

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

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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. Armstrong, 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 tricks 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 new plan 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.	
7:30-8:00—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 Chiclé 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 has 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 incalculable."

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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. Edelman in his easily understandable style. How do you like "Thirty-Minute A-B-C Lessons for Radio Beginners"?

Plain enough? "Straightening Out the Radiation 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 radiation 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.

Newsstands Don't Always Have One Left

WHEN YOU WANT

# Radio Digest

YOU WANT IT!

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Publisher Radio Digest,  
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Please Enclose check W. O. for Five Dollars (Five Dollars) for One Year's Subscription to Radio Digest, Illustrated.

Name.....

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## 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.

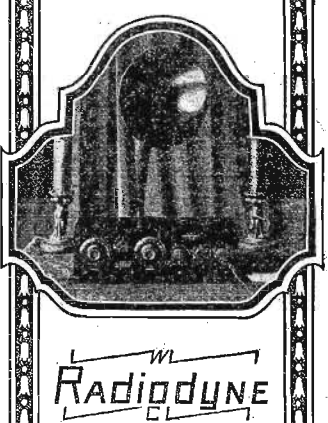
One case is reported of a man who two years ago, was totally deaf in his left ear. Now, after constant treatments by Radio, he declares he can hear a whisper across the room.

#### 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.



**Radiodyne**

"The Voice of the Nation"

NO LOOPS - - NO AERIAL

THE air is your theatre, college, church and newspaper if you own a Radiodyne. New York, Cuba, San Francisco and Honolulu can be picked up clear and distinct without interference from nearby stations.

The RADIODYNE is ready for operation by simply grounding to a water pipe or radiator, and throwing a few feet of wire on the floor. Uses any standard tubes—dry cell or storage battery. Extremely selective. Simple to operate. Only two controls—you can tune in on any program you select—any wavelength from 200 to 700 meters.

For use in apartments, boats, automobiles, railroad trains, etc., the RADIODYNE is enjoyable where other receiving sets would not be practical.

Price \$150.00

Write for illustrated folder which describes the RADIODYNE in detail. Every radio fan will be interested in this new type (antennalless) receiving set.

WESTERN COIL & ELECTRICAL CO.  
312 5th St., Racine, Wis.

# 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 traveling 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 a 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 prevent 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



Mrs. M. Fasamados, 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, Mrs. Fasamados, who is a talented singer, charmed the thousands of unseen listeners with a program of Greek folk songs.

## 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 Pittsburg 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, WSE, KYW, WJAF, WOS and WJWJ. His route includes WBAO, Columbus, April 4; WSAL, Cincinnati, April 5, and 6.

## WBXX 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 WBXX, 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.

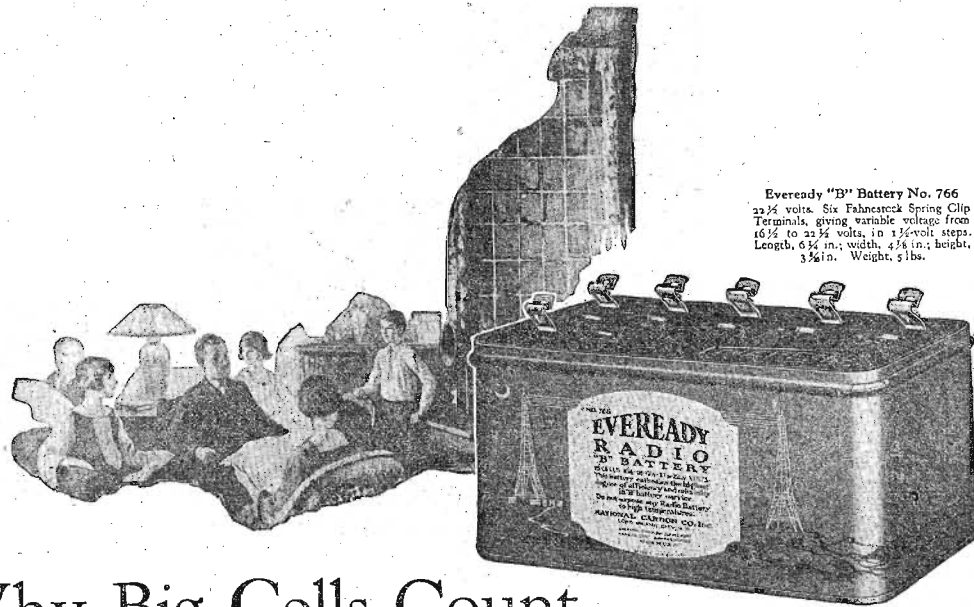
## THE ANTENNA BROTHERS

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, 6½ in.; width, 4¾ in.; height,  
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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.

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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.



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Vertical  
22½-volt  
"B" Battery

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

No. 771  
"C" Battery  
Clarifies tone and  
increases "B"  
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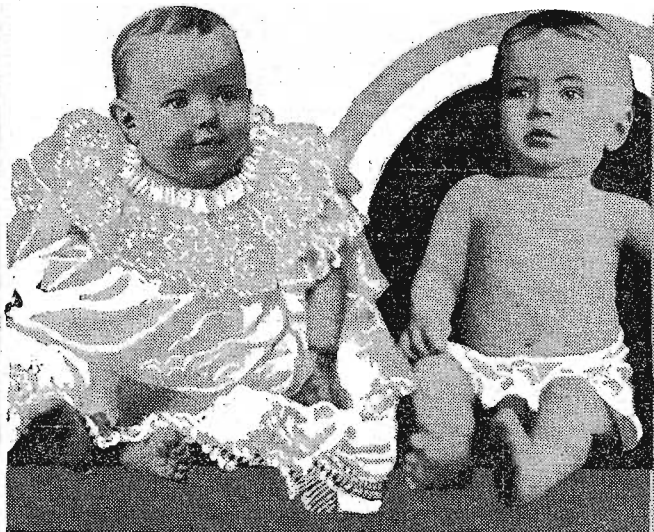
Eveready  
Radio "A"  
Dry Cell  
Specially  
manufactured  
for use with  
dry cell  
tubes

# 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.

### 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 howling (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 meetings 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.

### Arthur R. Herske, WTAM

THE SUBJECT of this biographical sketch has black hair, but it 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-Tec-Ay-Enn, 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.

## 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.

## 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 58½ 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 55 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 19-25, was a 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 F. 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.

## 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 23, 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.

## 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 areas 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 335 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 226 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 226 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. Radioplans 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 Masser 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 WBAO, Ohio State university. The lectures deal with the live problems of the growers and are de-

livered 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.

# Cleaning Up the Radio Pirates!

ON MARCH 12th, 1924, the Hon. William Bondy, U. S. District Court Judge for the Southern District of New York, issued a permanent injunction enjoining and restraining the Micadyne Radio Company from making and selling counterfeits of Dubilier Micadon fixed condensers and from using the name "Micadyne" to deceive the public.

By Judge Bondy's sweeping order, not only was the Micadyne Radio Company perpetually restrained from counterfeiting the well known Dubilier Micadon fixed condenser and using the deceptive name "Micadyne," but all the Micadyne Radio Company's finished and unfinished counterfeit condensers, all its dies, tools, drawings, and patterns for the production of counterfeits of genuine Dubilier Micadons, all its books containing the names of jobbers and dealers to whom counterfeits have been sold or delivered, were turned over to the Dubilier Condenser and Radio Corporation.

### Warning to the Public

The books of the Micadyne Radio Company, which, by Court order, have been turned over to the Dubilier Condenser and Radio Corporation, disclosed the names of jobbers and dealers who have bought the deceptive Micadynes and presumably sold them as genuine Dubilier Micadons. Among these are some of the largest radio retail stores.

Although the Court order effectually protects the public in the future, it is probable that some Micadyne Condensers on the shelves of dealers will still be palmed off as genuine Dubilier Micadons for a few weeks.

Be sure that the fixed condenser that you buy is a genuine Dubilier Micadon. The name "Dubilier Micadon" appears on the edge of each genuine Micadon Condenser. On the face of one metal clasp appear the type number and the capacity, and on the other clasp, the usual patent notice. The accompanying illustrations will make this clear.

Examine the circuits of the set that you buy and be sure that genuine Dubilier Micadons have been used where fixed condensers are required.

### Further Legal Action to Come

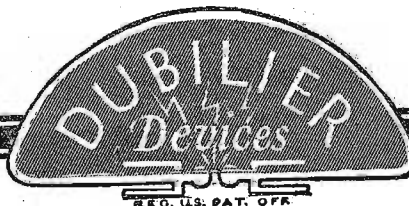
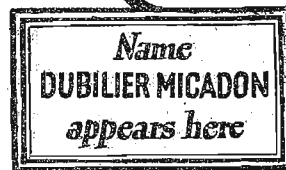
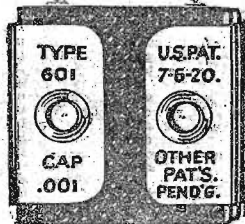
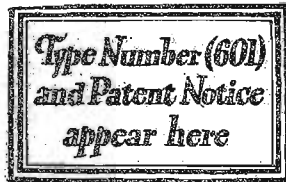
The Dubilier Condenser and Radio Corporation has been one of the principal sufferers from patent infringers and trade-mark pirates. It will not relax its efforts to stop the manufacture and sale of radio products that counterfeit genuine Dubilier Devices.

Criminal prosecution is now pending against one offender, who is charged with selling imitations as genuine Micadons; he has been held in bail in the Criminal Courts of New York State. Unfair competition and patent suits will be brought against others.

### For the Benefit of Radio

The purposes of the steps taken and to be taken by the Dubilier Condenser and Radio Corporation, is not only to protect its own rights and good will and the public, but also, pursuant to its general program, to purge the radio industry and the radio trade of pirates who willfully infringe patents and trade marks, deceive the public into buying inferior and often inoperative parts, and fatten on the pioneer work done by able inventors and engineers for the advancement of Radio.

Dubilier Condenser and Radio Corporation  
40-50 WEST FOURTH STREET NEW YORK



# 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 550,000 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 com-

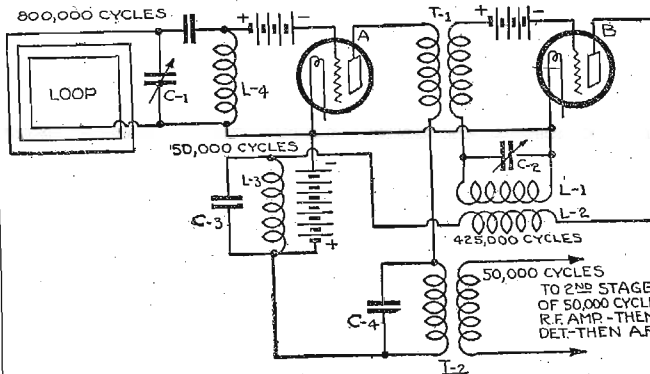


Diagram Showing New Reflex Scheme Employing "Second Harmonic"

bined 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.

### 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

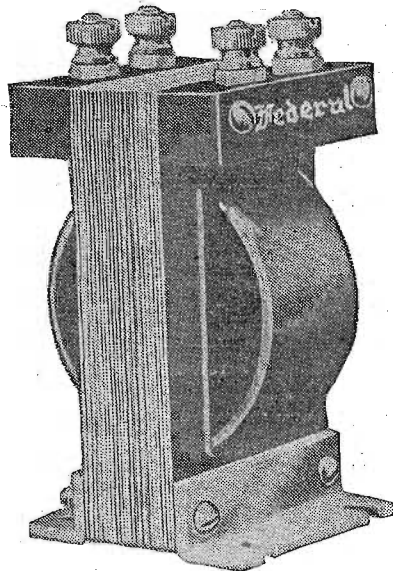
After their return from the war, Armstrong and Houck experimented for some time with discouraging results. Finally they designed a set for broadcast use. It worked—it worked splendidly but at that time the amplifier tubes on the market drew one ampere each. This fact gave the set its slogan, "The Rolls 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.



The now famous No. 65 Audio Frequency Transformer is but one of over 130 radio parts designed, manufactured and guaranteed by Federal.

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The set you build will please you more if you use—



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FEDERAL parts are made with but one purpose in mind—to deliver the utmost in radio service. Years of research and hundreds of experiments are often necessary before some of them have reached that standard of perfection demanded of all of Federal's more than 130 parts.

Remember, too, that a set built with a few good parts and some not so good, will only be as dependable as the inferior parts. For unqualified pleasure and satisfaction you must use good parts all through.

Federal will meet these requirements precisely. They are designed and built to work together—all as parts of a single unit—"that set that will please you more."

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# 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.



FADA "ONE SIXTY" NEUTRODYNE RADIO RECEIVER

## Selectivity

The FADA "One Sixty" radio receiver is known to thousands as the greatest triumph in radio engineering down to this very moment. It meets all requirements for simplicity of control, selectivity, volume, clarity and ability to bring in distant stations.

Its selectivity appeals to everyone—and to the women folks in particular. You can tune out local stations, even when several are broadcasting, and bring in distant programs. Or, you can tune in any local station you wish and not be bothered with interference from the others.

After any station is picked up with maximum intensity, notations can be made of the dial settings, and if one desires to listen to the same station again it is only necessary to reset the dials in the same positions as recorded.

The FADA "One Sixty" is a four-tube Neutrodyne radio receiver. Our engineers have found by exhaustive experiments that the FADA "One Sixty" with four tubes will produce results at least equal to those of any five-tube set. This means economy in tube and battery costs.

In appearance the FADA "One Sixty" is an attractive piece of furniture. Installed in the home, its chaste, handsome cabinet harmonizes with any interior. It is a quality product throughout. Made with all the care and skilled workmanship that have made FADA products noted, the "One Sixty" is a radio receiver that anyone may be proud to own.

Price, exclusive of tubes, batteries and phones, \$120—at all dealers.

F. A. D. ANDREA, INC., 1581 Jerome Avenue, New York City



## BLUE PRINTS

MAKE YOUR OWN SET

Special Offer  
3 Books \$2.00 for 2.00

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Five Tube Receiver  
Full Assembly Details  
Blueprints  
Tuning Instructions
  - REINARTZ**  
Three Tube Receiver  
Detector and Two Stage Audio  
Frequency Amplifier  
Assembly Details  
Tuning Instructions  
Blueprints
  - MILOFLEX**  
Three Tube Receiver  
Detector and Two Stage Audio  
Frequency Amplifier  
Assembly Details  
Tuning Instructions  
Blueprints
  - RELEX DE LUXE**  
Three Tube Receiver  
Full Details for Assembly  
Blueprints  
Tuning Instructions  
How to Make a Loop Aerial De Luxe
  - ELEWELLING**  
Three Tube Receiver  
Detector and Two Stage Audio  
Frequency Amplifier  
Assembly Details  
Tuning Instructions  
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Please send me the Special Offer of 5 Books. I am enclosing M. O. for \$2.00.

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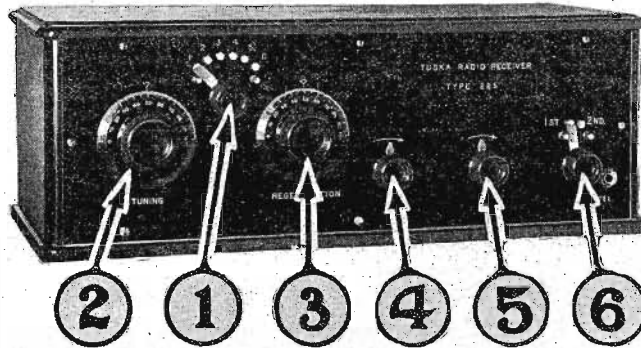
# OPERATING AND TROUBLE SHOOTING

For the Owner of a



Type 225 Receiver

**O**PERATING 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.



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 advan-

tage 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)

**T**HE 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

**RADIO TALKS**

A good point to remember is that your antenna and the ground constitute two plates of a condenser that you use in tuning your set. Why try to do all your receiving with condensers? This is about what you are attempting to do when you use 43 plate condensers for broadcast reception. Use 11 plates or less and get all that you can out of the antenna to ground condenser.

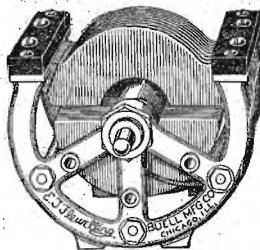
*E. J. Flewelling*

Genuine -  
**E. J. Flewelling**  
Radio Apparatus  
De Luxe

The new Flewelling Condenser is now being supplied. Its capacity test is interesting - Maximum - .0005119 mfd. Minimum - .0000099 mfd. This shows a range of 51.7 to 1 which means that with a certain fixed inductance this condenser will permit you to tune over a large wave band. It is a genuinely good condenser and you will be proud of the performance of a set built with these condensers as a basis.

**BUELL MANUFACTURING COMPANY**  
2977 Cottage Grove Ave.  
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Sockets  
Tuners



No  
**Outdoor Wires**

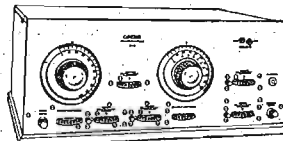
The 20-foot silk-covered wire is the only antenna required with

The New **GREBE** Broadcast Receiver



THIS wire may be concealed behind the picture moulding. There is no unsightly wiring of any kind, as compartments are provided for all necessary batteries.

Write for "Grebe Radio in the Well-Appointed Home."



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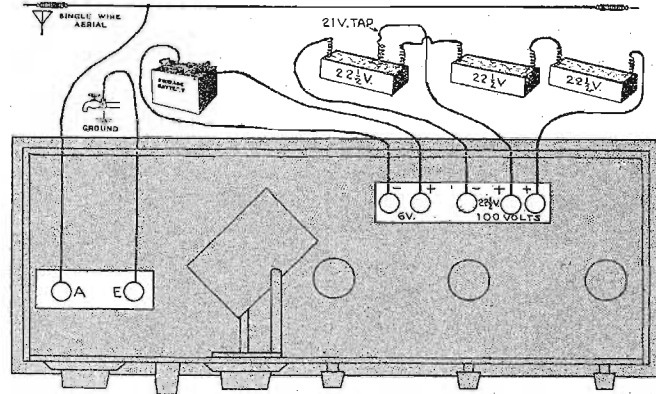
**A. H. GREBE & CO., Inc.**  
Richmond Hill, N. Y.

Western Branch—451 East 3rd St. Los Angeles, Cal.

**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 con-

nect 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.



ected 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 elec-

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 22 1/2 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 re-

ceiver. 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 22 1/2 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 50 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)

**SUPER VALUES**

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Uses Six Stages of Tuned Radio Frequency with but Two Controls

Write for complete details and price list of parts to build this new receiver

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**Four-Circuit Receiver**  
3000 MILES

Parts as specified by Mr. Cockaday

- 1-Cockaday Coil
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- 2-Amplex Grid-Densers
- 1-Pacnet Single Jack, 1/4 to 10 meg.
- 5-Melco Sockets
- 1-Amsco 6 ohm Rheostat
- 3-Amsco 2 ohm Rheostats
- 1-Pacnet Double Jacks
- 2-Amertran Transformers
- 1-Corno Push-Pull Transformer—Input
- 1-Corno Push-Pull Transformer—Output
- 2-Switch Levers
- 11-Switch Points
- 2-Switch Stops
- 1-Dubilier Condenser—.0005
- 1-Dubilier Condenser—.0025 with Mount
- 1-Durham Variable Grid Leak
- 3-Lavite Resistances—48,000 ohms
- 1-Amsco 400 ohm Potentiometer
- 1-7x24 Panel
- 1-3"x2 1/2" Sub Panel
- 1-12"x12" Panel

**Our Price \$59.00**

**Erla Two Tube Reflex**

All Parts for This Circuit

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Parts are Genuine and same as specified by Erla

**Power Amplifier**  
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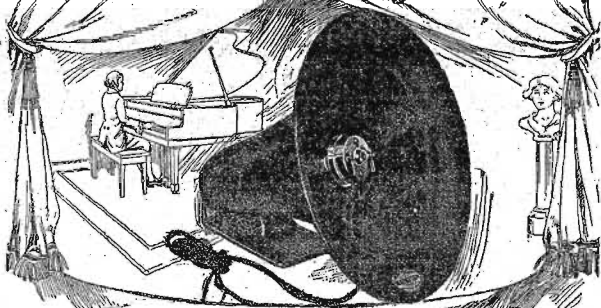
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OUR new reproducer is now under consideration by thousands of radio enthusiasts throughout the country. Singularly, many of the most expert are making quick decisions and below we quote from an opinion, entirely unsolicited, given us by Mr. C. E. Mattson, Baltimore.

"I gave the sample a test at one of the radio stores. About 15 customers crowded round and all agreed it was equal to the \$35.00 and won by several lengths against the \$30.00. My own opinion is that the M-G is going to be the greatest hit in radio this and next season."

Within five days (date of going to press) from receiving above, we have had orders for immediate shipment, aggregating exactly 146 complete reproducers and a large quantity of extra units for other makes of horns and phonographs from Mr. Mattson and his customers.

**PRICES. An Explanation**

We have been reluctantly obliged to slightly increase our price, and to prospective purchasers a full explanation will be mailed on receipt of a postal card.

- Complete with (gold plated) unit and cord, ready for attaching ..... **\$12.00**
- West of the Rockies..... 12.65
- Unit only (gold plated) with cord ready for attaching..... 5.00
- Unit only (nickel plated) with cord ready for attaching..... 4.00

**THE MOZART-GRAND CO.**

Manufacturers of Fine Instruments

NEWARK, N. J.

U. S. A.

# 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. Radiophones 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 excitation." 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 sta-

tion 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 Reduces 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) superheterodyne; (b) tuned Radio frequency amplification with regeneration; (c) untuned Radio frequency 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 properly 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

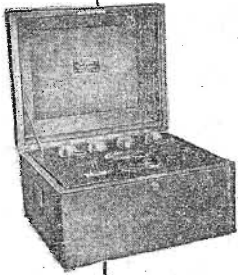
phenomenon, but it is either a periodic discharge, or a continuous series of waves of different frequencies. By "shock excitation," static forces an antenna or a tuned Radio frequency circuit to oscillate at its own frequency, producing thereby a second signal of the same wave length as the signal the 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)

## BRISTOL SINGLE CONTROL RADIO RECEIVER



### Most Simple to Operate

The set for those who want results with little effort. Anyone in the family can quickly learn to operate it because technicalities and guesswork are eliminated—One Control Dial does it all.

### Does Not Interfere With Your Neighbor

Other close by reception is not disturbed when you tune in with this non-radiating Receiving Set. It gives you a comfortable sensation of freedom to be able to change from one station to another knowing that you will not interfere with your neighbor's receiving.

### Choice of Aerial or Loop

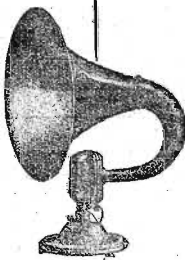
Where conditions make it difficult to install an outside aerial, as in congested sections of cities, good results can usually be had by using inside Loop. In fact, the directional feature of the Loop often brings in stations not possible with a stationary aerial.

Mounted in solid mahogany case with walnut finish, the Bristol Single Control Radio Receiver is handsome in appearance. The price is \$19.00. Bulletin AY-3013 describing this set will be mailed on request.

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# How I Average \$12 a Day in RADIO WORK

By Howard Houston

"YES, Mr. Crosby, I'll have the set installed tonight . . . yes, all ready to 'listen-in' . . . sure you'll be able to get Washington by 9 o'clock."

Another hour and a half job! And another ten dollar bill in my pocket! It all seems like a dream. But let me tell you the whole story from the very start.

A few months ago, I was driving a bread wagon, selling bread to retail stores. I had a good route though, and if I do say so myself, I had built up a pretty good business. But try as I could, thirty-five dollars a week was all I could make that job pay.

I'd be working there now if it hadn't been for Mary. We'd been "keeping company" for about two years, and everything was all set for our getting married as soon as I would be earning more money. But the old job didn't hold out much promise—and I didn't see how I was qualified for any other work that would pay more.

It was Mary who gave me the tip. "You can't earn big money," she said, "unless you're some kind of a specialist. Learn some line of work—become an expert in it." But what business, profession or trade was there that wasn't overcrowded? Where could an ambitious fellow stand a good chance to earn big money and get ahead. Stenographers, accountants, clerks—all down the line—every well established line of work was overcrowded, and the pay was small.

Then Mary said, "Why not find a new field?" That was a good thought. The men who went into the railroad business early "cleaned up." The same was true of the movie game, the automobile business—but what was the coming field? What new development was there that looked like a new promising industry?

We both jumped to our feet. "RADIO."

Why hadn't we thought of it before? All around us was the evidence of the tremendous development of Radio. The broadcasting stations sprouting up all around—the rapid increase in Radio Stores—new radio manufacturing plants—everybody talking about the latest radio program. Radio had captured America almost overnight—and thousands of men who were on their toes were due to make fortunes out of it.

### Thousands of Men Needed

The very next day after I had finished my route, I went to several radio business firms. "Sure, there was an opening. Oh, they'd pay big money—but did you know Radio?"

That was my cue. "Learn Radio. Become a Radio Expert and I did!"

Well, that really is my whole story. I've only started. I've followed the path of least resistance. Sort of built up a business of my own installing, building, and repairing radio sets. Any small job pays me at least \$5—and usually \$10. I can easily make from \$50 to \$100 a week—and more as I get my work systematized.

What Mary and I have got to decide after our honeymoon—oh, yes, we are soon having a very quiet wedding—what we must decide



after that—is which end of Radio will be best. You see, there are dozens of different kinds of work in this field, it's so big. I've already had several offers—one to take charge of a radio department, another with a broadcasting station, another to give radio entertainment, and a good offer as superintendent of construction in a radio plant. What we want to decide on is which will not only pay the most money now but will lead to the most rapid advancement in the future.

### Easy to Learn Radio at Home in Spare Time

Just a word about this Radio business. Some fellows think you've got to have some training before you start to learn Radio. That's not true. I didn't know the difference between an amplifier and a doorknob before I started. But let me give you a tip. Don't experiment with your radio course. Get the best. The National Radio Institute has been teaching Radio ever since 1914. The government recognizes its course by allowing credits to its graduates when they are trying for a license. So you see you can be confident you're getting the best training possible—and that means a lot.

### Send for Free Book "RICH REWARDS IN RADIO"

Incidentally, the National Radio Institute publishes a mighty interesting book on Radio. They send it out without cost to anyone who wants to learn about Radio. It is filled with facts, photos, and figures on the Radio industry, and tells all about its course which quickly prepares you right at home in spare time for one of the big pay positions in Radio.

Take my advice—and Mary's—and send for that, no matter how little you know of Radio, or what your plans are. Just mail the coupon for it now. Address the National Radio Institute Dept., Washington, D. C.

NATIONAL RADIO INSTITUTES,  
Dept. 523A, Washington, D. C.

Please send me without cost or obligation your free book, "Rich Rewards in Radio," which tells all about the opportunities in Radio, and how spare time study at home will qualify me for a big paying radio position. Also full details on your Free Employment service.

Name..... Age.....  
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### 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 "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 re-radiation 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 uncalculated 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 re-radiation 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, protects the strongest interference from re-radiation, 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 conditions must necessarily be close. If under these conditions the set is accidentally thrown into an oscillating state, it will re-radiate 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 returned 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 re-radiate 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 pro-

duce 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 manip-

ulation 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.

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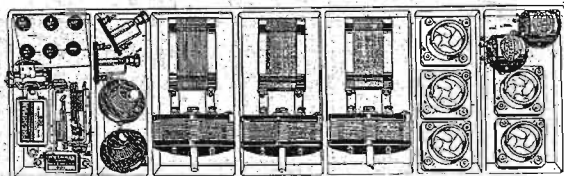
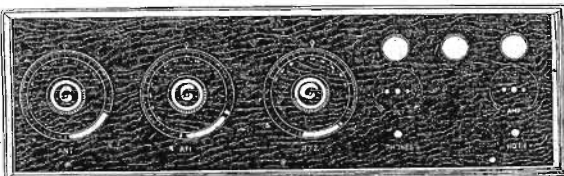
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- 1 Gold Plated Jack, Single Circuit
- 1 Gold Plated Jack, Double Filament Control
- 3 Genuine Hazeltine Licensed Neutrodyne mounted on
- 3 Genuine Comsco Condensers
- 2 Genuine Hazeltine Licensed Neutrodons
- 5 Standard Bakelite Sockets
- 1 6 Ohm Amplifier Rheostat
- 1 30 Ohm Detector Rheostat
- 2 Genuine Hegehog or Shielded Killark Audio Transformers
- 1 .00025 Freshman Fixo with
- 1 Tubular Grid Leak
- 1 .002 Freshman Micon
- 1 .006 Freshman Micon
- 20 Feet Bus Bar
- 1 Full Size Base Board
- 1 Complete Set Engraved Binding Posts

**\$34.50**

1 FULL SIZE BLUEPRINT SHOWING BOTH PANEL AND BASE MOUNTINGS

### Additional Accessories

These accessories, added to the above list of parts, are absolutely all the parts necessary for a complete set in operating condition.

- 5 Tested Type 201A Tubes.....\$19.50
- 2 45 Volt Extra Large Variable "BY" Batteries..... 6.50
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Send in your order NOW for  
1 5 Tube Kit.....\$34.50  
1 Set Accessories..... 43.40

Total.....\$77.90

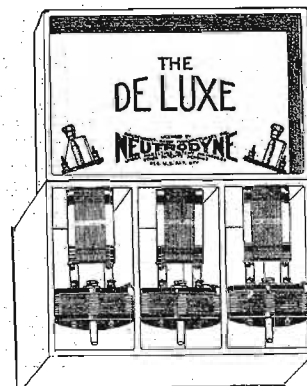
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# 30 Minute A-B-C Lessons for Radio Beginners

## Chapter III—How Radio Is Broadcast

By P. E. Edelman

**I**n 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.

**T**HE 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 or 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 elec-

**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

time is carried on within a range of wave lengths amounting substantially to 300 to 350 meters, with a few lower. Some rebroadcasts are conducted on about 100 meters. Seldom do the broadcasting sta-

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

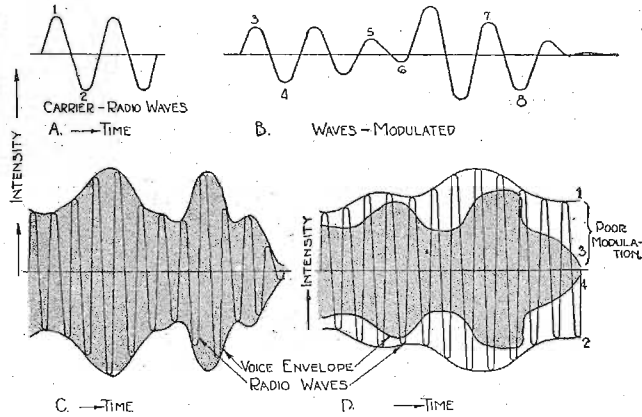


Figure 14.

tions adhere strictly to the assigned or supposed wave lengths and in some cases a station stated to operate at 330 meters will vary some ten meters either way. Some stations give much attention to careful maintenance of radiated frequency.

### 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.

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	1,495,100 cycles

(Continued on page 24)

### CROSS SECTION OF COPPER WIRE

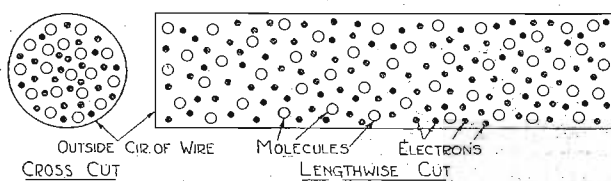


Figure 13.

trons in even a thick piece of copper wire can be moved almost instantly at tremendous speed when such a driving force is applied.

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.

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 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

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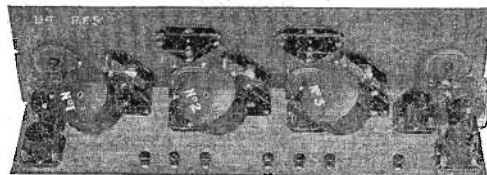
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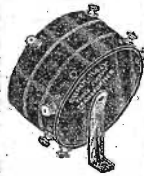
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3 Circuit Transformer

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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.

IF it's the outdoor antenna that's been holding you off, you want D-7-A or D-10 Portable, the De Forest Radiophones that use an indoor loop aerial the size of a small picture frame—and bring in the broadcast of half the American Continent. Authorized agents everywhere.



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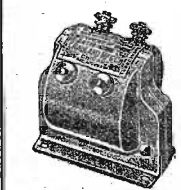
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# Meditations by the Inventor of King Miloplex

## Part XXVI—Construction of Loop Wave Trap

By the Mystery Man

**T**WO hundred and sixty-seven tro 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 inductances as they might have incorporated in their set.

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

spurse 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.

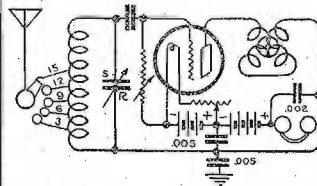
"Rawdeo is certainly maddening," yet parts and apparatus are getting better every day; therefore, we have hopes of some day being reasonably certain of going into a dealer's store and not buying other than merchandise which will do the trick. Get me right on this—I don't blame the dealer, that is, all 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 dec. wire, spacing each turn 1/2 of an inch apart. Approximately 125 feet of wire will be required to complete the above windings. Connect a wire at each start and finish of the winding and connect them to a variable condenser, having a capacity of approximately .0025 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 contiguity to oscillate at a given frequency, conditional upon the setting of the variable plates

when its inductance is energized from an outside source.

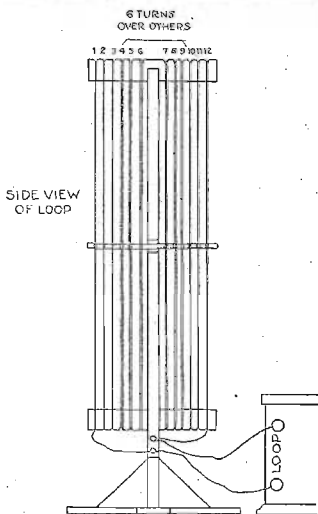
From the above it is quite apparent that we must, in order to make this circuit operate, energize it from an outside source, and in order to do this we will inductively couple it to the primary circuit. This primary circuit may be constructed by starting at the beginning of the 4th turn of your loop and winding on six turns of number 18 dec., 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 aperiodic, 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 scribbling 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.)



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 inter-

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Tuesday, November 27, during the test period between 9 and 9:30 P. M., Rev. E. A. Cole in the residence of J. A. McIver, of Roodhouse, Ill., while operating a set made of materials and in accordance with the hookup furnished by the ELGIN RADIO SUPPLY CO., tuned in 2-LO, London, England, using receivers and but one tube. Later another tube was lighted and the loud speaker used, so that four people could hear the program and concluding announcement. The numbers, time, and the order in which they were played were

**Officially Confirmed**

by the St. Louis Post Dispatch in conjunction with the National Association of Broadcasters, who had charge of the tests. (See page 34, St. Louis Post Dispatch, Dec. 2, 1923.) This same hookup has been advertised extensively as the one which brings in stations 2000 miles overland on a loud speaker and one tube; and this has been demonstrated so often as to need no repetition.

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Vol. VIII Chicago, Saturday, April 5, 1924 No. 13

## 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 strenuously 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 nationwide 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. WAORNER.



### 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? J. Noa Lorr.

P. S. Herewith is an appendix to my recent encyclopedia.

### Encyclopedia Indi-Cesticana

(Compiled by I. Noa Lott)

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

Jack.—Dough, mazama, spondulie, kale, money or anything used to purchase Radio appliances.

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

Plug.—A wooden stopper for a beer (I mean, vine-gar) keg bung.

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

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

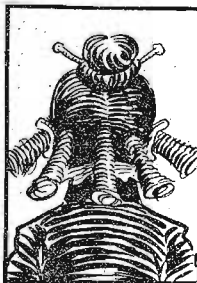
Spark.—The end of a cigar farthest from your mouth.

Tickler.—Woolen XYZ.

### Mrs. Partington Speaks Out

Dear Indi: Mrs. Partington says she's heard some oil men, or other greedy fellows is claiming a patented right to the Air, as well as on all the machinery they send it and we receive 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.

FIDDLER 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 WRAF 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 enlivenings 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

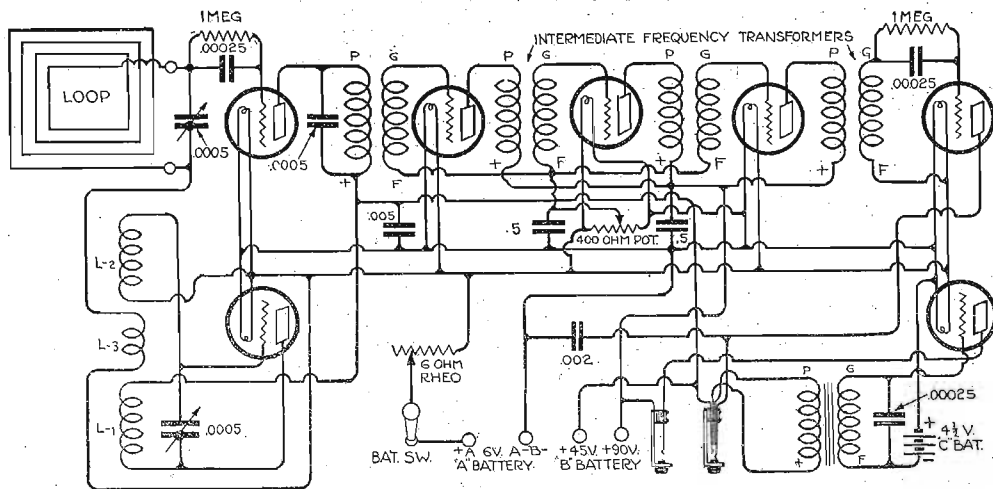


Figure 9.

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

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 3 1/2-inch tube. L-2 is the oscillator grid coil, with 42 turns of the same size wire on the same tube spaced about 1/2-inch from the plate coil winding. The pick-up or grid coupling coil, L-3, has 18 turns of the same wire on a 2 3/4-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 22 1/2-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 trying to clear up a station altogether.

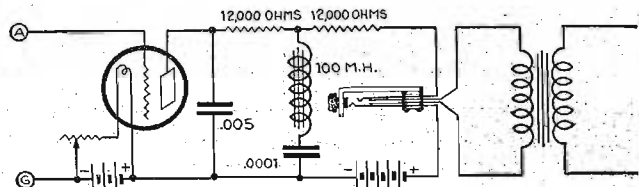


Figure 10.

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, hook 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 range, 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

Standard Merchandise Only **S. HAMMER RADIO CO.** Anything and Everything in Radio  
303 Atkins Ave. Dept. D. Brooklyn, N. Y.

**A New Simple Way to Build a Neutrodyne Set**  
We give you the entire set completely wired in a Genuine Mahogany Cabinet, with the exception of the Neuroformers and Neurotroids, which we supply and you mount yourself, for the **\$55.00** low price of **ABSOLUTELY GUARANTEED**

<p><b>PHONES</b></p> <p>\$30 Freed-Eisemann Parts for 5 Tube Neutrodyne \$65.00 None Shipped C. O. D.</p> <p>\$ 5.00 Duner, 3000 ohms. \$ 2.75 12.00 Western Electric. 8.75 8.00 Branda Superior. 4.75 12.00 Baldwin Eye Co. 7.95 7.00 Federal. 4.85 8.50 N. &amp; K. York. 6.00 5.50 Stromberg Carlson. 4.50 12.00 Dr. Subit 6000 ohms. 5.75</p> <p><b>RHEOSTATS</b></p> <p>1.00 Fada 30 ohms. 1.20 1.50 Federal 25 ohms. .85 1.00 Ameco 0 ohms. .85 1.25 Ameco 20 ohms. 1.00 1.50 Ameco 30 ohms. 1.15 1.50 Cutler Hammer 6 ohms. 1.15 1.50 Cutler Hammer 30 ohms. 1.15 1.00 Klossner 6 or 30 ohms. .80 1.00 Patent 6, 20 or 30 ohms. .80 1.25 Filbrick. 1.85 1.35 Bradley-Stal. 1.70 1.55 Franklin. 1.70 2.00 Eumostat. 1.70</p> <p><b>LOUD SPEAKERS</b></p> <p>\$30.00 Music Master. \$24.00 25.00 Neutrodyne. 23.00 30.00 Herald. 26.00 10.00 Branda Table Talker. 9.25 12.50 Public. 12.00 Baldwin Unit. 4.65 Amer. Radiohobby Unit. 3.95 Gerao Music Master Unit. 4.00</p> <p><b>JACKS AND PLUGS</b></p> <p>Patent Double Jack. .70 Patent Single Jack. .60 Federal Single Jack. .65</p>	<p><b>A 5 TUBE NEUTRODYNE SET.</b> wired complete in a Mahogany Cabinet with Genuine Fada Parts</p> <p>Dunster 6 Way Plug. \$1.20 Cico 2 Way Plug. .55 Western Plug. .50</p> <p><b>4 CIRCUIT TUNER</b> Complete parts for the improved Cockney 4 Circuit Tuner, exactly as specified by M. F. Cockney. <b>\$55.00</b></p> <p><b>VARIABLE CONDENSERS</b></p> <p><b>11-PLATE</b></p> <p>\$2.00 Signal. \$1.40 2.50 U. S. Tool. 1.50 1.80 Ameco. 1.30</p> <p><b>23-PLATE</b></p> <p>2.50 Signal. 1.60 2.75 U. S. Tool. 1.65 2.30 IT. Ameco. 1.55 2.50 Ameco. 1.95</p> <p><b>43-PLATE</b></p> <p>2.75 Signal. 1.65 3.25 U. S. Tool. 1.80 3.50 Ameco. 2.75</p> <p><b>VERNIER CONDENSERS</b></p> <p><b>11-PLATE</b></p> <p>6.00 Hammarlund. 4.95 4.50 U. S. Tool. 3.50 4.50 U. S. Tool. 3.10 4.00 Ameco. 2.95</p> <p><b>6-50 Hammarlund. 4.66</b> <b>5.00 U. S. Tool. 3.60</b> <b>4.50 U. S. Tool. 3.45</b> <b>4.50 Ameco. 3.35</b></p> <p><b>43-PLATE</b></p> <p>5.50 Hammarlund. 4.25 5.50 U. S. Tool. 4.05 5.00 Ameco. 3.65 4.50 Ameco. 3.35</p>	<p><b>EXTRA SPECIAL!!!</b> \$120 Fada 4 Tube Neutrodyne Set No. 160. None Shipped C. O. D.</p> <p>\$5.50 Ameco 28-Pl. \$ 4.10 3.00 Compensating Condenser. 2.65</p> <p><b>DIALS AND SOCKETS</b></p> <p>3" Ameco Bakelite. .45 4" Ameco Bakelite. .80 Bell Socket. .80 Mico Socket. .80 Triple Socket. 2.80 Bakelite Sockets. .45 Castion Socket. .85</p> <p><b>TRANSFORMERS</b></p> <p>7.00 Federal No. 65. 5.35 6.00 Ameco. 4.50 5.00 All-American. 3.85 7.00 American. 5.75 4.50 Thorndon. 3.75 12.50 Com Duplex. 10.60 12.50 Modern Push-Pull. 10.50 2.00 ERA. 4.25 12.00 All American P. E. 10.00 4.00 Dupliron R. F. 3.85 3.00 General Radio. 4.35</p> <p><b>POTENTIOMETERS</b></p> <p>1.25 Patent. 1.10 1.50 Ameco. 1.25 4.50 General Radio. 1.15 1.50 Klossner. 1.25</p> <p><b>MISCELLANEOUS</b></p> <p>Pathé Pushformers. \$7.95 Amplexor Coils. 5.25 Cockatay Coils, Precision. 4.50 Cockatay Coils, Eastern. 3.35 <b>AMPLEX GRID DENSER. 1.10</b> Layite Resistances. 48,000 1.10 \$2.00 Reinartz Coil. 1.40 Eria Crystals. .95 Brach Lightning Arrestor. 1.25</p>
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## Schickerling

### SUPER D X AMPLIFIER-DETECTOR

THE LAST WORD IN RADIO TUBES

**SPECIAL—DETECTOR**  
THE TUBE YOU HAVE BEEN WAITING FOR

The ideal "Detector" Tube for any set. Model S 290, 6 volt, 1/4 amp. super detector. A very sensitive gas filled tube, consuming only 1/4 amp., plate voltage 22-45 ..... **\$5.00**

**THE NEW RADIO FREQUENCY TUBE**

Model S 800, 6 volt, consuming only 1/4 ampere. The first tube ever made especially for radio frequency use. Requires 90 to 150 plate voltage. A wonderful tube ..... **\$6.00**

Ideal for Neutrodyne, Atwater-Kent, Superheterodyne, Grebe, Kennedy, Zenith, Crosley, Freed-Eiseman and all other good sets.

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Power Tube  
6 Volt 1/4 Ampere

For loud speakers of any make. No set worth while is complete without this remarkable power tube, consuming only 1/4 amp.

**MODEL S 500** **\$5**

Audio Frequency Super Amplifier  
6 Volt 1/4 Ampere

Exceptional volume. Amplifies at 45 to 90 volts. Fine detector on 22 to 45 volts.

**MODEL S 300** **\$5**

1 1/2-volt Dry Cell Tube, 1/4 amp. For one dry cell use. Fine detector on 22 to 45 volts and amplifies on 45 to 90 volts.

**MODEL S 400** **\$5**

3-volt Dry Cell Tube. 1-10 amp. Works well on two dry cells. Detector and amplifier 22 to 90 volts.

All Schickerling Tubes have standard bases. Look for trade-mark: Signature of Conrad Schickerling etched on tubes.

Mail orders promptly filled. Send money order or check direct to factory, 313 Halsey St., Newark, N. J. No charge for postage. All tubes fully guaranteed and demonstrated at our laboratories and at our authorized distributors and dealers.

The newly invented Schickerling Triangle Plate Vacuum Tubes mark a new departure in Radio progress. Sonorous, of magnificent volume, fluidly flexible, of splendid range, it lends itself with consummate grace to the greatest operatic arias, the simplest ballads or the passionate entreaty and faith of religious song. Free of distortion, a perfect revolution—and as you listen the richness of tone, the velvety smoothness of outpouring melody, will bring the singers themselves in all their magnanimity and charming personality before you.

DEALERS AND JOBBERS WRITE FOR DISCOUNTS

Made Under License of United States Patent Rights by

## Schickerling Products Manufacturing Co.

313 HALSEY ST., NEWARK, N. J.

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. Try first 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.

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.

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 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.

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.

(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 the 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 Radiophones. Twelve full page illustrations and diagrams. Price, 75 cents.

Radio for the Amateur. By A. H. Packer and R. K. 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 Radioteleg-

raphy 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.

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THE type A. B. F-F Battery Charger charges up 1 to 120 volts of "B" battery as well as 2, 4 or 6 volt "A," radio or auto battery. No fuses or trouble—anyone can operate successfully. Simple and fool-proof. The pioneer battery charger—a success for over ten years. Type A, B—Price, \$20; West of Rockies, \$22. Type B for "A" or auto battery charging, \$15; West of Rockies, \$18. "B" battery charging attachment, \$2.50 extra.

Write for new bulletin containing data on battery maintenance, station calls and wiring diagrams of basement installation of batteries. We will send name of nearest dealer.

Advertisement for the Triple Duty Charger, featuring an illustration of the device and a circular seal that reads 'CHARGES RADIO BATTERIES', 'CHARGES ALTO BATTERIES', 'CHARGES BATTERIES'. The seal also includes the text 'THE GREATEST VALUE OBTAINABLE!' and 'THE TRIPLE DUTY CHARGER'.

The France Mfg. Co.

10420 Berea Road, Cleveland, Ohio

PRICES SMASHED! GUARANTEED STORAGE BATTERIES

Quality Not Sacrificed

Here is real battery quality, guaranteed to you, at prices that will astound the entire battery-buying Public. Order direct from Factory. Put the Dealer's Profit in your own pocket. You actually save much more than half, and so that you can be convinced of true quality and performance, we give

Table listing battery prices and specifications:
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Here is your protection! No need to take a chance. Our battery is right—and the price is the lowest ever made. Convince yourself. Read the prices!
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Special 4 Volt Radio Storage Battery..... 6.50
6 Volt, 60 Amperes Radio Storage Battery..... 7.25
6 Volt, 80 Amperes Radio Storage Battery..... \$6.25
6 Volt, 100 Amperes Radio Storage Battery..... 9.75
6 Volt, 120 Amps. Radio Storage Batteries \$11.75
6 Volt, 140 Amps. Radio Storage Batteries. 13.50

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Parcel Post prepaid on all orders above \$5.00. Express Money Order, Certified Check, Bank Draft accepted; also C. O. D. Guarantee with all merchandise.

Table of radio parts and prices:
LOUD SPEAKERS: Magnavox (new type) \$27.25, Music Master 25.45, Pathe (new type) 18.50, Dictagraph 15.00, Stromberg Carlson 17.75, Mercury with Baldwin Unit 9.95, Nati. Baldwin Type C Unit 4.95, Manhattan Electric 22.50, Brandes Table Talker 9.95, Acoustical Phonograph Unit 8.45
CONDENSERS: Heath's Radian Vernier 13 Plate \$4.75, 23 Plate \$4.25, 43 Plate \$5.95, VARIOCOUPLERS: Fisher, 180° \$2.35, Wurts, 180° 2.95, Stencor, no Bus 3.75, Wurts, 180° 2.95, 43 Plate, auto 3.50, Gilliland, large 7.45, Unid., 180° 2.25, Genies All Wave 5.35, Cockaday Cell 1.85, Unid., 180° 2.95, VARIOMETERS: Fisher, large, 600 meter \$2.50, Brandes 2.95, Sleeper 5.85, Wurts 4.95, Gilliland, large 7.45, Pathe 2.65
PHONES: Turney \$2.85, Patent 3.45, Brandes Superior 4.85, Federal 4.95, National Baldwin Type C 7.95, Peerless Phonos 5.95, Wurts, Electric 3.85, Ambassador 4.50, Pathe Precision 3.25, Winner 5.90
TRANSFORMERS: Arno Audio and Radio \$3.90, All-American (all ratios) 3.90, Federal No. 65 5.95, Modern 4.50, Thorndson 3.45, Erla Reflex and Audio 4.45, Akroyd 5.95, Modern Push-Pull 10.75, Como Push-Pull 10.75, Radio Transformers 5.95

Table of complete parts sets and miscellaneous items:
Complete Parts for:
Neurodyne 5 Tube Set: 7x25 Panel 2 Single Sockets, Triple Socket 2 Neurodyne, Neuroformers, All American Transformers, Battery Switch, 4" Dials Fada Type, Power Rheostat, Vernier Rheostat, Binding Posts, Closed Circuit Jack, Filament Control Jack, 27 Ft. Insulated Tubing, 12 Ft. Tinned Bus Bar, 2 Fixed Condensers 400 Mfd., 1 Flood Condenser 500 Mfd., Grid Leak 2 Megohms, Diagram for Above Set. Our Price \$32.50
Ambassador 1 Tube Set: 1 Ambassador Coil, 1 U. S. L. 23 Pl. Ver. Condenser, 1 U. S. 0.0m Rheostat, 1 Bell Bakelite Socket, 1 .00025 Fixed Duffiler Cond., 1 3" Dia Fada Type, 1 7x12 Panel, 1 Single Circuit Jack, 1 Single Binding Posts, 12 Ft. Tinned Bus Bar, Diagram for Above Set. Our Price \$12.25
Erla 1 Tube Set: 1 Hilar Variocoupler, 1 2 1/2" Pl. Ver. Cond., 1 Bell Socket, 1 ERLA Reflex Transformer, 1 4" Dials Fada Type, 1 .0025 Fixed Duffiler Cond., 1 .001 Fixed Duffiler Cond., 1 .00025 Fixed Duffiler Cond., 3" Dials Fada Type, 1 6 Ohm Tillman Rheostat, 8 Marked Binding Posts, Switch Posts, 4 Stops, 1 ERLA Fixed Crystal Detector, 1 ERLA Bias Print. Our Price \$19.45
MISCELLANEOUS: Pathe Pulsiformers \$6.50, New Improved Cockaday \$5.50, Cutler-Hammer 30 Ohm Rheostat, Plain 1.20, Cutler-Hammer 30 Ohm Rheostat, Plain 1.20, Filokast 1.85, Brandes Table Talker 1.70, Bruno 14 Tap Inductance Sw. 70, Sta-out Phone Plug 35, Pathe Pulsiformers \$6.50, Phone Plug for 2 W. Phones 30, Phone Plug for 2 W. Phones 30, Double Circuit Jacks 45, 4" Dials, Fada Type 45, Cutler-Hammer 30 Ohm Rheostat 39, Triples Sockets, Fada Style 2.65, Marked Eby, Bind. Posts, Ea. 17, Brandes Table Talker 1.70, Shelton Midset Vernier 1.40, Freshman Grid Leak & Cond. 75

Coto "Built First to Last"

Stop the Leaks!

Save all the energy in the antenna for your detector tube. This Coto Compact Air Condenser with Vernier is so perfectly insulated that losses are reduced to a minimum. Plates are of silver plated copper soldered in place for lasting adjustment. If your dealer fails you, write us, giving his name and address and list of Coto parts you need.

Advertisement for Coto-Coil Co. featuring an illustration of a condenser and a price tag showing \$5 and \$6. Text includes 'COTO-COIL CO. 87 Willard Ave., Providence, R. I.' and a list of branch offices in Los Angeles, Minneapolis, Atlanta, and Winnipeg.

# 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

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

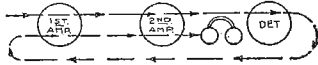


Figure 112.



Figure 113.

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.

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

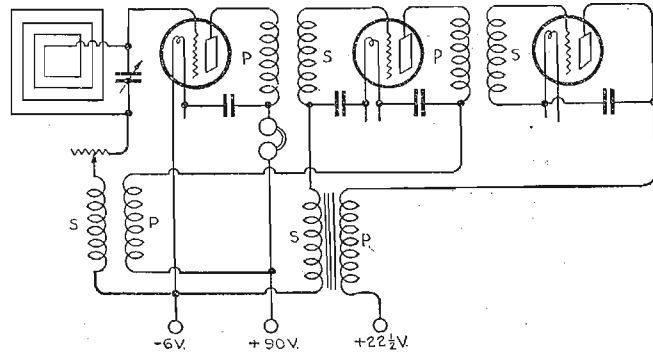


Figure 114.

### 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)

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110 Ampere Storage Battery	18.00		
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These TUNERS are in daily use within 400 feet of large broadcasting stations and enable their owners to easily and completely cut out the local station and bring in distant stations at any time on a loud speaker.

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Copyrighted diagram of this tuner, 50c, or with all parts, \$9.00. Complete instrument in walnut cabinet, ready to use, \$15.00.

A New and Wonderfully Efficient Coil for the Reinartz circuit for those who want the best. Price \$4.00, or with blueprint for either one or three tubes, \$4.50.

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Rheostat, 6 ohms	.50	9 Resistor Binding Posts	.75
3 Air Core R. F. Transformers, mounted on condensers, and 2 balancing condensers	20.00	1 6x20 Mahogany Panel	3.50
1 Potentiometer, 1850 ohms	1.05	6 Bells	5.00
3 Jacks, Carter	2.70	3 Dials	4.50
1 Condenser	.40	1 Baseboard	.50
Grid Leak	.65	24 Ft. Square Bus Wire	.60
5 Sockets, Kellogg's	6.00		
		<b>Total</b>	<b>\$33.89</b>

Panel not mounted or drilled, only \$45.50 with blueprints FREE

### CABINET FOR YOUR REFLEX NEUTRODYNE

Same Cabinet as shown on page 26, Radio Digest, March 8th issue

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**RADIO FOR EVERYBODY**

(Continued from page 23)  
through the windings of audio frequency transformers or the condensers shunting

**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

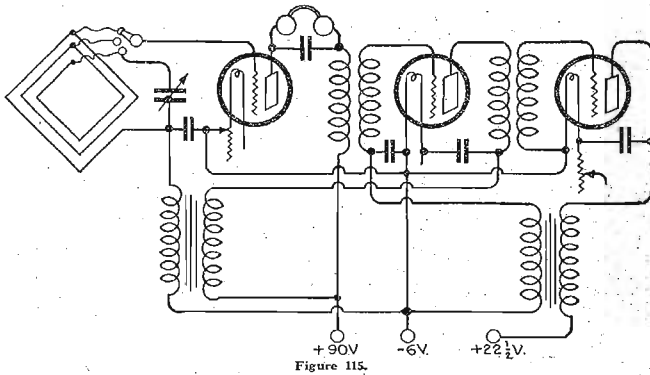


Figure 115.

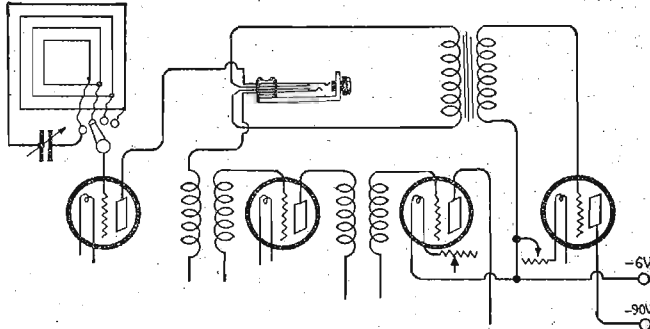


Figure 116.

them. This was the circuit which functioned so well with the old 201 tubes. which they were added. The head phones have been changed from their former position.

tion below the primary of the first Radio frequency transformer to the lead from the plate to the primary. This materially aided stability.

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 variable type.

An important point is that the audio transformers be of low ratio, not more than 3 1/2 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.)

**THIRTY MINUTE A-B-C**

(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 other 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 either 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 26)

**Type F The Air-Way Wonder Set of Radio**

"Getting Pacific coast stations strong with loud speaker on type F," writes E. S. White, Lowell, Mich. "Heard concerts from Havana, Cuba, Fort Worth, Texas, Atlanta, on a loud speaker," Austin Rhemer writes from Chicago. W. E. Culver, Savannah, Ga., says, "I get stations from all over the country loud and clear." "Picked up 72 stations—ten in Canada, and got them back any time I want them," writes Jas. Berner, Aberdeen, So. Dak. Like this hundreds certify the genuine quality and perfect performance of Air-Way—a radio set built to represent the highest permanent quality, and offered at nominal and fair prices.

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**Guaranteed Under Seal**

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# Reflex Neutrodyne Uses Crystal for Clearness

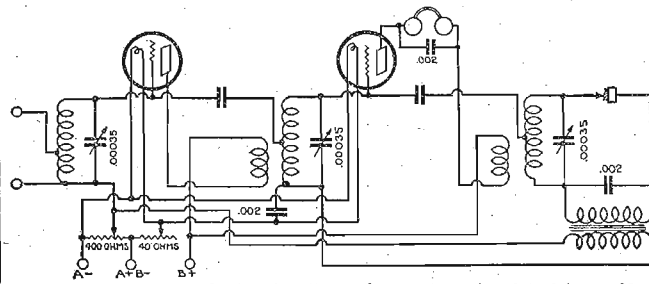
## Two R. F., Detector and One A. F. on Two Tubes

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 5/4 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 that one cannot say off-hand how far a set will receive.

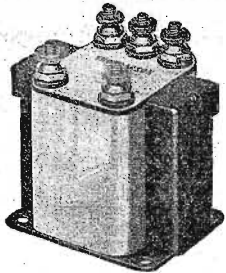
Sets constructed in like manner when located a few miles apart will show vast difference in the distance of reception. This is due to location. As to the set itself Radio frequency represents distance, audio frequency represents volume. Regeneration has, practically speaking, the effect of Radio frequency 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

## THORDARSON



### POWER AMPLIFYING TRANSFORMERS

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The new Thordarson Power Amplifying Transformers (push pull) are designed for use as third stage audio frequency amplifiers, to provide high power amplification for operating loud speaking devices.

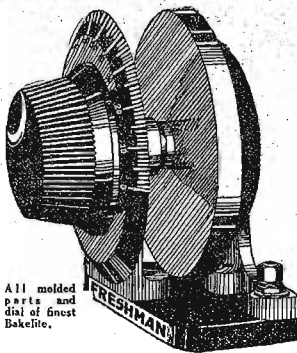
With power amplification, not only is it possible to increase volume, but, since two tubes replace the usual one, the distortion and howling which usually accompany the overloading of a single tube on the third stage is done away with entirely.

The Thordarson Power Amplifying Transformers are well constructed electrically and are capable of indefinitely carrying the additional load without breaking down.

In tonal purity these transformers equal the Thordarson Super Audio Frequency transformer whose rich quality and even amplification has made it the popular transformer of the day.

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Cannot become short circuited

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Write for FREE diagrams of Neutrodyne, Tri-Flex, Heterodyne circuits.

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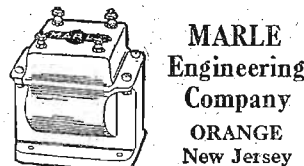
### Radio & Audio Frequency TRANSFORMERS

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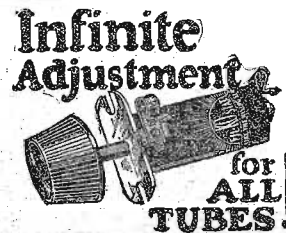
EQUAL to the widest range of reception requirements. Marle Transformers amplify the weakest broadcasting, over frequencies all the way up to 3500 cycles without variation. Perfect tone quality. Utter absence of howling or distortion. To get the most out of radio—use Marle Transformers.

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# 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—

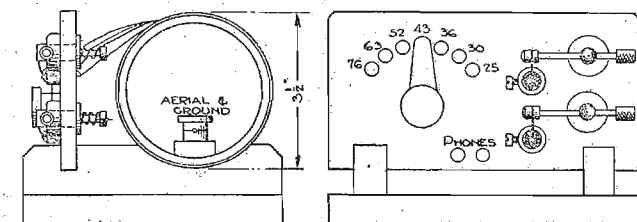
**T**HERE are many little kinks worked out at home that would aid your fellow Radio worker if only he knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. Radio Digest is very much interested in obtaining such material. Send them in with full details, including stamped envelope, 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.

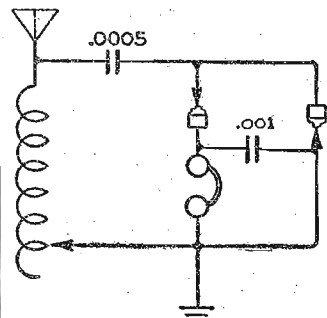
The crystals which are now available serve only as rectifiers and not as amplifiers, and must obtain all their energy from the aerial. This great absorption of energy results in broadness of tuning, so that a tapped inductance will be amply sufficient, without any additional provision for fine adjustment. 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, instruc-

## LOCATION OF PARTS ON PANEL



tions 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 pro-

portional 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)

## 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 antenna. 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.

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Manufacturers of the Universal Bradleystat

### 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.

**BARGAIN!**—A new Grebe CR12 4 tube Broadcast Receiver, regular price is \$175.00, at \$115.00. L. R. Floyd, Mooringsport, La.

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fer, 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.

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# 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 neces-

sary 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 dielectric 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 "crying" 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 microphone 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.

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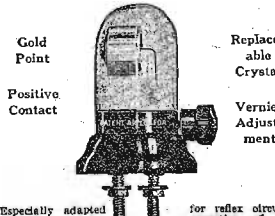
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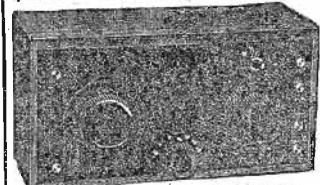


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34x3 1/2	2.25	1.95	2.25	2.25	1.95
36x3 1/2	2.25	1.95	2.25	2.25	1.95
38x3 1/2	2.25	1.95	2.25	2.25	1.95
40x3 1/2	2.25	1.95	2.25	2.25	1.95
42x3 1/2	2.25	1.95	2.25	2.25	1.95
44x3 1/2	2.25	1.95	2.25	2.25	1.95
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to hear concerts from out of town. If you want to get new stations

**ON YOUR CRYSTAL SET**

write me today. I get new records every day from people using my plans who hear programs on Crystal from stations

**400 TO 1000 MILES AWAY**

No tubes, batteries or amplifying apparatus necessary. I hear KDKA (Pittsburgh Pa.) on Galea. You may already have everything you need and just have it connected up wrong. Send self-addressed envelope for picture of my set, and reasons why you need my plans.

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# 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, 675 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

**NO AERIAL NEEDED**  
Works on any set.  
Give your set a chance. Why choke it with an obsolete, unsightly and dangerous antenna? Every modern home, office and apartment should count with this "DAN-DIE" inside wonder aerial. Scientifically and mechanically correct. Can be placed anywhere out of the way. We guarantee you stations you have had before.  
Six ft. long x 3/4 in. diameter. **PRICE \$2.50**  
Dan-Die Auto-Signal Co., El Dorado, Kansas.  
P. O. Box 734

**Baker Radio Log & Tuner**  
**SCIENTIFIC LOG SHEETS**, making it easy to tune in any station at will, and often naming the station immediately without waiting for the announcer to call it. Find more stations, all your set is capable of. Send a dollar bill with your name and address and we will mail you 10 BAKER LOG SHEETS with instructions. Money back provided promptly returned in good condition.  
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When you Get a **GLOBE K. D. Set**.  
**THE 4 TUBE SUPERDYNE CIRCUIT**  
With the famous Globe Coil unit. Front and Back Bakelite Panels drilled. Best parts used throughout.  
Tremendous volume on D. X. is the outstanding feature of this circuit. Works without Aerial. Simple to construct with our fitted parts.  
**COMPLETE OUTFIT \$35.00**  
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**COMPLETE PARTS for the 3 TUBE AMBASSADOR CIRCUIT**  
Special Globe Coil, wound with genuine Litz wire, included. Panels drilled. We use the best parts only.  
This set fills that want for clearness, selectivity and D. X. Does not radiate. Complete ready to build. Nothing else to buy.  
**\$30.00**  
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UV-201 C-301  
UV-202 C-302  
UV-201A C-301A  
UV-199 C-299  
DV-1 or 2 DV-6 or 6A  
**\$275**

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30 West Adams St.  
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RADIO TUBE SPECIALISTS  
137 Market St.  
Philadelphia, Pa.  
GLOBE ELECTRIC CO. 639 Cham. of Com. Bldg. Pittsburgh, Pa.  
WELLSTON RADIO CO. 1472 Westmont Ave. St. Louis, Mo.  
RIDENOUR, SEAYER & KENDIG  
Caxton Bldg., Cleveland, Ohio

PATENTS Procured. Send sketch or model today for examination, prompt report and advice. No charge for preliminary advice. Write for free Request and blank form on which to disclose your idea. Highest references. Promptness assured. Clarence A. O'Brien, Registered Patent Lawyer, 207-F Security Bank Building. Directly across the street from Patent Office, Washington, D. C.

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Never before offered at a price not exceeding the ordinary two or three circuit sets.  
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Sent postpaid on receipt of price or mailed C. O. D., plus a few cents extra for postal charges, if you prefer. Price **50c**  
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**WORLD BATTERY CO.**  
Dept. "L"  
80 E. Roosevelt Road  
Chicago, Ill.

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 8 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.

**INSIDE AERIAL**  
Unaffected by Wind-Rain-Snow-Lightning  
Or \$5, if four set owner's addresses are sent to us, INTER-STATE SIGNAL CO., DEPT. 1, COLUMBUS, O.

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Every one tested on stations from 300 to 1,000 miles away.  
These remarkable crystals give loud and clear reproduction without tubes or condensers. Send fifty cents (50c) by check, stamps, coin or money order for three (3) Long-Distance Crystals, with complete instructions and hook-ups.  
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Enables you to record all readings for every station. Absolutely indispensable to every fan. The student of radio secret books. Cover in colors. Beautifully bound—convenient pocket size. Bound in Mellin's emulsion cover. 43.00. At radio stores and news dealers, or sent postpaid anywhere on receipt of price. Satisfaction guaranteed or money instantly refunded. Order yours today.  
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# 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! © U. & U.



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.