:45-11:15 a. m., Household Hints; 11:15-12 m., Surprise Hour; 2:00-2:30 p. m., "Dressmaking," Mme. Myrtle Saperston; 2:40-4:00, Daylight Concert; 4:00-4:30, Magazine Reading; 5:30-6:00, Children's Stories, Mrs. Robert Cargill; 6:00-6:30, Sport Hour—"Getting Ready for Spring Sports," Ben Leighton; "Flying as a Sport," Prof. Chas. Boehnlein; 7:30-8:15, Farm Lectures—"Growing Sugar Beets in Minnesota," F. W. McGinnis; Talk, Dean F. J. Wulling, University of Minnesota; 9:15, Business Message; 9:30, Concert—Sutorius Mandolin Orch.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Special program for "Shut Ins," Wurlitzer Company Concert; 7:50, F. C. Schmidt; 8:00, Gerimer Band and Orchestra; Sinfonian Fraternity, Eta Chapter of the College of Music, American Compositions; 9:00, Choir program, Beecher Club; 9:30, Geringer's Band; Glenn Flowers, cornetist; Miamitown Orchestra; Dranville Buell, saxophonist.

WMAQ, Chicago, Ill. (Central, 447.5), 12:00 m., Speech, Senator Thurlow Essington; 1:00 p. m., Speeches, Chicago Association of Commerce; 4:20, Items of interest to women; 4:30, Pupils, Cosmopolitan School of Music; 7:00, Georgene Faulkner, story lady; 7:30, Weekly lecture from Northwestern University; 8:40, LaSalle Hotel Orchestra; 9:00, Talks, Chicago Charities; 9:15, Program, Y. M. C. A. Glee Club.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 8:30 p. m., "Patrick Henry's Appeal to Arms," C. A. Russell; 6:30, Sandman's visit; 7:00, "Orchard Spraying," Louis James; 7:15, "Some Interesting Facts on the Work of the U. S. Bureau of Fisheries," Herman O. Hesen, Jr.; 8:00, Organ recital, Erwin Swindell; Mrs. Arthur P. Griggs, contralto.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wanamaker Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt; 7:30, Havan Casino Orchestra from Hotel Sylvania; 8:45, Woo Orchestra, Robert E. Golden, director; 10:03, Organ recital, Mary E. Vogt.

WOQ, Kansas City, Mo. (Central, 360), 7:00 p. m., Music by Sickman's Society Orchestra, Talks by Democratic City Committee.

WOR, Newark, N. J. (Eastern, 405), 2:30-2:45 p. m., Piano selections by Frances Pehl of Brooklyn; 2:45-3:00, Recital by Marie Langdon Andrews, soprano; 3:30-3:45, Frances Pehl; 3:45-4:00, Marie Langdon Andrews; 6:15-6:45, Music While You Dine—Ernie Kricketts Paramount Record Orch.; 8:00-8:15, Charms Magazine presents a talk to lovers of flowers by K. M. Koster; 9:30-9:45, Jimmie Sherer's Revue; 10:00-10:45, Men's Community Bible Class Orchestra of Roselle Park, N. J., under direction of Fred G. Smith.

WOS, Jefferson City, Mo. (Central, 440.9), 8:00 p. m., Address, "Foliage Sprays for Apples, Peaches, Cherries and Plums," Ashleigh P. Boles; 8:15, Address, "Farm Motive Power," Dave E. Darrah.

WSB, Atlanta, Ga. (Central, 429), 12:00 m., Entertainment; 4:00-4:30 p. m., Howard Theater overture and prologue; 5:00, Vick Myers' Melody Orchestra; 5:30, Bonnie Barnhardt's songs and bedtime story; 10:45-11:45, DeKalb quartet in classic hour.

WTAM, Cleveland, Ohio (Eastern, 390), 8:00 p. m., Music, WTAM Symphony Orchestra; Solos, Marcia B. Francis, soprano; Dorothy Smith Lenz, contralto; Bud Van Kirk; Clara Sharp, accompanist; Barn Dances, Otis C. Arnold, violin; Mrs. Libby Arnold, piano; Quartette, Marcia B. Francis, soprano; Dorothy Smith Lenz, contralto; John L. Mainwaring, tenor; Bud Van Kirk, bass; Clara Sharp, piano; Saxophone solo, Frank Hruby; Duet, Dorothy Smith Lenz, John L. Mainwaring, tenor; Duet, Marcia B. Francis, Dorothy Smith Lenz; Clara Sharp, piano.

WWJ, Detroit, Mich. (Eastern, 517), 12:00 m., Jean Goldkette's Orchestra; 3:00 p. m., News Orchestra; 7:00, News Orchestra; Elsa Post, reader; Lucille Eggleston, pianist; Hudson Tschirrhart, Japanese fiddler; Lenten speaker.

George Chandler (left) and I[...] WDAP, Chicago. The hat i[...] hearing his own music. No[...] the cast of "Lollipop," a m[...] will be broadcast from WJY[...] noted dancer before the mi[...] on "The Body Beautiful." station on April 4. Morry I[...] on the afternoon programs wicked fingers when

Thursday, April 3

CKAC, Montreal, Can. (Eastern, 425), 7:00 p. m., Kiddies' stories in French and English; 7:30, Rex Battle and his Mt. Royal Hotel concert orchestra; Benjamin Scherzer, violinist; 8:30, La Presse studio entertainment; 10:30, Joseph C. Smith and his Mount Royal Hotel Dance Orchestra, featuring George Fishburg.

KDKA, E. Pittsburgh, Pa. (Eastern, 326), 12:20 p. m., Lenten services, Trinity Church, Dr. Frank H. Nelson; 6:15, KDKA Little Symphony Orchestra; 8:00, Farm program, National Stockman and Farmer; 8:30, Concert, Albert R. Norton; 11:30, Special Late Evening concert.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., Concert by Y. M. C. A., sales lecture and bedtime story; 8:00-9:00, Concert by Ambassador Hotel; 9:00-10:00, Examiner concert; 10:00-11:00, Vocal and Instrumental concert presenting Ann Thompson, pianist, and Chief Yowlache, Indian baritone.

KFKB, Milford, Kansas (Central, 286), 8:05 p. m., "The Easter Bonnet," Mrs. Harriet Paul; 8:30, "Keeping the Rainbow and Sunset in the House," Ethel M. Arnold; Vocal Solo, Harold Flamm; Ruth Faulconer, pianist.

KFSG, Los Angeles, Calif (Pacific, 278), 3:00-4:30 p. m., Organ recital; 7:00-7:30, Children's program—Bible story; 8:00-9:30, Musical program.

KGO, Oakland, Calif. (Pacific, 312), 8:00 p. m., California String Quartet, Scott Elder, Edward Cykler, Joseph Walters, C. Winston Petty; California Mixed Chorus, Laura Broderick, soprano; Ruth Waterman, contralto; Carl Anderson, tenor; Henry L. Perry, bass; "Aunt Mariah's Romance," Edna Sutton Stark; Edna Linkowski, pianist; "Migrating Birds of California," Dr. Harold Bryant; KGO Radio Minstrels; Clarence H. Oliver, baritone.

KGW, Portland, Ore. (Pacific, 492), 12:30 p. m., Concert; 3:30, Story, "The Midlander," 8:00, Accordion solos, Johnny Sylvester; 8:15, Dance music, George Olsen's Metropolitan Orchestra; 10:00, Dance music, George Olsen's Metropolitan Orchestra.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Concert; 2:30-3:30, Program presented by courtesy of Barker Brothers; 6:30-7:30, Children's program presenting Prof. Walter Sylvester Hertzog, Stories of American History; "Uncle John"; 8:00-10:00, Program arranged by Roy F. Chesley Ford agency presenting Mr. and Mrs. Blickford, the Blickford Mandolin Orchestra, and Gail Mills Dimmit, soprano.

KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m., Seiger's Orchestra; 2:30-3:30, Matinee program, U. S. Army Band; 4:30-5:30, Seiger's Orchestra; 5:30-6:30, Children's hour, "Big Brother" of KPO.; 7:00-7:30, Seiger's Orchestra; 8:00-9:00, Organ recital, Theodore J. Irwin; 9:00-10:00, Program by Cap and Bell Club, Dr. Heft, director; 10:00-11:00, E. Max Bradfield's Versatile Band.

KQV, Pittsburgh, Pa. (Eastern, 360), 11:00-11:30 a. m., Music; 1:00-1:30 p. m., Noon Musical program; 3:45-4:15 p. m., Music; 5:00-5:30 p. m., Music; "Twilight Tale" for "Kiddies"; Home features.

KSD, St. Louis, Mo. (Central, 546), 8:00 p. m., Studio program, Duo-piano recital, Olivia Williams, Hilda Medeira.

KYW, Chicago, Ill. (Central, 536), 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 2:35 p. m., Studio program; 6:50, Children's bedtime story; 7:00, Dinner concert, Joska DeBabary's Orchestra; Clyde Doerr's Orchestra; 7:35, Sport talk, Leo Fisher; 7:55, "Finance and the Markets," Thomas T. Hoyne; 8:20, Edison Symphony Orchestra; James Durham, tenor; 9:05, Talk, auspices of the Illinois Women's Voters; 9:20, Talk, auspices "The Black Diamond."

WAAM, Newark, N. J. (Eastern, 255), 7:00-7:30 p. m., Times Square Entertainers, assisted by the Irvington Trio; 7:30-7:45, Frank W. Efinger speaking on "Neutrodynes and Super-hetrodynes"; 7:45-8:00 Lillian Spitzer, juvenile concert pianist; 8:00-8:15, Margulies Trio; 8:15-8:30, Madame Gitta Rapoch, soprano; 8:30-8:45, "Roughage and Why We Eat It," by Dr. G. A. Lowenstein; 8:45-9:00, Ruby A. Heritage, soprano; 9:00-9:15, Victor Wilbur, baritone; 9:15-9:30, Rev. Dr. Arthur W. Brooks, scientific astrologist; 9:30-9:45, Fritzi Leyton, vaudeville headliner; 9:45-10:00, Sam Coslow, songster; 10:00-10:30, Charles J. Sanders' Sterling Dance Orchestra from Greenwood Lake, N. J.; 10:30-10:45 Plantation Male Quartette; 10:45-11:15, Continuation Program by Charles J. Sanders' Sterling Dance Orch.; 11:15-11:30, Harry Golub, tenor, and Jack Palmer, pianist.

WAAW, Omaha, Neb. (Central, 360), 8:00 p. m., Educational program; International Sunday School lesson, Rev. E. M. Brown; agricultural talk, W. J. Martin, Union Pacific System.

WBAH, Minneapolis, Minn. (Central, 417), 12:30-1:30 p. m., Dick Long's Trio and soloist; 9:30-11:00 p. m., All State Theater Program.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, James Wood, tenor; Mrs. Herman Knox, pianist; 9:30-10:45, Concert, 50-piece Fort Worth Police Band.

WBAV, Columbus, Ohio (Eastern, 390), 12:00 p. m., Weekly religious service, Rev. W. C. Hartinger, First M. E. Church, speaker.

WBZ, Springfield, Mass. (Eastern, 337), 7:00 p. m., Music talk, "Sacred Music: Oratorio; The Spirit of Worship," Prof. Robert E. S. Olmsted; 7:30, Bedtime story for the Kiddies; Sylvia Glasser; pianist.

WCAE, Pittsburgh, Pa. (Central, 462), 4:30 p. m., Sunshine Girl; 6:30, Dinner concert, William Penn Hotel; 7:30, Uncle "Kaybee"; 7.50, Travel talk, Rev. Clyde L. Nevins; 8:30, Musical program, Nevin Concert Trio.

WCAL, Northfield, Minn. (Central, 360), 9:45 a. m., St. Olaf College Chapel service; 9:00 p. m., Edna Mabon, soprano; Margaret Hoegaard, pianist; Mrs. George Mohn, accompanist.

WCX, Detroit, Mich. (Eastern, 517), 2:20 p. m., Sunday School lesson, Rev. Gaius Glenn Atkins; 5:15, Musical program; 6:00, Dinner concert, Hotel Tuller; 8:15, Lenten talk, Rev. John A. McClory, S. J.

WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., D. Ambert Haley's Dance orchestra; 6:00, Speaker from William Jewell College, speaker from National Livestock Board, reading by Miss Cecile Burton, children's story, Information man, Fritz Hanlein's Trianon Ensemble; 11:45, Nighthawks.

WDAP, Chicago, Ill. (Central, 360), 7:00-8:00 p. m., Drake Concert Ensemble and Blackstone String Quintette; 8:00-8:30, Barton Organ, Ralph Emerson; 10:00, Lake Forest School of Music, Jack Chapman's Orchestra.

WDAR, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Arcadia Cafe Concert Orchestra; 4:00, Mme. Julienna, songs; 4:30, Max Essner and his Orchestra from Cafe Martinique; 7:30, Dream Daddy's bedtime stories.

WEAF, New York, N. Y. (Eastern, 492), 4:00-5:00 p. m., Hotel Carleton Terrace Orch.; 5:00-5:15, Talk by Mrs. N. D. Chapman; 5:15-5:45 Beulah Rowland, soprano; 7:00-7:30, N. Y. Federation of Churches; 7:30-7:40, Thornton Fisher; 7:40-8:00, Geraldine Marwick, soprano; 8:00-8:10, Program by Horowitz Bros.; 8:30-9:00, Hunter College Musical Program; 9:00-9:10, Bank of America; 9:10-9:30, Hunter College; 9:30-9:45, Columbia Phonograph Co.; 9:45-10:45, Chiclet Program.

DANCING AND DRAMATICS

WHERE and when to dial to dance:

Tuesday: CKAC, KHJ, KPO, KYW, WDAP, WFI, WHN, WIP, WJAZ, WJZ, WLW, WMAQ, WOR, WTAS, WWJ.

Wednesday: CKAC, KGW, KHJ, KPO, KSD, KYW, WBAP, WDAP, WHN, WJAZ, WJZ, WMAQ, WOR, WOS, WTAS, WWJ.

Thursday: CKAC, KFI, KGW, KHJ, KPO, KYW, WDAP, WEAF, WFI, WHN, WIP, WJAX, WJAZ, WJZ, WMAQ, WOR, WTAS, WWJ.

Friday: CKAC, KHJ, KPO, KYW, WDAP, WEAF, WHK, WHN, WJZ, WMAQ, WTAS, WWJ.

Saturday: KFI, KHJ, KPO, KGW, KYW, WDAP, WFAA, WFI, WGY, WHN, WIP, WLAG, WOR, WTAM, WWJ.

Monday: CKAC, KPO, WEAF, WHAZ, WOS, WTAS.

DRAMA NOTES

Tuesday: WGY "Snowball."

Saturday: KGO, "It Pays to Advertise," KGO Players.

Tuesday: KGO Grand Opera, "Il Trovatore," KGO Players; WGY One Act Play "Rosalie," "HMS Pinafore," WGY Light Opera Company.

GREET MANY MID-SEASON LISTENERS

er (left) and his musical saw are regular Friday night features at go. The hat is for no reason and the earmuffs to prevent him from n music. Next to Mr. Chandler is Ada May, one of the stars in ollipop," a musical comedy now appearing on Broadway, which ist from WJY, New York, on April 4. Olive Ann Alcorn (above), efore the microphone at KFI, giving one of her weekly lectures Beautiful." Miss Alcorn's next lecture will be given from this il 4. Morry Harmon (right), pianist, appears as a regular feature on programs at WGR, Buffalo. Mr. Harmon shakes a bunch of fingers when it comes to getting music out of the ivories

Where to Hear Talks

TALKS, instructive, serious, humorous and even frivolous, are broadcast daily and below are listed the stations.

Tuesday: KDKA, KGW, KHJ, KYW, WAAM, WCAE, WCAL, WDAF, WDAR, WEAF, WFAA, WGI, WGY, WHB, WIP, WJY, WJZ, WKAR, WLAG, WMAQ, WMC, WOC, WSB, WWJ.

Wednesday: KDKA, KFAE, KFKB, KGO, KGW, KPO, KYW, WAAM, WBAH, WBZ, WDAF, WDAR, WEAF, WEAO, WGI, WHA, WJZ, WHAR, WLAG, WMAQ, WOC, WOR, WOS, WWJ.

Thursday: KDKA, KYW, WAAW WAAM, WAAW, WBZ, WCAE, WDAF, WDAR WEAF, WEAO, WFAA, WGY, WHAS, WHB, WIP, WJAX, WJY, WJZ, WKAR, WLAG, WMAQ, WOC, WOR, WWJ.

Friday: KFAE, KGW, KHJ, KYW, WAAW, WBZ, WCAL, WDAF, WEAO, WFAA, WGI, WGY, WHA, WHB, WIY, WJZ, WLAG, WMAQ, WOC, WOS, WWJ.

Saturday: KYW, WBAH, WBAP, WDAF, WFAA, WFI, WGI, WIP, WLAG, WMC, WOAW, WOC.

Monday: KFAE, WAAM, WBZ, WDAR, WEAF, WFAA, WGR, WGY, WHAZ, WIP, WLAG, WOC.

Tuesday: WDAF, WHB, WIP.

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WEAO, Columbus, Ohio (Eastern, 360), 8:00 p. m., Concert, double quartet, St. Paul's Episcopal Church; 9:30, "Opportunities for Women in Home Economics." Prof. Faith Lanman, head of department of Home Economics; Carl Hug, violinist.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., "Things Old and New," Epps G. Knight; 8:30-9:30, The Texans Orchestra, R. L. Keith, manager.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Stratford Concert Orchestra; 3:00, recital, Mrs. G. W. Moore, contralto; Blanche W. Morgan; Mrs. Davis M. Patterson, reader; 6:00, Stories by Sunny Jim; 6:30, Meyer Davis Bellevue Stratford Orchestra; 7:00, Dance music, Weymann Five; 8:00, Radio Boy Scouts Meeting; 8:30, Avis Concert Company of Trenton, Ethel Mae Sinclair, soprano; Burroughs Hunt, baritone; D. Hartley Sinclair, violinist; Charlotte R. Magill, pianist; 10:10 p. m., Charlie Kerr and his Symphonic Orchestra.

WGI, Medford Hillside, Mass. (Eastern, 360), 7:00 p. m., Talk, "The Radio Movie Man," by Geoffry L. Whalen; Concert, Vespers Quartette.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' musical program; 6:00-7:00, Chamber music recital.

WGY, Schenectady, N. Y. (Eastern, 790), 2:00 p. m., Music and talk, "Club Life in California"; Mrs. Andrew Blesser, Jr.; 6:30, Dinner music by Romano's Orchestra, New Kenmore Hotel; 7:15, Musical program, Piano solo, J. Reid Callanan; Reading, Pluma MacIntosh; Soprano solos, Mrs. Raymond N. Fort; Violin solo, Claud J. Holding; Contralto solo, Mrs. Horatio S. Bellows.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Strand Theater Orchestra; Walnut Theater Orchestra; 7:30-9:00, Senior Class of the Louisville Conservatory of Music, George T. Piggott; Four-minute digest of the International Sunday School lesson; Four-minute Radio Forum talk.

WHB, Kansas City, Mo. (Central, 411), 12:35 p. m., Popular music by Sweeney Radio Orchestra; 2:00, Ladies' hour of classical music by Sweeney Orchestra; 7:00, Program by Parent-Teachers' Association; 8:00, Music by Sweeney Orchestra, vocal numbers arranged by Herbert Frather.

WHN, New York, N. Y. (Eastern, 360), 2:15-2:45 p. m., Shapiro Bernstein Music Co.; 3:00-3:15, Ira La Shaw and Henry Heine, duets; 4:30-5:30, "The Original Charleston Five," Wm. P. Somerville, director; 9:30-10:00, Lou Gold's Wigwam Club Orchestra; 10:00-10:10, Zara Jay, dramatic soprano; 10:30-11:00, Sam Lannin's Roseland Dance Orchestra; 11:15-11:30, Richard Douglas, tenor; 11:30-11:45, Jack Morisse and Lucille Du Mont, songsters.

WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Gimbel Brothers Tea Room Orchestra, direction Ray Steen; 3:00, Recital, Melody Club of Ardmore; 6:05, Harold Leonard's Red Jackets from Club Madrid; 7:00, Uncle Wip's bedtime stories; 8:00, Camillo Zeckwer, distinguished Philadelphia composer; 9:00-9:30, Religious services, auspices Philadelphia Branch of United Synagogues, address by Rabbi Max D. Klein; musical selections, Adath Jesruhun choir and cantor, reading of prayer by Rabbi Samuel Fredman; 10:30, Recital, Karl Bonawitz; 11:15, Ted Weems and his recording making orchestra from Cafe L'Aiglon.

WJAX, Cleveland, Ohio (Eastern, 390), 8:00 p. m., Harp solos, Harry Chalmers; "Behind the Scenes with Your Telephone," Ohio Bell Telephone Company; Solos, Maybelle Miller, soprano, harp accompaniment; Songs, Charles Bill, tenor; Musical numbers, Cleveland Federation Women's Club members; Organ recital, Vincent H. Percy.

WJAZ, Chicago, Ill. (Central, 448), 10:00 p. m.-1:00 a. m., Stella Bunch Niebuhr, soprano; James Terence Conway, tenor; E. J. Appleby, banjoist; Oriole Orchestra.

WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 10:45-11.15 a. m., Household Hints; 11:35-12:00 p. m., Surprise Hour; 2:00-2:30, "Forty Wiggles," Tess Coperman; 2:40-4:00, Daylight concert; 4:00-4:30, Magazine reading; 5:30-6:00, Children's stories, Ellen Nye; 6:00-6:15, "Fishing," W. C. Vogt; 6:10-7:00, Dinner concert; 7:30-8:15, Farm lectures, "Facing the Facts in Agriculture," F. W. Peck; "Friendly Valley," Friendly Valley Association; "New Spring Books," Leonard H. Wells.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Piano solos, Adelaide Apfel; 10:00, Concert, Cincinnati Conservatory of Music, Leone Granstaff, vocalist; Alice Huebner, accompanist; Homer Fair, violinist; Emerson Hoffman, accompanist; Mildred McLachlan, pianist; Alice Belle Whiting, vocalist; Johanna Danziger, cellist; Popular dance program, Doherty's Melody Boys.

WMAQ, Chicago, Ill. (Central, 447.5), 2:35 p. m., Concert, Lyon & Healy Recital Hall; 4:20, Items of interest to women; 4:30, Illinois Federation of Women's Clubs; California Biennial, Mrs. C. M. Woodman; 7:00, Boy Scouts' weekly talk; Talk, Rockwell R. Stephens; Talk for the business man, Paul W. Ivey; 8:40, LaSalle Orchestra; 9:00, Recreational talk; 9:15, Program, Elizabeth Stokes, soprano; Charles Lee Cock.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Clara Ahern and her Hotel Chisca Philharmonic Orchestra.

WOAW, Omaha, Nebr. (Central, 526), 6:00 p. m., Children's Hour, conducted by Grace Sorenson; 6:30, Dinner program, Saxon Family Orchestra; 9:00, First Anniversary of WOAW, Concert program by Mt. Calvary Commandery No. 1, Knight Templar Band, A. A. Wedemeyer, director.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "Gastritis," Karl G. Stephan; 5:45, Chimes; 6:30, Sandman's visit; 9:00, The Palmer School Radio Orchestra; V. B. Rochte, baritone.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wanamaker Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt.

WOQ, Kansas City, Mo. (Central, 360), 2:30 p. m., Music from Liberty Theater; 8:00, Popular selections by Sickman's Society Orchestra.

WOR, Newark, N. J. (Eastern, 405), 2:45-3:00 p. m., Harold Taft Wright, tenor; 3:00-3:15, Recital by Millie Krueder, contralto; 3:30-3:45, Harold Taft Wright; 3:45-4:00, Millie Krueder; 6:15-6:45, Music While You Dine, Tom Cooper's Country Club Orchestra; 7:00-7:15, Albert E. Sonn of Newark Sunday Call on Radio for the Layman.

WSB, Atlanta, Ga. (Central, 429), 12:00 p. m., Entertainment; 4:00-4:30 p. m., Howard Theater overture and prologue; 5:30, Bonnie Barnhardt's songs and bedtime story; 8:00-9:00, John McCrindle, Scotch balladist; Dr. Charles A. Sheldon, city organist; 10:45-11:45, Christian Endeavor entertainment.

WWJ, Detroit, Mich. (Eastern, 517), 12:00 p. m., Edward Barnes, baritone; LeRoy DeTurk, tenor; 3:00, News Orchestra; 7:00, News Orchestra; Program by Shadukiam Grotto; 10:00, Dance music, Jean Goldkete's Orchestra from Garystone ballroom.

Friday, April 4

CFCF, Montreal, Canada (Eastern, 440), 8:30 p. m., Musical, Mme. Hector Marquette, pianist; S. L. Lortie, cellist; Mme. Blanche Archambault, soprano; Antonio Lamontagne, baritone; Harry Salter, violinist; B. Archambault and Antonio Lamontagne, duet; Recitation, Mildred Page.

CKAC, Montreal, Can. (Central, 425), 1:45 p. m., Classic concert, Mt. Royal Hotel Orchestra; 4:30, Dance orchestra, Mt. Royal Hotel.

KDKA, E. Pittsburgh, Pa. (Eastern, 326), 12:20 p. m., Lenten services, Trinity Church, Rev. Percy G. Kammerer; 6:15, Organ recital, Lucile Hale; 7:15, Sunday School Lesson, Dr. R. L. Lanning; 8:00, Radio Boy Scout meeting; 8:30, Westinghouse Employes' Band; Genevieve M. Becker, whistler; H. L. Smith, baritone.

KFAE, Pullman, Wash. (Pacific, 330), 7:30 p. m., Mandolin and guitar solos and duets, Valencrano and Conjuarez, Filipino students; "Secret Diplomacy," Prof. C. H. Wooddy; "Alfalfa in Rotation with Wheat, Benefited by Gypsum," Prof. R. P. Cope; Book Chat, Alice L. Webb; "Increase of Mechanical Power in Every Day Use," H. H. Langdon; Margery Segessenmann, pianist.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., Concert of vocal and instrumental numbers; 8:00-9:00, Evening Herald concert; 9:00-10:00, Examiner concert; 10:00-11:00, Vocal and instrumental concert; 11:00-12:00, Concert by Ambassador-Max Fischer's Cocoanut Grove Orchestra.

KFKB, Milford, Kansas (Central, 286), 8:05 p. m., "Rural Telephone Service," Prof. R. G. Kloeffler; 8:30, "What's Wrong with My Radio Set," Prof. F. A. Dawley; Dorothy Brown, pianist; Vocal solo, Blanche Berry; Lavina Waugh, pianist.

KFSG, Los Angeles, Calif. (Pacific, 278), 3:30-4:30 p. m., Special musical program; Talk Aimee Semple McPherson; 7:00-7:30, International Sunday School Lesson for April 6th; 8:00-9:30, Musical program; Revival service, Sister McPherson.

KGW, Portland, Ore. (Pacific, 492), 12:30 p. m., Program, Peck Halton's Orchestra; 3:30, Lecture, "Our Friend, the Dairy Cow," Margary M. Smith; 8:00, Lecture, Extension Division of University of Oregon; 10:30, Hoot Owls.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Concert; 2:30-3:30, Program through courtesy of Barker Brothers; 6:30-7:00, Children's program presenting Prof. Walter Sylvester Hertzog, Stories of American History; the weekly visit of Richard Headrick; "Uncle John"; 7:00-7:30, Organ recital from First M. E. Church; Arthur Blakeley, organist; 8:00-10:00, Program presenting the Studebaker Radio Orchestra from Long Beach; Floryano Thompson, soprano, and Walter F. McEntire, lecture.

KLX, Oakland, Calif. (Pacific, 509), 8:00-10:00 p. m., KLX Concert Trio; Solos, Harold Dana; Parodies, Ned Nicholson.

KLZ, Denver, Colo. (Mountain, 360), 7:30-8:00 p. m., Program, Reynolds, Radio Company, "What I Know About Colorado," George T. Wells.

KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m., Seiger's Orchestra; 2:30-3:30, Organ recital, Theodore J. Irwin; 4:30-5:30, Seiger's Orchestra.

KQV, Pittsburgh, Pa. (Eastern, 360), 11:00-11:30 a. m., Music; 1:00-1:30 p. m., Noon Musical program; 3:45-4:15 p. m., Music; 5:00-5:30 p. m., Music; "Twilight Tale" for "Kiddies"; Home features; 9:00-10:00 p. m., program by "Clever Junior Artists," of popular numbers, with Miss Luanna Landis, of Monaca, Pa., soloist.

KSD, St. Louis, Mo. (Central, 546), 3:00 p. m., Program, children under fourteen years of age; 8:30, Missouri Theater Orchestra and specialties.

KYW, Chicago, Ill. (Central, 536), 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 6:00 p. m., Spanish lessons, Prof. A. A. Brashie; 6:50, Children's bedtime story; 7:00, Dinner concert, Joska DeBabary's Orchestra; Clyde Doerr's Orchestra; 7:35, "State Police Organizations," F. L. Mather; 10:00-2:00, Midnight revue.

WAAW, Omaha, Neb. (Central, 360), 8:00 p. m., Lessons in bridge by Mrs. Guy U. Purdy; musical program.

WBAH, Minneapolis, Minn. (Central, 417), 12:30-1:30 p. m., Dick Long's Trio and soloist; 7:00-7:30 p. m., Dayton Music Department program; Style talk.

WBAP, Fort Worth, Texas (Central, 476), 7:30-8:30 p. m., Concert, Texas Christian University, Prof. H. D. Guelick, director; 9:30-10:45, Concert, 25-piece mandolin orchestra, Knights of Pythias Home.

WBAV, Columbus, Ohio (Eastern, 390), 12:00 m., Piano music, Ila Lorbach Owens; 8:00 p. m., Musical program, Ohio University talent, presented by Columbus Dispatch; Clarence C. Robinson, director of music, Ohio University, director; Men's Glee Club; Fred Lee Tom, tenor; Colene Norviel, soprano; Mixed quartet; Ronald Robinette, violinist; Helen Bowles, soprano; George Grayson, baritone; C. C. Robinson, tenor. Special: Wendell Hall, the red-haired music maker, presenting his own songs and own ukulele accompaniment.

WBZ, Springfield, Mass. (Eastern, 337), 6:00 p. m., Dinner concert, WBZ Orchestra; 7:00, Dramatized story, Youth's Companion; Current Book Review, R. A. MacDonald; 7:30, Bedtime story for the Kiddies; 11:00, Program of Chamber Music, WBZ Orchestra; Julia A. Mattson, soprano; Prof. A. Cerboneschi, accompanist; Ernest S. Valva, flutist.

WCAE, Pittsburgh, Pa. (Central, 462), 4:30 p. m., Special children's program, The Sunshine Girl and Uncle "Kaybee"; 6:30, Dinner concert, William Penn Hotel; 7:30, Uncle "Kaybee"; 8:30, Musical program, George Friedel's Melody Serenaders.

WCAL, Northfield, Minn. (Central, 360), 9:45 a. m., St. Olaf College chapel services; 8:30 p. m., Book talk, Dr. George Welda Spohn; "Rewriting American History," James Truslow Adams.

WCX, Detroit, Mich. (Eastern, 517), 4:15 p. m., Orchestra; 6:00 p. m., Hotel Fuller; 7:00, Special dance program, Arcadia auditorium.

WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., Request program by R. Leo Davis' Orchestra; 6:00, Speaker from Kansas City Children's Bureau, Children's story; Information man; Fritz Hanlein's Trianon Ensemble; 8:00, WDAD Minstrels, Jack Riley's Plantation Serenaders; 11:45, Nighthawks.

WDAP, Chicago, Ill. (Central, 360), 7:00-8:30 p. m., Drake Concert Ensemble and Blackstone String Quintette; Austin Angell; Cambridge Sisters; Geo. R. Hill, Jr.; George Chandler, musical saw soloist; Barton Organ, Ralph Emerson; Jack Chapman's Orchestra.

WDAR, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy with boys and girls; 8:00, Book review by Arnold Abbott; 8:10, Poets' and Authors' Corner; 10:10, Howard Lanin's Arcadia Cafe Dance Orchestra; features from Philadelphia's biggest theaters; special "Morning Glory Club" program; songs, Harry Glyn.

WEAF, New York, N. Y. (Eastern, 492), 4:00-4:30 p. m., Josiah B. Free, baritone; 4:30-5:00, Mildred MacLean, soprano; 5:00-5:30, Children's Hour; 7:10-7:20, Reid Ice Cream Co.; 7:30-7:40, Thornton Fisher; 7:40-8:00, Children story by Miriam Battista; 8:00-8:30, Billy Jones and Ernest Hare; 8:30-9:00, Atlas Portland Cement Quartette; 9:00-10:00, Astor Coffee Orchestra; 10:00-10:30, Lorna Lincoln, soprano; 10:30-11:00, Harold J. Bray, tenor.

WEAO, Columbus, Ohio (Eastern, 360), 4:00 p. m. Agricultural lecture, member of faculty; Music, Student artists.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., Address, Dr. Robert Stewart Hyer; 8:30-9:30, Charles Scogin, baritone; William Pennington, pianist and tenor; Charles McKinney and his Old-time Fiddlers.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis Bellevue Concert Orchestra; 3:00, Swarthmore School of Music, Margaret Hill, director; Mrs. Ruth Hill Munce, violinst; Abbie Kelly, soprano; Junior Orchestra of Swarthmore School; 3:45, Bowdoin College, of Brunswick, Maine, Mandolin and Glee Clubs; 6:00, Sunny Jim's bedtime stories; 6:30, Meyer Davis Bellevue Stratford Orchestra.

WGAZ, South Bend, Ind. (Central, 360), 7:00-8:30 p. m., Zulu A. Dove, contralto; Mrs. H. A. Harper, reader; Prof. George Chillcott, baritone; Mrs. Benj. Hance, contralto; John Earls, 6-year-old vocalist; Hotel LaSalle Orchestra.

WGI, Medford Hillside, Mass. (Eastern, 360), 3:00 p. m., Amrad Women's Club program; Afternoon Musicale, Brunswick Records; 7:30, Selected verses by Charles I. Wagner, Radio poet; Concert, Arlington Boy Scouts, Mr. Bacion, director.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' musical program; 6:30-7:30 and 11:30, Vincent Lopez Hotel Statler Orchestra; 9:00, Concert.

WGY, Schenectady, N. Y. (Eastern, 790), 2:00 p. m., Music and one-act play, "The Best Man"; 6:30, Children's program; 7:35, Health talk, N. Y. State Dept. of Health; 7:45, Weekly Health Talk, N. Y. State Dept. of Health; 8:00, Concert thru courtesy of Union College Alumni of Albany; Address, Dr. Charles A. Richmond, Pres. of Union College; "Viking Song," by Union College Glee Club; Piano duets, Glee Club; Novelty number, F. M. Bishop, S. M. Bishop, E. C. Schroedel, J. R. Sheehan, H. M. Weyrauch, Jr.; College songs and solos; music by Union College Dance Orchestra; 10:30, Dance program.

WHA, Madison, Wis. (Central, 360), 7:30 p. m., Readings from Literature, Prof. J. Barnes.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Walnut Theater Orchestra; Strand Theater Orchestra; 7:30-9:00, Crane and his orchestra; A. V. B. Sherlock, baritone; Reading, An Interesting Historical Episode.

WHB, Kansas City, Mo. (Central, 411), 12:35 p. m., Popular music by Sweeney Radio Orchestra; 2:00, Ladies' hour of popular selections by Sweeney Orchestra; 7:00, Sweeney Orchestra rendering popular numbers.

WHK, Cleveland, Ohio (Eastern, 283), 9:00 p. m., Concert program, arranged by Cleveland Radio Dealers' Association; Music, Louis Rich's Orchestra; Harmonium solo, Hans Koebel.

WHN, New York, N. Y. (Eastern, 360), 2:15-3:00 p. m., "Original Indiana Five"; 4:30-5:00, Snappy Trio; 11:00-11:15, Fred Whitehouse Review; 11:15-11:30, Al Novins and Clint Sommer, songsters; 12:00-12:15, Ross Fowler, baritone.

WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Gimbel Brothers' Tea Room Orchestra; 3:00, First of series of talks to mothers, auspices of Baby Welfare Association of Philadelphia, Mrs. Edith Y. Clifton; 6:05, Dinner music, Jordan-Lewis Dance Orchestra, direction, Bob Lewis; 7:00, Uncle Wip's bedtime stories.

WJAZ, Chicago, Ill. (Central, 448), 10:00 p. m.-1:00 a. m., Program, Mid-West Concert Management; Oriole Orchestra.

WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 10:45-11:15 a. m., Household Hints; 11:35-12:00 m., Surprise Hour; 2:00-2:30 p. m., "Human Side of Relief Work," Carrie Younker; 2:40-4:00, Grand Opera; 4:00-4:30, Magazine Reading; 5:30-6:00, Weekly Meeting Radio Health & Toothbrush Club of America, Dr. F. W. Pepper, president; 6:00-6:30, "Near East Relief," Prince Isaac Yonan, Assyria; "Radio Interference," Ray R. Sweet; 7:30-8:15, Farm lectures, "Filling Your Sugarbowl," C. H. Allen, Defiance, Ohio; "Community Church Movement and Church Co-operation," O. F. Jorgan, Parkridge, Ill.; 9:15, Business Message; 9:30-10:45, Musical program; South St. Paul Parents' and Teachers' Organization; 11:00, St. Paul Capitol Theatre Orchestra.

WLW, Cincinnati, Ohio (Central, 309), 4:00 p. m., Special program.

WMAQ, Chicago, Ill. (Central, 447.5), 4:20 p. m., Items of interest to women; 4:30, Pupils, Bush conservatory; 5:15, Senator Thurlow Essington; 7:00, Weekly "Wide Awake Club," Mrs. Frances M. Ford; 7:30, Music memory, Mrs. Marx E. Oberndorfer; 8:00, "Jottings," Janao H. Aronson; 8:40, LaSalle Orchestra; 9:00, Recreational talk; 9:15, Program, faculty, Cosmopolitan School of Music.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Pipe organ recital, Prof. H. O. Nichols; 11:00, Midnight Frolic.

WOAW, Omaha, Neb. (Central, 526), 6:30 p. m., Dinner program, Ackerman's Orchestra; 9:00, Musical program; 168th Regiment Band, John C. Oswald, leader, and soloists of Council Bluffs, Iowa.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "The Central Nerve System," R. G. Maybach; 5:45, Chimes; 6:30, Sandman's visit; 7:00, "Art Appreciation," R. J. McKinney; 7:20, Sunday School Lesson, Dr. Frank Willard Court; 8:00, Mt. Morris College Men's Glee Club; Lorraine Brown, accompanist; 9:00, Weekly Tourists' Road Bulletin, Touring Bureau.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wanamaker Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt; 7:30, Hotel Adelphia Concert Orchestra, A. Candelori, director; 8:30, Features from Fox Theater, selections by Fox Orchestra, Erno Rapee, director; 9:30, Organ recital, Mary E. Vogt; 10:03, Kentucky Kernels Orchestra from Adelphia Hotel.

WOQ, Kansas City, Mo. (Central, 360), 7:00 p. m., Program by Radio Club of Kansas City; Music by Sickman's Orchestra.

WOR, Newark, N. J. (Eastern, 405), 2:45-3:00 p. m., Special program by Ernest Cutting and his James Boys' Orchestra; 3:45-4:00, Ernest Cutting and his James Boys; 6:00-6:15, Agnes Leonard in songs for the children; 6:15-6:45, Man in the Moon Stories for Children; 6:45-7:15, Billy Cripps Song Revue.

WOS, Jefferson City, Mo. (Central, 440.9), 8:00 p. m., Address, "Missouri," by George A. Pickens; 8:20, Dance program, Melody Six Orchestra.

WSB, Atlanta, Ga. (Central, 429), 4:00-4:30 p. m., Howard Theater overture and prologue; 5:00, Vick Myers Melody Orchestra; 5:30, Bonnie Barnhardt's songs and bedtime story; 8:00-9:00, Atlanta Hawaiian Quintet; 10:45-11:45, Christian Endeavor entertainment.

WWJ, Detroit, Mich. (Eastern, 517), 12 m., Dance music, Goldkett's Orchestra, Graystone ballroom; 3:00 p. m., News Orchestra; 7:00, Anne Campbell, News Poet; Leona Hoffman, pianist; Mrs. Beatrice Brown, soprano.

Saturday, April 5

CKAC, Montreal, Can. (Central, 425), 7:00 p. m., Kiddies' stories in French and English; 7:30, Rex Battle and his Mt. Royal Hotel Concert Orchestra; Herbert Spencer, organist; 8:30, La Presse studio entertainment; 10:30, Joseph C. Smith and his Mt. Royal Hotel Dance Orchestra; Teddy Brown, saxophonist.

KDKA, E. Pittsburgh, Pa. (Eastern, 326), 12:20 p. m., Lenten services, Trinity Church, Rev. J. C. Sauber; 1:30, Daugherty's Orchestra; 6:15, Dinner concert, Westinghouse Band; 7:30, The Story, Dr. David Lang; 7:45, "Last Minute Helps to Teachers of Adult and Secondary Classes," Carman C. Johnson; 8:15, "International Relations in the Light of History," Prof. W. A. Cleven; 8:30, Chamber of Commerce Dinner.

KFI, Los Angeles, Calif. (Pacific, 469), 6:45-7:30 p. m., Concert of instrumental selections; 8:00-9:00, Vocal and instrumental concert; 9:00-10:00, Examiner concert; 10:00-11:00, Concert of vocal and instrumental selections; 11:00-12:00, Concert by Ambassador-Max Fischer's Cocoanut Grove Orchestra.

KFNF, Shenandoah, Ia. (Central, 266), 7:30 p. m., Program of old-fashioned music.

KFSG, Los Angeles, Calif. (Pacific, 278), 3:30-4:30 p. m., Special musical program; 7:00-7:30, Children's hour.

KGO, Oakland, Calif. (Pacific, 312), 8:00 p. m., "It Pays to Advertise," KGO Players; Arion Trio.

KGW, Portland, Ore. (Pacific, 492), 3:30 p. m., Children's program; 10:00, Dance music, George Olsen's Metropolitan Orchestra.

(Continued on page 18)

Saturday, April 5

(Continued from page 17)

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Program arranged by Alexander Cameron, presenting the Clan Cameron, in a Scotch program; 2:30-3:30, Program presented through courtesy of Barker Brothers; 6:30-7:30, Children's program presenting Prof. Walter Sylvester Hertzog, Stories of American History; Berenice Van Loan Gaines, composer; Tilda Rohr, contralto, and Marjorie Vorhes, violinist; 8:00-10:00, Program of compositions by Berenice Van Loan Gaines, presenting Tilda Rohr, contralto, and Marjorie Vorhes, violinist.

KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m., Seiger's Orchestra; 2:30-3:30, Matinee program; John Johnson, cornet; Richard Bailey, accompanist; Mission Pioneers Orchestra; 3:30-5:30, Seiger's Orchestra; 8:00-12:00, Dance music, Art Weidner and his popular dance orchestra; During intermissions, KPO Trio will sing popular songs.

KQV, Pittsburgh, Pa. (Eastern, 360), 11:00-11:30 a. m., Music; 1:00-1:30 p. m., Noon Musical program.

KYW, Chicago, Ill. (Central, 536), 11:35 a. m., Table talk, Mrs. Anna J. Peterson; 6:50 p. m., Children's bedtime story; 7:00-7:30, Dinner concert, Congress Hotel; 8:00, Musical program, Hearst Music Company; 9:05, "Safety First," Mr. Elkin; 9:15, "Under the Evening Lamp"; 10:10-2:00, Late Show.

WAAW, Omaha, Neb. (Central, 360), 7:30 p. m., Frank H. Schwarz and his Royal Orchestra; Verona Huston, piano; Fred Shandera, saxophone; W. Ryan, director and violin; F. H. Schwarz, drums; J. Minick, banjo, and Ed Ambrose, trumpet.

WBAH, Minneapolis, Minn. (Central, 417), 12:30-1:30 p. m., Children's Vaudeville; 7:00-7:30 p. m., Council of Churches.

WBAP, Fort Worth, Texas (Central, 476), 7:00-7:30 p. m., Sunday School lesson and Radio Bible Class, Mrs. W. F. Barnum.

WBAV, Columbus, Ohio (Eastern, 390), 12:00 m., Piano music, Ila Lorbach Owens.

WBZ, Springfield, Mass. (Eastern, 337), 6:50 p. m., "The Use of Ilo as a Radio Auxiliary Language," O. C. Roos; 7:00, Dinner concert, Hotel Kimball Trio, Jan Geerts, violinist; Angela G. Lonergan, cellist; Paul Lawrence, pianist; 7:40, Concert, Mrs. John R. Fausey, soprano; Rene Dagenais, pianist.

WCAE, Pittsburgh, Pa. (Central, 462), 3:00 p. m., Special musical program; 6:30, Dinner concert, William Penn Hotel; 7:30, Uncle "Kaybee"; 7:45, Popular songs, Lew Kennedy; Irene Satzler, pianist; 8:30, Musical program.

WCAL, Northfield, Minn. (Central, 360), 9:45 a. m., St. Olaf College chapel services; 12:00, Musical program.

WCX, Detroit, Mich. (Eastern, 517), 4:15 p. m., Concert, Albion College Glee Club; 6:00, Dinner Concert, Hotel Tuller.

WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., Riley-Ehrhart Orchestra; 6:00, Address by Edgar A. Lincoln, writer-lecturer, children's story, information man, Fritz Hanlein's Trianon Ensemble; 11:45, Nighthawks.

WDAP, Chicago, Ill. (Central, 360), 7:00-8:30 p. m., Drake Concert Ensemble and Blackstone String Quintette; 10:00, Harmony Girls, Bob Brown, Walter Peterson, Betty Holmes, Jack Chapman's Orchestra.

WDAR, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories.

WEAF, New York, N. Y. (Eastern, 492), 4:00-5:00 p. m., Mount Royal Orchestra; 5:00-5:30, Elizabeth Packinger, soprano; 7:30-8:00, Amphion Male Quartette; 8:00-8:30, Rosa Hamilton, contralto; 8:30-9:00, Alexander James, tenor; 9:00-9:10, Sophie Irene Loeb; 9:10-9:40, Ada H. Gordon, pianist; 9:40-10:10, Frances Christmas, cello.

WFAA, Dallas, Texas (Central, 476), 12:30-1:00 p. m., "Providing Things Honest," Judge Eugene B. Muse; 3:30-4:00, Special musical program, Old Fiddlers; 8:30-9:30, Piano recital, Elizabeth Gay Jones and ten other pianists.

WFI, Philadelphia, Pa. (Eastern, 395), 1:00 p. m., Meyer Davis' Bellevue Stratford Concert Orchestra; 3:00, Katherine E. Nolle, contralto; Concert, Swarthmore Preparatory School, direction Dr. J. Marvine Hanna; Talk, N. P. Tomlinson; 6:00, Sunny Jim's bedtime stories; 6:30, Meyer Davis' Bellevue Stratford Orchestra; 8:00, Medical Talk, Dr. George P. Muller; 8:15, Concert, Mary Smith Reese, soprano; Delrose Macan, reader, Jane Jones West, contralto, Sarah Davies Waltz, accompanist; 9:00, International Sunday School Lesson, Dr. William T. Ellis; WFI Male Quartette, Ednyfed Lewis, tenor; J. Bernard Poland, tenor; Harold Simonds, baritone; John Vandersloot, basso; 10:10, Charlie Kerr and his Symphonic Orchestra from Hotel Majestic.

WGI, Medford Hillside, Mass. (Eastern, 360), 8:00 p. m., Tenth series talk on New England Business Industry, Arthur R. Curnick; Musicale.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' Musical program; 6:00-7:30, Chamber music recital.

WGY, Schenectady, N. Y. (Eastern, 790), 9:30 p. m., Dance Music by Romano's Orchestra, New Kenmore Hotel, at Albany.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Strand Theater Orchestra; Walnut Theater Orchestra; Alamo Theater Orchestra; 7:30-9:00, Sylvian Trio, Fannie E. Stoll, violinist; Myrl Chrisman, flutist; Evelyn Kaiser, pianist; Reading, An Interesting Historical Episode.

WHB, Kansas City, Mo. (Central, 411), 12:40 p. m., Dance music by Sweeney Radio orchestra; 2:00, Ladies' hour of popular selections by Sweeney orchestra.

WHN, New York, N. Y. (Eastern, 360), 2:15-2:30 p. m., Fred Whitehouse Review; 2:45-3:15, Tom Banks and His Colonial Inn Orch.; 3:45-4:00, Little Mae Robertson, six-year-old star, in songs; 4:00-4:30, The Original Cambria Serenaders; 4:45-5:00, Avy La Skere; 5:00-5:15, Ross Fowler, baritone; 7:30-7:15, Al Reiser and His Dancing Carnival Matinee Orch.; 8:00-8:10, Jimmie Flynn, songster; 8:10-8:20, Baby Edna Keir; 8:20-8:30, Tom Bracken, tenor; 8:30-9:30, Metropolitan Dance Orch. and Entertainers; 10:00-10:15, L. B. Curt, tenor; 11:00-11:15, J. Fitzpatrick Bress, songster.

WIP, Philadelphia, Pa. (Eastern, 509), Organ recital, Karl Bonawitz; 8:00, Brown University Glee Club; 6:05, Dinner music, Club Madrid Dance Orchestra; 7:00, Uncle Wip's bedtime stories; 8:00, Talk on North Pole Expedition; 8:15, Meeting of Five Indian Chiefs, program of tribal songs and other features; 9:00-9:40, WIP Male Quartet; 10:15, Harold Leonard and his Red Jackets from Club Madrid.

WJAZ, Chicago, Ill. (Central, 448), 10:00 p. m.-1:00 a. m., George Hinckle, baritone; Louise McFadden, pianist; Cambridge Sisters, vocal trio; Langdon Brothers, steel guitar duets; Oriole Orchestra.

WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 10:45-11:15 a. m., Household Hints; 11:35-12:00 m., Surprise Hour—Meeting Postcard Club, E. R. Buell, president; 7:30-8:15 p. m., Business Message; 9:15-10:15; Musical Program—Macalester College Glee Club; 10:15-12:30, Dance Program, St. Paul Hotel.

WMAQ, Chicago, Ill. (Central, 447.5), 8:00 p. m., Welles Park Community Band; 9:00, Balaban & Katz Chicago Theater Revue.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Program, Fred Hardeman, College of Henderson.

WOAW, Omaha, Neb. (Central, 526), 6:30 p. m., Dinner program; Blackstonian Orchestra, Harold Wright, Director; 9:00, Musical program arranged by Harry B. Cockrell.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., "Nature's Greatest Gift to Man," C. C. Hall; 5:45, Chimes; 6:30, Sandman's visit; 7:00, "The Production of Silk and Its Uses," T. W. McFarlone; 7:20, "Food Producers for the World," Dave E. Darrah; 9:00, The Palmer School Radio Orchestra; V. E. Rochte, baritone.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wanamaker Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt.

WOQ, Kansas City, Mo. (Central, 360), 11:35 p. m., Sunday School services, Sacred music.

WOR, Newark, N. J. (Eastern, 405), 2:30-2:45 p. m., Recital by George Trisdorfer, pianist; 2:45-3:00, soprano solos by Ruth E. Dungan; 3:30-3:45, George Trisdorfer; 3:45-4:00, Ruth E. Dungan; 6:15-6:30, Esperanto and Its Present Progress, by James Benson Sayers; 6:45-7:15, "Music While You Dine," Paul Van Loans' Cinderella Orch.; 7:15-8:00, Fred J. Bendel, sports writer, on "Sporting News Up to the Minute"; 8:00-9:00, Gene Ingraham's Bell Record Orch.; 9:00-9:15, Recital by Edith E. Finkeldey, soprano, assisted by Dr. J. B. Bruns; 9:30-9:45, Edith E. Finkeldey; 10:00-11:00, "The Stabat Mater"—by Rossini, presented by the Choir of St. Joseph Church of Newark, assisted by an orchestra of 12 pieces under direction of Edward Boyd Smack.

WSB, Atlanta, Ga. (Central, 429), 12:00 m., Entertainment; 4:00-4:30 p. m., Howard Theater overture and prologue; 5:30, Bonnie Barnhardt's songs and bedtime story; 8:00-9:00, Georgia Stars in Georgian music; 10:45-11:45, Win-One Male quartet.

WTAM, Cleveland, Ohio (Eastern, 390), 9:00 p. m., Regular Saturday evening dance program, WTAM Dance Orchestra; Solo numbers by favorite entertainers.

WWJ, Detroit, Mich. (Eastern, 517), 12:00 m., Edward Barnes, baritone; LeRoy De Turk, tenor; 3:00 p. m., News orchestra; 7:00, News orchestra.

Sunday, April 6

CKAC, Montreal, Can. (Central, 425), 4:30 p. m., Sacred concert.

CKY, Winnipeg, Can. (Central, 450), 7:00 p. m., Church service, Young Methodist Church.

KFI, Los Angeles, Calif. (Pacific, 469), 10:00-10:45 a. m., Service by L. A. Church Federation; 4:00-5:00 p. m., Vesper service by Federated Church Musicians; 6:45-7:30, Concert; 8:00-9:00, Concert by the Ambassador Hotel; 9:00-10:00, Examiner concert.

KFNF, Shenandoah, Ia. (Central, 266), 6:30 p. m., Sacred song service; five-minute sermonette.

KFSG, Los Angeles, Calif. (Pacific, 278), 10:30-12:30 p. m., Full church service; sermon, Aimee Semple McPherson; 2:30-4:30 p. m., Full church service; 7:30-10:00, Full church service.

KHJ, Los Angeles, Calif. (Pacific, 395), 10:00 a. m., Sermon from studio of KHJ; 10:30-12:30 p. m., Organ recital and entire service from First M. E. Church; Arthur Blakeley, organist, and Rev. E. E. Helms, pastor; 7:00-7:30, Organ recital from First M. E. Church, Arthur Blakeley, organist; 8:00-10:00, De Luxe program.

KLX, Oakland, Calif. (Pacific, 509), 7:45 p. m., Sermon, Rev. John Snape; 9:30, Sacred songs.

KPO, San Francisco, Calif. (Pacific, 423), 11:00-12:00 p. m., Radio Church Services, American Bible Society; Rev. J. W. Lundy, D.D., Pastor; 8:30-10:00, Seiger's Orchestra.

KYW, Chicago, Ill. (Central, 536), 11:00 a. m., Central Church Service, Dr. F. F. Shannon; 2:30 p. m., Studio Chapel service, Chicago Church Federation; 7:00, Chicago Sunday Evening Club, Speaker, Francis G. Peabody.

WBAP, Fort Worth, Tex. (Central, 476), 11:00 a. m.-12:15 p. m., Church Services, First Methodist Church; Rev. J. W. Bergin, pastor; 4:00-5:00 p. m., Margaret Agnew White, organist; 11:00-12:00, Concert, WBAP Southern Serenaders Orchestra.

WCAL, Northfield, Minn. (Central, 360), 11:00 a. m., Services, St. John's Lutheran Church, Rev. Nils Kleven, pastor; Dr. F. Melius Christiansen, organist; 8:30 p. m., Dr. Martin Hegland, speaker; Edith Hanson, pianist; Helen Skifter, saxophonist; Agnes Gjerset, soprano; Florence Groettum, Roline Johnston, accompanists.

WCX, Detroit, Mich. (Eastern, 517), 2:30 p. m., Radio Chapel services, Calvary Presbyterian Church; 7:00, Central M. E. Church, Dr. Lynn Harold Hough; Guy C. Filkins, organist; Hudson Quartets.

WDAF, Kansas City, Mo. (Central, 411), 4:00 p. m., Program by Wyandotte Post, American Legion, Kansas City, Kan.

WDAP, Chicago, Ill. (Central, 360), 5:00-6:00 p. m., Barton Organ Recital, Ralph Emerson; 9:15, Drake Concert Ensemble, Artist announced later.

WDAR, Philadelphia, Pa. (Eastern, 395), 2:00-4:00 p. m., Concert, Arcadia Cafe Concert Orchestra, direction, Feri Sarkozi; Ambrose McIntyre, baritone.

WEAF, New York, N. Y. (Eastern, 492), 6:00-6:30 p. m., New York Flute Club.

WFAA, Dallas, Texas (Central, 476), 6:00-7:00 p. m., Radio Bible Class, Dr. William M. Anderson, Jr.; 9:00-9:30, Address, Rev. Harry Lee Virden; 9:30-11:00, Popular music, Adolphus Hotel Orchestra, Lawrence Morrell, director.

WFI, Philadelphia, Pa. (Eastern, 509), 4:30 p. m., Chapel services from studio.

WGI, Medford Hillside, Mass. (Eastern, 360), 4:00 p. m., Twilight program; "Adventure Hour," Youth's Companion; Concert, Mrs. M. P. Carter, soprano; 8:30, Talk, Greater Boston Federation of Churches; Musicale.

WGR, Buffalo, N. Y. (Eastern, 319), 3:00 p. m., Vesper service, the Rev. Oscar Krauch, St. John's Lutheran Church; 4:00, Laurence H. Montague, organist.

WGY, Schenectady, N.Y. (Eastern, 790), 10:30 a. m., Services of First English Lutheran Church, Schenectady, Rev. Herbert D. Shimar, pastor; 3:30 p. m., Program by WGY Symphony Orchestra, Leo Kliwen, conductor; 7:30, Service of First English Lutheran Church, Schenectady, N. Y.

WHAA, Iowa City, Iowa (Central, 484), 9:00 p. m., Familiar hymns, Lydia Walker.

WHAS, Louisville, Ky. (Central, 400), 9:57 a. m., Organ music; 10:00, Church service, Fourth Avenue Presbyterian Church, Rev. Dr. Charles W. Welch, pastor; William E. Conen, organist; Mrs. Douglass, soprano; Mrs. Virginia S. Herric, contralto; William L. Vick, tenor; P. A. Kelleher, baritone.

WHB, Kansas City, Mo. (Central, 411), 2:00 p. m., Church service, music by Sweeney orchestra; 8:00, Sacred concert by choir, First Baptist Church, sermonetta by George Reichel, pastor; 9:00, Classical concert by Sweeney orchestra.

WHK, Cleveland, Ohio (Eastern, 283), 8:00 p. m., Concert program, WHK Orchestra; solo numbers, popular entertainers.

WHN, New York, N. Y. (Eastern, 360), 3:00-4:15 p. m., Queens County Christian Endeavor Program; 4:30-4:45, Florence J. Schroeder, dramatic sopr.; 5:00-5:30, WHN Radio Five.

WIP, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Church services, Rev. Floyd Tompkins, speaker; 9:30 p. m., Recital, Germantown Theater, direction, Bon Stad and Karl Bonawitz.

WJAZ, Chicago, Ill. (Central, 448), 6:00-9:00 p. m., Artist series program, Henry P. Eames, pianist, director; Oriole Orchestra.

WOAW, Omaha, Neb. (Central, 526), 9:00 a. m., Radio Chapel Service, Rev. R. R. Brown, pastor; 2:00 p. m., Matinee Musical Program, courtesy of Nebraska Conference of Augustana Synod; 6:00, Bible Study Hour; 9:00, Musical Chapel Service by Hanscom Park Methodist Episcopal Church, Rev. Arthur Atack, pastor.

WOC, Davenport, Iowa (Central, 484), 9:00 a. m., Sacred Chimes concert; 1:30, Orchestra concert, P. S. C. Orchestra; 7:00, Musical program; 8:00, Church service; 9:30, Musical program, Erwin Swindell, conductor.

WOQ, Kansas City, Mo. (Central, 360), 11:00 a. m., Church services from Central Methodist Church; 7:00 p. m., Evening church service from Central Methodist Church, sacred music by WOQ Orchestra.

WOS, Jefferson City, Mo. (Central, 440.9), 7:30 p. m., Church Service, Methodist Church, Rev. J. E. McDonald, pastor.

WSB, Atlanta, Ga. (Central, 429), 11:00-12:30 p. m., First Presbyterian Church service, Rev. J. Sprole Lyons, pastor; Dr. Charles A. Sheldon, organist; 5:00-6:00, Sabbath twilight studio broadcast; 7:30-9:00, Wesley Memorial Church service, Rev. J. Marvin Williams; Mr. and Mrs. A. C. Boatman, musical directors.

WWJ, Detroit, Mich. (Eastern, 516), 2:00 p. m., News Orchestra; 7:30, St. Paul's cathedral services, Dean Warren L. Rogers.

Monday, April 7

CKAC, Montreal, Can. (Central, 425), 1:45 p. m., Mt. Royal Hotel Concert Orchestra; 4:40, Mt. Royal Hotel Dance Orchestra.

KFAE, Pullman, Wash. (Pacific, 330), 7:30 p. m., "Modern Capitalization—a Cause of War," Prof. F. R. Yoder; All-High-School-Program, Pullman High School Radio Club.

KFKB, Milford, Kansas (Central, 286), 8:05 p. m., "Grasses for Pastures," Prof. J. W. Zahnley; "Cattle Management," Prof. B. M. Anderson; Vocal solos, Otis Gruber; Gladys Warren, pianist; Edna Ellis, vocalist.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Concert.

KLX, Oakland, Calif. (Pacific, 509), 8:00 p. m., Music talk, Pres. W. W. Campbell.

KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m., Seiger's Orchestra; 2:30-3:30, E. Nickerson, pianist; Raymond Nealan, tenor; Elvira Valdes, pianist; Marjorie Sayles, soprano; Mme. Roma, accompanist; 4:30-5:30, Seiger's Orchestra; 5:30-6:30, Children's stories, "Big Brother," of KPO; Dorothy Rustadd, pianist; 7:00-8:00, Seiger's Orchestra; 8:00-9:00, Organ recital, Theodore J. Irwin; 9:00-10:00, Sherman & Clay night; 10:00-11:00, E. Max Bradfield's Versatile Band.

KSD, St. Louis, Mo. (Central, 546), 8:30 p. m., Music program, Grand Central Theater.

WAAM, Newark, N. J. (Eastern, 255), 7:00-7:15 p. m., Sterling Saxophone Sextette; 7:15-7:30, Fred Austin and Jack Berger, songwriters; 7:30-7:45, James Y. Moore and His Clover Club Entertainers; 7:45-8:00, Victor Wilbur, baritone; Jos. Macy, pianist; 8:00-9:00, Nelson Rogers' WAAM Dance Orchestra; 9:00-9:15, "The Best of Current Motion Pictures by Alice Belton Evans of National Committee for Better Films; 9:15-9:45, Branderff String Quartet; 9:45-10:00, "Tickling a Jaded Public's Palate"—Lyon Mearson, editor of Metropolitan Magazine; 10:00-10:15, Maurice Snoeck, Belgian lyric tenor; 10:15-10:30, Con Conrad, composer of "Moonlight"; 10:30-10:45, Jimmy Cardasco and Frank Maloney, banjo and banjo guitar duets; 10:45-11:15, Benjamin Friedman's "Nickerbocker Nifties"; 11:15-11:30, Vincent Roswell Stortz, concert pianist.

WAAW, Omaha, Neb. (Central, 360), 7:30 p. m., Vocal and instrumental solos by Mrs. E. F. Morearty.

WBAH, Minneapolis, Minn. (Central, 417), 12:30-1:30 p. m., Dick Long's Trio and soloist; 9:30-11:00 p. m., Lowry Quartet; Donald Bennyhoff, soloist.

WBAP, Fort Worth, Tex. (Central, 476), 7:30-8:30 p. m., Concert, Brooks Morris, violinist; Guy Pitner, pianist; 9:30-10:45 p. m., Concert, Walter Wylie and his high school cadet band.

WBAV, Columbus, Ohio (Eastern, 390), 12:00 m., Piano music, Ila Lorbach Owens; 8:00 p. m., Concert, Frances Handibeau and her WBAV Orchestra.

WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., Milo Finley's Dance Orchestra; 6:00, Speaker from University of Kansas; Children's story; Information man; Fritz Hanlein's Trianon Ensemble; 8:00, WDAF Minstrels, Ray Stinson's Serenaders; 11:45, Nighthawks.

WDAR, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories; 7:40, Moving Picture Review by James A. Nassau; 7:50, Regular weekly opera talk, Samuel Lacair; 10:10, Howard Lanin's Arcadia Cafe Dance Orchestra.

WEAF, New York, N. Y. (Eastern, 492), 4:00-4:10 p. m., Gene Louis Stotesbury's talk; 4:10-4:25, Clara Blankman, violinist; 4:25-4:45, Sarah Dorothy McKeon, soprano; 5:00-5:30, Mother's program; 7:30-7:40, Thornton Fisher; 7:40-8:00, Helen Morris; 8:00-8:10, Lawyers Mortgage Co.; 8:30-8:40, Sales Literature talk; 8:50-9:00, Reid Ice Cream Co.; 9:00-9:30, Charles Wellner, tenor; 9:30-10:30, Gypsy String Ensemble.

WFI, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Meyer Davis Bellevue Stratford Concert Orchestra; 6:00, Sunny Jim's bedtime stories; 6:30, Meyer Davis Bellevue Stratford Orchestra.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' musical program; 6:30-7:00 and 11:30, Vincent Lopez Hotel Statler Orchestra; 8:15-8:50, George Dibble, tenor; 8:50, Address, W. J. Regan, "The Continuation School and Part-Time Education"; 9:00, Concert, direction of P. Arlow Mathews.

WGY, Schenectady, N. Y. (Eastern, 790), 2:00 p. m., Music and Thrifty Hints from U. S. Department of Agriculture; 6:15, Review of week's sports, Elmer Q. Oliphant; 7:45, Musical program and three part address on League of Nations.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Selections, Walnut Theater Orchestra; Strand Theater Orchestra; Selections, Alamo Theater organ.

WHB, Kansas City, Mo. (Central, 411), 12:35 p. m., Popular music by Sweeney Radio Orchestra; 2:00, Ladies' hour of popular numbers by Sweeney Orchestra; 7:00, Educational program by Lenore Anthony, Book of Knowledge.

WHN, New York, N. Y. (Eastern, 360), 7:30-8:00 p. m., Mal. Hallett Roseland Dance Orchestra; 8:15-8:45, Eugene Aikens and His Capitol Palace Jazz Sync.; 8:45-9:00, Dorothy Wallace Portingall, saxophone and vocal solos; 9:00-9:15, Dan Gregory and His Dancing Carnival Orchestra; 9:30-9:45, Alfred Dulin, pianist; 10:00-10:30, Broadway Musical Alphas, John J. Dundou, leader.

WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Gimbel Brothers' Tea Room Orchestra, direction Bob Steen; 6:05, St. James Hotel Dinner Dance Orchestra; 7:00, Uncle Wip's bedtime stories.

WLAG, Minneapolis-St. Paul, Minn. (Central, 417), 10:45-11:15 a. m., Household Hints; 11:35-12:00 m., Surprise Hour; 2:00-2:30 p. m., "20th Century Housekeeping," Bernice Bell; 2:40-4:00, Daylight Concert; 4:00-4:30, Magazine reading; 5:30-6:00, Children's hour, Tess Cooperman; 6:00-6:15, "Sport Review," John Getchell; 6:15-7:00, Dinner concert; 7:30-8:15, Farm lecture: "Will Diversified Farming Solve Farmers' Problems," John W. Gamble, Omaha, Neb.

WMAQ, Chicago, Ill. (Central, 447.5), 4:30 p. m., Programs, Starett School for Girls.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Concert by Hotel Gayoso Orchestra.

WOAW, Omaha, Neb. (Central, 526), 6:30 p. m., Dinner program, Randall's Royal Orchestra; 9:00, Concert program, 17th U. S. Infantry Band, Herman Webel, bandmaster.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30 p. m., Lecture; 5:45, Chimes; 6:30, Sandman's visit; 7:30, Lecture; 8:00, Musical program, Erwin Swindell, director.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wanamaker Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt; 7:30, Hotel Adelphia Concert Orchestra, A. Candelori, director; 9:10, Fox Theater Grand Orchestra, Erno Rapee, director; 10:03, Organ recital, Mary E. Vogt; 10:30, Havana Casino Dance Orchestra, Hotel Sylvania, Vincent Rizzo.

WOQ, Kansas City, Mo. (Central, 360), 7:00 p. m., Music by Sickman's Society Orchestra; Political talks by Democratic City Committee.

WOR, Newark, N. J. (Eastern, 405), 2:30-3:00 p. m., John Steele and Frank Tours, composers; 3:30-4:00, John Steele and Frank Tours; 6:15-7:30, "Music While You Dine," Harry Cox and his Hotel Robert Treat Orch.; 8:00-8:15, Current Motion Pictures by "Hollywood" McCosker; 8:15-8:30, Alexander De Brulle; 8:30-8:45, Jolly Bill Steinke in "Radio Cartooning"; 8:45-9:00, Alexander De Brulle; 9:45-11:00, Concert by Plainfield Symphony Society.

WOS, Jefferson City, Mo. (Central, 440.9), 8:00 p. m., Concert, Radio Famous Missouri State Prison Band; Virgil W. Combs, bandmaster; Harry M. Snodgrass, pianist.

WSB, Atlanta, Ga. (Central, 429), 12:00 m., Entertainment; 4:00-4:30 p. m., Howard Theater overture and prologue; 5:00, Vick Myers' Melody Orchestra; 5:30, Bonnie Barnhardt's songs and bedtime story; 8:00-9:00, WSB All-Star revue; 10:45-11:45, Chicago concert, Bonnie Barnhardt, Ernest Rogers, Max Sasanoff, Nora Allen, Marcelle Stanton Megahee.

Tuesday, April 8

CKAC, Montreal, Can. (Central, 425), 4:30 p. m., Music; 7:00, Kiddies' stories in French and English; 7:30, Rex Rattle and his Mt. Royal Hotel Orchestra; Nap. Dansereau, cellist; 8:30, La Presse studio concert, J. C. Houle, director; 10:30, Joseph C. Smith and his Mt. Royal Hotel Dance Orchestra.

KFKB, Milford, Kansas (Central, 286), 8:05 p. m., "Silage and Pasture for Dairy Cows," Prof. H. W. Cave; 8:30, "Feeding for Winter Egg Production," Prof. D. J. Taylor; Elsie H. Smith, pianist; Vocal solo, Harry Wilson; College Quartet.

KGO, Oakland, Calif. (Pacific, 312), 8:00 p. m., KGO Grand Opera, "Il Trovatore," in four acts, music, Verdi; Carl Anderson, director; Cast; Leonora, Florence Ringo; Azucena, Blanche Hamilton Fox; Manrico, A. Cicolli; Count de Luna, Emanuel Porcini; Chorus of Soldiers and Gypsies; KGO Orchestra.

KHJ, Los Angeles, Calif. (Pacific, 395), 12:30-1:15 p. m., Concert; 2:30-3:30, Concert, Barker Brothers; 6:30-7:30, Children's program; 8:00-10:00, De Luxe Program.

KPO, San Francisco, Calif. (Pacific, 423), 1:00-2:00 p. m., Swiger's Orchestra; 2:30-3:30, Program, management of Joseph Carey, blind composer; 4:30-5:30, Seiger's orchestra; 5:30-6:30, Children's stories, "Big Brother," of KPO; 7:00-7:30, Seiger's Orchestra; 8:00-9:00, Program, under management of Hazel Huff, soprano; 9:00-10:00, Program, under management of Walter Wenzel, pianist.

WAAW, Omaha, Neb. (Central, 360), 9:00 p. m., Lenten services by West Center Street Lutheran Church, Omaha; W. W. Steeppelwerth, pastor.

WBAP, Fort Worth, Tex. (Central, 476), 7:30-8:30 p. m., Concert, Panther City Orchestra, J. N. Wimple, director; 9:30-10:45 p. m., Program by the Orchestra, Ladies' Glee Club.

WBAV, Columbus, Ohio (Eastern, 390), 12:00 m., Piano music, Ila Lorbach Owens.

WCAL, Northfield, Minn. (Central, 360), 9:45 a. m., St. Olaf College chapel services.

WDAF, Kansas City, Mo. (Central, 411), 3:30 p. m., Johnnie Campbell's Kansas City Club Orchestra; 6:00, E. O. Moffatt travelogue, children's story, information man, Fritz Hanlein's Trianon Ensemble; 11:45, Nighthawks.

WDAP, Chicago, Ill. (Central, 360), 7:00-8:00 p. m., Drake Concert Ensemble and Blackstone String Quintette; 8:00-8:30, Barton Organ, Ralph Emerson; 10:00, Annie L. Hyatt, Joseph Anderson, Mrs. Biermann, Miss Greenfield, Jack Chapman's Orchestra.

WDAR, Philadelphia, Pa. (Eastern, 395), 11:45 a. m., Daily Almanac; 12:02 p. m., Organ recital, Stanley Theater; 12:30, Arcadia Cafe Concert Orchestra; 2:00, Piano solos, Edna Finestone; Arcadia Cafe Concert Orchestra; 7:30, Dream Daddy's bedtime stories.

WEAF, New York, N. Y. (Eastern, 492), 4:00-4:30 p. m., Reid's Instrumental Quartette; 4:30-5:00, Harriet Sink, sopr.; 5:00-5:30, Children's stories; 7:30-7:40, Thornton Fisher; 7:40-8:00, Grace Fisher Reeve, dram. sopr.; 8:05-8:30, Helen Schafmeister, pianist; 8:30-9:00, Brooklyn Eagle News Review; 9:00-9:20, Lincoln High School Orch.; 9:20-9:30, Penn. Mutual Ins. Co.; 9:30-9:45, Columbia Phonograph Co.; 9:45-10:15, Louis Ziedler, tenor, and Dudley Warwick, bass; 10:15-10:45, Lincoln High School Orch.

WFI, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Meyer Davis Bellevue Stratford Concert Orchestra; 6:00, Sunny Jim's bedtime stories; 6:30, Meyer Davis Bellevue Stratford Orchestra; 8:00, Instrumental Trio, Florence Haenle, violin; Oscar Langman, violin; Mildred H. Ackley, piano; 10:10, Charlie Kerr and his Symphonic Orchestra from Majestic Hotel.

WGR, Buffalo, N. Y. (Eastern, 319), 12:30-1:00 p. m., George Albert Bouchard, organist; 2:30-4:00, The Radio Dealers' musical program; 6:30-7:30, Chamber music recital.

WGY, Schenectady, N. Y. (Eastern, 790), 2:00 p. m., Music and one act play, "Rosalie," by Max Maurey; 6:30, Dinner music by Instrument Trio of Hotel Ten Eyck, Albany, N. Y.; 7:45, Comic Opera, "H. M. S. Pinafore."

WHAA, Iowa City, Iowa (Central, 484), 9:00 p. m., Concert by faculty of music, University of Iowa.

WHAS, Louisville, Ky. (Central, 400), 4:00-5:00 p. m., Strand Theater Orchestra; Walnut Theater Orchestra; Alamo Theater organ; 7:30, Louisville Syncopaters; Reading, Mrs. Cordi Greer Petrie.

WHB, Kansas City, Mo. (Central, 411), 12:35 p. m., Popular music by Sweeney Radio Orchestra; 2:00, Ladies' hour of popular music my Sweeney Orchestra; 7:00, Piano solos by George Parrish; Weekly W. C. T. U. talk; 8:00, Program by students of Sweeney Automotive and Electrica School.

WIP, Philadelphia, Pa. (Eastern, 509), 1:00 p. m., Organ recital, Karl Bonawitz; 3:00, Six Saxaphone Serenaders; 6:05, Dick Regan and his WIP Symphony Orchestra; 7:00, Uncle Wip's bedtime stories; 8:00, Elliott Lester, dramatic reviewer; 8:15, Philadelphia Police Band, director Lieutenant Joseph Kiefer; 10:15, Ted Weems and his Cafe L'Aiglon Orchestra.

WHN, New York, N. Y. (Eastern, 360), 3:30-4:30 p. m., Bob Schaefer and His Entertainers, assisted by the Original Georgia Five; 9:30-10:00, Fletcher Henderson's Alabam Club Orchestra; 10:00-10:45, Shapiro Bernstein Music Co.; 10:45-11:15, Lorraine Society Dance Orchestra, Arnold Miler, leader.

WJAX, Cleveland, Ohio (Eastern, 390), 7:30 p. m., Program arranged by Cleveland News-Leader; Bedtime story, E. G. Johnson; Radio Talk Cartoon, Don Palmer; Solos and duets, Marcia B. Francis, Dorothy Smith Lenz; Talk, "Child Labor," member League Women Voters; Dance program.

WMAQ, Chicago, Ill. (Central, 447.5), 2:35 p. m., Concert, Lyon & Healy concert hall; 4:30, Pupils, Glenn Dillard Gunn School; 5:00, Marjorie Barrows, reading from "Child Life"; 7:00, Talk on New Zealand, Leila Bloomfield; 8:40, Hotel La Salle Orchestra; 9:15, Lyon & Healy weekly program.

WMC, Memphis, Tenn. (Central, 500), 8:30 p. m., Program, Cortese Bros.; 11:00, Pipe organ recital, Scottish Rite Cathedral.

WOAW, Omaha, Nebr. (Central, 526), 6:30 p. m., Dinner program, The Original Music Masters; 9:00, Musical program, arranged by Corrine Paulson Thorson, pianist and instructor.

WOC, Davenport, Iowa (Central, 484), 12:00 m., Chimes; 3:30, Lecture; 5:45, Chimes.

WOO, Philadelphia, Pa. (Eastern, 509), 11:00 a. m., Organ recital, Mary E. Vogt; 12:02 p. m., Wanamaker Crystal Tea Room Orchestra, Robert E. Golden, director; 4:45, Organ recital, Mary E. Vogt.

WOQ, Kansas City, Mo. (Central, 360), 2:30 p. m., Popular music from Liberty Theater; 8:00, Music by Sickman's Society Orchestra.

WSB, Atlanta, Ga. (Central, 429), 12:00 m., Entertainment; 4:00-4:30 p. m., Howard Theater overture and prologue; 5:30, Bonnie Barnhardt's songs and bedtime story; 8:00-9:00, First Methodist quartet and choir; 10:45-11:45, Georgia Serenaders, singing syncopators.

Filament Heating Transformer

Data on how to build a filament transformer seems to be very scarce in the Radio magazines so that I was obliged to work it out for myself and find that it requires only three hours and very little expense for material.

Have the tinner cut on his machine (hand-cut strips are worthless) from number 28 gauge black iron enough 1 by 3-inch strips to form two piles 1 inch high and enough strips 1 by 5-inches to make two more 1-inch piles. Pile up the 5-inch strips to form two piles 6 inches long by making every other strip project 1 inch. Tape them well except for 1 inch at each end. Cut two pieces of $\frac{1}{16}$-inch black fiber 3 inches square. With a ruler lay out a 1-inch square hole in the center of each and cut out with the sharp point of a knife. Slip one on each end and bend back one lamination on each side at the ends to hold them from slipping off. Drill a small hole in one head, near the core, to start the wire and wind on 1,600 turns of number 21 enamel scc. magnet wire. This will require a little less than 3 pounds if neatly wound on in layers. Drill a hole in the head to bring out the end and tape the winding well. Drill another hole in the other head to start the wire, and wind on 140 turns of Number 14 enamel scc. wire, winding over to center, back to end and then to center. These three layers between the end and the center should make 70 turns. Bring out a tap; then wind over the other half in the same manner. You will now have a 1-inch core wound with about 17 layers of primary and 3 layers of secondary wound over primary, making the winding about 3 inches in diameter. Assemble the other long leg of the core in the same manner as the one upon which the wire is wound and close the core by leaving in the short pieces across the ends.

Not having an a.c. ammeter handy I cannot say just what amperage this transformer gives but I am using it with three 5-watt tubes and believe it would carry six. The voltage is 9.25 which I find is fine for three tubes using a 1.5-ohm rheostat.—Chas. Middleton, La Porte, Ind.

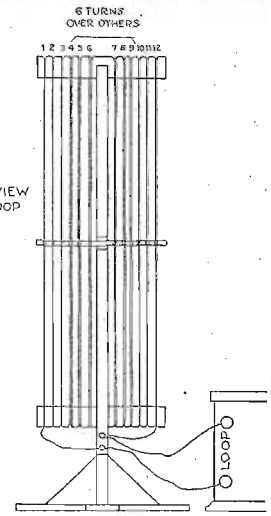
Meditations by the Inventor of King Miloplex

Part XXVI—Construction of Loop Wave Trap

By the Mystery Man

TWO hundred and sixty-seven tyro Hams, or members of "My Gang," report having built their selection of the wave traps which I have published, and with but few exceptions, found them quite efficient in operation. The usual cause of failure being that some few have attempted to use the trap through mounting it upon the panel adjacent to such tuning inductions as they might have incorperated in their set.

You can't do this, Bill; a wave trap is such an exclusive little "cuss" that when you attempt to associate him or even ask him to sit close by a tuning inductance,



his positive reply is "Not I." In other words, keep your wave trap out of inductive relations to such tuning inductances as your set may employ. The primary reason for doing this is not only to eliminate self-induction, but an even worse effect; that of electro-static coupling, and now that Maggie has re-read the above, her comment was, "You must have copied that out of a book." This merely goes to show she insists upon the "King" being himself, even though some of his readers would much prefer that he stick close to the serious and sublime, rather than to intersperse his writings with side lights upon the vernacular of the day. Methinks, and opine, with all seriousness that some day, in order that I may please those who desire the deep and uncut, I shall direct an article which will comprise little else than logarithms, calculus and the hypothesis of an undivided wave, and should they be able to understand it, then I shall have served them well.

Tuning Device

They tell me that the only way to build a tuner is to make it this-a-way or that-a-way; couple it tight or couple it loose; stand it upright or let it lay horizontal, but few, if any, of the journal articles which I have read in the past have taken up, for description, the elimination of electro-static coupling or that which you ordinarily know as back-coupling. Nor have they gone into detail relative to the percentage of coupling that should be employed for either Radio frequency or regenerative circuits, and while it is my intention to keep you fellows, who have been going out nights because you haven't had any circuits to build, busy with a couple or three circuits which might interest you. In order to help a great many of you plough through local, which is even more important than wave traps, is the use of an efficient, right-constructed tuning device.

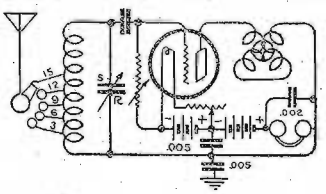
Man, man! How I tear my hair as I float around the country and see offered for sale, and also incorporated in receiving sets, doo-dads which are supposed to be tuning devices. I haven't enough blood to spare for boiling purposes, but if I had, believe me, the first job I would give Maggie would be that of presenting me with a dozen of these so-called couplers or tuners, and I'll say my blood would boil.

"Rawdeo is certainly maddening," yet parts and apparatus are getting better every day; therefore, we have hopes of some day being reasonably certain of going into a dealer's store and not buying other than merchandise which will do the trick. Get me right on this—I don't blame the dealer, that is, all dealers; it is a new business. We are getting wise now and it takes a mighty clever salesman to come in and sell the dealer, parts which will not step into the class of "good" merchandise, and now that I have this out of my system, suppose I give you the last of the wave traps and prepare you in a goodly measure for a few circuits which are to follow the newspapers' interview with me as promised last week.

Loop Wave Trap

Very often, particularly where the conditions are unusually severe, the use of a loop trap will enable you to accomplish results that are almost uncanny. Quite true, loops are more or less expensive to construct and I would not advise all of you to build the loop trap which I am about to describe, but rather file this issue of Digest for future reference, in order that should the conditions arise where a trap of this character could be used to advantage, you would then have the data available.

The diagram indicates the usual form of constructing quite an efficient loop, while accompanying it is data for the building of a loop having 30 inches to



the length of each side. For illustration, let us build the loop having 30 inches to the side, as it is quite generally understood that the larger the loop the greater its efficiency. Follow as closely as possible the general design of the drawing by winding on 12 turns of number 18 dcc. wire, spacing each turn ⅜ of an inch apart. Approximately 125 feet of wire will be required to complete the above winding. Connect a wire at each start and finish of the winding and connect them to a variable condenser, having a capacity of approximately .00025 mfd. This, then, becomes the trap or acceptor circuit. As I have previously outlined, the Eaton circuit, comprised of inductance and capacity, has a rather regular habit of contiguing to oscillate at a given frequency, conditional upon the setting of the variable plates when its inductance is energized from an outside source.

From the above it is quite apparent that we must, in order to make this circuit operate, energize it from an outside source, and in order to do this we will inductively couple it to the primary circuit. This primary circuit may be constructed by starting at the beginning of the 4th turn of your loop and winding on six turns of number 18 dcc., passing this wire through the same slot or hole as the first winding. In other words, it may then follow with and be within the slot or opening with the 4th, 5th, 6th, 7th, 8th and 9th turns, but not physically connected in any manner. One end of this primary should go to the antenna wire, the other end to the antenna binding post on the receiver.

This finishes the construction, and, if you will but glance at it carefully, it will be apparent that we have built an inductively coupled loop wave trap whose primary is what is known as untuned or amperiodic, or, as I have called them, spasmodic, which has not only many of the desirable features of traps previously described, but the further ability of assisting you toward the elimination of interfering stations through the directional properties which loops possess.

More Circuits to Come

This happens to be my busy day—I don't know whether I am going to get a new cook or get rid of the one I have—but at any rate, from now until the setting sun, the "King" has got to find money enough to pay his income tax and will have to get busy on the phone in order to see if he can't get some of his friends to make donations. Just because I am going to be so busy scraping this filthy wealth together, let me conclude this article by presenting to you an old time circuit in a somewhat new dress. Just look it over, old-timer, and see if you wouldn't like to build it before I tell you how I do the trick. 'At a boy! Let's Eat!

(TO BE CONTINUED.)

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The Radio Trust

Who Is Going to Settle the Radio Business?

BY WHAT divine right does the powerful and majestic Bell system step in to settle Radio's business? For no reason except that "might makes right." Radio can take care of itself—the problem of who shall pay for broadcasting will be settled by the Radio industry and the Radio public. Either a levy on set manufacturers or a sales tax on essential parts—and one of a dozen excellent ways are available for securing funds to pay the finest talent in the world.

The phone company's position is reported to be that there is bound to be a radical change in broadcasting because it is furnishing something for nothing. It applies to its own broadcasting particularly, as it is in the business of transmission and does not sell Radio receiving sets, nor do its subsidiaries, except for certain parts developed from telephone use.

The company argues that when the extraneous interests that have flocked into Radio on the boom die out it will still have to handle Radio transmission, and therefore it must stabilize the industry.

Why will it have to handle broadcasting? No law compels it to and it has implied no obligation to do so by the sale of Radio apparatus. The manufacturers have and they will see that there is plenty on the air to listen to. The phone company must stabilize the industry! Why? Are not the executives of some of the companies doing business in the field big enough to accomplish this at the right time? Have they appealed to this great divinity to come in and by a magic sweep of the wand make a thorny path over into a garden of roses?

Two events at Washington have important bearings on the subject. One was the hearing on the White bill which contains a clause providing for the ending of monopolies, and again, on April 10, will be opened the Federal Trade commission hearing of the investigation of a Radio trust.

Court Rulings

Judge Favors Boys in Putting Up an Aerial

A CINCINNATI justice to whom was referred a case of two boys wishing to construct an aerial on their home against the wishes of the landlord, who objected stronuously to having a couple of poles attached to the roof of a dwelling owned by him, decided in favor of the two youngsters.

In making his decision, after asking the property owner various questions, the court said: "Radio is one of the most beautiful and helpful influences a boy can have. It is a great factor in broadening their minds and I hope I will be able to help the young boys appreciate the advantages of a Radio receiving set."

Education by Radio

Country Places Get Most from Broadcasts

THE educational value of Radio to families in their homes and on the farms is becoming more fully appreciated. From a western broadcasting station people in many cities and towns and thousands of farm homes in the country enjoy daily entertainment.

Lectures from great educational centers scattered over thirty-one states are heard from one super-station.

The pleasure that a whole family gets from a nation-wide music and lecture broadcast is intensified by the fact that they have been deprived of these things until the discovery of Radio.

Speed of Waves

Sound Leaps Distance with Amazing Quickness

IF YOU are 186 miles from a broadcasting station, when you listen in, you hear each sound 1/1,000 part of a second after it is produced in the broadcasting station. This is because Radio waves travel at the speed of 186,000 miles per second, so fast as to be instantaneous over all normal broadcasting ranges. If you were in a studio and with one ear heard a note struck on the piano, and at the other ear could hear the same note transmitted 1,000 miles by Radio, your ears would be unable to distinguish between the two. They would sound like a single note.

RADIO INDI-GEST

You Can't Make Love by Radio

You can't make love by Radio,
It simply can't be done,
It has its limits and I'm sure
That love-making is one,
You can sing songs, I grant you
Of passion and of youth,
But when the World is listening in
You can't express love's truth.

You can't make love by Radio,
It lacks the soul's pure eyes
That, mirror-like, reflect its joy,
The joy that satisfies,
You can, upon the ether
Tell people how to live,
But to make love 'tis lacking
That thrill it needs must give.

You can't make love by Radio,
The microphone is dead,
No rosy lips to press a kiss
And kisses can't be said,
It has no silken tresses fine,
No dainty hands to hold,
No cheeks inviting love's caress,
No tears to be consoled.

You can't make love by Radio,
The World's too large, by far,
You need a cosy little room
Where two and no more are,
You can't have any listening in,
There's no fun if you do,
The Radio is NOT the place
To send my love to you.

CHARLES L. H. WAGNER.

Soozie and Mama Haymes Please Write

Dear Indi: Seeing as how Mama Haymes put several little crosses on one of her letters to you (Dec. 15), I suppose you know her rather intimately and can answer my questions. Has Mama Haymes a steady meal ticket? *(I don't know how steady.—Indi.)* Can she cook as good as King's Maggie? An how about Soozie; is she a her or a hymn? *(Yes.—Indi.)*

My offer of March 15 (object matrimony) is still open and as a greater inducement for the accepted matrimonial worse half, I will grant the full and exclusive rights to my receiving set one night each week (Sunday night). Love's wonderful isn't it? I. NOA LOTT.

P. S. Herewith is an appendix to my recent encyclopedia.
I. N. L.

Encyclopedia Indi-Gesticana

(Compiled by I. Noa. Lott)

Crystal.—The small, octagon shaped piece of glass that your friend declares to be a diamond.

Jack.—Dough, mazuma, spondulix, kale, money or anything used to purchase Radio appliances.

Lightning Arrester.—A detour for lightning, but lightning usually goes by too fast to read the sign.

Plug.—A wooden stopper for a beer (I mean, vinegar) keg bunghole.

Potentiometer.—An instrument called for in most Radio circuits for the purpose, evidently, of absorbing electricity, running down batteries or any other debrading use.

Re-Radiating.—The action of an improperly operated set that causes howls (the neighbors' squeals).

Spark.—The end of a cigar farthest from your mouth.

Tickler.—Woolen XYZ.

Mrs. Partington Speaks Out

Dear Indi: Mrs. Partington says she's heard some oil men, or other greedy fellers is claiming a patented right to the Air, as well as on all the machinery they send it and we receivo it with, and they seem to think all listeners is for is to buy patent machines to hear patent programs out of patented air.

She says, "First thing we know we'll be listening out of the little end of the horn, and paying the fiddler for that." She believes listeners had better get busy and send some applause letters to their congress members just to let them know that the Ether ain't got no Tea-pot Dome, and is not for lease, public nor private."

SIGNING OFF.

Bet He Owns R. C. A. Stock Too

Dear Indi: There's a guy in our block who's so tough he chews vacuum tubes and spits electrons.

FIDDLE D. DIAL.

Bigger Than the Government?

Condensed

By DIELECTRIC

It is unfortunate that so good a Radio bill as that sponsored by Congressman White and approved by the proper government departments should be slated for a long "silent period." Such a bill might go a long way to clear the air in these days of Radio monopoly. Again we have forced upon our attention the spectacle of a tube "shortage"!

Contests carried on by broadcasting stations are not so numerous as at one time, yet they flourish in spots. Of course, every such feature creates an added reason for selecting that particular station to listen to, also it helps the A. T. & T. increase their receipts from telegrams—some of which travel considerable distances. Not long ago WJAX and WJAZ announced contests on the same evening, though the latter was to be held at a later date. While listening for Chicago's announcement many a fan failed to win a prize from the Union Trust Company.

At last! After the various organizations opposed to giving the mass of music lovers in this country a chance to hear artists of renown, had performed their skit, we are about to be blessed with hearing classical music rendered by musicians who stand at the top of their profession. The Radio and Music Fund Committee, in New York, have announced their intention to begin broadcasting this class of programs and WEAF will donate their station to its use. Judging by the letters received, the idea has appealed to those in every walk of life who express their gratitude for fostering such a desirable plan. Send in your check.

Debates formerly were entirely confined to three judges, who were present in the hall in which the debaters held forth, for decision as to the winners. More recently such intellectual calisthenics have been staged before thousands of self-appointed judges. Except in a few instances, however, the three judges decided the case. WJAZ asked the Radio listeners to be the judges in a debate on the "wet" or "dry" question, debated before the microphone in their studio. The majority of listeners were "wet"—that is, they so voted. Being Saturday night——.

Some of the American broadcasting stations have no difficulty at all in reaching England with their programs, where they are relayed for the benefit of those unable to pick them up direct. But when the British stations attempted to reach our listeners last month the result was far from satisfactory. Only a comparatively few with super sets were able to catch more than the carrier wave. Not that they have any programs superior to ours—possibly not so good, but it would be very interesting to fans on this side to tune in an English station once in a while. It has been explained that the power used by their stations is not as great as used here. Put on more juice, England, and let's hear you!

A year ago broadcasting stations were guilty of keeping their Radio listeners waiting several minutes between numbers before announcing their call letters. Some even announce a half-dozen numbers without giving this information. This is seldom found to be the case today. The person at the dials wants to know to whom he is listening, at the earliest opportunity. A letter to RADIO DIGEST from Dorothy MacIntosh complains of the inability of listeners to church services knowing the location of the church to which they are tuned. Announcements at the beginning and close of a service are usually the only ones given. Preachers might preface the sermon with a statement which all fans would welcome.

The Latest in Super-Heterodyne Hook-Ups

Part IV—Seven Tube and Filter Circuits

By H. J. Marx

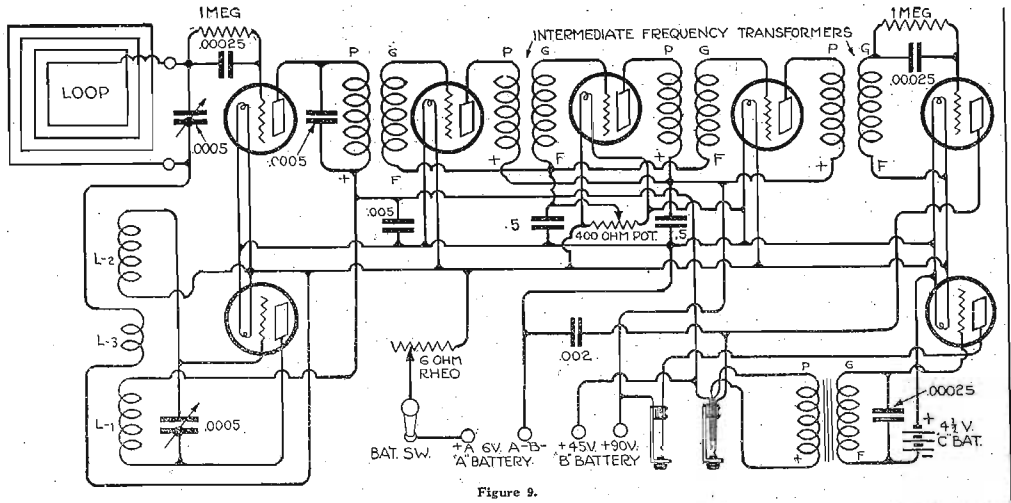

Figure 9.

A FAN writes a long letter asking which is best, the super-heterodyne or the neutrodyne. There is little doubt on the subject, the super-heterodyne circuit when the apparatus is properly designed, constructed and assembled will be far superior to any of the circuits at present known. But the problem of proper design and construction still retains a few kinks for complete solution. In addition, the panel layout. It is a foregone conclusion that when the panel layout is the first problem to be undertaken, the efficiency of operation is neglected.

Greater Selectivity

In most cases the volume of the super-heterodyne will not be any more than that of the neutrodyne, but its selectivity should be infinitely greater. The entire

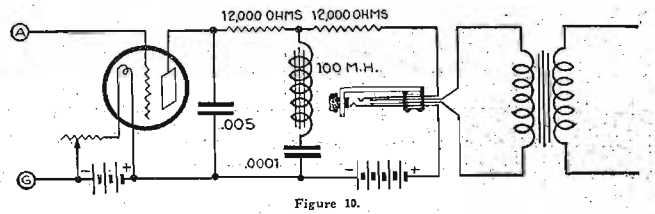

Figure 10.

the assembly of a set with the numerous tubes required is one of the most difficult problems that the average fan has ever undertaken.

The best procedure is to first assemble the apparatus on a flat board, book it up and make the necessary changes until it is working right. Then start figuring on range of the two variable condensers should be available for tuning the stations as desired. If the condensers are too large or have too much dead tuning area, the adjustment over its working range is unnecessarily critical. If the capacity is too small some stations can not be received. If the transformers are not properly designed very high or low wave lengths cannot be received without distortion or possibly not at all. It may often be found advisable to remove some of the rotating plates if the capacity is too large. If it is too small it may be easier to add a few turns to the inductance.

Seven Tube Circuit

A seven tube circuit is shown in Figure 9. This has four stages of super-audible amplification and one stage of audio frequency. Either the three or six volt tubes can be used. Changing the tubes around will soon indicate the arrangement giving the best results. All tubes are not good oscillators—likewise all tubes are not good detectors—so some changing around will help matters decidedly.

L-1 is the oscillator plate coil, which consists of 24 turns of number 22 dsc wire on a 3¾-inch tube. L-2 is the oscillator grid coil, with 42 turns of the same size wire on the same tube spaced about ⅛-inch from the plate coil winding.

The pick-up or grid coupling coil, L-3, has 18 turns of the same wire on a 2¾-inch rotor between the two fixed coils. The four super-audible transformers should be of the 6,000 meter type. The oscillator circuit should be well shielded from the rest of the circuit to prevent interference.

Once the wave length settings on the tuning condenser are determined—tuning of this receiver becomes a simple matter. The oscillator condenser will have two points for each station. The potentiometer controls the volume of reception. An improvement would be to use a separate rheostat for the two detector and the oscillator tubes, as the setting of the single rheostat is somewhat critical.

Filter Circuit

A filter circuit developed by Mr. Francis R. Ehle of Philadelphia, is shown in Figure 10. This is added between the second detector tube and the primary of the audio frequency transformer. It is desirable to use a separate 22½-volt B battery for this plate circuit in order to permit a complete elimination of stray impulses into the audio stages. The values of the various component parts are given in the diagram.

Keep Lead-In Free from Metal

Even though the lead-in wire is insulated, never let it touch against any metal. This means the cornice around the edge of the roof, the metal window screens or weather strip, or any other metal. In spite of the insulation, there will be leakage here, and trouble will surely result. Leakage will be greater during storms or damp weather and considerable difficulty may be encountered tuning in. It usually manifests itself by constant whistling and inability to clear up a station altogether.

OPERATION, TROUBLES

(Continued from page 10)

Tuning

The next step is the tuning. The Tuska receiver is tuned in a very simple, easy and obvious manner. First, the switch in the center, Number 1, which is labeled 1, 2, 3, 4, 5, 6, is almost an indication of the wave length, Number 1 being 100 meters, Number 2 being 200 meters, etc.

The dial marked tuning, Number 2, controls the variation between each switch point and enables much finer tuning to be obtained. In some cases, the figures on the dial will really indicate wave length. However, it is not designed to do this. If you want to listen for a broadcast station on 360 meters, set the switch Number 1 to point 3 and then slowly turn the tuning dial Number 2 throughout its range. As you turn this dial with the left hand, use the right hand on the regenerative knob, Number 3. Leaving the tuning dial at any setting, bring the regenerative dial Number 3 slowly from zero toward 100. You will hear a strange noise in the phones when you reach the critical point. This noise can be described as a hissing or sometimes a click or dull thud. When the click point is reached, the vacuum tubo detector starts to oscillate. This means not only interference for all of your Radio neighbors, but it will also bring about distortion of music in the receiver. To overcome this, turn the regenerative knob Number 3. This will stop the oscillating and you will be receiving at the most sensitive adjustment.

For every setting on the tuning dial Number 2 bring the regenerative dial Number 3 up to the point where it does not hiss but is almost at the hissing or regenerative point. This is best accomplished by working the dials with both hands. The left hand controls the tuning dial, and the right hand, the regeneration. To describe this in slightly different language, we would say that there is certain synchronizing action for tuning and regeneration. Some stations will be heard with the switch Number 1 set on tap 4 and sometimes on tap 5 if the aerial is short. Occasionally, a station can be picked up with two sets of adjustments, as for example with the tuning dial Number 2 set near maximum and the switch Number 1 on tap 4, and also with the tuning dial set lower and the switch on tap 5. You will find from experience how to get the best results.

Trouble Shooting

Sooner or later, every radio outfit in the hands of a novice gives some kind of trouble. As a general rule, it might be said that this trouble is almost invariably located in something other than the receiving set itself. The first trouble is apt to be a storage battery being discharged or in need of charging. Perhaps the dry cells have done their work and need replacing. Sometimes the B battery will break down as they wear out from old age. Occasionally some of the wires to the binding posts are disconnected or the telephone receivers become disconnected from the set. We have heard of cases where the lightning arresters became stopped up and caused the Radio current to go to the ground instead of to the receiving set. There are many causes of trouble indeed and we recommend that you first test the various batteries. Examine the 6-volt storage battery or your dry cells. Look over the B battery and see that it is up to the proper voltage. If you do not have a voltmeter go to your dealer, who will gladly test it for you. Sometimes the vacuum tubes are the cause of the trouble.

First look for the little obvious things such as a wire falling off or the antenna falling down. The ground wire may be broken. The tubes may not light. Vacuum tubes burn out with age or abuse. Look for the more complicated causes last.

Receiving Ranges

Some operators claim to hear 500 miles every evening. We cannot refrain from mentioning a word or two about receiving ranges. Range, in the very first place, depends largely upon the transmitting station. You cannot hear farther than a person can talk to you. Neither can you receive broadcast stations farther than the broadcast station will transmit. As a general rule, the reliable range of the average broadcasting station is about 100 miles. This range will be affected by daylight and by varying weather conditions. However, at night and especially in the winter time, the ranges go up greatly and often exceed 3,000 miles. The results which you obtain depend largely upon the carefulness with which you tune your set and hours when you listen. Good tubes, phones and aerial all help, of course. Do not think that you are not receiving as far as the other fellow if he tells you these wild stories about the distances he has heard. Remember this does not mean a reliable range nor is it possible to receive these distances every night.

(ANOTHER SET NEXT WEEK)

Review of Books

An Introduction to Radio. A real book for the amateur. This treatise comes in two volumes. 96 pages in each volume, fully illustrated, with flexible leather covers. Price, two volumes, $1.

Experimental Wireless Stations. By P. E. Edelman. Simple directions are given in this book for making Radio equipment for the transmission of messages over long distances. Price, $3.

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.

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

Wireless Telephones and How They Work. By James Erskine-Murray. Third Edition Revised and Enlarged. The author gives a well-balanced sketch of his subject in this edition, but because of the complexity of the subject, it has only been possible to show the leading principles in their proper values by excluding a mass of details of lesser importance. Price $1.50.

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 Radiophonos. Twelve full page illustrations and diagrams. Price, 75 cents.

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.

Elements of Radio Communication. By Ellery W. Stone. A splendid, well connected, complete, accurate and up-to-date discussion of every phase of Radiotelegraphy and Radiotelephony. Written in simple language. The subject is presented from the physical rather than from the mathematical standpoint, avoiding the use of higher mathematics. Price, $2.50.

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

Get your detector set working at its best and then add amplification for good results.

Simple Explanation of Radio for Everybody

Chapter XV—The Inverse Duplex

By M. W. Thompson

THE inverse duplex is an improved reflex developed by Mr. David Grimes after considerable theoretical calculation and much experimenting. As it was

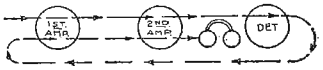

Figure 112.

first announced in the press this excellent method of connecting amplifiers was not a startling success but further work by its inventor resulted in a circuit called the improved duplex.

serious difficulties which are eliminated by the duplex. The second amplifier is overloaded by the strong Radio frequency and audio frequency energy which puts a low

Figure 113.

limit on the total amplification possible with that outfit. A small amount of Radio frequency goes through the detector bypass condensers and returns to the amplifiers with the audio frequency energy.

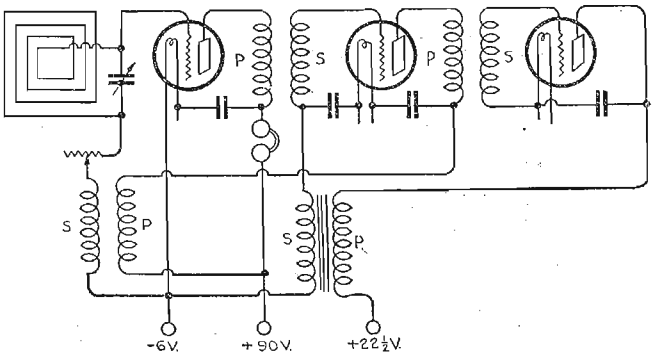

Figure 114.

Straight Reflex Hook-Up

Figure 112 shows, schematically, the use of three tubes in a straight reflex hook-up. The energy passes through the two amplifier tubes in 1-2 order, and then to the detector and finally back through the amplifier tubes in 1-2 order at audio frequencies. Such an arrangement has three

This conflicts with the desired Radio frequency energy and instability results. Third, the detector is not between the antenna and the phones, and "hum" or other objectionable noises from nearby electrical equipment will be amplified by the two tubes acting as audio frequency amplifiers and cannot be eliminated.

Duplex

In Figure 113 is shown a schematic drawing of a duplex. The incoming signal passes through the tubes in the same way as in the reflex and, as usual, to the detector. Then, instead of going to tube number one as audio frequency, it is passed to tube number two, from which it loops back to tube number one as the second audio frequency amplifier. This system has the important advantage that both amplifier tubes are loaded equally and the total amplification possible is much higher. The Radio frequency energy is weak in the first tube where the audio frequency energy is strong; Radio frequency energy is strong in the second tube where the audio frequency energy is weak.

There is, in this case, but one stage of audio frequency amplification between the antenna and the phones, and far less of the bothersome noises of electrical equipment in the vicinity will be noticed.

The first duplex hook-up was as shown in Figure 114. It should be noted that small fixed condensers were connected from the lower ends of both windings of the Radio frequency transformers and they permit the energy at Radio frequencies to pass directly back to the tube filaments after having performed their work in the transformers instead of having to go

(Continued on page 24)

RADIO FOR EVERYBODY

(Continued from page 23)

through the windings of audio frequency transformers or the condensers shunting them. This was the circuit which functioned so well with the old 201 tubes.

Improved Duplex

In Figure 115, we have the improved duplex and well may it be called "improved." The improvements and innovations were nearly as important as the great circuit to which they were added. The head phones have been changed from their former position below the primary of the first Radio frequency transformer to the lead from the plate to the primary. This materially aided stability.

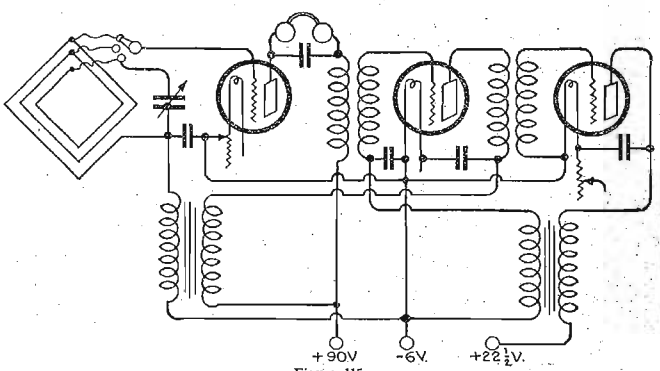

Figure 115.

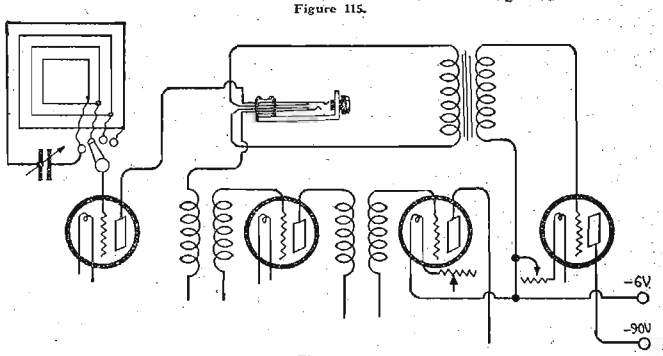

Figure 116.

The potentiometer was removed in favor of the tapped loop, which has several advantages. The potentiometer shorts the A battery and cuts down its life. A resistance in a Radio frequency circuit broadens the tuning and makes good selectivity impossible. This new circuit should be one of the sharpest known and nearly the equal of a Neutrodyne. This tapped loop method contains no resistance and so sharp is the tuning with a good loop that the condenser should most certainly be of the vernier type.

An important point is that the audio transformers be of low ratio, not more than 3½ to 1 and, preferably lower than that. A third step of power audio can readily be added to this set as shown in Figure 116. A two circuit jack is inserted where the phones were shown in Figure 115, the inner leads going to the primary of an audio frequency transformer. One of the secondary terminals is connected to the grid of the power tube, the other to the minus A battery wire.

(THE END.)

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(Continued from page 13)

The cycles are sometimes expressed in units of a thousand cycles, called "kilocycles." It is even possible to produce Radio wave lengths of only ten meters (frequency 29,982,000 cycles), and for laboratory purposes, down to a fraction of one inch. But the higher powered stations all use the lower frequencies. Strictly speaking there is no sharp boundary between Radio frequencies and audio frequencies as the transcontinental high powered telegraph stations use frequencies as low as 10,000 cycles, closely within the range of human ears.

Suppose, for discussion, that only a low frequency 60 cycle alternating current was applied to an aerial. Then each time the aerial is charged, there is an electrical strain between the aerial and the earth, and during discharge, this strain would be thrown back again. At a slow rate, the charge applied would come back, and practically none of the space strain would be thrown outwards so that it could be picked up at any considerable distance.

How Radio Waves Are Set Up

But by increasing the rate of charge and discharge, such ether strains occur at high frequency, and it is impossible for any one of the strains to collapse before the current has discharged and is again building up. The new strain can then oppose and push off into space what is left of the first one that did not have time to collapse. This effect continues rapidly in a continuous series of ether or space compressions which travel outward as Radio waves with the speed of light, namely 186,000 miles per second.

These waves travel outward, losing amplitude as the energy becomes dissipated and absorbed. A very small part of the original energy reaches a receiving aerial or receiving set, at the same frequency it was transmitted.

The high frequency is used then because it causes a large part of the applied energy to be thrown off from the aerial as Radio waves. The important point to remember is that each particular broadcasting station radiates a particular frequency of Radio waves continuously while it is on the air, and that it is the sound waves to be transmitted which govern the modulation or intensity.

Why Transmission Varies?

It is well established that transmission is better at night time than during the day, and that it varies from time to time, season to season, and in different localities. Thus transmission over water is usually better than over land. In the far south Radio is less reliable than in the middle north. In some mountainous districts or near mines, distant stations from certain directions can scarcely be heard, while others much further away are very distinct. In cities, the Radio results an outfit can give will vary from one section to another. There are certain districts termed "dead spots" where reception is very difficult. The reason for variations is being studied slowly and is thought to be due to atmospheric and natural changes,

(Continued on page 36)

Reflex Neutrodyne Uses Crystal for Clearness

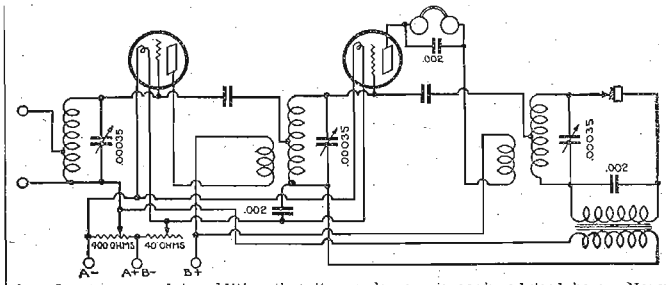
Two R. F., Detector and One A. F. on Two Tubes

By John T. Mathews

HERE'S a circuit that has only two tubes with two stages of neutralized Radio frequency, crystal detector, and one stage of reflex audio frequency amplification. A circuit of this type permits the maximum amount of selectivity and volume with a minimum amount of money invested in required apparatus.

The circuit itself is standard in every form and should present no difficulties in operation. The values of the various parts are indicated in the diagram. Three standard neutrodyne variable condensers are required. Two of the neutroformers are the usual two-coil air core transformer types. The third, used as the initial tuning unit, consists simply of the secondary winding giving a single circuit effect thus increasing the volume.

One rheostat controls the two tubes and a potentiometer of 400 ohms resistance permits close adjustment of the grid potential on both of the tubes. Care should be taken to see that the audio frequency transformer doesn't have a higher ratio



than five to one and in addition that its position is such that it doesn't come within the magnetic field of the neutroformer coils. The usual recommendation of 5¼ to 6-inch spacing between the variable condensers is again advised here. Many fans who have tried this circuit, say that it eliminates much distortion and noise often present in the ordinary neutrodyne receiver.

your set will be just that much harder to handle. It will require experience to learn how to tune it. I should not advise any beginner to try it until he has acquired considerable experience with a single tube set.

Audio frequency amplification which will increase the volume of sound is not so difficult to control; for that reason a beginner may easily use one or possibly two stages. More than two stages are not satisfactory because they will distort the music. One stage gives less volume than two but is more desirable because the results are much clearer.

One Stage Audio Frequency

If a powerful broadcasting station is operated within 10 or 15 miles and comes in with good round volume in the receivers, one stage of audio frequency amplification should enable one to use the loud speaker. One should not, however, expect he is going to hear the music blare all over the house like a phonograph, although persons sitting in any part of a fairly large room will have no difficulty in enjoying the music. One or two stages of amplification are necessary in order to use a loud speaking horn. It cannot be used on a crystal nor single tube set without amplification.

I should advise a subscription to some good Radio publication and a study of the general technical points governing the operation of the different kinds of sets.
—Albert E. Jones, East Melton. Mass.

Practical Remarks for Beginners in Radio

The ordinary beginner in Radio starts with a "listen in" on some friend's receiving set. If he has happened to hear a good program he decides to join the happy throng and build a set of his own.

His first investigation whether in buying one already assembled or putting it together is confusion, much of it—single circuits, double circuits, three circuits, Radio and audio frequency amplification, regeneration and the like. No wonder he is confused; yet through all this he has a definite idea of what he wants. Generally he wants a set that will give him results as good as are averaged by those in his vicinity, without having to go into technicalities to find the difference in the many kinds of circuits.

Atmosphere and Location

To begin, let me say that atmospheric conditions and location play a very important part in how well or how much you can receive. Night is better than day; winter is better than summer, and there will be a great variation from day to day. Stations will come in better from one direction than another; during the next night conditions may be reversed; yet through all these variations there is a rough average distance that the set may be relied on to cover except under the very worst circumstances. For a crystal set this average will be from 15 to 20 miles, with a single tube set from 75 to 100 miles. Yet under favorable circumstances the crystal set has been known to receive from distances greater even than 200 miles, single tube set distances up to and more than 1000 miles. By this it will be seen than one cannot say off-hand how far a set will receive.

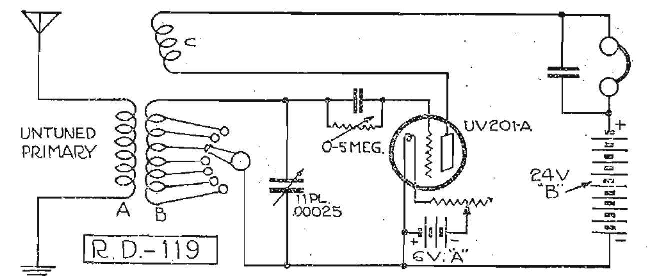
Sets constructed in like manner when located a few miles apart will show vast difference in the distance of reception. This is due to location. As to the set itself Radio frequency represents distance, audio frequency represents volume. Regeneration has, practically speaking, the effect of Radio frequency and audio frequency on the set; that is, it makes the set receive from a greater distance and also makes it louder.

Comparison of Circuits

Bearing these facts in mind we will now consider comparison of circuits. The single circuit is to my mind best adapted to general use, regardless of whether one is a beginner or an old hand at the game. After using all kinds of circuits I have come back to the standard single as the most reliable and easy to operate. The difference in the distance between single circuit, double circuit and triple circuit receivers is so slight that it should not be considered. The double and triple circuit tuners will tune a little more sharply than the single. That means they will be a little more impervious to interference by other stations; for that reason the three circuit tuner is preferred by those who find it necessary to work frequently through more or less serious interference.

When Radio frequency amplification is added to the set it is advisable to use not more than two stages; each time a stage of this amplification is added it means that

SIMPLE REGENERATIVE CIRCUIT



THE diagram given as R.D.-119, shows a circuit to increase selectivity. It is nothing more than a standard circuit with the addition of an untuned or a "periodic" primary which will respond to practically all the wave lengths used by broadcasting. This circuit gives very satisfactory results without the addition of any extra controls.

The secondary is wound with 70 turns of number 22 dcc. wire tapped every 10 turns. This should be put on a 4-inch tube. Directly over this is wound the primary consisting of 10 turns of number 18 dcc. bell wire. One end goes to the aerial and the other to the ground as shown in the diagram. The tickler coil is placed at one end of the tube and consists of 60 turns of number 22 dcc. on a 3½-inch rotor ball. There are but two controls, the secondary condenser and the tickler coil or regeneration. This method has the advantages of a double circuit tuner without the additional controls.

Using this hook-up with one UV-201A tube, 24 volts on the plate and an aerial 125 feet long, I have heard WFAA, WBAP, WSB, PWX, WOAW, WDAP, and many others. These have been received with a minimum of interference and distortion. Nearer stations, such as WGY and KDKA come in very loud and clear.—Sidney Bamford; Hammondsport, N. Y.

THIRTY MINUTE A-B-C

(Continued from page 24)

changing reflections and refractions, location of clouds, or other particular causes.

Owing to variables, the operation of Radio or a particular outfit cannot be reliably predicted for a locality not previously tried. This is the basis for the distance claims made for tests under favorable circumstances and the opposite disappointment with poor results from the same equipment elsewhere.

Receiving apparatus uses coils to provide electrical springboards called "inductance," and the next thirty minutes in this series will relate what inductances do.

(TO BE CONTINUED.)

LONG DISTANCE ON CRYSTAL SET

I have tried out the crystal hook-up using the split variometer as given by Chas. P. Lee in the March 1 issue of Radio Digest and have received a program from the Queen City Orchestra from KDKA this evening (February 26), getting good reception immediately. Thank you.

Lucian C. Miller,
Minneapolis, Minn.

Every State in the Union now has one or more broadcasting stations.

The electron has been weighed and measured very carefully. Its shape is circular sphere; weight is 8.8x10-28 of a gram; radius 1x10-13 centimeters; charge 1.59x10-19 coulombs; and speed at 0° Centigrade is 100 kilometers per second.

How to Make Set with Double Crystal

Louder Reception With Two Crystal Detectors

The crystal receiving set is one of the oldest, most generally known, and most reliable types of receiving sets, and hundreds, if not thousands, of crystal sets have been described in printed literature,

WORKSHOP KINKS? EARN A DOLLAR—

THERE are many little kinks worked out at home that would aid your fellow Radio worker if only he 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 obtaining 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.

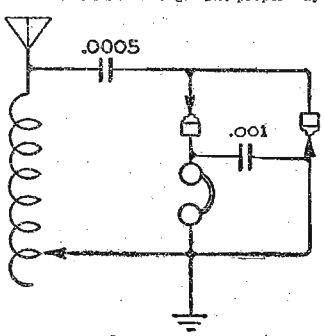
RADIO KINKS DEPARTMENT,
Radio Digest,
123 W. Madison St., Chicago

but, strange to say, I have not yet seen any crystal set that is perfect, or, rather, as nearly perfect as it is possible to make it. I am submitting to the readers the following specifications, and ask them if this is not as nearly perfect a set as it is possible to produce:

The crystals which are now available serve only as rectifiers and not as amplifiers, and must obtain all their energy from the aerial. This great absorption of energy results in broadness of tuning, so that a tapped inductance will be amply sufficient, without any additional provision for fine adjustment. A small fixed condenser may be used in the aerial, and the ground connected directly to the switch arm, as shown in the circuit diagram.

Tapping the Inductance

In tapping off the inductance, instructions usually tell you to tap off the coil at regular intervals, as every ten turns, for instance. This is wrong. The proper way



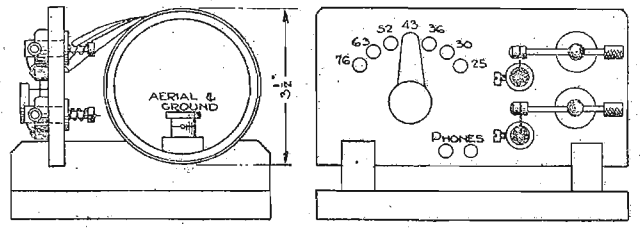
to tap off a coil is to have successive taps increase the wave length by the same fraction. Since the wave length is proportional to the square root of the inductance, and the inductance is approximately proportional to the square of the number of turns of wire, it follows that the wave length is directly proportional to the number of turns of wire (assuming that they all have the same diameter). The coil should therefore be tapped off so that the total number of turns of wire increase by the same fraction each time, and not by a fixed number of turns. For a crystal set the tuning will be sufficiently fine if each successive tap increases the number of turns by about one-fifth or one-sixth, while if a variable condenser is used in series with the aerial, the increase may be as much as one-third or one-half the total number of turns.

Number of Turns on Coil

In the set shown in the illustrations, I have designated the dimensions and number of turns which have been found most

(Continued on page 28)

LOCATION OF PARTS ON PANEL



Split Variometer Used To Make a Wave Trap

I have tried various types of wave traps and find that some eliminate the interference together with all other signals, and others eliminate too many of the desired stations with the interfering ones. The most satisfactory way, I find, is to split a variometer, put a 23 to 43-plate variable condenser across the rotor and put the stator in series with the antonna. If the type of variometer permits, a center tap should be tried, as in some cases less inductance in the antenna circuit is an advantage.

To use this trap, first tune in the station to be eliminated, then parallel the windings of the variometer and adjust the variable condenser until the interfering station is very weak. Now turn the rotor slightly and the station will fade out entirely. You can then go ahead and tune your receiver and never hear the station tuned out on the trap.

With this arrangement I have been able to tune in Chicago, Kansas City, Denver and Pittsburgh on a Reinartz, only five blocks from WOAW, when they were going full blast.—Ray Blain, Omaha, Neb.

Look out for the blue glow in a detector tube. This is a sure sign that the B battery voltage is too high, and it is apt to paralyze the tube.

DOUBLE CRYSTAL SET

(Continued from page 27)

satisfactory. The construction, as shown, is easy to build, and many of the details are left to the ingenuity of the builder, but one hint must be given, and that is, to solder the wires to the switch points before the coil is secured to the base, as otherwise it will be difficult to get the soldering iron in between the coil and the panel.

There are two crystal detectors used in this circuit. These are arranged in reverse order, as shown in the circuit diagram, and will be found to make the set much more reliable than if only one were used. Since a crystal acts only as a rectifier, each crystal can use only one-half of the wave. Now, if the conductivity of the crystal in the other direction would be absolutely zero, then the energy from the other half of the wave would merely be sent back into the oscillatory circuit to add to the energy of the next wave. But actually the conductivity of a crystal is not absolutely zero in either direction. It is merely greater in one direction than in the other. If, now, another crystal could be arranged in reverse order so as to utilize that half of the wave which the first crystal cannot use, then substantially all the energy of the waves would either be rectified to audio frequency or returned to the oscillatory circuit. This may be done in the manner shown on the illustrations.

Louder Reception

If the crystals are properly adjusted, reception will be perceptibly louder than if only one crystal is used, and even if one of the crystals is not very sensitive, so as to serve merely as a resistance, the set will still function as well as the ordinary single crystal receiver.

Each crystal detector consists of a central pivot drawn in by a spring, a catwhisker stem slidable through a transverse hole in the end of the pivot, and a ring or washer of insulation material surrounding the pivot and having a transverse slot for the catwhisker stem to rest in.—Carl F. Krafft, Washington, D. C.

Aerial for Crystal Set

A crystal detector set should have a long aerial, for the crystal detector relies exclusively on the strength of the incoming signal for its operation, as it has no local battery to assist it. The sounds heard in the telephones are the strength of the actual signals coming through after rectification by the crystal. The longer the aerial is, the better the results should be on the crystal detector.

Poorly Designed Tube Bases Cause Current Loss

Prevention of Small Losses Increases Range

By Henry Stockdale

ONE of the indications of the progress of the Radio art is the increased attention which is being paid to the design of the individual parts which are used in Radio receiving sets. Until quite recently most of this care was focused on the design of the coils and condensers alone. However, it is now realized that there are mile-wasting losses in poorly designed tube bases, tube sockets and other parts, as well.

A modern fairly efficient Radio receiver will receive signals which have as low a pressure as .001 volts. Even in a very good antenna this will not produce an energy of more than .0000001 watts. It is hard to imagine such a small quantity of energy, but forty million receiving sets would produce just about power enough to light one ordinary 40-watt tungsten light.

New Tube Construction

The oldest manufacturer of vacuum tubes has recently greatly improved its product by eliminating the traditional metal shell which surrounds the base of their tube. This change reduces the internal capacity of the tube and at the same time eliminates the losses from eddy currents in the metal shell itself. While the saving of power thus accomplished is quite small when expressed in figures, it becomes of importance when compared with the minute currents received on the antenna.

Importance of Vacuum Tube Socket

Second only in importance to the vacuum tube itself, is the tube socket, for all the energy must pass through the socket before it reaches the tube. Indications are that the metal shell socket will soon become obsolete as the single slide tuning coil. The best Radio engineering practice of today calls for the elimination of as much material as possible in the neighborhood of the parts of the Radio set which carry the Radio frequency current. This applies not only to metallic substances, but to insulating materials as well. The socket of the future will undoubtedly consist merely of a comparatively thin shell of some high grade insulating material, and a base only sufficiently large to accommodate the necessary contact springs and connecting posts.

Some manufacturers are already marketing sockets of this type. The necessary strength and durability is being secured by the use of Bakelite or similar material of uniform cross-section which assures thorough curing of the material, giving it the highest possible di-electric properties, as well as making it mechanically strong.

No Noisy B Batteries

A further interesting fact that has been developed through research conducted by one of the largest battery manufacturers, is that the "hissing" and "trying" noises often attributed to B batteries are in reality caused by poor connections, usually between tube terminals and the socket contacts. Their research shows that there are no noisy B batteries.

To prevent such noises and the shortening of many otherwise good concerts there are manufacturers who have not only provided sockets with the high insulating properties, but have devised contacts that are of a wiping nature, with dependable tension for each and every type of tube. In certain instances they have also provided dual wipe contacts on both ends and sides of the tube terminals, eliminating all possibility of trouble from this score.

It is interesting to realize that only a few years ago, we were thrilled at the thought of receiving broadcasting at distances of a few hundred miles, while today coast-to-coast reception is by no means uncommon. While a large part of this progress has no doubt been due to new circuits and to the refinement of old ones, we must not forget to give due credit to the Radio engineer who has been silently but busily engaged in saving the micro-micro watts which add the mileage to our receiving sets.

Do not forget to solder every joint in the set and antenna, otherwise joints will corrode and will offer resistance to the very feeble currents which try to flow in the antenna.

There are 250,000 persons directly or indirectly connected with the Radio industry in the United States.

Questions and Answers

Malicious Interference

(07100) SCM, Grayville, Ill.

We wish you would advise us on a case of malicious interference that we have been having here of late.

Some one here in town is hooking up a spark coil to his aerial and completely spoiling all Radio reception while this is going on.

This has happened twice in the last week. Will you inform us some way in which we can trace or detect from whose aerial this is coming? We have a suspicion of who is doing this, but of course cannot be sure of it. Can you advise us some test whereby we can trace this out and run down the offender?

In case we find out who is doing this, to whom should we report the case for action, and what would the penalty be?

A.—We are advising in your inquiry that the source of the interference to which you are subjected can be traced by means of a portable set and loop aerial, using the directional properties of loop to locate the position from which it emanates. This matter should be reported to the United States Radio Inspector, 575 Federal Building, Chicago.

The first penalty imposed for violation of regulations is a notice to desist, and a second notice will be followed by confiscation of transmitter of offending party.

Reception Trouble

(06971) GEH, Kirkland Lake, Ont., Can.

Have often wanted to ask for advice on trouble I have been having with my set, which is a single circuit WD-11 set, with a 2-stage Hamilton amplifier attached.

My trouble has been this: At intervals of sometimes only a few seconds, the detector tube starts to fry and when I hit the table or jar the set it will stop, often I have to rap quite hard to bring it back. When enjoying a good program this is often a great annoyance. What would you advise?

I am in an apartment where the question of an aerial is a difficult one, having only room enough for a 50 foot single wire about 30 feet high. I made a frame 6 by 3 and wound about 400 feet of annunciator wire around this, putting it in series with the outside aerial. This, I might say, gives excellent results.

A.—The action encountered in the operation of the receiver is undoubtedly due to the fact that some connection in the circuit has been disturbed and loosened. Hitting the table, as cited, jars it together temporarily until the current flowing through it will cause it to break. A review of connections is in order.

Radiophone Broadcasting Stations

Corrected Every Week——Part I

AA3, Denver, Colo. 440 meters. Fitzsimmons Gen. Hospital. (Educational Dept. U. S. Army). Thurs, 7:30-8:30 pm, music, entertainment. Mountain.
AO6, Canton, O. 425 meters. Hdqtrs. 135th Field Artillery O. N. G.
AV7, St. Paul, Minn. 400 meters. 6th Inf. Minn. Nat'l. Guard. St. Paul Armory. Irregular schedule. Central.
AW5, Dayton, O. McCook Field, U. S. Army. Experimental work only.
BEI, Tacoma, Wash. 400 meters. 50 watts. Camp Lewis, U. S. Army, Third Signal Corp. Discontinued indefinitely.
CFAC, Calgary, Alta., Can. 430 meters. 650 watts. Calgary Herald. Daily ex Sun, 7 pm, 3:30-4:30, Tues, Wed, Fri, Sat, 7:45-8:45; Mon, Thurs, 9-10 pm; Fri, 11 pm, music, entertainment, news, market, weather. Dance orchestra Sun, 11 am, 7:30 pm. Church services. Mountain.
CFCA, Toronto, Ont., Can. 400 meters. Toronto Star. Daily ex Sun, 12 m, weather, news, stock; 5:30-6 pm, news; 8-9 pm, music. Sun, 7 pm, church services. Eastern.
CFCF, Montreal, P. Q., Can., 440 meters, 400 watts. Marconi Wireless Tele. Co. Daily, 1-1:30 pm, Mon, 7:30-9 pm; Wed, 6-8 pm; Fri, 7:30-12 midnight, music, entertainment, reports. Eastern.
CFCH, Iroquois Falls, Ont., Can. 400 meters. 250 watts. Abitibi Power & Paper Co. Ltd. Slogan, "The Call of the North." Daily, 9 pm, reports, music, entertainment. Experimental station. Eastern.
CFCJ, Quebec, Que., Can. 410 meters. La Cie de L'Evenement.
CFCK, Edmonton, Alta., Can. 410 meters. Radio Supply Co. Daily ex Sun, 8-8:45 pm, music. Sun, 3:30-4:30 pm. Concert. Mountain.
CFCL, Victoria, B. C., Can. 400 meters. 500 watts. Centennial Methodist Church. Slogan, "Where Religion Cheers." Tues, 8:30-10:30 pm, concert; features. Sun, 11 am, 7:30 pm, church services. Pacific.
CFCN, Calgary, Alta., Can. 440 meters. 500 watts. W. W. Grant Radio Ltd. Slogan, "Voice of the Prairies." Mon, 11 pm, music. Wed, 10-1 am, dance music. Sat, 10-12 pm, dance music. Test program, Sat, after midnight. Mountain.
CFCO, Bellevue, P. Q. 435 meters. Semmelhaack-Dickson, Ltd. Daily ex Sat, Sun, 9:45-10:30 pm, news, markets, reports, sports, time, music. Sat, 9:30-11 pm, music. Sun, 9:15-10:45 pm, sacred music. Eastern.
CFCQ, Vancouver, B. C., Can. 450 meters, 10 watts. Radio Specialties, Ltd. Mon, Thurs, Sat, 7:30-8 pm. Music. Tues, 7:30-8 pm, children's evening. Wed, 4-5 pm. Music. Sun, 8:30-9:30 pm, classical music. Pacific.
CFCR, Sudbury, Ont., Can. 410 meters. 200 watts. Laurentide Air Service, Ltd.
CFCW, London, Ont., Can. 420 meters. 500 watts. The Radio Shop. Tues, Fri, 8:30-9:30 pm. Eastern.
CFDC, Nanaimo, B. C., Can. 430 meters. 10 watts. Sparks Co. Mon, Wed, Fri, 7:30-8 pm. Pacific.
CFGC, Sask., Sask., Can. 400 meters. 50 watts. The Electric Shop, Ltd. Slogan, "The Hub City of the West Where No. 1 Northern Hard Wheat Grows." Daily ex Sun, 1-1:30 pm, markets, reports, music. Mon, Tues, Thurs, Fri, 7:30-9 pm, news, reports, markets, entertainment. Sun, 9-9:45 pm, church services. Mountain.
CFRC, Kingston, Ont., Can. 450 meters. 500 watts. Queen's University.
CFUC, Montreal, P. Q., Can. 400 meters. Univ. of Montreal.
CHAC, Halifax, N. S., Can. 400 meters. 20 watts. Radio Engineers.
CHBC, Calgary, Alta., Can. 410 meters. The Alberta Pub. Co. Daily ex. Sat, 8:45-9 pm, news, stock quotations, music. Mountain.
CHCO, Quebec, Que., Can. 440 meters. Canadian Wireless and Electric Co. Mon, 7:30-9 pm; Wed, 8-9; Sat, 8-10, music. Eastern.
CHCE, Victoria, B. C., Can. 310 and 400 meters. Western Canada Radio Suppl, Ltd. Slogan: "The Voice of the Island." Daily ex Sun, 7-8 pm, music, stock reports, entertainment. Sun, 9-10 pm, music, entertainment. Pacific.
CHCL, Vancouver, B. C., Can. 440 meters. 2000 watts. The Vancouver Merchants Exchange, Ltd.
CHCS, Calgary, Alta., Can. 430 meters. 500 watts. Riley & McCormick Ltd. Thurs, 7:30-8:30 pm, musical. Mountain.
CHYC, Montreal, Que., Can. 341 meters. 500 watts. Northern Elec. Co. Wed, 8:30 pm, Sun, 7 pm. Eastern.
CJCA, Edmonton, Alta., Can. 450 meters. 500 watts. Edmonton Journal, Ltd. Slogan, "The Sunniest Spot in Sunny Alberta." Club, "Igloo Hut." Daily ex Sun, 12:30 pm, weather, markets, 7:30-8 pm. Children's half hour. 8:30-9:30 pm, concert, reports. Thurs, 11:15 pm, Igloo Hut meetings. Mountain.
CJCD, Toronto, Ont., Canada. 410 meters. T. Eaton Co. Daily ex Sat, Sun, 4-4:30 pm, music. Eastern.
CJCE, Vancouver, B. C., Can. 420 meters. Sprott-Shaw Radio Co. Daily ex Sun, 12:30-1:30 pm. 3:30-5 8-10, music, news. Pacific.
CJCI, St. John, N. B., Can. 400 meters. Maritime Radio Corp., Ltd. Mon, Wed, Fri, 7:30-9 pm, music. Sat, 9-11 pm, music. Eastern.
CJCM, Mont Joli, P. Q., Can. 314 meters. 250 watts. Dr. L. P. Landry. Slogan, "Where weeks below Quebec where civilization nearly ends." Daily ex Sun, 5-6 pm, music, news; 11-12:30 am., Radio vaudeville. Sun, Wed, 8:30-10:30 pm, music. Eastern.
CJCN, Toronto, Ont., Can. 410 meters. Simons, Agnew & Co. Signals.
CJCX, Olds, Alta., Can. 400 meters. 200 watts. Perfect Wireless. Slogan, "Echo from the Rockies." Daily ex Sun, 6:45-7:45 pm, music, news, time, entertainment. Mountain.
CJCC, London, Ont., Can. 430 meters. London Free Press. Daily ex Sun, 3:30-10 am, 12-1 pm, 5:30-6, news, market and weather, 8-9, music, entertainment. Eastern.
CJSC, Toronto, Ont., Can. 430 meters. The Evening Telegram.
CKAC, Montreal, Que., Can. 425 meters. 1,200 watts. La Presse. Daily ex Sat, Sun, 4 pm, music; 4:30, weather, markets, stocks. Tues, Thurs, Sat, 7 pm, children's hour; 7:30, concert; 10:30, specials. Sun, 4:30 pm, sacred concert. Eastern.
CJCD, Vancouver, B. C., Can. 410 meters. 2,000 watts. Vancouver Daily Province. Daily ex Sun, 8:30-9:30 pm, music, news, entertainment. Pacific.
CKCE, Toronto, Ont., Can. 450 meters. 750 watts. Can. Ind. Telephone Co. Occasional programs.
CKCH, Ottawa, Can. 435 meters. 500 watts. Canadian National Railway.
CKCK, Regina, Sask., Can. 420 meters, 500 watts. Leader Pub. Co. "The Queen City of the West." Daily ex Sat, Sun, 9:54, time; 10-10:30 am, 1:15-2 pm, 7:30-8:15. Tues, 7:30-9 pm, music, entertainment, news, market, weather. Sat, silent night. Sun, 9, service. Mountain.
CKCX, Calgary, Alberta, Can. 440 meters, 500 watts. P. Burns & Co., Ltd. Tues, Fri, 9-10 pm, music. Mountain.
CKGC, Hamilton, Ont., Can. 410 meters. 20 watts. Wentworth Radio Supply Co., Ltd. Slogan, "In the Garden of Canada." Mon, Wed, Fri, 8-9 pm, music, entertainment. Sun, 7-8 pm, church services. Eastern.
CKY, Winnipeg, Man., Can. 450 meters. 2,000 watts. Manitoba Tel. System. Daily ex Sun, 12:30-1:30 pm, music, lectures, etc.; 3 pm, grain markets, weather. Tues, Thurs, Fri, 8:15-8:25 pm, bedtime story; 8:25-10, music, lectures. Sun, 7 pm, church services; 8:15, sacred concert. Central.
CYB, Mexico City, Mex. 370 meters. 500 watts. El Buen Tono. Tues, Sat, 7:30-9 pm. Thurs, 8-10 pm, concert. Mexican time.
CYL, Mexico City, Mex. 500 meters. 510 watts. La Casa de Radio. Tues, Fri, 9-10:30 pm. Mexican.
CYX, Mexico City, Mexico. 500 watts. Excelsior-Parker.
HBI, Geneva, Switzerland. 1100 meters. 900 watts. Marconi's Wireless Telegraph Co., Ltd. Daily ex Sun, 3:15 pm, music, news. Swiss.
KDKA, E. Pittsburgh, Pa. 526 meters. 1,000 watts. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 9:45-10 am. 12-1 pm, market reports, music; 6-10 pm, news, features, markets, concert; 9:55-10, time. Sun, 10-45 am, church service; 3:30 pm, Bible story; 3 pm, concert; 4:45 pm, 7:30, church service. Eastern.
KDPM, Cleveland, O. 270 meters. 500 watts. Westinghouse Elec. & Mfg. Co.
KDPT, San Diego, Calif. 244 meters. 50 watts. Southern Elec. Co. Slogan, "At the End of the Trail." Daily ex Sun, 1:30-3:30 pm, 6:00-6:45. Wed, 8:00-10:00 pm, Sun, 10:00-11:30 am. Pacific.
KDYL, Salt Lake City, Utah. 360 meters. 100 watts. Newhouse Hotel. Slogan, "Better Radio." Daily ex Sun, 6:30-8 pm, news, music, entertainment. Mountain.
KDYM, San Diego, Calif. 280 meters. 100 watts. Savoy Theater. Mon, Wed, Fri, 8-10 pm, music, entertainment. Pacific.
KDYO, Portland, Ore. 360 meters. 100 watts. Oregon Institute of Technology. Slogan, "The Radio School." Educational programs.
KDYW, Phoenix, Ariz. 360 meters. 20 watts. Smith Hughes & Co. Temporarily discontinued.
KDYX, Honolulu, T. H., Hawaii. 360 meters. 100 watts. Honolulu Star-Bulletin Co., Ltd. Daily ex Sun, 12:15-1:15 pm, reports; 6:30-7:30 pm, entertainment, music, talks. Mon, Wed, Sat, 9:15-10:15 pm, dance music. Sun, 11 am-12:15 pm, church services. 120th Meridian.
KDZB, Bakersfield, Calif. 240 meters. 100 watts. Frank Siefert. Daily ex Sun, 8-9 pm, reports, music. Sun, sacred program, irregular. Pacific.
KDZE, Seattle, Wash. 370 meters. 100 watts. The Rhodes Co. Daily, 12:30-1:30 pm. Pacific.
KDZI, Wenatchee, Wash. 360 meters. 50 watts. Elec. Supply Co. Temporarily discontinued.
KDZQ, Denver, Colo. 360 meters. 10 watts. Nicholas Academy of Dancing. Daily ex Sun, 1 pm; 5:30. Mon, 6-7:30 pm. Tues, Thurs, Sat, 9 pm. Sun, 6 pm, 8, 11. Mountain.
KDZR, Bellingham, Wash. 261 meters. 50 watts. The Bellingham Pub Co. Slogan, "Tulip Town." Daily ex Thurs, 7-8 pm. Pacific.
KFAD, Phoenix, Ariz. 360 meters. 100 watts. McArthur Brothers Mercantile Co. Daily ex Sun, 7:30-8:30 pm, news, weather, stock reports, music. Mountain.
KFAE, Pullman, Wash. 360 meters, 500 watts. State College of Washington. Slogan, "Your Service Station." Mon, Wed, Fri, 7:30-9 pm, lectures, music, readings. Pacific.
KFAF, Denver, Colo. 360 meters. 500 watts. Western Radio Corp. Slogan, "Voice from the Rockies—Out Where the West Is." Mon, Tues, Fri, Sat, 8-9 pm; Thurs, 7:30-8, music, reports, news. Wed, silent. Mountain.
KFAJ, Boulder, Colo. 360 meters. 100 watts. Univ. of Colo. Tues, Thurs, Sat, 9 pm, time, music, addresses by faculty. Sat, 2:30-5 pm, football. Mountain.
KFAN, Moscow, Ida. 360 meters. 50 watts. The Electric Shop.
KFAR, Hollywood, Calif. 280 meters. 100 watts. Studio Lighting Service Co.
KFAU, Boise, Ida. 270 meters. 150 watts. Boise H. S. Daily ex Sat, Sun, 3:30-4:15 pm, markets, weather, news. Mon, Wed, Fri, 8-9 pm, concert. Mountain.
KFAW, Santa Ana, Calif. 280 meters. 10 watts. Radio Den. Daily ex Sun, 4:30-5 pm, news, reports, music. Mon, Thurs, 6:30-7:30 pm, concert. Pacific.
KFAY, Medford, Ore. 283 meters. 50 watts. W. J. Virgin. Temporarily discontinued.
KFBB, Havre, Mont. 360 meters. 50 watts. F. A. Buttrey Co. Discontinued temporarily.
KFBC, San Diego, Calif. 278 meters. 20 watts. W. K. Auhll. Thurs, Sun, 8-9 pm, Bible lesson, sermon. Pacific.
KFBE, San Luis Obispo, Calif. 360 meters. 10 watts. R. H. Horn. Temporarily discontinued.
KFBG, Tacoma, Wash. 360 meters. 50 watts. First Presbyterian Church. Sun, 11 am-12:15 pm, 7:30-9. Pacific.
KFBK, Sacramento, Calif. 283 meters. 100 watts. Kimball-Upson Co. Slogan, "Heart of California." Daily ex. Sun, 6-6:45 pm, concert, news, codes. Wed. 8-9:30 pm, concert. Pacific.
KFBL, Everett, Wash. 224 meters. 10 watts. Lease Bros. Daily ex Sun. 7:15-8:15 pm. Sun, 2-3 pm. Pacific.
KFBS, Trinidad, Colo. 360 meters. 10 watts. Chronicle News & Gas & Elec. Supply Co. Mon, 8-10 pm. Mountain.
KFBU, Laramie, Wyo. 283 meters. 50 watts. The Carlson Radio. Irregular schedule.
KFCB, Phoenix, Ariz. 238 meters. 10 watts. Nielson Radio Supply Co. Slogan, "When It's Wintertime in Michigan, It's Summertime Down Here." Daily, 7-7:30 pm, bedtime stories. Mountain.
KFCF, Walla Walla, Wash. 360 meters. 100 watts. Frank A. Moore. Mon, Fri, 8-9:30 pm. Pacific.
KFCH, Billings, Mont. 360 meters. 10 watts. Electric Service Station, Inc. Wed, Fri, Sun, 7:30-9 pm, music, Sun, 11 am-12:30 pm. Mountain.
KFCM, Richmond, Calif. 360 meters. 100 watts. Richmond Radio Shop. Slogan, "Out Where the West Ends." Daily ex Sun, 1-2 pm, music. Tues, Fri, 8-9 pm, music. Pacific.
KFCP, Ogden, Utah. 360 meters. 25 watts. Ralph W. Flygare.
KFCV, Houston, Tex. 360 meters. 10 watts. Fred Mahaffey, Jr. Daily ex Sun, 7:30-8 pm, markets, entertainment. Sun, 2-3 pm, entertainment. Central.
KFCY, Le Mars, Ia. 252 meters. 50 watts. Western Union College. Wed; 10-11 pm, music, educational. Central.
KFCZ, Omaha, Neb. 258 meters. 100 watts. Central H. S., Minn, Tues, Wed, Thurs, Fri, 3-4 pm. Mon, Tues, Thurs, 7-8 pm. Central.
KFDA, Baker, Ore. 360 meters. 5 watts. Adler's Music Store. Daily ex Sun, 5-6 pm, 7:30-8, music. Sun, 6-8 pm. Pacific.
KFDD, Boise, Idaho. 252 meters. 10 watts. St. Michael's Cathedral. Sun, 11:15-12:30 pm, 7:30-9:15, church services. Mountain.
KFDH, Tucson, Ariz. 360 meters. 150 watts. Univ. of Ariz. Irregular schedule.
KFDJ, Corvallis, Ore. 360 meters. 50 watts. Oregon Agri. College. Mon, 8-9 pm. Thurs, 8-9 pm. Pacific.
KFDL, Denver, Colo. 360 meters. 5 watts. Knight-Campbell Music Co.
KFDO, Bozeman, Mont. 248 meters. 50 watts. H. Everett Cutting. Mon, Wed, Sat, 8-9 pm. Mountain.
KFDR, York, Neb. 360 meters. 10 watts. Bullock's. Slogan, "The Little Station with the Big Kick." program. Central.
KFDV, Fayetteville, Ark. 360 meters. 200 watts. Gilbrech & Stinson. Slogan, "Southern Gateway to the Ozarks. "Land of a Million Smiles." No regular schedule.
KFDX, Shreveport, La. 360 meters. 100 watts. First Baptist Church. Sun, 11 am; 7:30 pm. Central.
KFDY, Brookings, S. D. 360 meters, 100 watts S. D. State College of Agri. & Mech. Arts. Tues, 11 am, music lectures, news. Wed, 8:15 pm. Music, lectures. Central.
KFDZ, Minneapolis, Minn. 231 meters. 5 watts. Harry O. Iverson. Sun, 6-7 pm, pipe organ. Central.
KFEG, Portland, Ore. 248 meters. 50 watts. Meier & Frank Co. Inc. Daily ex Sun, 12 m, weather, reports; 4-5 pm, music; 6:30 pm, weather, crop, markets, reports. Thurs, 9-10 pm, concert. Sat, 11 am 12 m, children's hour. Pacific.
KFEL, Denver, Colo. 360 meters. 50 watts. Winner Radio Corp. Temporarily discontinued.
KFEQ, Oak, Neb. 360 meters. 100 watts. J. L. Scroggin. Tues, 9-10 pm. Central.
KFER, Fort Dodge, Ia. 231 meters. 10 watts. Auto Electric Service Co.
KFEV, Casper, Wyo. 263 meters. 250 watts. Caspar Radio Club. Daily, 8:30 am, weather warnings, entertainment. Tues, evening program. Sun, 3 pm, news; 8 special program. Mountain.
KFEX, Minneapolis, Minn. 261 meters. 100 watts. Augsburg Seminary. Tues evening, music. Central.
KFEY, Kellogg, Ida. 360 meters. 10 watts. Bunker Hill & Sullivan Mining & Con. Co. Slogan, "Voice of the Coeur D'Alene." Mon, Wed, Sat, Sun, 7:30-8:30 pm. Pacific.
KFEZ, St. Louis, Mo. 360 meters. 100 watts. American Society of Mech. Engrs. Wed, 8:30-9:30 pm, Engineering program. Central.
KFFB, Boise, Ida. 240 meters. 10 watts. Jenkins Furn. Co. (Owyhee Hotel). Tues, Thurs, Sat, 8-10 pm, concert. Pacific.
KFFE, Pendleton, Ore. 360 meters. 10 watts. Eastern Ore. Radio Co. Daily 8:30-9:30 pm, music. Pacific.
KFFO, Hillsboro, Ore. 229 meters. 5 watts. Dr. E. H. Smith. Daily, 6-7 pm, music, sports, news. Fri. 9-10 pm, Chamber of Commerce Community Program. Pacific.
KFFQ, Colorado Springs, Colo. 360 meters. 100 watts. The Marksheffel Motor Co. and W. D. Pyle. Wed, 11-12 midnight. Mon, Fri, 8-9:30 pm, special program. Mountain.
KFFR, Sparks, Nev. 226 meters. 100 watts. Jim Kirk. Thurs, 7-8 pm, "Sagebrush Canaries." Pacific.
KFFV, Lamoni, Iowa, 360 meters. 100 watts. Graceland College. Tues, 7 pm, musicale. Thursday, 7 pm, educational program. Sun, 6:30 pm, religious services. Central.
KFFX, Omaha, Nebr. 278 meters. 100 watts. McGraw Co. Daily, 2:30-3:30 pm. Central.
KFFY, Alexandria, La. 275 meters. 100 watts. Pinkus & Murphey, Inc.
KFFZ, Dallas, Tex. 228 meters. 20 watts. Al. G. Barnes Amusement Co. (Portable Set).
KFGC, Baton Rouge, La. 254 meters. 100 watts. Louisiana State University. Fri, 8-9 pm. Central.
KFGD, Chickasha, Okla. 248 meters. 200 watts. Okla. College for Women, Chickasha Radio & Elec. Co. Tues, Thurs, Sat, 8 pm, music, lectures. Wed, 10 am, chapel service; 11 pm, special jazz program. Central.
KFGH, Stanford Univ., Calif. 360 meters. 500 watts. Leland Stanford Junior University. No regular schedule.
KFGL, Arlington, Ore. 234 meters. 5 watts. Arlington Garage. Fri, 7:30-8:30 pm. Pacific.
KFGQ, Boone, Ia. 226 meters. 10 watts. Crary Hardware Co.
KFGV, Utica, Nebr. 224 meters. 10 watts. Hildbroder Radio Supply Co. No regular schedule.
KFGX, Orange, Tex. 256 meters. 500 watts. First Presbyterian Church. Sun, 11 am, 7:30 pm, church services. Central.
KFGZ, Berrien Springs, Mich. 294 meters. 500 watts. Emanuel Missionary College. Mon, 7:30-9:30 pm, music. Wed, 8-9:30 pm, orchestra. Fri, 9-10 pm, sacred music. Sun, 9:30 am; 7:45-9:15 pm, talks, music. Central.
KFHA, Gunnison, Colo. 252 meters. 50 watts. Western State College of Colorado. "Where the Sun Shines Every Day." Daily ex Sun, 8:30 am, weather, markets. Tues, Fri, 7:30 pm, entertainment. Mountain.
KFHB, Hood River, Ore. 280 meters. 5 watts. A. S. Kohstad, Rialto Theater. "Where the Big Apples Grow." Mon, Wed, Fri, 6:30-7 pm, music. Special program 11 pm. Pacific.
KFHD, St. Joseph, Mo. 226 meters. 100 watts. Utz Electric Co. Daily ex Sun, 8:30-6 pm; Tues, Thurs, Sat, 8-9:30 pm, concert. Central.
KFHF, Shreveport, La. 266 meters. 150 watts. Central Christian Church. Sun, 10:55 am, 7:30 pm. Central.
KFHH, Neah Bay, Wash. 261 meters. 50 watts. Ambrose A. McCue. Tues, Thurs, 9-10 pm; Sat, 9-11 pm, dance. Pacific.
KFHJ, Santa Barbara, Calif. 360 meters. 100 watts. Fallon & Co. Wed, Thurs, Fri, Sat, 6-6:45 pm; Wed, Fri, 9-10 pm; Sun, 10 am, church services. Pacific.
KFHR, Seattle, Wash. 283 meters. 50 watts. Star Elec. & Radio Co. Slogan, "The Voice of the Charmed Land." Daily ex Sun, 4:30-5:30 pm. Mon, Wed, Fri, 6:30-7:30 pm. Tues, Thurs, Sat, 6:30-8:30 pm. Sun, 4:30-7:15 pm. Pacific.
KFHS, Lihue, Hawaii. 275 meters. 30 watts. Clifford J. Dow.
KFHX, Hutchinson, Kans. 229 meters. 150 watts. Robert Nelson.
KFI, Los Angeles, Calif. 460 meters. 500 watts. Earle C. Anthony, Inc. Slogan, "The Radio Central Station." Daily ex Sun, 5-6 pm, 6:45-7:30 pm, 8-11 pm. Wed, Fri, Sat, 8-12 pm. Sun, 10-10:45 am, 4-5 pm, 6:45-7:30, 8-11. Pacific.
KFID, Iola, Kans. 346 meters. 20 watts. Ross Arbuckles Garage. Slogan, "The Garden Spot of the State." Daily, 5:15-5:45 pm, Tues, 9-10 pm. Central.
KFIF, Portland, Ore. 360 meters. 200 watts. Benson Tech Student Body.
KFIL, Louisburg, Kans. 234 meters. 30 watts. Windisch Elec. Farm Equip. Co. Wed., Sat., 8-10:30 pm. Sun., 11-12 m, church services. Central.
KFIO, Spokane, Wash. 252 meters. 50 watts. North Central High School.
KFIQ, Yakima, Wash. 242 meters. 50 watts. Yakima Valley Broadcasting Assn. Slogan, "The Station That Will Make 224 Famous. Mon, Wed, Fri, 7:30-8:30 pm, concert. Sat, 7:30-8 pm, S. S. lesson. Sun, 4-5 pm, music. Pacific.
KFIU, Juneau, Alaska. 226 meters. 10 watts. Alaska Elec. Light & Power Co. Mon, Wed, Fri, 8-9 pm. Alaskan.
KFIX, Independence, Mo. 240 meters. 250 watts. Reorganized Church of Jesus Christ of Latter Day Saints. Tues, Thurs, 9 pm. Sun, 11 am, 7:30 pm. Central.
KFJB, Fond du Lac, Wis. 273 meters. 100 watts. Daily Commonwealth and Oscar A. Hoelsman. Daily ex. Sun, 5 pm, music news, markets, weather. Central.
KFJB, Marshalltown, Iowa. 248 meters. 10 watts. Marshall Elec. Co. Slogan, "Marshalltown, the Heart of Iowa." Tues, Fri, 8:30 pm. Central.
KFJC, Seattle, Wash. 270 meters. 100 watts. Seattle Post Intelligencer. Slogan, "Broadcasting from the Charmed Land." Daily ex Sun, 3:30-4:30 pm, music; 6:30-10, programs, dance music. Tues, Thurs, 7-7:30 pm, code. Sat, 8:30-12 m, dance. Pacific.
KFJF, Oklahoma City, Okla. 252 meters. 20 watts. National Radio Mfg. Co. Slogan, "Radio Headquarters." Daily ex Sun, 3 pm, concert; 7:30, police announcements. Tues, Fri, 8:30 pm, concert. Central.
KFJI, Astoria, Ore. 252 meters. 10 watts. E. E. Marsh and Liberty Theater. Daily ex Sun, 6:30-7:30 pm. Sun, 9:30-10:30 pm. Pacific.
KFJK, Bristow, Okla. 233 meters. 100 watts. Delano Radio & Elec. Co. Daily ex Sun, 3-4 pm, music. Thurs. 8-8:30 pm, music. Sun, 7:30 pm, church services. Central.
KFJL, Ottumwa, Ia. 242 meters. 10 watts. Hardsocg Mfg. Co. Club, "Boiled Bugs." Mon, Wed, Fri, 7:30-8:30 pm. Central.
KFJM, Grand Forks, N. D. 236 meters. 100 watts. University of North Dakota.
KFJQ, Grand Forks, N. D. 280 meters. 5 watts. Valley Radio Div. of Elec. Constr. Co.
KFJR, Stevensville, Mont. 258 meters. 6 watts. Ashley. C. Dixon & Son. Slogan, "The Bitter Root Valley Broadcasting Station." Irregular schedule.
KFJV, Dexter, Ia. 224 meters. 10 watts. Thomas H. Warren. Daily ex Sun 9:15 am, 10:25, 1:45 pm, weather, markets. Tues, Fri, 8:30 entertainment. Central.
KFJW, Towanda, Kans. 226 meters. 10 watts. Le Grand Radio Co. Mon, Thurs, 6:45-10:45 pm. Wed, 7-8 pm. Sat, 7-8:30 pm. Sun, 7:30-9 pm, church services. Central.
KFJX, Cedar Falls, Iowa. 228 meters. 50 watts. Iowa State Teachers College. Educational programs.
KFJY, Fort Dodge, Iowa. 246 meters. 50 watts. Tunwall Radio Co. Daily ex Sun, 9-10 am, 12 m, 5:45 pm, markets, news, weather; 8:45, weather, concert.
KFJZ, Fort Worth, Texas. 254 meters. 20 watts. Texas National Guard, 112th Cavalry, Wed, 8:30-9:30 pm, Sat, 8:30-10 pm, program. Central.
KFKA, Greeley, Colo. 273 meters. 50 watts. Colorado State Teachers College. Daily ex Sun, 3:30-9 am. Sun, 8:30-10:30 pm, concert. Mountain.
KFKB, Milford, Kans. 286 meters. 500 watts. Brinkley-Jones Hospital Assn. Slogan, "The Home of Gland Transplantation." Mon, Wed, Fri, 7-8 pm, 8-10, 11-12, 12:15-2:30. Sat, 11-2:30 am, Early Bird Concert. Central.
KFKQ, Conway, Ark. 224 meters. 150 watts. Conway Radio Lab. Daily ex Sun, 12 m, weather, market reports. Tues, Fri, 8 pm, music. Sunday evening, church services. Central.
KFKV, Butte, Mont. 283 meters. 50 watts. F. F. Gray. Tues, Thurs, 8-10 pm. Mountain.
KFKX, Hastings, Neb. 341 meters. 1000 watts. Westinghouse Elec. & Mfg. Co. Mon, Thurs, 9:30-11 pm. Rebroadcast KDKA's programs on other nights.
KFKZ, Colorado Springs, Colo. 234 meters. 32 watts. Nassour Bros. Radio Co. Daily ex Sun, 12-1 pm, 5-6, matinee musicale. Mountain.
KFLA, Butte, Mont. 283 meters. 5 watts. Abner R. Willson.
KFLB, Menominee, Mich. 248 meters. 5 watts. Signal Elec. Mfg. Co.
KFLD, Franklinton, La. 234 meters. 20 watts. Paul E. Greenlaw.
KFLE, Denver, Colo. 268 meters. 100 watts. National Educational Service. Daily, 7-7:30 pm. Broadcasts for schools on request. Mountain.
KFLH, Salt Lake City, Utah. 261 meters. 50 watts. Erickson Radio Co., Inc.
KFLP, Cedar Rapids, Iowa. 240 meters. 20 watts. Everett M. Foster.
KFLQ, Little Rock, Ark. 264 meters. 20 watts. Bizzell Radio Shop. Mon, 8-9 pm, music. Tues, Thurs, 8-9:30 pm, revival services. Sun, 11:00-12:00 m., 8-9:30 pm., church services. Central.
KFLR, Albuquerque, N. M. 254 meters. 100 watts. University of New Mexico. Slogan, "The Sunshine Center of America." Fri, 8 pm, educational program. Mountain.
KFLU, San Benito, Texas. 238 meters. 60 watts. Rio Grande Radio Supply House. Slogan, "Heart of the Magic Valley." Thurs, 7-8 pm, talk. Sun, 7-8 pm, service. Central.
KFLV, Rockford, Ill. 229 meters. 100 watts. Rev. A. J. Frykman. Sun, 12:30 pm, Service for Shut-ins (Swedish); 8:45, Service (English). Central.
KFLX, Galveston, Tex. 240 meters. 10 watts. George R. Clough.
KFLY, Fargo, N. D. 231 meters. 20 watts. Fargo Radio Supply Co. Irregular schedule.
KFLZ, Atlantic, Ia. 273 meters. 100 watts. Atlantic Automobile Co. Slogan, "The Garden Spot of Iowa." Wed, 6-7:15 pm, dinner program, 9-11, music. Sat, 11-12:30, midnight, dance music.
KFMB, Little Rock, Ark. 254 meters. Christian Churches of Little Rock.
KFMQ, Fayetteville, Ark. 263 meters. 100 watts. U. of Arkansas.
KFMR, Sioux City, Ia. 261 meters. 10 watts. Morningside College.
KFMS, Duluth, Minn. 275 meters. 100 watts. Freimuth Dept. Store. Daily ex Sun, 11 am-12, weather, concert. Mon, Fri, Sat, 8-9 pm, concerts. Central.
KFMT, Minneapolis, Minn. 231 meters. 5 watts. Dr. George W. Young. Thurs, 8:15-9:30 pm, Sun, 12:15-1:45 pm, 2-3:30. Central.
KFMU, San Marcos, Tex. 240 meters. 20 watts. Stevens Bros.
KFMW, Houghton, Mich. 266 meters. 50 watts. M. G. Saterlen. Daily ex Sun, 12 m, news, music, markets. Evening program. Central.
KFMX, Northfield, Minn. 283 meters. 500 watts. Carleton College. Wed, 7:30 pm. Central.
KFMZ, Roswell, N. M. 250 meters. 500 watts. Roswell Broadcasting Club.
KFNC, Corsicana, Texas. 231 meters. 20 watts. Alonzo Monk, Jr.
KFNF, Shenandoah, Ia. 266 meters. 500 watts. Henry Field Seed Co. Slogan, "A Friendly Station in a Friendly Town." Daily ex Sun, 12:30-12:35 pm, Wed, Sat, 7:30-9 pm, concert. Sun, 6:30-7:30 pm, sacred song service. Central.

(NOTE—The second part of the station data list will appear next week.)

CHALLENGE!

ONE DOLLAR will be paid to the Radiophan submitting the most errors in any one station's listing. Letters must reach Radio Digest office not later than one week from date of issue corrected. Readers are not limited to correcting one station. Turn in corrections for as many stations as you can find—if you can find errors! In case of tie, duplicate awards will be made. Use separate sheets of paper for each station submitted and place name and address on each sheet.

That's just how sure Radio Digest is that this Radiophone station directory is correct! To make the challenge fair for everyone, broadcasting stations and their employes are barred from this offer. Why? Because the broadcasters are the source of all the data given herein. They are (or should be) interested enough to answer the inquiry sent them every time data on their station appears. This inquiry contains a proof of their last listing and must either be corrected or oked as correct and returned to the Digest. Nevertheless, sometimes the stations are careless and mistakes are made. But Radio Digest is so sure of the exactness of this directory that this challenge is made unconditionally.

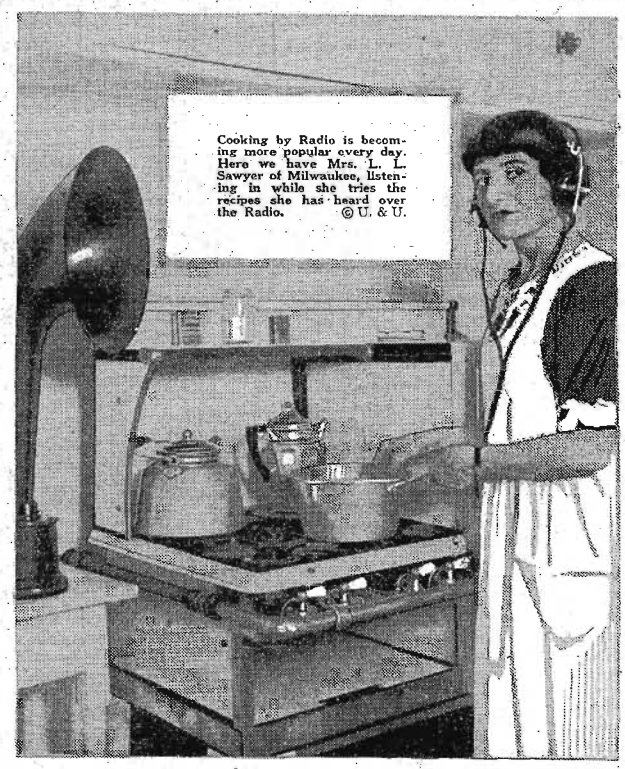
With reference to the directory: It appears in four parts, serially continuously; the first three parts are station data listings, arranged alphabetically; the fourth part is a state, city index of stations. The information contained in each station data listing is given in the following order: Call letters, city, state, wave length used, watts antenna input, owner's name, slogan used if any, name of listener in "club," schedule of operating hours, and kind of time used, as "Central," "Mountain," etc.

Four successive issues of Radio Digest will give one the most complete and accurate list of broadcasting stations obtainable. This service is original with this publication, and has been maintained from the start. Right of reproduction without permission of any or all of the data contained herein is denied.

Radio Illustrated

This $5,000 wolf hound, "Zorky," seems to be enjoying the Radio as much as his little pal, Martha Trudeau. Miss Trudeau is the lucky owner of the finest collection of wolf hounds in Chicago. Below, a portable receiving set put to practical use by a German physician. During the winter sports, when he receives an urgent call, he hurries to its source and administers first aid. The bottle looks like BV (before Volstead) medicine. Quick, Doc, gimme a drink, I feel faint!

Above © U. & U. Below © Int.



Cooking by Radio is becoming more popular every day. Here we have Mrs. L. L. Sawyer of Milwaukee, listening in while she tries the recipes she has heard over the Radio. © U. & U.